

ANC



POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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FLY INTO THE HEART OF A TYPHOON

—Read this terrific story of a B-29 crew—Page 133

NEW PLYMOUTH



packed with value and ready to prove it!

Here's the sensational new standard for excellence in the low-priced car field—the brilliant new, value-packed Plymouth!

No other car at the price gives you anything like the new Plymouth's great engineering advantages. The speed and ease of Ignition Key starting . . . the thrilling performance of the 7.0 to 1 high compression en-

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Plan to visit your nearby Plymouth dealer now. He'll gladly arrange for a demonstration drive. Then you can test this car and see for yourself that the new Plymouth is the most car value you can possibly buy at Plymouth's low price!



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A NEW STAR RISES



PATENTED **CORALOX** INSULATOR

CORALOX is rising swiftly in public preference, because it eliminates the principal causes of spark plug trouble.

Fouling at low engine speeds—misfiring under heavy loads—failure due to heat shock—accumulation of oxide coating—these are primarily *insulator* troubles.

CORALOX is AC's patented Insulator. It has 4 times greater heat conductivity—10 times greater electrical resistance at high temperatures—than the best ceramic insulator material in use before **CORALOX**. It is 3 times as strong. It is basic in chemical composition.

For better and more economical performance in your car, truck or tractor, use AC Spark Plugs with patented **CORALOX** Insulator. There's a size and type for *your* engine.



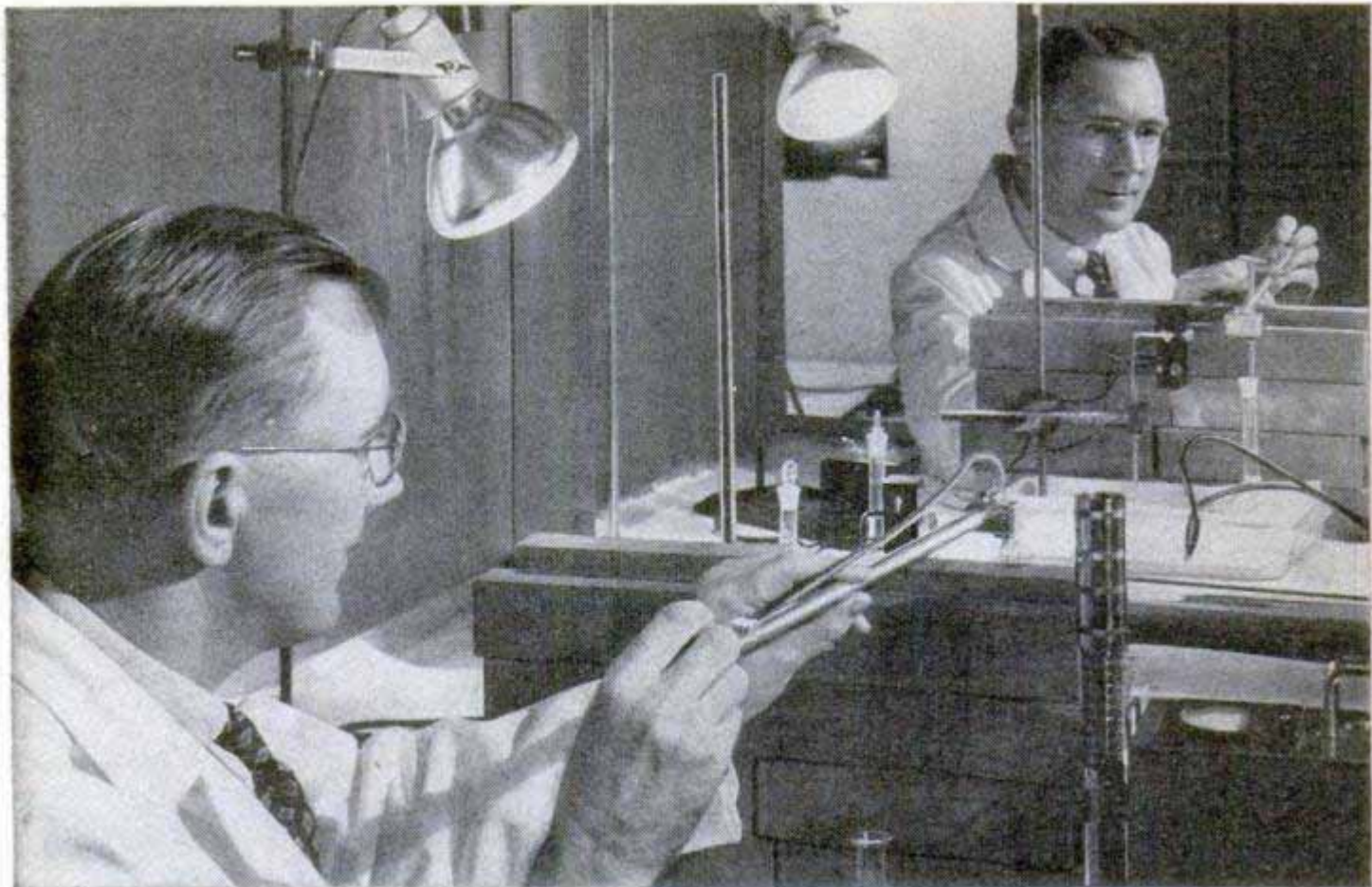
AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

MARCH 1950

This One



1



IT'S **DONE WITH MIRRORS!**

Protected by a wall of lead bricks and using a mirror to guide his instruments, this Bell Laboratories scientist is preparing a solution of a radioactive isotope, for use as a tracer to study materials for your telephone system.

Bombardment by neutrons turns some atoms of many chemical elements into their "radioactive isotopes"; these are unstable and give off radiation which can be detected by a Geiger counter. Chemically a "radioactive isotope" behaves exactly like the original element. Mix the two in a solution or an alloy and they will stay together; when the Geiger counter shows up an isotope, its inactive brother will be there too. Minute amounts beyond the reach of ordinary chemical methods can be detected—often as little as one part in a billion.

The method is used to study the effect of composition on the performance of newly developed germanium transistors—tiny amplifiers which may one day perform many functions which now require vacuum tubes.

It enables scientists at Bell Telephone Laboratories to observe the behavior of microscopic impurities which affect the emission of electrons from vacuum tube cathodes. It is of great help in observing wear on relay contacts. And it may develop into a useful tool for measuring the distribution and penetration of preservatives in wood.

Thus, one of science's newest techniques is adopted by Bell Laboratories to make your telephone serve you better today and better still tomorrow.



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Popular Mechanics Magazine

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Volume 93 MARCH 1950 Number 3

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this month's cover

SLAMMED AND WRENCHED by the mighty muscles of Nature, that B-29 on our cover is skywriting history. She is a tough old bird, the only plane ever to circle at low level through the eye of a typhoon and come out alive. She barely limped back to base, flaps twisted, rivets popped from her skin, great gaps in her wings and her fin askew. Her opponent was Beverly, as vicious a lady as ever roared out of the tropics to threaten the islands of the Pacific. Beverly started as a wisp of a cloud, then wrapped herself in a swirling wind and sped northeast, spinning like a destructive top. She toyed playfully with the big B-29, then roared on to the Arctic where a mass of polar air tore her heart out. "Look a Typhoon in the Eye" on page 133 is as exciting a story as we've ever presented, a story of weather research that reads like fiction. Artist Roswell Brown depicted the eerie battle on our cover

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

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SUPER-QUIET
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50

WAYS NEW



New rotary door latch, with nylon-plastic shock absorber in striker plate—doors close silently and securely.



Style Note—The rich, new Ford medallion on hood and rear deck marks America's "Fashion Car."



Ford's "Lifeguard" Body—now 13 ways stronger—additional heavier sealer in 41 areas for better sound and weather conditioning.



New automatic courtesy light goes on when either front door is opened—for comfort, convenience, safety.



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Dozens of other new advancements—AND 35% easier acting King-Size Brakes . . . "Hydra-Coil" and "Para-Flex" Springs... "Mid Ship" Ride . . . "Deep Deck" Luggage Locker.



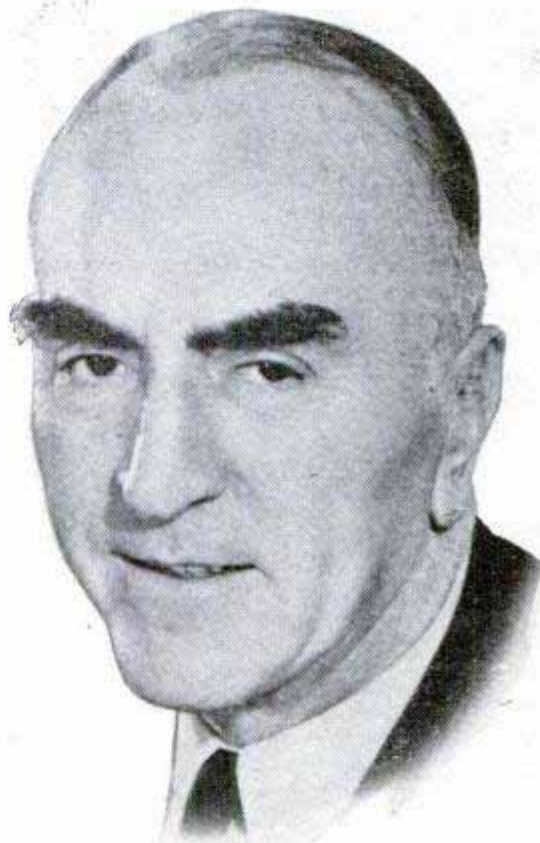
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Eddie Rickenbacker

FOLLOW THE EXPERTS

Demand



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in this corner.....

THE EDITORS



World's Largest "Pineapple"

WHEN the Hawaiian Pineapple Company announced plans for a huge water tank, the City Fathers cried out against any "eyesore" on the lovely Hawaiian sky line. The result, writes Dick Botts, author of the story on the mechanizing of the pineapple plantations (page 144) is shown here—the world's largest "pineapple."



* * *

Letter to the Editor

It has taken us just 32 years to learn that we played the part of Cupid, unwittingly, in a World War I romance of 1917. The story began at—well, let William E. Rohrer tell it himself, in the letter he wrote to the Editor:

November 1, 1949

"This is a letter I have been wanting to write to *Popular Mechanics Magazine* for the past 25 years. While serving in the U.S. Army at Camp McClellan, Anniston, Ala., in the summer of 1917, I visited the camp library and became interested in an issue of *Popular Mechanics*. While reading same I noticed the name of a girl in Jersey City, N. J. Also her address. The name was Frances Gude, 254 Sherman Ave., Jersey City. I felt the urge to write to her at the time just for the sake of correspondence. You know how it is in Army camps.

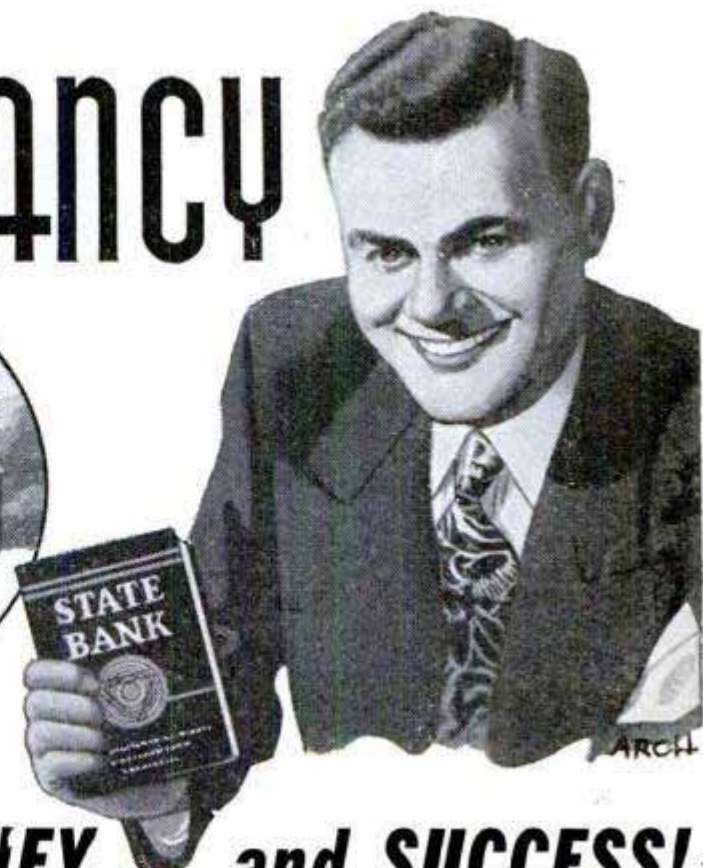
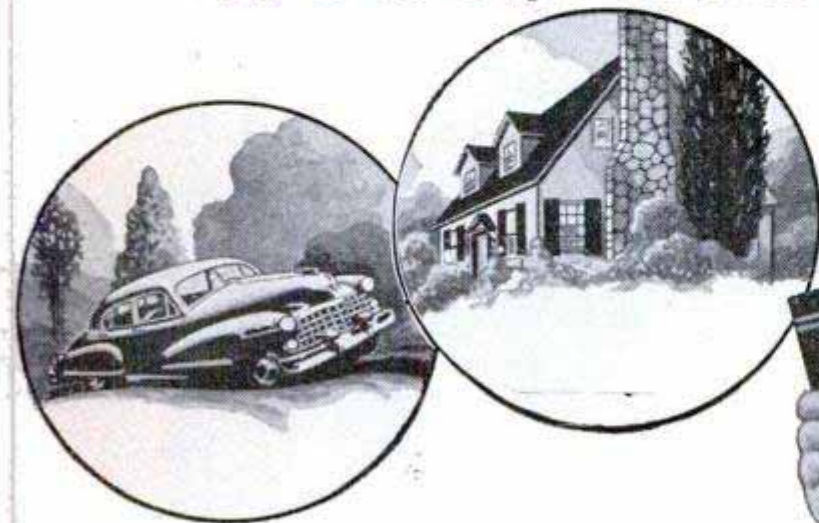
"I was 18 at the time and I later found out that she was 16. I continued writing to her during the period which I served overseas. When I returned from overseas our friendship became stronger, though I will admit I had some competition. It was not long before I had the situation well in hand.

"So on November 19, 1924, we were married.

"I want to take this opportunity to thank a wonderful magazine for introducing me to a wonderful girl who has been a wonderful wife for the past 25 years, along with three daughters. My wife has all of my

(Continued to page 8)

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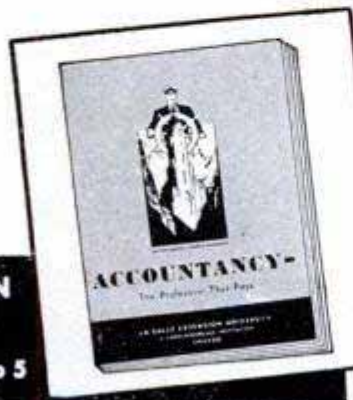
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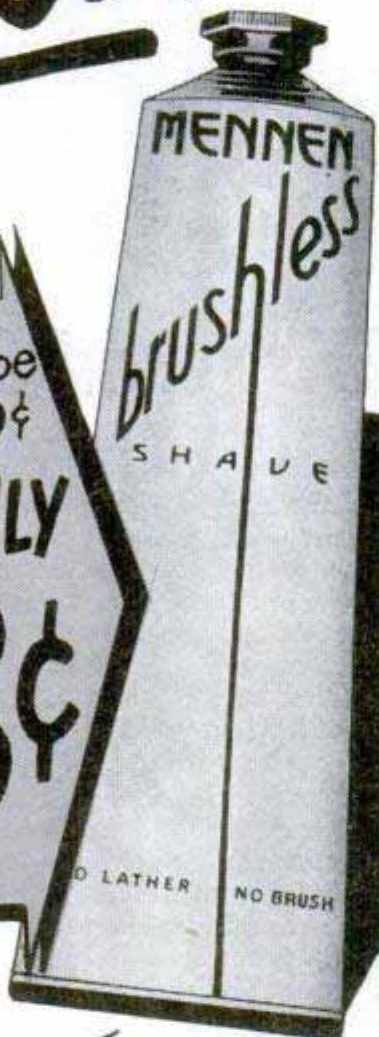
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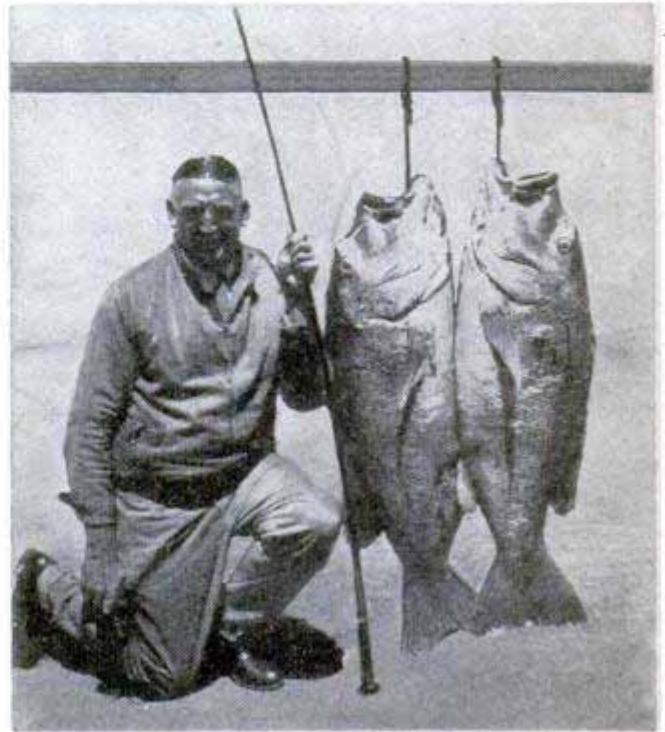
(Continued from page 6)

letters to her; her letters to me at the time we met by mail were lost when a transport was sunk in the Atlantic.

"Wishing you many successful years . . . I remain ever thankful to you.

"William E. Rohrer
254 Sherman Ave.
Jersey City, N. J."

* * *



Letter to the Editor

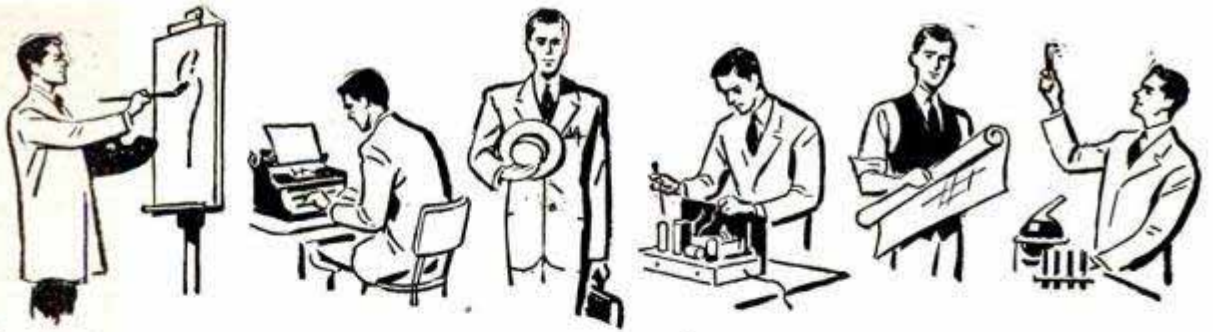
Your recent articles on fishing lures (April, May, June 1949) were very interesting. I am an ardent fisherman and we do really get some big stuff here. I enjoy the "hints and tips" given in your magazine . . . may I give you one or two?

When fishing with bait which is liable to be nibbled off by small fish, try criss-crossing an elastic band around the bait when on the hook so the small fish cannot get it off.

Iron or steel exposed to sea water . . . rusts away quickly. The following is a mixture I put on some exposed iron work 36 years ago. It is still unblemished. The proportion is as follows: Coal tar, one gallon; paraffin oil, one pint; cement, one pound; mix well, heat and keep stirring; apply hot and your troubles are over.

I enclose a shot of two red steenbras caught by me on light tackle within 25 minutes of each other from a pier at Simons-town. One was 73 pounds, the other 70 pounds. In case you get mixed, I am the person holding the rod.

Col. W. McI. Robinson,
The Firs,
Simonstown, South Africa.



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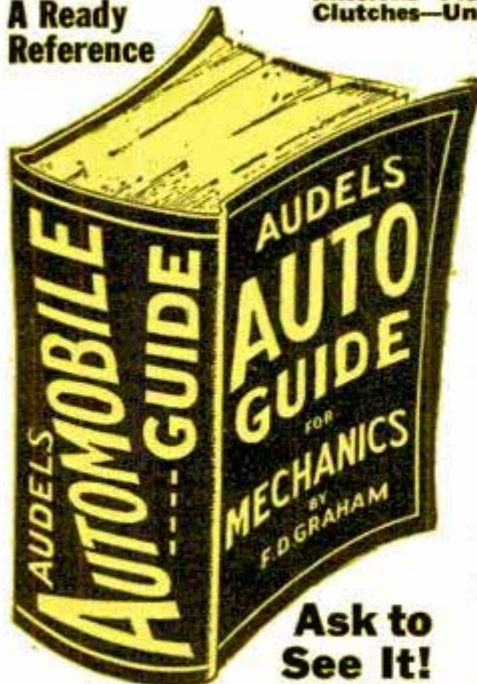
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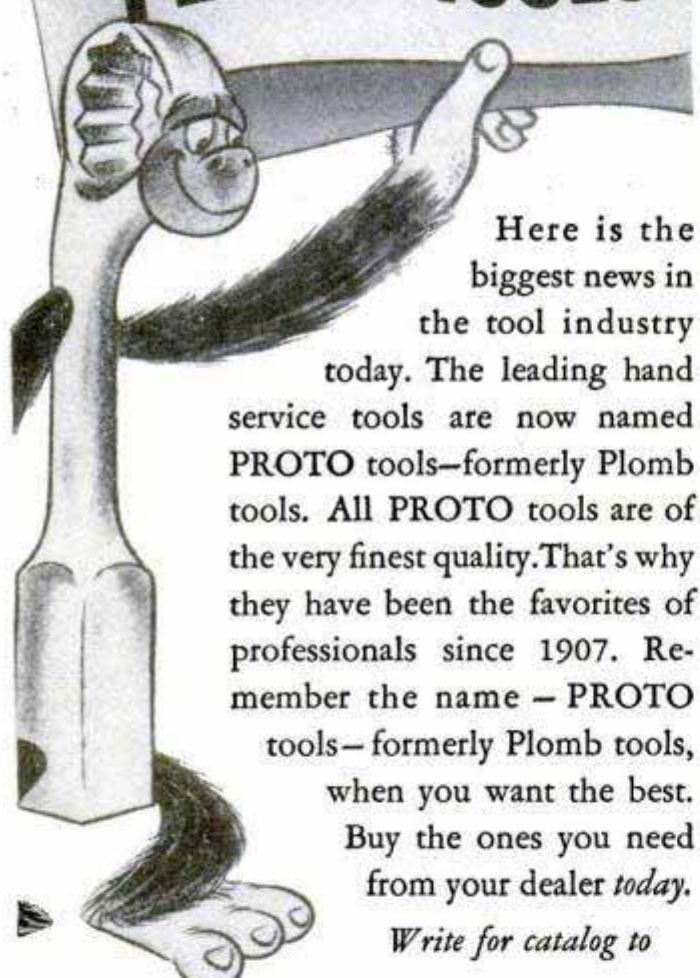
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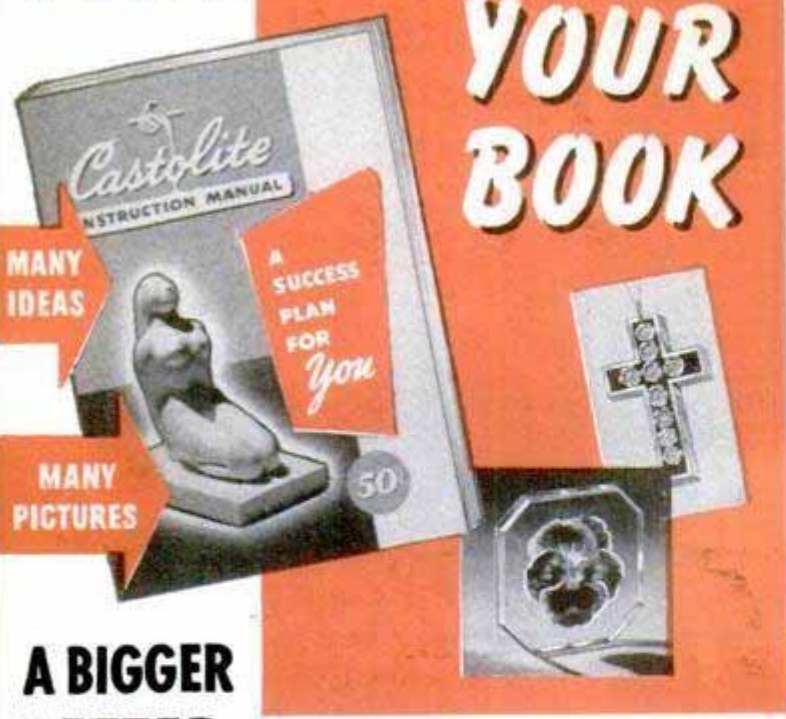
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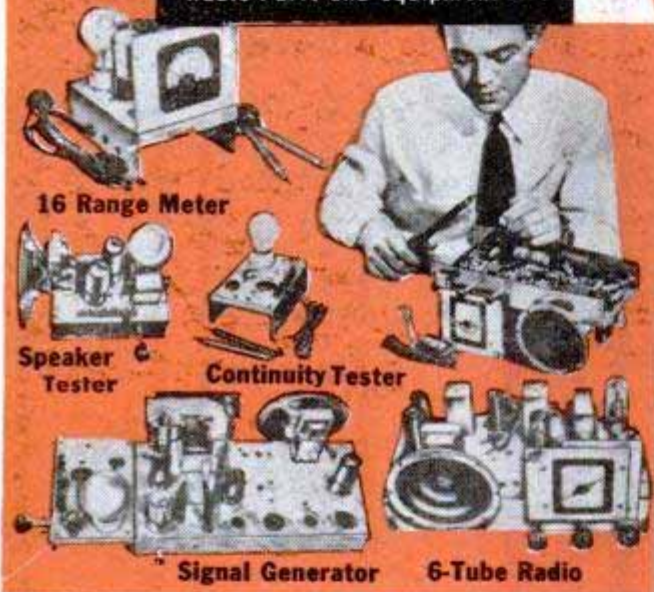
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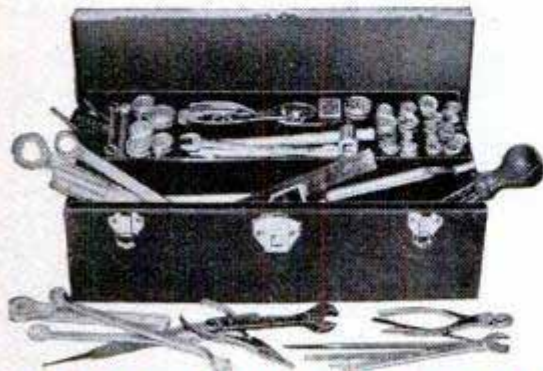
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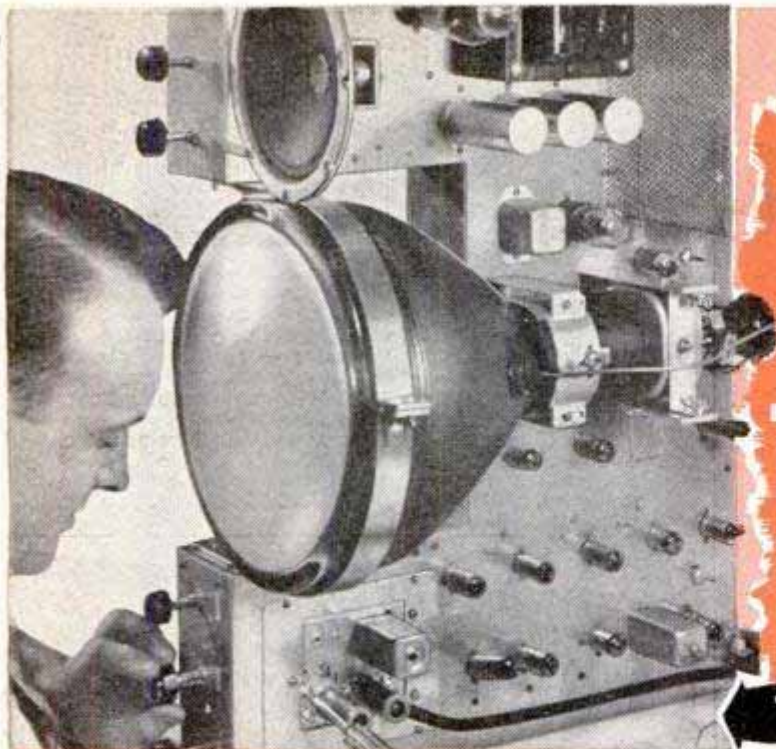
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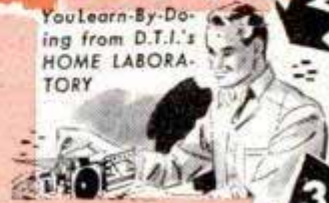
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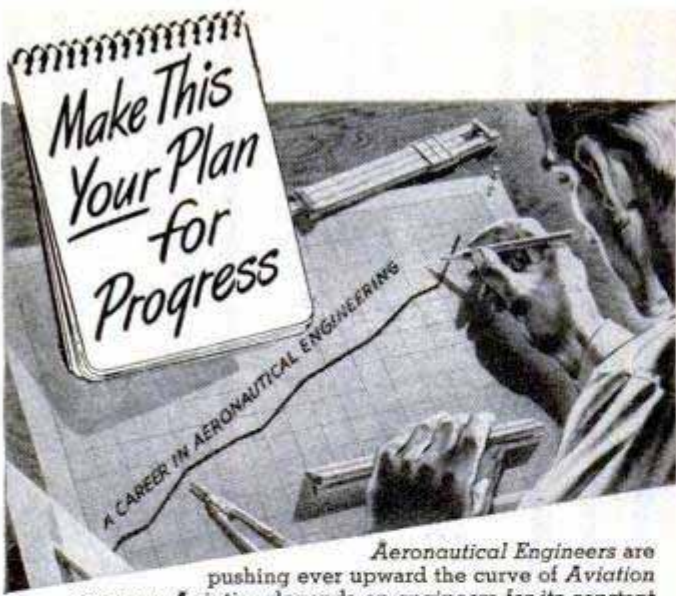
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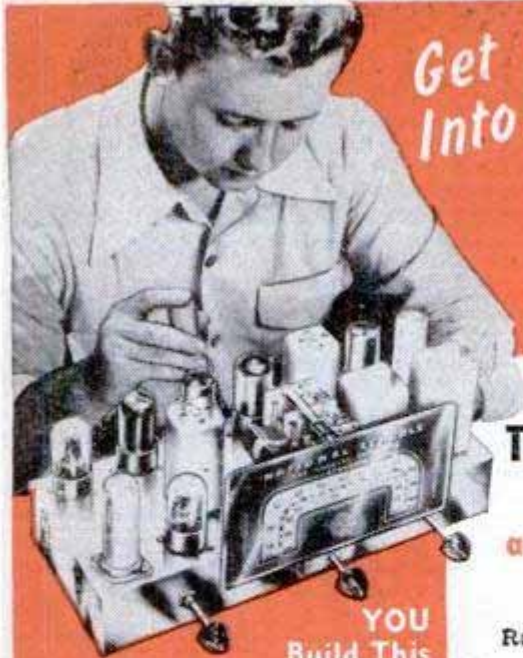


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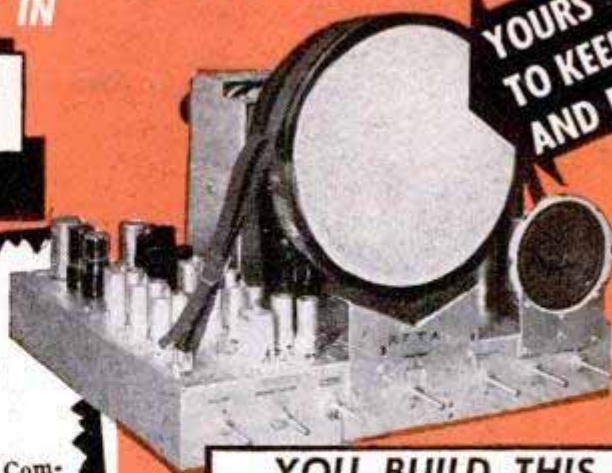
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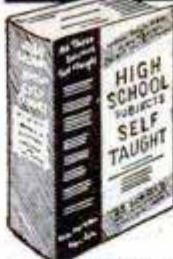
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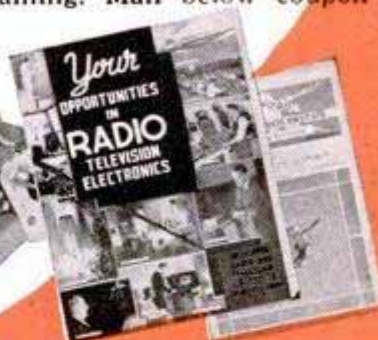
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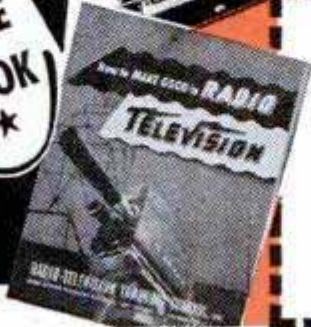
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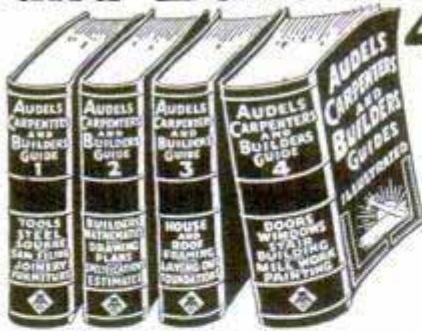
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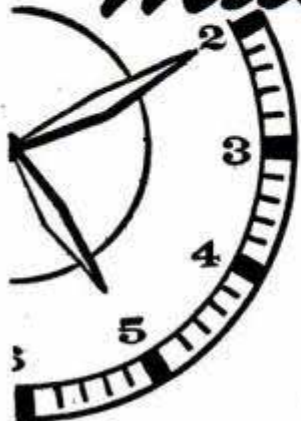
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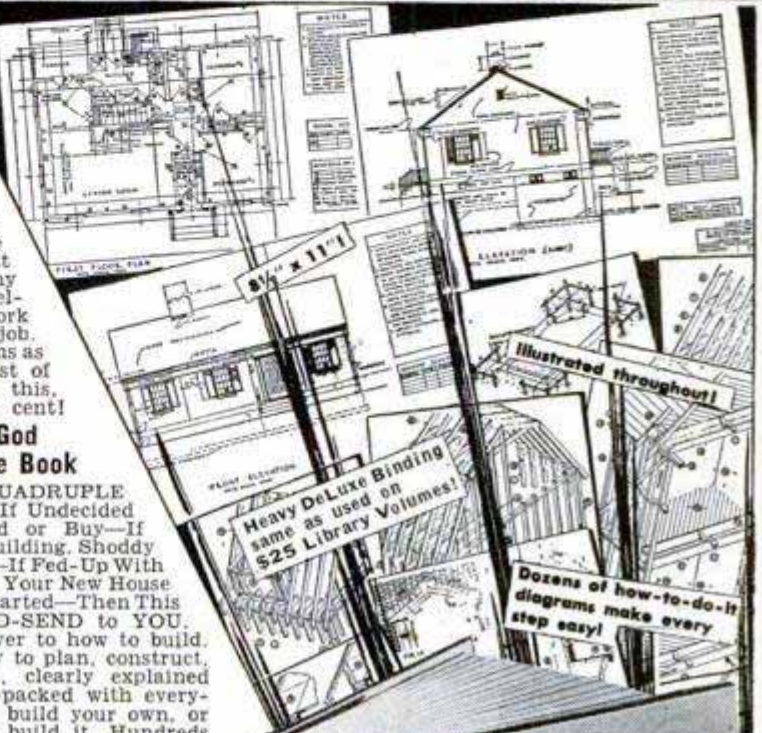
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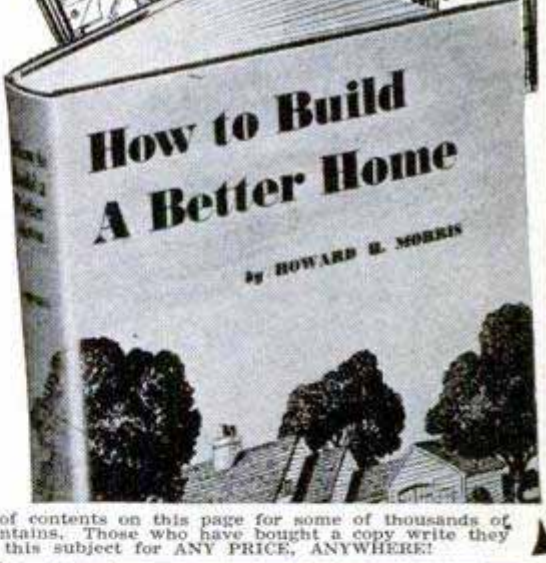
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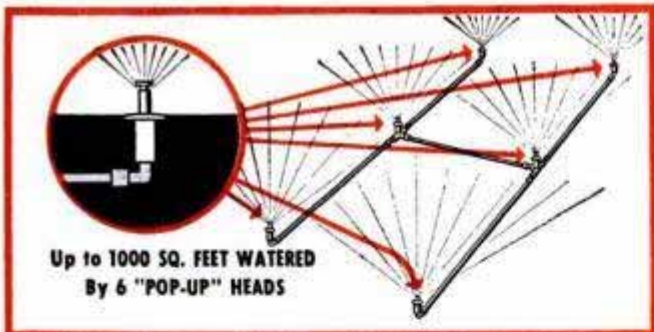
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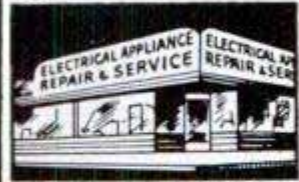


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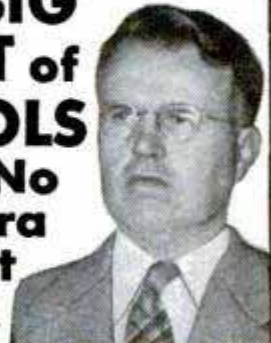
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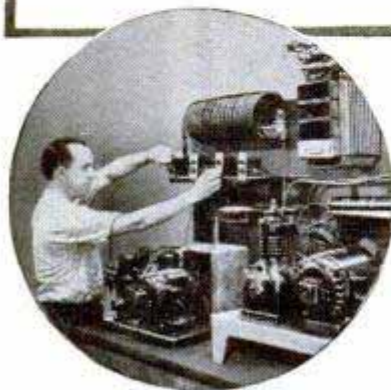
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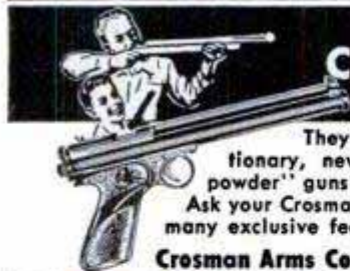
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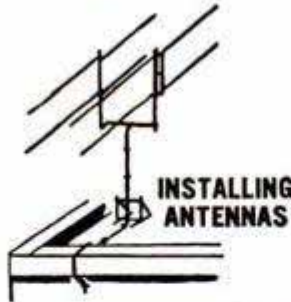
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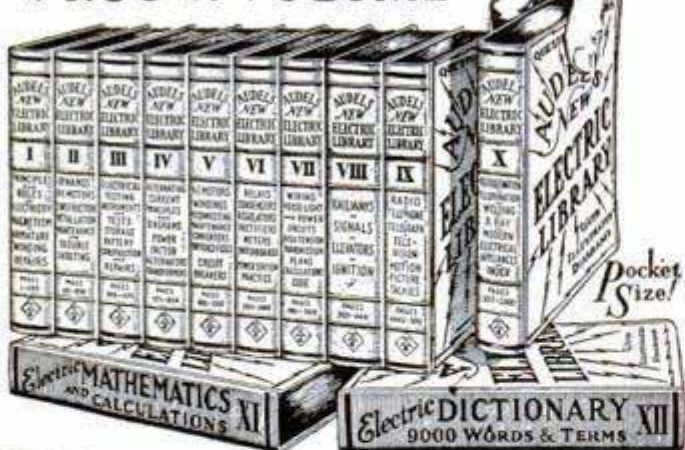
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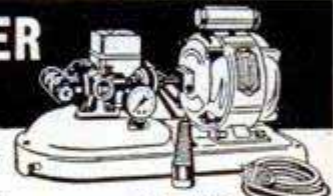
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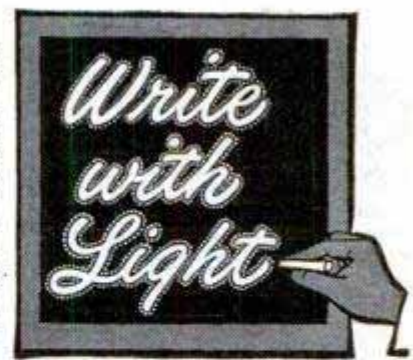
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LOCATE Opportunity in U.S.A. \$1.00. Research, 407 Washington, Shreveport, Louisiana.

EARTHWORM Breeding. Valuable bulletins on successful methods mailed free. Earthmaster Publications, Dept. 14, Sun Valley, Calif.

SPIN Angora wool into beautiful yarn at home. Easy, enjoyable work. House of Angora, PM, Springfield, Illinois.

BUSINESS Opportunities galore, hundreds successful! Interesting details free. Stout, 1110A Caesar, Pasadena 10, Calif.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for cast metal autos, soldiers, ashtrays, banks, etc. keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for full information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

POPCORN And potato chip equipment. Long Eakins Company, 5060 High, Springfield 99, Ohio.

PEARL Finishing—New, amazing. Huge profits. Start making big money first day. Free facts show easy way to \$25 to \$50 per day at home. Absolutely no experience. Be first; scoop the market. Write Pearl-Kote, Dept. R, 2111 W. Manchester, Los Angeles 47, Calif.

SEWING Machine business tops. Big money—not crowded. Spare time home set-up. Repair course, new machines, motors, etc., wholesale. Hurry. Taylor Service, PM, Hamilton, Ohio.

LEARN The letter shop and addressing business. Complete copyrighted information; \$2.00. Rosdahl Industries, 72 W. Washington St., Chicago 2, Illinois.

PROFITABLE Mail order plan. Details free. Stanley Skinner, Star Route, Nicholson, Penna.

PIANO Tuning learned at home. Free information. Empire School, Champaign, Illinois. (Est. 1935.)

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

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

DRESDEN Craft figurine molds and many others, natural liquid rubber, statuary plasters, flock finishes, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

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

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

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RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 8, Illinois.

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HOW To set up and run a mirror shop! Resilver mirrors. Make chipped glass nameplates. Electroplating salts and rectifiers. John Sprinkle, V60, Marion, Indiana.

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

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

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

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

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

BIG Money regraining, refinishing automobile dashboards, garnish mouldings. Write Outman Service, 4323 So. 38th, St. Louis 16.

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

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

MOLDING Rubber for hobbyists, industry, classroom projects! Flexible molds easily made from the best quick-drying white liquid rubber! (Gallon, \$7.95; quart, \$2.95; sample half-pint \$1.00) prepaid parcel post! Plastercraft Supply Co., 3051 St. Clair Ave., Cleveland 14, Ohio.

LEARN Electrical appliance repair. House wiring, motors, washers, cleaners, refrigerators, lamps, auto ignition, etc., complete illustrated course. Tools furnished. Free booklet. Pacific School, 7219 South Broadway, Los Angeles 3.

SELL By mail. Good deal with nice profits. Home City Services, Box 1062-PM, Springfield, Mass.

OWN A printing business. Good profit printing cards, stationery, etc., in spare time. Easy rules furnished. Have home shop. Write for details. Kelsey Corp., Meriden 24, Conn.

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GROW—Sell potted flowers, vegetable plants. Details free. Shiffer Associates, Box 129, Millersburg, Penna.

PROFITABLE Home business. Start on small capital with latest tested formulas. Interesting booklet free. Pont, Box 635-XM, Terre Haute, Indiana.

SPECIAL Rubber for making molds. Literature and sample free. Universal, Box 1076-A, Peoria, Ill.

MAKE Money at home decorating greeting cards. We supply instructions. Powell, 5713-C Euclid, Cleveland 3, Ohio.

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

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

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

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

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

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

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

BIG Time mail business propositions built-to-order. Professional preparation-production. Personal guidance. Descriptive bulletin free. National, Box 88-Z, Dorchester 22, Mass.

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SHARPEN And gum saws for others. Build machine yourself. For crosscuts, woodlot circulars, bucks and bow saws. Saves hand labor. Illustrations, instructions \$1.00. Satisfaction guaranteed. C. Lashley, Wellington, Ohio.

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RAISE Tadpoles and frogs for pleasure, profit. Free booklet. Specialties, Whiting 3, Indiana.

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ELECTRICIANS Make big money. Earn while you learn. Students supplied with materials at wholesale prices. For complete information, send fifty cents for one of our dollar bantam flashlights. Credit allowed on course. McCarty Electric Corporation, Kalamazoo, Michigan.

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HOME Book shop opportunity—Get orders by mail. New! Different plan! Big profits. Everything furnished. National, Box 88-K, Dorchester, Mass.

FREE Facts! How you can make big money in new, different, exciting home mail business! Smith, Box 2592-A, Hines, Illinois.

MADE \$24.50 Using money making plans from Scherer Magazine, Box 775M, Alliance, Ohio. Year \$2.00. Sample 20c.

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

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PRIZE Contests! How and where to win your share! 25c coin (refundable). National Contest Bulletin, Box 2685-P, Miami 16, Florida.

MONTHLY Contests. Cash prizes. Magazine subscription \$1.00. Fezler, Patchogue, N. Y.

5 GUARANTEED Plans! Enjoy building up national mail order business. Information sheets, free. Vargo Company, 9080-M Lyon Street, Detroit 17, Michigan.

EARN Money by mail, like I do! Free details. House of Friendship, Bowen Court, Douglas, Mass.

EARN Money at home! Amazing lesson tells how. Sample 25c. Write Income Builders, Hollywood 508, Calif.

COLD Cash at home! No selling, investment, experience. \$5-\$15 hourly! Proof: Aichner, 267-A Maple, New Wilmington, Penna.

\$82.00 FROM Scrap wood, spare time, first month I used this method. Plans, instructions \$1.00. E. Bunnell, Tarpon Springs, Florida.

HUGE Profits using easy to apply luminescent products. Catalog, liberal samples 25c. Glowelico, 475-B Fifth Ave., New York 17, N. Y.

OPERATE Concessions at carnivals, fairs, shows. Surprising details. Stampico, Detroit 4, Mich.

URANIUM — Prospecting, information free. Write Sharpe, Prospector, Box 142, North Battleford, Canada.

"OPPORTUNITIES Preferred Magazine" tells how. Sample, 25c. Glen, Howel 3, Kentucky.

"WESTERN Advertiser" offers many worthwhile money-making opportunities. Sample copy 3c. H. Edlund, 577 Kensington, Los Angeles 26, California.

EASY Ways to earn extra income are described in Money-Making Hobbies. 132 projects you can make at home and sell anywhere. 160 pages, \$2.00. Popular Mechanics Press, 200-MH East Ontario, Chicago 11, Ill.

RAISE Ginseng. Roots bring fortunes. Circular free. Fezler Seed Co., Patchogue, N. Y.

MAKE Flexible arch supports. Profitable business. Tunis System, 1341 Kwis, Puente, Calif.

WANT Notary Public appointment? Official in usually 10 days. Stationers Exchange, Boerne 50, Texas.

UNPAINTED Figurines. Free list. Progress Company, 4033-P Chowen, Minneapolis 10, Minn.

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

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

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

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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.

FORMULAS, PLANS, ETC.

MILLER'S Modern post-war formulas make products that get the business. Fifty years supplying the best. Literature free! Miller, Manufacturer's Chemist, Tampa 6, Florida.

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

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

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

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

PLASTICS

PLASTIC: Sheets, cut pieces, and scrap in clear and colors. Rod, tubing, acetate, dies, jewelry findings. Send \$1.00 for 4 pound scrap assortment and fabricating manual. Regal Plastic Supply, 720 Main, Kansas City, Missouri.

ADHESIVES For thermoplastic materials. Lucite, polystyrene, celluloses. Half pint \$1.00. Craft Chemical Lab, 453½ East Exchange St., Akron 4, Ohio.

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

INTERNAL Carvers—Guaranteed fast cutting, high speed, tapered drills with sharp points that make carving easier. 1/16", 3/32"-80c; 1/8"-\$1.00 each postpaid. Send for literature. Bay Sales, Dept. B, 101 Fifth Ave., New York 3, N. Y.

EMBED Real flowers, butterflies, shells, photos, to make unusual coasters, plaques, tiles, jewelry, buttons, other objects with new liquid plastic. Crystal clear or colors. Saw, carve, turn, drill. Use only home tools. Big, picture-packed manual shows how to make things very first day. Book also explains proved 6-point success plan for starting your own profitable plastics business. Send 35c for "A Success Plan for You." Castolite, Dept. C-101, Woodstock, Illinois.

SPECIAL Prime masked 6" x 12" Plexiglas sheets 3 for \$1.25 postpaid. Carving drills 1/16" 75c; 1/8" 85c each postpaid. Free catalogue. Craft Plastics, Somerville, New Jersey.

AMAZING Liquid plastic kit \$3.25. Embed photographs, keepsakes, coins. Makes solid objects, clear, colors. Beautiful results in half hour. Easily tooled. Inexpensive hobby. Send 15 cents for catalogue. Kristalon Plastics, Dept. Z-30, Box 29, Wilmette, Illinois.

PLASTIC Engineer and consultant, 65 East Rich Street, Columbus 15, Ohio.

EARN Money with plastics. New book, "Money-Making Hobbies," shows you how. 160 pages, \$2.00. Popular Mechanics Press, 200 E. Ontario, Chicago 11, Ill.

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

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

WHOLESALE Plastics supply catalog, 10c. Lucite, clear, colored. Metallic acetate, 15 colors. Thick lucite cutoffs, polished blanks for carving. Metal findings, tools, ideas, bargains galore. Quantity prices on casting plastic. Gem-O-Lite, Box 686S, North Hollywood, Calif.

CHEMISTRY

USEFUL Laboratory item, catalog of chemicals, laboratory apparatus, 10c. Rex Laboratories, 2849A Birchwood, Chicago 45, Illinois.

NEW, Used catalog 10c, refundable. Atlantic Laboratory Supply, 21 Wenham, Boston JP, 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, N. Y.

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

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

SNOOPERSCOPE Tube. Permits nighttime vision. Tube and complete instructions \$14.95. Limited quantities. Infrared filters 15c. Precise, 942 Kings Highway, Brooklyn 23, New York.

TUBULAR Ultra-violet light units for laboratory or hobby, \$4.50. Write for details. C. Warner, 82-60 116 St., Kew Gardens 15, New York.

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

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VENETIAN Blind salesmen. Full-part time. Liberal commissions. Kraft, 309-68 St., Brooklyn 20, N. Y.

WANTED. One boy in every town to work during spare time advertising our Cleo safety razor blades. Write for information. Cleo Razor Blade Co., Easley, S. C.

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MAKE 1950 Your biggest year. Sell improved Shopwell shopping bag. Every housewife prospect. Quick turnover. Over \$1.00 profit. Bonus plan. No investment. Sample \$1.50. Request free catalog fast selling items. Johnson Brothers, 730 Illinois, Morris, Illinois.

TRIPLE Your investment—Sell brushes, waxes, deodorants, household necessities. Send for catalogue. Frank-Lin Brush Co., 91 Allyn St., Hartford 3, Conn.

COLLECT Easy profits to 100%. Sell biggest line greeting cards. Plastic everyday, comics, gift wrappings, scented floral stationery, hankie gifties, plastic tablecloths, novelties bring money galore. Bonus. Write today for deluxe all-occasion, little pearls assortments on approval and special offer. Tom-Wat Studios, Dept. PM, Bridgeport, Conn.

CANVASSERS! Crew managers! A penny post card brings you full details on how you can become a direct factory dealer in your area without any risks, with our beautiful, popular priced, fast selling stainless tableware. Guaranteed for lifetime! Enormous profits! Dept. PM, John Hull Cutlery Corp., 1239 Broadway, New York City, N. Y.

EARNINGS Of \$25 to \$100 weekly possible selling established family shoe line direct to consumer. 70 styles. Amazing comfort features. Samples to producers. Experience unnecessary. Mench Shoes, MH-27, Brockton, Mass.

"SUCTION" Auto washer. New invention. Mirror finish. Banishes autowashing drudgery. Lightning seller. Samples sent on trial. Kristee 145, Akron, Ohio.

MONEY In your pocket! Profits to 100% yours selling sensational greeting card values. Everyday, religious, birthday, children's, little pearls, gift wrap assortments, gifts. Experience unnecessary. Special offers. Request samples personal imprinted stationery and deluxe all-occasion assortment on approval. Holiday Card Co., 463 Congress, Dept. E, Portland, Maine.

FREE Samples personalized stationery. Napkins, coasters, matches bring you extra money! Customers buy on sight. Profits to 100% selling sensational new plastic greeting cards, gift wrappings, children's books. Big demand. Experience unnecessary. Write today. Senrab Co., 129 North Warren St., Syracuse, N. Y.

GREETING Card moneymakers. Birthday, Easter, mothersday. Catalog free. Greenport Art Company, Brooklyn 15, New York.

BRAND New! Amazingly different and smart everyday cards. Magic window designs. 2 in 1 metallics. Take easy orders. Pays up to 100% cash profit. Big line of everyday assts. retail 60c up. Personal stationery, coasters, napkins. Free imprint samples. Assortment on approval. Write today. North Star. 31 Glenwood, Dept. G-18, Minneapolis, Minn.

BOYS! Earn big money easy, spare time selling brass name plates for neighbor's doors. Write Hubstamp, 359-C Congress, Boston, Mass.

\$85.00 WEEKLY Selling 4 pair shoes daily direct. Free outfit. Samples. No investment. Experience unnecessary. Advance commissions, bonus. Paragon Shoes, 739 Columbus, Boston, Mass.

EASY Dollars even for beginners! Sell friends plastic greeting cards, scented stationery. Profits to 100%. Bonus. Glamorous metal foil, little pearls, hankie gift greetings. Irresistible novelties. Free samples imprinted, decorated stationery. Deluxe all-occasion samples on approval. Special offers. Write Pilgrim Greetings, 111 Summer, Dept. AN-3, Boston, Mass.

MAKE \$50 Selling America's leading all-occasion greeting card assortments. Samples on approval. Complete line fast money makers. Free samples imprinted and monogrammed stationery, napkins and guest towels. Write Lorain Art Studios, Dept. AO-1, Vermilion, Ohio.

REAL Cash income! Sell exclusive cushion shoes insulated against summer heat. Advance commissions. Bonuses. Free new selling outfit. Concordian Shoes, G-2 West Concord, Mass.

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

AMAZING Offer—\$40 is yours for selling only 50 boxes. Also entirely different, new deluxe all-occasion assortment with television card, Little pearls, hankie gift greetings, other surprise items. Feature boxes on approval. Free samples imprinted stationery and rose scented notes. Write today. It costs nothing to try. Cheerful Card Co., 1226, White Plains, N. Y.

EXTRA Money! Sell new, different greeting cards. Complete line includes regal plastic assortment, metallics, "stand-up" and "double" cards. Free samples exclusive imprinted and engraved stationery. Sales kit on approval. Regal Greetings, Dept. PM-13, Hazel Park, Mich.

TIE Salesmen—Sell the finest quality and fastest sellers in \$1.00 and \$1.50 neckwear direct. Write: Wolfmark, 931 W. Roosevelt, Chicago, Ill.

FEATHER Bird pictures. Sample 25c. A. Staff, 7975 Lakeshore, Rt. 1, Port Huron, Mich.

300% PROFIT Selling razors. Send 25c for sample. 4-S-Razor, Hutchinson, Kans.

SPARE Time, \$50 up, selling top line everyday greeting, personalized stationery, napkins, coasters. Victory Studios, Mt. Vernon, N. Y.

SELL Stainless steel, burglarproof window guards. Free details. Sample: 25c. Artware, 11110 Ventura, North Hollywood, California.

MEXICAN Feather pictures. Big profits! No investment! Free details. Sample 10c stamps. Silvia-P. Apartado 9036, Mexico City.

AT Last! Something new and sensational in everyday cards. Make extra money fast! Show gorgeous satin velour metallic cards. Get orders easy. Scented stationery, charmettes, napkins, kiddie cards. 25 other assts. retail 60c to \$1.25. Samples on approval. Puro Co., 2801 Locust, Dept. O40-C, St. Louis 3, Mo.

SELLS Fast to housewives. Book of 760 household hints. Sample with prices—\$1. King Sales Service, 55-P Oleander, West Springfield, Mass.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 146, Akron, Ohio.

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, Delaware 13, New Jersey.

AGENTS Wanted. Amazing repeat profits. New medical discovery—Saf-Te-Gard Vaporizer. Kills 85% germs, viruses. Send for details. Sample \$1.75. Sells \$2.50. Hunssinger Sales Co., 8526 So. Ada St., Chicago 20.

SOAPSAVER—New, magic, automatic measuring device for all granulated substances. Eliminates waste. Distributors wanted. Price \$1.20 dozen, retails 25c. Soap saver, 3410 Glenway, Cincinnati 5, Ohio.

"GLINT" Amazing new cleaner concentrate. Simply mix with water. Cleans windows, dishes, woodwork like magic. Whirlwind seller—great repeater. Excellent profits. Carhoff, 9321 Buckeye, Cleveland, Ohio.

SPARETIME Profits operating your own magazine subscription agency from home. Also handle all type greeting cards, stationery. Big confidential catalog and supplies free! It costs you nothing to try! Cassell Service, Westfield 3, N. J.

AGENTS—Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sales plans make sales easy. Permanent repeat business. Powerful premiums and free door openers for easier sales. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. M-3, Chicago.

STARTLING New product—No competition. Tremendous field. Good profit. Free sample. Ford Prod. Co., 7143 S. Claremont, Chicago 36.

THEY Smiled when I went out to sell! "My family humored me—thought me too old to work. I earned \$50.00 my first week." Free selling outfit. Consolidated Shoe System, Dept. S-541, Chippewa Falls, Wis.

CASH In now! Sell Forcolcar Canasta cards, Pixie cameras, Woody Woodpicker toothpick dispensers, novelty weather forecasters, greeting cards, stationery, and other items. Samples c.o.d. on request. Details free. Sunshine Sales, Dept. W-P2, Loudonville, Ohio.

EXTRA Money! full or part time selling "Sunshine Line" religious cards. New all-occasion greeting cards and Christian correspondence notes. Special new gift wraps with religious motifs is a winner. Write Triumphant Art Publishers, N9, San Jose, Calif.

OUR Agents are making big money, reaping tremendous profits. Write today for agents' proposition. You can now obtain pure silver in liquid form under our trade mark Liquid Silver. Nothing like it on the market. When applied with cloth it will immediately deposit a new layer of pure silver on copper, brass, bronze, rusty or tarnished auto bumpers, etc. L & D Mfg. Co., 270 Delancey St., New York 2, N. Y.

SENSATIONAL Nylons guaranteed against runs. Nationally advertised. Not sold in stores. No experience or money needed. Also lingerie, robes, men's hosiery. Outfit, sample, etc. free. Wonderful opportunity earn big money spare or full time. See our full page advertisement on page 71. Kendex Co., Babylon 546, New York.

AMAZING Opportunity. Big money. Demonstrating roll of honor Bible. We instruct. No invest. Col. Smith, 1211 Chestnut, Room 603-D, Philadelphia 7, Penna.

JOIN Manufacturers "Products of the Month Association" and get California's hottest selling lines. Sponsored by manufacturers. Dollar bill brings membership, and, Hollywood's newest \$1.95 automotive accessory. Director, Box 2470, Hollywood, California.

FAST Seller—Big profit. Sell our book "Be a Photographer's Model in 10 Days." Copy 50 cents. Money back guarantee. Schick Publishing Co., 631 Third Ave., New York City.

MAKE Big money with fast selling item every automobile operator will buy for \$1.00. Send \$1.00 for two introductory samples or \$5.00 for one dozen samples, postage prepaid. Peggio, 117 Arch Street, Philadelphia 6, Penna.

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

SAMPLE Power mowers \$74.50; garden tractors \$77.00. Seasonal selling is most profitable. Ohio Power Equipment Service, Wakeman, Ohio.

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

BIG Money in decals—Entirely new line of name plates. Tremendous demand. Also terrific new monogram display set ups for retail stores. Sells on sight. Constant repeats. Excellent side line printing and advertising salesmen. Free samples. Enco, 817 W. Cumberland, Philadelphia 33, Penna.

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

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

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 5277, Cincinnati 3, Ohio.

FREE Samples, and amazing plan, giving you gorgeous dress without penny cost. Rush name today, with dress size. Harford, Dept. B-435, Cincinnati 25, Ohio.

AMAZING New discovery makes hats, shoes, garments, etc. rainproof at home. Big profits. Amhar Industries, Plant 5E, Huntington, New York.

MAKE Money calling on friends. Show nationally advertised greeting card assortments. 16-card all occasion assortment only \$1.00. Also birthday, gift wrapping, plastics, imported English napkins, floral stationery, children's books, many more! Up to 50c profit on each assortment. Experience unnecessary. Samples on approval. Write Wallace Brown, 225 Fifth Avenue, Dept. J-4, New York 10.

HOUSE Paint—Your name on label. Agents wanted. Experience unnecessary. Free sample. Certified Products, Louisville, Ky.

STEADY Profits—No investment. Earn \$50-\$75 weekly spare time. \$100-\$250 full time. Plastic aprons, tablecloths, etc. Free catalog. Halliday Co., Dept. M-3, 347 Broadway, Passaic, New Jersey.

FREE Literature—Thousands wholesale supply sources. Money-making business ideas. Wilkin Company, Hillsboro 2, Ohio.

\$1 STARTS You in business. Sell top quality \$1.00 ties. Now only \$7.20 dozen, your profit \$4.80 dozen. Regular \$1.50 up values. Send \$1.00 for introductory offer two ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-41, New York 10.

HOT Special! Power mowers \$59.50. Delivered. World's cheapest. Modern, 7401-AC, North Kansas City, Mo.

\$18 An Evening for you! Spend just two hours showing housewives exclusive D-Frost-O-Matic refrigerator control. Saves time, food, money. Sure-fire sales plan. Write today. No obligation. D-Frost-O-Matic, 6 N. Michigan Ave., Chicago 2.

NEW! Birthday party pack. Be first! Sell this sensational new assortment. Contains everything but the food. The invitations, table cover, napkins, nut baskets, place cards, snapper hats, cups, plates, game booklet and six different games; a complete party for eight. Sample \$1.25. Also America's leading greeting card line featuring personalized stationery, napkins, book matches and exclusive new wedding invitations. Free samples. Elmcraft Chicago, 5930 S. Western, Chicago 36, Illinois.

EASY Sales! Guaranteed button hole maker \$1. Fits any sewing machine. Large profits. Particulars free. Telford Sales Company, Telford 1, Penna.

SELL New clothing. Lowest prices. Operate from home, auto, store. Enormous profits. Big catalog free. National Mail Order, 1219-F South Jefferson, Chicago.

SELL Balloons! Combs! Novelties! Excellent sideline. Carleton House, Texas City, Texas.

DRESSES. 18c; Coats \$1.00, blouses 35c. Free catalog. Crown, 164-P Monroe Street, New York 2.

WHERE To buy 800,000 articles and nationally advertised merchandise direct from manufacturers and jobbers. Sent free. "Buy direct and make bigger profits." Glass Pub. Co., Ellwood City 7, Penna.

\$100.00 FAST—Easy. New office necessity does it. Hudson, 934 Lakeside, Chicago 40.

BE Renewal headquarters for all magazines. Handle everything at home. Big profits. No experience—no capital needed. Free catalog tells how. Write: McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

DOUBLE Your income—Sell wool and cotton uniforms, badges, initial buckles, belts, etc. Write Hook-Fast, Box 480PM, Roanoke, Va.

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.

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

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

NEWEST Money-making sensation, miniature authentic replicas, police and firemen's badges also pocket pieces, key chains. Write for descriptive folder. Hook-Fast Specialties, Dept. 20, Box 1425, Providence, R. I.

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

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.

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

SCHOOL Seniors—Earn 40% commission 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.

LOOK! Make money all year round selling personal initialed individualized belts, buckles, cap badges, tie holders, complete line police and firemen's badges. 2000 emblems to choose. Big profits, whole or part time. Please write today special outfit offer. Hook-Fast Specialties, Box 1425, Dept. 6, Providence, R. I. Established 1926.

SEWING Machine electrification kit. Nationally advertised. Has Good Housekeeping Guaranty Seal. Can be demonstrated and sold in 5 minutes. Make at least \$5 per sale. For complete details write today to Brownell Distributors, Inc., Dept. PM, 308 Canal St., New York 13, N. Y.

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

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

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

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

PHOTO-Salesmen-agents. Sell beautiful hand-colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

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

CLEAN Up with plastic rayon towels. Powerful quick demonstration. Ink, grease rinse right out. Every home, every business a prospect. Package 6 towels sells \$1.00. Gross \$54.00. Send \$1.00 sample package. Sunbeam Products, 701 Third St. So., St. Petersburg, Florida.

HIGH-GRADE SALESMEN

50% COMMISSION, Steady repeat orders. Lifetime income, free outfit. Nichols Company, Purvis, Miss.

SALESMEN. Earn \$50 weekly, selling only three pairs shoes daily. Commission and bonus. Wide variety for men, women, children. No investment. Experience unnecessary. Free catalog. Tanners Shoes, 559, Boston, Mass.

SALESMEN—Sideline. Earn \$3,000 next 5 months selling calendars, advertising specialties. Buyers everywhere. Big commission advanced. Samples free. Continental Calendar, 542-A South Dearborn, Chicago.

INDUSTRIAL Maintenance, write for free prospectus. Own your own business. Pioneer Chemical Manufacturing Co., 1828 Columbus, Cleveland 13, Ohio.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7x11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 525, New York City 7.

SELL New automatic floor waxer. Trigger on handle. Hands never touch floors or wax. Retail \$2.95. Profit 125%. Write Smith, Inc., Greenfield 29, Mass.

MAKE \$15.00-\$30.00 Daily selling full size shopping bag that folds into purse size. Firestone plastic; looks, wears like leather. Every housewife wants one. Details free. Vinyl Industries, 839-P N. Western, Chicago 22.

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., Dept. M-350, 7530 Greenwood, Chicago.

SENIORS Electric air deodorizer. Minute demonstration sells 9 out of 10. Long profit. Free introductory offer. Melco Products, Inc., 24 East Hennepin, Minneapolis 1, Minnesota.

CALENDARS And advertising novelties. Full time or side line. Every business wants them. Few calendar salesmen are on the road now which means more sales for you. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Ill.

OVER 50% Profits—New concealed automatic fire control. Quality closes sales. Red Ball Inc., Box 1552, Salt Lake City, Utah.

EARN Big money fast! Sell finest-quality advertising work uniform to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. A-30, Rochester, Ind.

BIG Money selling tooth powder. J. Walker, 633 Plymouth Ct., Dept. 1, Chicago 5, Ill.

SALESMAN Wanted. Make over \$100.00 a week. Each sale you make \$10.00. Selling on instalment watches: Bulova, Longines, Elgin, Benrus at \$2.00 weekly easy to sell. We supply samples. Car necessary. For new open territories. Furnish references. Ergim Co., Inc. (Wholesalers), 992 Columbus Avenue, New York City.

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-3, New Holstein, Wisconsin.

SENSATIONAL Nylons guaranteed against runs. Nationally advertised. Not sold in stores. No experience or money needed. Also lingerie, robes, men's hosiery. Outfit, sample, etc. free. Wonderful opportunity earn big money spare or full time. See our full page advertisement on page 71. Kendex Co., Babylon 546, N. Y.

JOIN. Salesman's Club. Education, social. Fraternal. Application. Professor Martin, Bonners Ferry, Idaho.

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.

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

EDUCATIONAL AND INSTRUCTION

LEARN The collection agency business. Highly profitable. Easily mastered. Free folder. Cole Associates, Syracuse 2, N. Y.

NEW Profession—Pedemetry (foot correction). Learn at home. Write: American Foot Health Institute, 514 S. Sacramento Blvd., Chicago 12, Ill.

WANT \$66.34 a week? U. S. civil service jobs. Men, women. You can qualify now for secure positions. Many openings expected soon. Write today for free 40-page book showing jobs, salaries, sample tests. Franklin Institute, Dept. C-24, Rochester, N. Y.

LEARN Auto or diesel mechanics for higher pay. Actual shop training in our up to date Chicago shops. Approved for veterans and civilians. Established 1902. For free information write to Greer Shop Training, Dept. 210C, 460 South State Street, Chicago 5, Illinois.

PRINTING Correspondence course with type. Work for others or in business for yourself. Printing S. Institute, 4328 Lincoln, Chicago 18, Ill.

STUDY To be a doctor of psychology or metaphysics. Obtain Ps.D., Ms.D., D.D. or Ph.D. degree. Chartered by state. Write for free book telling how. The Neotarian Fellowship, Dwight Building, Kansas City 6, Missouri.

LOCATE Missing persons, hidden assets. Be a credit investigator or skip tracer. Free details. Continental School, 492 44th Street, Oakland, California.

INVESTIGATOR—Criminology courses. Free literature. Allied Schools, 14 No. East, Indianapolis.

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

EXPORT-Import! Big money and world-travel opportunities. Represent buyers, sellers. International mail order without capital. Practical inexpensive course teaches you quickly at home in spare time. Free book Mellinger, 103W, Los Angeles 24, Calif.

MAKE Up to \$35-845 week as a trained practical nurse! Learn quickly at home. Booklet free. Chicago School of Nursing, Dept. M-3, Chicago.

"HOW To Break and Train Horses"—A book every farmer and horseman should have. It is free; no obligation. Simply address Beery School of Horsemanship, Dept. 1103, Pleasant Hill, Ohio.

USED Correspondence courses and educational books bought, sold, rented. Catalog free. Educational Exchange, Summer-ville, Ga.

INCREASE Your earnings—Learn watch repairing at home. Ten easy lessons. We furnish free watches and all tools. A licensed school. Large percentage of students make up to \$40 a week in spare time while learning. Write today for free information. Illinois School of Watch Repairing, Dept. CPM-3, 2870 Elston Ave., Chicago 18, Illinois.

NON-Resident courses: High school, college. Earn Triplespeed selfstudy short-hand. Capital City College, Washington 5, D. C.

FREE—Bookkeeping lesson, particulars. Buchalter, 1280 Ocean Avenue, Brooklyn 30, N. Y.

PHOTOGRAPHIC Mind with Super-memory. Write Thor Books, M-3, Box 1210, Chicago.

BECOME Mail order specialist. Operate own profitable business or assist others. New course reveals successful methods of the experts. Free information. Mail Business Associates, Inc., 919 State Tower, Syracuse 2, N. Y.

BE A real estate broker through home study or classroom instruction. Write for free book. Approved for veterans. Weaver School of Real Estate, 15 E. Pershing Rd., Box CP-3, Kansas City 8, Missouri.

MIND Asleep? Try "Thinking-Alphabet." Write Frank Tibolt, 17M, Philadelphia 20.

VOICE! Priceless secrets! Free information! Studio, 14356B Jersey Avenue, Norwalk, California.

READ With speed! New amazing method. Save time. Learn more. Earn more. Send for free home test and details. Brownson, 9111 Hoyne, Chicago 20.

LINGUAPHONE Makes languages easy. At home learn to speak Spanish, Portuguese, Italian, French, German, Russian, by quick, easy Linguaphone Conversational Method. Save time, work, money. Send for free book. Linguaphone Institute, 83 RCA Bldg., New York 20, N. Y.

HOME Bible course. Simple, helpful, instructive. Total cost \$4.00 includes textbooks, stationery, examinations, certificate. \$1.00 starts you, or simply request prospectus. The Bible Study School, 378 Van Houten Street, Paterson 1, N. J.

HOME Study course, drugless therapy. Free literature. Institute of Drugless Therapy, Tama, Iowa.

ELECTRIC Appliance service handbook with catalog C-50, \$1.00 (refunded on \$5.00 order). C-US Supply, 2512 Prevost, Fort Worth 7, Texas.

YOU For president of your own credit-collection business. Many who answered our ads now have their names on office doors. Franklin Credit, Roanoke 7, Va.

INVESTIGATOR Training. Phillips Secret Service System, 1917-B North Ken-neth, Chicago 39.

HOW To get a job the scientific way. Take your pick of the jobs you should have. Secure your future. Send for details. Bushnell, 25 Union Park, Boston, Mass.

USED Correspondence courses. Bought, sold, rented. Free literature. Baker, 5509-B Winthrop, Chicago 40.

INVESTIGATORS Needed in every town. National, 3911 Tacon, Tampa 9, Florida.

USED Correspondence courses and books bought, sold, rented and exchanged. Catalog free. Lee Mountain, Pisgah, Alabama.

BOOKKEEPERS! Increase your earnings! Operate your own simplified "dollar-a-week" bookkeeping and tax service. Full or spare time. Details free. No obligation. Ellis, Box 200, Cedar Grove, N. C.

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SHORTHAND In one week. Easy long-hand system. \$1.48. Self-instructor. Free literature. Zinman, 215F West 91, New York 24, New York.

SECRET Investigation. Experience unnecessary. Investigators particulars free. George Wagner, M 125 West 86th, New York.

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute, Box 973-J, Austin, Texas.

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WRITE For pay. Proven-easiest way! Receive checks for \$3 to \$100—offered daily, for re-writing ideas in newspapers, magazines, books. C.C., Mich. writes: "Received check for \$27." Mrs. R.C.B., Mass., writes: "I made \$20." No previous experience necessary. Write for free details and how to get free Writer's Market Guide! Comfort Writer's Service, Dept. 1-L, 200 South 7th St., St. Louis, Mo.

I WANT New writers to cash checks of \$1 to \$100 offered daily. The easiest way to write for pay. No previous experience necessary. Free details. Saunders M. Cummings, 468-11 Independence Bldg., Colorado Springs, Colo.

BUSINESS SERVICE

LET Me re-mail your letters from Boston, The Bake Bean City, 20c. William Cuppello, 24 Mayberry Ave., Medford 55, Mass.

MIAMI Postmark! Letters 25c each; \$3.00 monthly. McDowell, 504 Pacific Building, Miami 32, Florida.

SPECIAL SERVICES

CUBA—Letters remailed, 25c each. R. Morejon, Box 1291, Havana.

ATTENTION Manufacturers, home shop operators, hobbyist, salesmen. Let us show you where you can buy everything you want, have parts made, sources of supplies, tools, machinery, etc. This is not a mailing list. We choose reliable manufacturers, suppliers, importers that can furnish exactly what you want. Save time and money by buying direct. List of five for only \$1.00, additional 15c each. Minimum order \$1.00. Guaranteed prompt service. Tell us what you want. We'll furnish names and addresses of reliable sources or refund your money. John Allis, Box 214, Mount Clemens, Michigan.

MAKE Our Chicago address yours for profit and prestige. Business or personal mail. Low rates. Free details. Schultz House, 3116 Seminary, Chicago 13.

INVESTIGATION And cash liquidation—Old or recent stock certificates, bonds, bank books, promissory notes, deeds, wills, financial documents of every description. Send us your list for appraisal. National Evaluators, P.O. Box 5852, Cleveland 1, Ohio.

DRAFTING, Mechanical design, detailing. Send sketch and particulars for estimate. Robert Worsham, 5635 Cottage Grove, Chicago 37, Ill.

"CUSTOM Die cutting." cork, rubber, paper, metal, to any shape. Medco, 416 S. 6th Street, St. Louis 2.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

LEARN Professional lettering. Easy, experience unnecessary. Amazing mechanical process. Complete instructions, 75 alphabets, 250 designs \$1.00. Major-Art System, 3510-B Palmer, Chicago 47.

CARTOON Your way to success! Internationally known instructor. Raye Burns, will personally teach you to create salable, original cartoons at home. Course of 26 lessons only \$2.85. Send remittance with order or write for free details and addresses of successful students. Raye Burns School, Box 3583-M, Cleveland 18, Ohio.

130 ALPHABETS, Many numerals. New \$1.50 book for sign men, students. Special \$1.00. Gray Associates, 3852 North Oakley, Chicago 18.

EDITORIAL Cartooning—Tells how and where to get ideas, \$2.75. ISCM Press, Ames, Iowa.

CARTOONISTS! 150 Basic stick-figure drawings by "Zin," nationally famous cartoonist. Makes cartooning easy; only 25c! Latest free lance market guide. Lists 150 magazines paying \$3-\$40 per cartoon, \$1.00. Zin, Box 10215, Tampa, Fla.

SHOWCARD Writing pays big! Learn rapid, artistic lettering quickly, easily. Our low-cost course shows how. Details free. Sherwood Publishing Co., Irvington 7, N. J.

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 93-C, Pleasant Hill, Ohio.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Advertise. Argyle 2-B, Wisconsin.

BARGAIN, Quick landscape painting, poster art—lettering, art lessons, catalog 10c. Art Book Shop, Arnold 8-D, Missouri.

TALENT Test, information. Give age. Art, Box 8066, Dallas 8, Texas.

SIGN Painting taught at home. Test lesson free. Ben Kerns, Box 812-T, Greenville, S. C.

CHALK Talks. Laugh producing program, \$1.00. Catalog 10c. Balda The Cartoonist, Oshkosh, Wisconsin.

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

BETTER Sales letters—Stronger ads. Complete advertising service any size budget. Write fully. Monroe, Box 1002, Chicago 90.

TRADEMARKS Designed complete with cut, \$10.00. Rough sketch, \$1.00. Catalog free. Burke, 3208 McKinney, Dallas.

MAILING Lists: \$5.00-1000 up. Write Dixie Service, King, N. C.

FREE! 1949 Advertisers Rate and Data Directory, 52 pages! E. H. Brown Advertising Agency, 20 N. Wacker, Chicago 6.

ADVERTISERS! Reach nearly 18,000,000 readers. 23 Sunday national key newspapers, 18 words, \$51.50. "Terrific pullers." 20 popular newspapers, \$10.00. "Free booklet." Special—One inch display 2-821,198 circulation, \$48.30. Newmark's Advertising Agency, (Established 1893), 317-7th Ave., New York 11.

ADVERTISE! 24 Words, 40 newspapers \$3.50. Lists free. Advertising Bureau, 10511-C Springfield, Chicago 43.

AVOID Costly advertising mistakes. Get enlightening Ad-Guide and Ratebook leading newspapers, magazines, mailing lists, 10c. Chicago Advertising Agency, (Established 1900), Chicago 4.

24 WORDS In 50 weeklies, \$4.96. J. Darnell, 730 Hays, Jackson, Tennessee.

REACH Spanish-speaking mail-order buyers. Great new market for your merchandise. Your classified ad in the Spanish Edition of Popular Mechanics will bring you some nice business from this new field. Rate only 25c per word. Circulation 100,000 copies. Mail a trial ad right now. Popular Mechanics Magazine (Spanish Dept.), 200 E. Ontario Street, Chicago 11, Ill.

ADS Placed in out of town newspapers and magazines. Low rates. Catalogue free. Ideas that pay. Baker Advertising Agency, Successors Ankrum Agency, 189 W. Madison, Chicago 2.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

FAST Figuring secrets in "How to Use the Chinese Abacus." \$1.00. Low-cost fast adding-calculators available. Free circulars. W. D. Loy, 1317 R.I. Ave., N.E., Washington 18, D.C.

ADDING Machine, Desk model portable \$12.95. Business Taxtimer, \$7.00. Details one stamp. Johnson, 2611 Harriet, Minneapolis 8, Minnesota.

PHOTOGRAPHIC Stencils for your duplicator. Free information. Smith Co., Halfwaytree—21, Jamaica, B. W. I.

RECONDITIONED Typewriters, printing devices. Write Dixie Service, King, N. C.

NEW, Selffeeding mimeograph prints postcard to full letter size. Only \$27.50. Factory discount to distributors. Dansen Company, Hopkins, Minnesota.

ADVERTISE. Increase business. "Printomatic" selffeeding "mimeograph" post card duplicator prints, reproduces, thousands anything typewritten, handwritten, \$13.50. Literature. Pittsburgh Typewriter Company, 336-3 Fourth Avenue, Pittsburgh 22, Penna.

RUBBER STAMPS AND OFFICE SUPPLIES

MIMEOGRAPH Paper, 68c ream, samples. Brookman, 56-A West 24th, New York 10.

RUBBER Stamps. Send for catalog. Excello, Box 500, Shreveport, Louisiana.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

BUSINESS Cards—Blue or black raised lettering. 1000 guaranteed \$3.40. C-U's Supply, 2512 Prevost, Fort Worth 7, Texas.

EMBOSSED Cards, envelopes, letterheads. Samples. Spada Enterprises, 4 Eastview, Rocky Hill, Conn.

YEAR'S Supply personalized printed memos, (2000) with beautiful bakelite desk holder, packaged for each month, only \$3. Indispensable. Print name clearly. Memos. Bovey, Minn.

BUSINESS Cards—Raised printing. Blue or black. 1000 \$3.50 postpaid. Samples. Arthur Mitchell, 220 Arguello, San Francisco, Calif.

100 EACH Noteheads, envelopes, printed name, address, \$1.15. Gooch, 202PM, Hernando, Miss.

1000—6 $\frac{3}{4}$ WHITE Wove envelopes \$3.75 f.o.b. Ideal Printing Company, 225 State, Hudson 7, New York.

100 8 $\frac{1}{2}$ x 11 **HAMMERMILL** Letterheads and 100 envelopes, \$1.85. Herbert Hudson, Centredale, R.I.

PRINTING. Lowest prices. Free samples. Belanger's, 51-X Talcott Ave., Rockville, Conn.

500 2x3 **TWO** Color shipping labels \$2.25. General printing. Myers Company, 1228-C Adams, Owosso, Michigan.

ECONOMICAL Printing; state requirements. Odum Supply, Box 9345, Tampa, Florida.

250 **ENVELOPES** And 8 $\frac{1}{2}$ x 11 bond letterheads \$3.00. Webpress, Farmland, Indiana.

1000 **BEAUTIFULLY** Embossed business cards \$2.75. Avery, 112-M Elizabeth, Wichita 12, Kansas.

MIMEOGRAPHING. Modern vari-typed, 500 for \$3.50. Samples free! Creamer, Box 737, Lowell, Massachusetts.

ENCLOSE Stamp for lower prices. Crane, Box 7625-D, Kansas City 3, Mo.

100 8 $\frac{1}{2}$ x11 **HAMMERMILL** Letterheads and envelopes printed—4 lines \$1.75. Samples. Rex, 446 East 87th Place, Chicago 19.

QUALITY — 150 Business cards or 60 noteheads and envelopes, \$1. Free price list. Johnson, A-24, 140 Spring, Rochester, N. Y.

QUALITY Printing. Lowest prices. Anything in any quantity. Free price list. Albert Wilcox, Nichols, Georgia.

2000 **FEATHERWEIGHT** Business cards only \$3.00. Free samples. Havos, Dept. P.M., 1133 Broadway, New York 10, N. Y.

PHOTO Offset printing. No cuts needed. Lowest prices. Literature free. Ramshaw Co., 180 West Washington, Chicago.

GUMMED Labels, stationery. List free. Reed, Box PM-135, Spiro, Okla.

QUALITY Printing. We specialize in publications, newspapers, tabloids. Send copy for estimate. Bagby Printing Co., Georgetown, Ohio.

1000 **BUSINESS** Cards \$2.50. 2000 \$4.50 prepaid. Murrell, 715 Cedarcroft Road, Baltimore 12, Md.

5000 6 $\frac{3}{4}$ **ENVELOPES** Printed \$2.75 per thousand, price list free. Michel, Box 76F, New York 16.

SEND 10c Now, for our 48 page 1950 price list—refunded first order. McCall Press, 1326 South 27th, Omaha, Nebraska.

1000 **BUSINESS** Cards \$2.50 prepaid. Samples free. Reliable Print Shop, 905 East Jefferson, Louisville 6, Ky.

QUALITY Printing! Free price list. Nationwide Printing Company, Dept. PM, 2337 Bath Avenue, Brooklyn 14, N. Y.

500 3 $\frac{1}{2}$ x2 $\frac{1}{4}$ **FOUR** Line gummed stickers 35c; red border 50c. Moritz Printery, Saginaw, Mich.

MIMEOGRAPHING—Letters, pricelists, formulas, instructions. Lowest prices. Lem's Letter Shop, 5710 Stanton, Detroit 8.

PRINTING OFFSETS AND SUPPLIES

PRESSES, Type, cabinets, supplies. List for stamp. Lincoln Press Company, 220H Hartwell, Fall River, Mass.

PRESSES, Type, supplies. Catalog 10c. Printers Supply, 211, Springfield, Missouri.

HOBBY Printers' new press; productive, inexpensive; details free. Roberts, Box 184, Walpole, Mass.

MAKE Your own rubber printing cuts. Self molding process. Plexirubber, Argyle 1, Wisconsin.

PRINTING Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

PATENT ATTORNEYS

PATENT Protection—Unless you are thoroughly familiar with such matters, you are advised to employ a competent, registered patent attorney because the value of a patent depends largely upon the skillful preparation of the specification and claims. Send for booklet, "Patent Protection for Inventors," outlining preliminary steps to take to obtain patent protection. Victor J. Evans & Co., 531-C Merlin Building, Washington 6, D.C.

PATENTS. "Proof of Invention" folder mailed without obligation. E. E. Vrooman, Registered Patent Attorney, 507 McKim Building, Washington 5, D.C.

INVENTORS—If you believe you have an invention, you should find out how to protect it. The firm of McMorrow, Berman & Davidson with offices in Washington, D.C., is qualified to take the necessary steps for you. Send for copy of our patent booklet "How to Protect Your Invention." We will also send you an "Invention Record" form. No obligation. They are yours for the asking. McMorrow, Berman & Davidson, Registered Patent Attorneys, 134-X Victor Building, Washington 1, D.C.

HERMAN Lewis Gordon, Registered Patent Attorney. Patent investigations and opinions. Warner Building, Washington, D.C.

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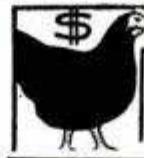
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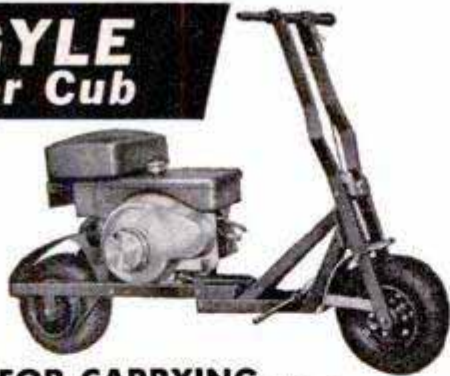
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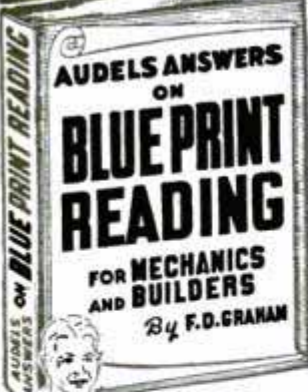
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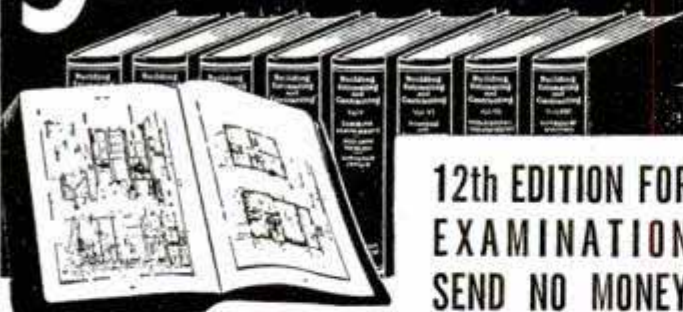
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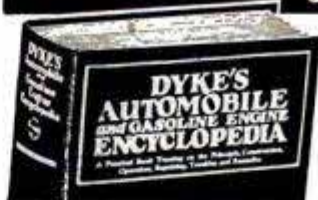
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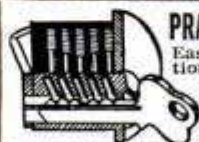
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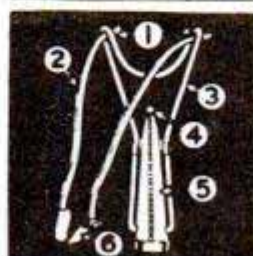
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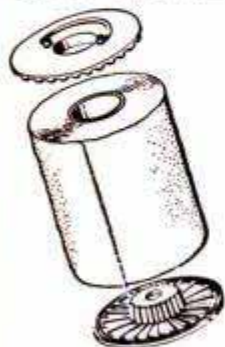
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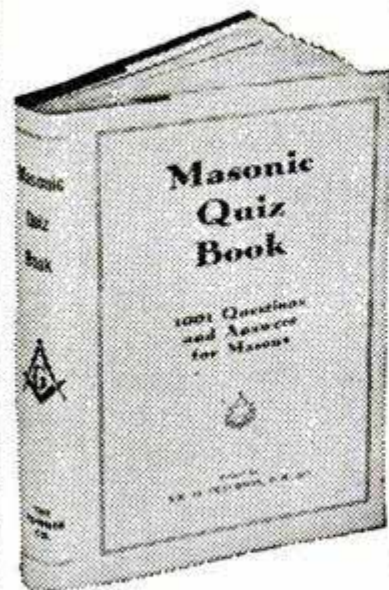
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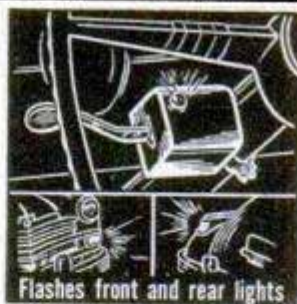
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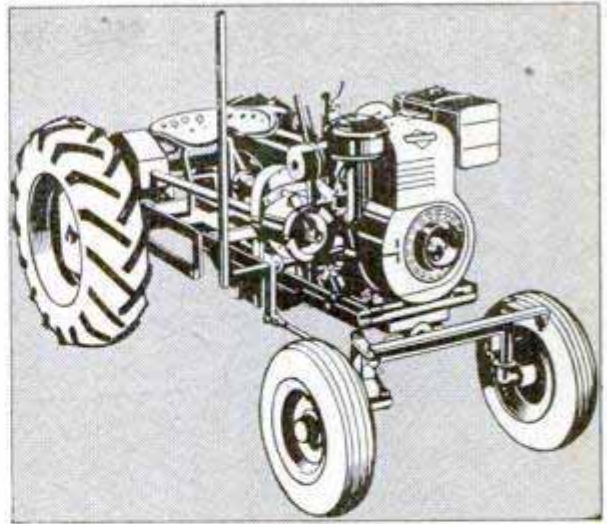
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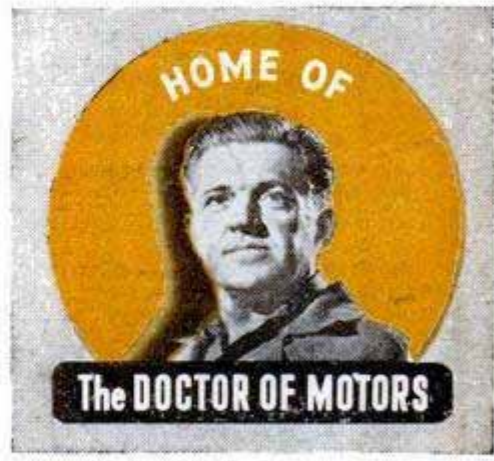
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POPULAR MARCH 1950 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 93 NO. 3

Inventor in a Carriage House

By
Walter E. Burton

James H. Rand, III, sold a washing-machine invention for \$500,000, plus royalties. From his Ohio workshop come also such items as metal fabric, a heart massager for surgeons — and a diaper

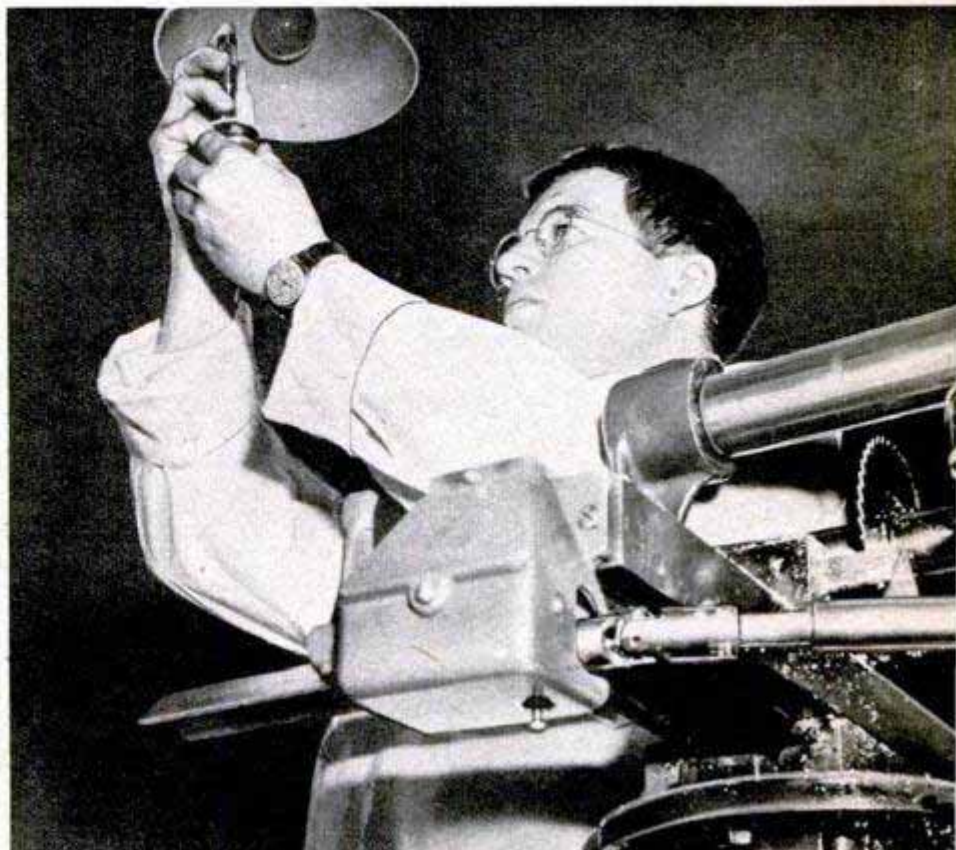
NOW IF YOU will hold out your hand . . ." the man suggested.

I extended one hand, palm upward, and he spread over it a four-inch square of thin, metallic-looking cloth. After perhaps 10 seconds, he said, "Now tell me what you feel?"

"It's getting warm!"

He nodded. "Your hand feels warmer, but it isn't receiving any heat from the outside or from the cloth. What you feel is the accumulation of heat radiated by your skin, heat that normally would be lost. The cloth keeps it from escaping."

Rand, shown at one of his milling machines, established a busy center for inventive research in an old carriage house





Staff members test a sleeveless jacket made of metallized cloth which stores up the heat radiated from the body. Below, wheel chair at left is operated by one finger, that at right by tongue in the mouthpiece



This new kind of cloth, by enabling us to get along with lightweight gold, silver or aluminum-lined clothing in the severest weather, may change our centuries-old ideas of how to keep warm.

The demonstrator was James H. Rand, III, who operates a unique research and invention center in Bratenahl, a suburb of Cleveland, Ohio. I had gone to his workshop, which formerly was a carriage house, mainly to learn how he had developed a washing-machine idea he sold for \$500,000 plus royalties. I discovered that this ex-barn is a humming laboratory in which are brewing dozens of ideas for making living easier and cheaper, and even for saving life itself.

Rand, a 36-year-old son of the president of Remington Rand, Inc., is considered one of the country's most energetic inventors. Among other accomplishments, he designed the Remington Rand electric shaver. Since 1936 he has been operating his own research establishment and has surrounded himself with a staff of scientists and mechanical specialists. His chief engineer, W. M. Nichols, has been with him for 15 years.

The inventor has set up the Rand Foundation for Medical Research, which builds special medical equipment—for free. Of all the money Rand's laboratory earns from development work and the sale of patents, 25 percent goes into the medical foundation. Three shop projects out of four pertain to medical problems.

Among Rand's newest inventions is a "robot watchman" that calls the fire department if a house catches on fire when the family is not at home. It is a telephone attachment that is set off by a thermostat when heat reaches 160 degrees. The machine dials the fire department and when a fireman answers a phonograph record starts

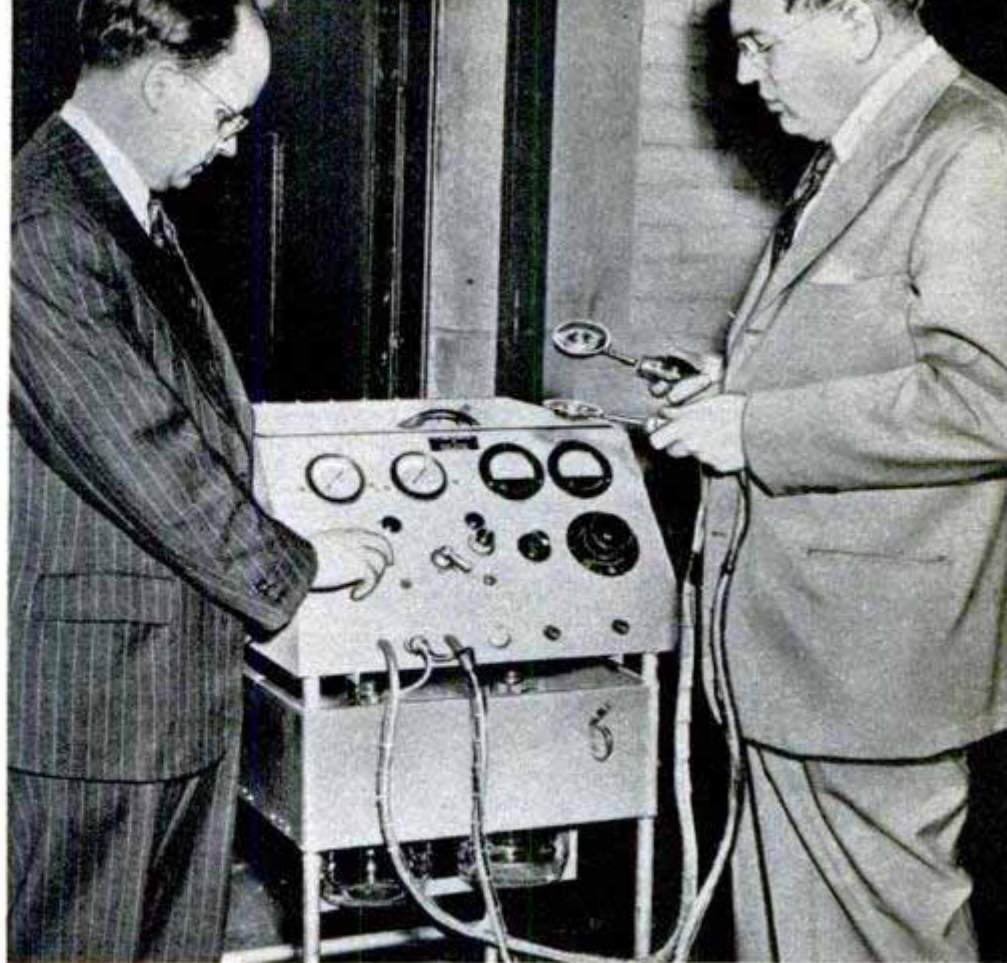
and a voice reports the blaze. If the wrong number is accidentally dialed by the attachment, the "robot" tells whoever answers of the fire and asks them please to call the fire department. The attachment, nearing production, will sell for between \$25 and \$50.

Naturally, Rand frequently is approached by inventors who are seeking help in perfecting or marketing their ideas. He tells them that he is not a promoter. Being an inventor himself, he is really one of their competitors.

As an example of Rand's strikingly original thinking, take a look at his flexible washing machine. He sold the patent rights for \$500,000 plus royalties that may bring him several times that amount. Surprisingly simple in operation, the washer has a tub made of a flexible material. Extending upward in the tub center is a plastic agitator which produces an undertow action in the water. After a period of agitation, a suction pump extracts air from the top of the tub through the hollow agitator. Atmospheric pressure pushes the tub wall inward, squeezing the clothes toward the agitator. Lighter-than-water impurities are floated to the top and disappear down the agitator spindle, while sand and other heavy materials pass out through a bottom drain. At the end of the washing cycle, rinsed clothes are subjected to the vacuum and squeezing action until they are damp-dry and ready for the line.

A laboratory flask planted the idea for the novel washer in Rand's mind. He had observed many times that water can be made to boil in a partly filled flask by pumping air from the space above it. Water alone will boil for a time, but eventually the action stops. But if the water contains a trace of soap, bubbling will continue until the flask has boiled dry.

It occurred to the inventor that this action might be applied to washing clothes. He tried various methods before

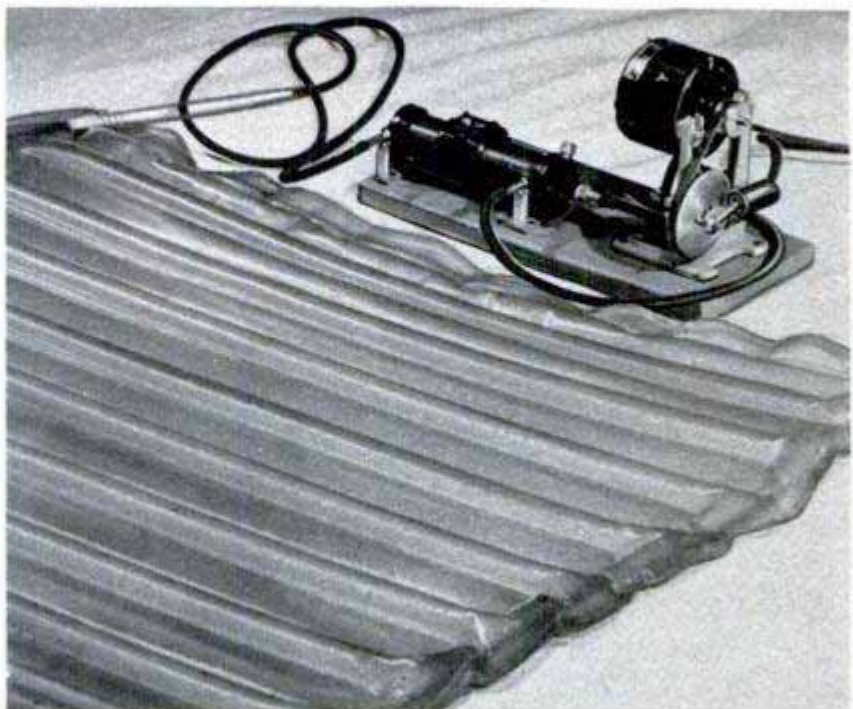


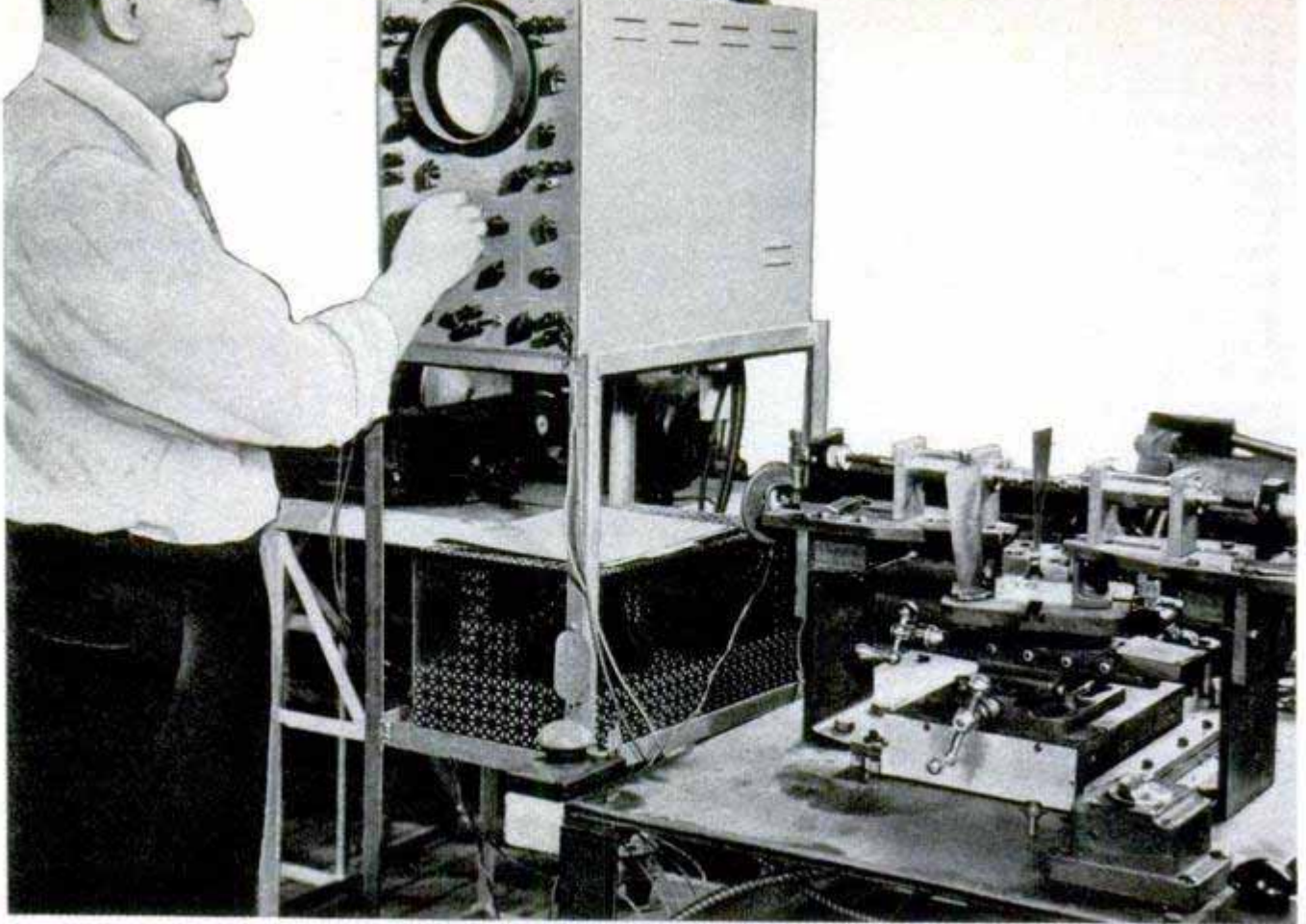
In Rand's hands are two vacuum pumps he invented for surgical use. They massage heart to revive action if it stops during an operation

he hit upon the idea of a flexible tub. Lowering of the atmospheric pressure in the covered tub duplicates the action in the evacuated flask.

The National Association of Washing Machine and Ironer Manufacturers has set up, as a target for all makers of washers, a "standard washing machine" that has an

Rand's plastic air mattress prevents bed sores. Divided into compartments, it is inflated and deflated to change its shape automatically





Tracing instrument analyzes the complicated contours of jet-engine rotor blades on an oscilloscope screen

arbitrary cleaning efficiency of 100 percent. When Rand's squeeze-tub machine was tested against the standard, its efficiency was reported at 188 to 120 percent.

Some day your winter shirt may be a lightweight rayon affair coated with gold, and your overcoat a featherweight topper having a silver or aluminum lining—if Rand's metal-treated fabrics are generally adopted.

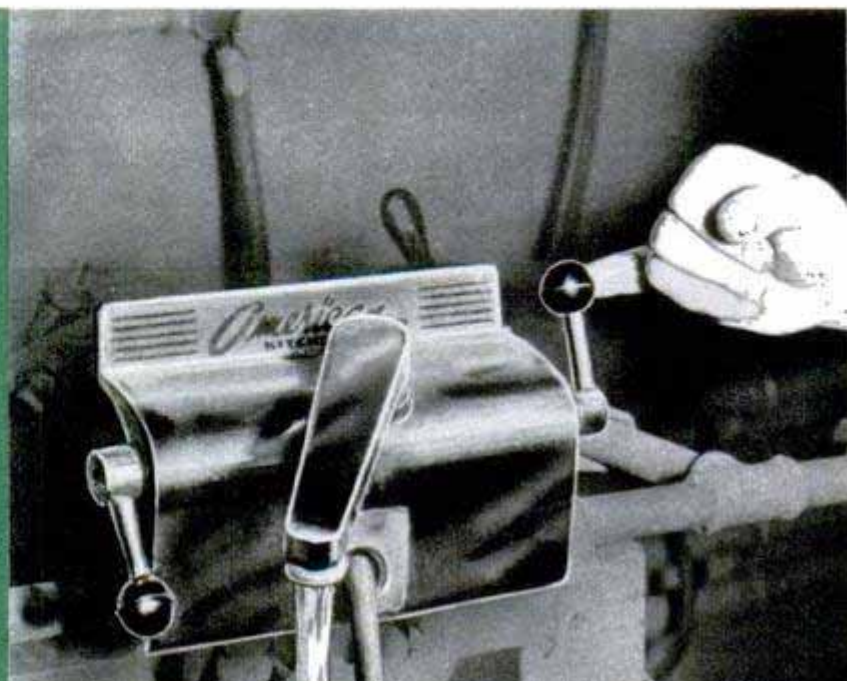
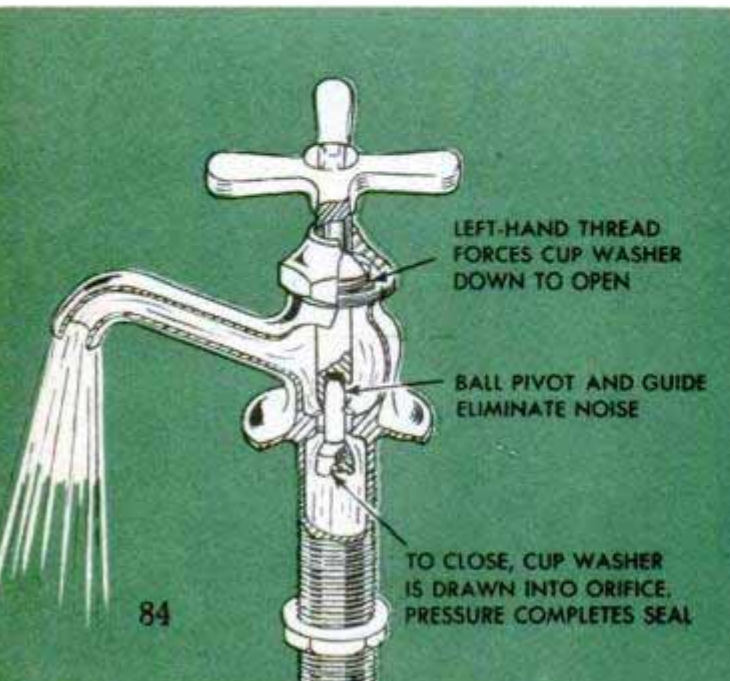
Rand explains that the body loses heat in four ways: by convection, conduction, evaporation and radiation. For centuries,

people have been trying to regulate this heat loss by controlling, largely with wool and cotton clothing, the first two factors and, to some extent, the third. But almost no effort has been made to regulate the fourth and usually the most important—radiation.

When the temperature is around 70 degrees Fahrenheit, as much as 70 percent of the body heat may be radiated. At lower temperatures, the loss is still higher.

Wool fibers are constructed of smooth-surface, overlapping plates, making wool a

Rand's seatless water faucet will last indefinitely, cleans itself and can be operated with one finger



fairly good natural reflector of heat. But Rand has shown that there can be better materials for conserving body heat.

By metallizing rayon cloth .008 inch thick, he can make it warmer than unmetallized wool .033 inch thick. The metal, whether gold, aluminum or something else, is in the form of very thin overlapping flakes. Because of its thinness, even gold can be used economically, just as gold leaf is used for decorating book covers.

Rand explains that the fabric won't become uncomfortably hot, for it is porous and permits hot air and moisture to escape through it.

Another Rand invention is a seatless valve that apparently will last untold years. A test water faucet has been turned on and off, twice a second, for months, has worn out one automatic counter and is still going strong after 32,000,000 on-off operations.

Conventional valves, the inventor explains, try to compress rubber, which is essentially an incompressible material. Rubber flows under pressure. If the flow is extensive enough it will undergo permanent set. So Rand designed his simple valve so that the rubber in it is distorted only slightly—enough to make a tight seal but not to cause permanent set. When the valve is open the rubber plunger moves against the pressure, which tends to close it. At each movement the plunger wipes the seat clean. Rand demonstrates the valve's dirt-handling ability by dumping a spoonful of sand into a disassembled model, reassembling it and then cleaning out the sand in two or three open-shut operations. The faucet works so easily that it can be opened and closed with the little finger.

Rand's ideas wander into strange fields. One of his inventions, now on the market, is a baby diaper that eliminates the flood hazard. A waterproof-plastic envelope carries a replaceable pad that absorbs moisture, drawing it away from baby's skin.

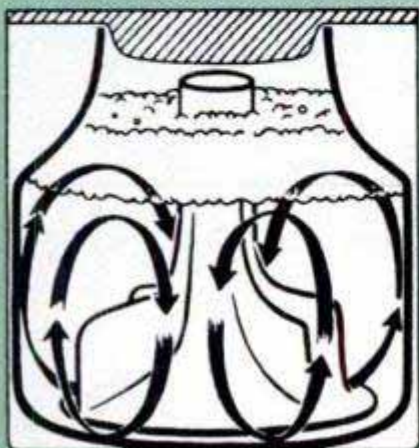
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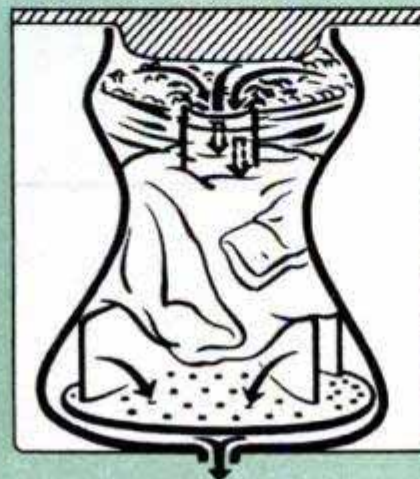
Inventor's respirator automatically breathes for the patient during an operation, administers anesthesia at definite rate. Below, washing machine with flexible tub earned him \$500,000 and royalties



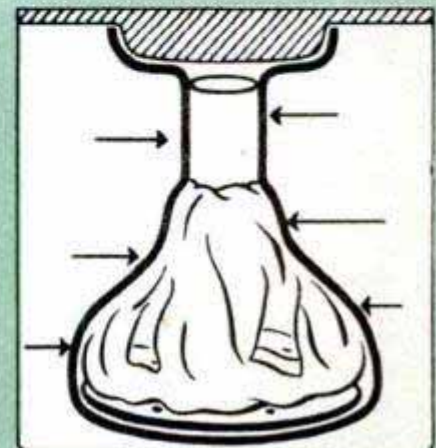
Washer's agitator moves clothes through suds to start the action

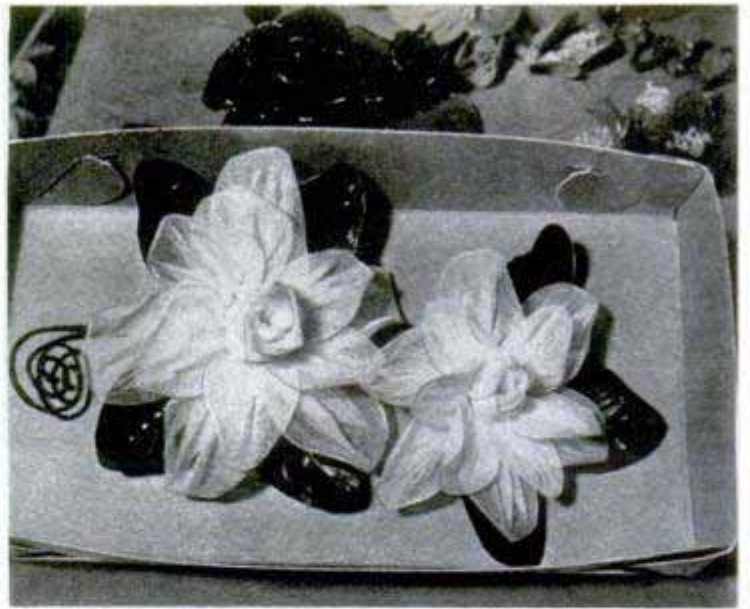


Vacuum folds in sides, squeezing dirt through washer's two drains



In the final step the sides firmly squeeze most of water from clothes

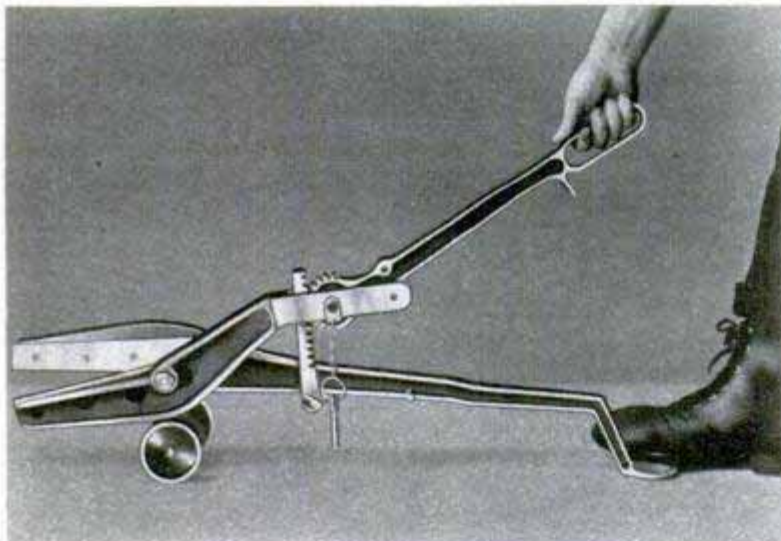




Discarded Nylon Hose Make Artificial Flowers

Discarded nylon hose, some fine copper wire and an artistic talent are all that Mrs. Vivian Keller of Long Beach, Calif., needs to create beautiful artificial flowers. She bleaches the nylon and tints it to the de-

sired shades. The copper wire is formed to the shape of the petal or leaf and the nylon folded over it and fastened with adhesive. Commercial stamens complete the attractive floral displays.



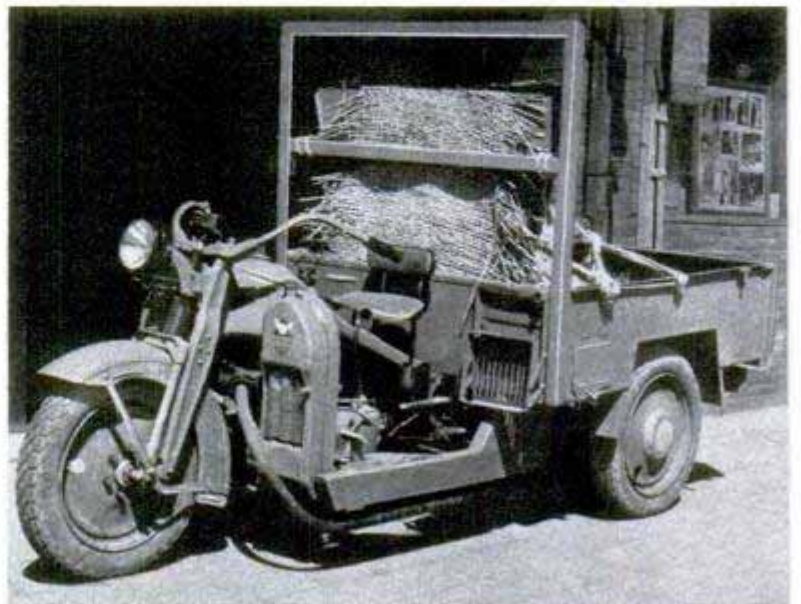
Super Scissors

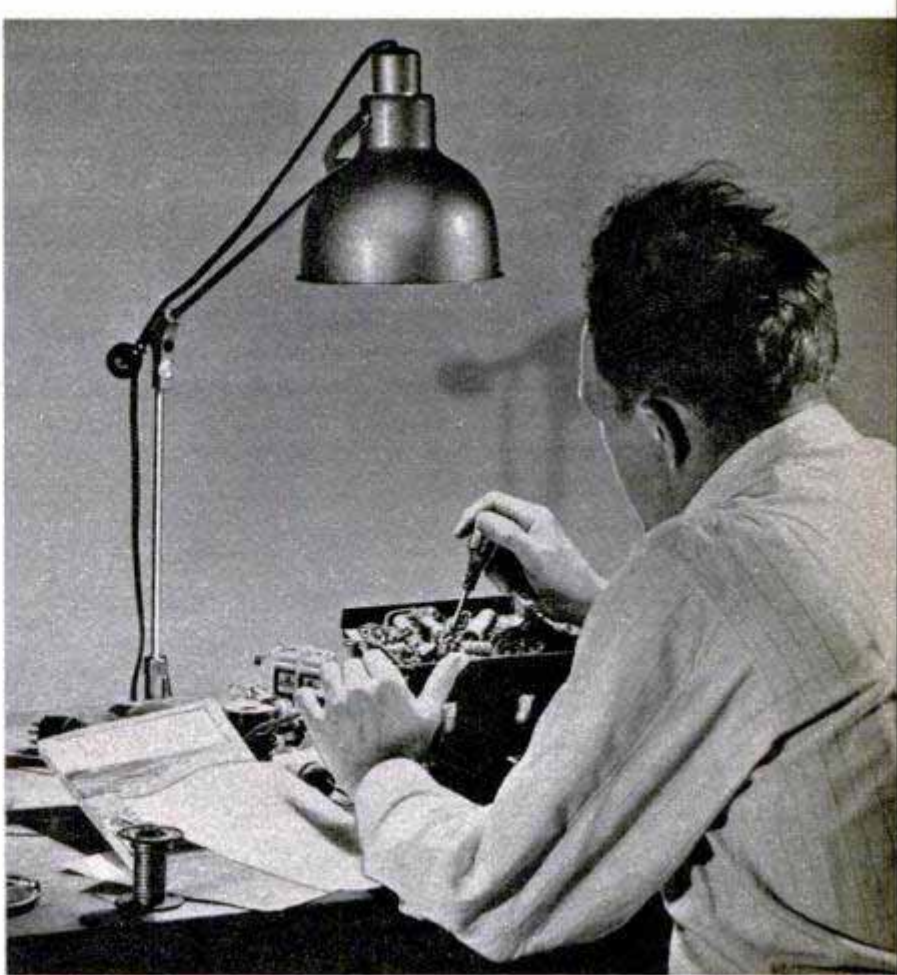
Giant scissors employing compound leverage will cut metal stock in sheets, rods or bars up to $\frac{1}{8}$ inch thick. Added leverage for the shears comes from a rack and gear mechanism. Only 60 pounds of pressure are needed to cut stock that requires 145 pounds of pressure with ordinary shears. One of the handles ends in a foot pedal which can be held stationary while both hands are used to apply leverage. The tool is 36 inches long, has 9-inch blades and weighs 27 pounds.

Japanese Cycle Truck

Powered by a liquid-cooled motor, a three-wheel cargo cycle is used in Japan where narrow streets and congested traffic make the small truck excellent for delivery purposes. The cooling system, which uses two radiators, one on each side of the motor, prevents the motor from overheating at the slow speeds necessary in city streets. A combination chain-and-shaft drive transmits the power to the rear wheels.

Aluminum, one of the most versatile metals, already has more than 4000 applications.

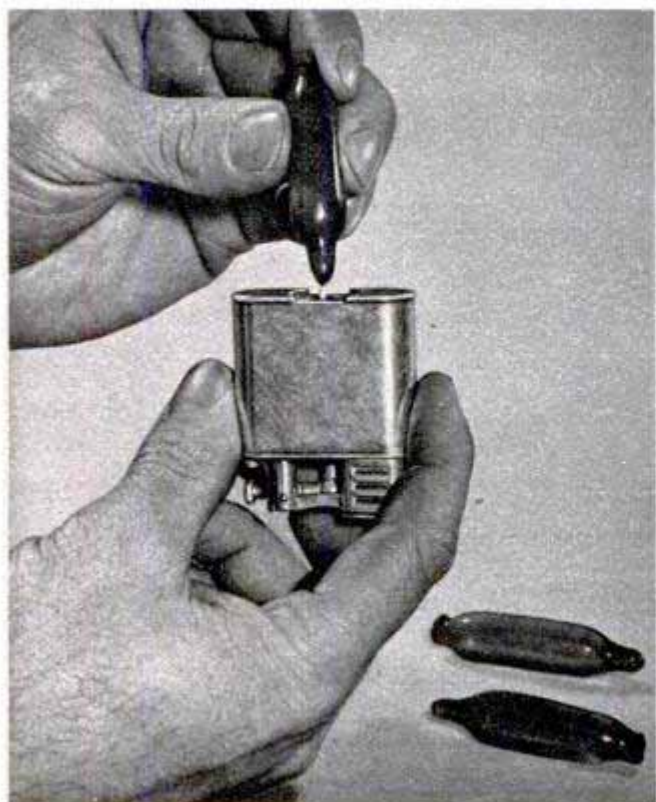




Adjustable Stand Focuses Light for Many Uses

With an adjustable stand and metal reflector the homeowner can direct a concentrated pool of light anywhere from the top of his head to the tip of his toes. An ordinary light bulb, a sun lamp, an infrared lamp or a photoflood bulb can be used with the stand. With the proper bulb, the light

stand can be used as a hair drier, reading lamp, nail polish and glue drier and radiant heater. When the stand is to be readjusted, a lever is depressed and the extension rod pushed into the new position. The slight pressure required prevents the stand from collapsing during the change.



One-Shot Capsules Fill Lighters

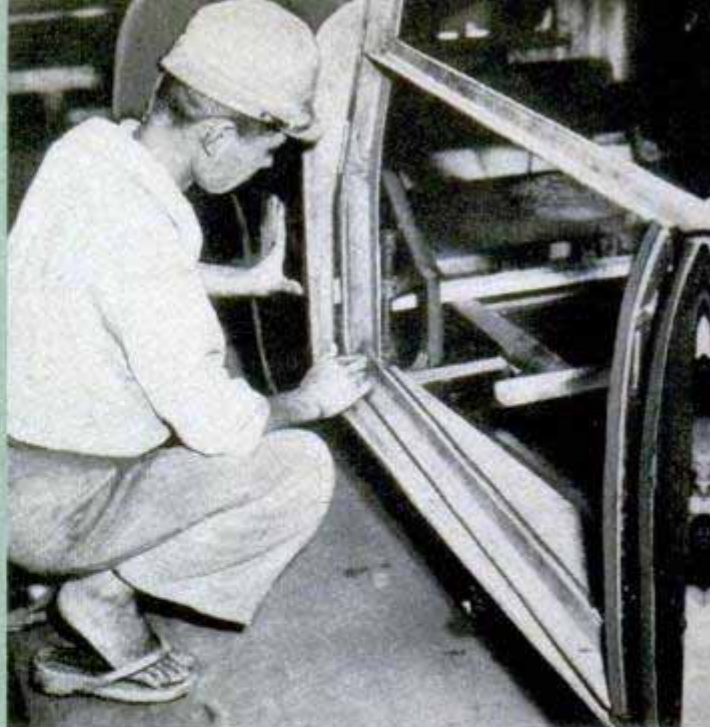
You can carry lighter fluid in your pocket or suitcase without danger of leakage, thanks to an unbreakable capsule that holds enough fluid to fill a standard cigarette lighter. Imported from England, the gelatin capsules are sealed to prevent evaporation. Pricking the capsule with a pin allows the fluid to be squeezed out. The capsules are also handy for emergency removal of stains from clothing.

Rubber "Bath" Toughens Leather

Soaking leather in a solution of natural rubber increases its durability, according to three National Bureau of Standards scientists who developed the new treating process. Abrasion and water resistance are increased sufficiently to allow even substandard leather to be used commercially. Rubber stock for the solution is first cold-milled to make it less viscous and better able to penetrate the leather.

JAPAN ELECTRIFIES THE GAS BUGGY

Detroit auto builders would gasp with unbelief if they visited the Japanese plant that makes 35 Tama cars each month by hand. The model changes are a cinch



U. S. Air Force photos

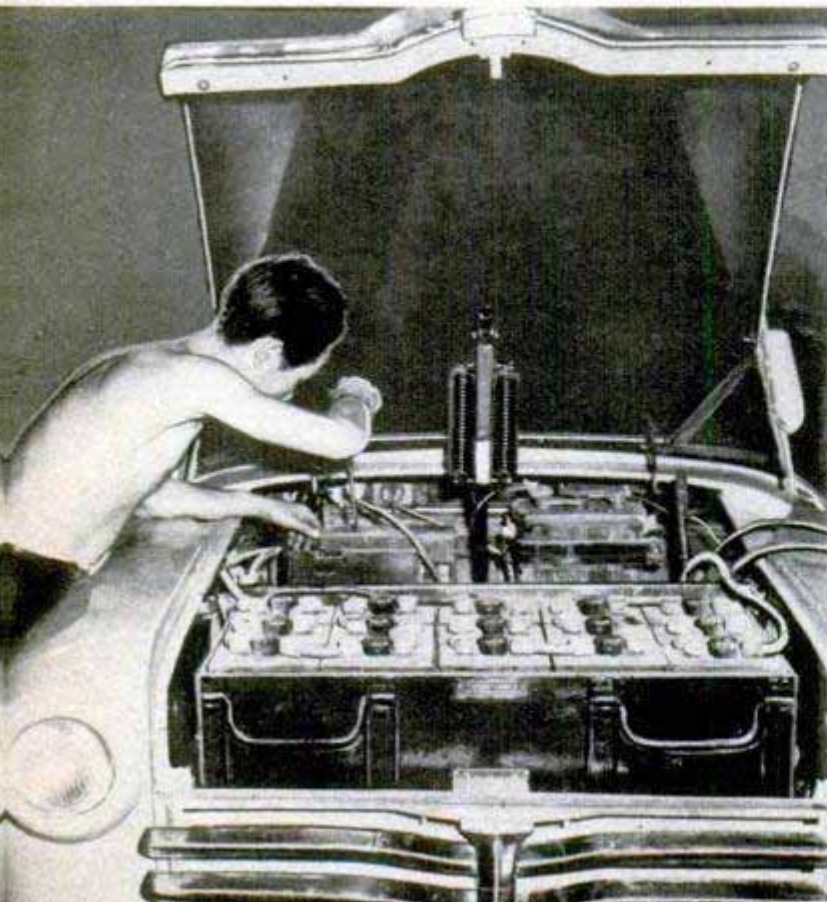
In Tama plant nothing fits until it's made to fit. Worker is adjusting part of a body on a wooden jig

PAPA SAN has fired his jinrikisha man. Nowadays, when he leaves for the chopstick factory in Tokyo, he buzzes off in a shiny new Tama, Japan's postwar menace to the pedestrian. It has a top speed of 33 miles per hour, can be operated for a fraction of a cent per mile and passes up all the gas stations. Every time the speedometer begins to show another 200 kilometers (about 125 miles) Papa San merely gets out his long extension cord and looks for the nearest wall plug. The Tama is powered by a battery-driven electric motor, and the batteries can be recharged anywhere.

The Tokyo Electric Automobile Compa-

ny, which builds the cars, is a source of amazement to visiting Yanks from the near-by Tachikawa Air Force Base. The plant is manned by "monkey wrench" mechanics and has no overhead cranes, no hydraulic presses or no heavy machine tools. Hundreds of hours of handwork go into each car. The wooden frame is held together by screws and is carried by hand to a body shop where sheet-metal panels are cut to size, hammered and rolled into shape, and hand-fitted to it. From this point on,

Front view of car (left) shows battery installation and at right worker is grinding pigment to paint a car





the body is pushed around on wooden dollies rolling on boards. Each part is installed by the worker who made it. Only the motor and wheels are received from outside sources.

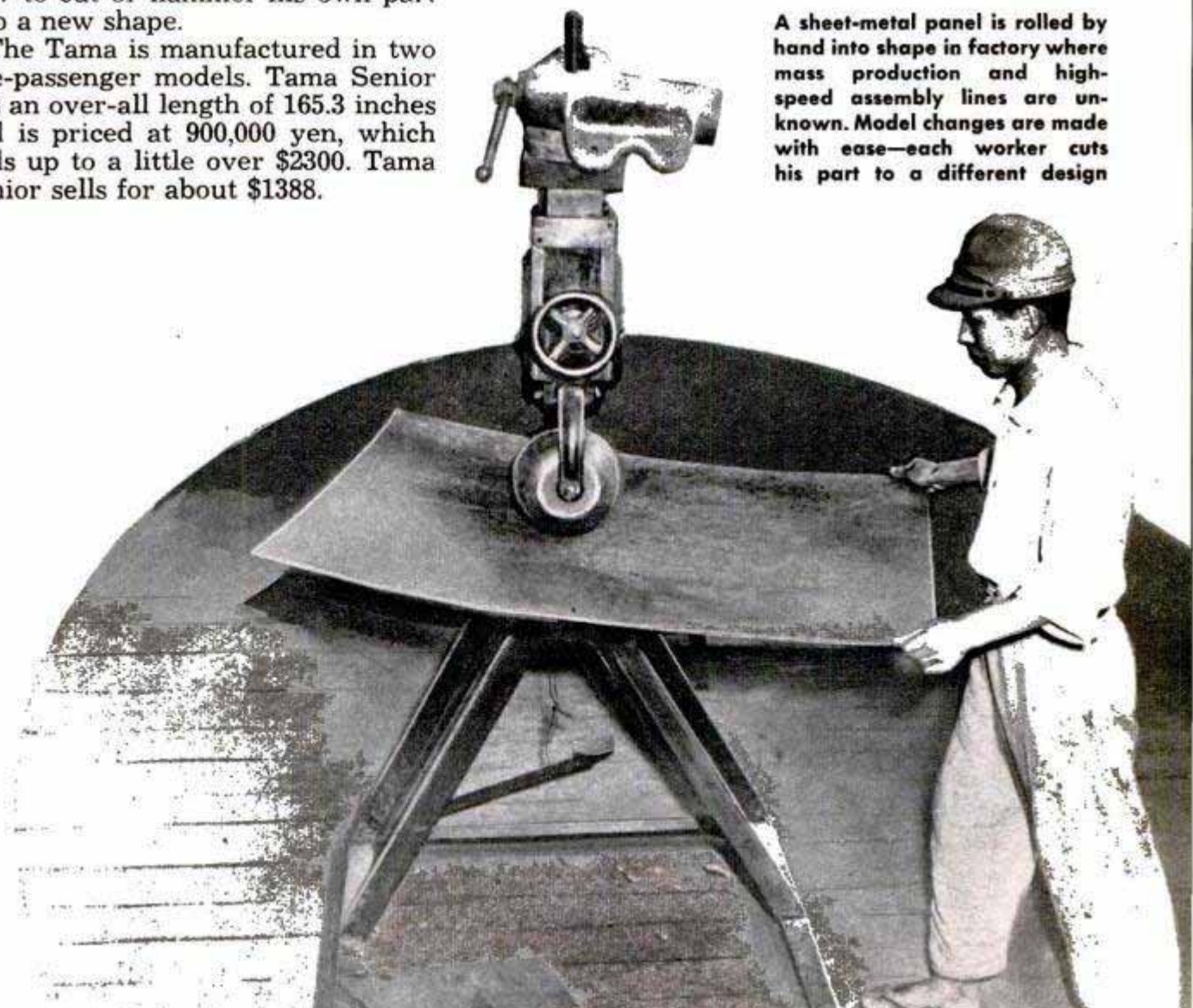
After the car is given a primer coat of paint, it is pushed out in the open air to dry and when the final color is decided on, a worker makes the paint by hand. Upholstery is put in by an outside contractor.

Model changes are a simple matter; with no expensive re-tooling to worry about, each worker is merely instructed how to cut or hammer his own part into a new shape.

The Tama is manufactured in two five-passenger models. Tama Senior has an over-all length of 165.3 inches and is priced at 900,000 yen, which adds up to a little over \$2300. Tama Junior sells for about \$1388.

American Jeep is considered a big car in Japan. Here one is posed alongside the electric Tama Senior, the larger of the two Tamas now being manufactured by hand in unique factory near Tachikawa Air Force Base

A sheet-metal panel is rolled by hand into shape in factory where mass production and high-speed assembly lines are unknown. Model changes are made with ease—each worker cuts his part to a different design





Tough Plastic Disks For Street Markers

Longer-lasting plastic street markers are replacing painted lines in Portland, Ore. The tough 4½-inch disks will last from four to six years, compared with the painted lines that have to be redone about twice yearly. On asphalt they are laid on a hot mastic adhesive and secured by driving a two-inch pin through the center. On concrete the installation is identical, except that a hole is drilled through the marker and into the concrete for the smaller one-inch securing pin.

"Paintbrush" Photo Kit

Even an inexperienced child can make permanent prints with an unusual photographic kit that is used in ordinary room light and requires no trays or mixing of chemicals. The special printing paper is placed in a frame with the negative and exposed to the light from a 100-watt bulb. When developing and stabilizing liquids are applied to the paper with a small brush, the permanent image results.



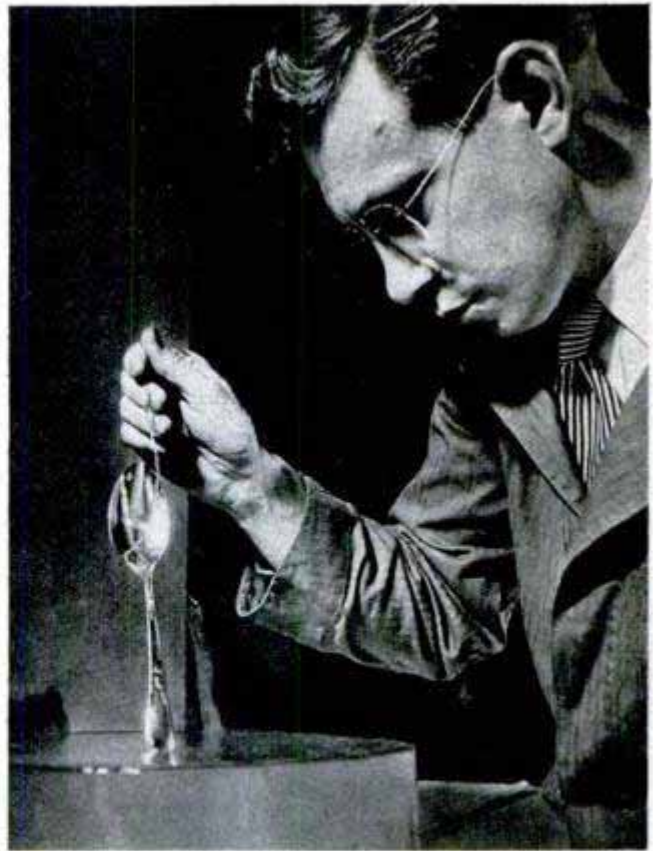
Elevator on Wheels Loads Bus Luggage

Luggage is loaded aboard the top of busses at an airport in France by a mobile elevator. Mounted on a tiny truck, the elevator is wheeled up to a bus waiting to be loaded and the baggage is placed on the machine's endless belt. The truck's engine drives a generator which supplies electric current to rotate the belt. The luggage moves to the top of the bus where an attendant fastens it in place.



Bath Polishes Metals

Metal products are polished to a mirror-like luster simply by dipping them in a chemical bath that does not deposit anything on the metal, but merely shines it. No buffing is required and the shiny surface will serve as a base for plating or, if desired, can be left as the finished surface.



Metals that can be chemically polished include brass, copper, nickel, Monel and aluminum. No electricity is used, the polishing baths being simply a mixture of acids. Immersion periods vary from 10 seconds to 10 minutes and are followed by a rinse bath. It is expected that the process, developed by Battelle Institute, will result in savings in the manufacture of metal products.



Photographer's Camera Wagon

When Langston McEachern, Louisiana news photographer, drives off on an assignment, he doesn't worry about leaving any of his equipment behind. His car, a Jeepster, is designed to carry all his photo equipment and, in addition, it serves as a platform from which he shoots over



crowds. In place of the rear seat, McEachern installed a cabinet with drawers and compartments for film, maps, cameras, tripods and other accessories. There is even space for extra clothing. The cabinet has a hinged lid, strong enough for him to stand on with a tripod. Lights inside the cabinet and under the dashboard enable McEachern to locate his equipment at night.



C-47 showers death along a strip of woodland in Pennsylvania in the successful battle against gypsy moth

Forest Killers Are on the Run

Cameraman photographs a droplet released by plane. Such experiments lead to the most effective sprays
USDA photo



IF, AS THE scientists say, the insects one day will be in charge, it's fairly certain that the gypsy moth will not be among the bugs running the earth. Nor will the tussock moth, the hemlock looper, spruce budworm or a host of other little monsters that have been chewing through some 500,000,000 board feet of timber each year.

A new offensive on a dozen buggy war fronts, spearheaded by the U.S. Department of Agriculture's "air force," is resulting in the first real wipe-out operations in history. Last spring the anti-insect fleet of about a hundred government and private aircraft, equipped with DDT spray booms under the wings, roared up to shower a mist of death over more than a million acres of infected forest from coast to coast. In Idaho, the DDT fleet routed huge infestations of the tussock moth, whose ugly little larvae were busily chewing the needles off a half-million acres of virgin firs. More than 800 billion tussock-moth caterpillars bit the dust under the 390,000-gallon DDT storm. Not a single moth has been seen in the area since.

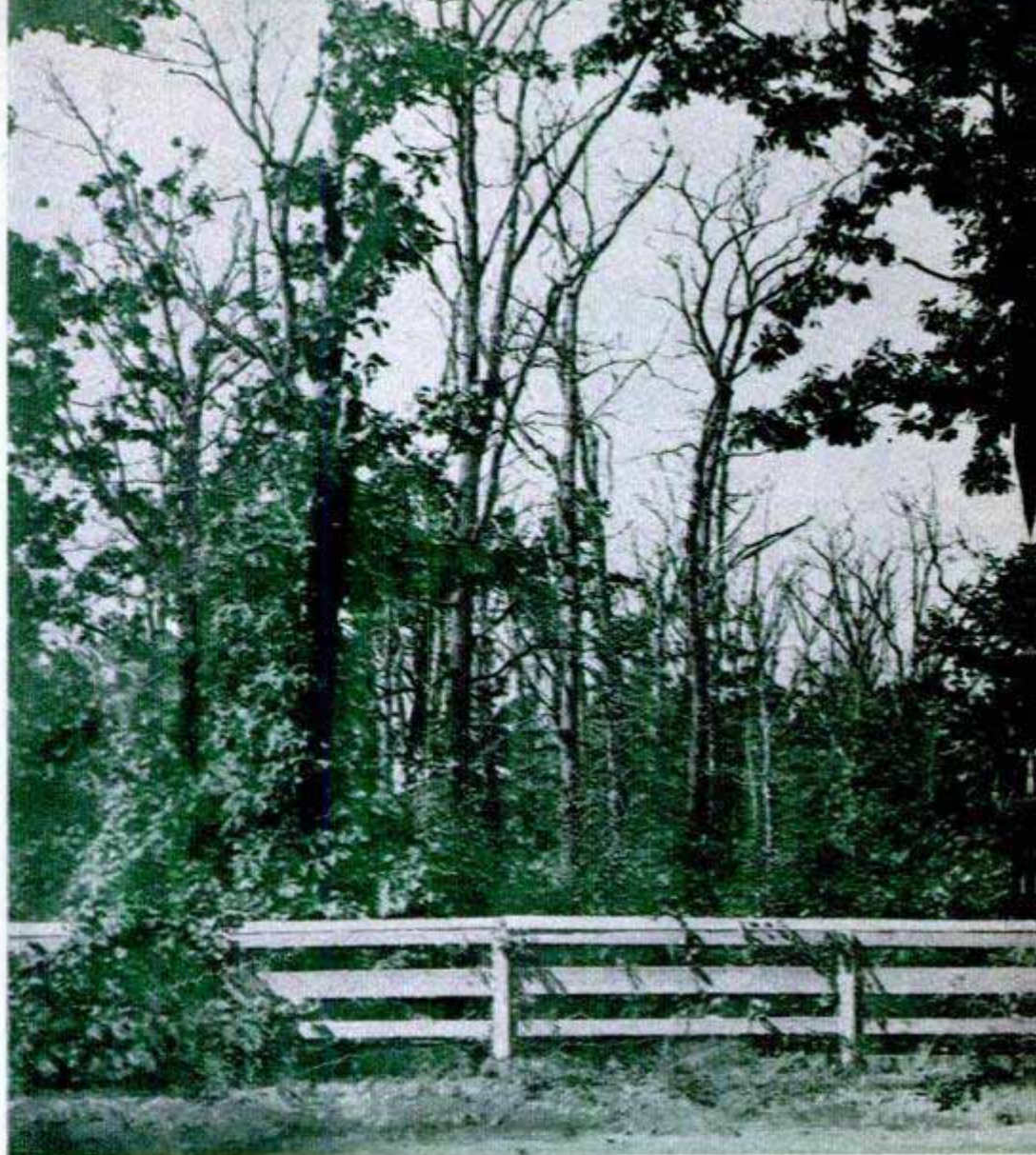
In the Northwest, the hemlock looper has taken a 300,000-acre shellacking and

will get another, bigger jolt this spring. The spruce budworm won't be back to gnaw new shoots off a quarter-million acres of Maine and Oregon spruce forests that were sprinkled last year. The gypsy moth is on its way to complete extermination — the first such annihilation of a forest insect pest ever achieved.

The gypsy is a harmless-looking miller about the size of a quarter. But towering forests of dead, gray snags are a grim monument to the destructive prowess of the midget.

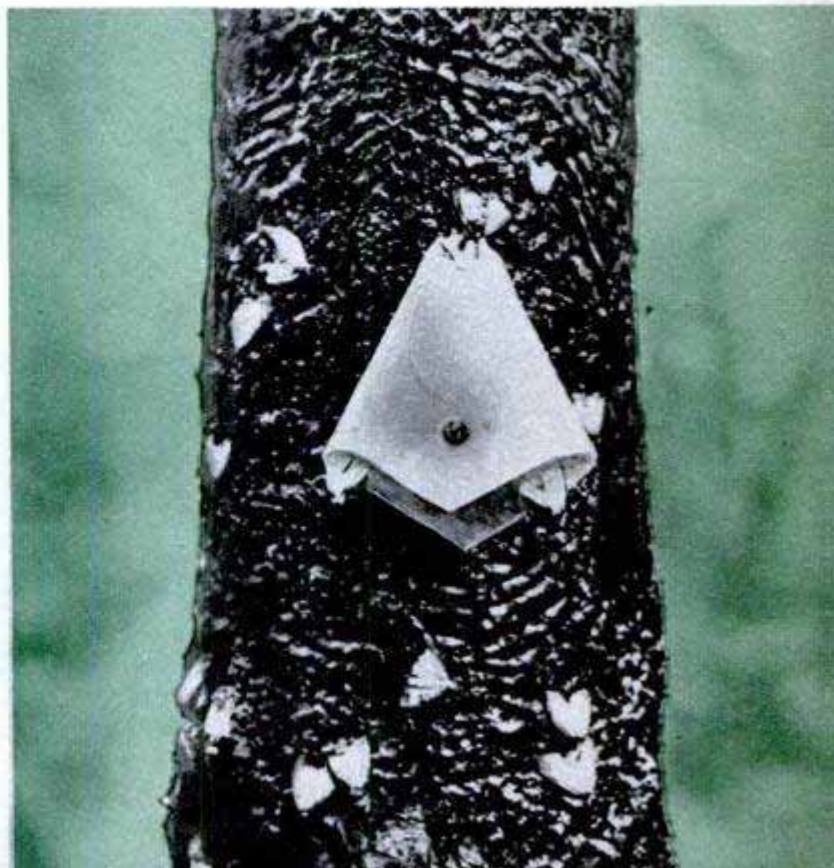
Today, the gypsy is losing ground under a fantastic DDT bombardment. In 1948, six spray planes zoomed over upper New York on wipe-out operations. Last year Pennsylvania saw the end of huge infestations, and 664 square miles throughout New England were swept clean. But there's a lot of infested forest still left.

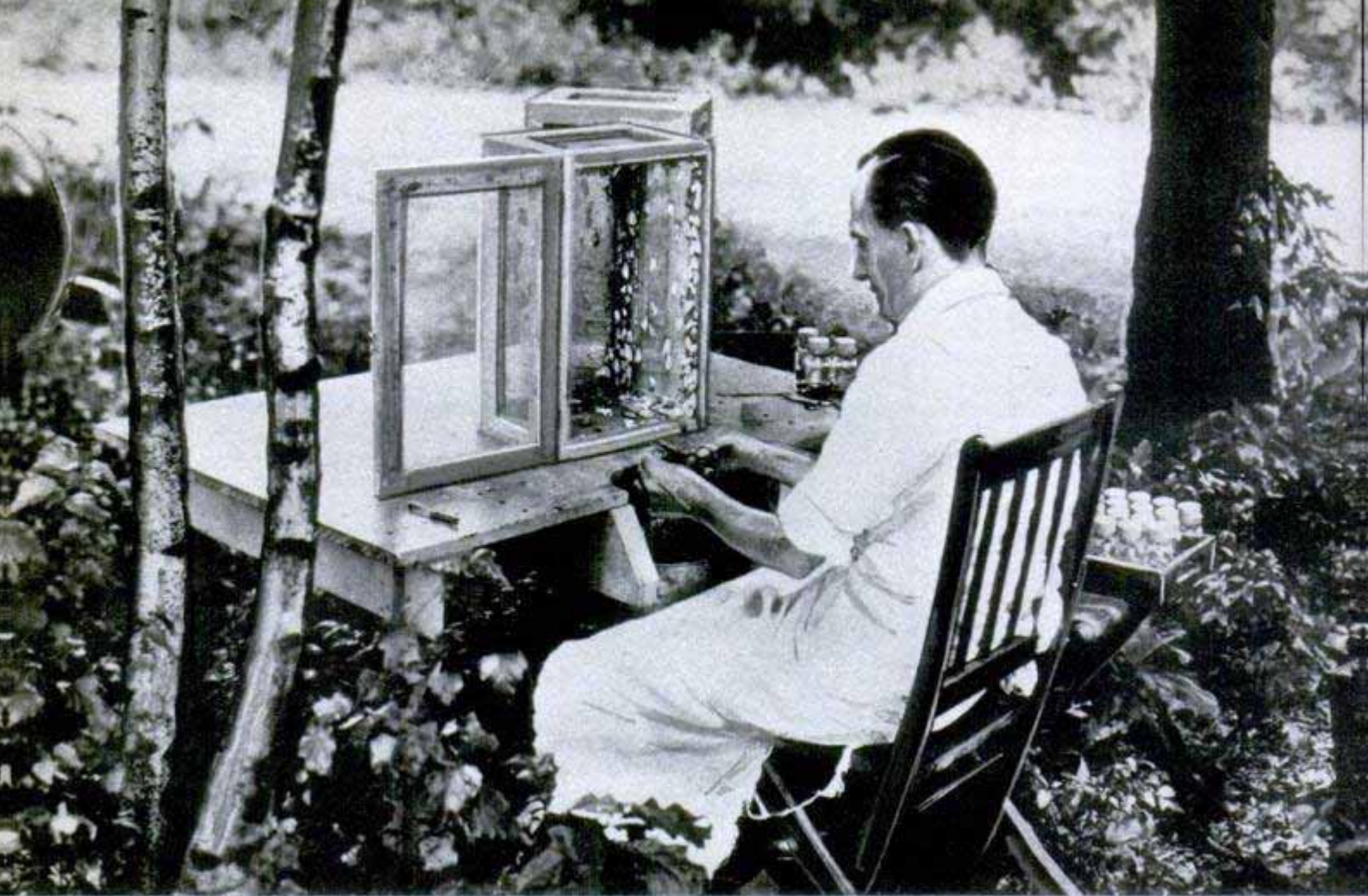
Gypsy-moth slaughter begins in spring. The first warm days bring out little green caterpillars with appetites out of all proportion to their one-inch



Trees stripped of foliage show the tremendous damage caused by gypsy moths each year. Below, left, first warm days of spring bring out little green caterpillars that eat through the forests. Below, female moth's scent in paper cone attracts males who stick to substance daubed on tree

USDA photos





Scent of females is made stronger in "aging cage." Then their tail segments are clipped and odor extracted

wheel bases. After stripping the trees, caterpillars "pupate" and finally emerge as grown adult moths. Along toward mid-summer, lady moths lay their egg clusters on tree trunks—or anything else handy.

Armies of entomologists used to scout the woods each summer to count those

clusters, thereby getting advance information on where to spray.

Today, under Jack M. Corliss who heads up the Gypsy and Brown Tail Moths Control Headquarters in Greenfield, Mass., the boys have developed a neat system for making the moths count themselves.

Young lady moths, it seems, are especially endowed with perfume in the last two segments of their tails, which attracts male moths like mad. So, every June, some 75 men from the Greenfield station prowl the New England forests plucking moths from the trees. Last year they got 2,000,000—enough to bait 25,000,000 acres of forest. These are kept in wire-screen trays in the Freetown, Mass., insectary until they hatch. Then males are destroyed. Females go in "aging cages." This aging, explains Corliss, increases the intensity of the attractant. Then the clippers go to work, snipping the tail segments and

Shaped like a bomb, new 25-gallon dispensing tank can be installed on any plane within five minutes. DDT sprays out the propeller blades



dropping them in a chemical solvent. The liquid solvent, loaded now with "attractant," is dropped on paper wicks in special traps. Some traps consist of tin cylinders with screen baffles on each end. More common is a simple affair made of a sheet of tangle-foot paper, in the center of which is placed an inverted paper cone containing the bait.

Thousands of these contraptions are tacked to tree trunks in suspect areas. Nature does the rest. As little as three milliliters of the attractant draws eager male moths from a quarter of a mile around. Simply by counting the males thus trapped, entomologists get an accurate estimate of the number of moths in that whole area—thus determining the need for spray the following spring.

The toughest problem in gypsy-moth control has been to keep the demon from getting out of the New England area and starting new colonies. The lightweight fuzzy caterpillars, spinning from treetops on their silken strands, have been known to carry 20 miles on a stiff breeze.

Worse, lady gypsy moths aren't fussy about where they lay their eggs. Christmas trees, railroad ties, telephone poles, lumber, furniture, rugs — everything shipped from infested areas must be inspected by eagle-eyed quarantine officials.

The big weapon in the new offensive is, of course, the new insecticides. DDT and other high-powered bug killers are easy to handle, spread easily and cost one fourth as much as the older types to spray. They are spread from planes equipped with spinner-disk sprayers, designed to break up the solution into extremely fine mist over a 110-foot swath. Nowadays, a good pilot like Don Whittam can cover 80 acres of infested forest in three minutes.

It's the most hazardous kind of precision flying a few feet above the trees. In hilly country the pilot must fly on the contour around slopes for most effective placements of spray. There must be no overlap or "misses." Whittam knows how to keep throttled to 80 or 85 miles an hour—and to manage mushy controls at that near-stalling speed while skimming the leaves.

The only monkey wrench in the whole high-powered insecticide air program is people—some just ignorant, others frightened. No sooner was word of the tremendous success against the gypsy and tussock moths rumored about, than Department of Agriculture mailbags were stuffed with squawks from sportsmen, claiming that DDT was killing hordes of fish; bird lovers, who fumed that it killed birds and destroyed their food; nature lovers, who said it upset the balance of nature. A bird watcher in Scranton saw the planes fly over

spreading mist and knew what it was. She promptly called the Secretary of Agriculture himself and complained bitterly. The Secretary asked if she had seen any dead birds. "Well, no," replied the bird lover, "but there's a bumblebee in my back yard in terrible shape."

What about the beneficial insects, birds and balance of nature? Down at the Department of Agriculture's big farm in Beltsville, Md., there's an experimental biplane with a 60-gallon tank. Every calm morning it roars into the sky to test different spray concentrations and droplet sizes, over carefully controlled areas. Dr. C. H. Hoffmann usually is on hand. It's his job to find out just what the poison will do to insects important as natural control agents and as food for game and wildlife.

Before the battle of DDT started in earnest, Hoffmann marked off a square-mile area of forest and also a trout stream for test work. Fish were netted, counted and put back in the stream. Weirs were set up at the downstream end of the area to catch fish that might die of DDT. A hive of bees was borrowed and placed in the center of the square mile.

Finally, on a mild spring morning, the N3N zoomed aloft, carrying its poison cargo, to be sprayed in murderous concentration—five pounds to the acre.

While the pilot was dumping his mist, Hoffmann and a team of scientists went in under it. "Within 10 minutes bugs fell from trees like rain," he recalls. "Birds quit singing and disappeared."

The men found seven dying birds. In the weirs, by the week's end, were about 1.3 percent of the total native brook-trout population.

It sounds bad, but don't forget it was five times the normal dose. What about the balance of nature in that forest? How long would it take for uncontaminated insect food for birds and fish to build up again, and where would it come from? Hoffmann and his men found out. With a special digging tool, they cut a square foot of soil three inches deep from the forest floor and carefully screened it. In that tiny chunk they discovered more than 10,000 crawling insects of all kinds and sizes.

Ask the bug men about insecticides upsetting the "balance of nature" and you'll get a mighty short answer. "Bugs do more unbalancing than any bug killer," they point out. "When all the trees in a big forest are killed by insects, birds must go elsewhere, food disappears, watersheds are ruined, waters become silted and won't sustain many types of native fish, the recreational value is lost. No insecticide known at the present time does that much damage—even temporarily."



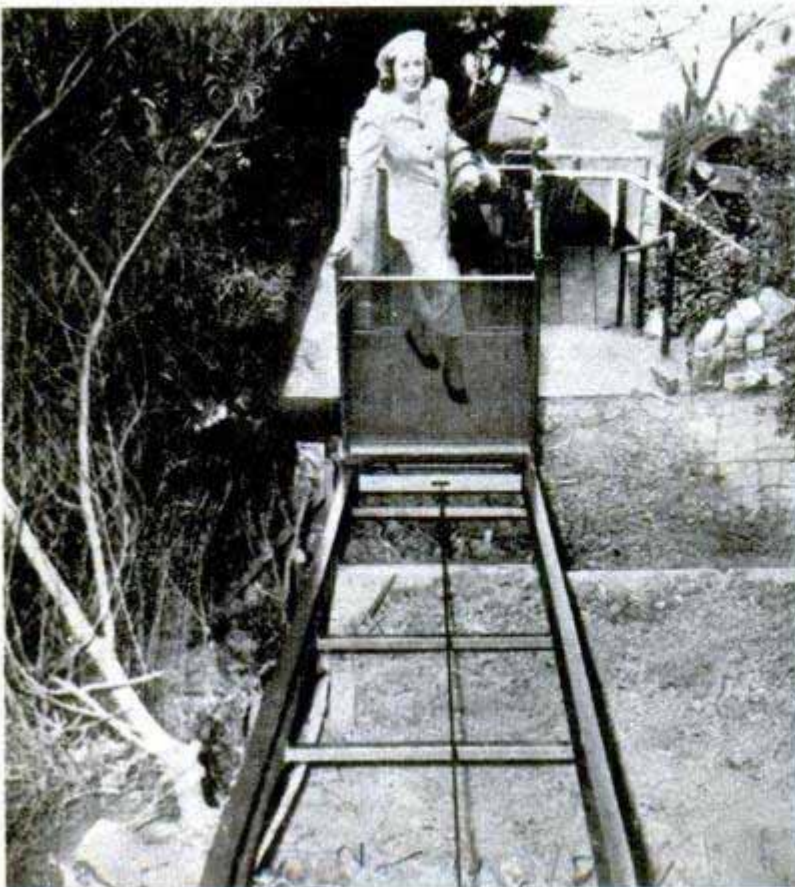
Saw Cuts Its Own Starting Hole

There's no need to drill a starting hole for internal sawing when you use a light-weight, portable power saw that will start cutting anywhere. The blade quickly drills its way through the material and cuts any intricate shape in wood up to an inch thick, making $\frac{1}{4}$ -inch turns without binding. It can also be used as a table saw for band or jigsaw work by clamping it in a table that is sold as an accessory.



Nailing Machine Speeds Building

Subfloors and sheathing are nailed securely and speedily by a pneumatic machine that drives the nails at a rate of 40 to 50 nails a minute. Weighing about 32 pounds, the machine has a capacity of 400 to 600 nails. The operator steps on a foot-rest to steady the machine during use. Operated by air pressure, the tool handles 7, 8 and 10-penny nails, driving them below the surface, if desired.



Private Cable Car

Tired of climbing the 62 steps to his home, James M. Hammil of San Francisco had a personal-type cable car installed to run from street level to the door. Powered by a $\frac{3}{4}$ -horsepower motor, it makes a 60-foot steep ascent over an 80-foot track. The car automatically stops at each end of the line and will also halt if the cage gate is opened during the run. Over 100 similar cars are being installed in the city.

Popular Mechanics provides two sources of further information pertaining to articles published in each issue: the **WHERE-TO-BUY-IT INDEX**, which appears on pages 10, 12 and 14, and the **WHERE-TO-FIND-IT INDEX**, available to readers without charge. To obtain a copy of the latter index, just send a postcard to Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois



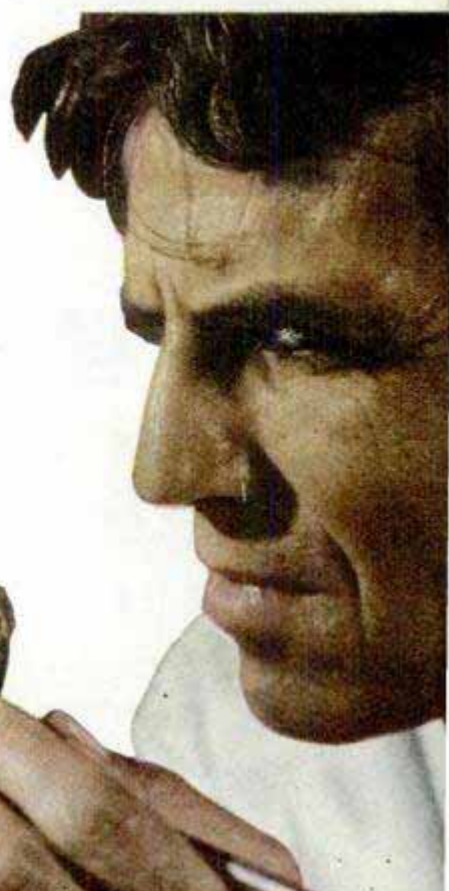
Masterpieces in Miniature

By Richard F. Dempewolff

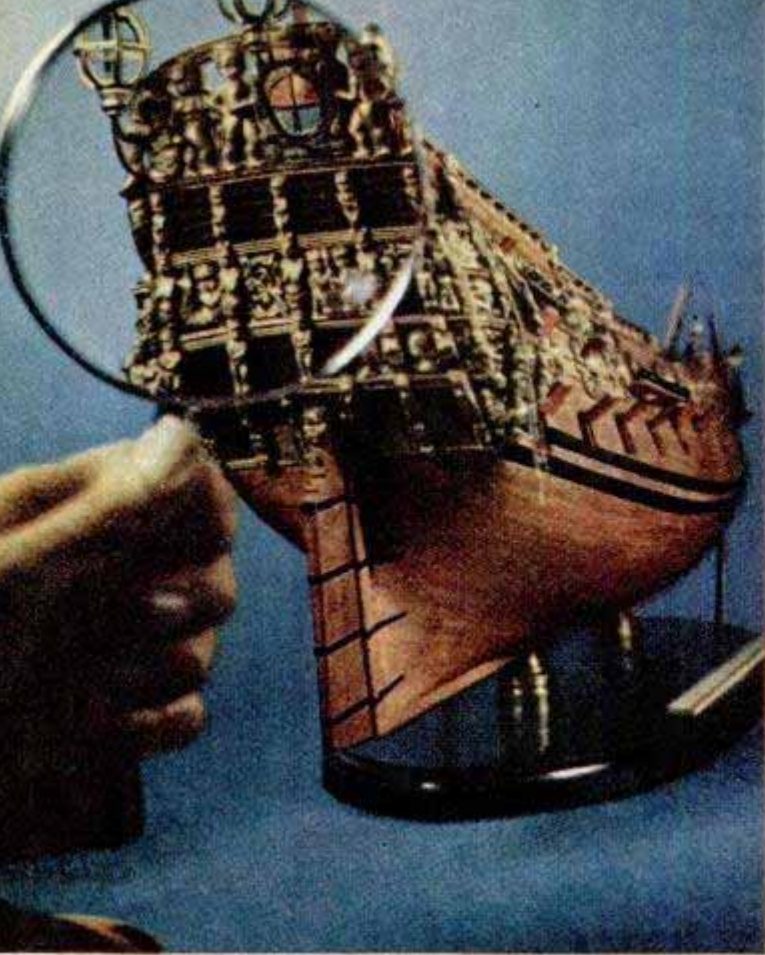
ALL RIGHT from a distance, but terribly crude." If the builder of the intricately rigged model sailing vessel in a steamship line's Chicago show window had heard August Crabtree's comment, he'd probably have had a convulsion. But Crabtree, tall, gaunt and quiet, meant what he said. His criticism was based on his own 15-ship fleet over which he has toiled 12 to 15 hours a day for the past 22 years.

The models, built $\frac{1}{4}$ inch to the foot, literally are jewels of microscopic perfection. Sails can be raised or lowered by hauling threadlike lines through blocks smaller than apple seeds. Even the smallest— $\frac{1}{16}$ inch in diameter—have movable sheaves, so tiny they are made under a microscope. "Drop one on the floor, and it will slip into the nap of the rug and get lost," says

To carve intricate decorations on his seven-inch gondola, Crabtree uses this chisel which has a $\frac{1}{2000}$ -inch blade



MARCH 1950



Opposite page, intricate carvings on sterns of these three vessels follow the originals exactly. At left is the French galley. Center is the Royal Yacht of Charles II, with its beautifully carved portholes. Smaller model at right is the Dutch Admiralty yacht →

their builder, speaking from experience.

No single detail of construction is faked on any Crabtree ship. Each is built up plank by plank, fixture by fixture. Quarter-inch gun ports open and close on infinitesimal hinges. Belaying pins, $\frac{1}{4}$ inch long, slip into racks along the carved balusters. Ring bolts no bigger than this "o" are hand-forged to scale. Other fittings, the size of pinheads, must be placed with a magnifying glass. One-inch grille hatch covers—usually punched or carved from a wood block by model builders—are made up of painstakingly scaled "lumber," notched, fitted and framed, just as they were on the real ships.

Each detail of hull construction conforms to big-ship plans, even to the size of timbers that are pegged or nailed with scale replicas of the pegs or spikes specified by the original shipwrights. The foot-long deck spikes used by old builders show up as $\frac{1}{4}$ -inch brass nails on Crabtree's models. Some he made himself, others were specially made for him in England. Commercial supplies rarely satisfy him. To get proper texture and scale, he weaves his own line of fine linen thread and forges his own minute chain.

Even the six-inch lifeboats on Crabtree's



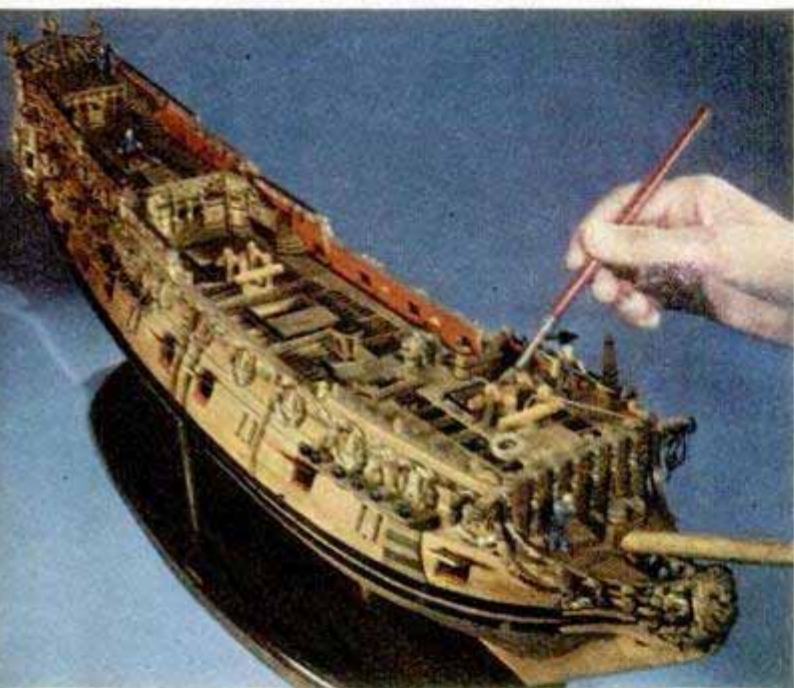
Top, model of the "St. Albans" has 270 carvings, some of which are shown under reading glass. Left, stern lamp of Dutch Admiralty yacht has all the details of the original. Below, left, primitive vessels of the Crabtree fleet are a Stone Age raft and hollow log. Below, unplanked side of British East Indiaman shows rib design. Portions of the deck are unplanked also







Above, that's the first known seagoing vessel at the left. Other sailer is William the Conqueror's "Mora"



Above, dusting intricate models is done with a small oily brush, being used here on "St. Albans." Below, Mrs. Crabtree touches up paint on Venetian galleass



ships are not carved from blocks, but are built up in lap-strake fashion. To remain faithful to scale in these lifeboats, the builder shaved shiplap so fine that the eggshell hulls are often transparent.

"Building them accurately and faithfully," Crabtree explains, "is harder than building a real ship. You work with unusually small bits of wood and very small tools. On a big ship, if you make a mistake on hull construction, you can always go below later and change it. But you can't go below on a model. It must be right the first time."

Though the Crabtree fleet ranges from a beautifully sculptured, inch-high Stone-Age man poling a raft to a six-foot model of the Cunard Line's first sidewheeled steamer launched in 1840, most are models of the ornately carved vessels that rode the seas centuries ago. This often means months of poring through rare books, crumbling shipwrights' plans and charts just to get the proper detail for a single item—like the profile of a figurehead, or the contour of a tiny baluster.

Crabtree never knows where he'll find the necessary data. The best working description for his model of the old Roman grain ship in which St. Paul took his last voyage, came from the Bible. Similarly, his model of William the Conqueror's "Mora," a Viking-type ship of lap-strake construction with shields along the side and a dragon figurehead, was pieced together largely from a picture of it which he discovered quite accidentally on the famous old Bayeaux tapestry in Normandy, France. Tiny covers over the sweep tholes on this model are so thin you can see light through them, but they open and close just as they did on the real ship.

The model with the most far-flung and romantic research background is that of the first seagoing ship known—an Egyptian vessel built about 1500 B.C.

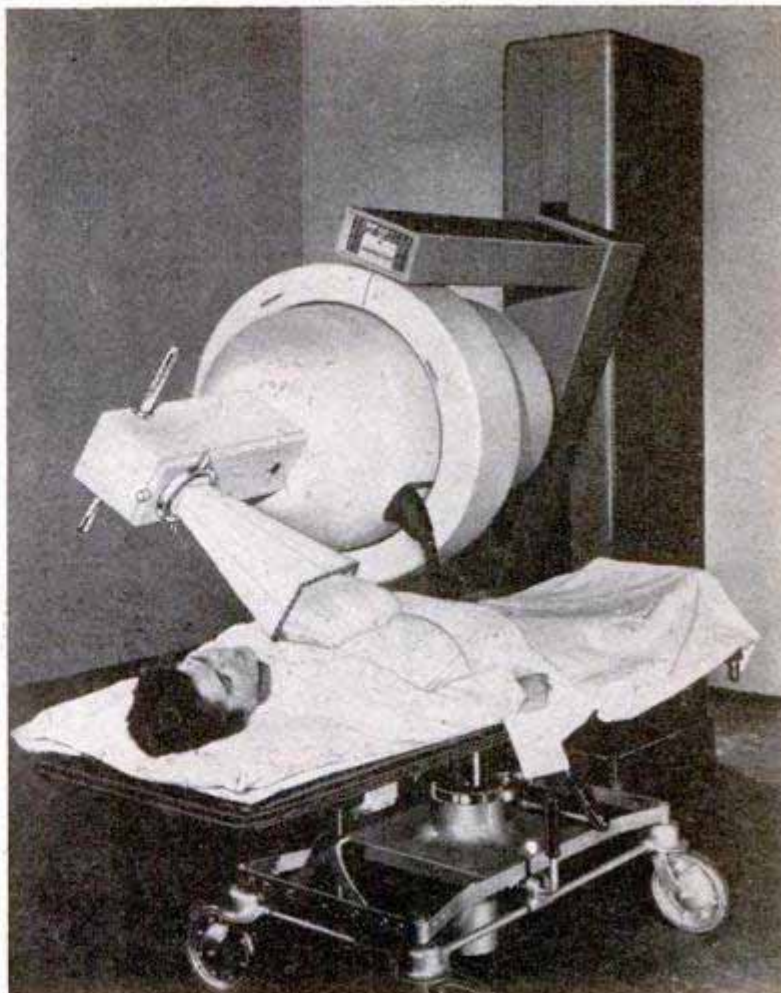
General contours of the ship came from bas-reliefs carved in the Temple of Dier el Bahari and from hieroglyphics discovered by V. O. Lawson, British archeologist, who opened King Tut's tomb. Ancient books and parchments revealed that Egypt had no tall timber, nor did she import any in those days. Hence, Crabtree knew that side planking for the old bark would be short. The King Tut and temple drawings showed him how the short timbers were butted and dovetailed and also showed a long, heavy rope stretched from bow to stern over supports, giving the weakly constructed vessel support to prevent it from "hogging," or breaking in the middle in a heavy sea. This was known as a "hog truss."

Working with Lawson, Crabtree was able to duplicate the old ship in scale. He wove

(Continued to page 238)

"Three Speed" X-Ray Unit Gives Varied Treatments

Producing radiation of phenomenal intensity and in a wider range than any of the single X-ray treatment units, the Maxitron 250 makes possible three types of treatment. Capable of delivering X-rays at voltages ranging from 100,000 to 250,000, the unit can be throttled down to produce non-penetrating "soft" rays effective in the treatment of skin diseases. The machine produces rays that penetrate sufficiently to reach lesions of medium depth in the body, and at its full voltage, can be used to treat deep-seated malignancy. The intensity of radiation is a result of a beryllium window located in a special tube and an amount of amperage double that usually used in therapy units. Differing radically in design from therapy machines, the Maxitron employs an end-grounded, multisection tube which allows the anode end of the tube to be brought closer to the part that is being treated. The design of the head makes possible 360-degree rotation and permits the beam to be aimed in any direction. Another new feature of the Maxitron is the use of a spe-

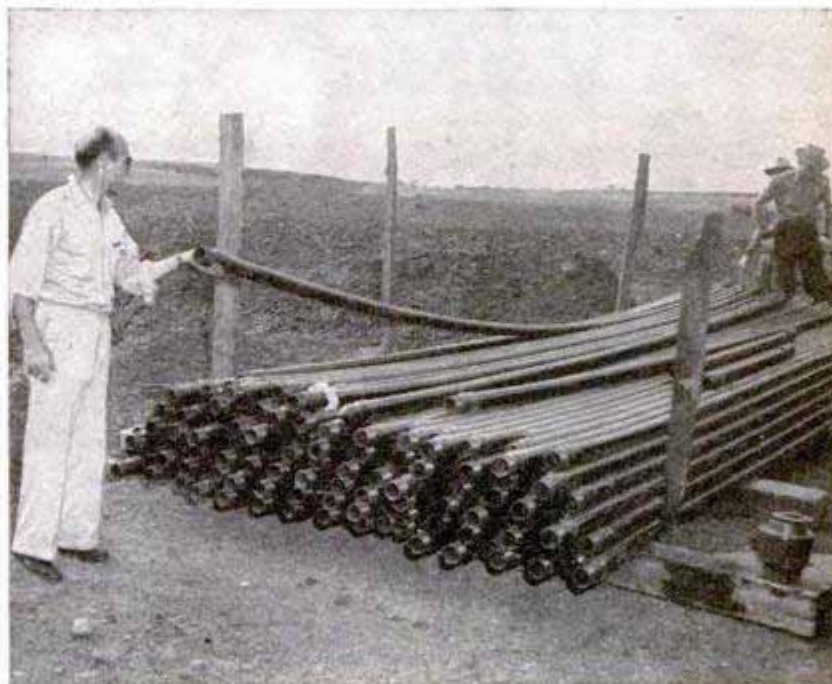


cial gas instead of oil as insulation in the cylindrical tank containing the tube and transformer.

Plastic Piping Drains Salt Water From Oil Deposits

Weighing less than one pound per foot, a noncorroding plastic piping, made of Tenite, is being used by oil producers to draw off salt water from crude deposits. Being plastic, the pipe is not corroded by

the salt water and requires no cement lining as does the steel pipe normally used. In addition, the tubing is flexible enough to follow the contours of the earth, making backfill requirements much less exacting.





U. S. Army photos

Mine planter equipped with whirling blades makes a neat about-face, reversing course within its own length

SEA-GOING EGGBEATERS

A BIG TANKER, with trawler in tow, hove-to in Charleston Harbor recently, while all hands lined the rails to watch a Navy mine planter that seemed to be wallowing and in need of help.

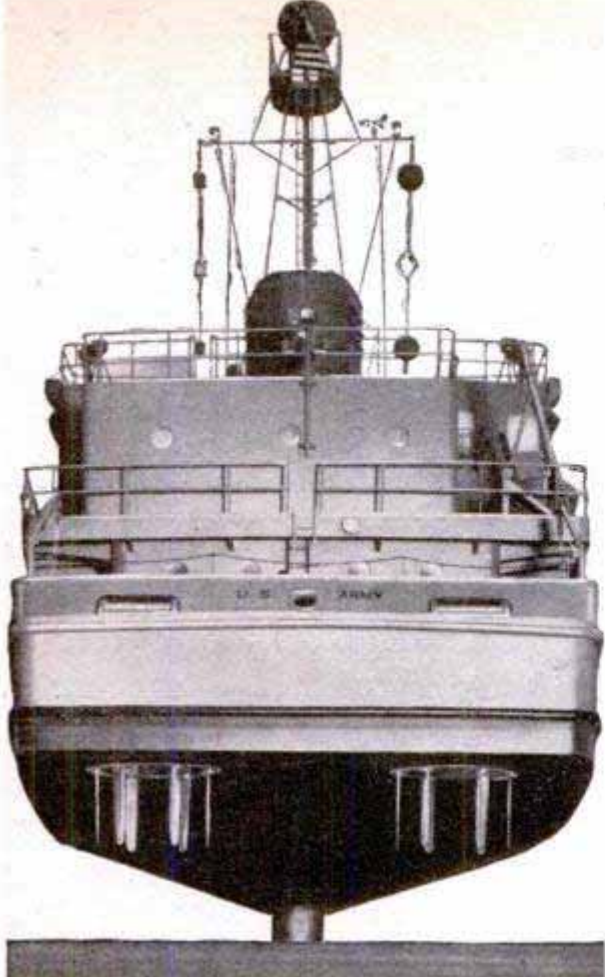
Suddenly, eyes popped as the mine planter spurted forward with incredible speed, spun like a top in a space no greater than its own length and headed for a pier. It didn't coast in to a landing. It roared up parallel with the dock, about 50 feet offshore and, as though by magic, stopped on a dime. Then, like some crazy waterbug, it crabbed sideways into the pier and tied up.

Astounded watchers on board the tanker had reason to gape. They were looking at the results of the greatest advance in marine propellers since invention of the helical screw. The secret of the mine-planter's antics was "cycloidal propulsion," a method of locomotion developed in this country by Prof. F. A. Kirsten of the University of Wisconsin.

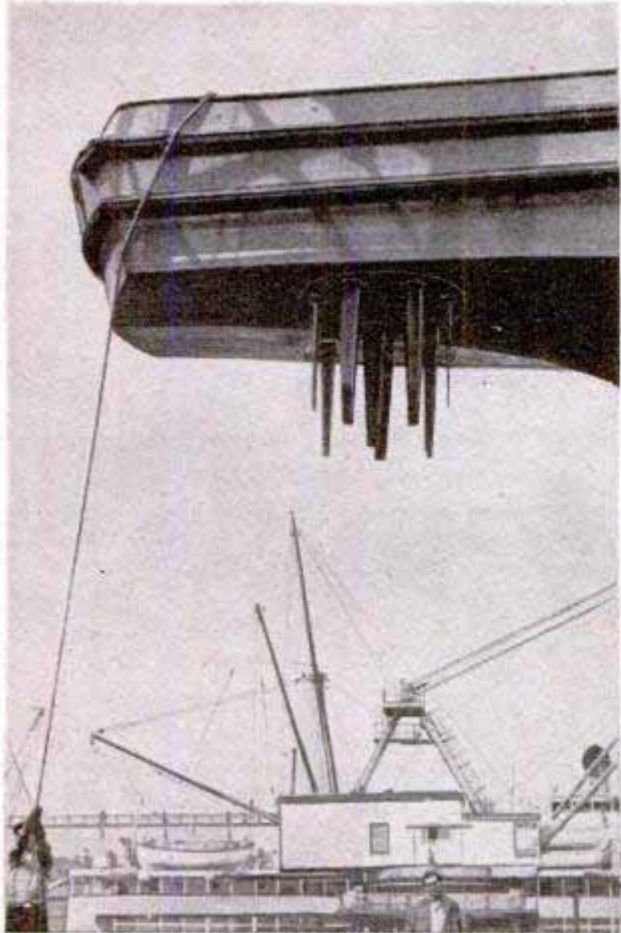
First tested on a harbor tugboat some three or four years ago, the Voith-Schnei-

der or "eggbeater" propeller is made up of a disklike blade wheel, flush with the bottom of the ship. Sticking downward from the bottom of the blade wheel are anywhere from four to eight blades, similar to airplane propellers chopped in half. As the blade wheel whirls, the blades rotate, too, so that in ordinary forward movement they knife the water on the forward sweep, and present a paddle surface on the backward sweep. Through hydraulic controls on the bridge the pilot can adjust or even reverse the angle of the blades. The ship will respond by going faster, slower, turning, sidling broadside, backing up or spinning as though hung on a pivot. Since all movement is controlled by the propellers, the ship has no rudder.

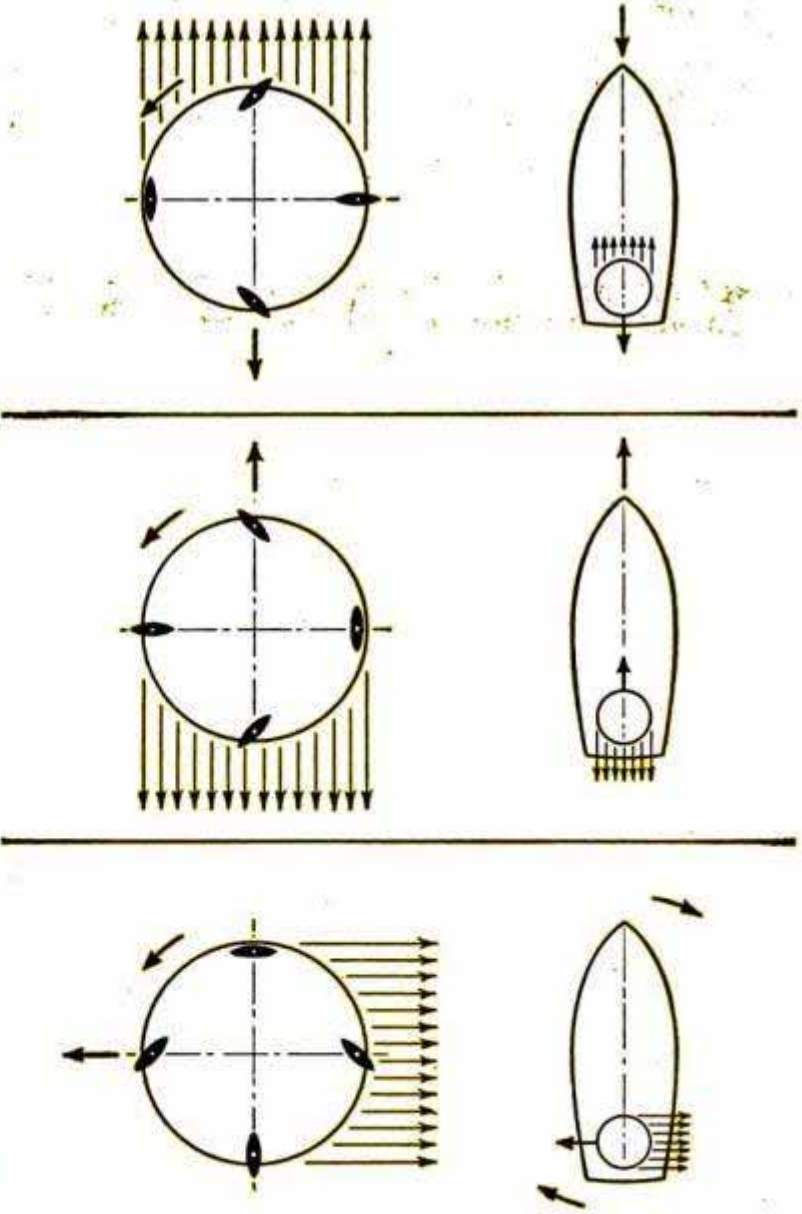
Because of advantages in maneuverability, cycloidal propellers are considered ideal for military craft, towboats, mine planters and tugs. The propellers have tremendous drive, giving a speed about 30 percent faster than is possible with the conventional screw.



↑ Twelve blades knife downward from the two blade wheels on a model of the mine planter. Below, cycloidal propeller also was installed on a towboat. Though this unit has eight blades, number can vary



↑ Simple controls on the bridge permit pilot to spin the ship like a waterbug. Three diagrams below show how angle of blades changes direction of craft. Arrows in groups show thrust of the blades to maneuver ship in direction indicated by single arrows





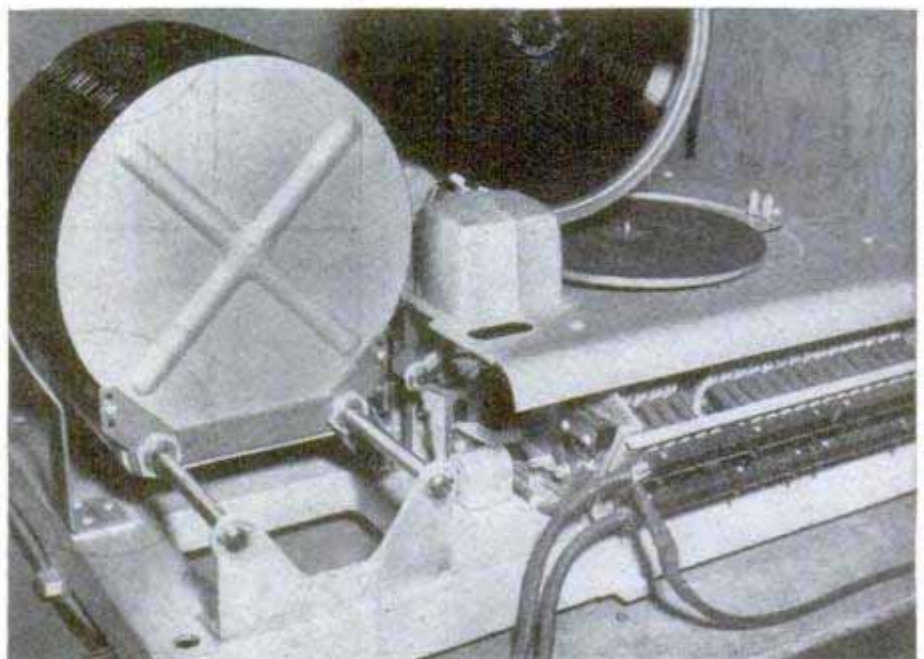
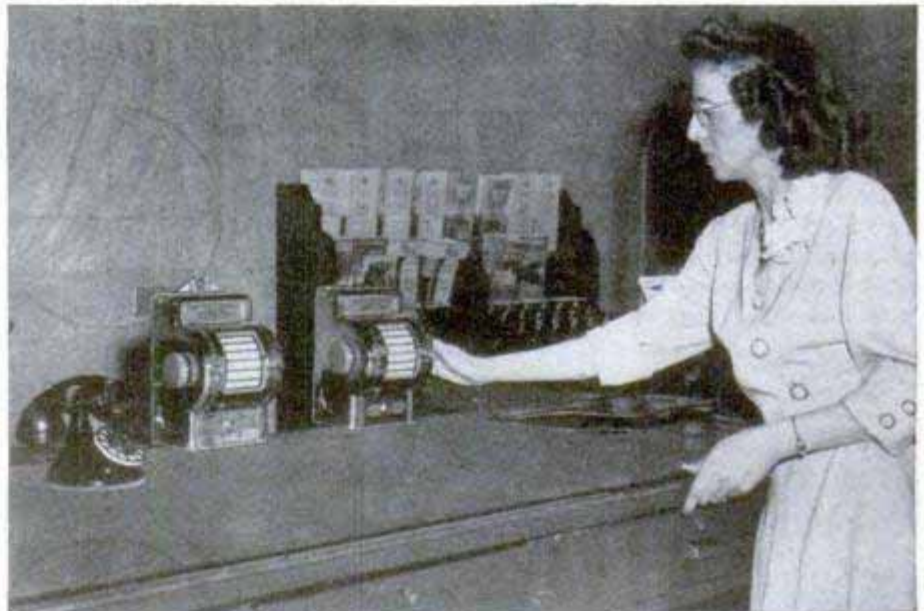
Wide-View Mirror Aids Safe Driving

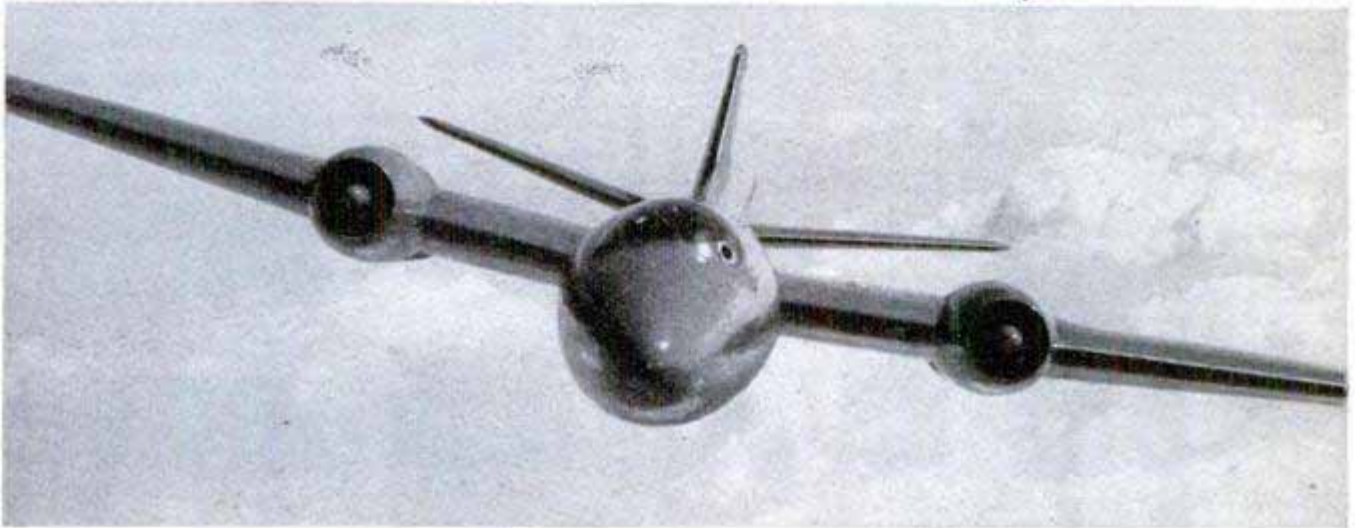
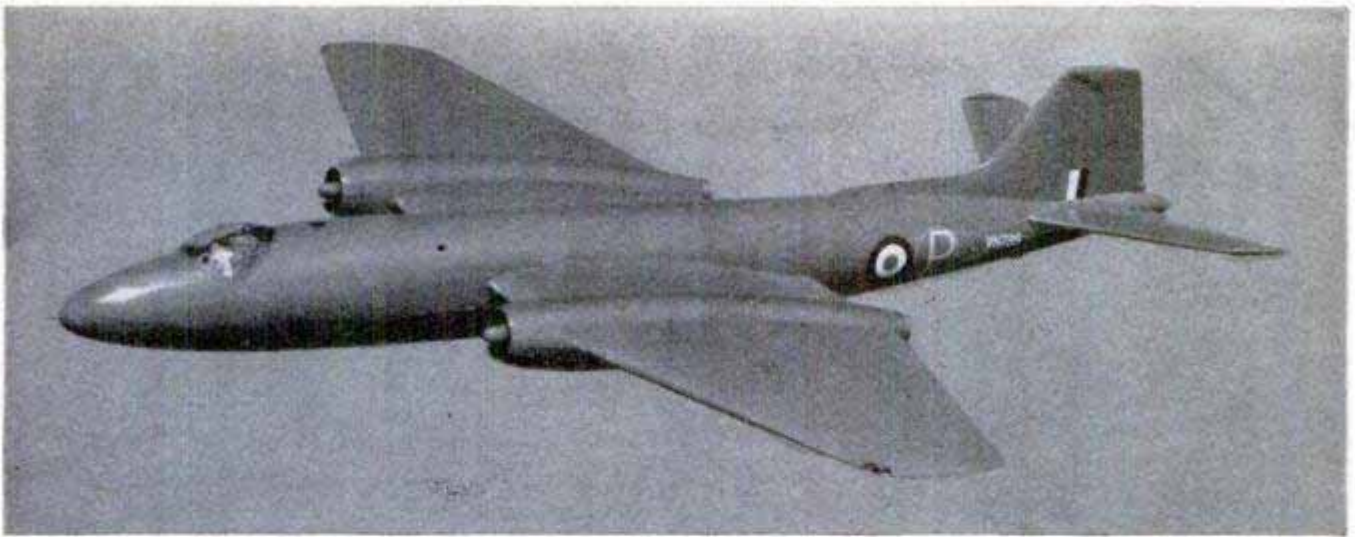
Motorists can see in a 160-degree arc to the rear with a five-section rear-vision mirror that attaches to the upper molding of the windshield. With the mirror, motorists can see both sides of the road as well as directly to the rear, eliminating the need for glancing over the shoulder in traffic. The mirrors are set in a metal frame at various angles to provide the continuous view rearward. The inventor, Charles L. Bennett of Chicago, adapted the 70-square-inch mirror from a wartime model he produced for aircraft.

"Juke Box" Caller Announces Trains

Once the chore of a leather-lunged man in uniform who sometimes sounded as though his mouth was full of pebbles, train calling is now being done in distinct and well-modulated tones by an adaptation of the modern juke box. Built for the new Texas & Pacific station at Fort Worth, the electronic caller uses a series of professional recordings that gives the calls of all trains arriving and departing from the station. Two automatic selectors, of the type used in restaurant juke boxes, are mounted behind the ticket counter in the waiting room. All a clerk has to do is dial the name of the desired call and the announcement goes out clearly over a public-address system. Professional radio talent was used to make the recordings to assure proper enunciation.

Top, selecting the proper train call is as simple as dialing a tune on a juke box. Right, this changer automatically plays any of 38 recorded announcements

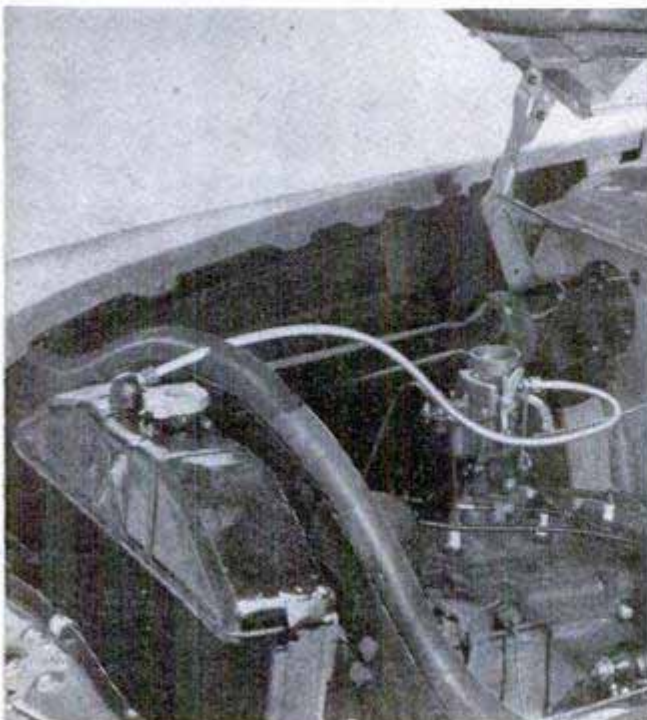




Acrobatic Bomber

One of the most unusual new warplanes is Britain's twin-jet Canberra, a bomber that does slow rolls, high-speed turns and sharp climbs like a fighter. It has a speed range of from less than 100 to more than

500 miles an hour. Classed as a light bomber, carrying a 10,000-pound bomb load, the Canberra has a crew of two, pilot and radar operator. Twelve are being built by the English Electric Company for Royal Air Force service testing. It is Britain's first jet bomber.



Water Vapor From Radiator Increases Gasoline Mileage

By transferring water vapor from the radiator to the carburetor, a vaporizer is said to make automobile-engine operation smoother and more economical. From a thermal dome, soldered to the radiator, a length of aluminum tubing carries the moisture-laden air to the carburetor to act as an antidetonant, producing more even combustion. According to the manufacturer, the vaporizer, which provides the same moist air that makes your car run better on rainy days, increases gas mileage, reduces carbon and gives longer oil life. Antifreeze, either permanent or alcohol-base, does not lessen the effect; in fact, alcohol vapors increase the benefits.

☐ Airline travel throughout the world averaged 70,000 passengers a day during the past year.

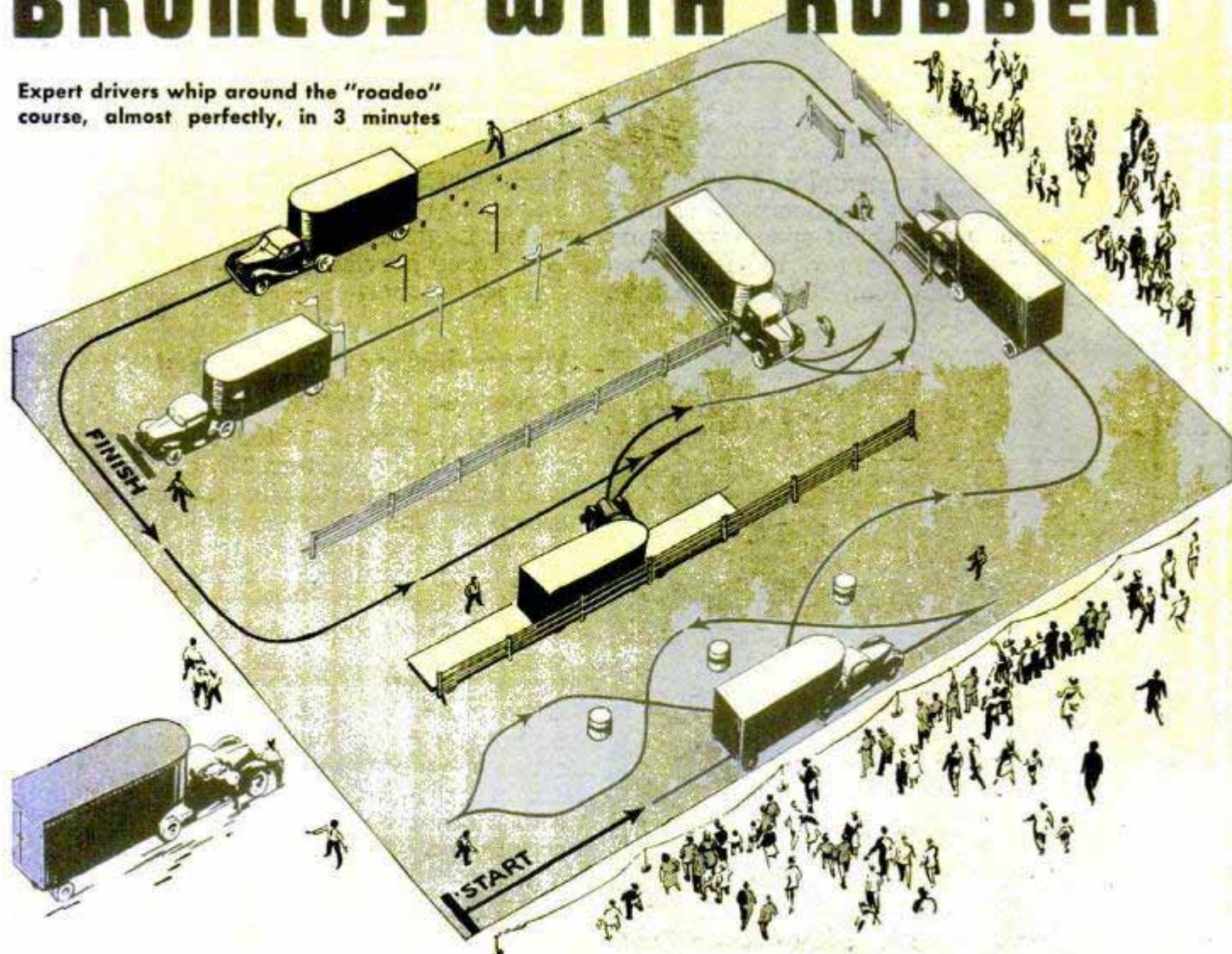
Top drivers for 1949, left to right: Johnny Castner, double-bottom king; Ben Winterberger, semitrailer, and Steve Moon, straight truck

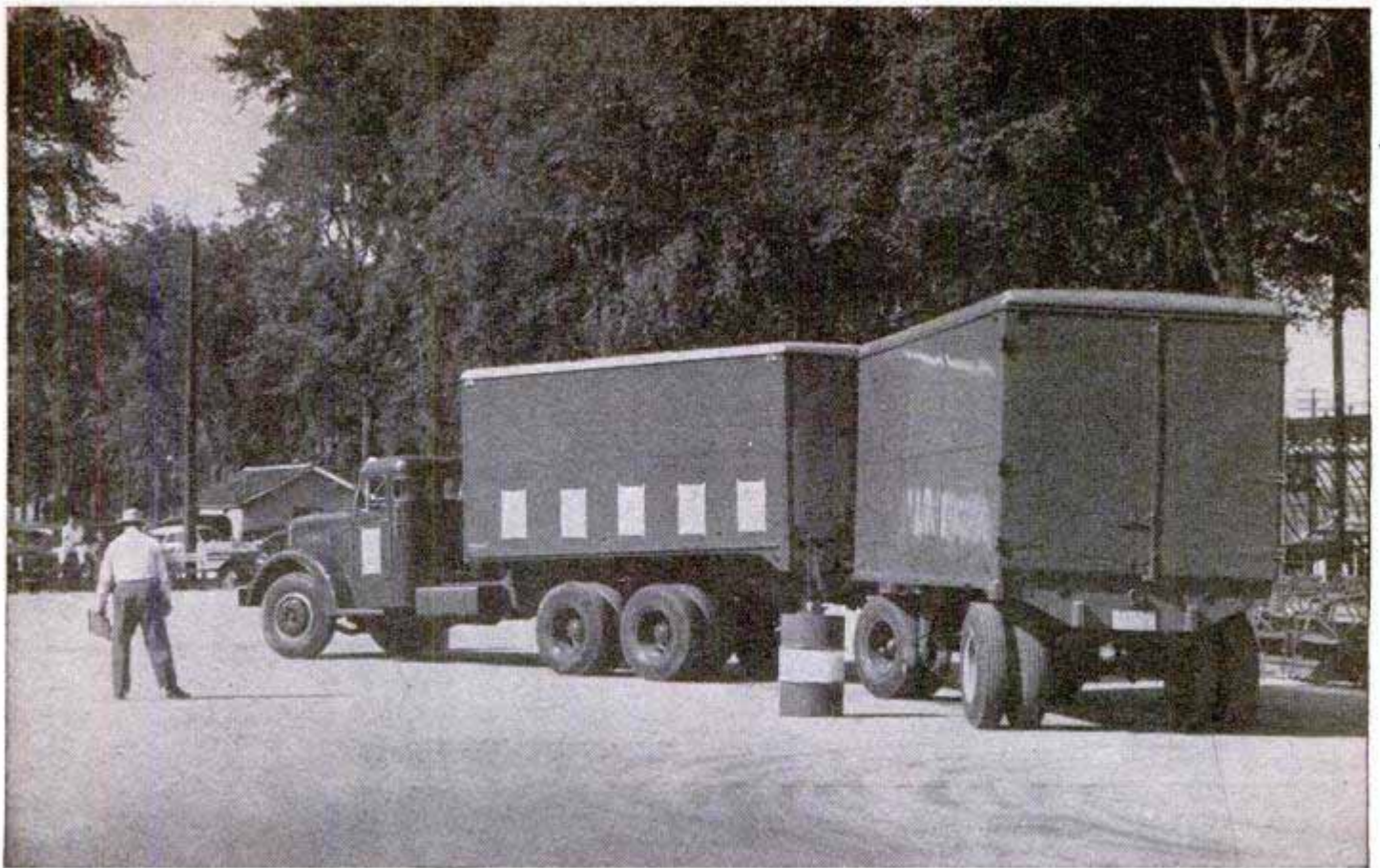


If you've cussed 'em on the highway, prepare to take it all back. They're the world's safest drivers, these cowboys who ride

BRONCOS WITH RUBBER

Expert drivers whip around the "roadeo" course, almost perfectly, in 3 minutes





TIRES

It takes precise wheel-handling to roll this 18-wheel double-bottom truck forward and backward through the serpentine without hitting a single barrel

Champion Johnny Castner shows a former B-29 pilot, Leverett Richards, how to do the two-handed shift

The Portland Oregonian



By

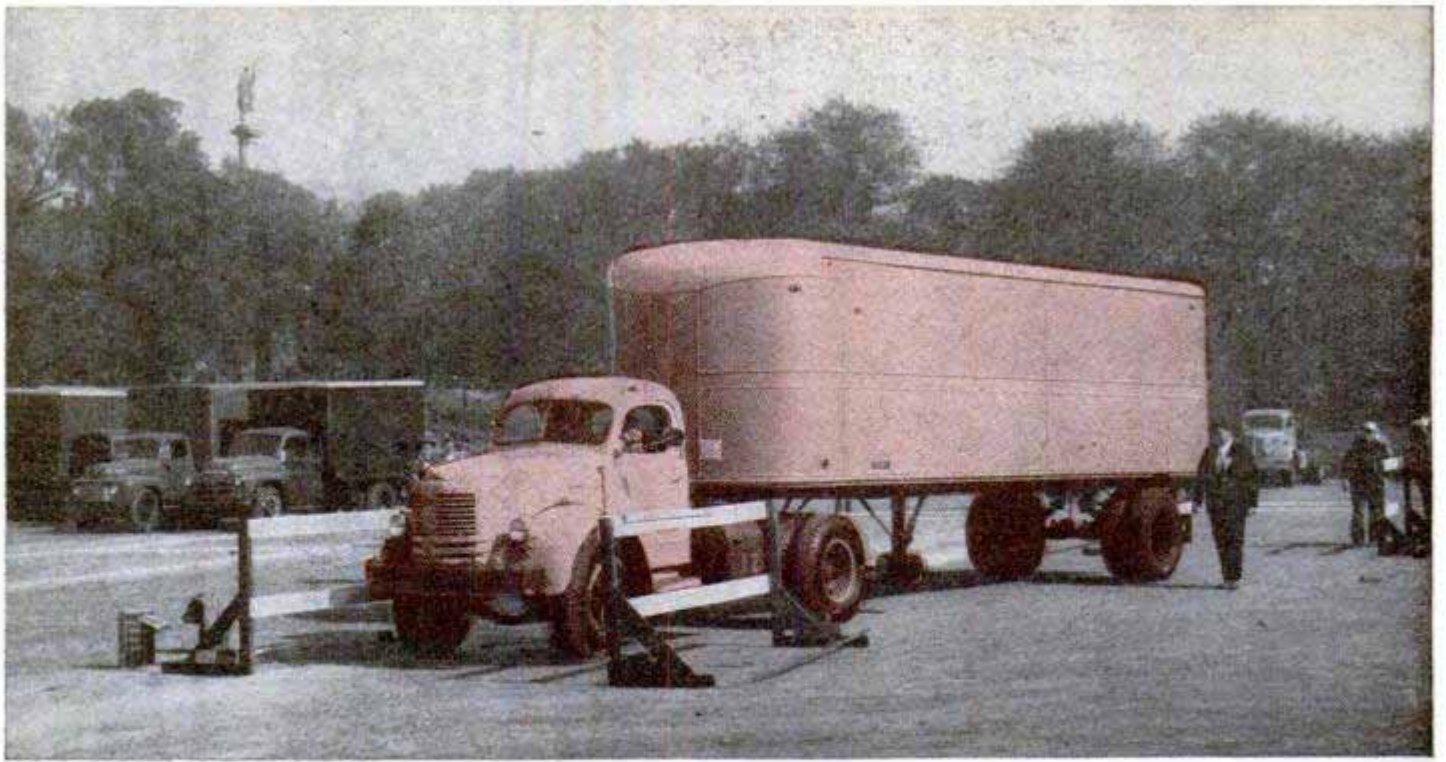
Richard F. Dempewolf

RODEOS once were affairs in which bandy-legged cowboys rode kidney-busting broncos and Brahma bulls, rope-tied calves and "yahooed" all over the corral.

Now, like everything else, rodeos have gone 20th century. The steeds are there, all right, but they "augerate" on bolognas (rubber tires to you) instead of iron shoes. And instead of snorting, they roar oil or gas-fumed defiance. Instead of the comfortable creak of saddle leather, there's a clashing of gears and a rumble of 20-ton trailers being whipped through narrow alleys, snaked around barrels and backed into docks that are invisible from the driver's seat.

Even the spelling of the game has been changed to conform with progress. It's a "roadeo." The only familiar item in the whole show is dust, which swirls from the spinning dual wheels of the mighty transport trucks more abundantly than it ever did from under the shoes of an ornery bronc.

The National Truck Roadeo is a natural outgrowth of a fast-growing industry. In 20 years, trucking has grown from almost nothing to a point where now some 7,500,000 thundering vehicles carry 80,000,000,000 ton-miles of freight each year across the country's supply lanes. That's more than half of all the freight in the nation. Eight billion



After leaving the serpentine, the truck has to maneuver through this offset alley with only inches to spare

gallons of gas each year go into the hungry maws of those transports. If all that gas were put in gallon cans, you'd have enough to make five stacks to the moon.

The men who weave these gas or diesel monsters through today's traffic are a tight-knit group of swell guys, not too different from airline pilots. They are primarily interested in engines and horsepower and they're wizards behind a wheel.

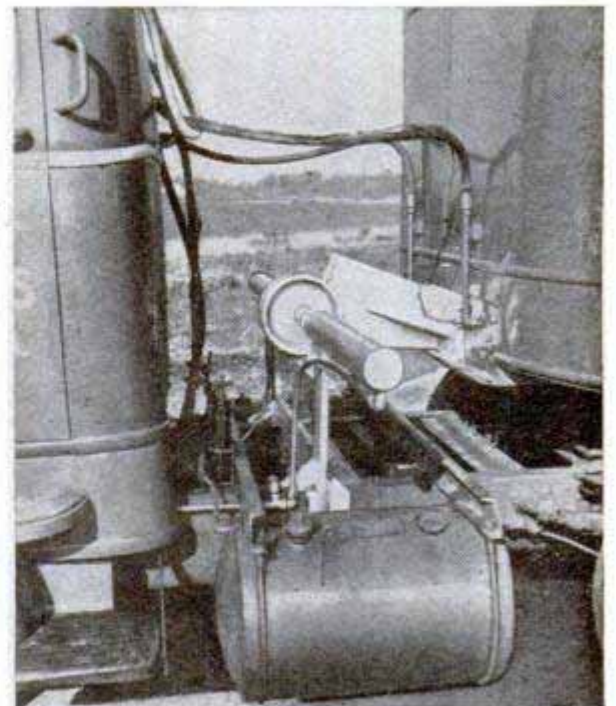
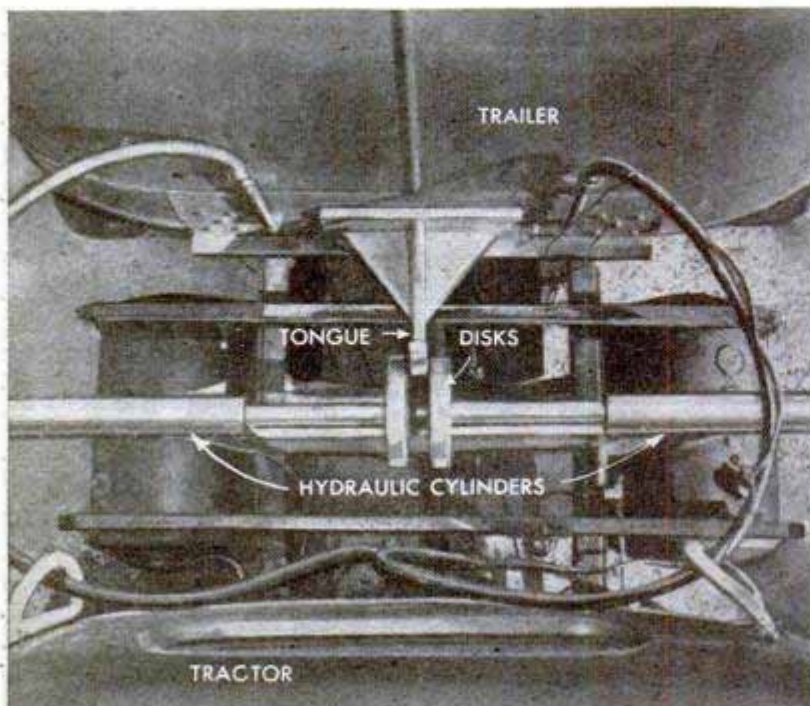
It was to show the public the incredible degree of safety, courtesy and driving judgment these men have achieved that the American trucking associations held

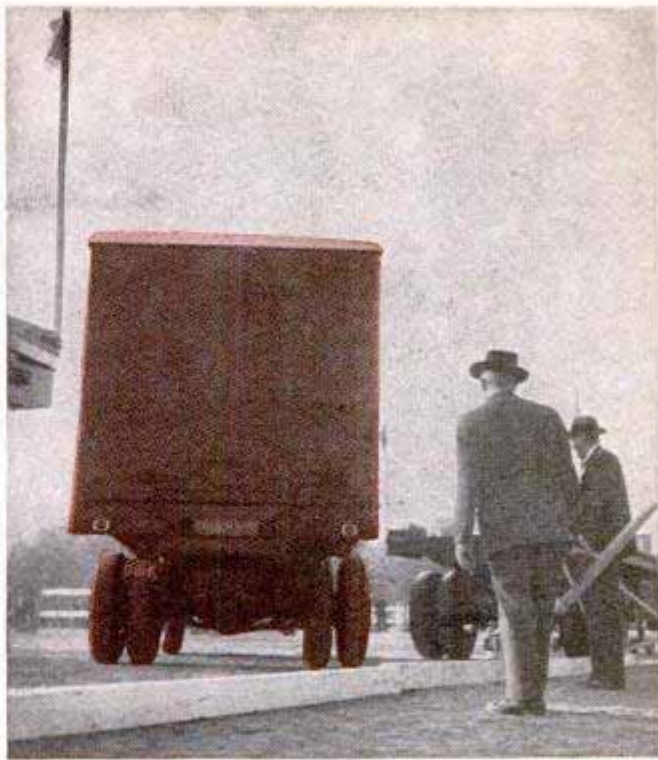
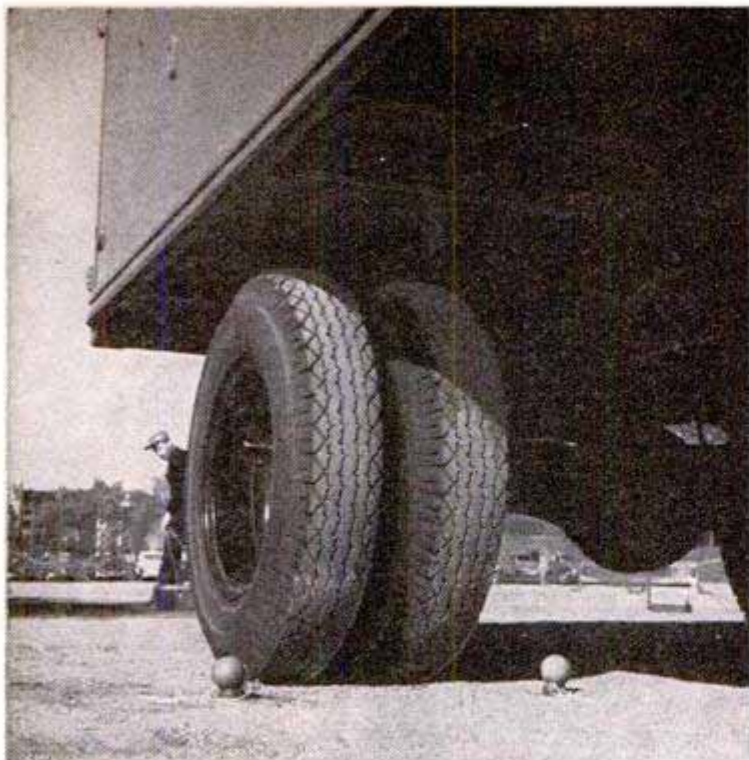
their first roдео in 1937. It was such a whopping success that, except for a war-time intermission, it has been held every year since.

The 1949 winners of preliminaries in 34 state rodeos roared around Boston Common in their cumbersome rigs to determine who were the best truck drivers in three classes: truck and full trailer; tractor and semitrailer, and straight truck.

Biggest are the "double bottoms." These 14 to 20-wheel, 36-ton rubber-tire "freight trains," measuring some 60 feet from end to end, consist of a full-size truck with a

This hydraulic control, between cab and trailer body, is said to stop jackknifing. Pressure in cylinders retards whip action on turns and, if desired, disks can be locked in center to make vehicle a rigid unit





Left, on straightaway, wheels are driven between these markers. Right, backing into a tight parking space

full trailer. They haul freight across the Rockies. Besides the usual collection of multiple gearshift levers and a maze of instruments including tachometer (since diesels are shifted according to engine speed instead of road speed), they carry flares, shovels, sand (for trouble), and a "suicide box" or sleeping compartment behind the driver's seat. The boys call these rigs "pajama wagons."

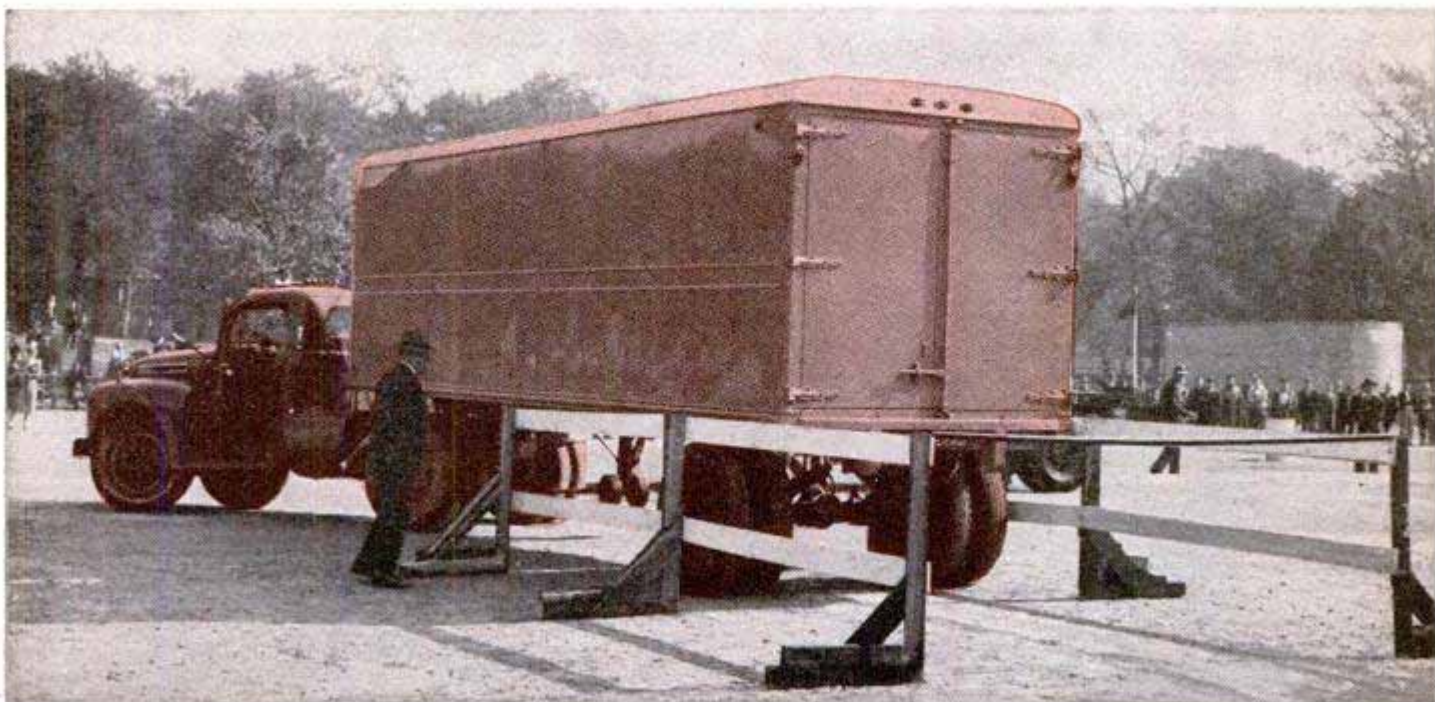
Since most double-bottoms are out West, their roдео finals were run off in Phoenix last year. Only the familiar tractor-trailer and straight trucks competed in Boston.

Before a driver can qualify for the

roдео, he must not have had a single accident during the previous year—even one that wasn't his fault. Then he must pass an examination on ICC regulations, first aid, fire fighting and general trucking-industry questions, as well as a personal-appearance test. If he weathers all this, he's already logged up a possible 100 points against the roдео maximum of 400.

At Boston Common, where the semi-finals were run off last October, the park was a beehive of motorized activity. Conversation among the snappily uniformed contestants was spattered with truck jargon. Riding a tractor without trailer is a

Semitrailer being backed into alley dock must stop within six inches of the end and no fair touching sides

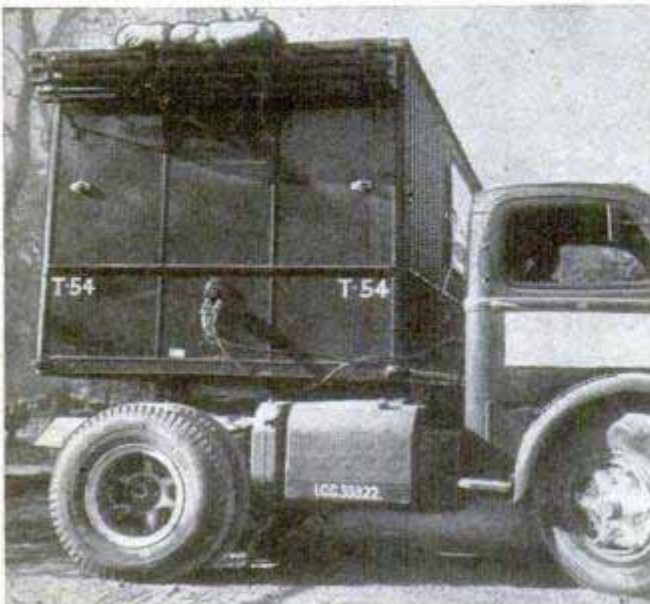




Backing a semitrailer can be hazardous. Because the fifth wheel doesn't turn, this sharp tilt results



To prevent the tilt, shown at top of page, this new fifth wheel turns with the trailer. Below, the same truck in the same maneuver, but this time there is no tilt because the tractor has the new fifth wheel



"bareback" ride. An explosive truck is a "broom wagon," a poultry truck a "cackle crate." You don't have noisy brakes; you have "cop callers." A beat-up jalopy has "friendly fenders" that wave at you. A cab without windows is a "pneumonia sedan," and you never haul an empty truck—you "haul postholes."

Truck drivers must know every inch of their vehicles, check them over thoroughly before each run. So, each roadeo contestant must check a truck he has never seen before—and into which the judges have introduced eight "bugs;" a loose lug nut, a headlight that conks out on high bright, a loose wiper and so on. The driver is graded on the number of defects he finds and his method of inspection. Now he's ready to climb behind the wheel.

First, the roadeo driver backs his rig in and out through the "serpentine"—a row of three barrels, spaced 34 feet apart. If any are left standing, he weaves forward through them.

Now he moves to the "offset alley"—a pair of alleys about 24 inches wider than the truck. They are 10 feet apart. The second alley jogs a full 10 feet to the right of the first, so the driver must "S-turn" his long rig through both without so much as brushing a "wall."

If he's still in the fight, the jockey then does a parallel-parking job between two trucks. Straight trucks get a six-foot clearance. Trailers only get four, since they can jackknife into place. Everybody gets two cracks at it and must wind up no more than six inches from the curb without having touched either parked vehicle. Otherwise, he loses points. He loses points for hitting the curb, too.

Next comes the "alley dock," into which the driver backs, without being able to see where he's going. In spite of this, he's got to wind up with his tailgate within six inches of the loading dock at the end. One reporter at the double-bottom roadeo in Phoenix looked at it and announced: "It's impossible, that's all. Impossible." Nevertheless, Johnny Castner, last year's winner in the double-bottoms, managed the alley dock in 30 seconds—maneuvering his 60-foot rig like a tricycle.

Generally, Johnny and all the other boys manage their backing feats by use of rear-vision mirrors alone. But that's not always enough. One fellow in a previous roadeo, after three bad tries, finally ground his gears down to the "bottom hole," shut the throttle to $\frac{1}{16}$, then got out and walked the rig into place, steering with one hand from the ground. This trick was banned in the 1949 roadeo; the drivers now are allowed to be only far enough out the door to put one foot on the running board.

Once out of the dock, the driver "walks the plank"—running his right-hand dual wheels through a double row of rubber balls on tees. He's got two-inch clearance on each side of his big tires and loses points for every ball he tees off. If he makes it, he swings into the "diminishing alley"—a row of six-foot poles which get closer and closer as the driver approaches the finish line. When he stops between the last two poles, each stick will be exactly one inch from the side of the truck—provided the vehicle has stayed "on course."

"An extra layer of paint on the truck and we can't make it," one contestant observed.

All these shenanigans must be executed at a "cruise" pace—no jiggles, jumps or hesitations. And the man who winds up with the most points and shortest time for the course is the winner.

It pays to win, too. First place in the double-bottoms was copped by Johnny Castner, driver for Pierce Auto Freight Lines in Oregon, who piled up 344 points out of a possible 350. Semitrailer winner was Ben Winterberger of the Dohrn Transfer Co., in St. Louis, with 368 of a possible 400 points. Steve Moon of the Georgia Highway Express took the straight trucks with 385 of a possible 400 points. Besides big trophies, these lads will all get \$50 a month for one year from the A.T.A. Second and third-place winners get \$30 and \$20, respectively.

Roadeo obstacles are not so far removed from the conditions which the average truck driver meets in his daily rounds.

"That alley dock," says Kermit Kruschka, semitrailer champ from Wisconsin, "doesn't hold a candle to one of my daily Green Bay stops. Every day I back my 40-foot rig half a block down an alley that is exactly two inches wider than the truck—and it's not bad until I hit the bend. I've got it down to 15 minutes now, with only two pull-ups to straighten out. This roadeo thing—if you don't make it, you don't make it. But that Green Bay loading dock . . . ! If I don't roll the cargo in, I carry it in."

Tommy Bennane, three-time Michigan straight-truck champ and last year's national winner, claims that practically all city delivery alleys are offset. "I've got one with fire escapes that come so close, if I stuck my head out the window I'd wear it right down to my neck," he says. Steve Moon, present national straight-truck champ, delivers to an Atlanta radio shop at the end of an alley with a two-inch clearance and an S-curve to boot. He has to pull in his mirrors and sneak back by instinct.

Even so, if you think it's easy to wham a big rig through its roadeo paces, think again. Out in Portland, Ore., Lev Richards,

(Continued to page 272)

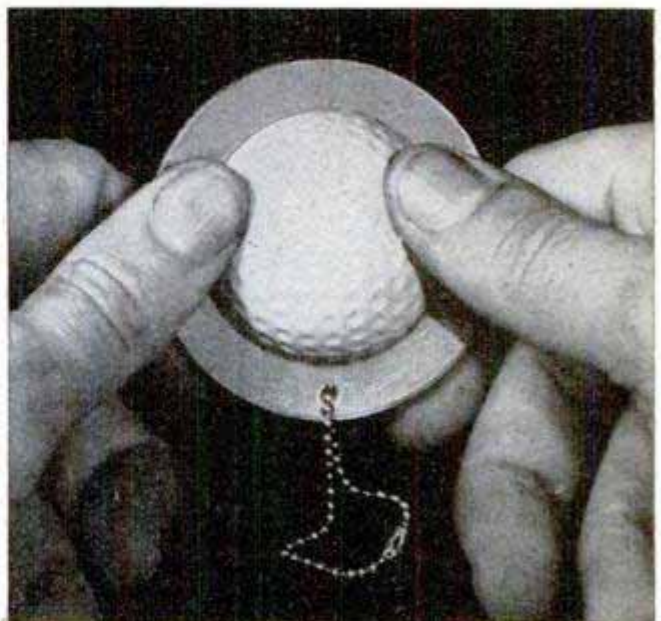


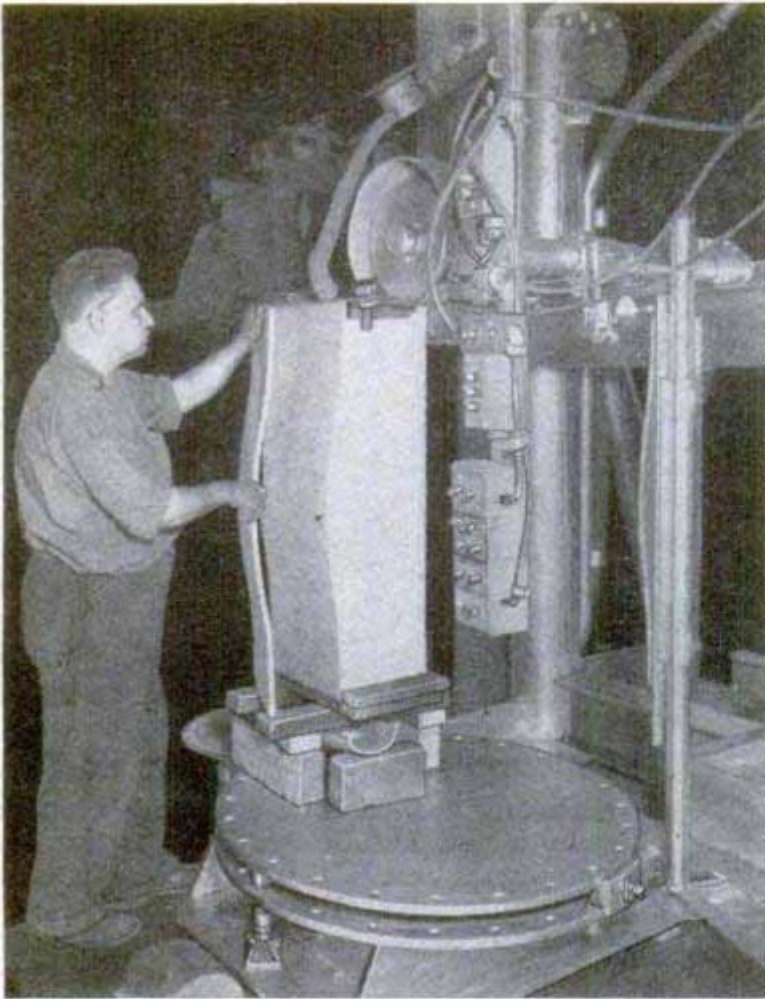
File Handle Makes Pressure Easy

Pressure is distributed evenly along a file by a new handle which gives the tool a planing motion. The handle has a tapered groove into which the shank of the file is slipped. It describes an arc above the file, thus exerting pressure along the tool instead of at one end only. Quickly installed or removed, the handle fits all sizes of flat or half-round files from 8 to 16 inches in length. The handle also can be used with carpenters' rasps.

Pocket Gauge Checks Golf-Ball Size

Golfers can be sure the ball they are using is perfectly round, thus eliminating one cause of bad shots, with a pocket gauge that is accurate to $\frac{3}{1000}$ inch. The gauge is made of aluminum and is precision bored to match Professional Golf Association standards for ball diameter.





Wire Stone Saw Cuts Granite Wafer Thin

Originally developed to cut granite—in addition to marble, sandstone, limestone and other rocks—a wire stone saw may have an important bearing on a variety of stonework. A basic part of this electro-pneumatic machine is a three-strand steel rope which, when used with an abrasive, cuts the densest of stone much as a big knife would slice cheese. Granite may be cut to such waferlike thinness that it is translucent. It may be cut into blocks, slabs, veneers or other shapes requiring straight, vertical, horizontal, radius or internal cutting. Granite veneers obtained by using this machine lend themselves to at-

tractive and original designs for the exteriors of stores and office buildings, and the interiors of theaters, office buildings, and even homes. The natural beauty of rock can be utilized without the depth and weight of solid blocks. The saw cuts granite at speeds ranging from 12 to 36 inches per hour. This machine, developed by the L. M. Gilbert Company, Philadelphia, is 13 feet 5 inches high, 18 feet wide and 18 feet 11 inches long. The three-strand steel-wire blade rotates in a horizontal plane around two large wheels which are automatically lowered as the cut progresses. The outfit is powered by a $5\frac{1}{2}$ -horsepower motor.

Traffic Through Tunnel Controls Ventilation Blowers

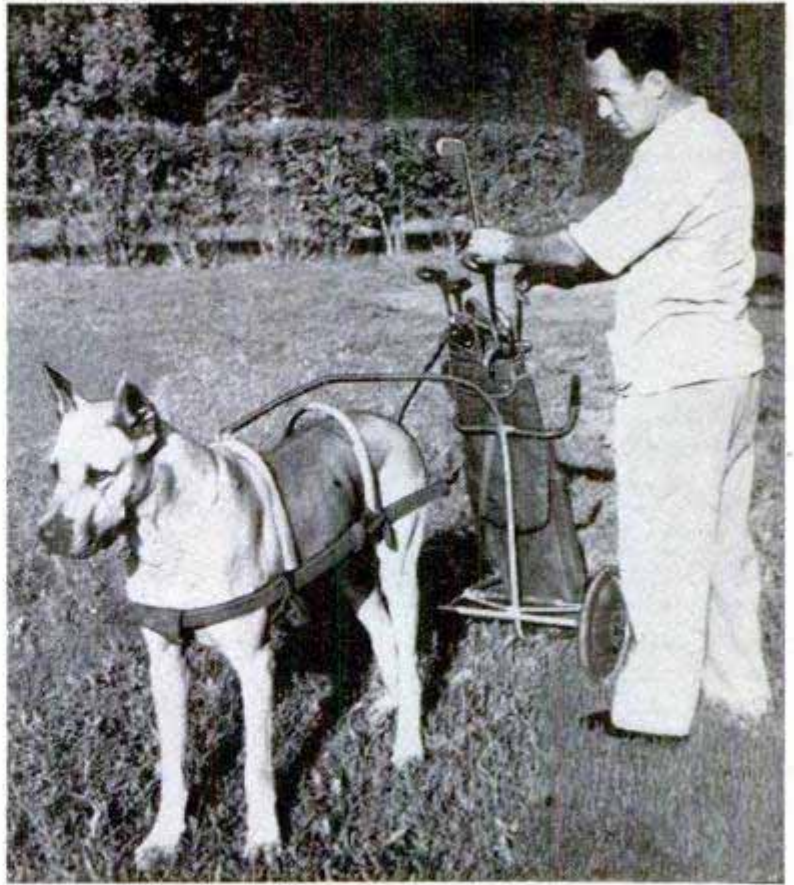
What is believed to be the first tunnel to have automatic ventilation control is now being built near Houston, Tex., under the ship channel connecting that port to the Gulf of Mexico. The speed of the blower fans providing fresh air for the new Washburn Tunnel will be governed automatically by the number of cars in the tube and the amount of poisonous carbon monoxide in the air. Photoelectric cells at the entrance and exit of each side of the tunnel will count traffic in both directions. They will transmit their count to a mechanical

computer, which will keep a running total of the traffic. Traffic increases will speed up the blowers. At two points in the tunnel an automatic air-analysis machine, connected to the fan governor, keeps a constant carbon-monoxide count. Whichever unit—car counter or air analysis—calls for the most fresh air actually controls the blowers' speed at any particular time.

ⓄTransportation costs for all goods and people in the U. S. during 1949 added up to a total of over 38 billion dollars.

Canine Caddy

Capitalizing on the dog's sport of chasing a ball, Dominic Colucci of Chicago converted his Great Dane, King, into a caddy by means of a harness and two-wheel cart. During the wartime caddy shortage, Colucci began using the dog to pull his caddy cart and now he wouldn't think of beginning a round of golf without him. Lost balls are infrequent because King gallops after the ball as soon as it has been hit.



Odorless Paint

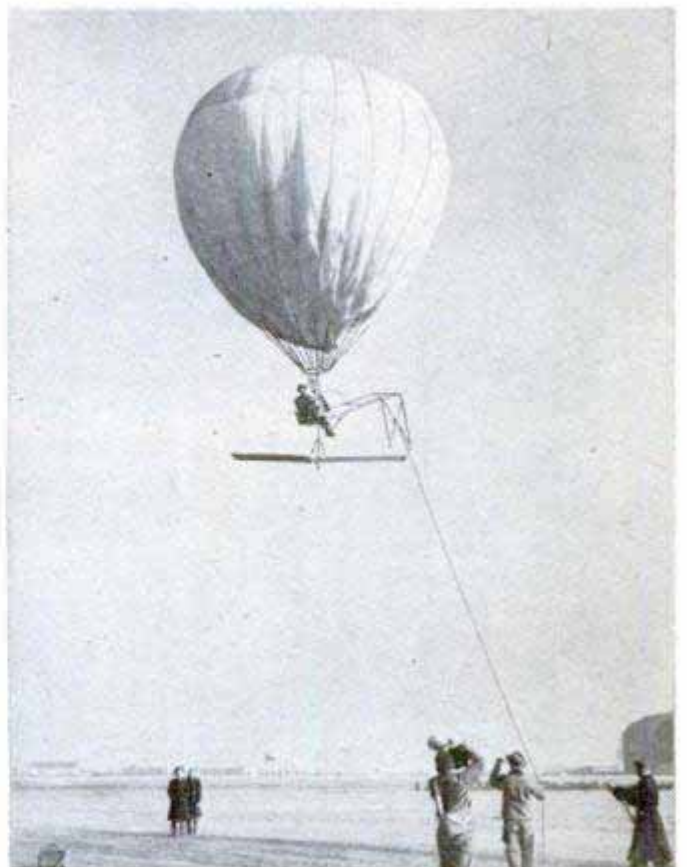
Millions of submicroscopic balls of rubber, whipped up in water to form an odorless rubbery film, may be used to coat the interiors and exteriors of houses of the future. It is washable. The new paint, made by the Dow Chemical Company, Midland, Mich., dries by the evaporation of the water component, leaving a thin sheet of rubber which adheres firmly to the wall but allows dirt to be washed off. Ordinary water-base paints now in use do not always wash satis-

factorily. Pigments can be added to the new paint, but there are no turpentine, solvents or oils to cause odors.

Cyclist Propels 24-Foot Balloon Through Sky

Leg power alone runs a unique pedal-copter built by Charles Paul, a Lakehurst, N. J., attorney. He sits in a bicycle frame

suspended below a 24-foot balloon and pedals a bicycle device to turn the helicopter blades operating the craft.



NIGHTLY, on the circus lot, a stocky 44-year-old Texan eases his 212 pounds into a cardboard carton, puts his head inches away from a stick and a half of dynamite and blows himself up! And all he gets is an occasional headache. How Leopold Simon does it puzzles the thousands who watch the act from behind a wire fence a safe distance away.

But it is no puzzle to Suicide Simon. He has worked out his chances of coming out alive down to a science. "My head," he says, "is only six inches from the dynamite when it goes off. I'm in the center of a vacuum. That's why I'm safe. If I were three feet away, the explosion would kill me."

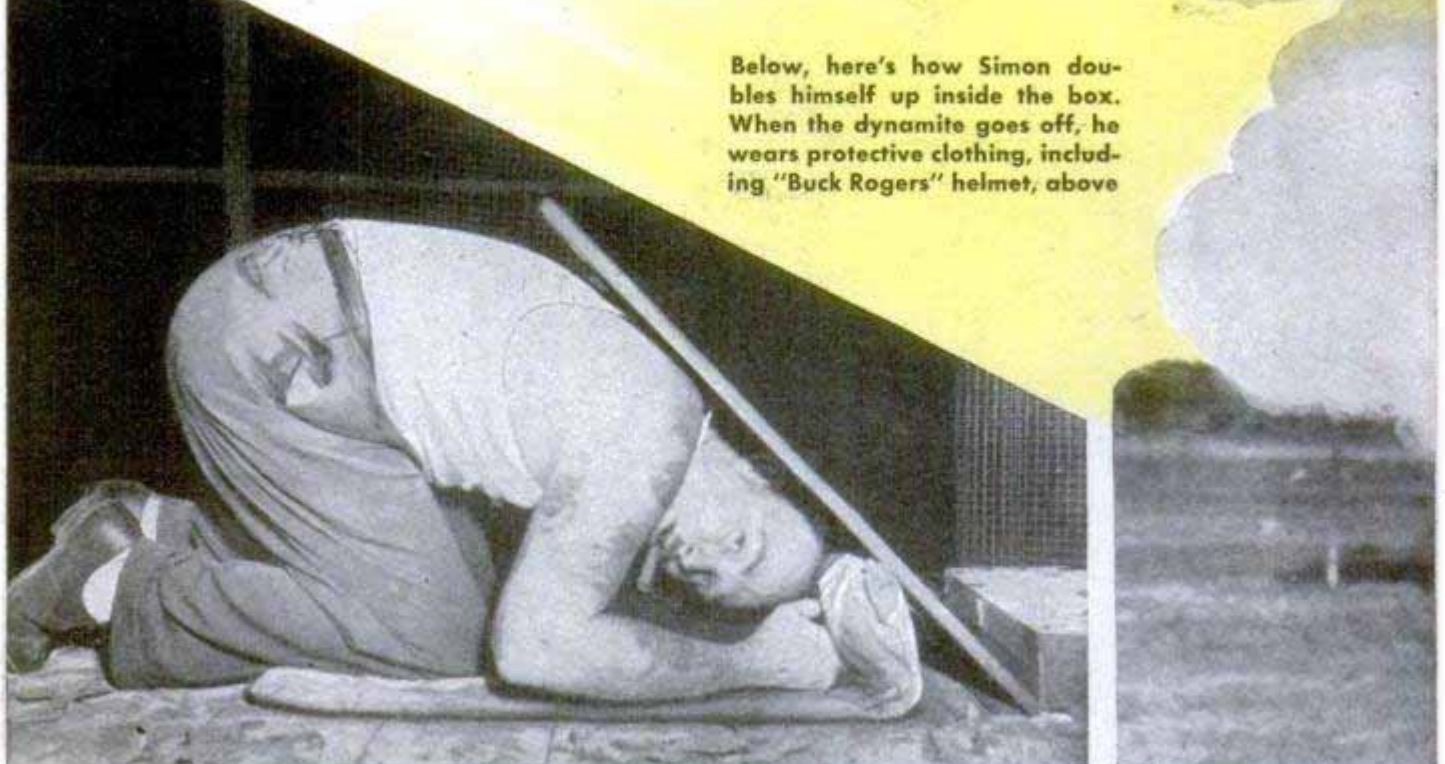
The box in which he and the dynamite get together is made of wooden slats and corrugated cardboard. It is five feet long, two feet wide and two feet high. Half of the top piece is stapled to the sides of the box, the other half being left unfastened so Simon can get in. A piece of nylon string is used to tie the box down to the platform. The dynamite, together with a

There are many ways of earning a living. Blowing himself up nightly with dynamite is the chosen profession of a Texan called

Suicide Simon

By Edward Pinkowski

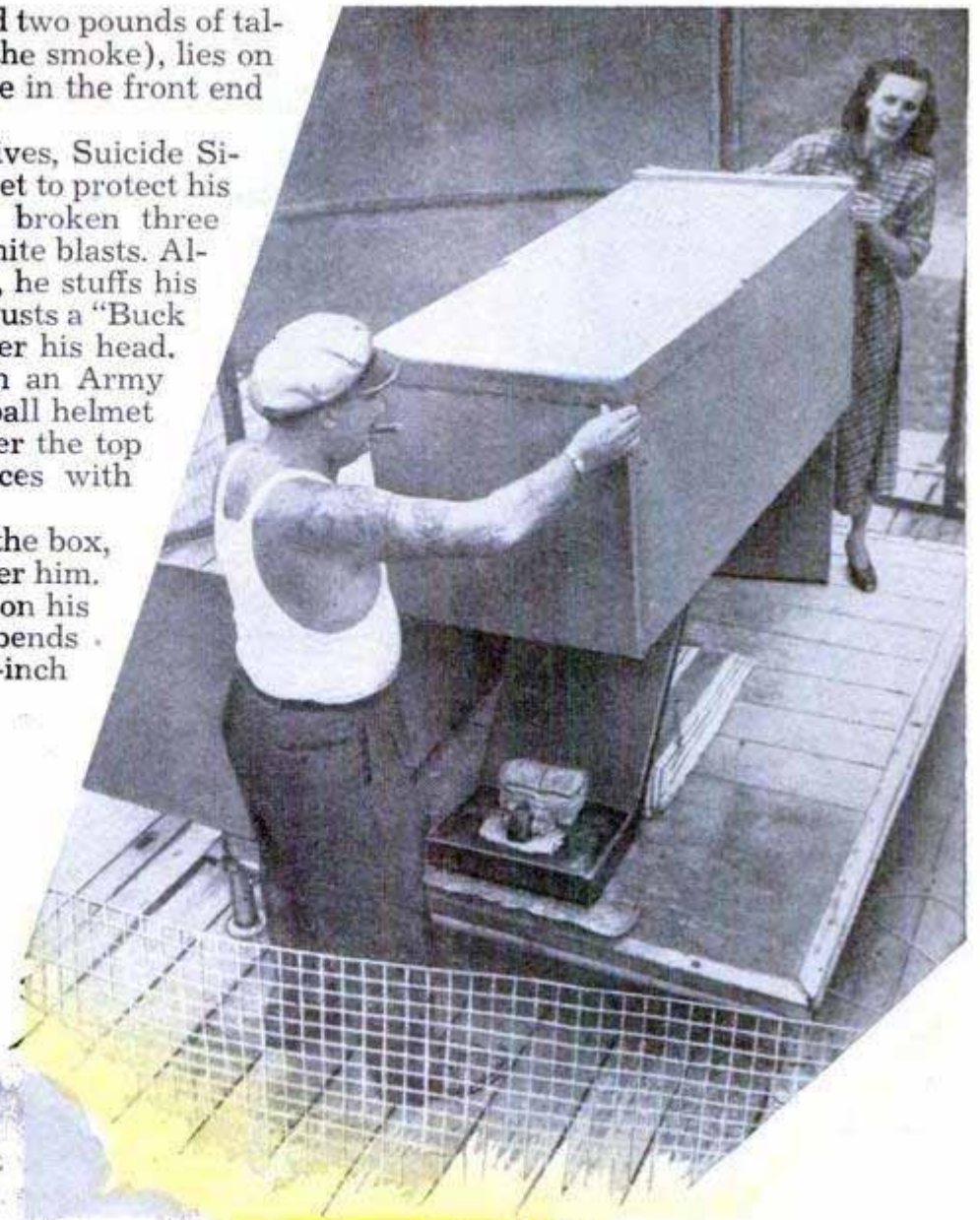
Below, here's how Simon doubles himself up inside the box. When the dynamite goes off, he wears protective clothing, including "Buck Rogers" helmet, above



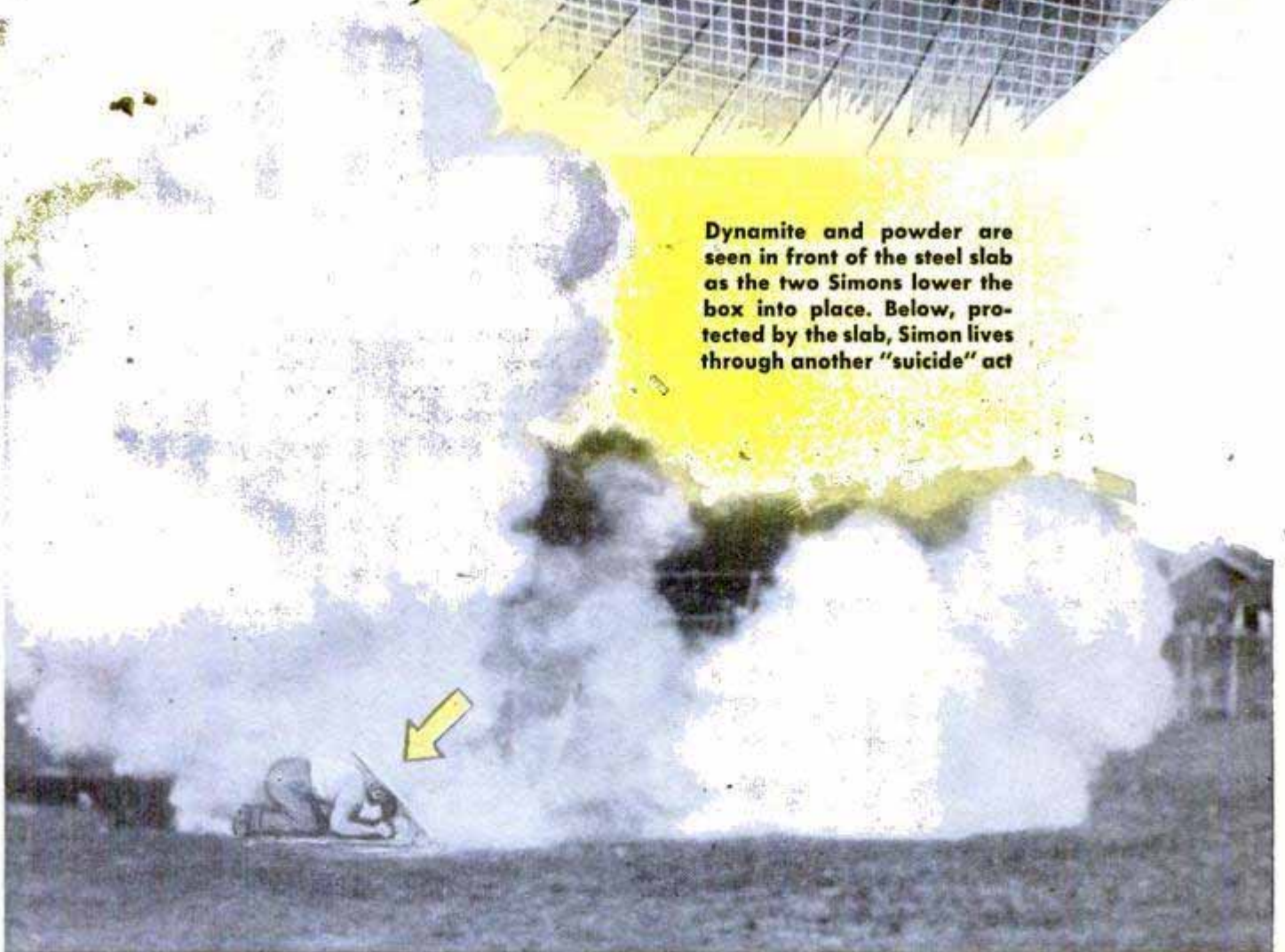
bag of black powder and two pounds of talcum powder (to make the smoke), lies on a three-inch armor plate in the front end of the box.

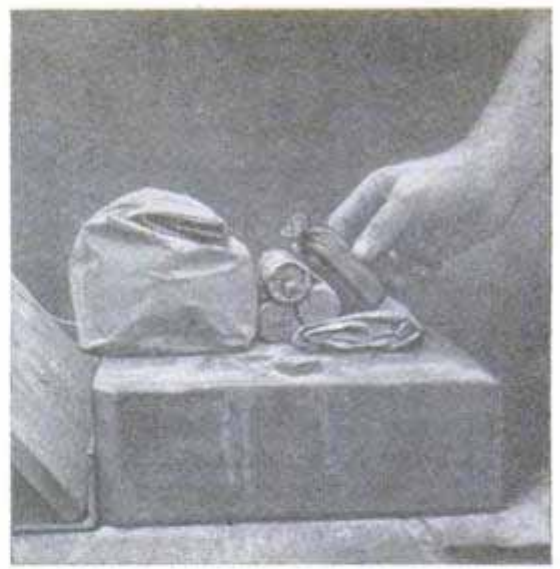
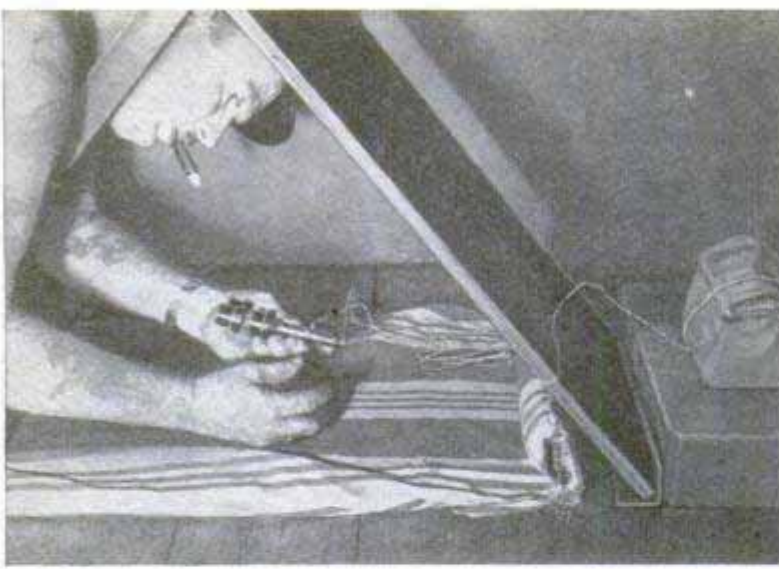
When show time arrives, Suicide Simon dons a padded jacket to protect his neck, which has been broken three times, but not by dynamite blasts. Although hard of hearing, he stuffs his ears with cotton and adjusts a "Buck Rogers" contraption over his head. It is nothing more than an Army helmet put over a football helmet and a steel rod bent over the top to hold rubber earpieces with water-faucet handles.

When he crawls into the box, he pulls the lid down over him. Inside, Simon crouches on his hands and knees and bends his head under a 5/8-inch



Dynamite and powder are seen in front of the steel slab as the two Simons lower the box into place. Below, protected by the slab, Simon lives through another "suicide" act





Left, Simon checks the switch before the show. Right, he places a bag of black powder next to the dynamite

plate. With the plate supported by his shoulders, he reaches for an improvised pencil flashlight that he uses to fire the dynamite. The spectators wait tensely.

Suddenly there is a deafening roar, a towering cloud of smoke and millions of pieces of box flying in the air. Somewhere in the debris is the dynamite demon. Sometimes he hits the screen with the force of a cannonball and bounces back in the center of the stage. Or, he might jack-knife above the spot where the dynamite went off.

Some months ago, in Jacksonville, Fla., the plate on which the dynamite rests broke in two, but he didn't get a scratch. He doubled the thickness next time. Feeling a little cocky after his narrow escape from death, he added a little more dynamite to his act. But when he set it off, he

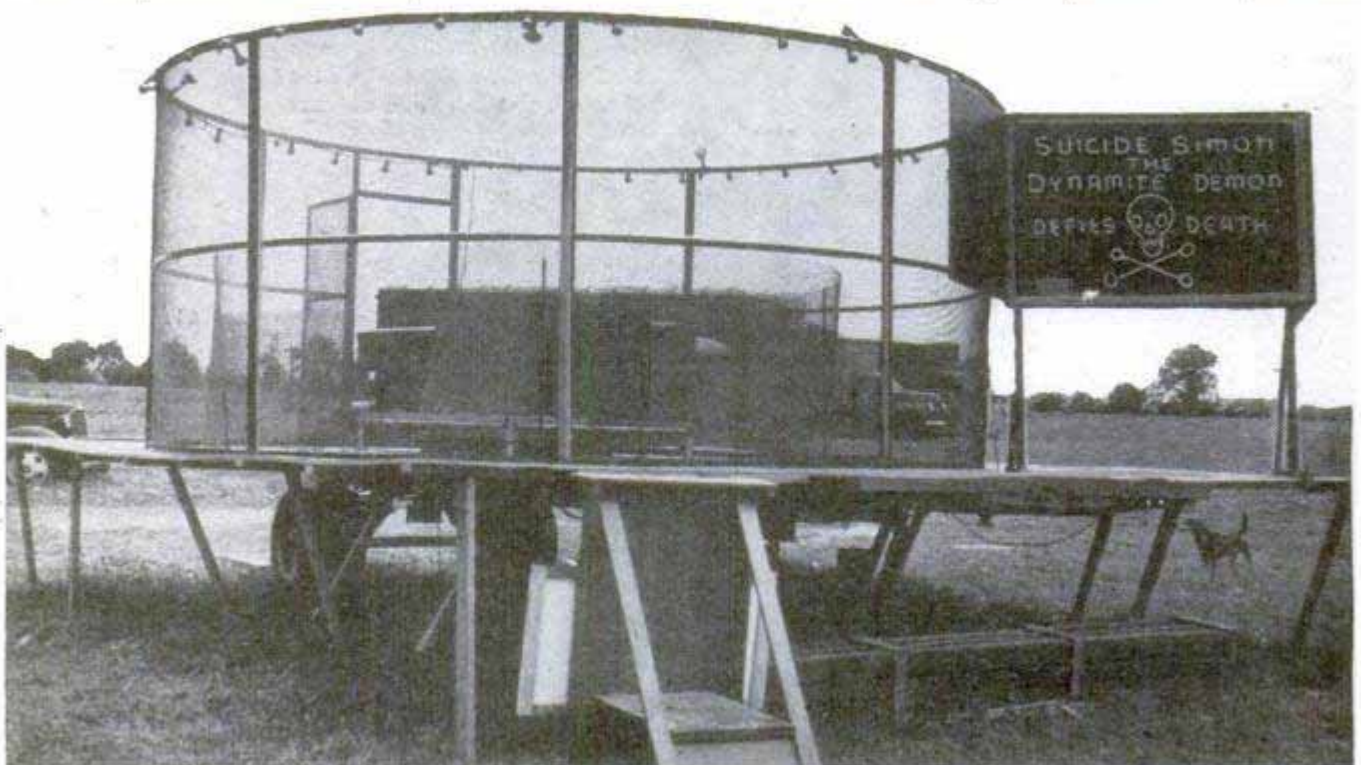
landed on his back and, instead of jumping up to bow to the crowd, he lay still. His wife, Donna, who helps him put on the show, rushed into the cage and found him unconscious. She summoned an ambulance.

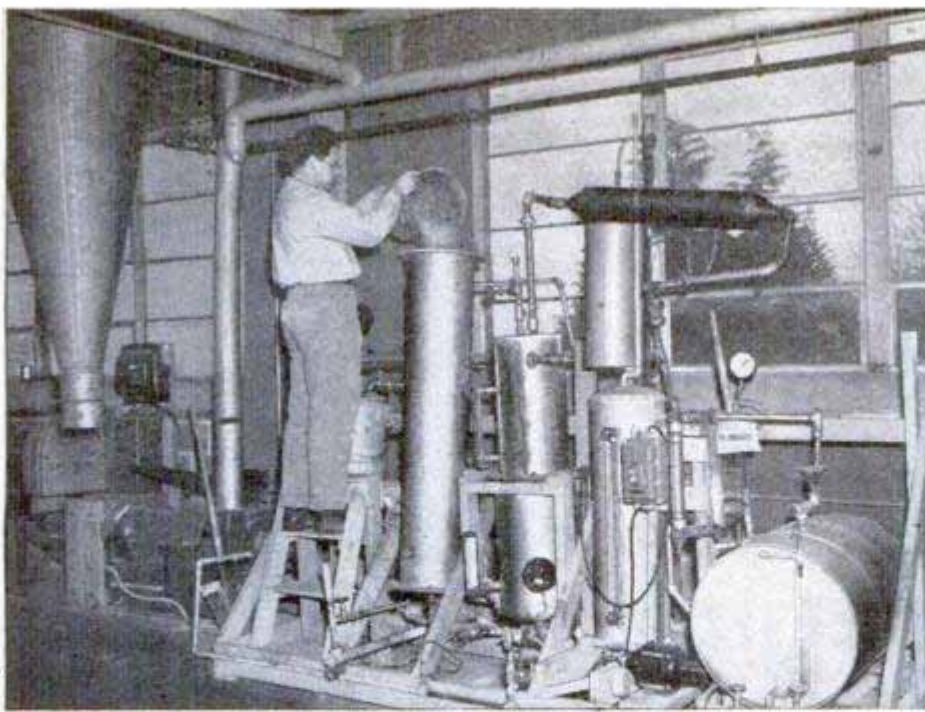
A short distance from a hospital, he regained consciousness. "Where am I?" he asked. "You're going to a hospital," Donna replied. "Turn around," he said, "I'm all right." The following night, Suicide Simon was jarring himself again with 50 percent nitroglycerine lollipops.

The hardest part of the performance, Simon admits, is the timing. He has to exhale the air out of his lungs, place his tongue in the right spot and still keep his mouth open. He moves the plate up and down until he coordinates all his movements and as the plate is moving down he

(Continued to page 276)

A trailer opens out to form a platform. The box is inside the wire netting that protects the spectators





Left, extractor removes wax held by the girl at right. Shredded bark is shown falling from her left hand

Wax From Waste Bark

Douglas-fir bark, at present a waste product that piles up around lumber mills in Oregon, may soon be converted into highest wax which will make this country independent of foreign supplies. Developed at the Oregon State College, an extraction process produces 54 pounds of wax from the bark of 1000 board feet of logs. At 40

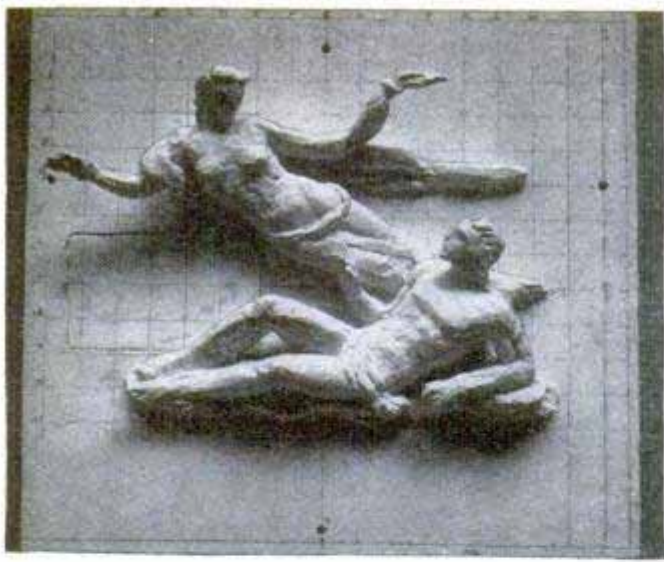
cents a pound for best-quality wax, this would mean the waste bark would be worth \$20, enough to make the lumber operators anxious to perfect the process for commercial application. At present, the scientists are working out methods to reduce the cost and complexity of the process. Another by-product of the extraction process is tannin, an important item that is used by the leather-tanning industry.



Knapsack Bike

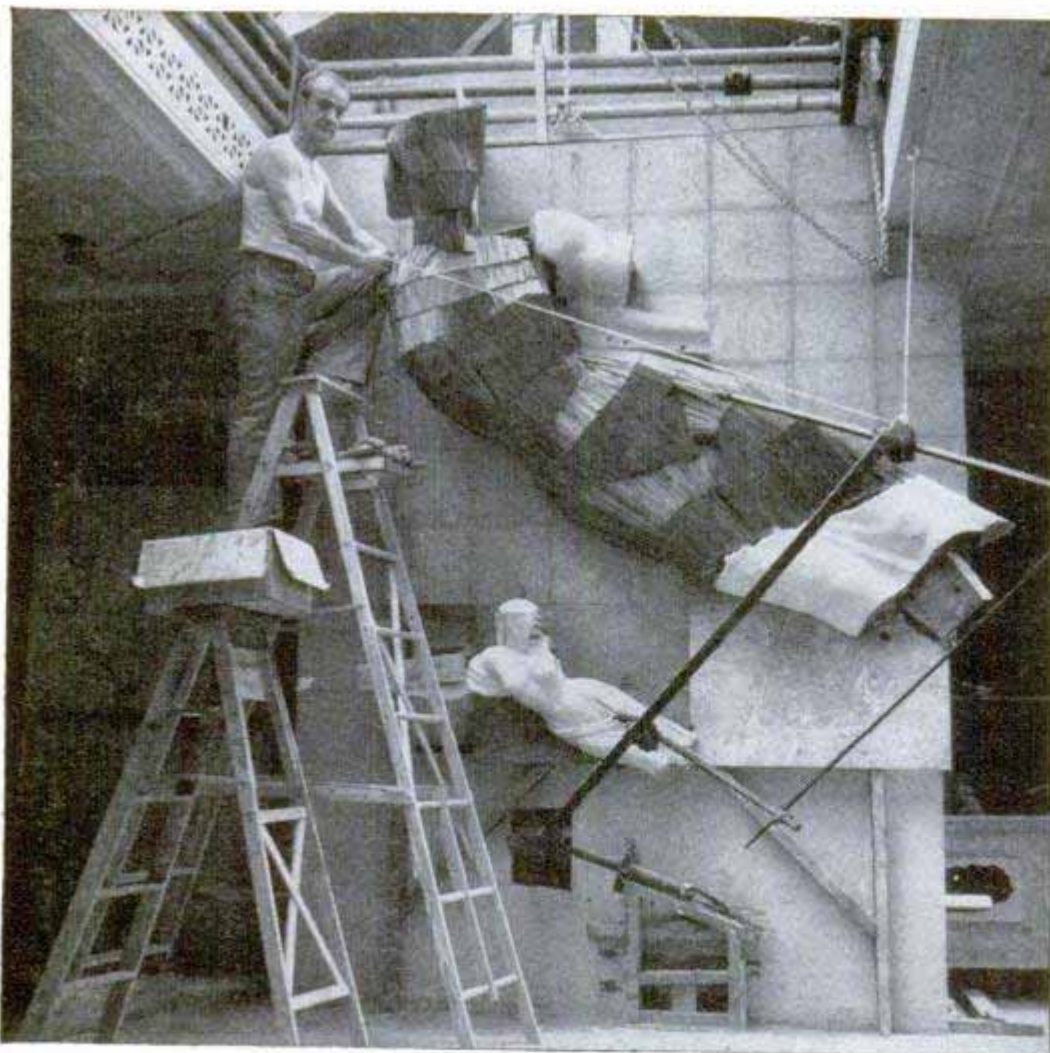
Instead of a bike carrying man, man now can carry a bike if he uses a type invented by Johann Kaiser of Munich, Germany.

The purpose, of course, is to make the bike easily portable when you don't want to ride it. With one bolt removed, the frame can be folded up and stored in a zipper bag along with the wheels.



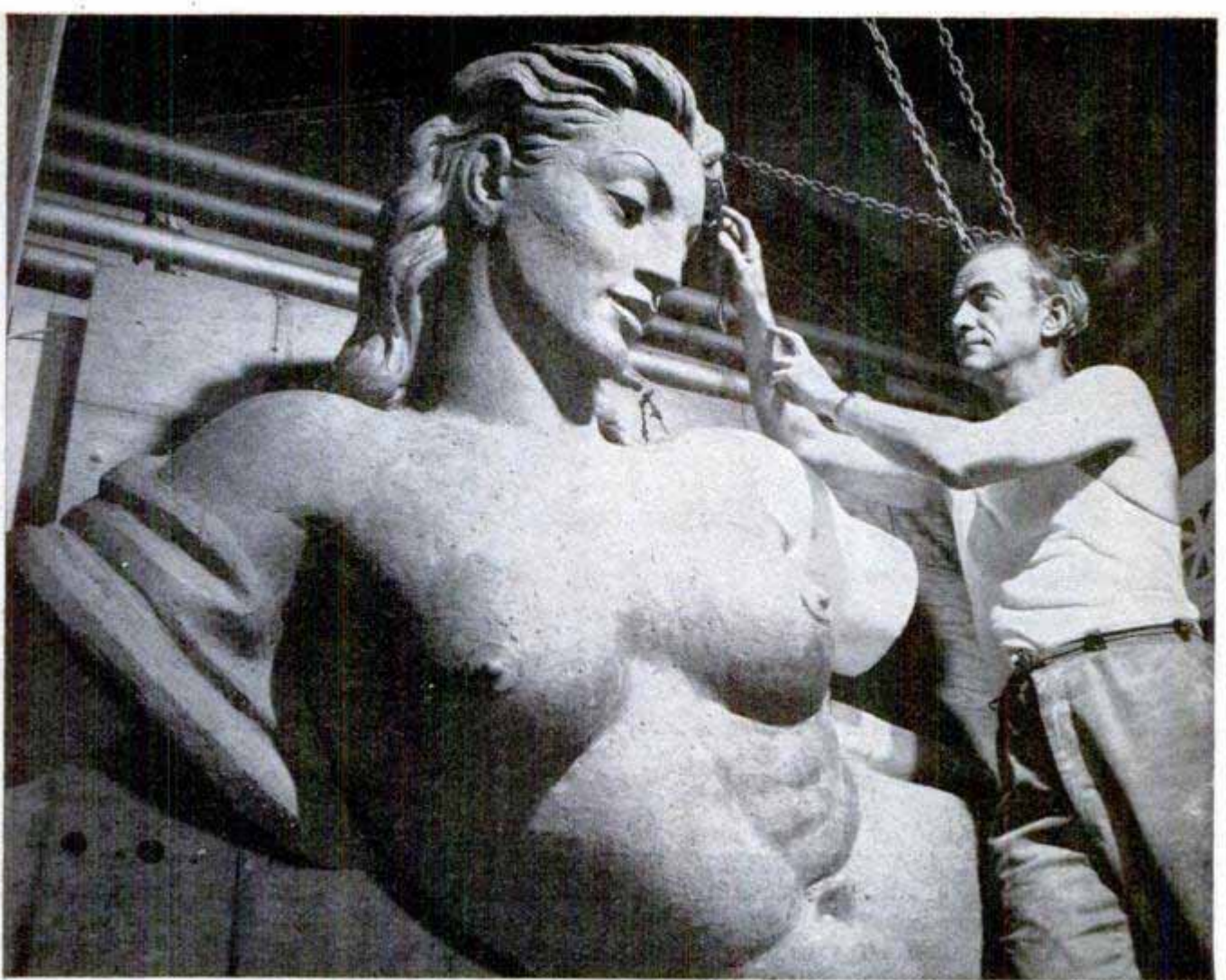
← First step in casting the gleaming aluminum statue was to make this "sketch model" in clay. Model then was cast in plaster and served as guide for statue

MANHATTAN'S ALUMINUM VENUS



Sculptor Williams uses a pantograph to transfer proportions from the "sketch model" to the armature made of wood. Space between clay nubbins is filled to make the finished clay model

Armature—the base—was also made by using a pantograph to trace dimensions in the air. The wood lath is covered with clay



Hal Phylfe photo

With a layer of clay covering the armature, Williams does the final delicate sculpture on one of the figures

MAKE US a cast-aluminum statue in full round relief, colossal proportions, to throw interesting shadows across the entry of the new Parke-Bernet galleries. We need it in nine months."

That was the substance of the order Sculptor Wheeler Williams got from the New York City Investing Company a year ago. Not much to it. "Like asking for an atom-powered jet plane to be delivered day before yesterday," says Williams, who is among the nation's top 10 sculptors.

Today the statue, "Venus and Manhattan," gleams like old silver over the entrance to the new gallery—a monument to the incredible achievement of Williams.

Many people think of sculptors as dreamy folk. "Nothing," Williams points out, "could be further from the truth. Every sculptor worth his salt has to be a first-rate carpenter, carver, solid geometrist, anatomist, plasterer, draftsman, rigger, acrobat, businessman with bank connections, metallurgist with complete knowledge of foundry work and salesman. But," he adds, "all this is useless unless he is an artist as well."

Any statue starts with a pencil sketch. From this, a "sketch model" is roughed out in Plasteline or Italian clay. Williams'

sketch was one inch to the foot. This is covered with plaster to make a mold. From the mold a plaster cast is made.

Next, working from this sketch model, the sculptor models a bigger clay reproduction. In this case, it was one third the size of the finished statue. This, too, is molded and cast in plaster—only now it's done in sections just as it will be in the final scale.

All of these sections later are locked together in the finished statue by what sculptors know as "Roman joints"—pyramidlike projections on one piece that fit into identically shaped sockets of the other. Thus the parts become rigidly joined and are bolted on the inside.

Having completed his accurate one-third scale model, Williams went to work on identical sections of the full-size colossus. By now, he had a staff of men in the shop.

Together, they helped build the "armature," or wooden frame on which the Plasteline would be laid. No big sculpture is ever solid Plasteline or clay. Its own weight would break it apart.

To get the armature just the right size, the men used a three-dimensional pantograph. This is a simple rig, with two pointers coming off a pole which is hinged at the

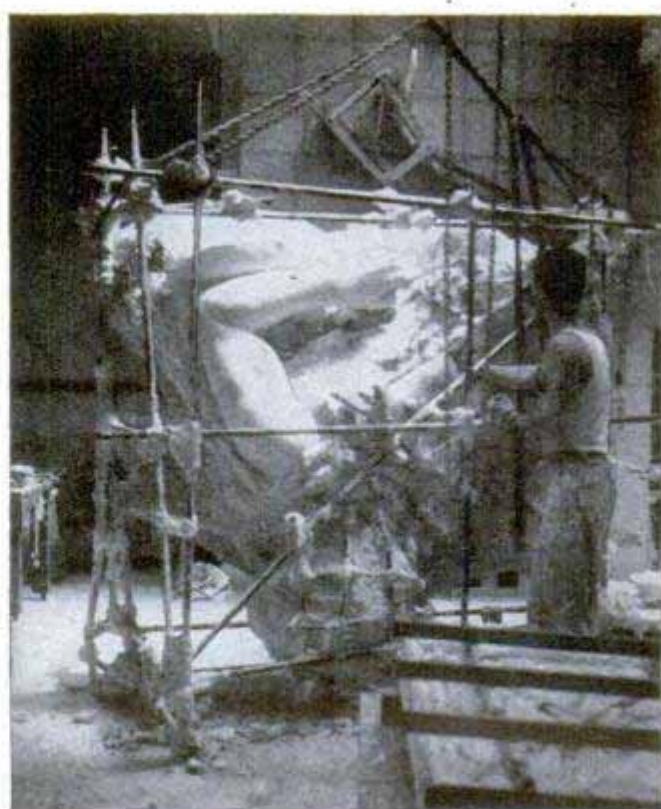


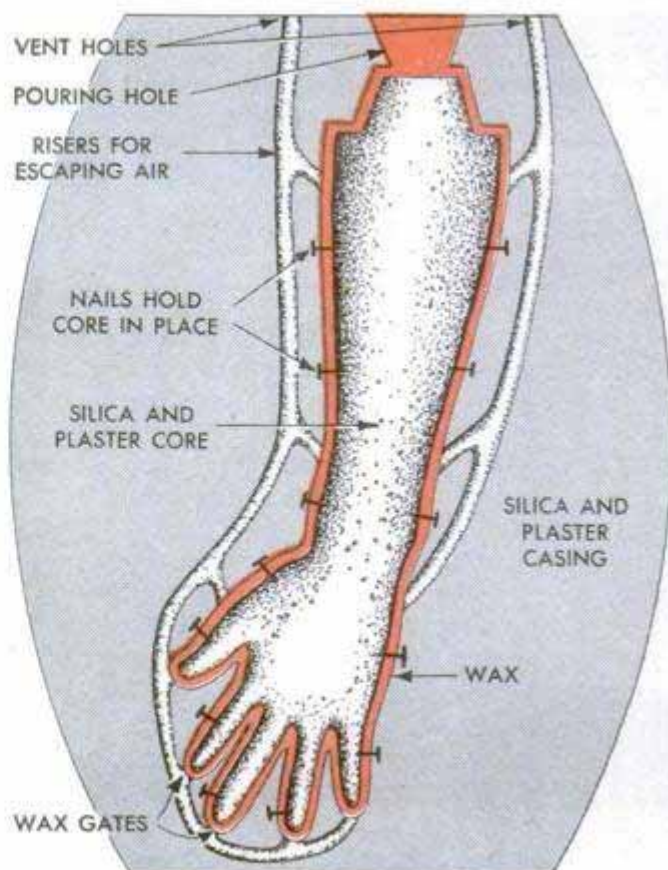
Figure is divided so sections can be lifted off. Right, original mold is chipped away from plaster mold

base on a universal joint. By adjusting the distance between the pointers and the length of the pointers themselves, any object touched by the bottom pointer will be increased to the desired size by the top pointer. In this case, the bottom pointer took "points" on the scale model. The top pointer jabbed the air above. The men knew that anything built out to it would

be exactly three times the size of the little statue. In making their armature, they allowed an inch or two for the thickness of the Plasteline.

First, two-by-four framework went down. Then "contour boards" or shelves were set up to give the frame fullness. To these were nailed shinglelike slabs of lathing. In a short time, the thing taking shape

Beautiful statue adorns building entrance. Diagram shows how an arm was cast by the "lost wax" method





Hal Phylfe photo

Molten wax is poured into the mold, flushed out, and the process repeated until ¼-inch layer is built up

on the wall began to resemble some Frankensteinian robot.

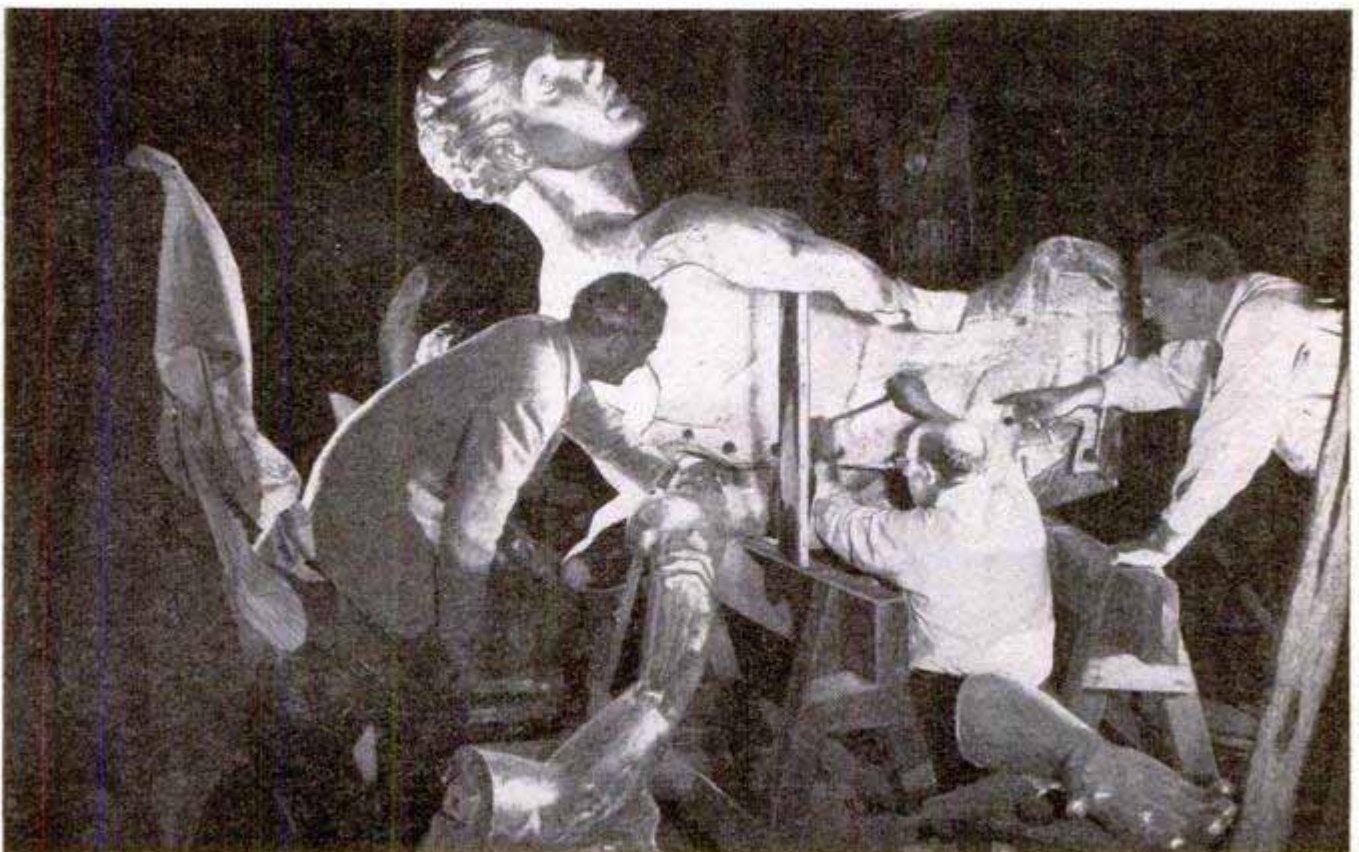
Using the pantograph again, Williams then took accurate "points," which he marked with nubbins of Plasteline. Later, the spaces between the nubbin points were filled in and the statue section was modeled to perfection.

As sections of the big Plasteline model

came down, the plaster casters went to work on the big molds and casts. Molds are made by coating the Plasteline statue sections with plaster. When the mold has attained a desired thickness, it is reinforced with a cage of iron pipes held together by ties of burlap dipped in plaster. To divide the mold so it can be removed, the men

(Continued to page 268)

Imperfections are removed by metalworkers and sections bolted together to complete "Venus and Manhattan"





Drawing shows huge dam to be built in India. Below, river model shows points where erosion can be expected

Model of River Helps Build Dam

Hydraulic engineers at the University of Minnesota are conducting experiments in river control that eventually will aid in building one of the world's largest dams. To be constructed halfway around the world from the Minnesota campus, the Ramapadasagar dam and power site will harness the Godavari River in southeastern India. Built of concrete, it will impound a reservoir 100 miles long which will supply irrigation for 2,000,000 acres of land. The dam will be 428 feet high and 1½ miles in length. Engineers have built a model of the river with an ad-



justable flow. When the water is cut off, the sandy bed shows points of erosion. The information will be used in building cofferdams for the river while the dam is built.



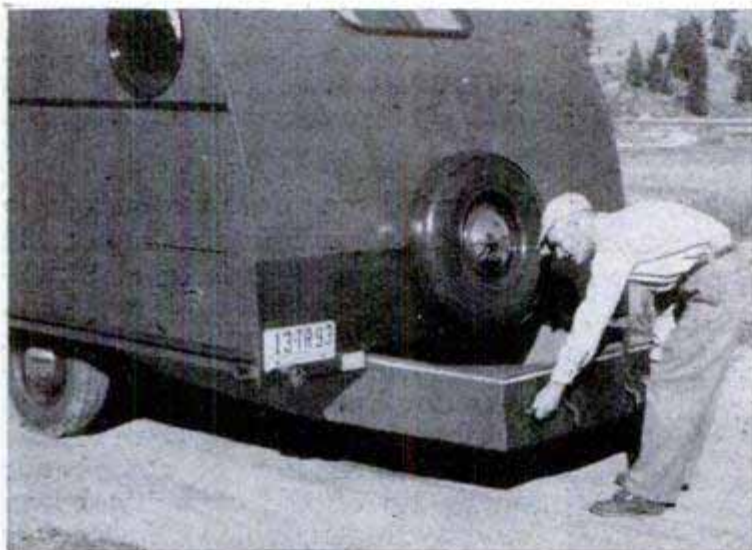
Cartridge Carrier

Large enough to hold a box of .22 cartridges, a carrying case dispenses cartridges one at a time at the touch of a finger. The case is molded of plastic and accommodates .22 short, long, and long-rifle cartridges. With the case clipped to his belt in a convenient position, the rifleman can load his gun with one hand.

☐ About 300,000 passengers flew across the North Atlantic on 11,000 scheduled flights made in 1949.



Carrying a boat beneath his house trailer, Coultas is always ready to go fishing. He just pulls the boat out like a drawer, below left, hooks on a tail wheel, below right, and hauls it away behind his car, above



"Boathouse on Wheels" Built Beneath Trailer

When Jack Coultas of Conner, Mont., takes his house trailer to the lake or river, he doesn't have to worry about renting a boat because he carries one with him under the trailer floor. The 13-foot boat slides on tracks beneath the trailer body, closing dust-tight like a desk drawer. A forked tail wheel can be snapped into lugs on the bow for easy wheeling to the water's edge or, if

the distance is long, the boat is hitched to the car and towed like a trailer. The out-board motor is stored in a locker at the rear of the trailer, which was designed by Coultas and contains a toilet, shower bath, photographic darkroom, air-conditioning unit, refrigeration and sleeping facilities for four persons. A small power plant supplies electricity for the appliances.

Artificial Sapphire Lens for Movie Camera Resists Scratches

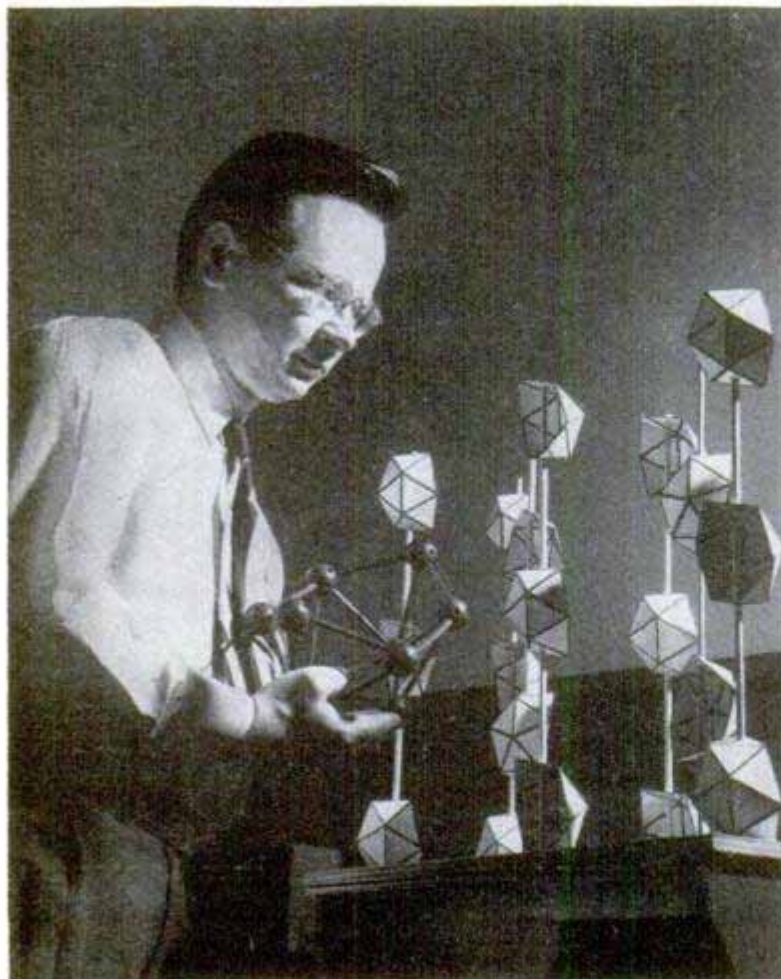
Motion-picture camera lenses made of artificial sapphire have been developed at the University of Rochester. The lenses have several advantages over those made of glass. Artificial sapphire, made by crystallizing oxygen and aluminum oxide in a high temperature, is much harder than optical glass. Lenses made of the material can be cleaned by scouring them with sand without injury. The sapphire lens also has a high refractive index and low dispersion,

which improves the sharpness of the images produced. As artificial sapphire is relatively inexpensive, the principal handicap to making lenses of the material is its extreme hardness, which makes it more expensive to polish than glass.

☐Sunflower-seed hulls formerly thrown away by a Canadian vegetable-oil company are being pressed into fuel "logs" three times as dense as wood.



Above, a G.E. scientist studies photographic film spotted by X-rays deflected from their path by the internal structure of a decaborane crystal. The film was in cylinder form during test. Below, Dr. John Kasper holds model of a decaborane crystal



MAPPING

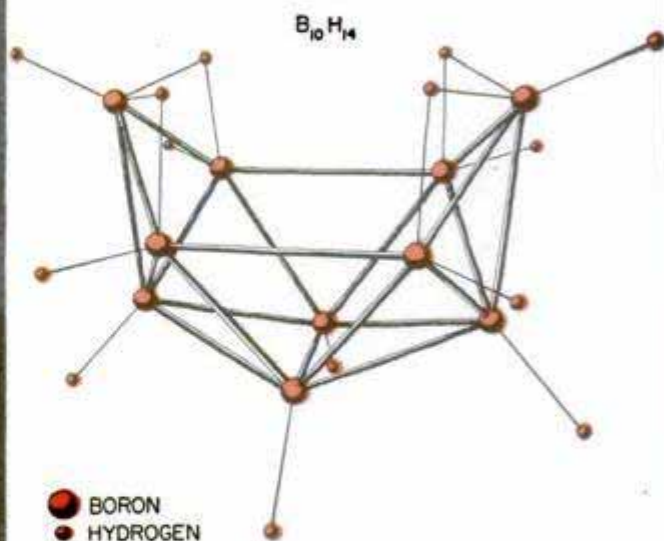


Diagram of a decaborane molecule, showing relative location and linkage of 10 boron and 14 hydrogen atoms that comprise it

THREE men have just spent two years exploring a region 30 billionths of an inch long, 16 billionths wide and 10 billionths high. The area they "mapped" was a molecule whose structure is unlike any known before.

Chemists have long been baffled by the behavior of compounds made up of the elements boron and hydrogen, which didn't act as they should under the laws of chemistry. To find out why, Drs. David Harker, C. M. Lucht and John S. Kasper set about mapping the molecule of a boron and hydrogen compound called decaborane. For their exploration, the three General Electric Company crystallographers used the X-ray-diffraction technique.

Two years of data gathering, rechecking and almost constant use of calculating machines were needed to fix the relative location of each of decaborane's 10 boron and 14 hydrogen atoms. In revealing decaborane to be a new exception to one of the laws of chemistry, the mapping showed why chemists have been at a loss to explain the molecule's behavior.

Any given element, depending on its make-up, is supposed to have only a fixed number of links with adjacent atoms. Decaborane's boron atoms, supposedly capable

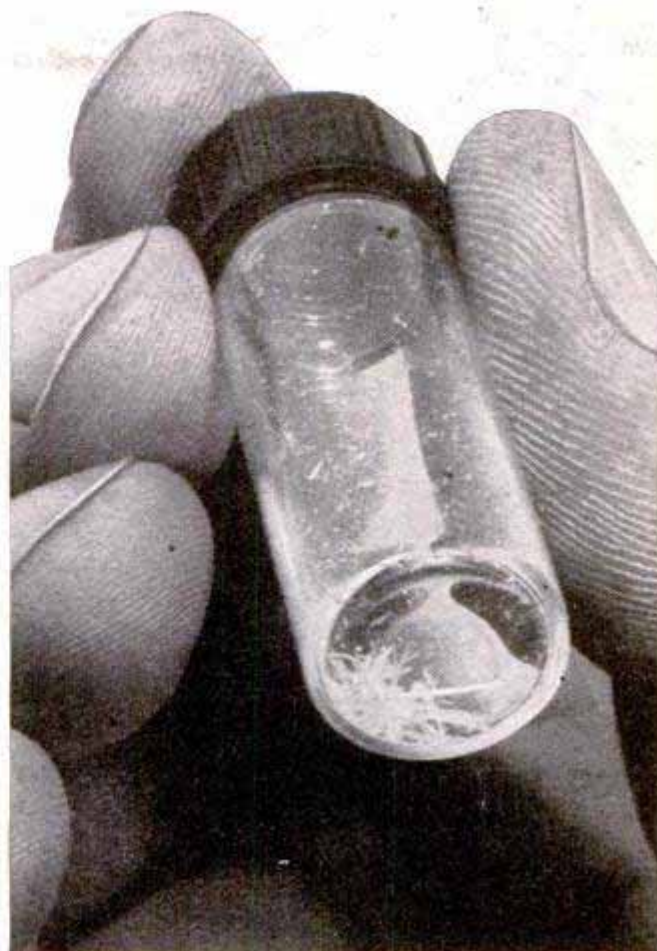
A MOLECULE . . .

of only three links, are bonded to six adjacent atoms. Four of the hydrogen atoms, theoretically limited to single links, have somehow formed two apiece.

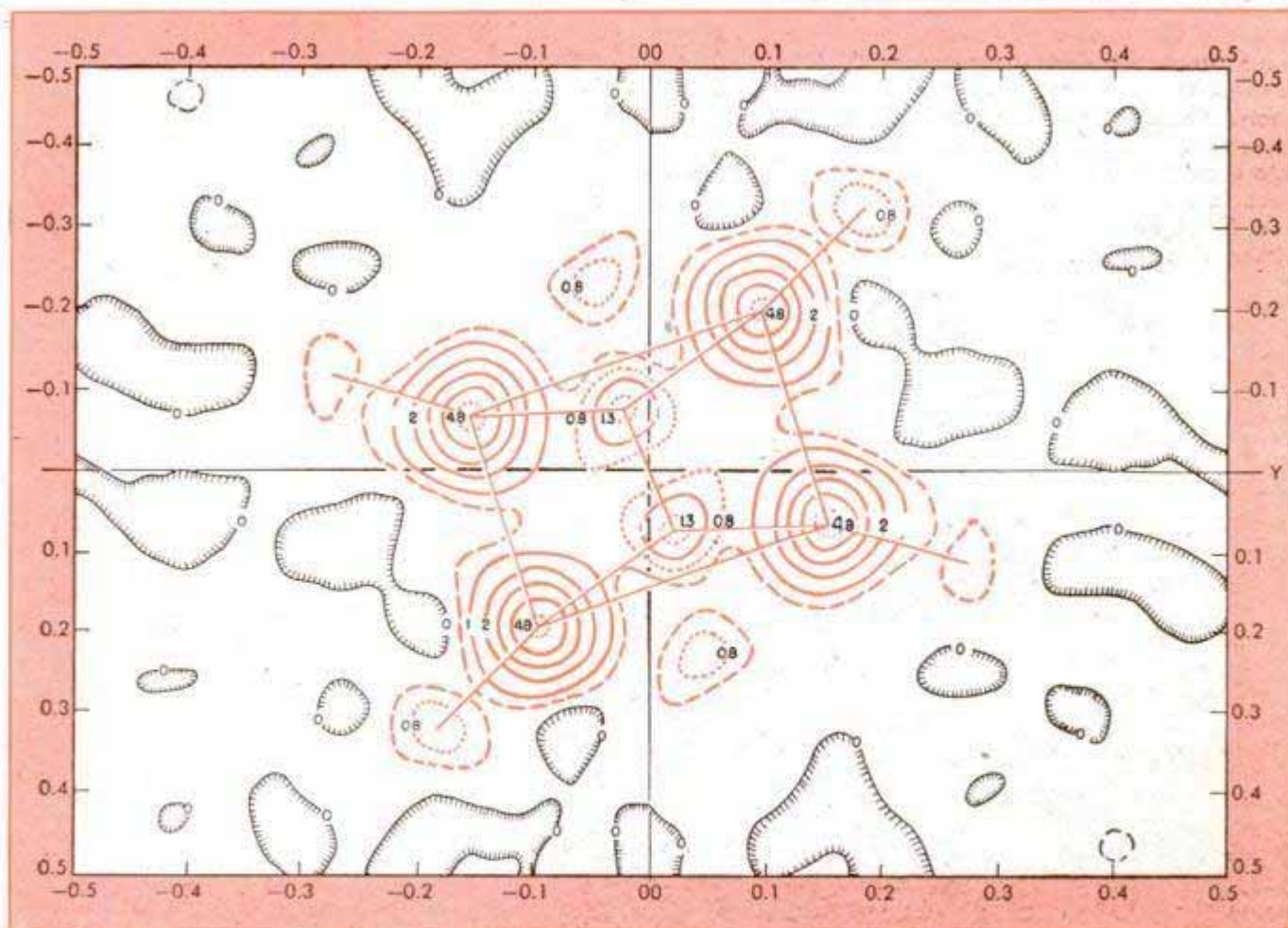
The mapping was accomplished by passing an X-ray beam through a needlelike crystal of the substance, which was surrounded by a cylinder of photographic film. When the beam struck planes in which the atoms were arranged, it broke up and scattered at different angles. The deflected X-rays made spots on the film.

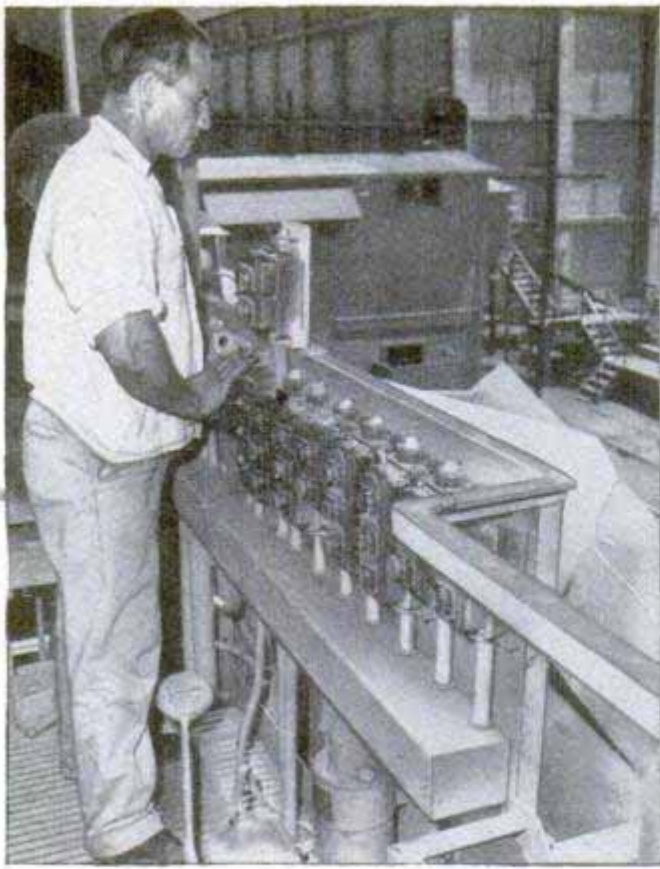
From the position of the spots, it was possible to determine the direction of the planes in the crystal. The intensities of the reflected beams, gauged by the darkness of the spots, revealed the positions of the boron and hydrogen atoms.

Based on the results of their experiment, Harker, Kasper and Lucht believe X-ray-diffraction techniques and advances in mathematics will eventually permit exploration of the structures of such materials as hormones and viruses.



Right, white crystals in the bottle are decaborane crystals. Below, "map" of a molecule. The concentric circles indicate areas of different electron densities, the highest of which are the nuclei of atoms

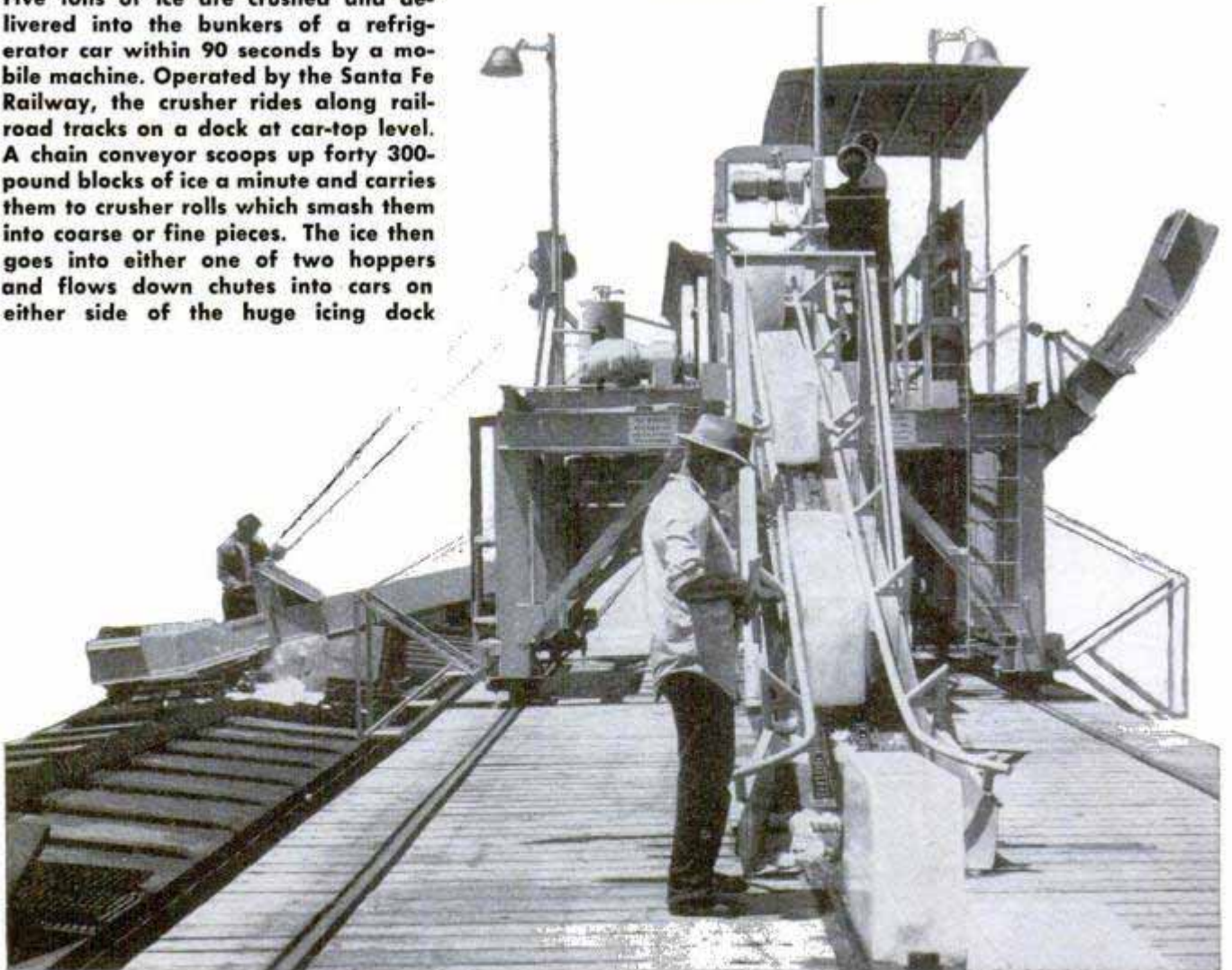


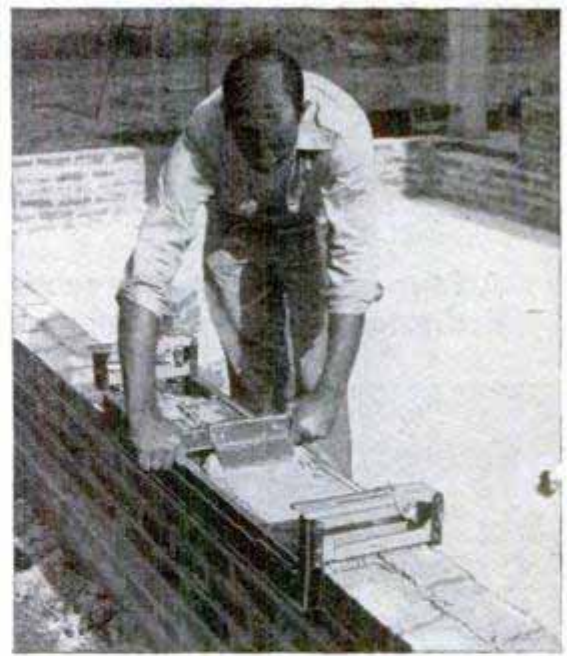
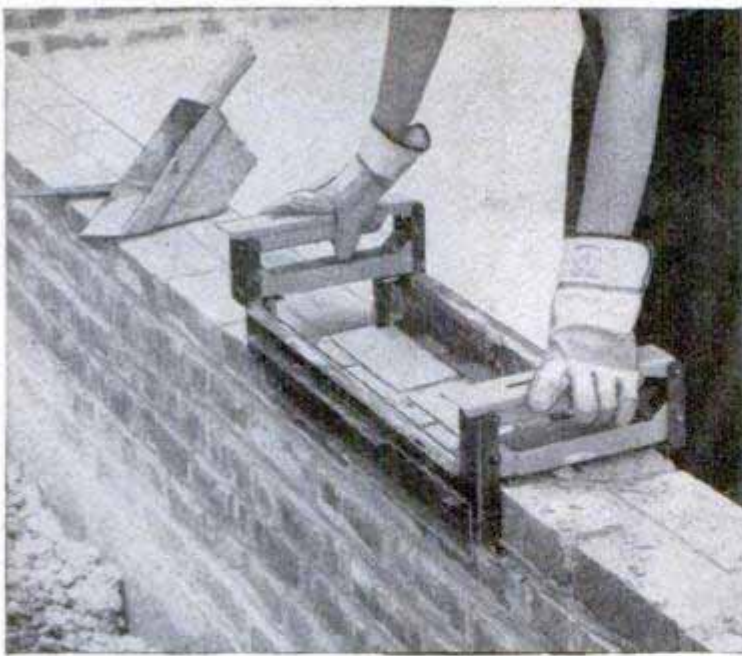


PUSH-BUTTON ICER FOR TRAINS

Five tons of ice are crushed and delivered into the bunkers of a refrigerator car within 90 seconds by a mobile machine. Operated by the Santa Fe Railway, the crusher rides along railroad tracks on a dock at car-top level. A chain conveyor scoops up forty 300-pound blocks of ice a minute and carries them to crusher rolls which smash them into coarse or fine pieces. The ice then goes into either one of two hoppers and flows down chutes into cars on either side of the huge icing dock.

Above, left, operator has a battery of push buttons to control movement of ice. Above, ice pours into "reefers" from chutes on either side of the dock. Below, conveyor scoops up blocks of ice and delivers them to crusher. Machine moves along railroad tracks





Bricklaying Jig

Bricks are laid three or four times faster with a portable jig that enables the workman to lay up to 12 bricks at a time. A giant scoop spreads sufficient mortar to bed the 12 bricks and spirit levels on the jig assure

accurate placement. With the bricks in place, a second scoopful of mortar and a single troweling complete the operation. The jig is then lifted and placed in an adjacent position for the next operation. According to the manufacturer, a novice can learn to lay bricks quickly with the jig.

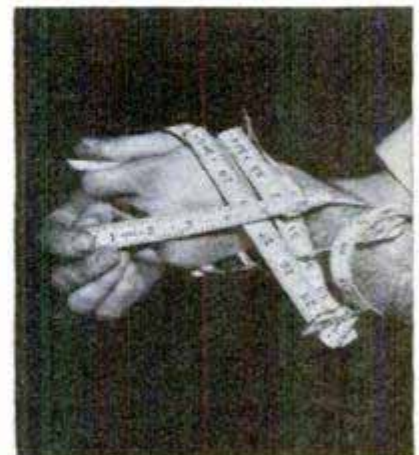
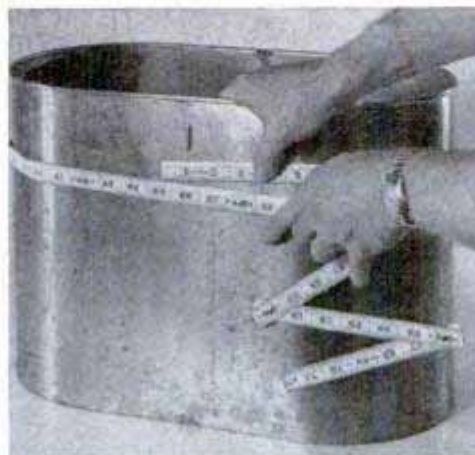


Gear-Driven Tripod

Vertical or horizontal panoramic shots are made as "smooth as oil" with a gear-driven tripod head designed for home-movie fans. There are no lock knobs or keys to tighten or loosen when you need the camera most. You just crank one of the handles for vertical movement, the other for horizontal movement. There is also a clutch to disengage the gear mechanism entirely.

Steel Folding Rule → Takes Punishment

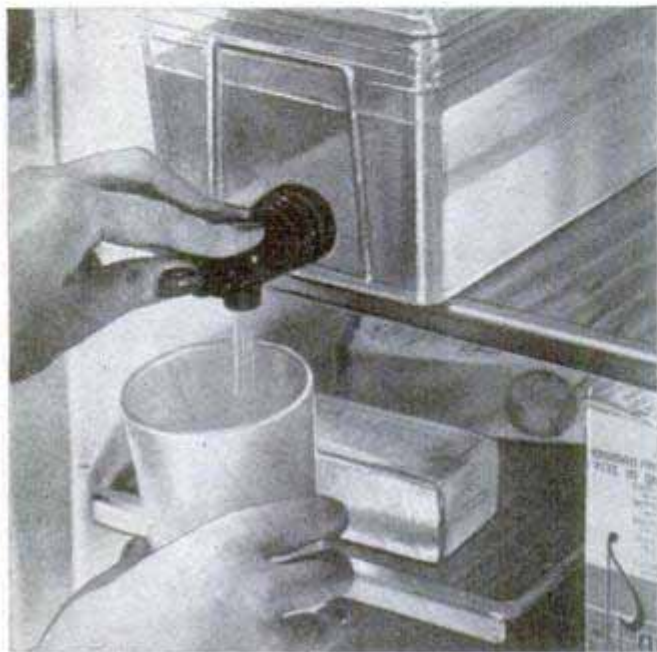
Combining the features of a steel tape with those of a wooden folding rule, a tempered-steel zigzag rule is so flexible it can be twisted like a pretzel without damage. It can be wrapped around cylindrical objects to measure circumference, yet it has the rigidity of a standard rule, enabling it to be used as a straightedge for drawing lines. Lighter than the average wooden rule, it does not have to be folded after each use because it



is virtually indestructible. You can even step on the steel rule while it is open or closed without damage.

WHAT'S NEW *For Your Home*

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

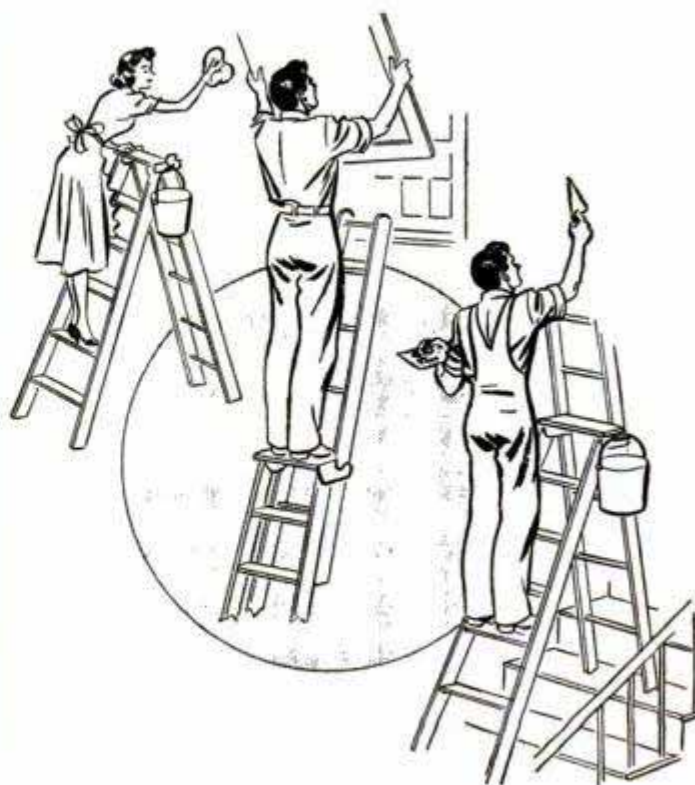


COLD DRINKS serve themselves from a dispenser that fits any refrigerator shelf. You just press a push-type faucet and you've poured yourself a drink



CHERRY PITTER removes the stones from a quart of cherries a minute! Crank-driven, the pitter feeds by gravity, discharging pits and cherries separately

SPACE SAVER for closets holds as many as six garments on one hook. Made of plastic with a metal hook, the hanger comes in two models, one for dresses, the other for slacks



ALL-PURPOSE LADDER is used as a step-ladder, extension ladder or stairway ladder, as well as two individual ladders, if desired



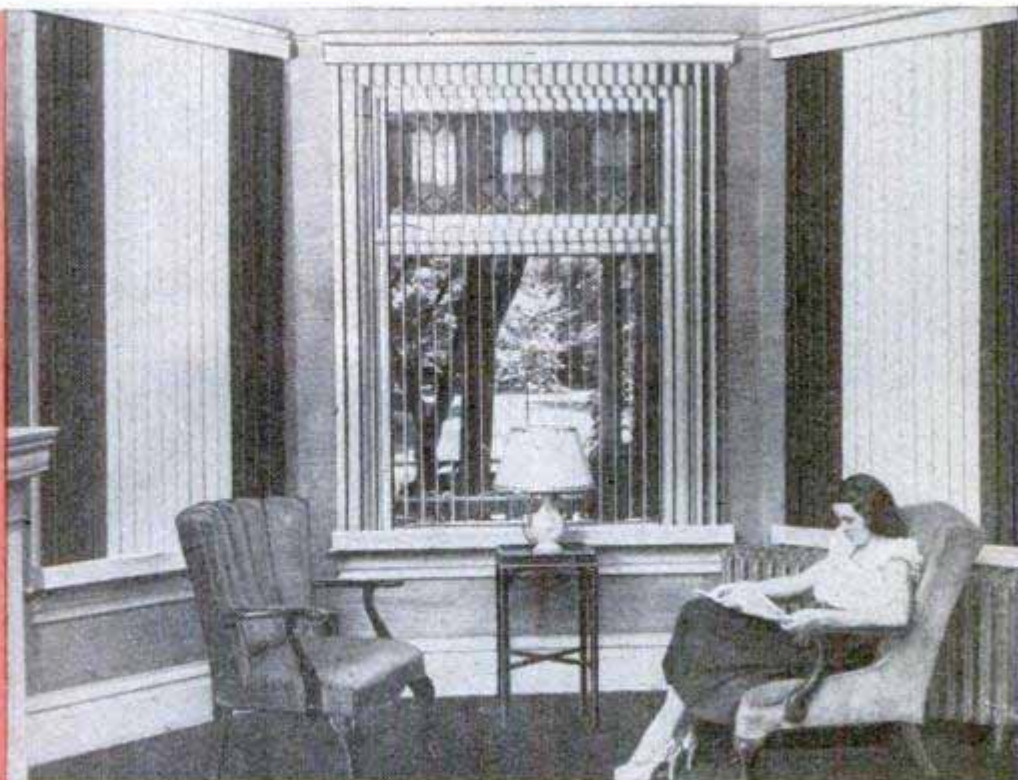
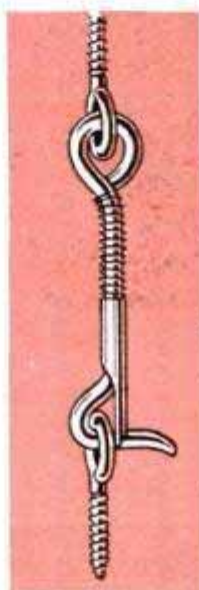
FIRE GUARD, top left, is on duty 24 hours a day to warn you of fires. When a fire starts, the guard lets out a shrill whistle that is audible for $\frac{1}{4}$ mile

ELECTRIC DISHWASHER, top right, washes and rinses a dinner service for four in 10 minutes. It weighs 25 pounds and takes up little storage space

SAFETY HOOK, right, protects youngsters from accidents and discourages prowlers. To unlatch the screen or door, you push back a spring-loaded guard

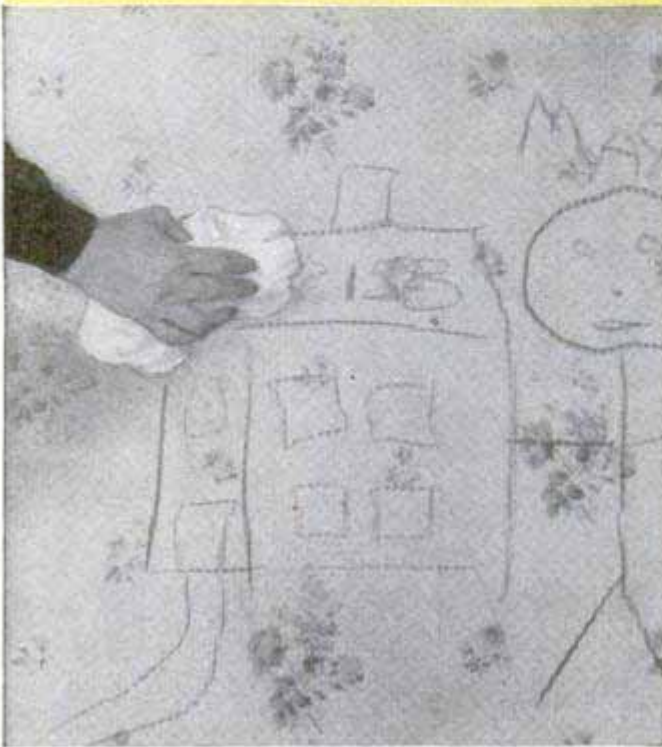
OPENER DE LUXE, below left, is a whole kitchen workshop in one item. With it, you can open any can, bottle or jar, remove corks and even screw-on lids

VERTICAL BLINDS, below right, are decorative and practical. Made of translucent fabric, they are colorful, can be washed and put back in 20 minutes



WHAT'S NEW *For Your Home*

Continued from preceding page



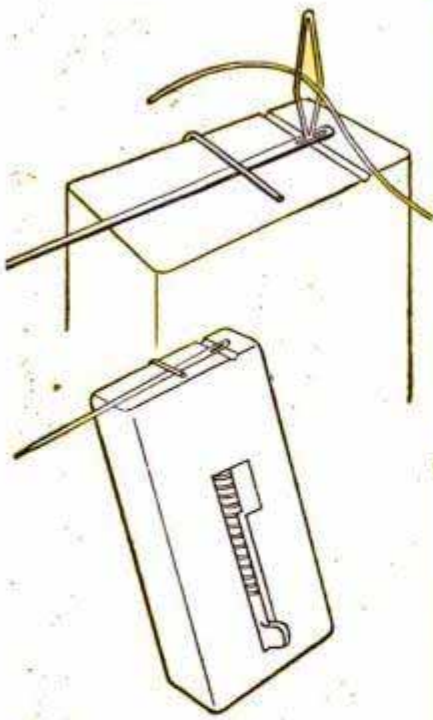
WALLPAPER COATING is invisible, but it protects the paper so you can wash off marks with a soapy cloth.



BOTTLE STERILIZER works under pressure and it lets you sterilize the bottles with formula in them.

STEEL FIREPLACE can be installed wherever a flue is available. It can even be suspended from the wall.

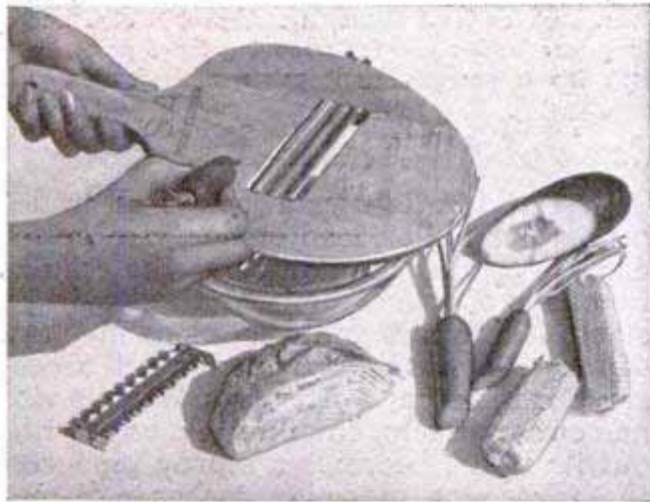




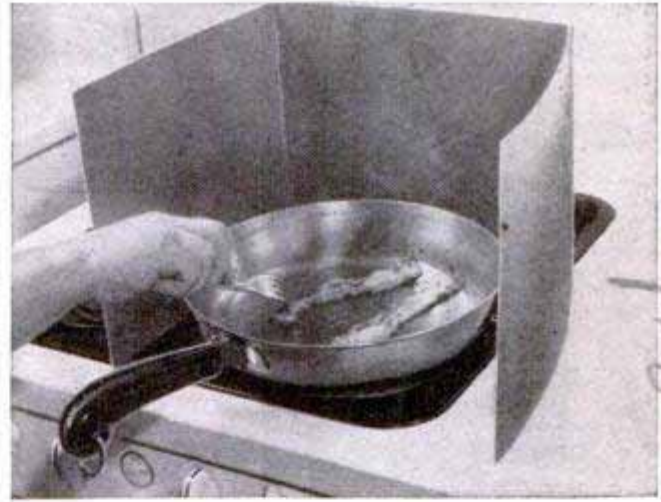
NEEDLE THREADER works with any size needle. A spring on a wire loop pulls thread through the eye



SINK DIVIDER makes a regular sink into a double-compartment model. A rubber channel strip is held against the sink by suction cups, forming a watertight seal on any sink. An aluminum sheet is the partition

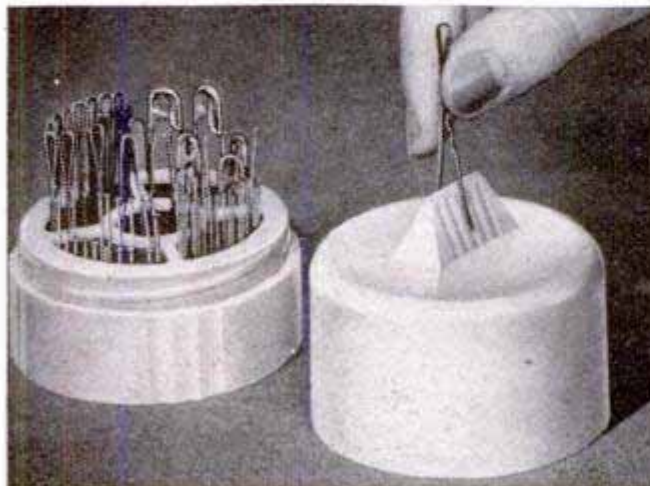


TWO-WAY SLICER has a double blade so you cut the vegetable in both directions, speeding the job

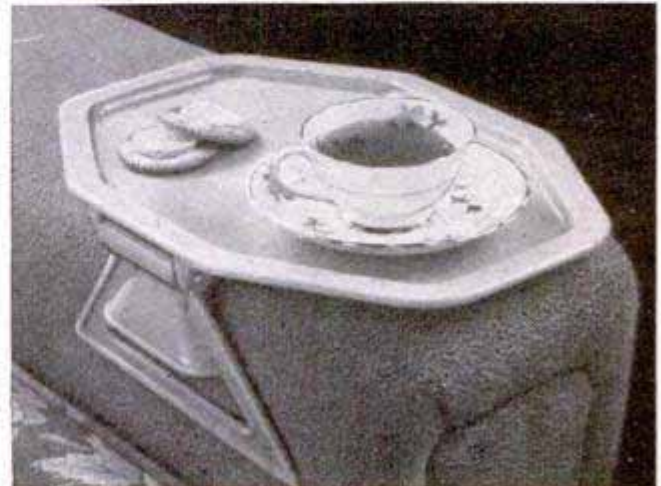


SPLATTER STOPPER fits around the skillet to prevent grease from flying all over the stove and the wall

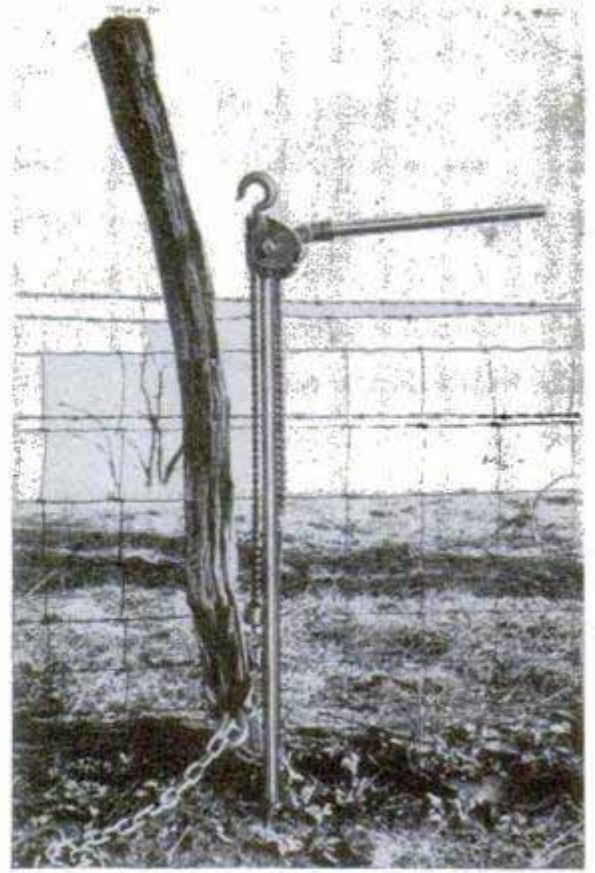
MAGNETIC RACK, below, holds small metal items upright by magnetism. The top has bobby-pin opener



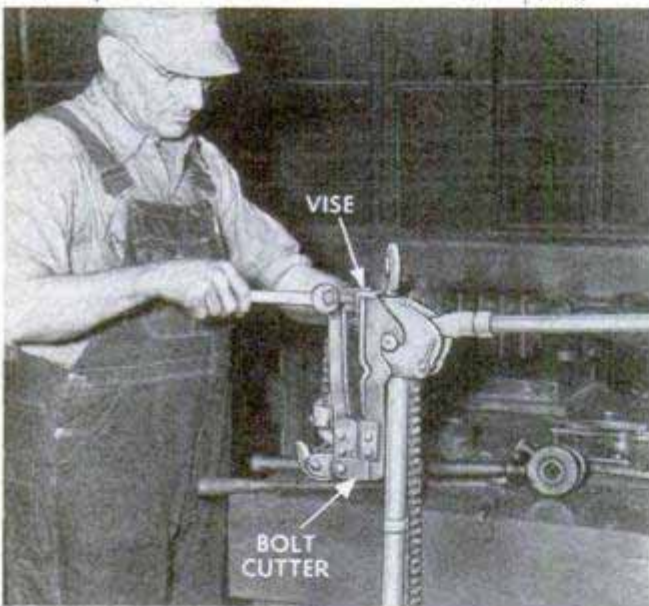
GRIP TRAY, below, clamps firmly to the arm of a chair, providing a safe place for a cup or a glass



*Patent Cases -
Manufacturer - MRS. LETHA O.W. CORDREY, 4071 KANSAS ST., SAN DIEGO 4, CA*



Above, left, this jack can be used for many pulling jobs, such as load tightening. Above, it also has a long, continuous pull for removing fence posts, and, left, it's a powerful bolt cutter and vise as well

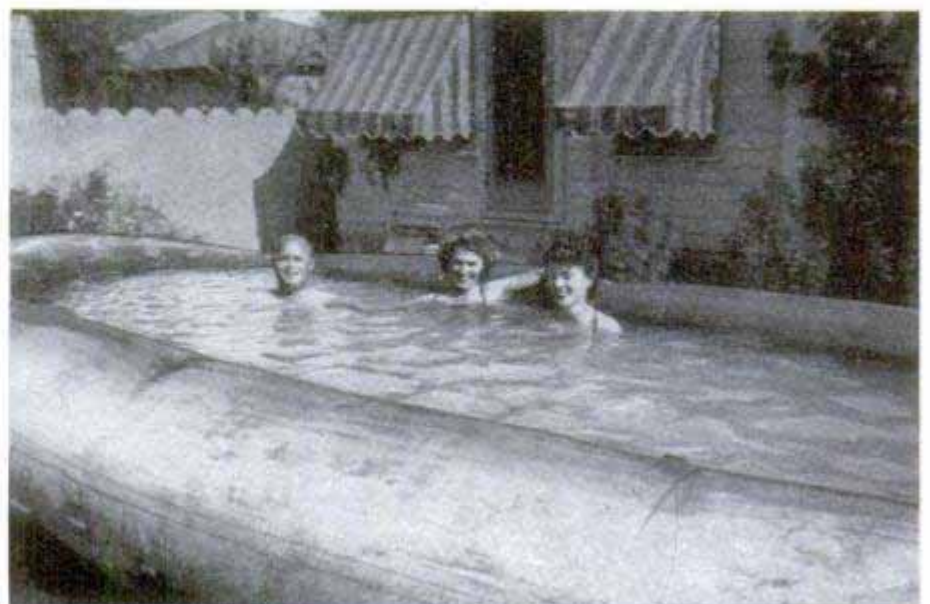


Jack-of-All-Trades

Versatile in its uses a jack-of-all-trades serves as a puller, load binder, vise, cutter and post puller in addition to the regular functions of a bumper jack. Used with its stand, it lifts cars and tractors as much as 44 inches. It has the continuous pull necessary for removing fence posts. With its vise and cutter attachment, the jack, used without its stand, becomes a sturdy pipe vise that takes pipe up to eight inches in diameter. It also serves as a bolt cutter with a capacity of $\frac{3}{8}$ inch.

Back-Yard Beach

Larry Nelson of Burbank, Calif., converted a war-surplus rubber pontoon into a family-size back-yard swimming pool. Thirty feet long, seven feet wide and three feet deep, the pontoon is the type Army engineers used in building temporary bridges. It can be inflated in 15 minutes with a tank-type vacuum cleaner and quickly deflated by opening valves. Nelson's total cost was less than \$70.





U. S. A. F. photos

Heroic in peace as in war, B-29 crews roam the wide Pacific exploring the turbulent hearts of typhoons

Look a Typhoon in the Eye

By
George Scullin

Beverly was a typhoon. When Lt. Lykins' B-29 flew into its heart, it was like hitting Niagara. This is the heroic story of one of the missions of our typhoon trackers over the Pacific

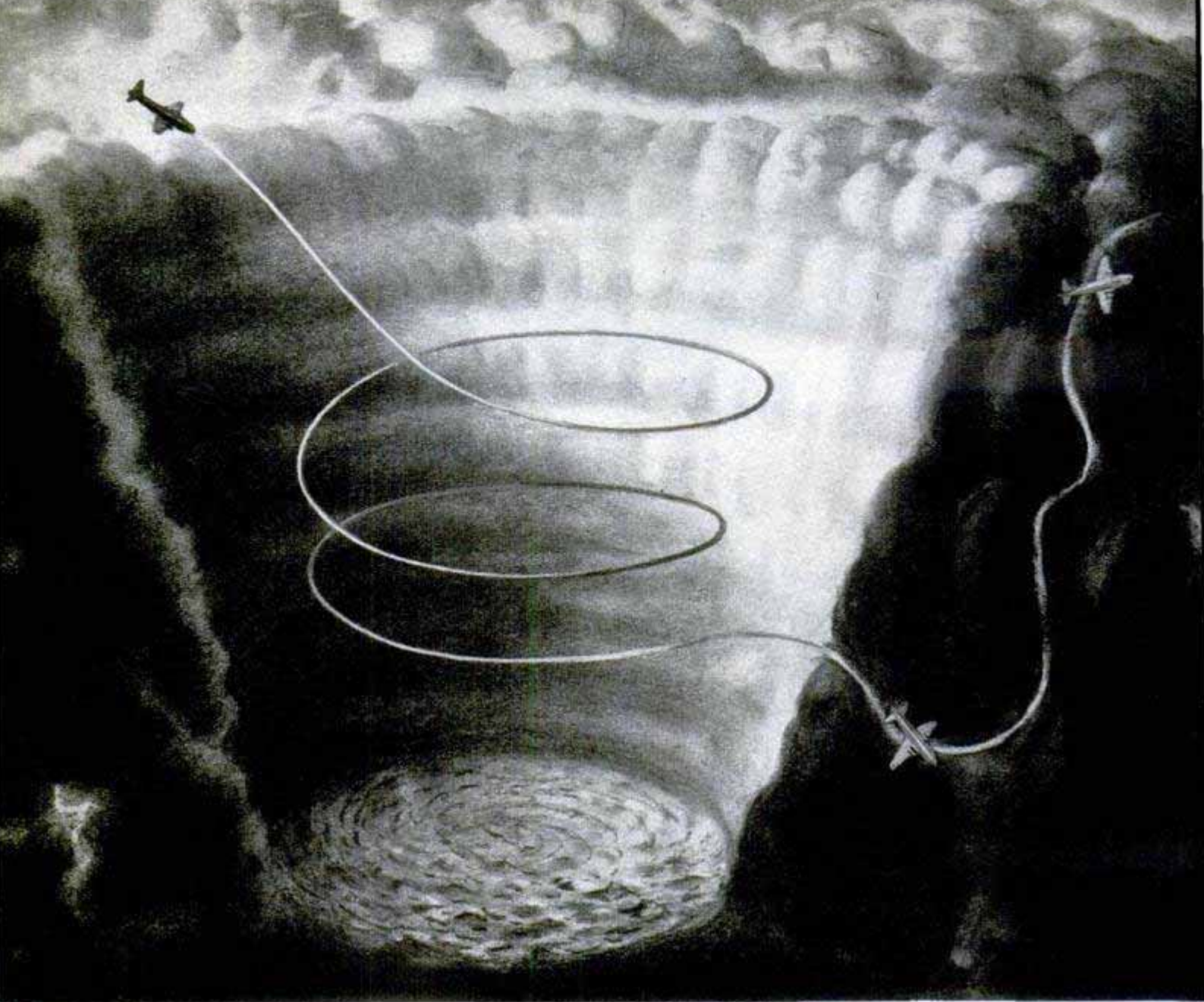
HER NAME was Beverly, and when she was born she was just another puff of cloud on the northern edge of the doldrums. Millions like her had been born that day, and they lay in the warm sun above the equatorial current like a blanket of cotton bolls all the way from Borneo to the coast of the Americas. All day they floated in the hot, moist air, their shadows barely moving on the dead, blue water below, and that night in the coolness they slowly sank and vanished. All except Beverly.

Sometime during that December

Lt. Lykins makes a careful instrument check before take-off on perilous flight into storm



MARCH 1950



Harrowing flight into the typhoon eye and out again is depicted by Leydenfrost, noted illustrator. Lykins' plane came out of the eye at 1500 feet and was tossed up and down at rate of 1000 feet a minute on way out

afternoon the stagnant air held within the strange walls of the doldrums had spilled over, and Beverly was carried north on the overflow. That night there was no warm air beneath her in which to sink into oblivion. Instead, a refreshing cool stream from an air mass to the north slid below, and she found herself being hurried up its slope. Around her in the darkness were other vague shapes and, as she rose higher, they fell in behind her and began joining their forces to hers. Before dawn, swollen into a vast, towering mass, she expressed her resentment of her uncomfortable condition by releasing bolt after bolt of lightning into the cold air that had caused it all.

The next day did nothing to improve her temper. She found herself squeezed into a narrow valley between two domes of cool air, and while it was easy to drift down the valley, every hour carried her farther and farther away from the quiet doldrums. It

was getting colder. The left side of the valley was steep and rough; the right side sloping and smooth, and the obstructions kept dragging at her left side, holding her back. As she flowed north at 15 miles an hour, she encountered a new annoyance. Down around the equator the pull of the spinning earth had been constant, almost as straight as gravity itself, but up around latitude 15, North, its pull was weaker on her north side than on the south. Twisted by the pull of the earth and snagged by the obstructions on her left, she began to turn like a chip in a swirling stream. So Beverly drifted north and east, fuming and spluttering and drawing to her assistance all the warm, moist air from a hundred miles around. Occasionally, her rage overflowed and she would drench the ocean with lakes of water, or she would lash at an island with venomous fury, tearing out giant palms like dandelion tufts.



D. Leydenfrost

On her third day, grown now to a hundred miles in diameter and still circling sluggishly while awaiting reinforcements, she made a trial test of her strength. While an alarmed skipper saw the bottom fall out of his barometer, she hit his freighter a quartering blow with a 60-knot gust that drove the starboard rail into the water. She hit him again before the ship could right itself, but she had neglected to pile up enough of a sea to smash him down for keeps. The ship lurched out of the danger area, but with no radio left to notify the world of its experience. Beverly lashed on, pounding the seas with such violence that the bottom three miles below shook.

On the island of Guam, a thousand miles to the east, the ultrasensitive seismograph of the U. S. Navy's weather station picked up the vibrations of the ocean bottom. A few minutes later the seismographs at Okinawa and Manila were taking bearings on Beverly's outburst, and within an hour her position had been pegged. She was, the Navy announced, a big storm that had am-

bitions to become a dangerous typhoon.

The boys at the U. S. Air Force weather station on Guam had not been caught napping. They had noticed an hour earlier an almost imperceptible drop in the barometer. On this island, where the weather is always perfect, a change of any kind can be only for the worse, and a pressure change so light as to be ignored elsewhere is here regarded with deep suspicion. The radio, too, was bringing in the repercussions of Beverly's electronic indigestion.

The next morning there was no need for seismographs or barometers to warn of Beverly's approach. A roller longer than the whole island heaved out of nothing and smashed upon the coral. A long pause, as though the sea were taking a deep breath, and another roller foamed up the beach. After that you could see them, a quarter of a mile from one round crest to another, each roller firmly rounded in front and then gently sloping back in a long smooth fetch to the base of the next. In the west the blue of the sky was cloudless, but the



U. S. Navy photo

An aircraft carrier rides out a typhoon in South China Sea. Despite the extreme roll and apparent danger, at least one crewman grins with confidence



Light cruiser is tossed around like a rowboat in heavy typhoon sea. Below, destroyer looks half submerged but is only caught in trough of giant waves

milky whiteness that usually lay low upon the horizon now extended well up into the heavens, and it was no longer friendly.

The time had come to do some flying.

The big B-29, peregrinating weather laboratory of the 514th Reconnaissance Squadron of the 2143rd Air Weather Wing, is gassed for very long range, and the ground crew again goes over her sun-bleached, rain-scarred skin, looking for ripples in the aluminum fairing and for loose rivets. She is a tough old bird.

In the weather shack of the U. S. Air Force Weather Central at Harmon Field, the weather forecasters and analysts of the Typhoon Warning Network were going over their charts with Lt. David W. Lykins, in command of the flight, his two copilots, his weather observer and his navigator. The charts showed Beverly had tightened up considerably during the night, and although her top was spread like an umbrella over 200 miles of sky, she was winding up around a central core of less than 50 miles in diameter. Wind velocities on the northeast side were pounding at the 100-knot mark, while those in the southwest quadrant were hitting 70 and 80 knots in gusts.

"She seems fairly well behaved," says the chief observer. "Not as bad as Ione or Karen or Libby. We'd like to have you hit her at about 10,000 feet and penetrate to the eye."

"Any special instructions?"

The chief hesitates. "Well, yes," he admits. "When you get inside the eye, you might buzz around a bit, then drop down to 1500 feet and break through her wall at that level. We're getting a good picture of typhoons at high level, and we know from ships what they do at sea level. Now we would like a cross section at low level."

Bedlam in the cockpit is portrayed on opposite page → as the B-29 worked its way out of the typhoon eye. The crew said it was like "hitting Niagara Falls"







Before take-off on weather-reconnaissance flight from Guam, the crewmen check over emergency equipment

The three pilots exchange glances. The navigator gulps. The weather observer looks eager. "Yes, sir," he says.

No plane, or at least none ever seen again, had tackled a typhoon at low level before.

At 3 p.m. the B-29 leaves Harmon Field and heads due west. On board, in addition to the men listed above, are a radar operator, a radio man, a flight engineer and two scanners, one for each side of the plane, to watch for damage during those moments of extreme turbulence when not even the loss of an engine would be felt by the pilot. Flight lunches and all gear are carefully stowed. Safety belts and shoulder straps are checked again for the 20th time.

Two hours out the first feathers of a high fan of cirrus clouds reach their tips over the plane, and the weather observer, seated in the nose between and slightly below the pilots, estimates their altitude at 30,000 feet and their length at 100 miles. Lykins is holding the plane at the 700-millibar level, and the radar altimeter by the navigator shows a true altitude of 10,000 feet. Under normal weather conditions the barometric altimeter scaled in millibars drops 34 millibars for each thousand feet of climb from a standard of 1013 millibars at sea level, and a quick comparison of the two altimeters shows that Beverly's presence has caused little drop in barometric pressure.

Ahead the swells on the sea are growing closer together and higher. They are like the spreading ripples of a stone dropped into a millpond, closest together near the scene of the disturbance, but now, even from 10,000 feet, the sea is no millpond.

Whitecaps appear on the swells, and then the whitecaps are blown to a froth that whips away at right angles to the direction in which the waves are moving. The navigator estimates the swells rolling east at 26 knots, the wind swirling north at 50 knots. A high-reaching gust flows beneath the plane and gives it a playful toss the height of a five-story building, and then drops it ten. The radar operator, tuning in on the eye, has his hand wrenched from the knob by the toss, and has to begin over.

And then Beverly looms before them.

Radar operator on weather plane found weak spot in typhoon wall through which Lykins' plane "escaped"



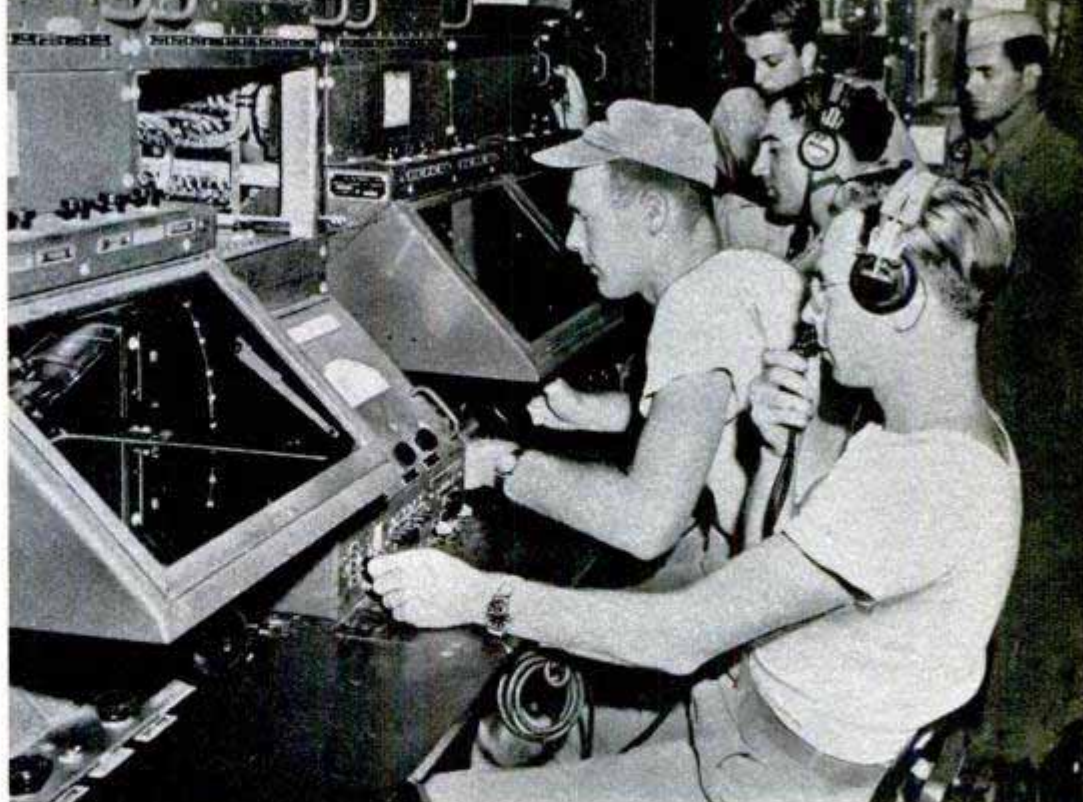
Low at first, only her crown of innocent puffs gleaming white beneath the late sun. To north and south the rolls of clouds lie, almost in a straight line, and the B-29, much smaller now, moves toward them as if drawn by some superior power. Minute by minute the clouds seem to grow higher. The sun is swallowed, leaving a blazing halo on the topmost puffs, while the solid wall beneath turns from gray to black. Lightning flashes inside the blackness like the opening and closing of doors in a blast furnace. A deck of strato-cumulus clouds slides beneath the plane, looking amazingly smooth and calm after roiled waves, lashing out in all directions.

The radar operator has the eye of the storm on his screen, high and to the right. Lykins swings the plane 25 degrees to the right, and stretches against the shoulder straps that are pressing him into his seat until his backbone seems permanently curved. The picture of the eye is clear, like an X-ray in green of the bow of a man's rib. Occasionally, lightning flames across the screen, but the eye always returns.

The navigator makes his final notations as Beverly towers above him, her 40,000-foot summit suddenly wiped out in a blast of rain. His pencil bites deep into the paper on an updraft. "Surface winds, 70 knots from 180 degrees." A downdraft lifts him hard against his shoulder straps but his trained pencil, barely touching the paper, records, "Temperature still 10 degrees Centigrade at 7:56Z."

The weather observer had quit making notations on paper, and is now talking into a voice recorder. "Moderate rain. Ex-ooh-treme turbulence."

The radio operator has locked his mike in a bracket and is now pounding his key at a steady 20 words a minute as the navigator hands him position reports and the ob-



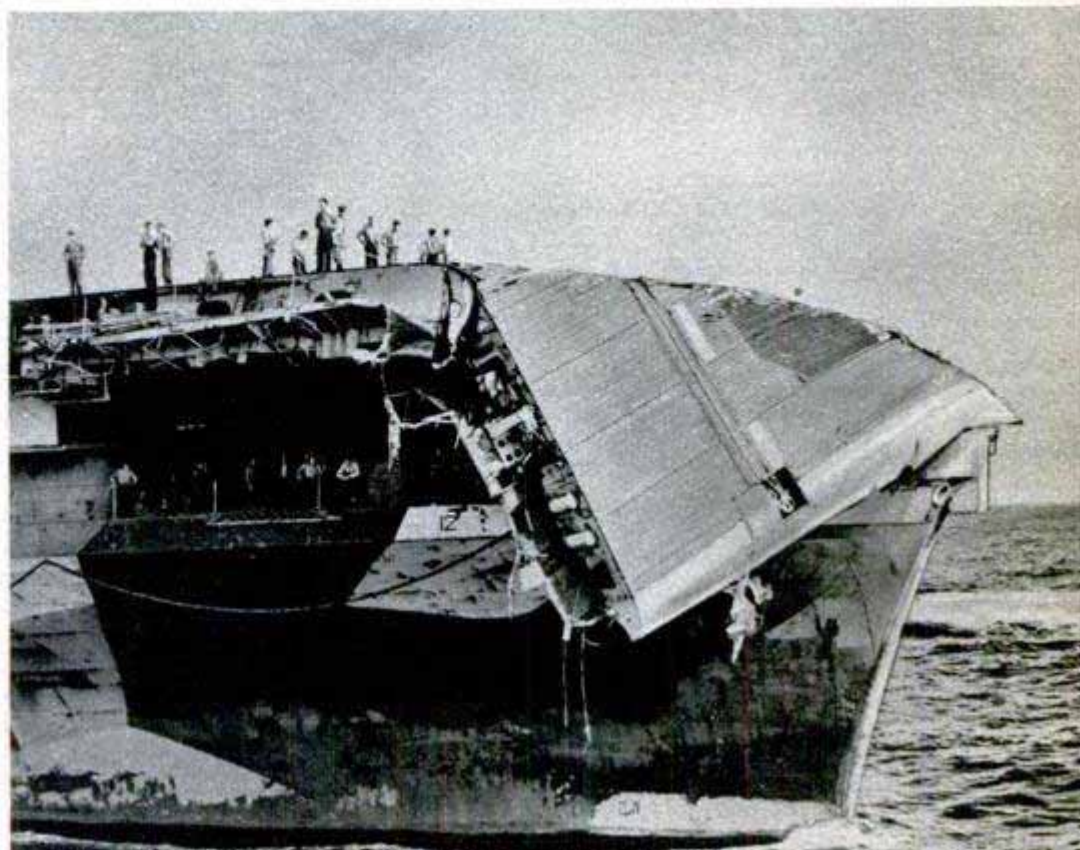
Zippo, high-precision radar device at Guam field, lands planes in fog

server feeds him the last written notations. The third pilot, clinging grimly to any handhold, acts to relay the messages from man to man.

From Lykins report we get the following: "At 09:06Z we broke into the most beautiful and well-defined eye that I have ever seen. It was a perfect circle, about 30 miles in diameter, and perfectly clear overhead. The sides sloped gently inward toward the bottom from 25,000 feet, and appeared to be formed of a solid stratus layer down to

(Continued to page 248)

Wartime typhoon caught USS Hornet and twisted her deck like a hat brim

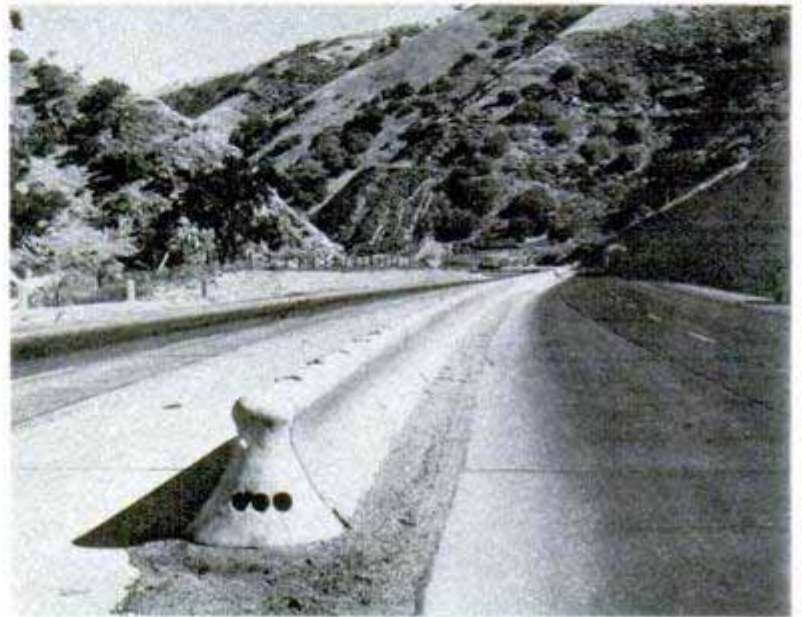




Above, concrete divider in background is replacing wood-steel type on California roads. Right, close-up of the new divider

Non-Jump Highway Divider In 10-Foot Sections

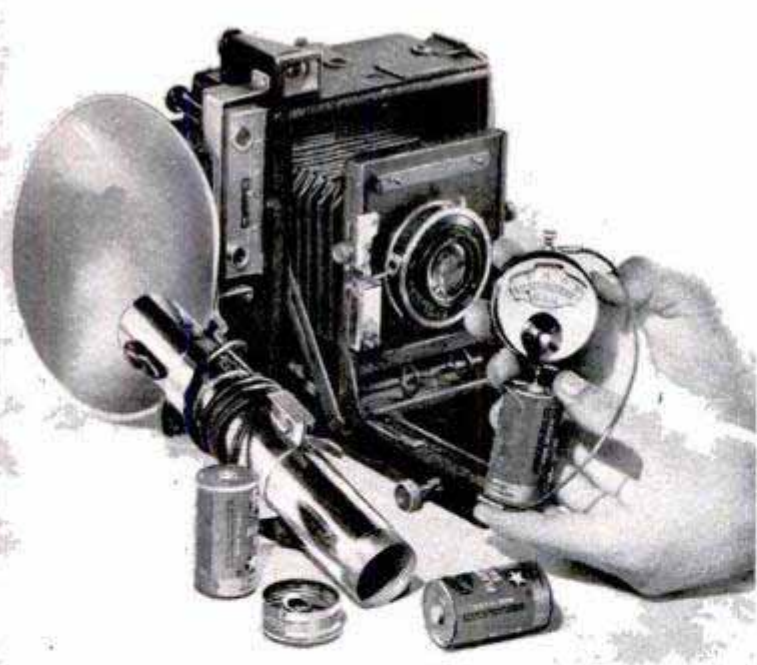
Neither speeding autos nor heavily loaded trucks can "jump" a new-style highway divider being installed in California. It consists of 10-foot-long slabs of reinforced concrete, curved inward on the sides and bolted to the road. The state says the divider, costing \$7.50 per foot to build, will pay for itself in a little over two years, since maintenance on the wood-steel barrier that is now in use averages \$3.50 per foot yearly.



Typewriter Keyboard On Typesetting Machine

Typists can now set type on Linotype and Intertype composing machines through the development of a keyboard that has the standard keys of a typewriter. Forty-four keys, electrically operated, fit over the 90 keys of a standard composing machine. The keyboard can be moved from one composing machine to another as there is no installation. The new keyboard is simply placed over the top of the existing keyboard and the unit is ready for use when it is plugged into an electrical outlet. The complete outfit weighs only 25½ pounds.

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

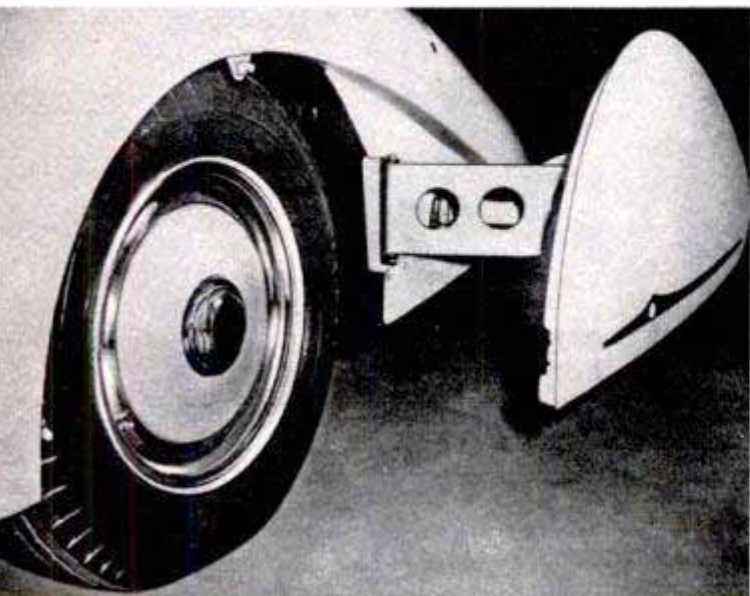


Meter Checks "Juice" in Batteries To Insure Firing of Photo Bulbs

With a new meter, photographers can check the "juice" in photoflash batteries before they make that all-important shot. A spur on the meter is touched to the positive end of the battery and a flexible cord is pressed against the bottom of the battery. The available power then is read in amperes on the meter. The little meter is scaled from 0 to 23 amperes and gives positive evidence as to whether the batteries are strong enough to fire the bulbs.

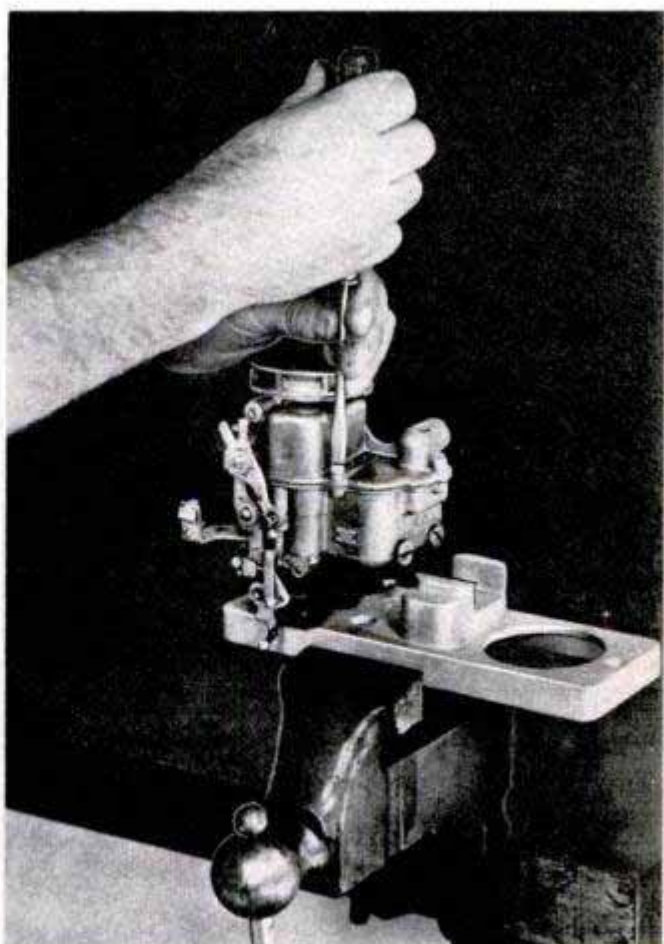
CARBURETOR JIG, at right, gives the mechanic an extra "hand." Holding a Ford V-8 carburetor firmly, it lets him work with both hands. The jig, made of aluminum, can be clamped in a vise or bolted down

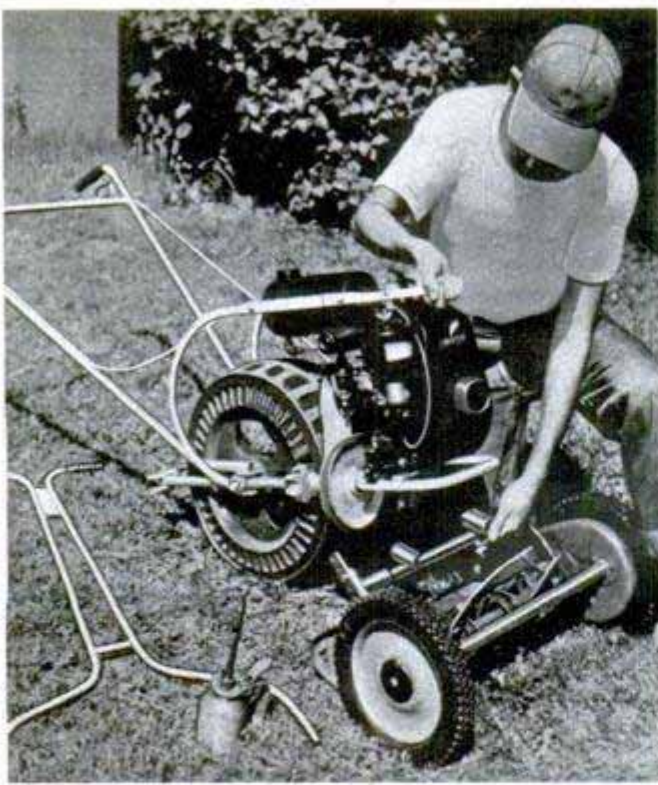
FENDER SKIRT swings out on hinges to provide easy access to the wheel. This innovation was shown at the International Motor Show in London and was demonstrated on a Rolls Royce. It's a low-cost item



Twist of the Wrist Loads and Cocks Camera

Sequence shots of rapid action are taken by a fast-operating camera designed for sports and spot-news photographers. A twist of the left wrist cocks the shutter and automatically advances the film. The lens aperture is adjusted without looking at the scale by counting audible clicks that mark each stop. The focal-plane shutter has speeds from $\frac{1}{100}$ to $\frac{1}{500}$ second. The camera comes with an f:4 lens and uses 80-mm. perforated film.





One-Wheel Garden Tractor

Weighing only 87 pounds, a new lawn and garden tractor has only one wheel that not only supports the tractor, but also has, as part of the casting, a ring gear which drives the implement. The wheel has a six-inch tread for good traction and load distribution. A regular lawn mower, with handle detached, can be hooked to the tractor to convert it into a power mower.

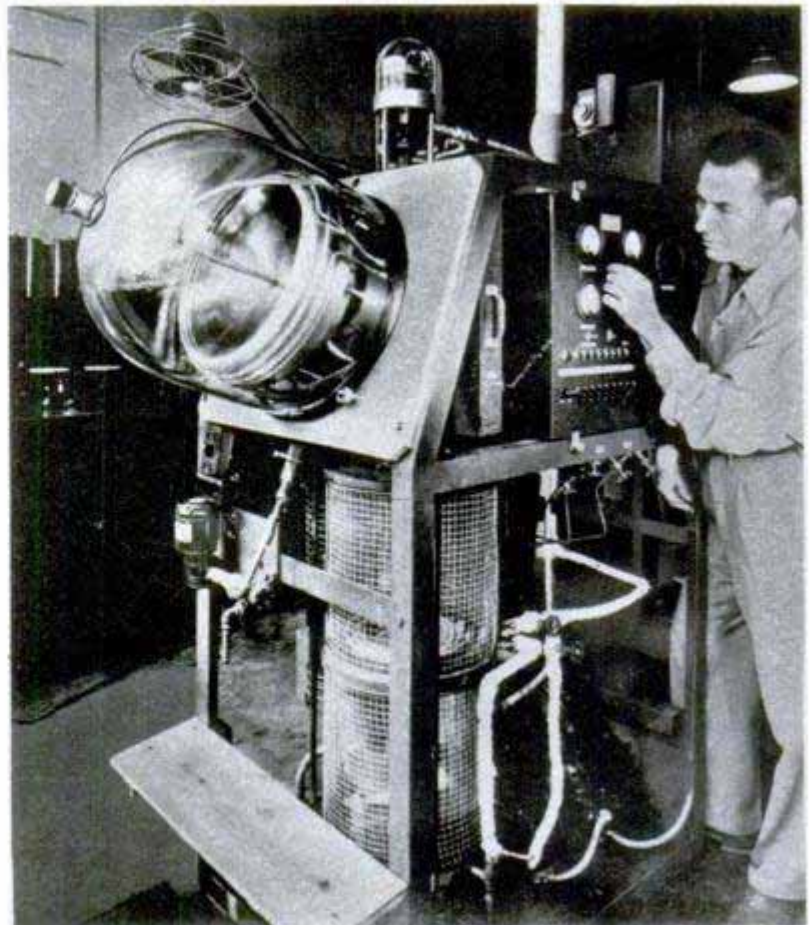


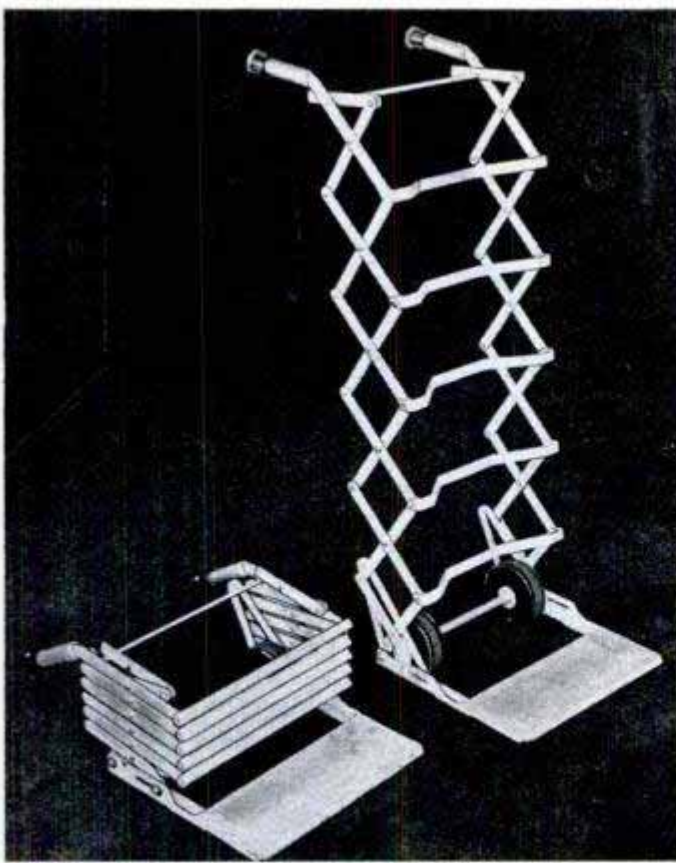
Weed Cutter Uses Razor Blades

Old razor blades are put to good use in a grass cutter that takes four single or double-edge blades. A slide, which fits into the cutting arm of the tool, holds the blades firmly for good cutting action. Designed for use in trimming grass around flower beds and trees, the cutter can also be used to remove weeds by cutting below the ground surface and for light pruning.

Vacuum "Churn" for Oils May Improve Quality

Better lubricants may result from a new research technique, known as molecular distillation, that reduces changes in the molecular structure of oil to a minimum. Key to the process is an apparatus consisting of a shallow steel cone, spun at 1725 revolutions a minute inside a glass vacuum chamber. The oil is fed to the center of the cone through a tube and centrifugal force spreads it over the radiantly heated metal surface in less than $\frac{1}{10}$ second. The more volatile or lighter portions of the oil are distilled off and collected, while the less volatile portions are thrown off the edge and collected as residue. Because the liquid spreads over the cone in a layer only 3000 molecules thick, it is distilled in a fraction of a second, thus keeping hydrocarbon decomposition at a minimum.

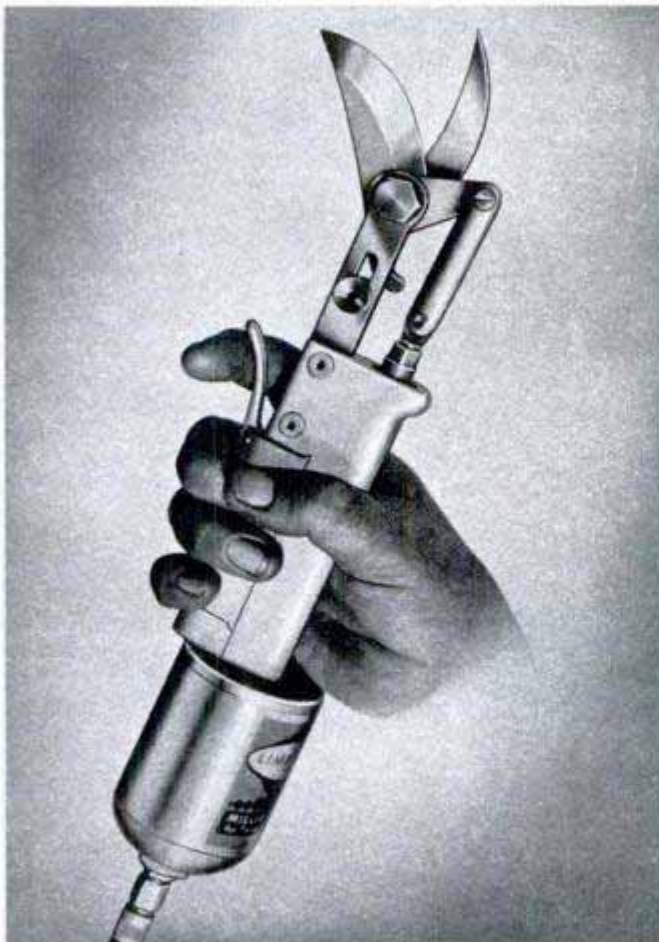




Folding Hand Truck Will Carry 700-Pound Load

Folding like an accordion, a lightweight hand truck — weighing only 25 pounds — can carry up to 700 pounds. It folds into a compact heap, only nine inches high; when folded, 10 of these trucks can be stored in a space ordinarily occupied by two rigid-

type trucks. When fully opened, the truck reaches a height of 42 inches. A glider bar on the truck makes it easy to take loads up and down stairs. The wheels are mounted inside the frame to prevent them from catching on passing objects.



Pneumatic Pruning Tool

Only the touch of a trigger is required to lop off limbs with a new air-operated pruning tool. The pruner handles limbs ranging up to $\frac{3}{4}$ inch in diameter, and larger cuts can be made if the operator rotates the tool slightly between pulls of the trigger. Action is rapid because air pressure opens as well as closes the cutters of the $1\frac{3}{4}$ -pound tool. The cutter opening can be adjusted from wide to narrow range by a slide stop to increase efficiency in cutting small vines and branches.

No-Contact Printing System

Onset printing, a revolutionary system in which no contact or pressure is used, transfers ink to paper by what is called an electronographic press. Positive and negative electrical forces work to attract the ink to the paper from the inked image. The paper is separated from the image by .001 inch. The inventor of the process, W. C. Huebner of Mamaroneck, N. Y., claims it can be used with any of 32 different printing processes and will print one or both sides of the paper in one to six colors.



Worker inserts steel trowel through mulch paper spread over the ground and plants a pineapple slip. Twenty months later the ripe pineapple (below) is ready for harvesting. A second crop ("ratoon") ripens a year later

STRANGE INVENTIONS of the past have nothing on the Hawaiian pineapple industry which for sheer survival has had to create some pretty queer machinery over the years. Today, after many decades of designing odd contraptions, the highly mechanized, multimillion-dollar industry hums along like a well-oiled machine producing golden sun-ripened pineapples by the millions.

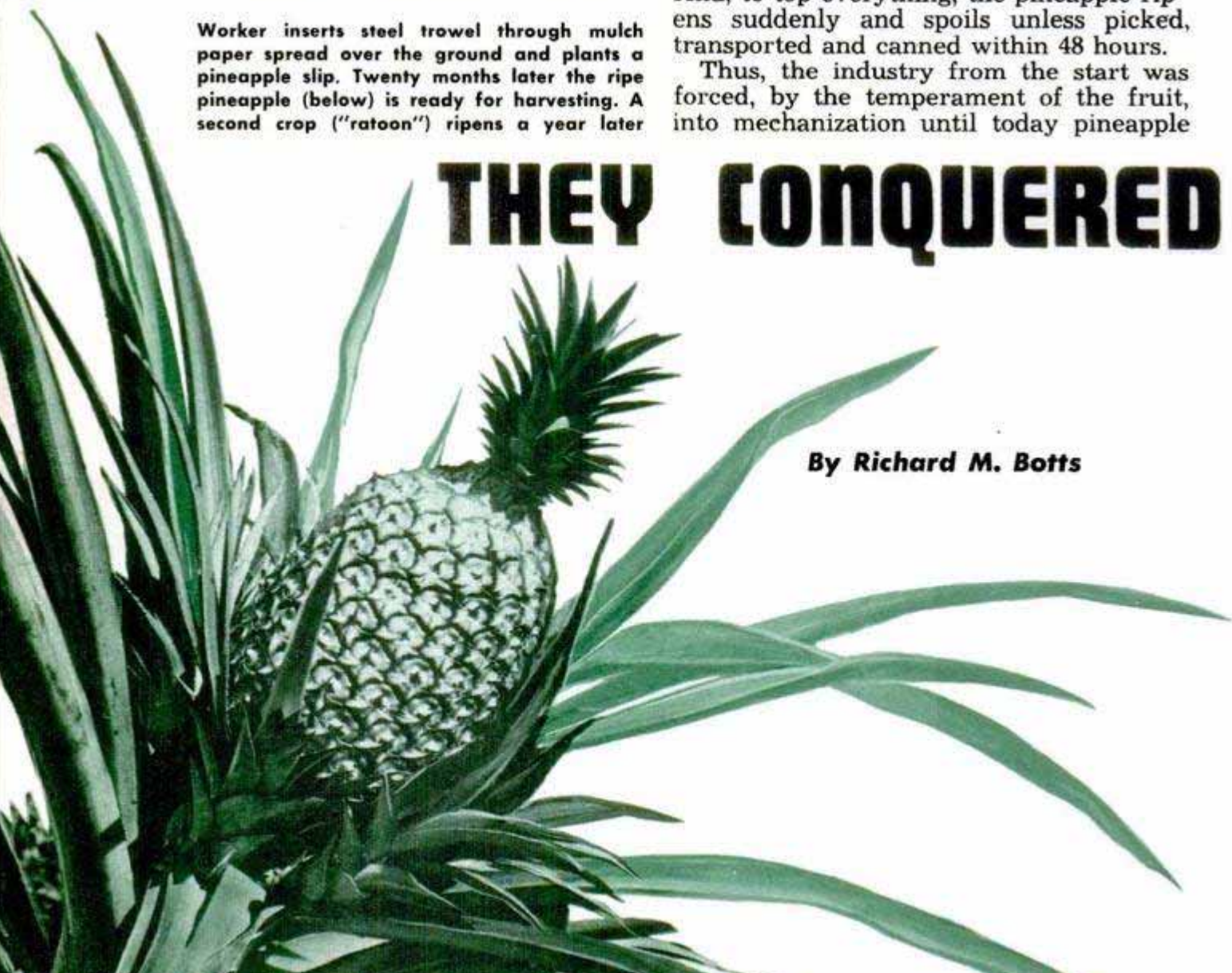
Yet, the early producers who first grew pineapples commercially about 50 years ago found the going anything but smooth and must have frequently cursed the Spaniard, Don Francisco de Paula y Marin, for introducing such a cantankerous fruit to the islands in 1813.

Strangely enough, it was the very cantankerous nature of this West Indian fruit which started the trend toward mechanizing the infant industry around the turn of the century. For instance, the industrial pioneers found peeling and coring the pineapple by hand costly and time consuming. Gathering the crop solely by hand was slow and dangerous, for the fruit grows tough, razor-sharp and needle-pointed leaves which liked nothing better than poking out a worker's eye or slicing his legs as he hauled his bag of pines through the field. And, to top everything, the pineapple ripens suddenly and spoils unless picked, transported and canned within 48 hours.

Thus, the industry from the start was forced, by the temperament of the fruit, into mechanization until today pineapple

THEY CONQUERED

By **Richard M. Botts**





Aerial view of huge pineapple field in Hawaii shows contour planting which guards against soil erosion

A CANTANKEROUS CROP

is handled almost entirely by mechanical work horses from planting to final canning.

The mechanical robots begin in the virgin field from six to eight months before the pineapple is ready for planting. The land is prepared by powerful tractors, which plow about 12 inches into the soil. This is followed by multiple disk harrows which are drawn back and forth across the field. Between plowings the soil is left to rest and soak in rainfall.

Besides plowing, subsoiling is frequently practiced. The subsoilers are tractors which trail specially built steel booms behind them. On the booms are large disks which break up the soil to a depth of 20 inches. At the tail end of the boom is a long roller that smooths out the soil after the disks have torn it up.

Finally, when the field is ready for planting, the mulch-laying machine unrolls strips of 30-inch mulch on the soil. This tar-paper-looking substance is used to dis-

courage weed growth and hold moisture and heat within the soil. As the machine unrolls the mulch, disks on either side toss soil on the edge of the paper to hold it down. Workers, following the machine, plunge steel trowels through spots marked on the mulch and insert the pineapple slips.

While it takes about 20 months for these slips to bear, mechanical aids to the pineapple's health are continually applied until the fruit is ready for picking. For instance, it was found that while Hawaiian soils contain iron it is, oddly, in a "fixed" state and cannot be taken up by the plant's roots. And iron plant food is necessary for good, healthy pineapples. To add the required iron, growers simply dissolved scrap iron in sulphuric acid, thus creating iron sulphate.

When spraying is contemplated, these green iron-sulphate crystals are dissolved in water and sprayed from derrick booms on the back of trucks. The spray is shot over the fields from the booms so as much



Disks on subsoiling tractor break up the ground to depth of 20 inches; roller on end of boom smooths earth

iron as possible will fall on the leaves which in turn absorb the iron into the plant.

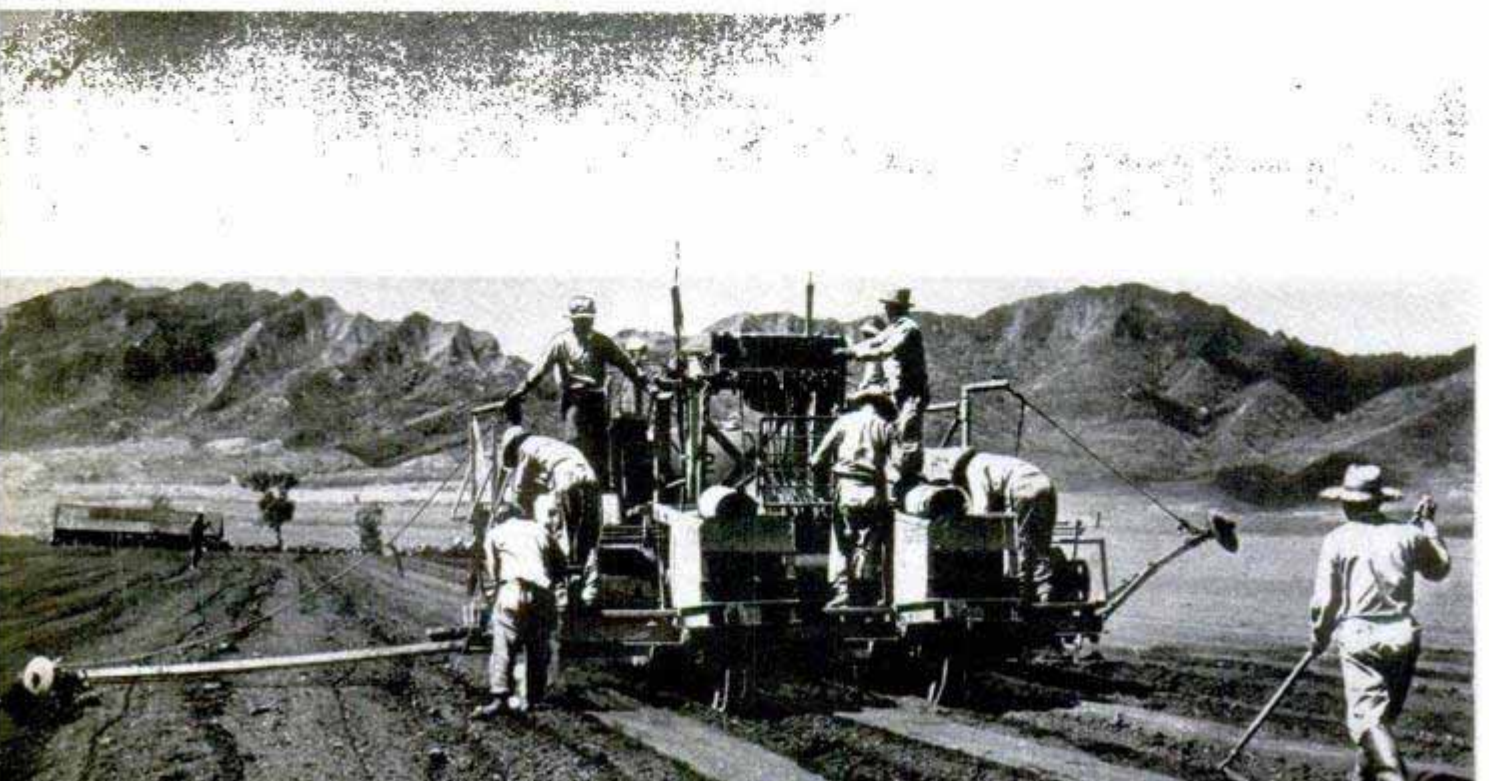
Another spray machine invented by the industry is a truck mounted with a long, right-angled pipe boom. This is used for killing the mealy bug which at one time almost wiped out the pineapple industry. The bug feeds on the plant, sucking the juice and eventually killing the plant. An effective spray was finally found and is now used to completely saturate the plant and kill the bug. From the truck, the spray is forced under heavy pressure out through the many small holes in the pipe boom and onto the plants. A great number of plants are sprayed at one time by this method.

When the pineapples have ripened, a mechanical harvester enters the field. The harvester resembles a "carry all" lumber

vehicle. There are four hydraulically operated wheelless metal "legs" which support the harvester about 20 feet off the ground. A truck coming in for a load of pines drives between these spindly legs. The "legs" are then hydraulically drawn up so the harvester actually rides on the back of the truck. The harvester then lowers its conveyor-belt boom over the field and rides piggyback on the rear of the truck, which slowly moves ahead with the pineapple pickers.

The field worker picks the pineapple, strikes off the crown with a sharp knife and dumps the pine on the conveyor-belt boom. The conveyor belt carries the pineapple along the boom to a revolving "stepladder," which transports the fruit to the top of the harvester and then down into the wooden

Strips of mulch paper 30 inches wide are placed on plowed earth just before planting to discourage weeds





Pineapple plants must have their iron so this spray machine dispenses barrels of iron sulphate over them

bin on the truck. When the bin is filled, the mechanical harvester lowers its legs and lifts its body off the back of the truck. The truck then pulls away and proceeds to the cannery while another truck takes its place.

At the cannery the wooden bin is lifted from the truck's back by tall straddle trucks known as Ross carriers. The bin is then placed on a hydraulic dumping unit which tilts one end of the bin, sending the fruit rolling out onto spiral graders.

The spiral graders have conveyor belts 48 inches wide and 250 feet long and can handle up to 100,000 pineapples an hour. The graders automatically separate the large and small pineapples and carry them on different conveyor belts into the can-

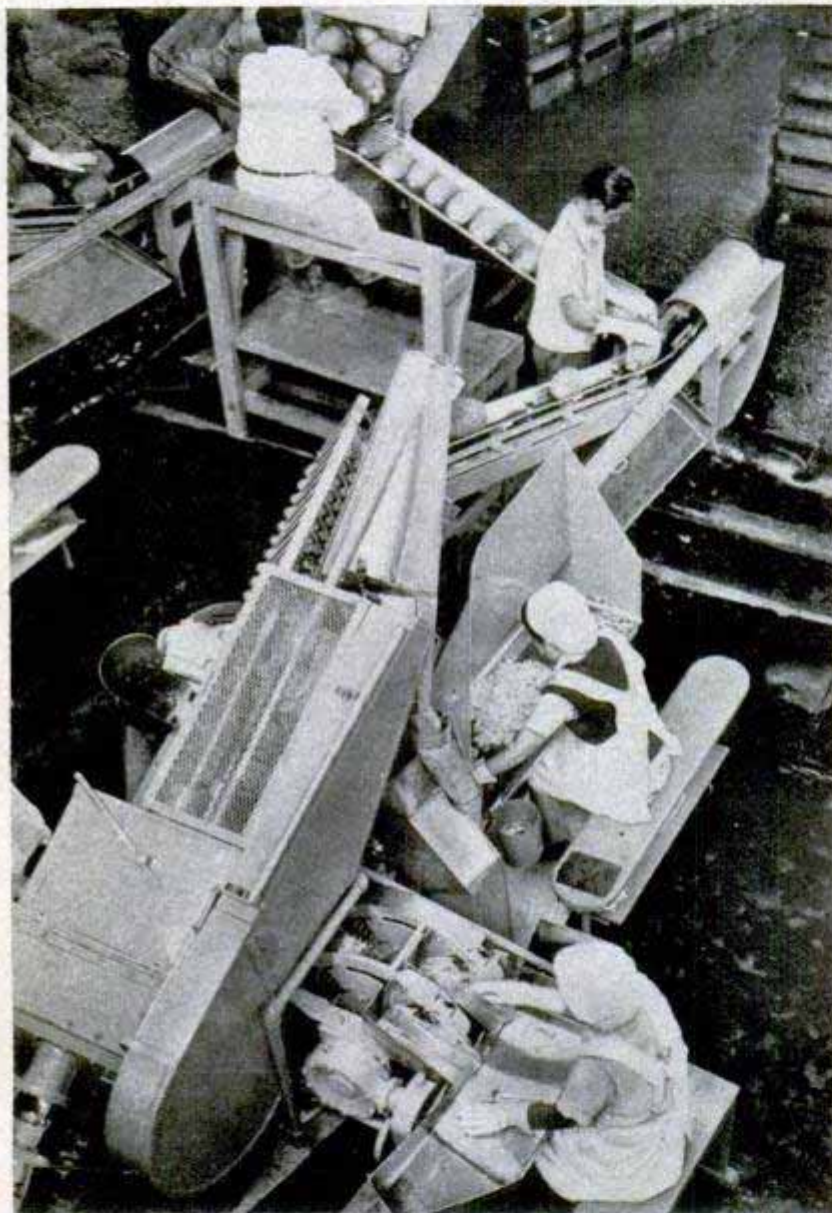
nery. All along the route, the pineapples are washed by high-pressure water sprayers which remove the field dirt.

At the end of the conveyor belt the pineapples are ready for the first step in the canning process—the Ginaca machine.

Invented by Henry Ginaca, in 1913, this machine is the key to mass pineapple production. The pineapples go head first into the machine and in split seconds are shelled, center cores punched out, and the naked cylinders of fruit are sent sliding through tubes to the trimming table. The machine may be adjusted to shell fruit to any size can and easily processes 100 pineapples a minute. With 30 Ginaca machines operating at full capacity, a cannery can

Besides their "iron diet" young plants must be adequately nourished with commercial fertilizers carried by special tractors. They have high wheels and the fertilizer boxes on either side of the tractor. Mechanical "hands" elevate the hoses for the correct height





handle 180,000 pineapples an hour.

At the trimming table highly trained girls quickly inspect the fruit and do whatever final trimming the Ginaca machine missed. From the trimming table the cylinders of fruit pass onto a moving chain where they go through a cold-water spray and then into the slicing machine, which automatically cuts the pineapple cylinders into uniform slices.

From the slicing machine the pineapples move on a belt to the packing table. This is one operation that hasn't been mechanized and the sorting of pineapple slices into grades and packing into cans is done by trained workers. The workers fill the cans which are then stacked and sent to the syruping machines.

After receiving their syrup the cans of pineapple slices are run through the sealing machine which completes the vacuuming process. From here the hermetically sealed cans go to the pasteurizers where they are heated for 5 to 15 minutes so as to sterilize completely the canned product.

Cold-water sprays then cool the sterilized cans. When down to normal temperature, the cans are sent on their final assignment—to the labeling machine which can label over 1400 cans a minute.

Then, from Hawaii the mechanized pineapple goes by the millions to the far corners of the world—an example of American ingenuity and high mechanization.

Left, a close-up of the Ginaca machine for processing pineapples. Pineapple moves side-wise down chute and is spaced as it enters machine. Cored pineapple shoots through tube on far left. The girls in the picture keep pulp moving into separate chute. Below, harvester moving through field. When truck on left was full, harvester raised up to permit it to pass through. A second truck (empty) waits its turn at the harvester



Hydraulic Jack Has Separate Pump

Designed for work in close quarters, a new hydraulic jack comes in two sections. The pump is in one section and the jack in another, the two parts being connected by a rubber tube, permitting the pump to be placed some distance from the work. Because the oil is completely sealed inside the mechanism, the jack can be used in any position, horizontal or vertical. The low-lying jack is designed for railroad and industrial uses.



Portable Respirator Works by Bellows

Firemen and police officers may be able to save more lives with a compact resuscitator that requires little storage space. Developed by Dr. Joseph Kreiselman of Washington, D. C., the portable artificial respirator consists of a facepiece connected to a small bellows. The mask is held across the victim's nose and mouth with one hand while the other pumps the bellows to force air in and out of his lungs.

Bottle-Cap Vases

Discarded bottle caps provide the raw material for yard vases made by an Illinois hobbyist. The caps are center-punched and strung on stovepipe wire to form rings of varying sizes. These rings are then used to build up the vase. When completed, the vases are lacquered to prevent rusting. One large vase contains almost 6000 caps.

☞ Sounding like the whistle of a steam locomotive, a six-tone diesel horn has been invented by a Canadian railway worker.



By Georg Mann

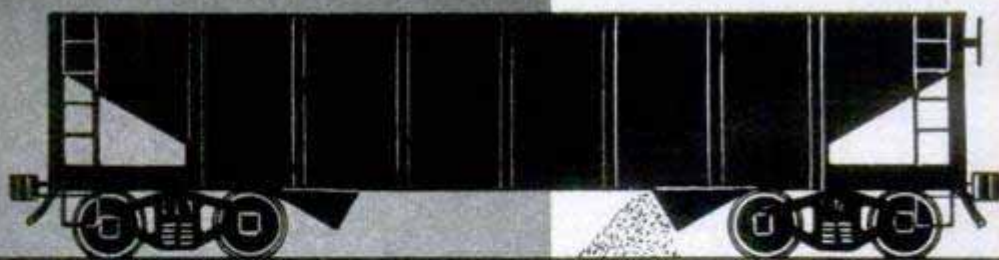


Here are samples of the tongue-twisters with scores of uses from camera lens to cigarette-lighter flint

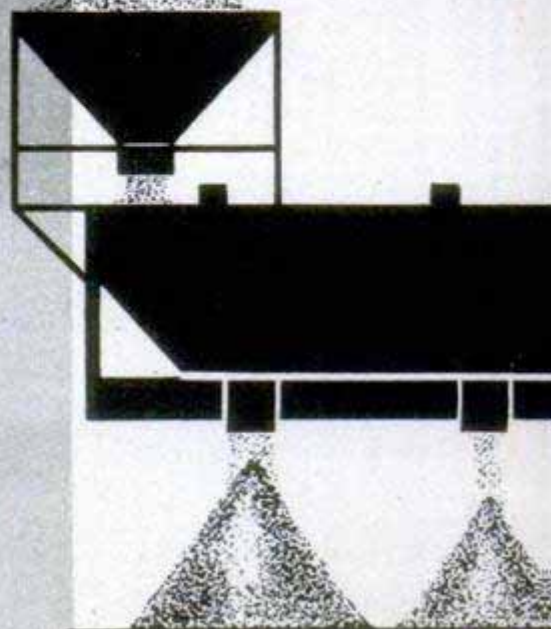
Boom in Tongue-Twisting Metals

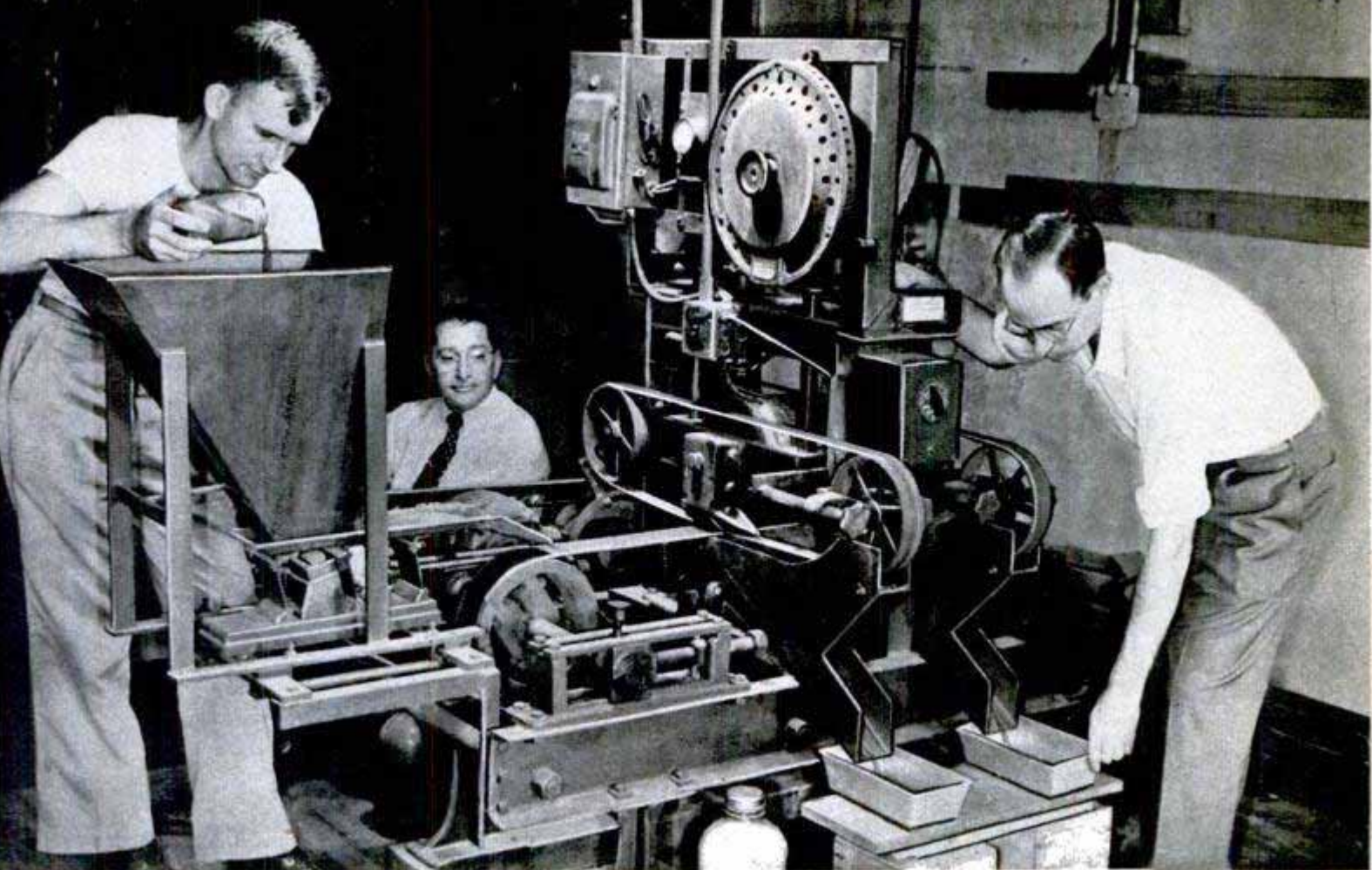
TUCKED AWAY in a corner of the periodic table of the elements—that chart which every year baffles a new generation of high-school chemistry students—is a group of chemical elements that nobody pays much attention to. They are called the “rare earths” and properly speaking are the “rare earth metals.” If there is time, the teacher may point out that there are 15 of these rare earths, that their atomic numbers range from 57 to 71, and there is one of these elements that even scientists are not absolutely sure exists.

Nobody minds snubbing the rare earths. Even their names are forbidding and include such tongue-twisters as praseodymium, gadolinium, ytterbium and dysprosium. Chemists are a little inclined to blush because they mar the regular pattern of the periodic table itself.



One 50-ton carload of monazite sand yields the following “rare earth metals”: A—32,500 lbs. of mixed rare-earth oxides, B—16,300 lbs. of cerium oxide, C—6000 lbs. of lanthanum oxide, D—4750 lbs. of neodymium oxide (95 percent pure), E—400 lbs. of samarium oxide. Among the important uses for these oxides is making cores for arc-light carbons which burn brilliant white





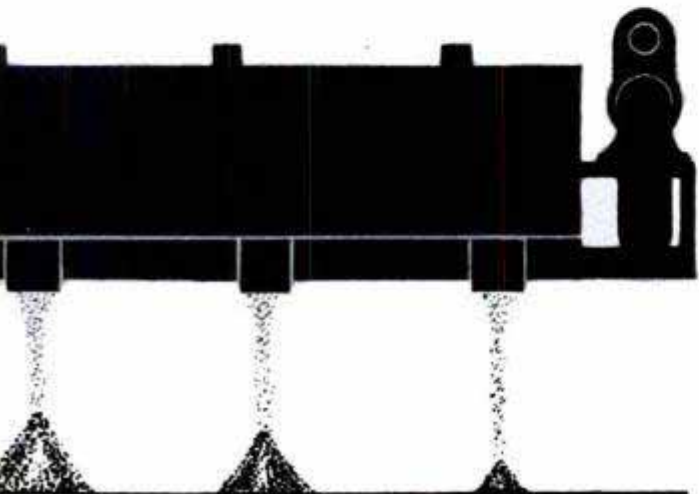
Magnetized belts leading from hopper separate rare-earth ores into monazite and iron ore in laboratory

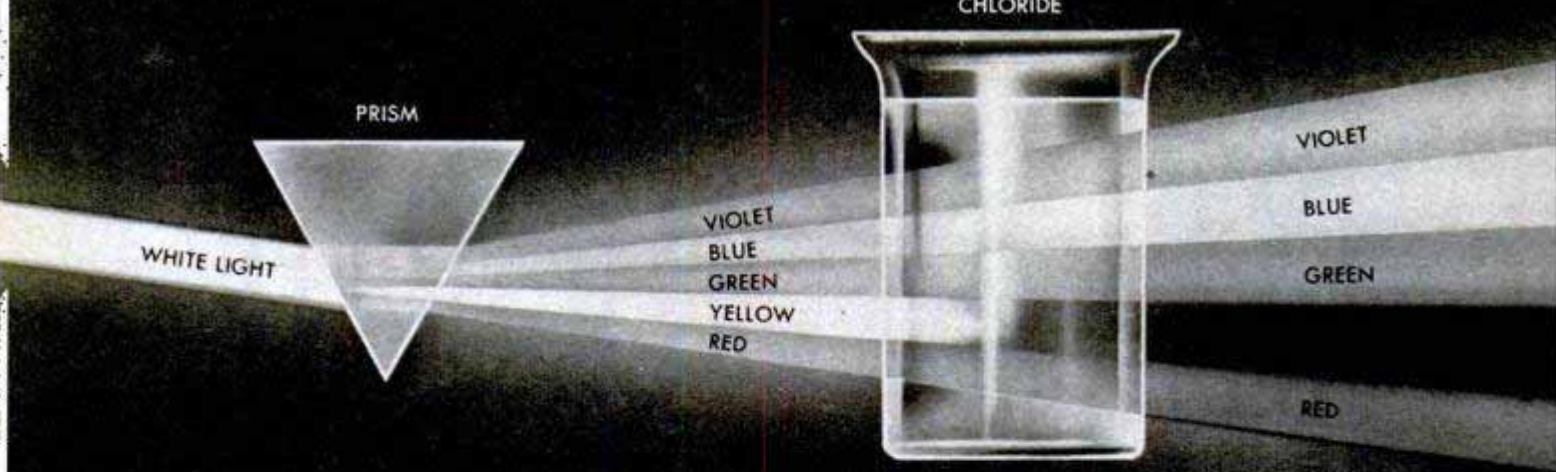
But without fanfare, a few industrial chemists have been making useful, hard-working citizens out of these orphan children of the periodic table. Chances are the sparks that fly when you flick your cigarette lighter come from a flint that contains some of the rare earths. The mantle hooked up to a gas jet or used to make gasoline or kerosene flames burn more brightly owes its efficiency to a healthy trace of one of the rare earths in its make-up. That expensive raspberry-colored goblet you admired on a trip through the department store probably owed its unique color to another of the rare earths. And better lenses for cameras, eyes that see farther for the Air Force, have come from putting the rare earths into overalls.

The story is a long one. It jumps from

Sweden to laboratories in Paris, Heidelberg and the University of Illinois. At one time or another, a Swedish army surgeon, a Finnish professor, a Czech chemist and an Austrian baron enter into the story. It all began more than 160 years ago when a strange-looking black rock turned up near the little Swedish town of Ytterby. Slowly, step by step, the Swede, the Finn, the Czech and the Austrian—plus others—found first one, then another unique chemical element in this strange-looking mineral. The search for the rare earths resembles nothing so much as the listings for a golf or tennis tournament seen wrong end to. In such a tournament, a group of players start; from every pairing one victor emerges, until one final champion is crowned. In the case of the rare earths, the chemists first found two elements in the black rock from Ytterby, then in successive steps broke these down into new substances until they arrived at a final result of 15.

Two of the 15—rare earths called praseodymium and neodymium—were discovered by Karl Auer, an Austrian chemist who first put the rare earths to work. Auer was a pupil of Robert Bunsen, the chemist who invented the Bunsen burner. Auer was dissatisfied with the flickering gas flames that provided light during the 1880s. He had a hunch that if some mineral were put into the flame, it would glow and give a brilliant,





This demonstration with a prism and beaker containing a weak solution of didymium chloride shows the white light entering prism and being separated into all the colors of the spectrum. The didymium solution stops the yellow light—a boon to glass workers hampered by the brilliant yellow glare given off by sodium

steady light. Thorium, a radioactive chemical but not one of the rare earths, looked like the best bet. But Auer's thorium gas mantles didn't work properly. Not until he mixed a thorium compound with one percent of a compound of cerium—still the most useful of the rare earths—did he produce a mantle that satisfied the customers.

That was in 1885. Cerium helped make Auer a millionaire, bought him an impressive castle, and eventually led the Emperor Franz Joseph to turn plain Karl Auer into Karl, Baron Auer von Welsbach. More than

40,000 workers all over the world made and sold his gas mantles. And there are few Americans over 50 who haven't touched a match to a Welsbach mantle.

Fame and a more modest degree of fortune came even more slowly to the other rare earths. Auer made use of a mixture of the rare earths and iron that gave off sparks when it was struck in an automatic gas lighter. The flint in your cigarette lighter is a lineal descendant of Auer's device. But for years the firms that made gas mantles regarded the rare earths as a good deal of

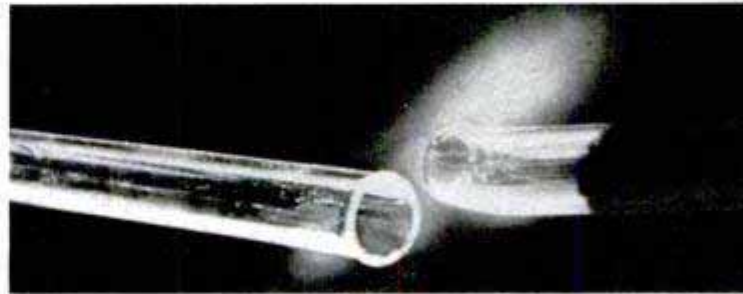
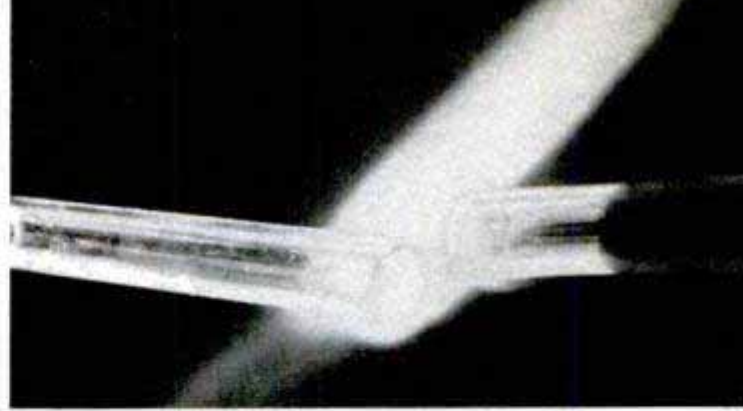
TABLE OF THE RARE EARTHS AND THEIR USES

Rare earth	Symbol	Atomic number	Use
Lanthanum	La	57	better camera lenses
Cerium	Ce	58	gas mantles, optical polishing, coloring glass, alloys
Praseodymium	Pr	59	rare-earth mixtures used—arc-light carbon cores
Neodymium	Nd	60	coloring glassware, filter for ultraviolet in sunglasses
Illinium		61	discovery disputed
Samarium	Sa	62	infrared phosphors
Europium	Eu	63	infrared phosphors
Gadolinium	Gd	64	minor
Terbium	Tb	65	minor
Dysprosium	Dy	66	occurs in rare-earth mixtures
Holmium	Ho	67	used in mixtures
Erbium	Er	68	used in mixtures
Thulium	Tm	69	used in mixtures
Ytterbium	Yb	70	used in mixtures
Lutecium	Lu	71	used in mixtures

} none of these have important separate uses



Didymium lenses used by glass blower block out 90 percent of brilliant glare from yellow sodium flame. Top photo at right shows how bright flame obscures details of the work while just below it work is shown through lens. Below, separator sorts the rare earths in accordance with their magnetic strengths



a nuisance in the ore they refined. At most, they were saved in small amounts for what, in the language of industrial chemistry, was strictly a "drugstore business."

The growth in the importance of the rare earths can be seen in the history of the Lindsay Light and Chemical Company of West Chicago, the largest U. S. producer of these neglected elements. This firm, first known as the Lindsay Light Company, was founded by Charles Lindsay, Jr., back in

1902. Lindsay was interested in the sale of gas mantles. Eventually, he became interested in refining the raw materials for the mantles, manufacturing them directly for the market. By 1916, Lindsay Light was refining monazite sand, the principal commercial ore of thorium and the rare earths.

During the first World War, the gas-mantle business boomed. But inevitably, the market for gas mantles began to contract as electricity dominated the lighting field. There was still a market for mantles but the future didn't look rosy. In the meantime, Lindsay's chemists were finding a mounting pile of rare earths on their hands from the monazite sand they were refining.

The situation called for some action. As Mark Eichelberger, Lindsay's vice-president explains it, monazite sand from Brazil contains six to eight percent thorium compounds. But nearly 60 percent is made up of the rare earths, and cerium makes up nearly half of these rare earths. So the chemists got busy. They worked with the rare earths, analyzed properties, tried to fit them into current methods of industrial production. They sent samples of rare-earth compounds to firms they thought would have a use for them. The missionary work paid off. Sales of the rare earth began to mount. In fact, shortly before World War II broke out, the thorium in the monazite was a drug on the market, the rare earths were the salable returns.

The atomic research of World War II brought thorium back with a bomblike bang, however, when researchers discovered that thorium could be the starting point for atomic fission. Thorium from being a temporary stepchild, became a stand-in for uranium and plutonium in the atomic-energy program.



Lanthanum lens in this camera assures photographer clearer, faster pictures with much less distortion

Processing of monazite sand has stepped up enormously. Before the war, Lindsay Light and Chemical processed about 700 tons of monazite a year. Now they are extracting rare earths and thorium from 2500 tons a year. Most of the monazite comes from Brazil, although smaller amounts are shipped in from Idaho and Florida. India is another major source. And because of its thorium content, prospectors in a great many atom-ambitious countries are on the hunt for the ore. Dr. Howard E. Kremers, Lindsay's research director, averages two

or three inquiries a week from people interested in the cinnamon-brown heavy sand. And he replies with a quick, "Sure," when asked whether it's worth-while prospecting for. Current delivered prices for the monazite average around \$145 a ton, more than twice what the ore sold for in 1945.

In spite of the beginning boom, not all of the 15 rare earths are important commercially. Some of them are simply too hard to get in any reasonably pure form. Others have no immediate uses. Currently, cerium, lanthanum and neodymium are among the leaders. Cerium, in a pure form soft as lead, turned up more than a century ago in the researches of the great Swedish chemist, Jons Jacob Berzelius. Nobody ever saw pure cerium, however, until 1911. That year, after three years of intensive laboratory work, Dr. Alcan Hirsch of the University of Wisconsin prepared cerium in a pure form, that is 98 percent pure. In the form of compounds, however, cerium is turning into a minor industrial jack-of-all-trades. Every one of the 15 million gas mantles made every year contains cerium nitrate. Compounds of cerium and oxygen are highly recommended for polishing glass, particularly precision lenses. Other cerium compounds are mixed into the glass itself to get rid of unwanted colors that sometimes turn up. Such compounds also ward off the color-changing effects of the sun on glass. Mixed with the metal titanium, other cerium compounds give glass a fine yellow tint. And yet other cerium compounds are being tested in metal alloys. So far, they've been found to give new and better properties to cast iron. And cerium has also turned up in therapeutic lamps and powders for flashlight photography.

Lanthanum was first discovered by the

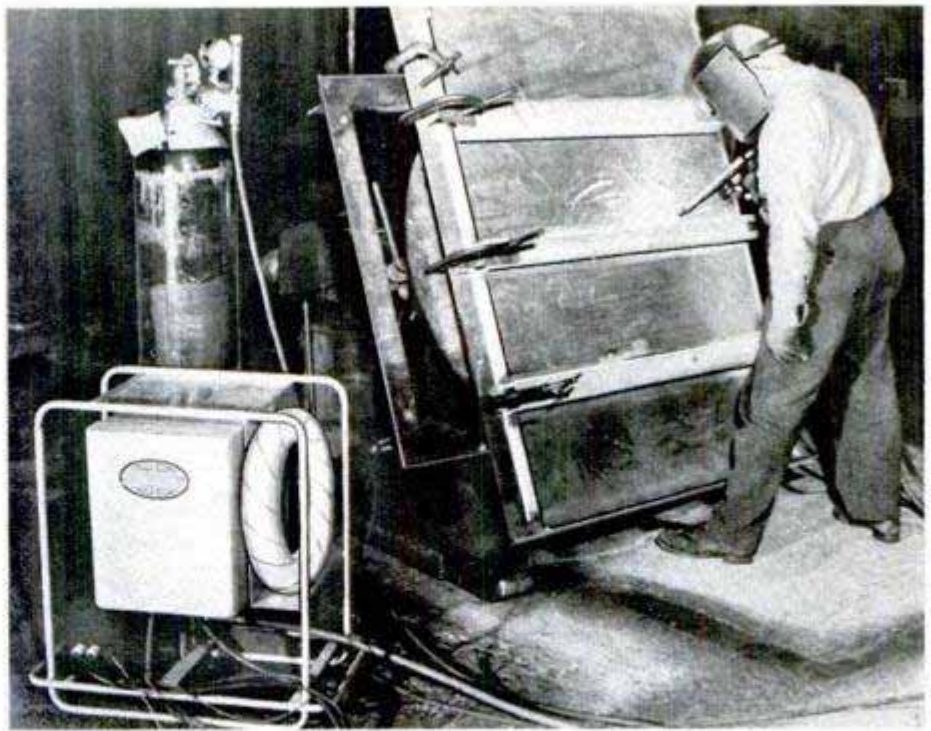
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Carbon arc lights made of rare-earth oxides give this motion-picture set a natural "daylight" illumination



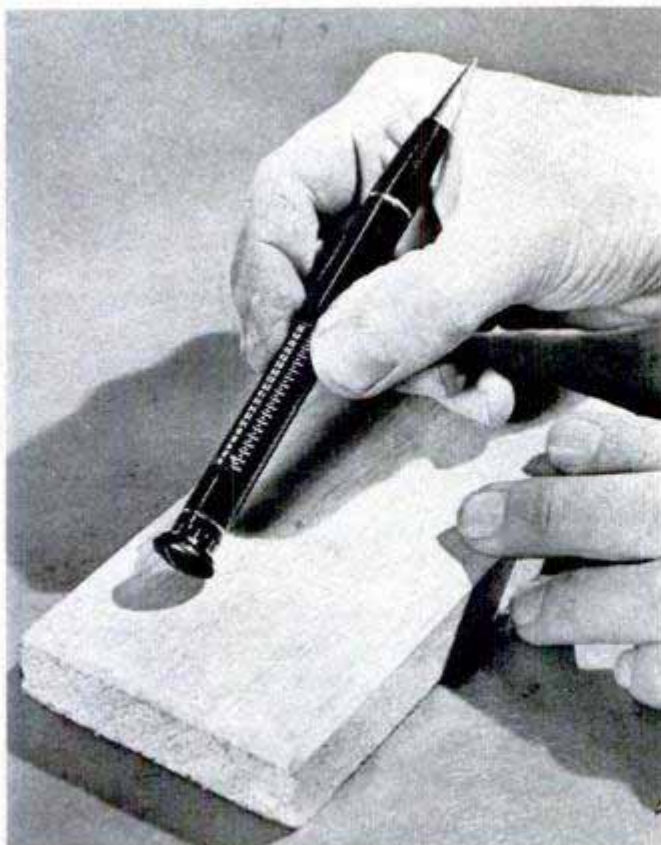
Gun Welds Aluminum Four Times Faster

Aluminum is welded four times faster by a pistol-shaped tool which feeds the filler metal in wire form at controlled speeds. The metal carries the welding current. A sheath of argon or helium gas surrounds the arc between the wire and the aluminum, preventing air from contacting and oxidizing the molten metal. A trigger regulates the gas flow and wire feed. Drive rollers move wire to the gun at speeds ranging from 100 to 350 inches per minute.



Mechanical Pencil "Yardstick"

Here's a mechanical pencil with a built-in "yardstick" that enables the user to measure any distance, from a fraction of an inch upward, simply by rolling the head along the line of measurement. The head is mounted on a shaft that rotates, moving a pointer along a longitudinal slot in the side of the pencil. It has a "range" of 36 inches in one direction; for greater distances, the pencil can be reversed every 36 inches so the pointer moves the other way. The pencil can also be used as a calculator for adding and subtracting.



Electric Drive for Small Lathe Has Stepless Speed Control

Smooth and stepless speed control for a small lathe is now available by turning a single knob. The equipment does away with mechanical adjustments of gears and belts while providing greater speed range and smooth transition. Speeds may be preset or varied during operation. Developed by General Electric and called the Thy-motrol drive, the unit is easy to wire because the terminals are located at the front of an electronic panel and separated from the tubes by a protective cover. The simple control station has stop and start buttons and the knob for adjusting speed. The drive operates from 220-volt alternating current.





U. S. Bureau of Mines photos

Spent shale at the Bureau of Mines experimental plant at Rifle, Colo., is pushed into a ravine by a bulldozer

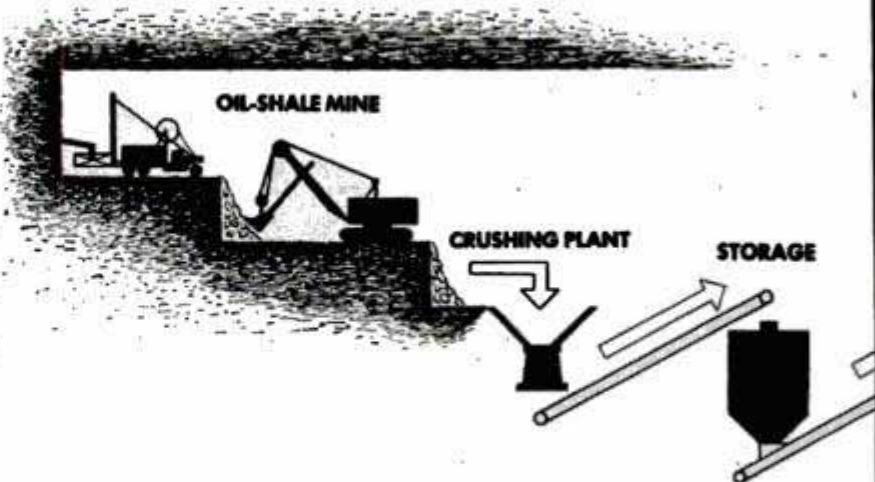
By Thomas E. Stimson, Jr.

When Oil Wells Run Dry....

there's gasoline for hundreds of years in our mountains of shale, already being refined in a pilot plant in Colorado

MECHANIZED mining and improved processing is cutting the price of shale oil to where it can compete with petroleum for the motorist's gasoline dollar.

W. C. Schroeder, chief of the Office of Synthetic Fuels of the U. S. Bureau of Mines, estimates that gasoline can be produced from oil shale for as little as 8.4 cents per gallon. This is based on trials at the bureau's experimental plant near Rifle, Colo., where the shale is mined and trucked to a huge retort, to have its waxy oil extracted



Left, in the Green River shale formation beneath Utah, Wyoming and Colorado—once thought to be valueless—there is potentially enough oil to assure the U.S. an adequate supply for at least several centuries. It covers 1100 square miles. Above and right, steps in the production of liquid fuels from shale. Conversion of the shale is more expensive than refining of most crude petroleum

and refined into gasoline. Fuel oils and other typical products can also be produced.

Ordinary overhead, transportation to market, profits and taxes would raise the base cost of shale gasoline considerably. Delivered to the consumer, shale-oil derivatives could be expected to sell in the same price range of petroleum products.

This doesn't mean that the market is going to be flooded with shale oils and gasolines. For one thing, the United States and the world in general are enjoying a temporary overproduction of crude oil. For the next several years, at least, there is all the crude oil we need, even though the United States alone is consuming six million barrels a day.

Too, oilmen say that a complete shale-oil plant, producing 100,000 barrels a day, would cost a fabulous \$400,000,000. No oil company can afford such a huge investment as long as it has adequate amounts of crude petroleum to feed to expensive refineries it already owns. Smaller shale-oil refining units would not permit the savings that are possible with large production.

Instead of starting a price war, the Rifle plant is confirming the comfortable thought that this country will not run out of liquid fuels for at least several centuries. Concern about our dwindling petroleum reserves (which is quite true) has lost its sting. The Green River oil-shale formation in Colorado, Utah and Wyoming, covering 1100 square miles, has an estimated minimum of 300 billion barrels of recoverable oil.

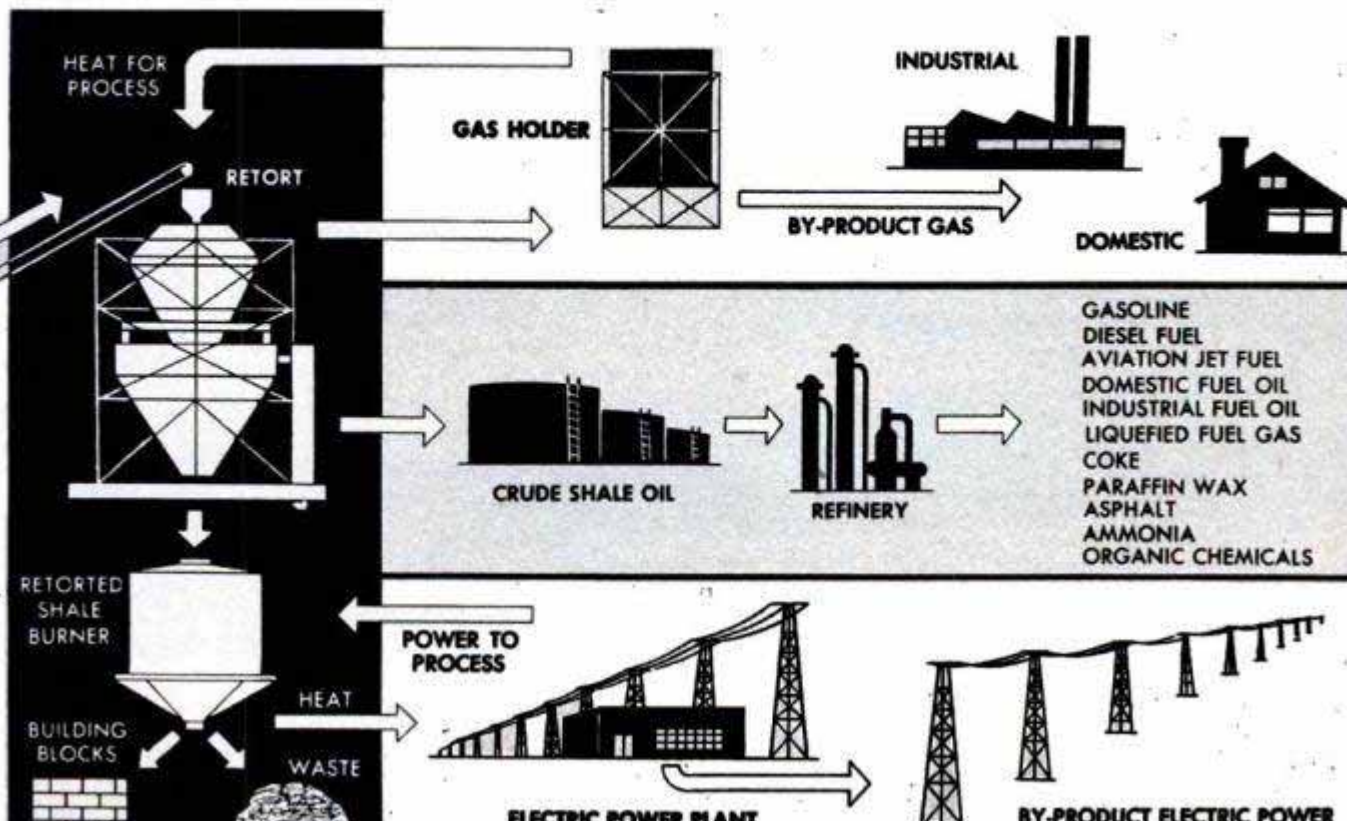
Boyd Guthrie, engineer-in-charge at Rifle, has the job of determining the cheapest way to mine the rock, the easiest way of extracting its oil and the most efficient method of refining it into useful products. Original ideas by his staff, techniques from

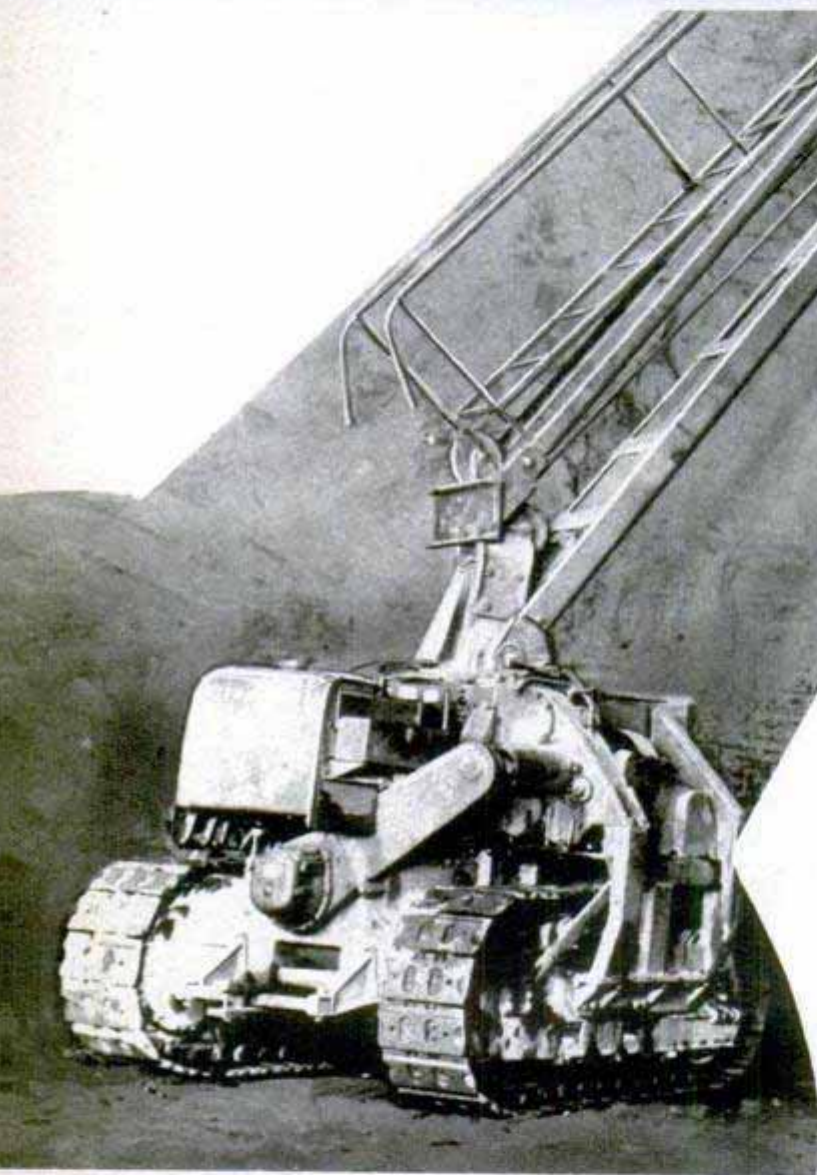
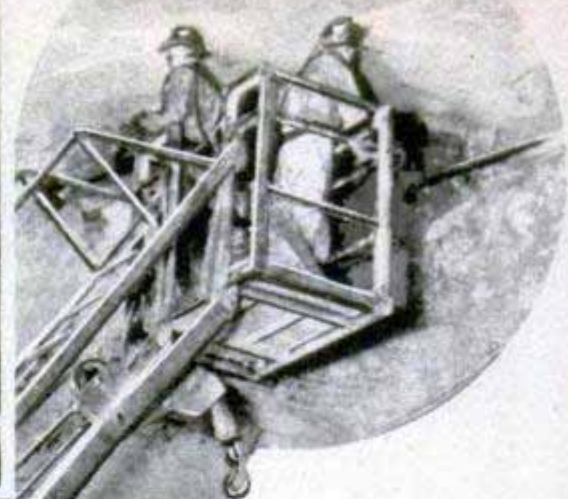
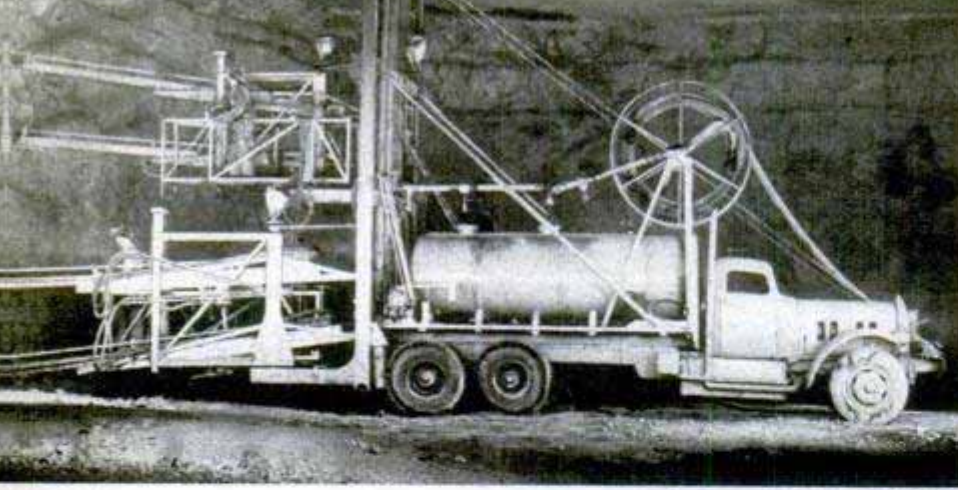


Gasoline for all the autos and trucks used at the pilot plant is now being made from the shale mined near by

abroad and suggestions by the oil industry at large are all evaluated.

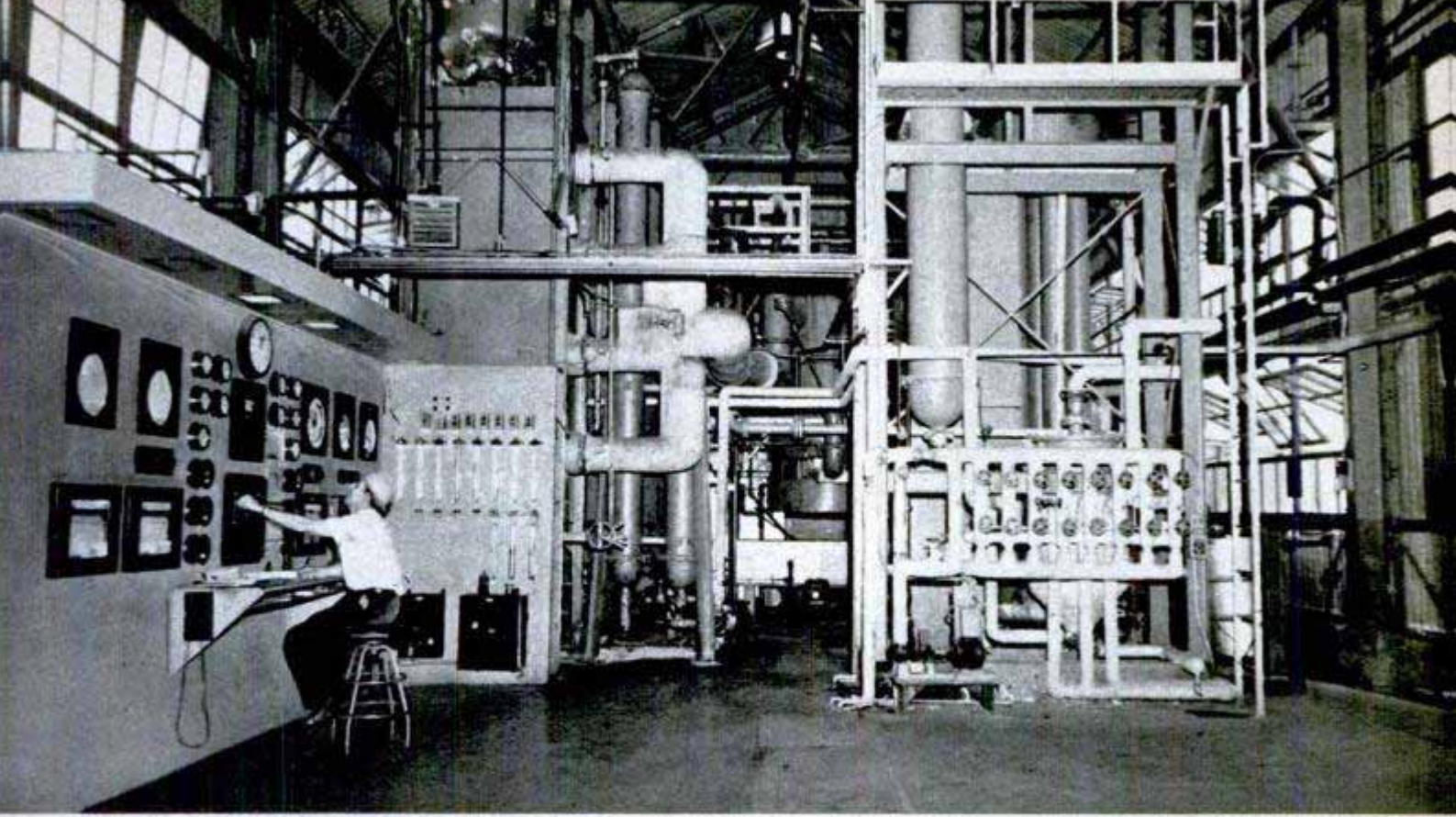
At Rifle the rich 73-foot-thick Mahogany Ledge that assays 100 million barrels per square mile is used for testing mining methods. Entrance to the mine is high on the face of a cliff and the mine itself is actually an underground quarry. During a recent test period, when an average of 1491 tons of shale were broken out and moved per day, the direct mining cost was estimated to be 32.9 cents per ton. This is about half of what earlier estimates indicated.





Upper left, new multiple carriage developed by Mines Bureau drills 72 fifteen-foot shot holes in six hours. Left, a scaling rig helps men reach loose rock clinging to the walls. Lower left, "steps" in the Rifle mine are spacious enough for large, open-cut type equipment. Below, cracking unit where diesel oil and gasoline are both produced





To get the costs down that low, power shovels are used in place of hand shovels and 15-ton diesel trucks replace ordinary mine cars. The trucks drive right into the mine and haul their loads direct to the retorting plant.

The mine is a huge cavern of the room-and-pillar type, with 60-foot square pillars of shale left 60 feet apart supporting the roof. Mining is done on three levels and in cross section the mine appears in the form of three giant steps. The top step is 27 feet from floor to roof. Behind it is a 23-foot-deep bench, and below and behind it is a second bench.

Fifteen-foot shot holes are drilled into the top step with a special multiple-drill jumbo that enables two men to drill 72 holes in six hours. Then the face is blasted out with dynamite. The lower benches are advanced by similar blasting operations.

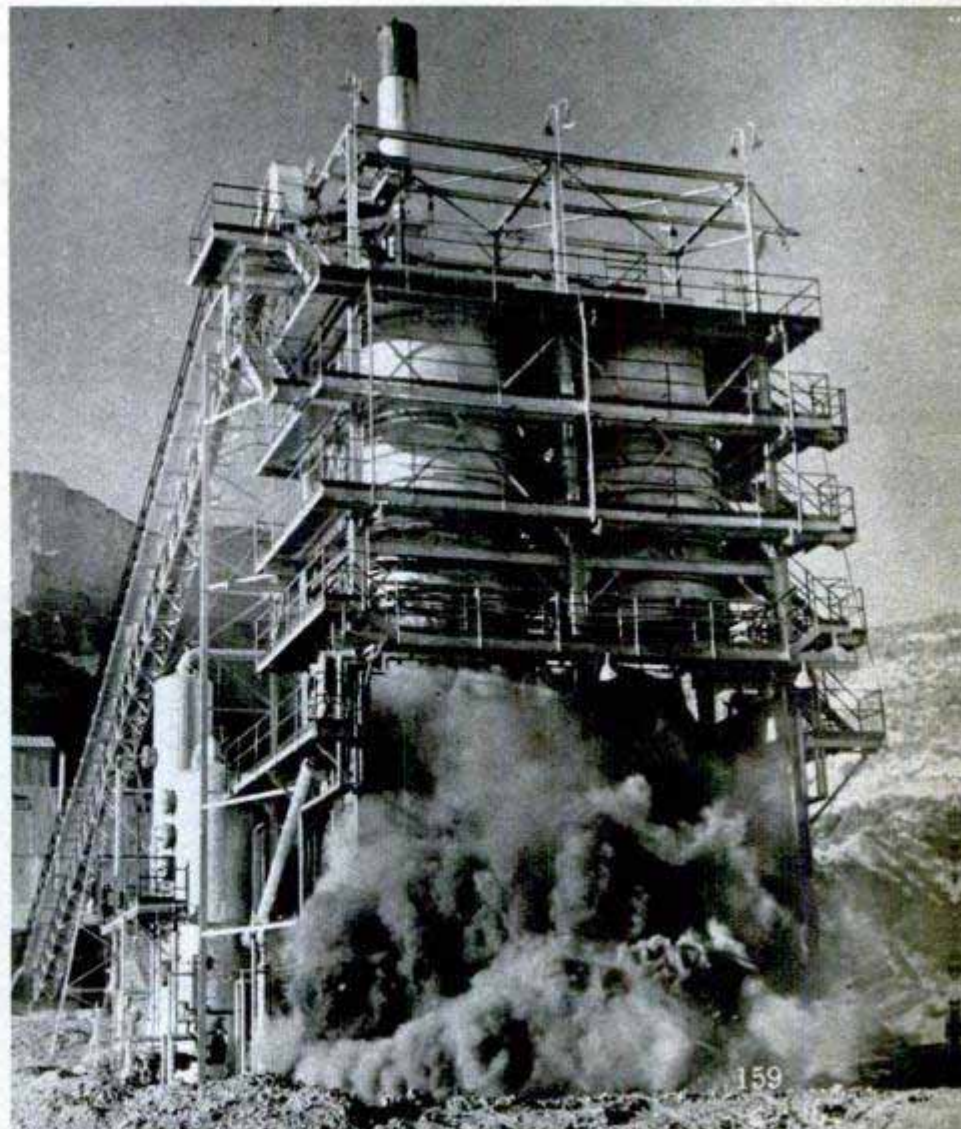
At the preparation and retorting plant, the shale is crushed to particles one to four inches in size and moved by conveyor belt to the retort. There, oil is extracted by heat.

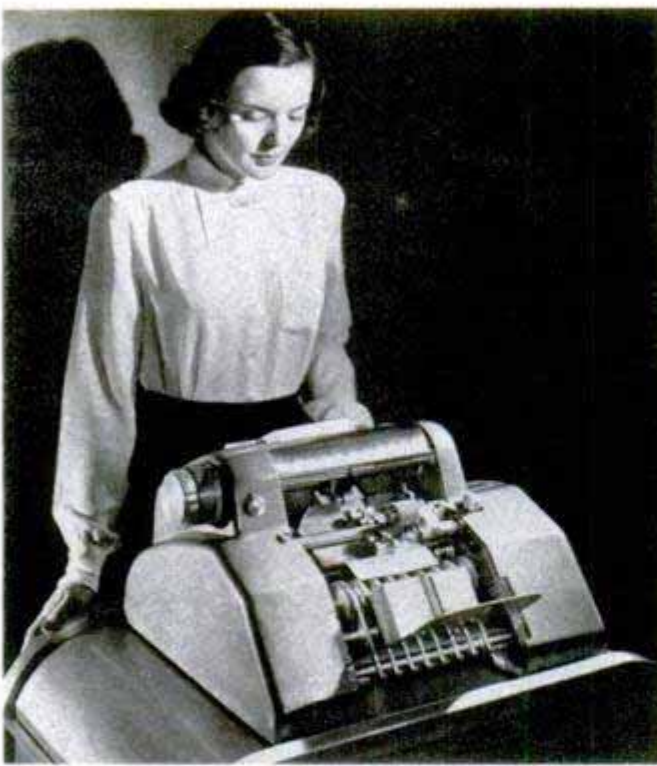
The present Rifle retort is of the batch type. Various oil companies have developed continuous-flow types of retorts and some of these are to be tested at Rifle.

(Continued to page 260)

Above, continuous-flow retort now used at Rifle. In it the residual oils and carbons in spent shale are burned to supply hot gas that in turn heats raw shale and drives off its oil

Below, smoke, fire and dust billow forth as 35 tons of spent shale is dumped out a trap door beneath one of the retorts





Counting Machine is "Sleuth"

Anything from dollar bills to world-series tickets is counted accurately at speeds up to 1000 a minute by a new machine that feeds and stacks automatically. An optional imprinting device permits dating, coding, endorsing or canceling during the counting operation. Its trip mechanism is said to be so sensitive that it once picked out a counterfeit bill from a stack of currency, rejecting it and stopping the machine because the bill was too thick.



Trailer Coupler Applies Brakes

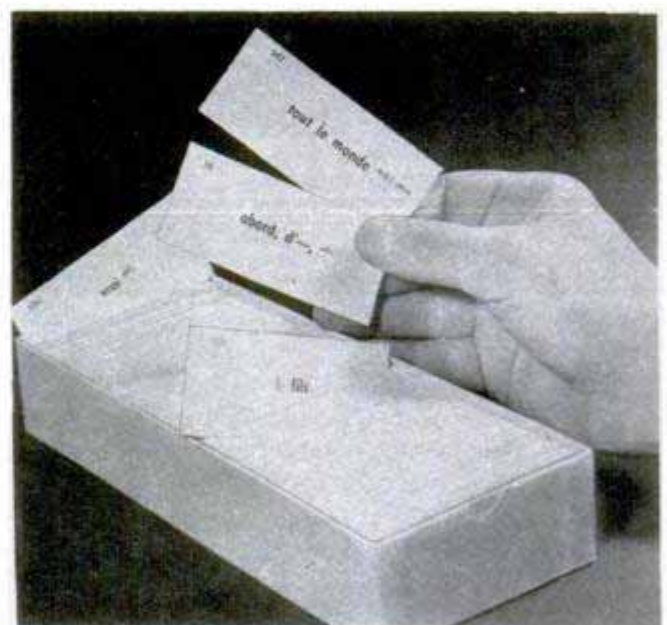
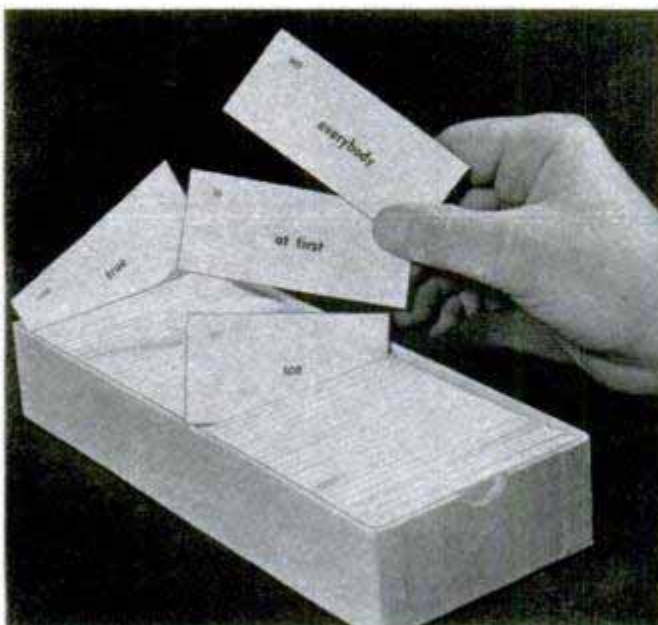
When the trailer and automobile are coupled with a new type of hitch, the two braking systems act as one, making it unnecessary for the driver to operate two separate controls. When he applies the brakes on his car, the coupler actuates those on the trailer. Built into the hitch is a delay mechanism which applies the trailer brakes slightly before the car brakes. Should the trailer uncouple accidentally, the brakes are locked automatically.

Two-Language Cards Help Students

Vocabulary cards aid in learning the words of a foreign language. The cards have a foreign word on one side and the English meaning on the other. Several cards are placed on the table and then put

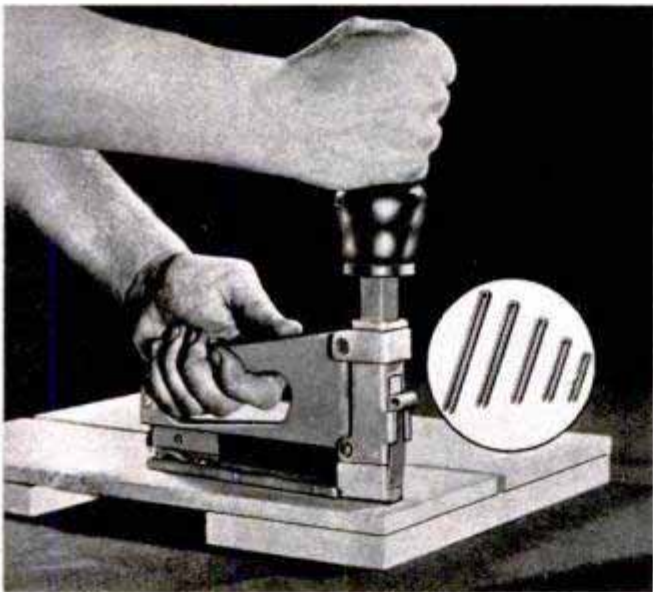
Learn Foreign Tongue

aside one by one as the meanings are memorized. A complete set includes 1000 foreign words and their meanings, plus a set of blank cards upon which the student may write other words.



Mine-Trolley Phone System

Collision hazards of electric trolleys in coal mines have been reduced to a minimum by a carrier-wave telephone system. With the communications system, which puts out a high-frequency signal over the power wire, motormen can talk to each other and to the dispatcher simply by pressing a button on the microphone. A loudspeaker on the car is always turned on, broadcasting all messages sent over the system. The set is shock-mounted to protect it from vibration.



Machine Drives Nails Like Hand Stapler

Four times faster than hand nailing, this portable nailing device operates like a stapler. One blow drives and countersinks the U-shaped nail that locks into the wood. Holding 100 nails in strip form for easier loading, the device feeds the nails automatically. The nailer can be used with hard or soft wood, composition and light metals. The U-shaped nail possesses greater holding strength and will not split wood. Available in several sizes from $\frac{7}{16}$ to $1\frac{1}{8}$ inches long, the nails are galvanized, copper, bronze or electroplated. The machine enables factory workers with little skill or experience to do the precision work.

"Economy" Car

One of the most popular new small cars at the recent International Automobile Show in Paris was the Italian "economy" car. It contains a basic Fiat engine and is said to burn a minimum of gasoline. The car has a top speed of 77 m.p.h.

☐ At any given moment, there are approximately 1800 thunderstorms in progress all around the earth, the number needed to recharge the earth's electrical field and keep it healthfully "negative."



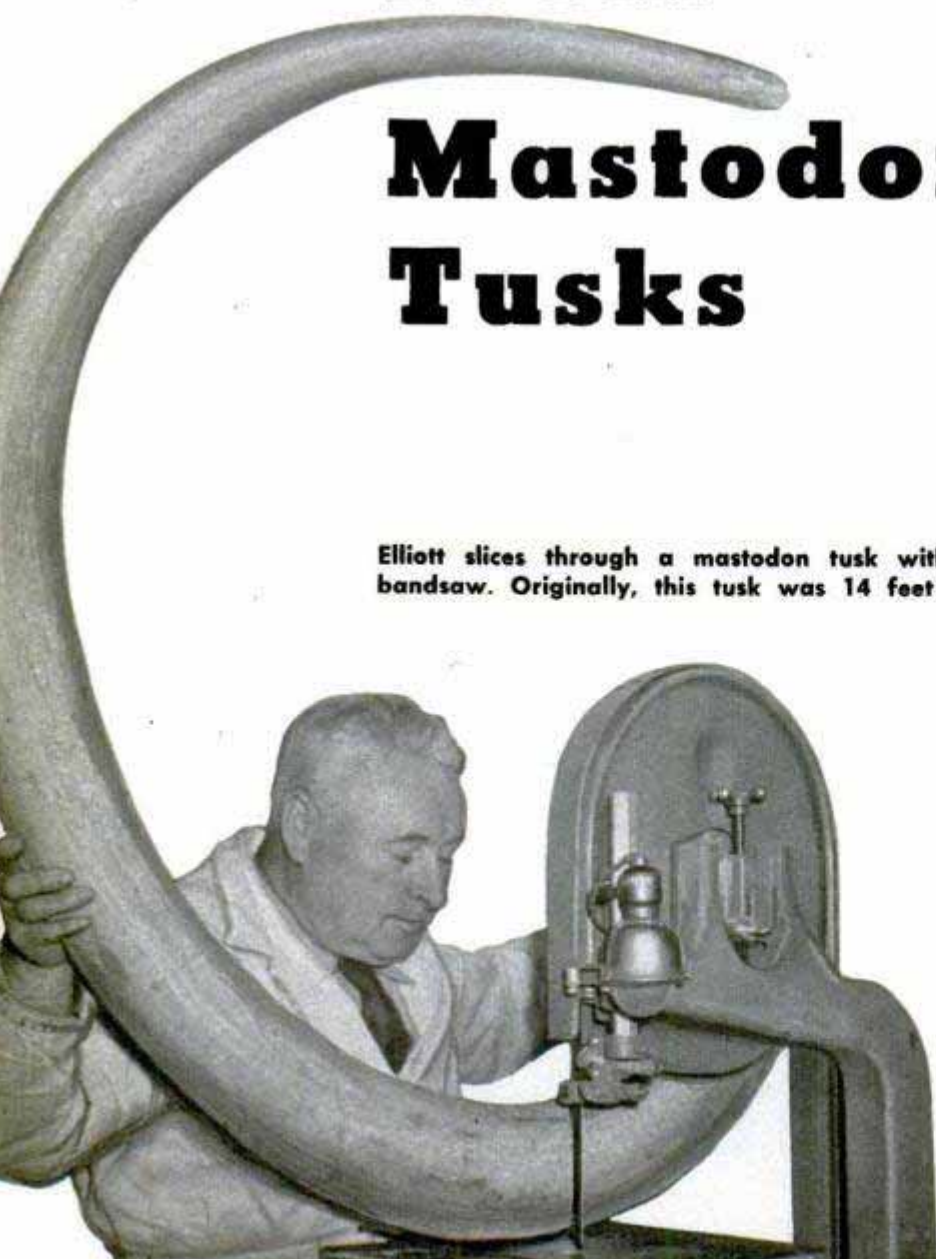
On a square of ivory cut from a tusk of a prehistoric mastodon, Yukon craftsman Jack Elliott is sketching the flower design that he uses for one pin. Also shown are several samples of jewelry in various stages of production

By
Lyn Harrington



Jewels From Mastodon Tusks

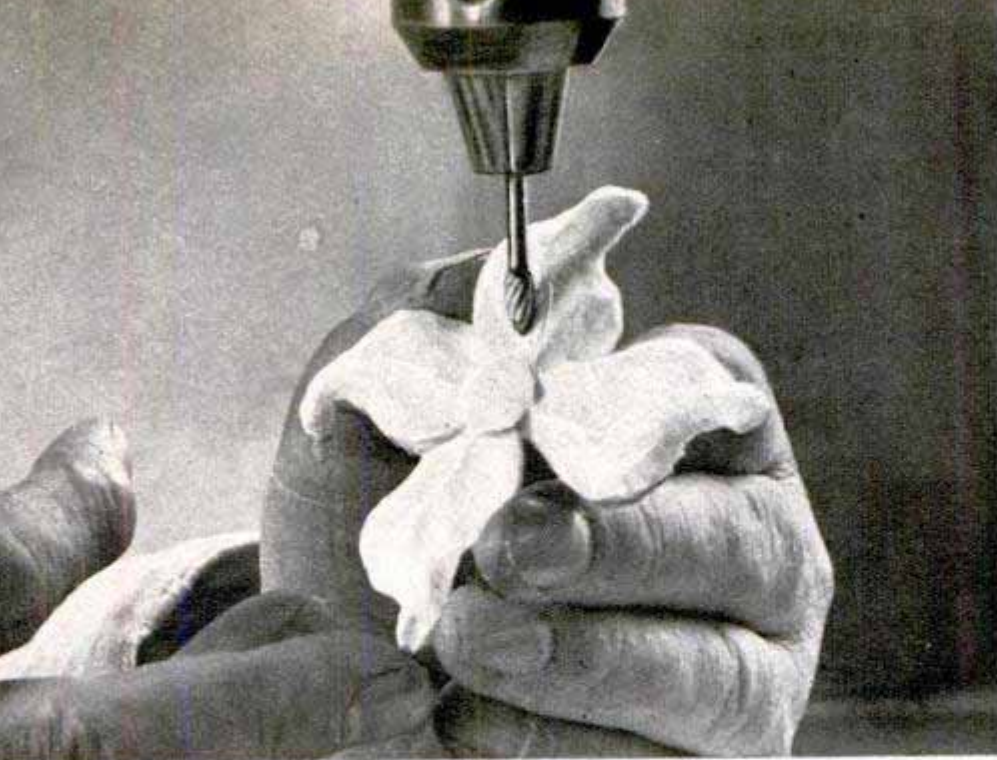
Elliott slices through a mastodon tusk with his bandsaw. Originally, this tusk was 14 feet long



PROBABLY the last place you'd expect to find a jewelry craftsman is far north in the Yukon, where men are rough and tough and winters are long and cold. Yet, Jack Elliott of Whitehorse, Yukon, has been turning fossilized mastodon tusks into fine costume jewelry for years and it all began because of the long, cold winters.

Elliott went to the Yukon in 1916 on his way to China, but that's as far as he got and he still has no desire to leave. He took an engineer's job on a stern-wheeler plying the Yukon River. The long, cold winter, however, turns the river into solid ice and that meant no work for Elliott, and no pay. Spotting some fossilized mastodon tusks that gold miners often uncover, he thought he saw a way to pay his winter grocery bills. Since then, he has been carving the ivory into earrings, pendants and other novelties which are eagerly bought by tourists who ride his river boat in the summer.

Mastodons roamed North America in the Pleistocene Era, about 20,000 years ago. Their bones have been covered during the centuries by layers of



When he first started creating costume jewelry, Elliott used simple hand tools. Today, this power drill with a variety of heads enables him to do the job faster and much more skillfully

Photos by

Richard Harrington

earth, now permanently frozen. Today, hydraulic dredges that mine the gold of the North uncover these bones, providing Elliott and other craftsmen with jewel materials.

Carving fossilized mastodon tusks is no job for a blunt jackknife. At first, Elliott used files and scrapers to shape his unusual jewels. Now, he uses a power drill with 60 different heads. With a band-saw, he slices the tusk to the correct thickness. Then he sketches the design on the flat surface and, with the drill heads, carves back and forth to form the ornament. A buffing operation brings out a high luster. Most of his jewels also have a small gold nugget, an appropriate souvenir of the Yukon. The nugget and a strong clasp are attached by gold screws, securely tightened in the ivory.

To the tourist, anxious to take home a gift or souvenir that has the flavor of the Yukon, mastodon-ivory jewelry is perfect. Fashioned in these pins and trinkets are centuries upon centuries of Nature's work plus the skill and individual touch of a true craftsman of the Yukon.

Earrings, pendant, pin and dinner ring worn by this girl are all part of Elliott's handiwork. Each has a polished nugget set in the center





Hydraulic Lifter Speeds Auto Repairs

For fast and efficient transmission repairs, a hydraulically operated lift permits one man to remove transmission units from all makes of passenger cars and trucks. After the transmission is removed, the lift can be used to transport the unit to any part of the shop. Because of its great flexibility—the lift tilts backward, forward, to the right and left of center—the lifter can be used to replace the transmission unit. It can be fully rotated and permits quick alignment of locating pins with bolt holes. The hydraulic unit can also be used for other lifting tasks such as handling of drive shafts, gasoline tanks, power take-offs and truck springs. It has a lifting table 15½ inches in width. With a capacity of 800 pounds, the lifter cannot be harmed by the accidental letting down of the car as a safety relief valve protects both the car and the lifter. Maximum lift height is 70 inches.

Danish Electric Motor As Small As a Match Head

Powered by a one-volt battery, a midget electric motor built by a Danish electrician, Joergen Joergensen, is no larger than the head of a wooden match. The motor is mounted inside a glass tube to protect it from damage. A small propeller, attached to the shaft of the motor, spins rapidly when the current is turned on.

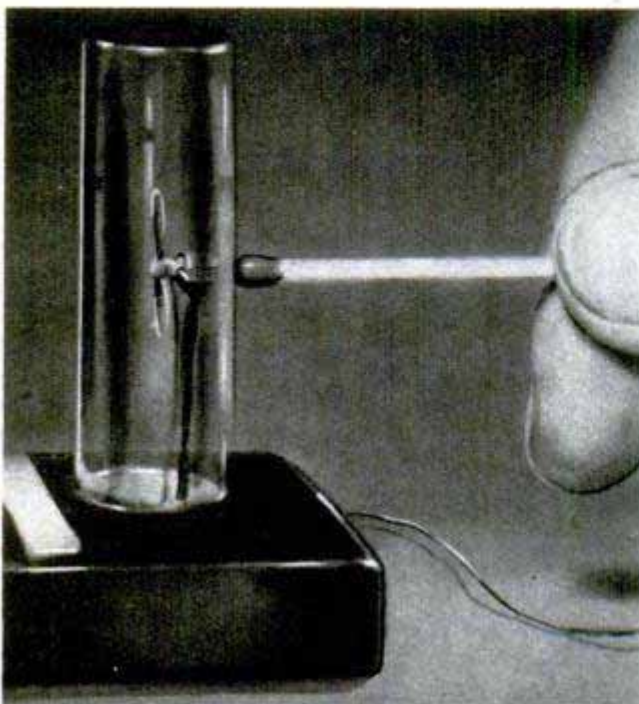


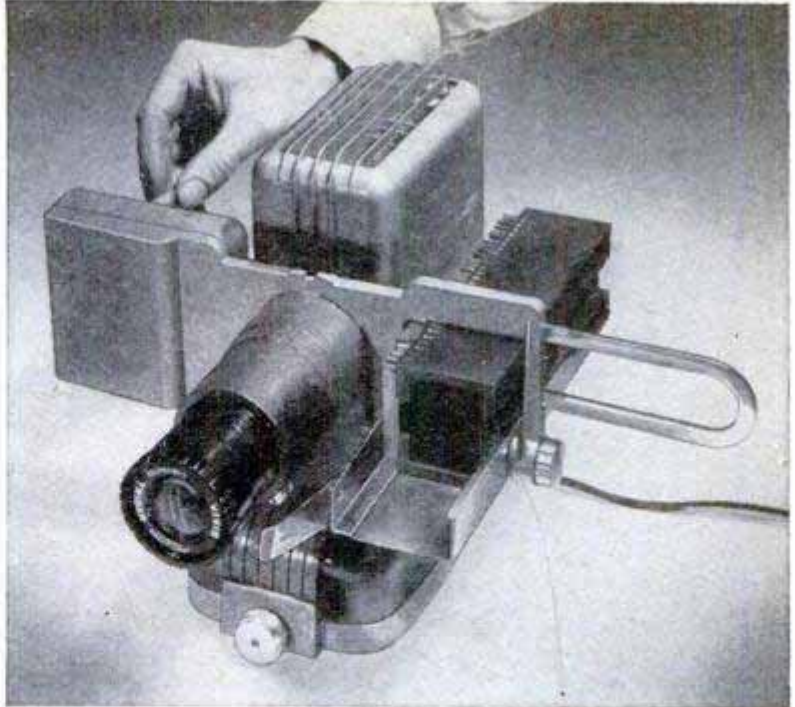
Photo Meter Converts for Color

By attaching a converter to his General Electric exposure meter, the photographer can measure the color temperature of the light and select the proper correction filter. The instrument has a range from 2800 to 30,000 degrees Kelvin, sufficient for use with any light. It also can be used for measuring incident light, thus being useful for either black-and-white or color film.

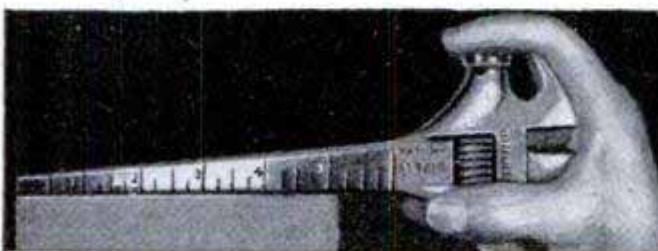
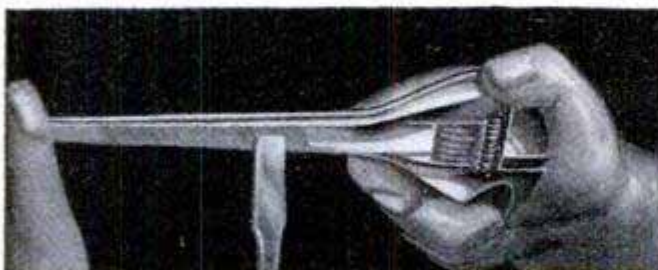
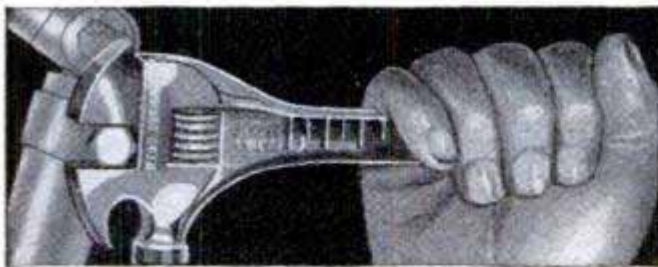


Automatic Slide Changer

You never have to handle your color slides once you file them in a plastic tray that serves as a magazine for an automatic slide changer. The slides fit in conveniently numbered slots in the tray which can be labeled for quick reference. When you want to show slides on a certain subject, you select the proper tray, insert it in the slide changer, mounted on the projector, and you are ready to put on a show! A half-turn on the changer crank moves the slide into projecting position. The second half-turn of the crank returns the slide to its original position in the tray. Additional turns move the other slides in and out of the tray for projection. When the 30 slides have been shown, you slip the tray from the changer and return it to its storage place, the slides back in original order and still untouched by hand. You can reverse the crank motion to repeat any slide



or, if you wish, you can skip any number of slides. The automatic changer is designed for use with any TDC Vivid projector and works with any type of 2 by 2-inch slide.

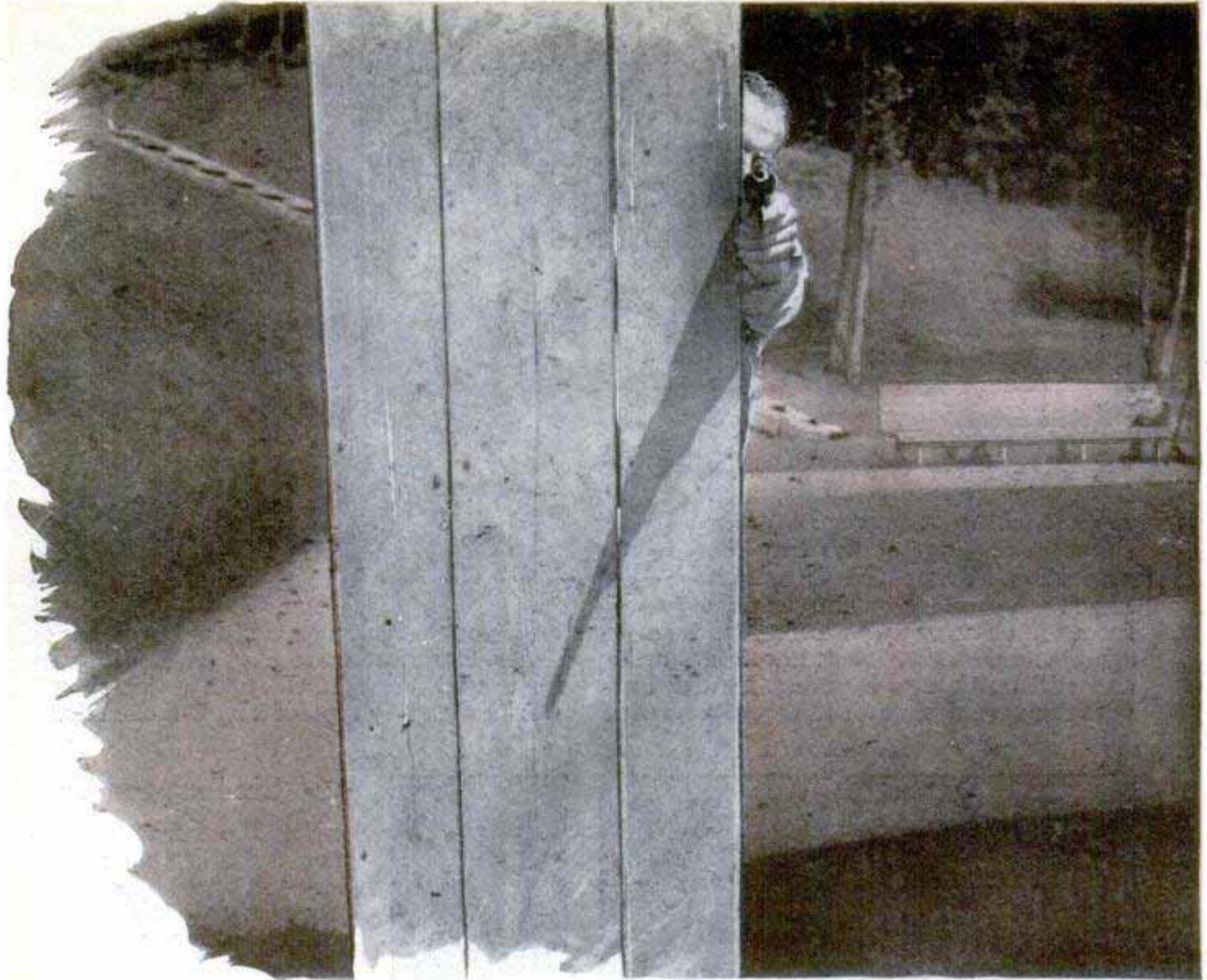


← Six-Purpose Tool

For the home handyman there is a new British-built utility tool that serves six different purposes. Made of forge-hardened steel, it is a hammer, has a claw for removing nails and has a spanner end that will turn nuts and bolts up to $\frac{3}{4}$ inch in width. One side of the tool handle is a file, the other is a six-inch rule and the tapered tip acts as a screwdriver.

Chemical Kills Brush

Brush and stumps can be prevented from resprouting by spraying them with weed killer during the cold dormant season, according to the Dow Chemical Company. In one test, brush sprayed during the winter with the weed-killing 2,4,5-T failed to produce leaves in the spring. Freshly cut stumps sprayed with 2,4-D and 2,4,5-T in kerosene or fuel oil during winter did not resprout.



Police learn to shoot without exposing themselves. Less than five percent of the officer is visible here

FBI ROAD SHOW

By Rafe Gibbs

AN FBI AGENT and five policemen were sitting in the agent's car parked beside the police station in a little Western town. They were talking shop and spotting the darkness with glowing cigarettes.

Suddenly, a new sedan with out-of-state license plates squealed around the corner, sped on down the street.

"This is for us," said the FBI man and spun the motor of his car into action.

The racing sedan cut off on a deserted road leading to the country and the police-loaded car reeled after it. As the gap closed, the siren sounded. The sedan slowed reluctantly, pulled to a stop at the side of the road. The FBI agent cut in behind it, quickly stepped out and walked over to the sedan, his hand on the gun at his hip.

"All right, you can—"

The driver of the sedan, holding a lev-

eled pistol, pulled the trigger. The FBI agent slumped to the road—then got up quickly and dusted himself off.

"See what I mean?" he asked the policemen. "I'm dead—or would be if that gun was loaded and the man who pulled the trigger wasn't another agent. Now I'll do it right."

The agent got back in the car and this time, before stepping out, he swung a spotlight on the driver of the sedan. Then he eased out of the car, taking care to stand behind the protective glare of the spotlight.

"Now, you in the sedan, step out."

The roadside drama was just part of the "classwork" in one of the world's most unusual traveling schools conducted for policemen by the FBI. In these schools, the book is not "thrown at the students." It is thrown away. There are lectures, of course,



This dummy has been "murdered" hundreds of times to help the FBI teach proper methods of handling clues

but they are kept to an absolute minimum.

Practical demonstrations are stressed, with emphasis on the word "practical." Checking up on a suspicious car, for instance, is one of the most dangerous assignments a policeman has to perform. The number of officers now dead from bullets fired inside a car attest to this fact and the FBI is stressing the wary approach.

As one agent told a class, "It's sometimes an officer's own fault when he gets killed."

It is significant to note that you rarely read of an FBI agent being killed by a criminal. The answer is his training, which is now being brought directly to the nation's local police stations. This police-school program, with a curriculum covering such varied subjects as safe-cracking, bank robbery and murder, is the most intensified and widespread this country has ever known.

Between June 30, 1945, and Nov. 30, 1949, enrollment in

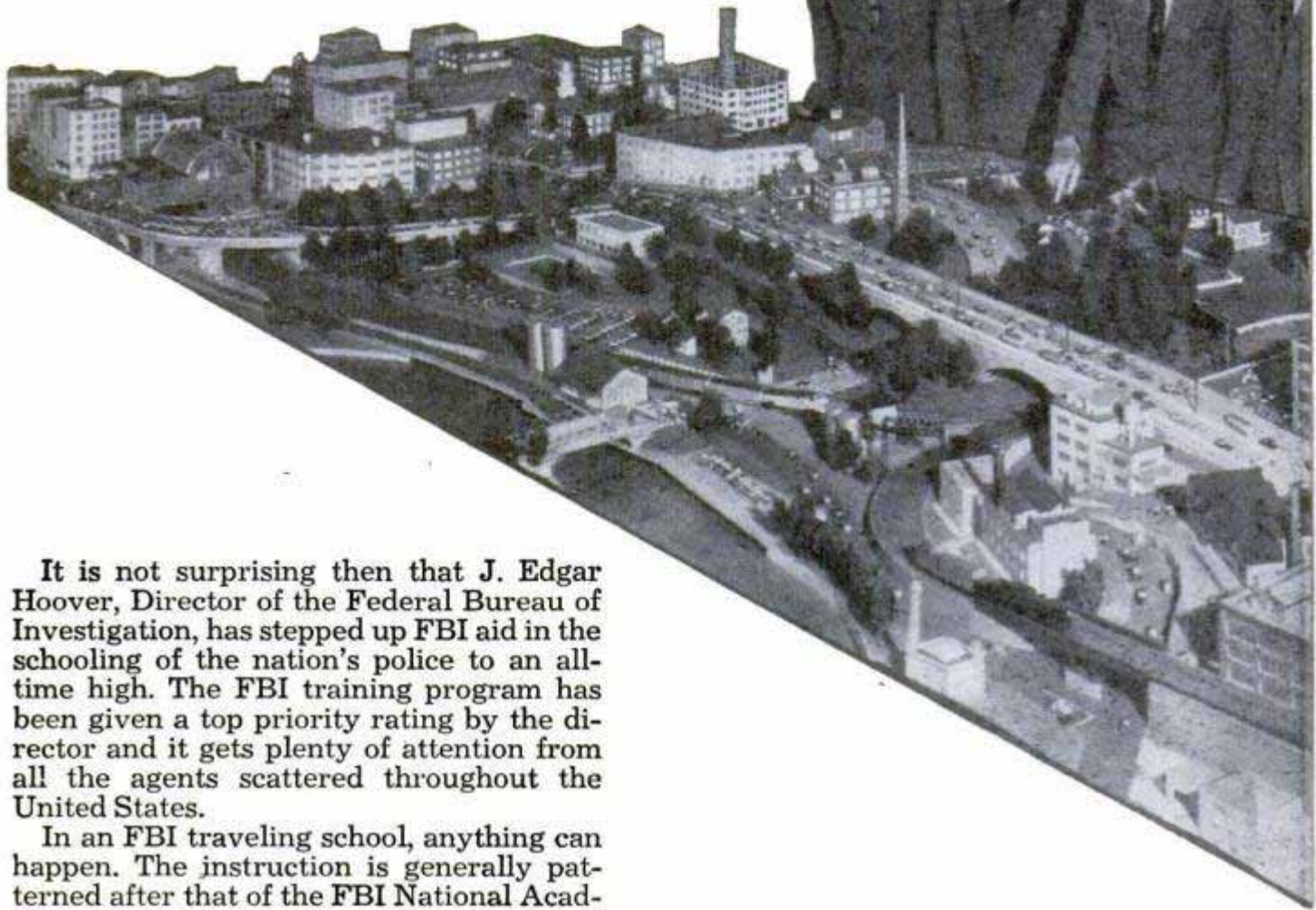
training schools put on by the FBI totaled 316,150. During the current year that training is expected to continue at an even higher rate. Many officers represented in these enrollment figures attend more than one school, but, since World War II, it is estimated that more than 150,000 different officers have had an opportunity to familiarize themselves with the latest FBI techniques.

The need for such widespread training is pressing. Our crime rate went up rapidly

during and following the war and has maintained a high level. In the first six months of 1949, crime increased 2.7 percent in the cities and 7.6 percent in rural areas, compared with the same period in 1948. Burglaries rose 4.4 percent in cities and 13.1 percent in the country, and larcenies went up 3.3 and 8.8 percent, respectively, in cities and rural areas. Robberies remained about the same in urban areas but increased 8 percent in rural districts.



On a large table-top city at the FBI Academy in Washington, search and arrest techniques are worked out before being taught to police in your home town



It is not surprising then that J. Edgar Hoover, Director of the Federal Bureau of Investigation, has stepped up FBI aid in the schooling of the nation's police to an all-time high. The FBI training program has been given a top priority rating by the director and it gets plenty of attention from all the agents scattered throughout the United States.

In an FBI traveling school, anything can happen. The instruction is generally patterned after that of the FBI National Academy, but the ingenuity and imagination of the individual agents leave their mark on the various schools.

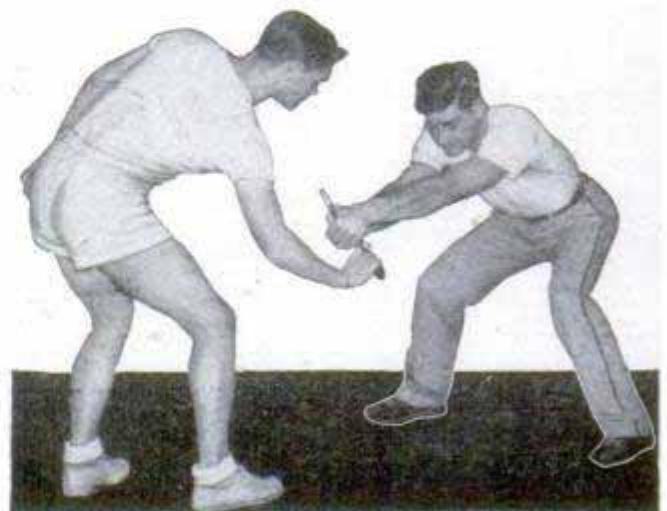
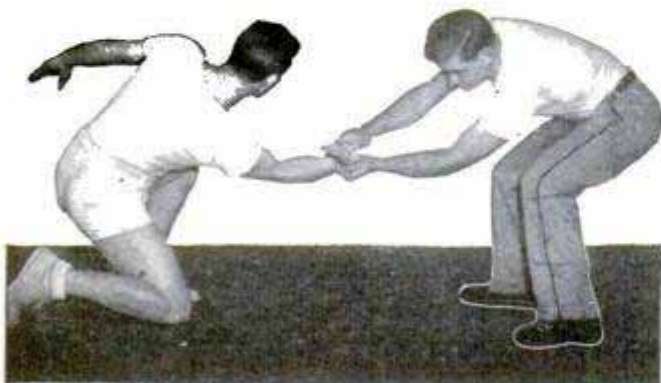
While one school was in progress, a safe was cracked in the town's biggest warehouse and the policemen students were put to work on the case. The best clue was the peculiar tread mark of a tire so the students spent hours between classes checking tires

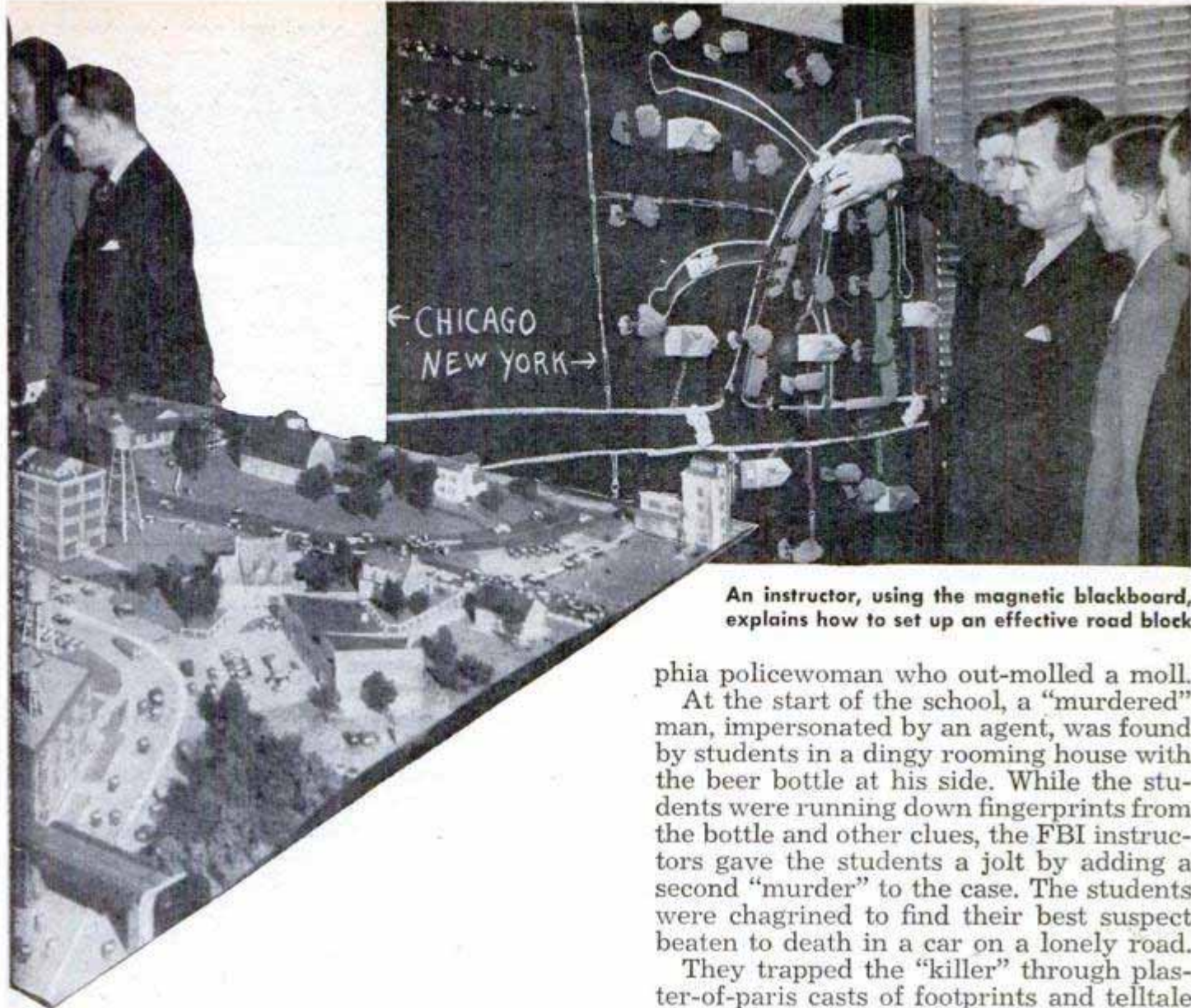
in town. Finally, one patrolman, who was willing to suspect anybody, found the right tire—on the local chief's car parked daily in front of the school. The safe-cracking job was a cooperative one between the chief and the FBI for instructional purposes.

One of the most dramatic traveling-

Policemen learn judo also. This is the wrist throw

This disarming maneuver has to be done fast or else!





An instructor, using the magnetic blackboard, explains how to set up an effective road block

school crimes was the "Case of the Bloodstained Beer Bottle," staged by agents of the Philadelphia office in a Pennsylvania town. In addition to FBI agents, the actors included a local judge, prosecuting attorney, chief of police, some of the businessmen, a college law professor and a Philadel-

phia policewoman who out-molled a moll. At the start of the school, a "murdered" man, impersonated by an agent, was found by students in a dingy rooming house with the beer bottle at his side. While the students were running down fingerprints from the bottle and other clues, the FBI instructors gave the students a jolt by adding a second "murder" to the case. The students were chagrined to find their best suspect beaten to death in a car on a lonely road.

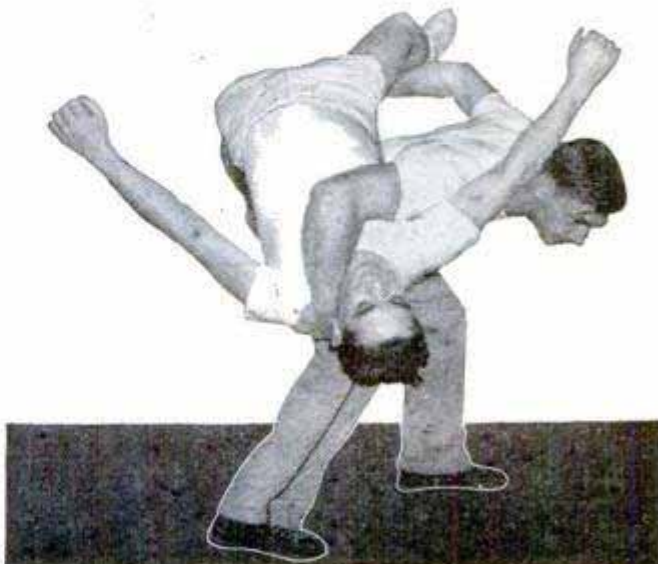
They trapped the "killer" through plaster-of-paris casts of footprints and telltale arm scratches, but when he was tried in a moot court, the jury acquitted him. The students had failed to follow up on a couple of vital pieces of evidence, which would probably have knotted the rope around the "killer's" neck. One consisted of fibers of cloth caught in the molding at the scene of

(Continued to page 266)

Caught in a bar hammer lock, the pupil is helpless

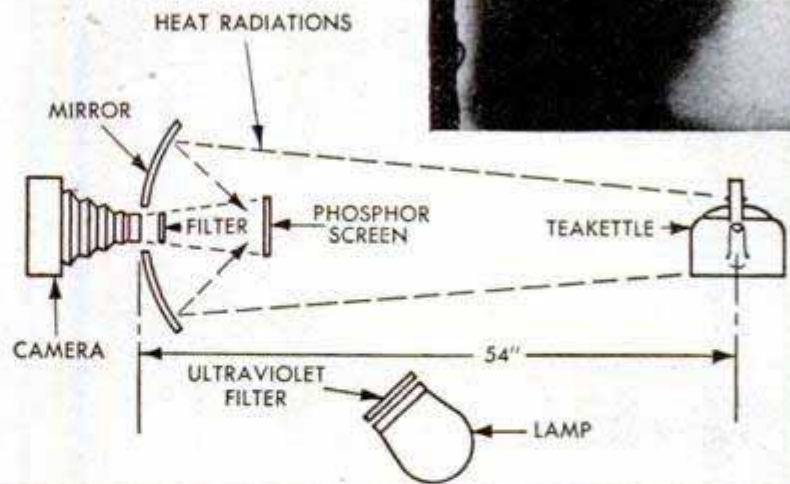


The hip throw is used to counter a right-hand punch





SETUP FOR THERMORADIOGRAPHY



Small white screen in front of the camera lens is the phosphor screen where the object appears under ultraviolet light. The drawing shows the setup for photographing the heat of a teakettle through the screen

Camera Photographs Temperature of Objects

Sensitive chemicals known as phosphors, which absorb heat waves and give off a glow, are used to "take" the temperatures of objects by photography. With the technique, it is possible to record temperatures of many parts of an object simultaneously. A small screen, coated with phosphors, is placed between the object and a large curved mirror which focuses the heat radiations of the object on the screen. When ultraviolet light is flashed on the screen, an image of the object, varying in bright-

ness as its temperature varies, can be photographed through a hole in the mirror. Because the phosphors show a 20-percent change in brightness with each Centigrade-degree change in temperature, accurate temperature readings can be computed from the varying tones in the photograph. This is the first time such a comprehensive picture of heat distribution has been available, according to scientists at Eastman Kodak, where the temperature-recording technique was developed.

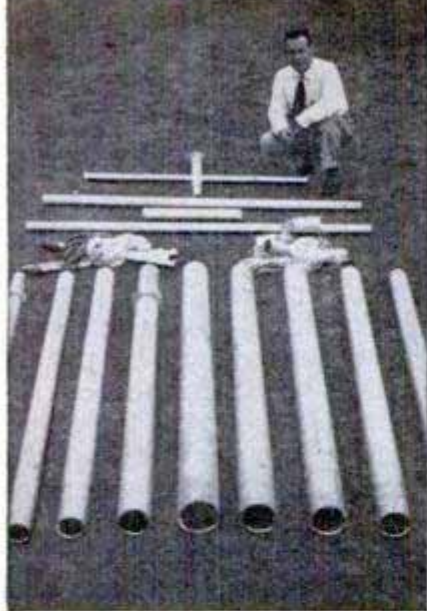


Left, heat circulator in fireplace opening and, right, partially inserted, showing smoke and gas outlets

Heat Circulator Can Be Inserted In Fireplace

No rebuilding is required for a new heat circulator that can be inserted in the opening of a conventional fireplace. It eliminates loss of heat through the chimney, uneven

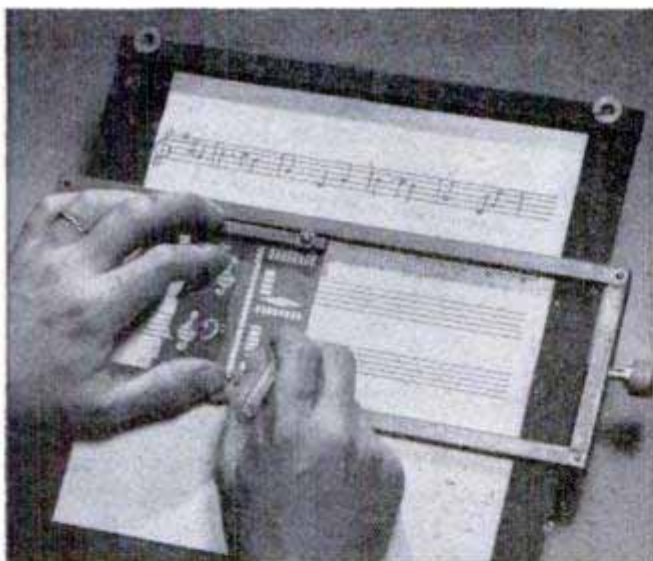
heating of the room and formation of drafts within the room. The circulator, which can be controlled by hand or thermostat, is custom-made in aluminum, copper or brass.



Sectional Masts of Lightweight Plywood Tubing

Weighing less than 1½ pounds per foot, a strong mast of plywood tubing provides a long-lasting support for television antennas. Sold in kit form for masts of various heights, the tubing comes in handy six-foot sections which nest together, forming firm, unyielding joints. One person can erect a flagpole or unguyed antenna mast unaided

and it takes only two persons to put up a 90-foot guyed mast with an erection boom furnished with the kit. The mast won't rust and doesn't conduct electricity. The lead-in wire is strung through the tubing where it is protected from the weather. Also available are lampposts, flagpoles and roof-peak antenna masts.



Blind Musicians' Helper

Blind composers and arrangers can write anything from be-bop to counterpoint with a special music writer. It consists of a stencil—with all the musical signs and notations—that travels within a guide mounted on an inclined board. The inventor, a blind Belgian organist named August Liessens, has allowed just enough space within the guide so that notes drawn with the stencil against the bottom are on the line, while those notes drawn with the stencil against the top are in the spaces. Liessens' invention has been put into production by the American Foundation for the Blind.



Vibrating Meat Cutter

Using a short, vibratory stroke similar to a jigsaw, a cutting machine, developed in Switzerland, slices meat to any thickness. Instead of a cutting wheel, the machine uses an oscillating arm on which the blade is mounted. The blade, which can be changed in a few seconds, vibrates as it cuts.

☞ Chemical 2,4-D, sprayed from airplanes over an area in Oklahoma, killed 90 percent of the sagebrush at a cost of \$2.25 per acre.

The Packers Also Sell Meat . . .

LESS THAN a hundred years ago the meat packers of this country were engaged in the simple business of selling meat. They paid hard money to teamsters who would haul away any part of the carcasses not fit for your dinner table.

Today not much is left to haul away. The packers are still in the business of selling steaks and chops, but even at today's fancy prices for beef and bacon the "waste" of packingtown earns a substantial percentage of the industry's profits. Hide and hair, hoofs and glands go down the production line into an amazing variety of goods.

One of the newest and most publicized end-products of the hog market is the drug ACTH, certainly one of the essential ingredients of De Soto's fountain of youth if its benefits prove out the promises of its first tests.

The hormone is extracted from a tiny fraction of the pea-sized pituitary gland of the hog. One 61-year-old businessman who had suffered crippling arthritis for 10 years was a "guinea pig" for the ACTH arthritis treatment. Within 48 hours after he received the first injection of the hormone, he tossed away his cane. A few days later all swelling had gone from his arthritic joints.

The effects were dramatic. The doctors and the packers are tempering their enthusiasm, however, with hard facts. One fact is that a handful of experimental "cures" does not prove the over-all value of the drug; it apparently relieves the symptoms of arthritis so long as ACTH is continued, but does not cure; and there may be less pleasant effects.

Fact No. 2 is that it takes 400,000 hogs to supply enough pituitary glands to pile up one pound of ACTH. It will be a long time before a sufficient supply is available for adequate research, let alone the treatment of the more than 6,000,000 Americans suffering from arthritis.

The new hormone is just one example of the results of scientific research applied to the packing-industry products. Considerable research has been conducted of late into the fatty acids derived from animal wastes, and both Armour and Swift have built new plants to isolate commercial chemicals from these fats and oils. The process is roughly similar to the fractionation of petroleum. The fatty acids serve as starting materials, and further synthesis produces new chemicals with such unusual properties that even the scientists are seeking industry's help in exploring all the uses of them.

Certain of these chemicals combine with

metals, metallic oxides or metallic hydroxides to form salts and soaps. Detergents now popular in hard-water areas come from these fatty acids and don't precipitate scum in hard water.

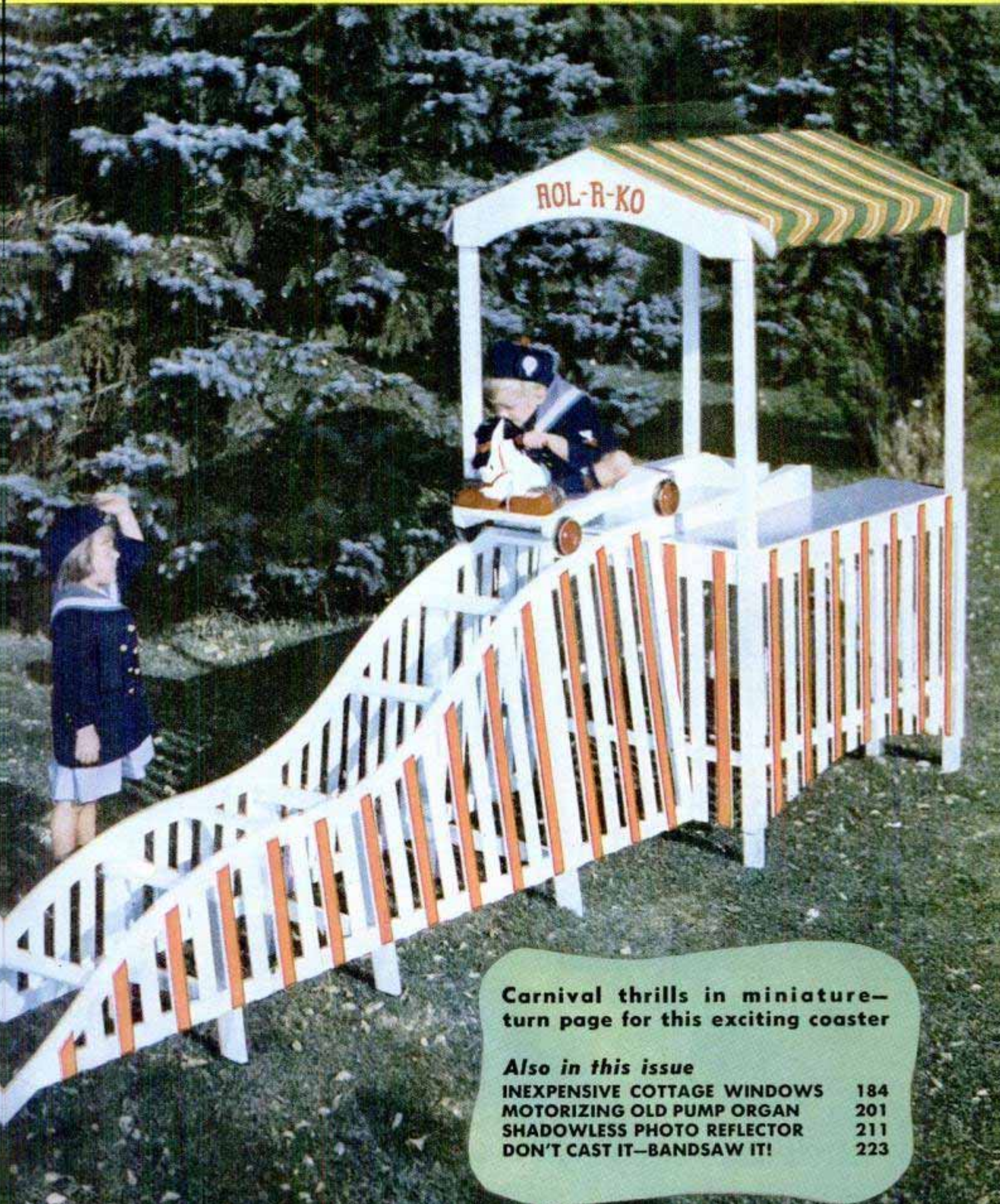
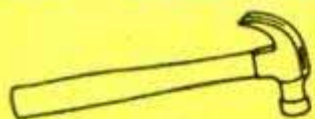
Another chemical, stirred in small amounts into printing inks, "pulls them together" to decrease spread on the paper. Asphalt compounded with another chemical is more fluid when hot and tack-free when cool. Surfaces wiped with still another actually repel dust because static electricity is eliminated. Added to paint, one of them prevents a skin from forming inside the can. Still other chemicals are powerful germicides and disinfectants. Some are excellent softening and finishing agents for textiles. Another, mixed into garden sprays, "sticks" the chemicals to the plant.

A new wax, compounded with the chemicals, is resistant to both acids and alkalis, and won't melt even when boiling water is poured across the surface.

Several of the chemicals have an odd ability to cause some water-attracting surfaces to become water-repelling and oil-attracting. A small amount stirred into a mixture of asphalt will cause it to coat sand and gravel even after a heavy rain—a fact which may bring large savings in the upkeep of the nation's highways. Ordinarily, asphalt can't be mixed unless the aggregate is dry, and keeping it dry often entails considerable expense and delay.

Still another new product from animal waste is a novel upholstery material. There are objections to the two materials most frequently used at present in upholstery and mattresses. Curled animal hair, used in furniture upholstery for hundreds of years, has a tendency to pack down and may mildew. The more modern foam rubber is uncomfortably warm for the human body in some applications because there is restricted air circulation through it. The new material combines the advantages and eliminates the disadvantages of each. Millions of tiny hair curls are covered and interlaced with a thin coating of rubber which binds them together, making a pad that is cool and resilient, will not lump or shift. You can sew it, nail it or tuft it. It is water, moth and vermin resistant. You'll find it in some of the latest automobiles.

Not much of the animal carcass is considered waste, now that industry and medicine have found uses for these by-products. Even the animal's gallstones bring income to the packer—for centuries peoples of the Orient have considered them good-luck charms!



**Carnival thrills in miniature—
turn page for this exciting coaster**

Also in this issue

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Toys you can make
KIDDIE ROLLER COASTER

Designed by WAYNE C. LECKEY

ROL-R-KO is a toy that will make your back-yard playground complete. You can build it from common lumber and standard iron wheels, and it comes apart in seven easy-to-handle sections for winter storage





ROLLICKING good times are ahead for Billy and his pals when dad sets up this thrilling back-yard roller coaster. The rider mounts the platform by steps at the rear and climbs aboard a four-wheel car. Depressing a trip lever starts the car on its way, sending it down the dips and up an inclined section of track. In climbing the incline, the car gradually loses speed and strikes a spring bumper at the end of the track. From there it rolls backward and finally comes to a stop at ground level. The car is returned to the starting platform by pushing it back up the track. Having a platform only 3 ft. high, and deep-flanged wheels which hold the car on the track, Rol-R-Ko is perfectly safe for three-year-old youngsters. The toy is complete as originally built and pictured here, but if you have a large yard, the track can be extended to provide a much longer and more thrilling ride. This can be done either by adding additional dips down the line or merely letting the track run off on level ground, using flat, straight sections. The track sections are staked to the ground to assure a solid roadbed for the car. This, together with the flared structure



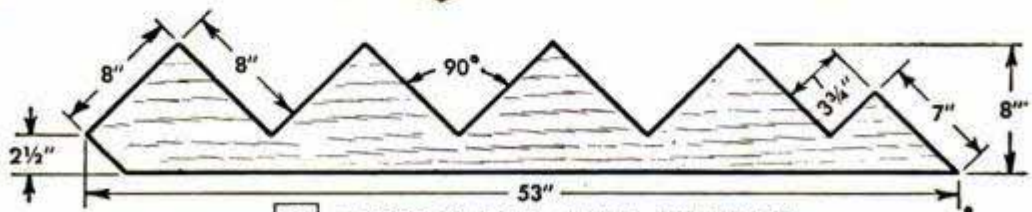
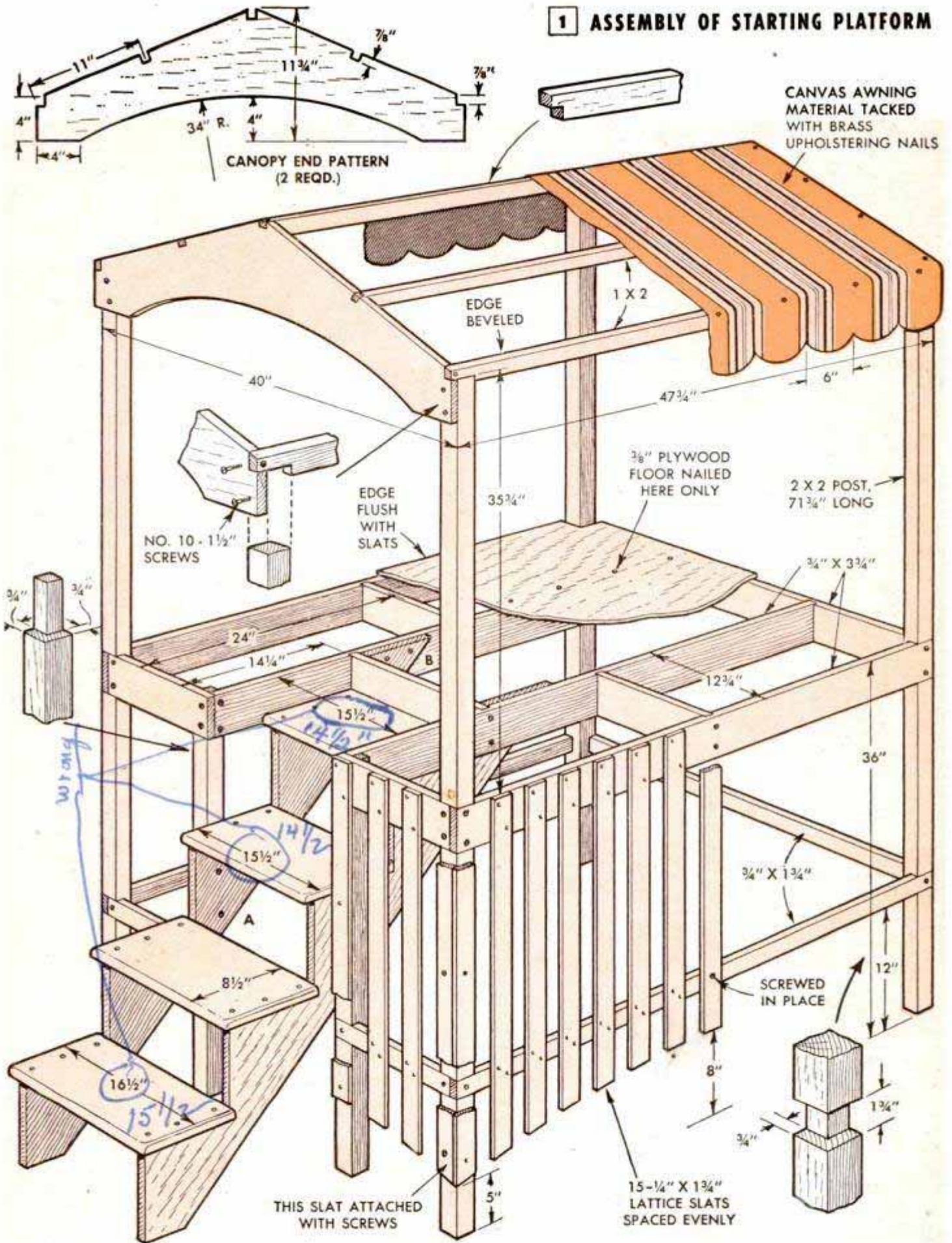
which supports the elevated sections, eliminates any likelihood of the toy tipping over or the track giving way under the weight of the rider. There's no problem in putting Rol-R-Ko up for the winter as it is designed for easy dismantling in sections of a size convenient to handle and store overhead in a garage. For example, the canopy lifts off, both sides of the platform pull away and the steps slide out as a unit, leaving the floor and rear posts of the platform in one piece. The track itself is detachable from the platform by removing four screws and, in turn, comes apart in two separate sections. Being of knockdown construction, Rol-R-Ko can be built easily in the basement workshop which permits you to get an early start and have the toy ready to set

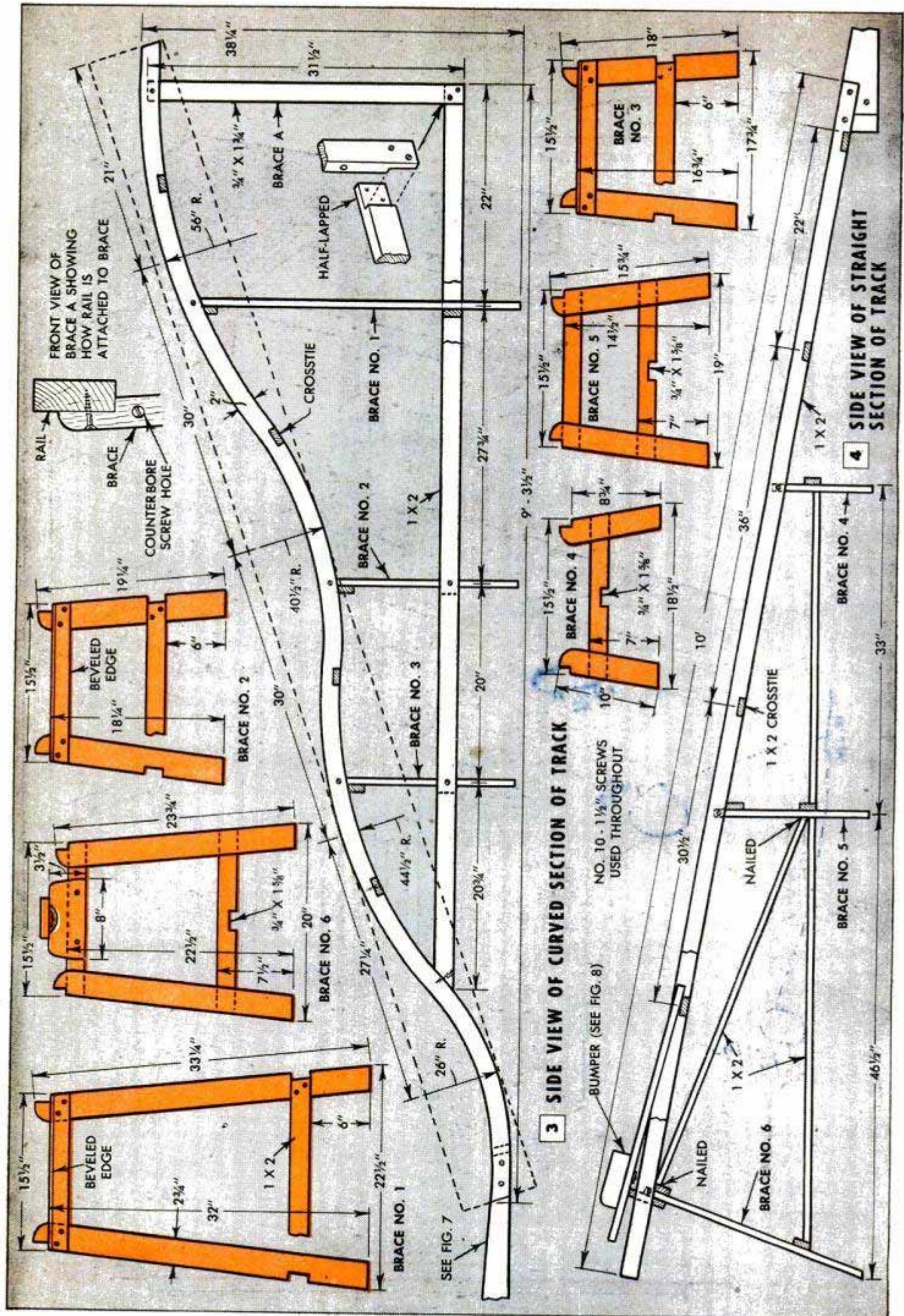
up outdoors when warm weather arrives.

The complete toy is constructed from common lumberyard material, No. 2 grade being good enough. The posts for the canopy are 2 x 2s, the platform framework is of 1 x 4s, the slats are common 1 $\frac{3}{4}$ -in. lattice stock and the majority of the track and bracing is of 1 x 2s. The flanged cast-iron wheels for the car are standard items which can be purchased for $\frac{1}{2}$ -in. axles. Colorful waterproof awning material is selected for the canopy.

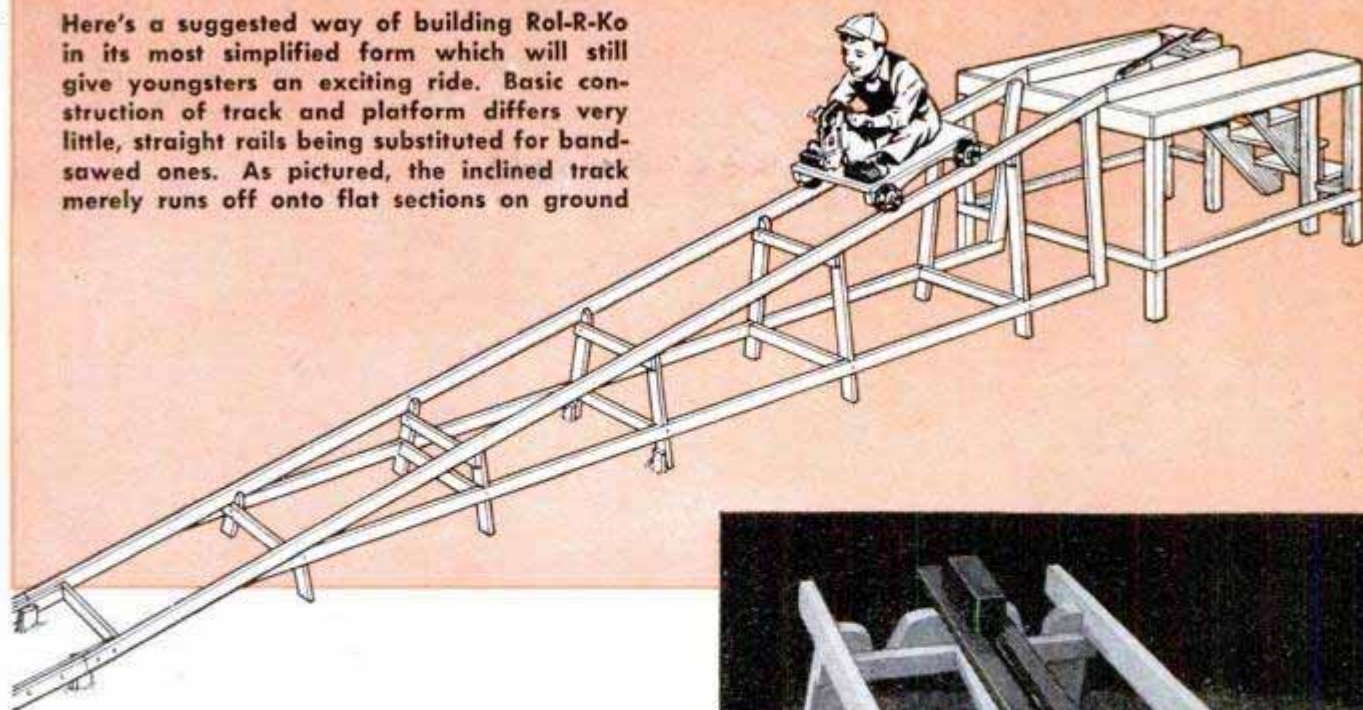
A simplified and less-expensive version of Rol-R-Ko is suggested on page 179. Here, the toy is stripped to the minimum, a straight length of track being substituted for the dipped section which is merely extended off onto the ground with whatever

1 ASSEMBLY OF STARTING PLATFORM

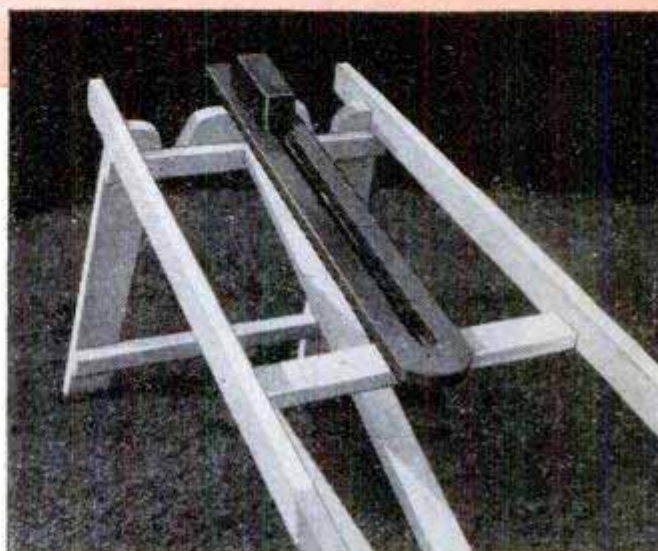




Here's a suggested way of building Rol-R-Ko in its most simplified form which will still give youngsters an exciting ride. Basic construction of track and platform differs very little, straight rails being substituted for band-sawed ones. As pictured, the inclined track merely runs off onto flat sections on ground



number of straight sections of track you have room for. In either case, the basic construction of the platform is the same. The cutaway drawing in Fig. 1 details the assembly, with No. 10, 1½-in. screws being used throughout. Two 12-ft. lengths of 2 x 2 will make the four posts with waste allowed for cutting. As shown in the lower detail, Fig. 1, the posts are notched on two adjacent faces to receive the 1 x 4 platform framing and the 1 x 2 bracing at the bottom. Mortising the ends of the cross members of the framing in dado cuts makes for rigid construction, although plain butt joints can be used. The steps, Fig. 2, are assembled as a separate unit and are fastened in place with eight screws at points A and B on both sides. A 4 x 4-ft. sheet of plywood is used to floor the platform. Note that this is notched at the corners to fit around the posts and is cut out for the steps. The plywood is nailed to the ends and all cross members of the platform, *but not along the sides*, as otherwise the sides of the structure cannot be removed. The slats around the sides of the platform are optional, although when painted alternately red and white they add considerably to the colorful carnival appearance of the toy. All of the slats are nailed in place except those that are indicated; namely, the end ones, Fig. 9, those at each corner and the center one on each side. These must be attached with screws so that the slats can be taken off to get at the screws that are removed in dismantling the toy. Two screws at each corner of the canopy are used to fasten it to the upper ends of the posts. Each end of the canopy framework is cut from a 1 x 12-in. board and then notched along the top edges for joining both together with 1 x 2

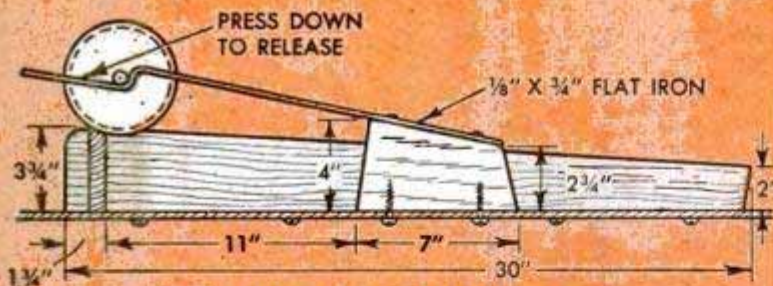


Spring-loaded bumper absorbs the impact when the car strikes it and the car rolls back down the track

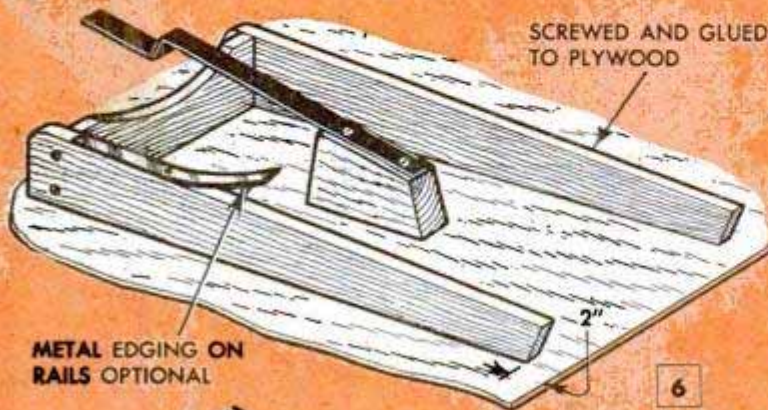
LUMBER LIST

(Sizes are stock sizes—not actual)

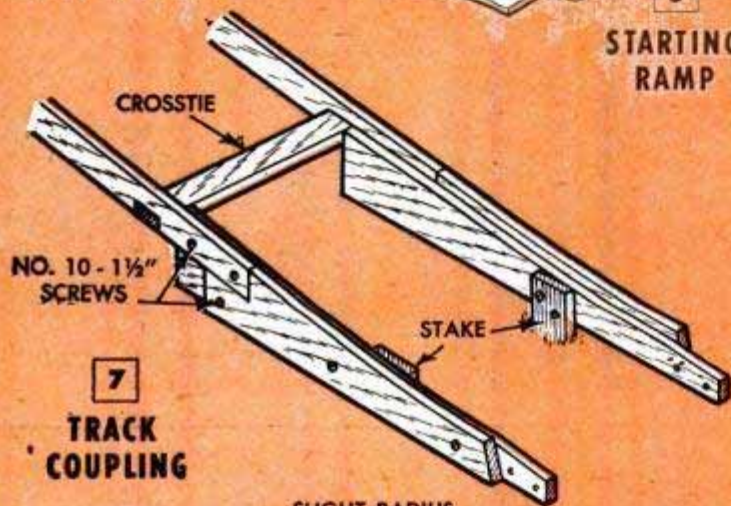
- 1 pc. pine, 2 x 2 x 6 ft.—Stair posts
 - 2 pcs. pine, 2 x 2 x 12 ft.—Corner posts
 - 1 pc. pine, 1 x 10 x 10 ft.—Stair stringers
 - 1 pc. pine, 1 x 10 x 6 ft.—Stair treads
 - 1 pc. plywood, ¼" or ⅜" x 4 ft. sq.—Floor
 - 1 pc. pine, 1 x 12 x 8 ft.—Canopy ends
 - 5 pcs. pine, 1 x 2 x 4 ft.—Canopy stretchers
 - 2 pcs. pine, 1 x 4 x 8 ft.—Platform framing
 - 1 pc. pine, 1 x 4 x 10 ft.—Platform framing
 - 1 pc. pine, 1 x 2 x 10 ft.—Platform stretchers
 - 11 pcs. lattice, 1¾ x 10 ft.—Platform slats
 - 1 pc. pine, 1 x 4 x 6 ft.—Platform track
 - 2 pcs. pine, 1 x 8 x 10 ft.—Bandsawed rails
 - 2 pcs. pine, 1 x 2 x 10 ft.—Straight rails
 - 2 pcs. pine, 1 x 2 x 8 ft.—Track side rails
 - 1 pc. pine, 1 x 2 x 12 ft.—Track cross ties
 - 8 pcs. lattice, 1¾ x 10 ft.—Track slats
 - 1 pc. pine, 1 x 2 x 6 ft.—Braces (A)
 - 1 pc. pine, 1 x 3 x 10 ft.—Brace legs Nos. 1 and 6
 - 1 pc. pine, 1 x 3 x 12 ft.—Rest of brace legs
 - 1 pc. pine, 1 x 2 x 10 ft.—Brace cross cleats
 - 1 pc. pine, 1 x 2 x 12 ft.—Track bracing
 - 1 pc. pine, 1 x 4 x 3 ft.—Bumper
 - 1 pc. pine, 1½" x 10" x 14"—For horse head
 - 1 pc. pine, 1" x 13" x 26"—Base for car
 - 1 pc. pine, 1" x 4" x 26"—Sides for car
 - 1 pc. pine, 2 x 4 x 2 ft.—For bumper, etc.
- (Waste from rails will make track coupling)



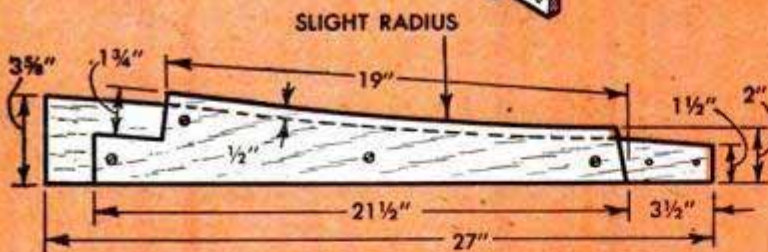
5 SIDE VIEW OF TRIP LEVER



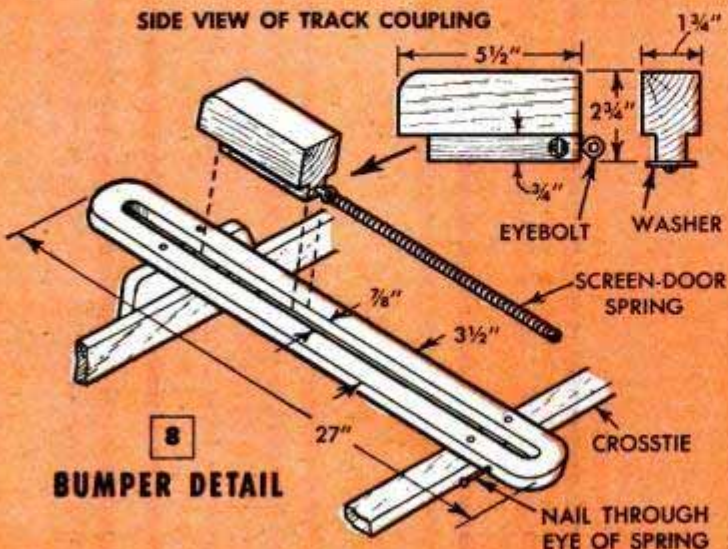
6 STARTING RAMP



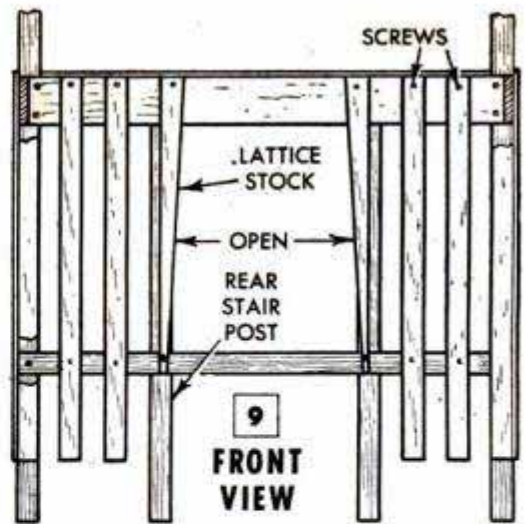
7 TRACK COUPLING



8 SIDE VIEW OF TRACK COUPLING



9 BUMPER DETAIL

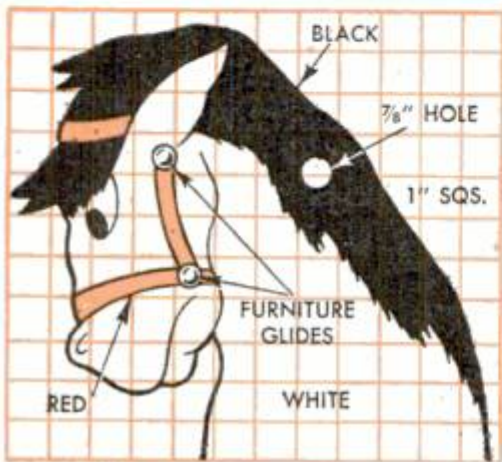
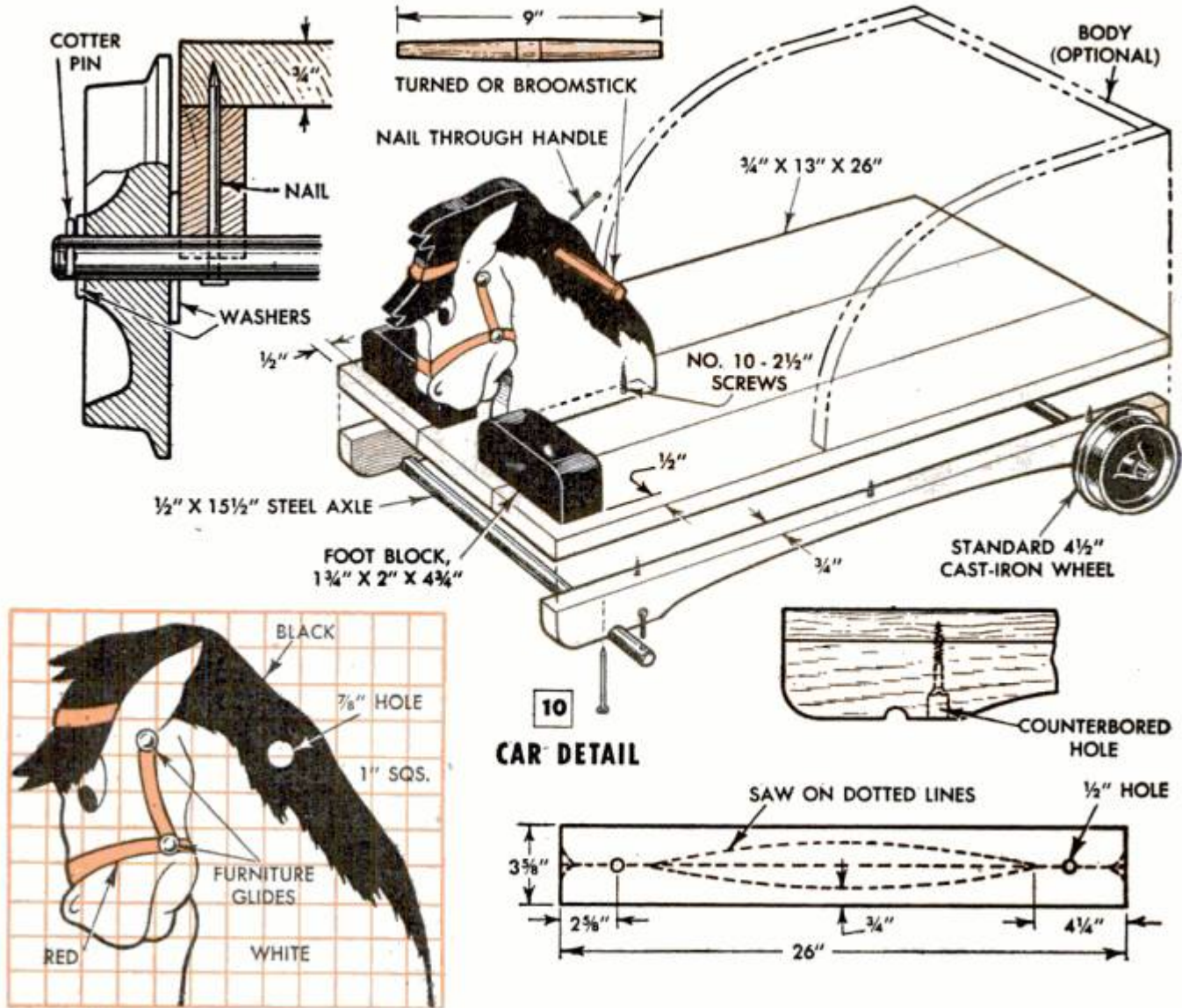


9 FRONT VIEW

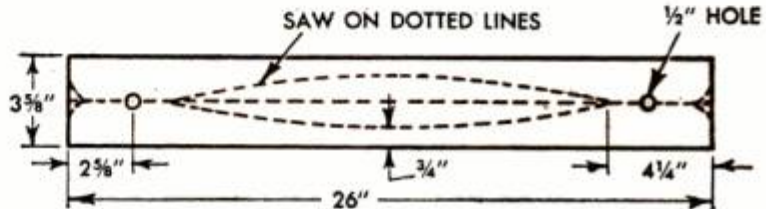
stretchers. Unless you can buy 48 or 54-in. awning material, two separate pieces will have to be stitched together to cover the top. Eight scallops are cut along each edge and small copper nails are used to fasten the canvas in place.

The rails for the curved-track section, Fig. 3, are bandsawed 2 in. wide from two 1 x 8 x 10-ft. pieces. Starting from the upper end, each board is marked off lengthwise according to the drawing and the various radii indicated are swung at these points, using a long flat stick for a compass. With help, both rails can be cut at one time and notched on the bottom edges for four crossties, 15 1/2 in. long. A fifth crosstie at the lower end of the track is notched 1/2 in. deep at each end for wheel clearance and merely butted between the inner faces of the rails. The curved track is supported at the points indicated by braces, Nos. 1, 2 and 3. Brace No. 2 measures 19 1/2 in. across the bottom. The legs of each one are cut from 1 x 3 stock and the crosspieces are 1 x 2s. Notches are cut on the outside of each leg for 1 x 2 side rails, 7 ft. 6 1/2 in. long. The ends of these rails are half-lapped into braces A which, in turn, are drilled and counterbored for screws that are used to attach the section to the platform.

The straight inclined section of track, Fig. 4, is made similarly. Here, the rails are 10-ft. lengths of 1 x 2, crosstied together as before and supported by braces Nos. 4, 5 and 6. Both sections of track are coupled together as shown in Fig. 7, the outside pieces being notched to take the 1 x 2 ends of the inclined track. The coupling becomes a permanent part of the



CAR DETAIL



inclined section. The short section of track on the starting platform, Figs. 5 and 6, is screwed to the plywood from the underside and is positioned to align with the abutting track. The manner in which the trip lever engages the rear axle of the car is shown in Fig. 5. The lever should extend far enough behind the car to permit the rider to reach around and release it. The bumper, Fig. 8, makes use of a screen-door spring to ease the shock when the front axle of the car strikes it. It's apparent from the drawing just how it works. The bumper itself is rabbeted along each side to fit in a 7/8-in. slot cut in a piece of 1 x 4. A nail driven through from the side of the slot engages the eye of the spring, while a screw and large washer retains the bumper in the slot and yet allows it to slide freely. One end of the slotted member is fastened to a crossie and the other end to a block screwed to brace No. 6, Fig. 3. The top edges of the rails can be faced with a metal strip, if desired, although the wood will withstand considerable wear. Regular linoleum seam molding makes a neat facing.

The car is assembled as detailed in Fig. 10. If you are unable to obtain a piece of wood 13 in. wide for the base of the car, it

can be built-up by doweling and edge-gluing together several narrow pieces. Both side rails of the car are cut from a single piece of 1 x 4 in the manner shown in the detail below Fig. 10. First, holes for the axles are drilled at each end and the piece is ripped in half through the center of the holes. Then each strip is bandsawed on the dotted lines. These pieces are screwed securely to the underside of the base flush with the side edges. The axles for the wheels are placed in the half-round notches, drilled for an 8d nail and pinned as shown in the sectional detail, Fig. 10. Drill a pilot hole for the nail so that it does not split the wood. A standard 1/2-in. washer placed on each axle between the wheel and the car will provide the correct tread. A paper pattern for the horse head is drawn full size from the squared outline given, then traced and cut from a piece of 1 1/8-in.-thick wood. The head is drilled at the point indicated for a cross handle turned in a lathe or improvised from a broomstick. The handle is locked in position by driving a nail through it from the edge. The horse head is fastened securely to the base, 2 in. from the edge, with three long screws and finally the foot blocks are screwed in place.

Window Boxes Detached Quickly If Hung With Shelf Brackets

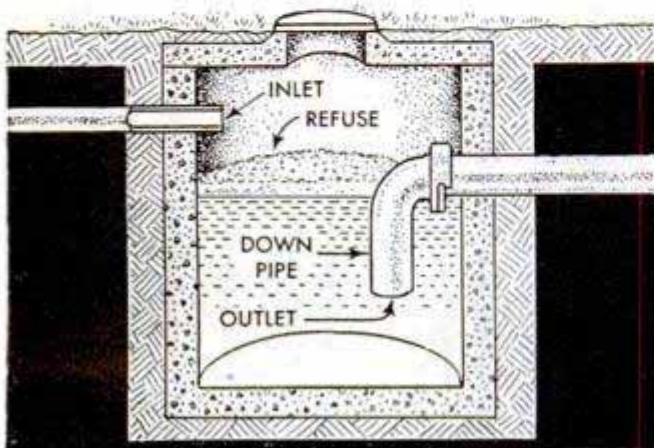


Small flower boxes on garage windows are easy to remove for painting or refilling if they are hung with metal shelf brackets. Two brackets are used for each box. These are inverted and screwed to the top edges of the box ends, and the holes in the upright arms are slipped over heavy screw hooks turned into the siding. To be sure the brackets will clear the window sill allowing the box to hang straight, the box should be longer than the window frame.

G. E. Hendrickson, Argyle, Wis.

Down Pipe on Cesspool Drain Eliminates Clogging

When a cesspool is drained directly from the surface of the water, the draintile is likely to become clogged with muck, causing the cesspool to back up and overflow. To remedy this condition, install a down pipe on the end of the drain so that the open end of the pipe is at least 6 in. from the bottom of the cesspool. In this way, only



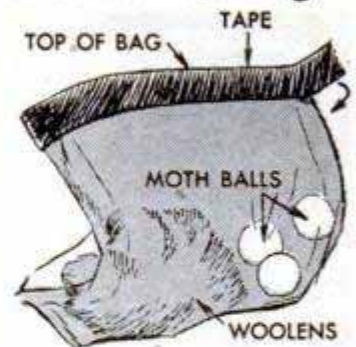
clear water is drained off, the solid matter floating to the top of the water where it decomposes. Be sure that the horizontal run of tile is below frost level.

Septic Bend Co., Rockland, Mass.

Woolens Stored in Sandwich Bag

Mothproof storage of woolen yarn, gloves and other small items is attained by placing the material together with several moth balls in a wax-paper sandwich bag. The open end of the bag is sealed with cloth or cellulose tape. Not only are the contents of the bag protected in this way, but they are prevented from becoming breeding places for moths which are likely to infest larger garments.

Helen Lemberger, Chicago.



Chemical "Ferret" for Deep Holes

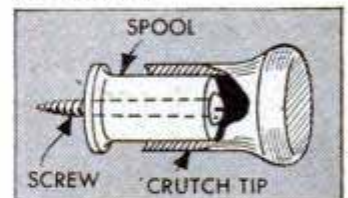
Animals can be routed from the deepest den in a few minutes without digging or drowning if this chemical ferret is burned in the hole. To make the ferret, saturate 6 x 6-in. squares of Canton flannel with a solution of potassium nitrate (saltpeter), 1 part, and water, 2 parts. After the squares have dried thoroughly, sprinkle the rough side of the flannel with a finely ground mixture of cayenne pepper, 1 part, dry mustard, 1 part, and sulphur, 3 parts. Roll the pieces of cloth, similarly to rolling a cigarette, and cement the loose edges in place with waterglass. To use, ignite one end of the roll and push it as far down into the hole as possible. The fumes given off by the burning mixture will quickly ferret the animal from its den.

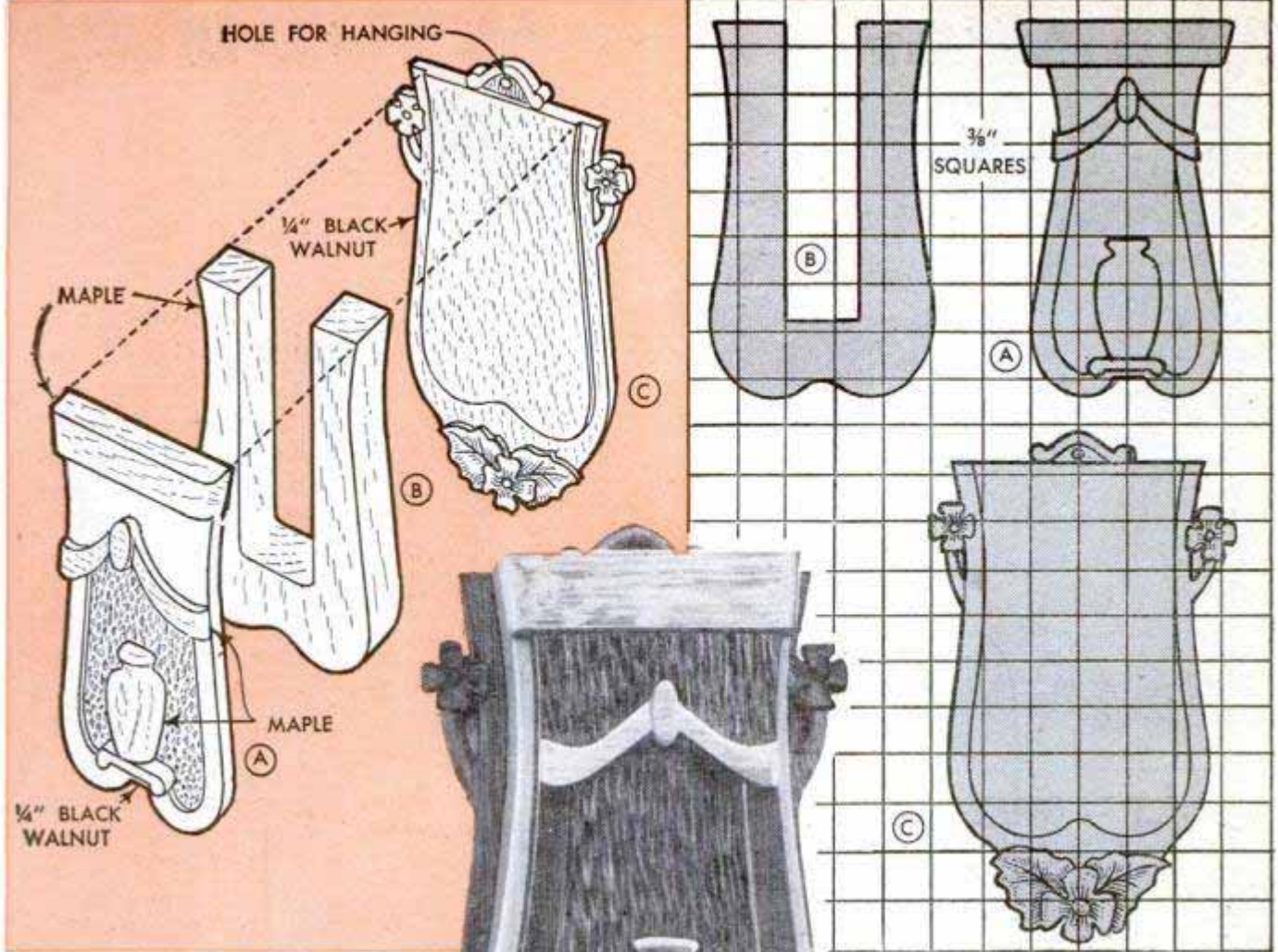
R. A. Jenkins, St. Louis, Mo.

Improved Door Bumper

If a door bumper is broken, the wall can be protected by this improved bumper until a new one can be obtained.

Cut one of the flanged ends from a thread spool and fasten it to the baseboard with a long wood screw. Then, simply press a crutch tip, if available, or a short piece of hose, over the end of the spool. Using the crutch tip and painting the exposed portion of the spool provides a suitable bumper that will give long service in proportion to its extremely small cost.





Carved WALL VASE

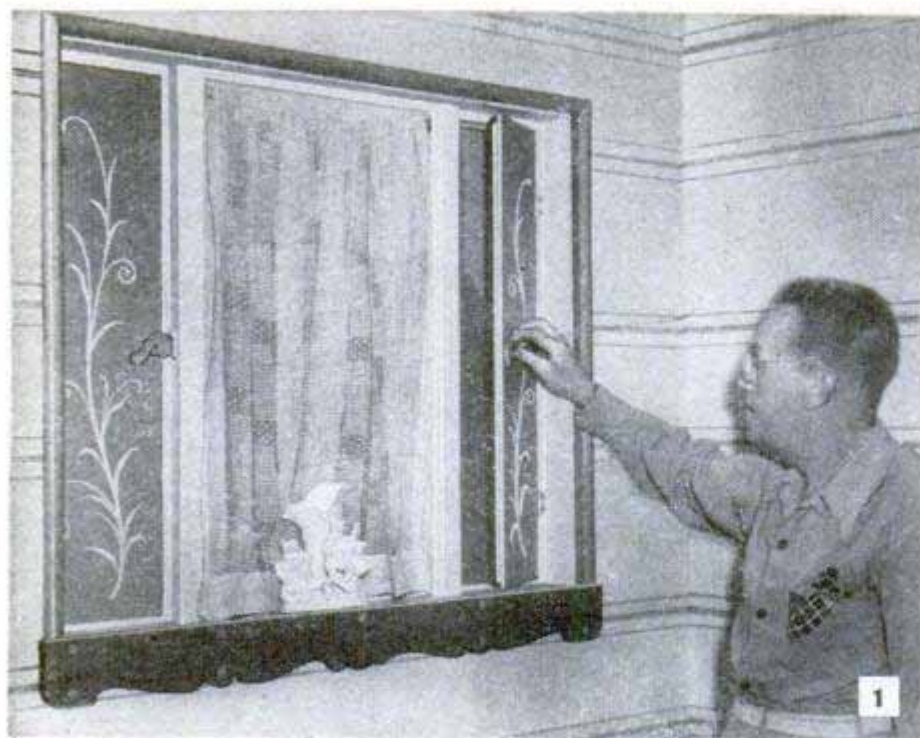
By Dick Hutchinson

IF YOU'D like to try your hand at elementary wood carving, a pair of these unique wall vases provides a simple project for beginners. Some jigsawing also is required as well as practice in making a split turning. The vase is built up of three pieces (A, B and C) from black walnut and maple. First, a pattern of each cutout is made full size. Piece B, which forms the pocket in the vase, is cut from $\frac{3}{4}$ -in. stock, while the others are cut from $\frac{1}{4}$ -in. material. After piece B has been cut and sanded, its outside profile is traced directly on piece C. This establishes a guide line to follow in carving the outer edge in low relief, about $\frac{1}{8}$ in. deep. Score the petals and leaves of the design with the point of a sharp knife and carve in bas-relief. Piece A is similarly carved, the inside area being

marked off according to the pattern and given a tree-bark texture by taking small gouging cuts with a narrow gouge.

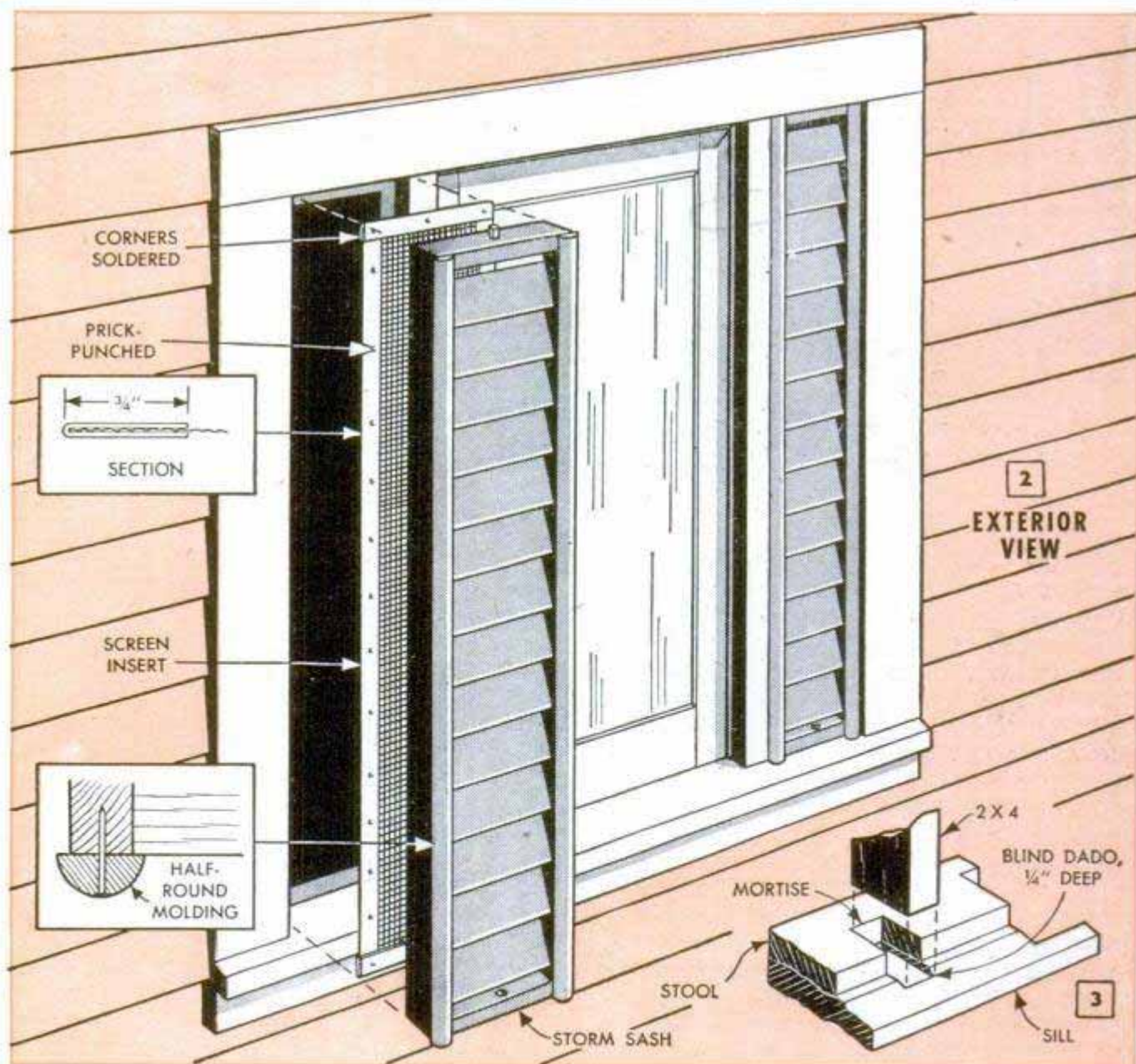
Now, the three pieces are glued together, centering and gluing piece B to piece C first. When in proper position, all three are glued and clamped together. Watch to see that they do not shift, and wipe off any excess glue. With piece A being smaller than piece B, a border of maple extends beyond the edge of piece A. The maple overlay pieces are added last. The piece at the top comes flush with the sides of piece B and the jigsawed cutout below it is merely surface-glued to piece A. The urn overlay is a split turning made by gluing two blocks of wood together with a thin cardboard inserted between them. This permits the turning to be parted in half with a knife.

INEXPENSIVE WINDOWS

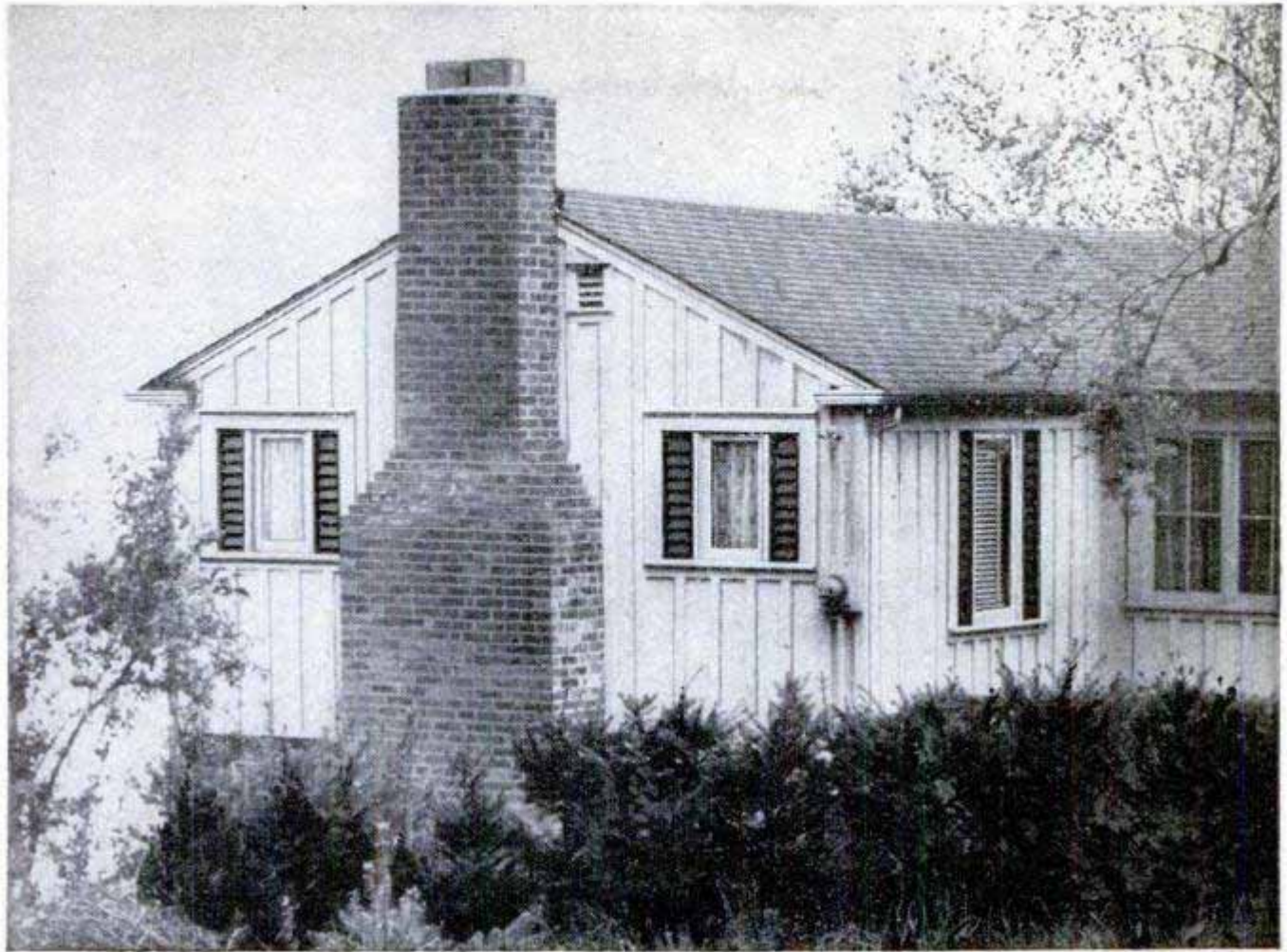


By
Carl R. Berg

Although designed primarily for summer cottages, these windows are suitable for installation in small ranch-type homes, particularly those with board-and-batten construction. From the outside, the louvered inserts appear to be ordinary window shutters.

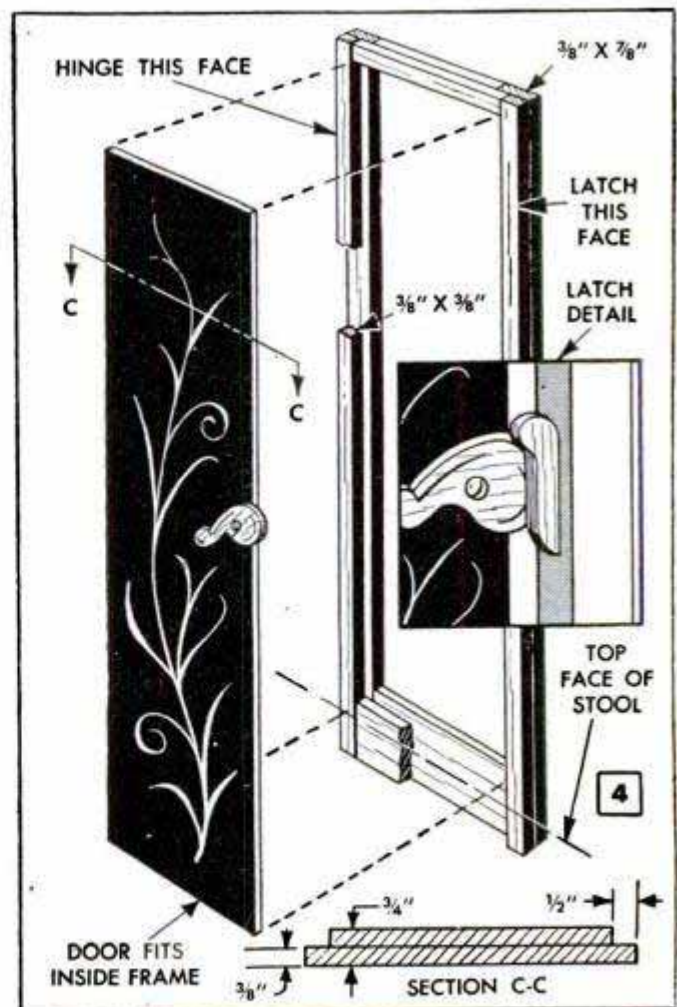


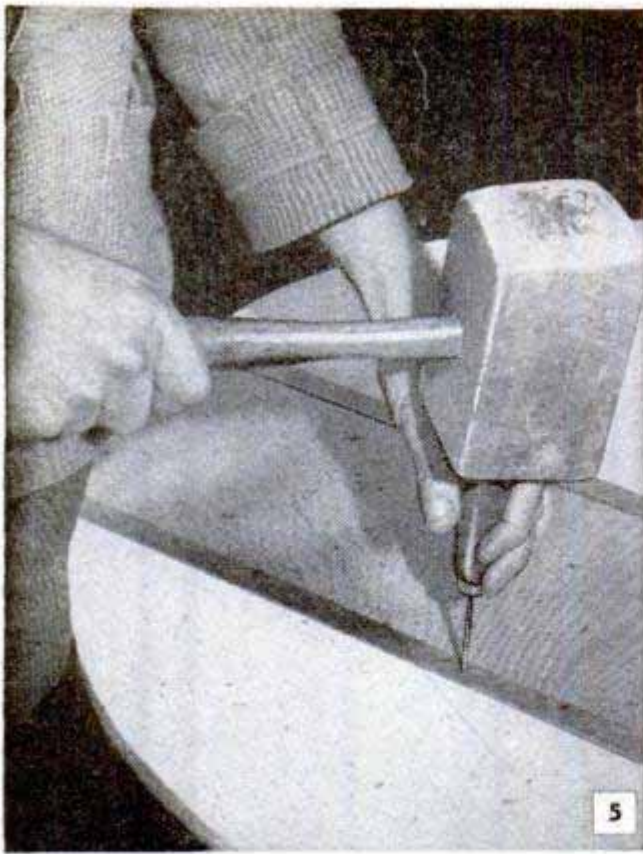
for your LAKE COTTAGE



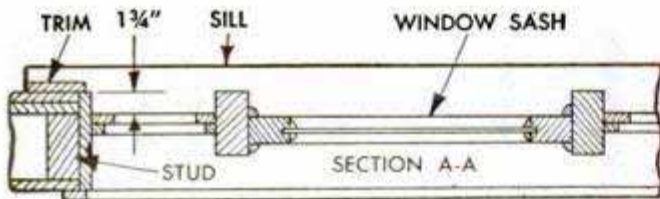
THE REMOVABLE louvers of these novel windows not only add to the architectural lines by giving the effect of shuttered sash, but they also provide ample air circulation in summer and serve the purpose of storm sash in winter. As detailed, the frame is fitted with solid, hinged shutters with a painted decoration on the inside, Figs. 1 and 4, while the openings are closed on the outside by removable louvers made as in Figs. 2, 3 and 7. The frame must be large enough to accommodate both the window sash and the louvers, which fit into openings $6\frac{1}{2}$ in. wide. Vertical members, or muntins, within the frame are dadoed into the sill and the stool is notched around them as in Fig. 3. The upper ends of the center members are simply toenailed to the upper rail of the frame. The single-pane fixed sash, Fig. 6, is fitted between the center frame members and is held in place with quarter-round molding as in section A-A. On the outside, the molding should be coped at the corners and attached with screws so that it is easily removed without damage. On the inside, the joints can be mitered and the molding nailed in place.

Note from sections A-A and B-B in Fig. 6 that the apron overlaps the stool, while the sill is nailed flat on the header, not tilted



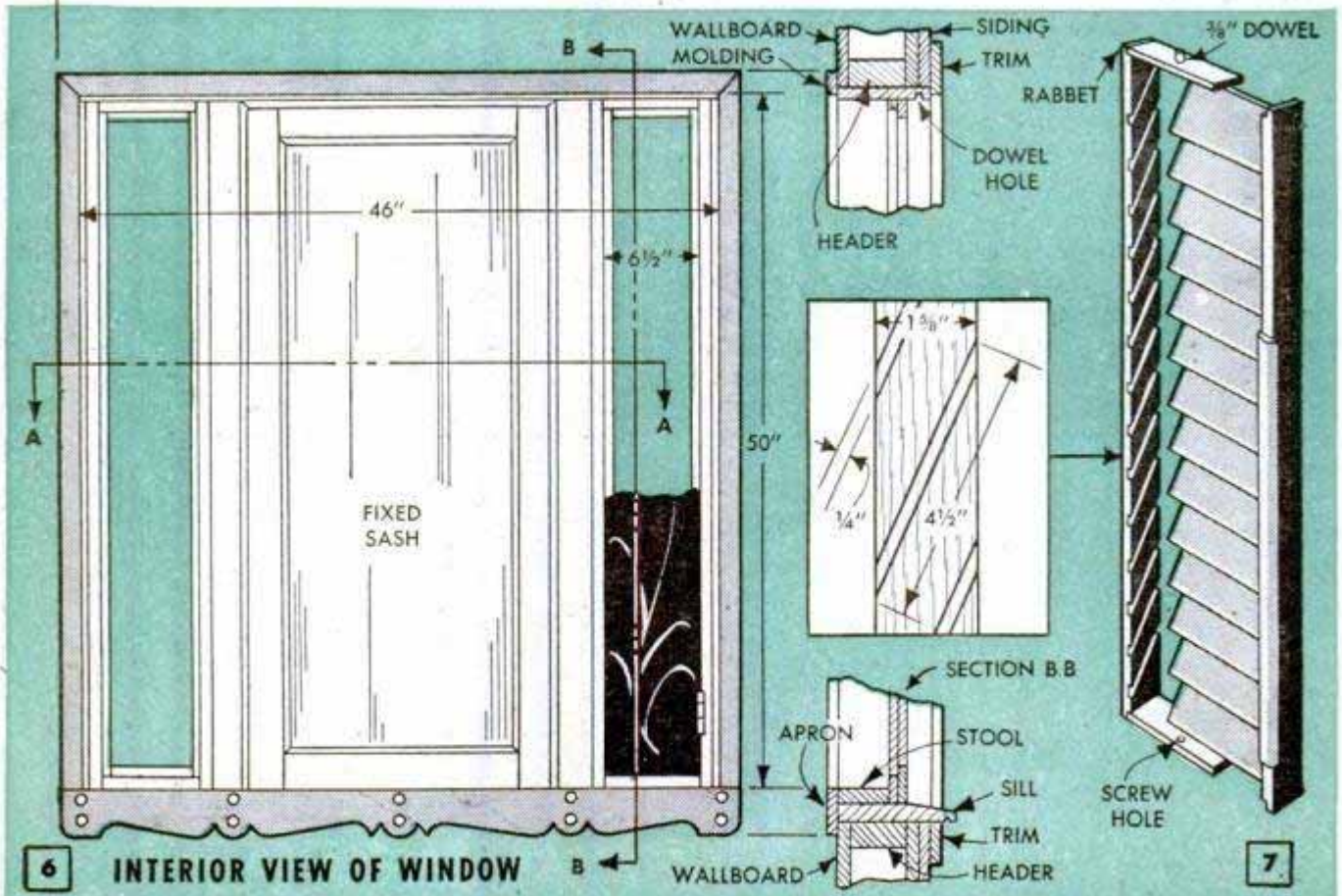


Screen inserts are made by folding strips of metal in half lengthwise and placing over edges of screen wire. Prick-punching the metal holds wire in place



at an angle. There are two ways of installing the frame: Assemble the frame first, and then fit it into the wall opening, or simply build it into the opening piece by piece. If the latter method is used, set the sill and the headpiece first. Then fit the side members and also the center members in place.

The inside panels, Figs. 1 and 4, are hinged at the outer edge and swing into built-up frames as in Fig. 4. The frames are made by nailing and gluing together strips of two different widths, making a frame rabbeted on all four inside edges. Likewise, two plywood panels are fastened together to form a matching rabbet, section C-C, Fig. 4. Tight closure of the panel is made by means of a two-part hardwood latch in scrolled design. Construction of the louvers is detailed in Fig. 7. Grooves to take the louver slats are laid out on the uprights, or stiles, as in the detail. The slats are of 1/4-in. stock and the lower edges are beveled so that they are flush with the outer edges of the stiles when assembled. After assembly of the unit, the edges of the stiles are finished with half-round molding as in Fig. 2. Note that the molding is placed so that it overhangs the edges slightly. For summer use, screens are placed behind the louvers as in Figs. 2 and 5. In winter, the space can be closed by panels made by gluing together several thicknesses of felt paper. The louver unit is installed in the frame by placing the top end so that the short dowel enters the hole drilled in the frame. The bottom end is held securely in place by a single wood screw.



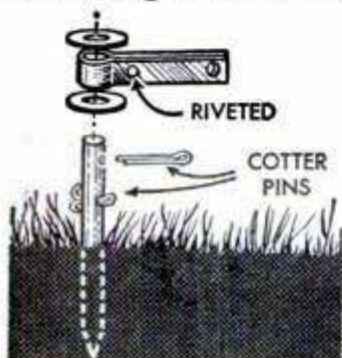
Combination Noted on Tape Label When Storing Unused Padlock



After a combination-type padlock is stored for a considerable length of time, the combination is likely to be forgotten or mislaid. One of the easiest ways of keeping the combination with the lock and prevent its being lost is to print it on a strip

of adhesive tape and stick the tape to the lock. When the lock is in use, the tape can be removed and placed in some inconspicuous spot for future reference.

Rotating Tether Prevents Tangling



Winding of a tether line around the stake often reduces the area of the yard capable of being covered by a watchdog or the grazing radius of a farm animal. This will be prevented and the animal allowed the

full length of the rope if a rotating tether is used. The stake is simply a length of pipe or pointed rod which is drilled transversely near the upper end for two cotter pins. Washers and a rotating arm are slipped over the stake between the cotter pins as shown. The arm is bent from a piece of flat iron to fit loosely over the pipe. Two holes are drilled through the arm, one to permit riveting the two ends of the flat iron together and the other to allow fastening the rope to the free end of the arm.

Paper Cup Aids Transplanting



Starting small plants, such as tomato and cabbage, in wax-paper drinking cups facilitates transplanting, as the plants can be left right in the cup. Before setting the plant in the ground, the bottom of the cup is removed.



Handy Condiment Compartment Installed in Sink Cabinet

Owing to the construction of many wooden cabinet sinks, it is a simple matter to utilize the waste space in front of the sink basin as a convenient storage compartment for spices, salt and pepper. On this type of cabinet there usually is a panel directly in front of the sink and above the doors which is fastened from the inside and can be removed easily. All that is necessary to install the condiment shelf is to measure carefully the space between the sink basin and the front of the cabinet and then build the compartment to fit. Nail a backing of 1/4-in. plywood or hardboard to two side members of solid stock, nailing the latter to the cabinet posts. Then screw the shelf to the lower edges of the side members. Use the front panel to provide a door, mounting it on standard cabinet hinges and fitting it with a catch. A length of chain should be fastened at each end of the door to support it in the horizontal position. It will be necessary to bevel the edge of the rabbet at the top of the panel so it will not bind when closed.

John Dalen, Morton Grove, Ill.

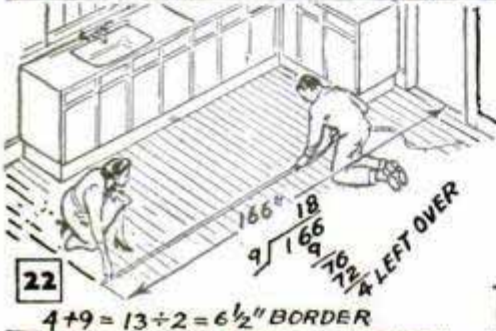
Sample Checks Matching Paint

When mixing paint to match a color already applied, eliminate guesswork by drying a swatch of the mixed paint and comparing it with the color to be matched. Paint the sample swatch on a tin can or scrap of sheet metal and place it on a radiator or in the oven to speed drying.

100 W. P.



Courtesy Douglas Fir Plywood Association



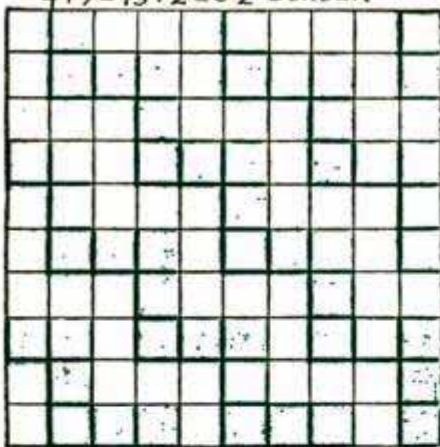
LAY YOUR OWN

PART II

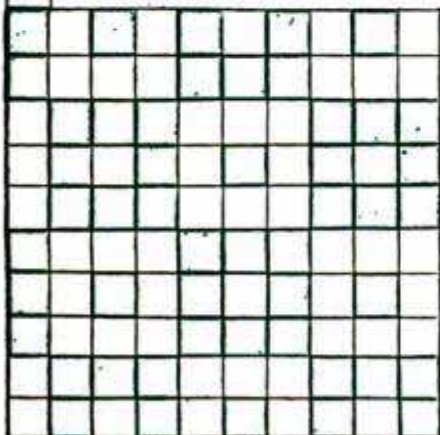
By Sam Brown

LAYING LINOLEUM on floors from wall to wall, and the procedures for laying the border and the border-and-feature-strip designs were covered in Part I last month. But that was only the beginning. Linoleum is supplied as either floor or wall tile to be applied in various sizes and pattern combinations and it's also used for wainscoting, all-over wall coverings and counter tops. Such applications require somewhat different procedures.

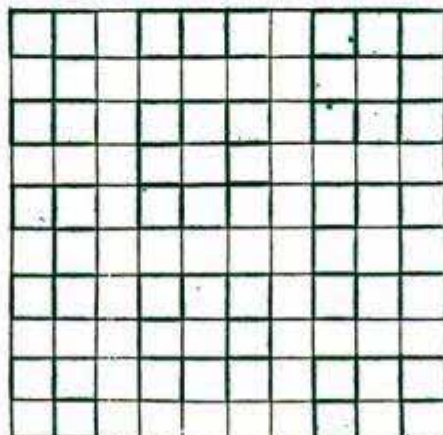
Floor tiles: Linoleum tiles are easy to install over wood floors and, in some cases, over concrete floors that are dry at all times. The most common tile sizes are 9 in. square and 9 x 18 in. rectangular. The squares can be laid in one color only or in various patterns such as shown in Figs. 23 to 26 inclusive. Tiles are obtainable in a variety of plain and marbled colors in standard linoleum



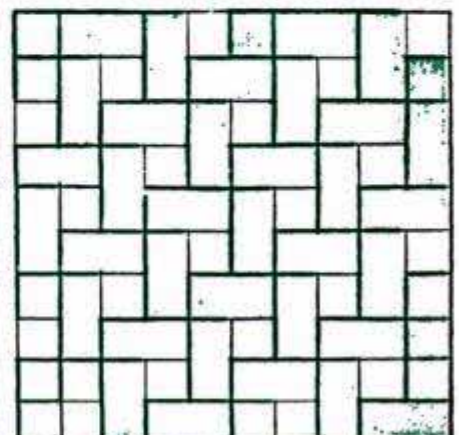
23 ZIGZAG



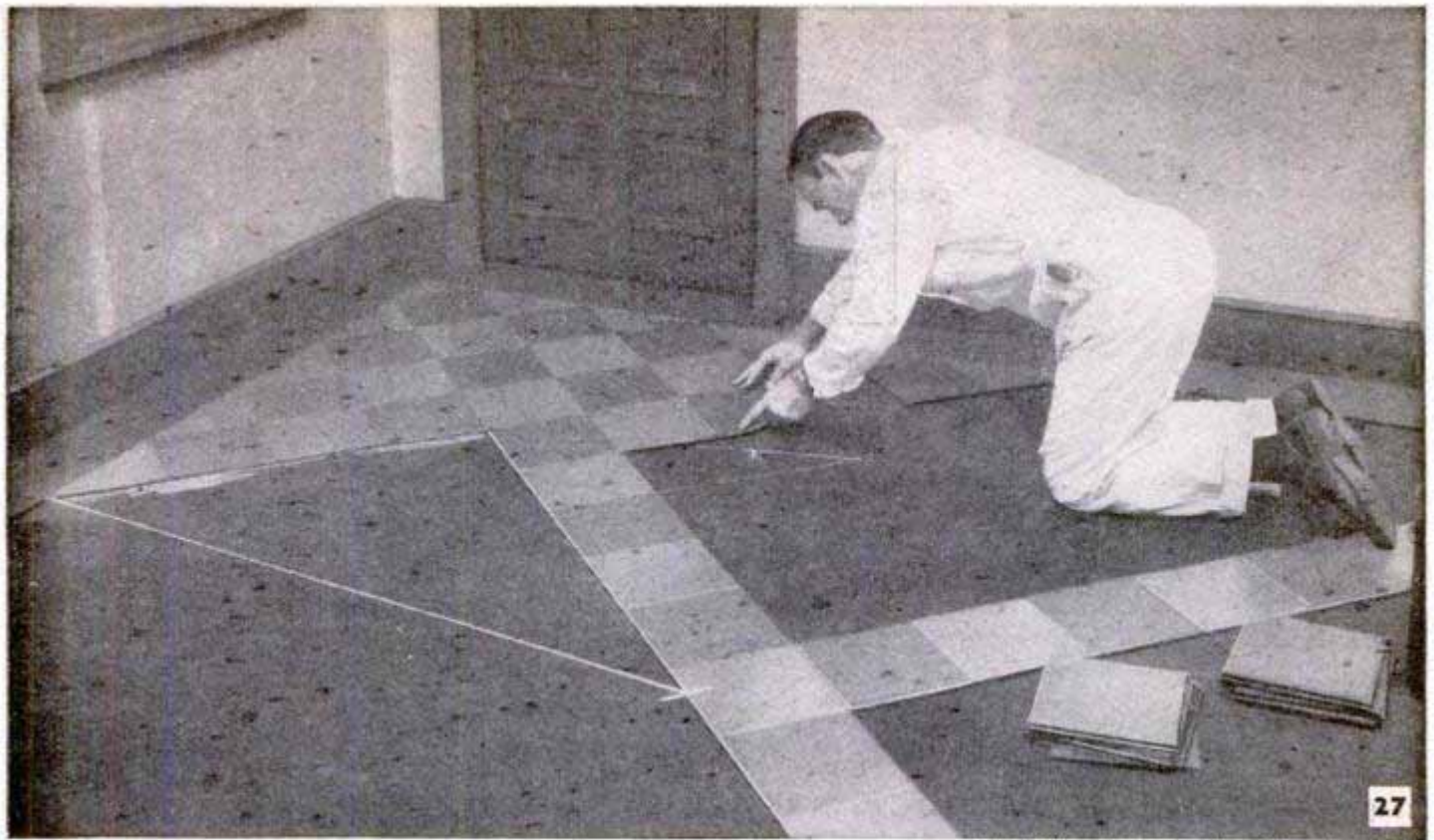
24 ENCLOSED SQUARE



25 SQUARE WITH RUNNER



26 PINWHEEL (9" X 18" TILES)

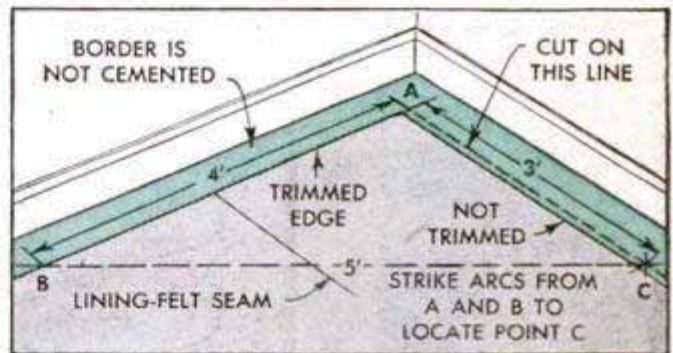


Installation photos courtesy Congoleum-Nairn

LINOLEUM

and also in a special asphalt-base product. The latter floor covering is intended for use over concrete floors below grade, Fig. 21. The ordinary linoleum tile should not be laid on damp basement floors. On wooden floors, the tile is regularly applied over a felt liner which has been previously cemented to the floor. On concrete floors below grade no liner is used. Instead, the tiles are applied directly to the concrete, using a special cement which is proof against dampness. It is important that the floor over which the tiles are to be laid be made smooth and level.

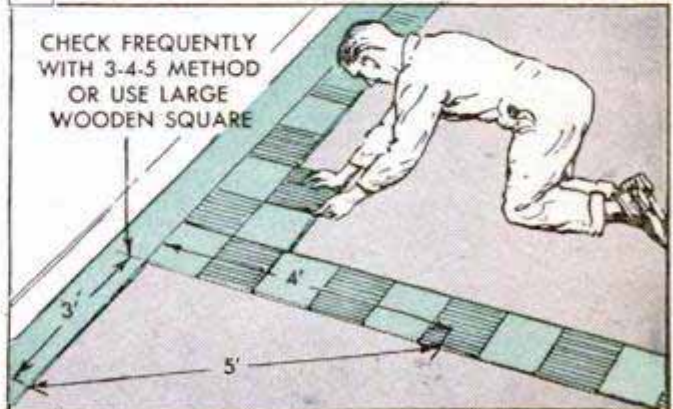
Application of tile: Tiles usually are applied in a field-and-border design and the border width for any room is determined by using the simple calculation given in Fig. 22. After determining the border width required, the first border piece is laid out and cut, but is not cemented down. Then the second piece is left overwidth and is fitted to the second wall. The width of this piece is then marked at the point A, Fig. 28, and it is then squared by using the 3-4-5-ft. method, A, B, C, Fig. 28, or any other means which will assure a square corner. Never depend on the room being square. The second border piece is then cut and both the first and second pieces are cemented down. Now, start putting the tiles in place. Apply the cement with a toothed trowel over an area about equal to that covered by 8 to 10 tiles. Position each tile individually and press firmly in place. If



28 SQUARING THE BORDER IS FIRST OPERATION



29 DIAGONAL CHECKERBOARD STARTS WITH QUARTER TILE



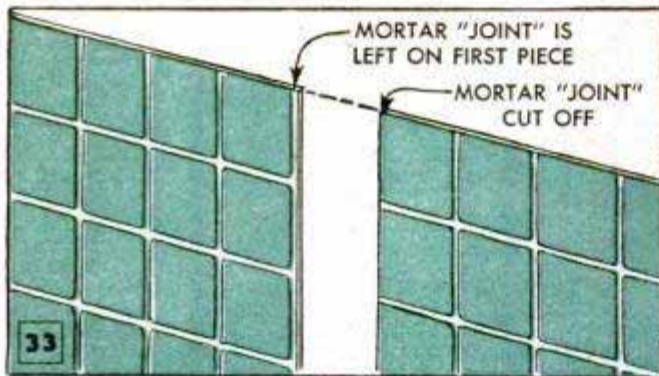
30 BREAK LARGE FIELDS INTO SMALLER AREAS



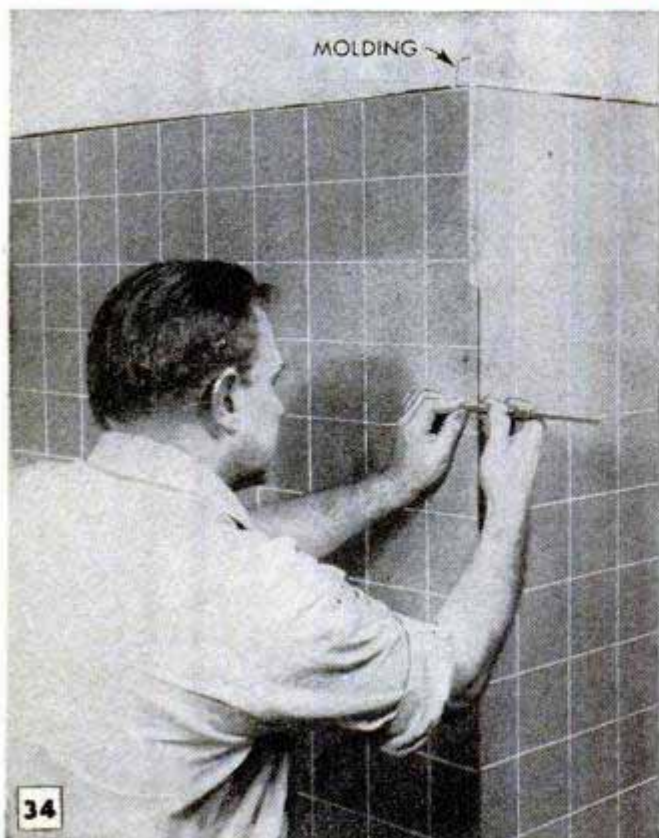
Standard wall linoleum comes 4 ft. 6 in. wide and is cemented directly to the wall, keeping it running level with a guide line marked on the wall. Detail shows how corner molding fits



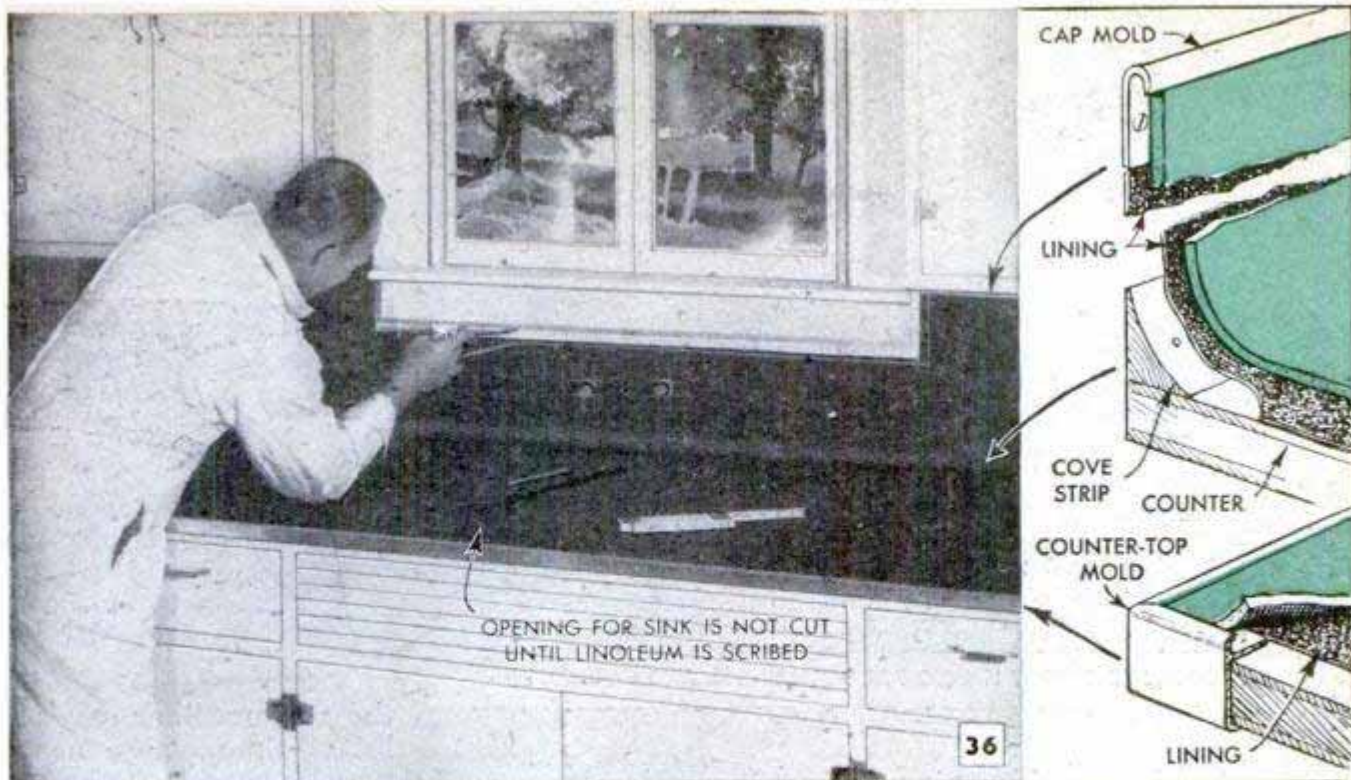
Top of linoleum is finished with cap mold



the field (room) is large, take a little extra time to square up smaller areas and then fill in these areas by working from outside to center as in Figs. 29 and 30. Wipe off all surplus cement with a damp cloth, and roll the tiles lightly as they are laid, using an ordinary rolling pin. Check carefully as each row of tiles is laid so that straight lines are maintained in both directions, Fig. 27. This precaution will assure that you finish with a straight line of tiles at the opposite walls. When the field is completed, scribe and fit the remaining border pieces. If you use a diagonal checkerboard pattern, the start in the corner is made with a quarter tile, Fig. 29. Of course, the edges will be finished with half tiles. Asphalt tiles will break cleanly along a scored line, but linoleum tiles must be cut through with a sharp knife. It will save time to make a simple wooden frame to serve as a template, or cutting jig, for this special purpose.



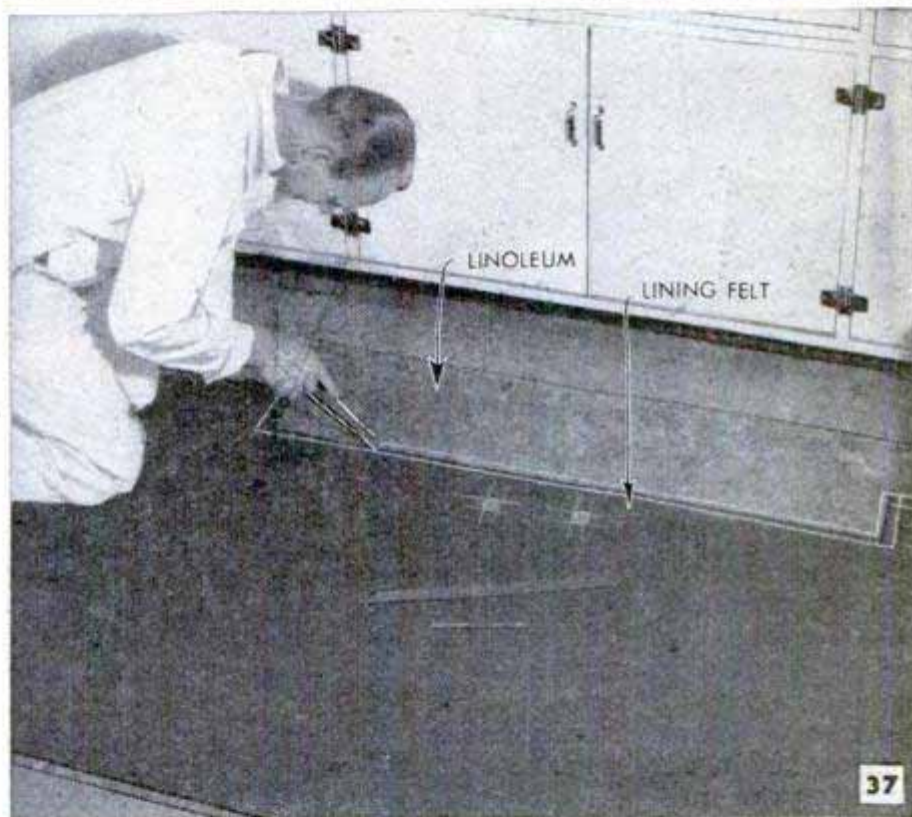
Wall installations: The standard material for wall application is linoleum sheets ruled into 4½-in. squares. Usually the sheets are 4½ ft., or 54 in. wide. If the baseboard is level, the job is simple. Always check the room and the baseboards with the level first. If the baseboard is not level all around then it will be necessary to scribe a leveled line around the room a little less than 4½ ft., or the width of the linoleum sheet, above the top of the baseboard. The top edge of the linoleum is fitted to the line, Fig. 32, and the bottom edge is



Above, counter installation is made over a duplex felt lining. After the lining is fitted, it is used as a pattern for marking and cutting linoleum as at right

scribed to fit the baseboard. Joints should be butted, Fig. 33, and if there is an outside corner, Fig. 31, it is fitted with a metal or plastic molding after one of the walls has been finished. The adjacent wall is then fitted and the edge is under-scribed to fit the molding, Fig. 34. Inside corners can be butted, although special metal moldings available for this purpose make a neater job. After the linoleum has been applied to all the walls, the job generally is finished with a metal cap strip as in Fig. 35. Wooden strips and matching linoleum strips sometimes are used. If the baseboard is fitted with a top molding, this should always be removed before fitting the linoleum. In this case, rough fitting at the bottom edge is satisfactory as the edge will be covered when the molding is replaced. If the original baseboard is badly scratched it may be replaced with a new matching baseboard of rubber or plastic. These baseboards usually are applied with special cement.

Counter tops: Counter-top jobs call for the best-quality linoleum and careful workmanship. It's common practice to lay

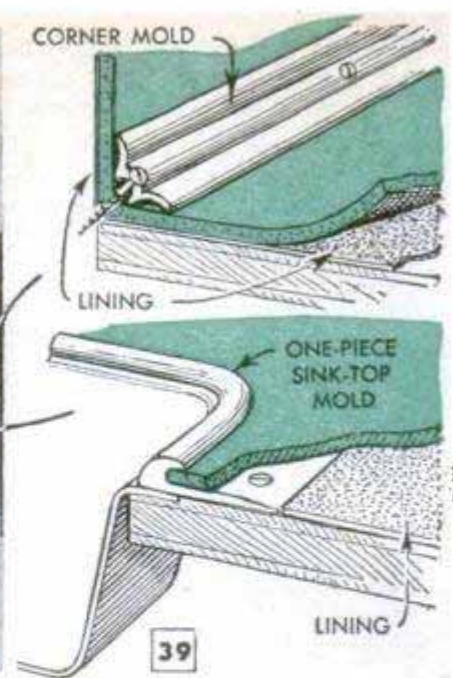


the linoleum top over a felt liner, which provides not only a good cementing base but also a template for cutting the linoleum accurately. Start the job by installing all metal trim, Fig. 36. Then, if the linoleum is to extend up the wall to provide a splash back, apply a flexible plastic cove strip in the corner between the counter top and the wall. Next, fit a length of liner felt $\frac{1}{2}$ in. short at the corners, edges and metal trim. Do not cut out for the sink well; this will be taken care of later. After rough-cutting the felt, fasten it securely with thumbtacks so that it will not move during the scribing operation which is to follow. Be sure that

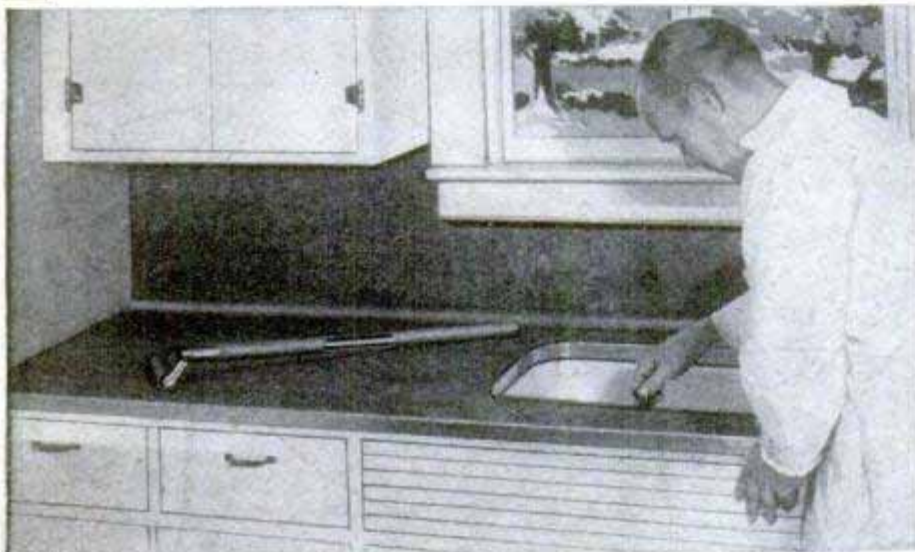


38

DAMPPROOF CEMENT IS USED FOR BOTH LINING AND LINOLEUM



39



40

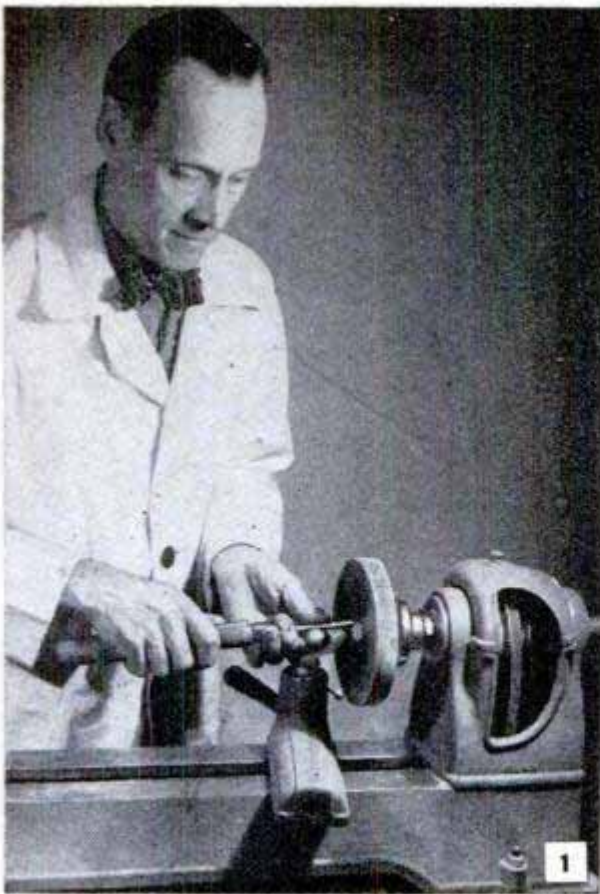
THE LINOLEUM IS UNDERSCRIBED TO FIT THE SINK MOLDING

the felt is pushed tightly against the cove strip. Set the scribe (dividers) to approximately a 1-in. opening and scribe up to all edges except the sink well and the front edge, Fig. 36. Now, remove the felt and spread it over the linoleum. Tape it in place to prevent movement. Then, with the same divider setting, retrace the scribed lines to transfer the outline to the linoleum as in Fig. 37. Next, place the felt back on the counter top and fit it carefully to the flanged metal trim. Then cement in place, using a moistureproof cement. Cut the linoleum to the scribed lines, spread moistureproof cement over the felt, Fig. 38, and roll the linoleum in place. Make certain of a good contact over the cove strip in the corner. Go over the entire linoleum surface with a rolling pin to assure perfect contact. Underscribe the overhanging front edge and roll it down last. Cut out the sink well with a sharp knife about 1 in. oversize. Then underscribe to a neat fit in the sink-top molding as in the lower detail, Fig. 39, and also in Fig. 40. For this particular work

the underscriber saves a lot of time where neatness is so essential. The upper detail in Fig. 39 shows an alternate back-corner treatment which is somewhat easier to work out than using the continuous top and splash back over a corner cove. In this, the top and back are applied separately, the back being butted to the top in a right-angle butt joint. A corner mold of plastic or metal finishes the joint. Finish all counter tops with paste wax rubbed to a high polish.

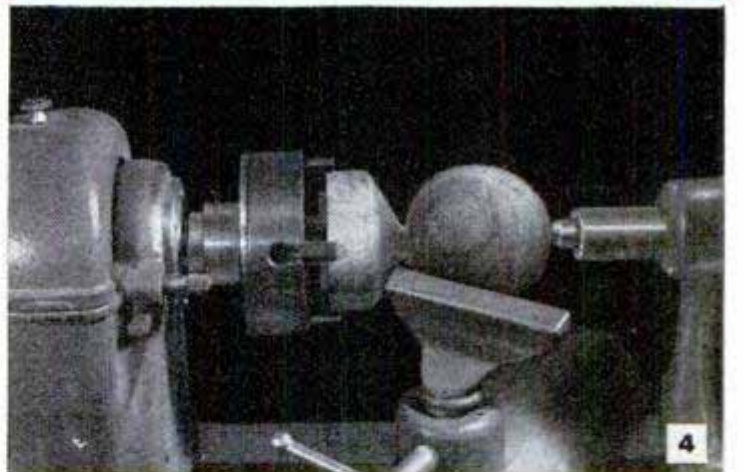
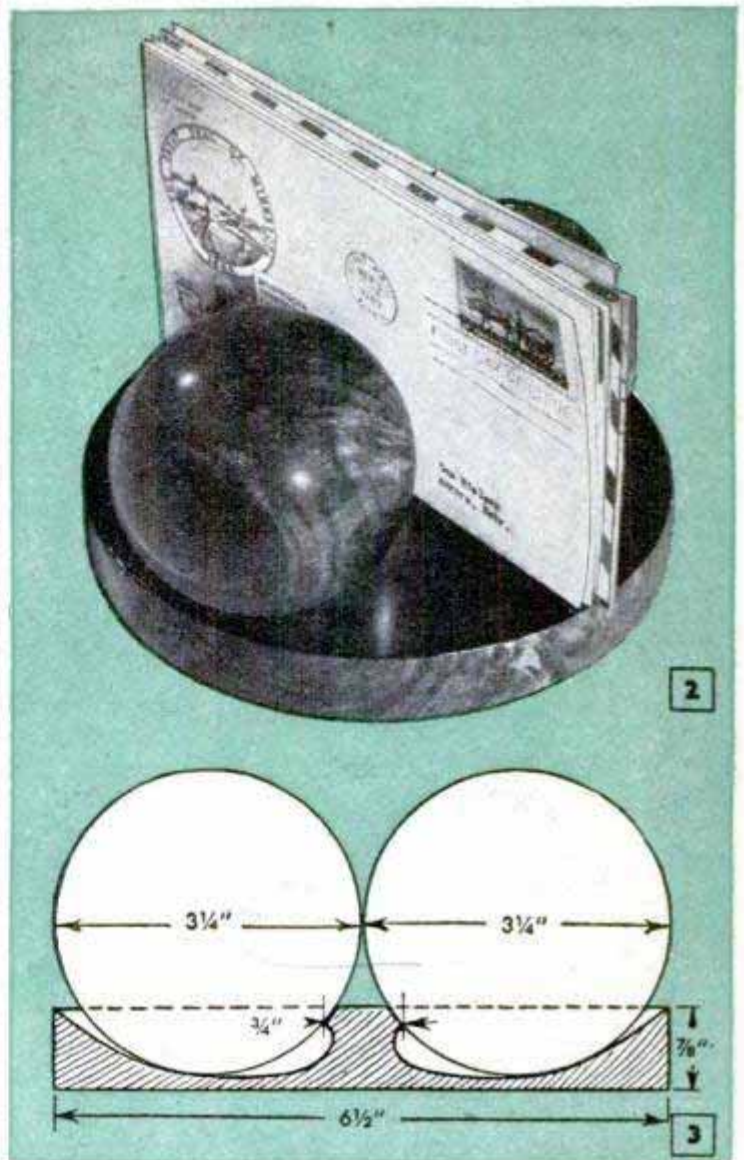
Patching: Very often existing linoleum installations on floors, walls and counter tops can be made to give much longer service by patching the worn areas. Greatest wear comes in narrow traffic lanes through doors, in front of the kitchen stove and sink, and also on the counter top at both sides of the sink. Since most linoleum patterns are stock items, it generally is possible to purchase the amount necessary to make the repair. If the linoleum is figured, be sure to allow material for matching the pattern. Cut out the worn area, following the pattern lines wherever possible. Then match the new piece over the opening. Fasten with thumbtacks or tape and rough-cut to about 1 in. oversize. Then use the underscriber to obtain a perfect cutting line. Spread cement in the open area and press the patch firmly in place, rolling it down until it makes full contact. Clean up all excess cement and, finally, rub lightly with fine steel wool to dull the surface so that it will match the old as closely as possible.

THE END

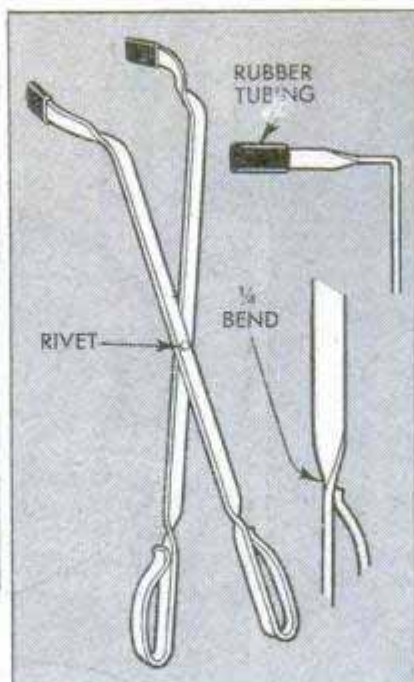


Twin-Ball LETTER HOLDER

HERE'S something decidedly different in a letter holder for your desk. Two wooden balls of equal size resting in a dished base, Figs. 2 and 5, automatically expand to accommodate one or more letters. Resting on a concave surface, the balls provide a constant inward pressure to grip the envelopes firmly. The sectional drawing in Fig. 3 shows the contour to follow in dishing the base. The work is mounted on a lathe faceplate, Fig. 1, by first gluing it to a scrap block. A piece of paper or thin cardboard inserted between the work and the block will permit separating the two easily with a knife blade after the turning is completed. The balls should be turned as near to a perfect sphere as possible, using a cardboard template as a guide. The balls are first rough-turned between centers, Fig. 4. Using a four-jaw chuck to hold the work permits backing away the tail center and turning the outer end. To finish off the chucked end, a wooden chuck is made by turning out a soft block to a radius slightly less than the diameter of the ball and pressing the ball firmly in place.



Lightweight Cupboard Tongs of Duralumin Reach High Shelves in Cabinet Kitchen



You don't have to climb a ladder or stand on a chair to take canned goods off high cabinet or pantry shelves. Just use a pair of these easy-to-handle tongs which can be made quickly from lightweight duralumin. The metal is bent as shown in the detail and the two parts are riveted at the center, a washer being inserted between them for smooth operation. In this way, a positive gripping action is attained, causing the arms to grasp the can firmly when the handles are held closed. Note that the arms of the tongs are curved slightly and that a piece of rubber tubing is pressed over the ends.

Several Needles Previously Strung on Thread Save Time When Sewing

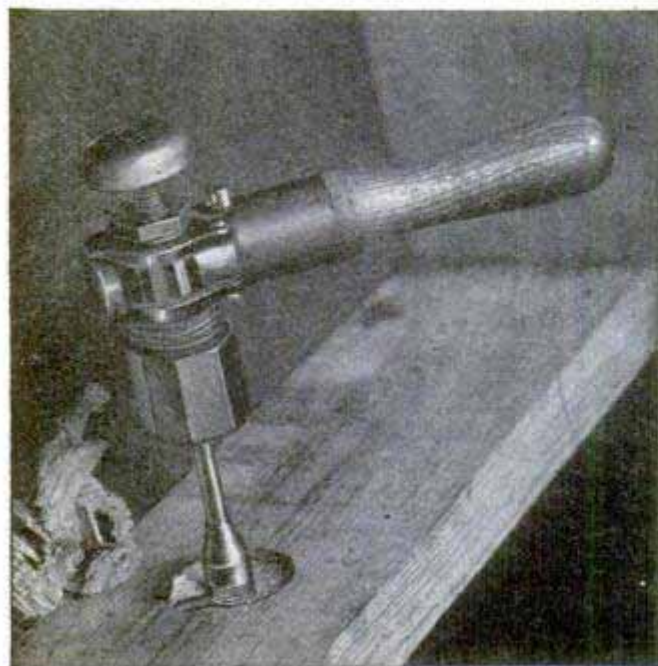
Sometime when you have a few minutes to spare, why not thread five or six needles on each spool of thread that you use frequently. Then, when you're in a hurry to finish a particular job of sewing, you won't have to bother threading needles. Just use the first one threaded on the spool, slipping

the others down the thread and using them in succession as needed. If your vision is such that it is difficult to thread a needle, it is helpful to have someone else thread a number of them so you will have a supply of threaded needles on hand.

Mrs. Nancy Smith, Camden, N. J.

Lead Screw Draws Special Expansive Bit Through Cross-Grained Wood

When drilling large-diameter holes through floor joists, one plumber found that the lead screw on the ordinary expansive bit lacked sufficient "bite" to draw the bit through, especially when drilling in cross-grained wood. To remedy this trouble, he made a special bit having a



wing-type cutter with the same general clearance and cutting-edge characteristics as the one furnished with the regular bit, but having a lead screw turned on the body of the bit so that it would follow a pilot hole of the same diameter as the body. The body and shank of the bit are turned from tool steel and the body is shouldered and threaded for about half its length, the thread running back from the outer end to the shoulder. Next, the body is drilled transversely to provide an opening for insertion of the wing cutter, which is ground and filed to shape from tool steel. A second hole is drilled into the first one at right angles and tapped for a headless setscrew to hold the wing cutter in place. To use the bit, first drill a pilot hole clear through the wood, the pilot hole being of the same diameter as the body of the bit measured at the bottom of the thread. Then insert the threaded end of the bit in the hole and turn the brace slowly until the threads "take" in the wood. While an auger-bit brace will serve for ordinary work, the short-handled ratchet illustrated is best in places where movement is restricted.

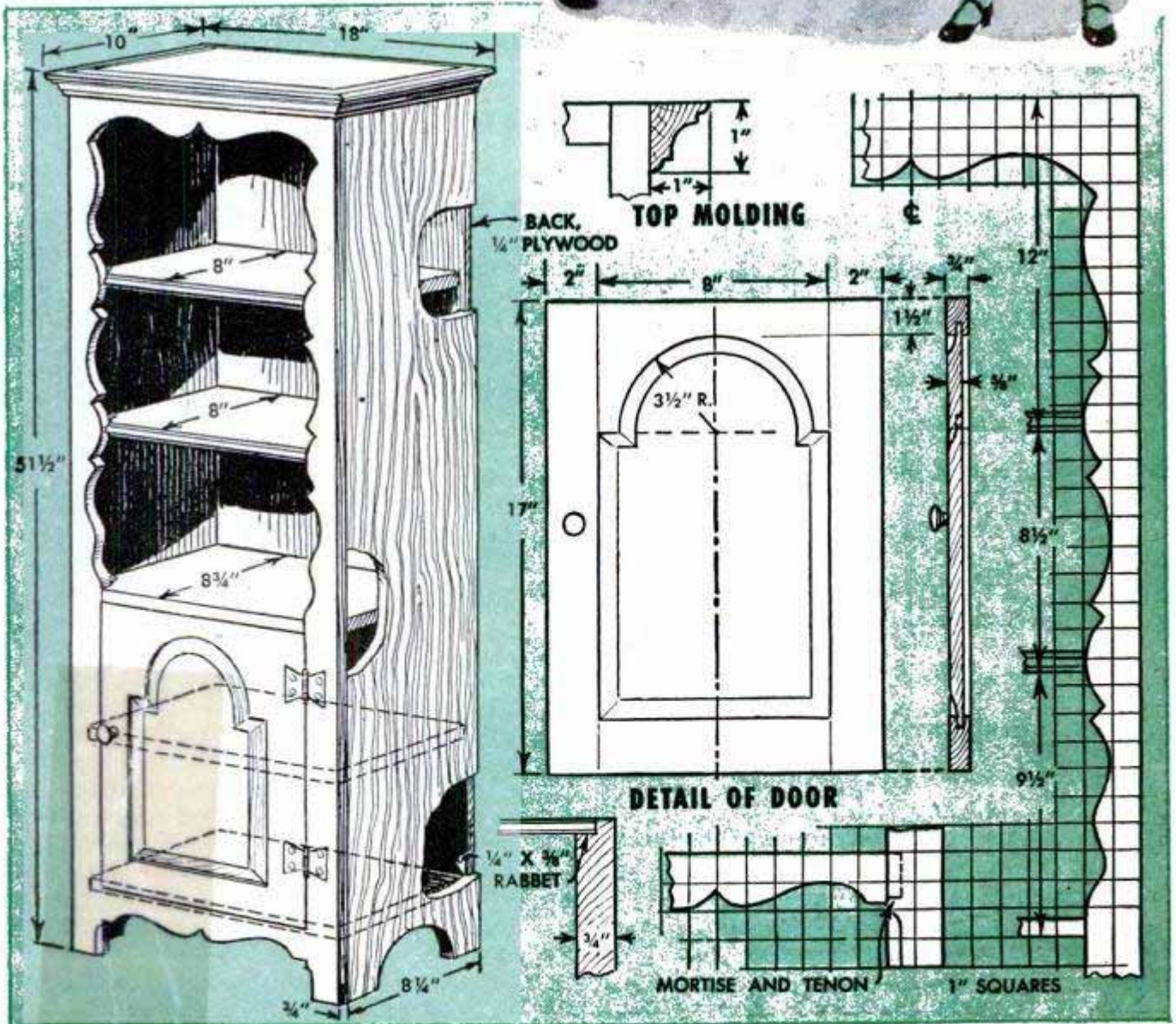
E. K. Walrath, West Springfield, Mass.

CURIO CABINET

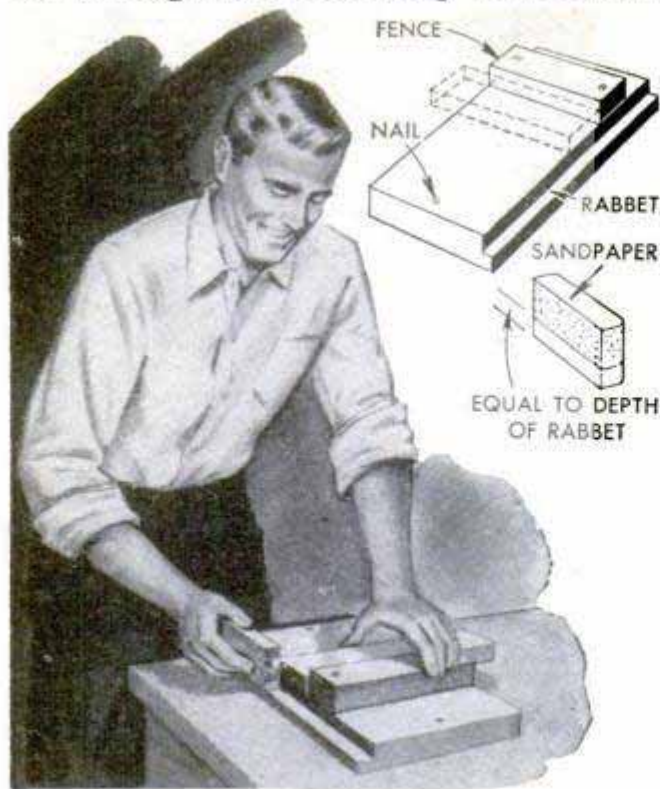
Colonial both in design and finish, this little curio cabinet provides an appropriate setting for displaying your treasured bits of bric-a-brac. Typical cabinet joinery is used, a right and left-hand side member being cut first from maple or birch and rabbeted along the rear edges for a 1/4-in. plywood panel. Except for the shelf above the door, all others, including the top and bottom of the cabinet, are cut the same size. The scrolled valance, which frames the open shelves, is built-up from four separate pieces, the side strips being bandsawed from stock 2 in. wide. The side pieces are joined to the top and bottom scrolled pieces with mortise-and-tenon joints and then nailed to the face of the cabinet flush with the sides. Finally, the top is finished off with a cove molding, and the bottom is fitted with a raised-panel door, being built-up as detailed and hung with wrought-type hinges. A bullet friction catch holds the door shut. A bullet friction catch holds the door shut.
 Norbert Engels, South Bend, Ind.



Furniture you can build p 139



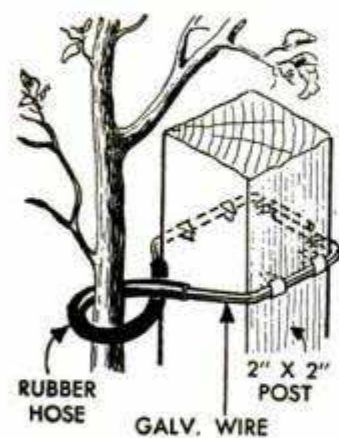
Bench Jig Aids Sanding End Grain



In order to facilitate holding work on the bench top while sanding the end grain, one craftsman made this sanding jig simply by nailing a cleat to a rabbeted board. The cleat provides a fence against which the work is held and a sanding block is moved back and forth along the rabbet. A nail, dropped through a hole in each end of the jig so that it engages a hole drilled in the bench top, holds the unit stationary while the work is being sanded. The sanding block is made by wrapping a strip of sandpaper around a block of hardwood and tacking it at the back. Note, however, that the lower portion of the block is not covered with sandpaper.

Lorenzo Daniel, Ciego de Avila, Cuba.

Saplings Supported With Posts



Supporting young saplings with guy wires until they are old enough to stand alone forms a hazardous obstacle and detracts from the appearance of the yard. To eliminate the possibility of children tripping over the wires while playing and also to provide an

inconspicuous support for the trees, use a 2 x 2 post embedded in the ground near the base of each tree. Wrap two lengths of galvanized wire around the trunk and sta-

ple them to the post, as shown, placing one about 3 ft. from the ground and the other near the top of the tree. Sections of rubber hose slipped over the portion of the wire which comes in contact with the trunk will protect the tree. The brackets will not only hold the tree upright but will also keep it away from the post.

D. H. Anderson, Long Beach, Calif.

Cutting Glass Jars and Bottles

To do a fast and neat job of cutting the top from a glass jar or bottle, try using oil and a heated steel rod. Fill the jar with oil to the point at which it is to be cut. Then, holding a length of steel rod with a pair of pliers, heat the rod to a cherry red, and immediately quench it in the oil.



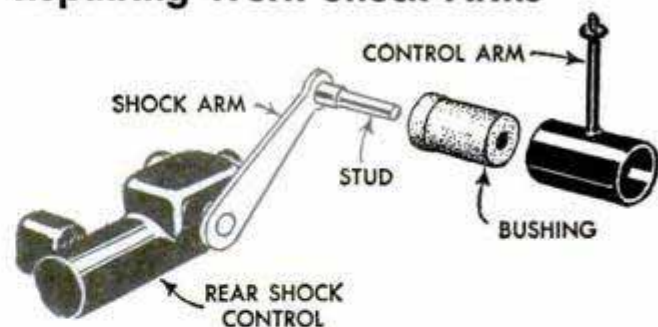
In most cases, the glass will break at the level of the oil.

Paul H. Will, Chicago.

Folding Tablecloth for Storage

After washing a tablecloth that is used only on rare occasions, fold it wrong-side-out for storage. Then, if the creases become soiled, the spots will be on the underside of the cloth when it is placed on the table.—Pat Fey, New York City.

Repairing Worn Shock Arms



Unable to purchase new control arms for the rear shocks on my 1939 Oldsmobile, I repaired the old ones with rubber bushings of the type found in the rear-spring shackles of late-model Chryslers. I forced the bushing over the stud and pressed the control arm over the bushing. Lubricating the bushing with vegetable-oil soap or graphite aids in slipping the control arm over it.—Coolidge T. Braley, Oswego, N. Y.

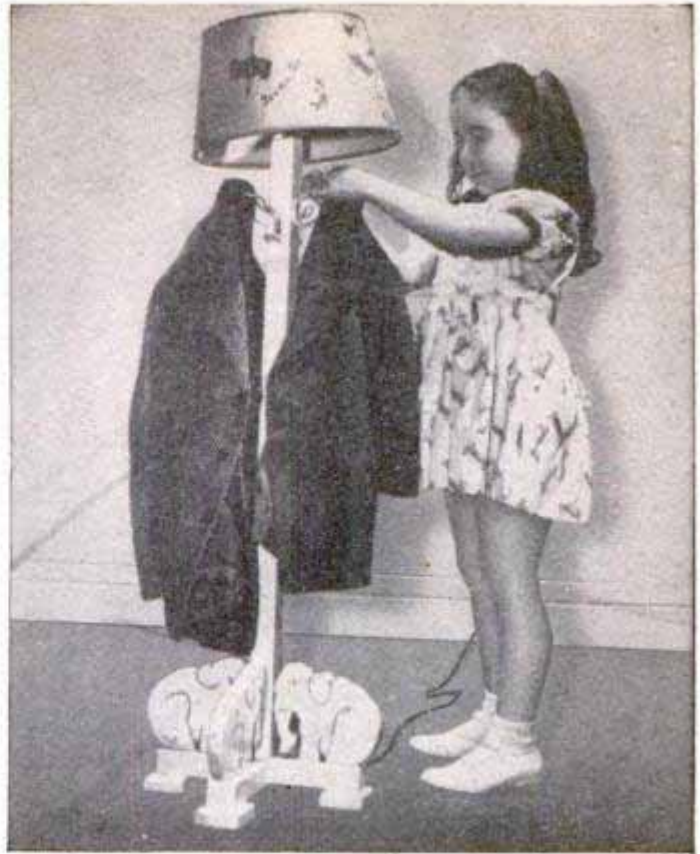
Woodenware should not be placed near the fire to dry, as it is likely to crack.

LAMP COSTUMER

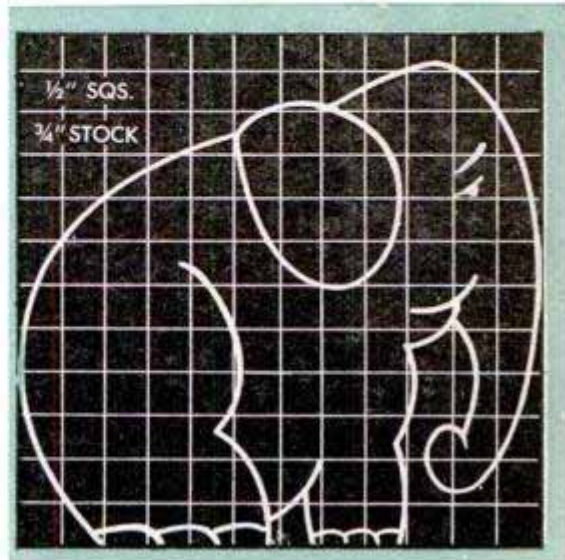
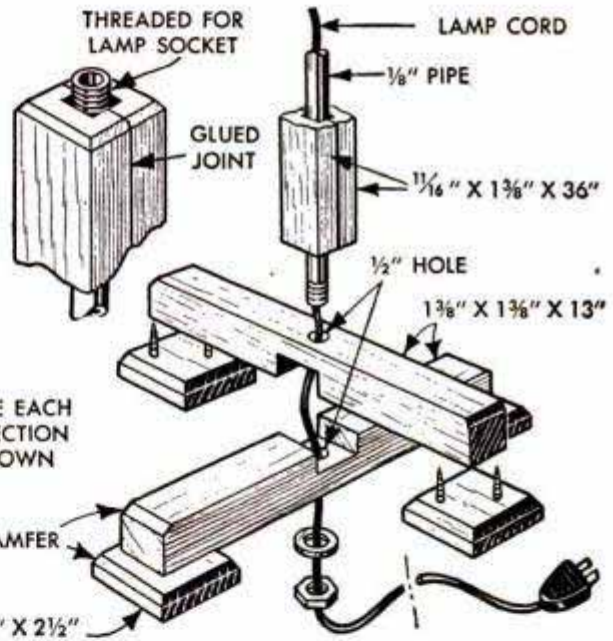
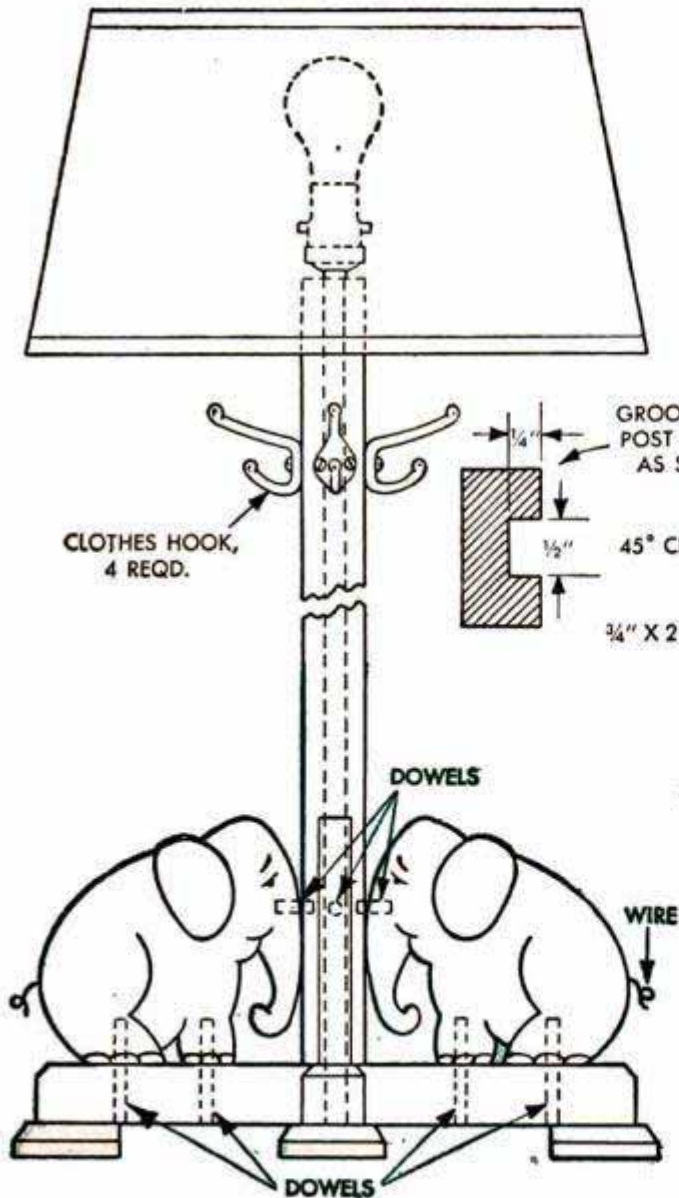
For Children

LITTLE folks soon learn to keep play-rooms in order when they have this novel lamp costumer which not only provides four hangers for child-sized garments but serves as an attractive floor lamp as well. Four elephant cutouts stand patiently on the base with heads bracing the lamp column. Note that the column is made from two strips, each grooved lengthwise to take $\frac{1}{8}$ -in. pipe which holds the assembly together and houses the wire, the strips being glued together to form one piece. Join the parts of the base as shown in the pull-apart detail. Round or chamfer all exposed corners and assemble and wire the lamp as indicated. Bandsaw the elephant cutouts and join them to the base and column with dowels and glue. Paint or stain to suit.

I. M. Fenn, Chicago.



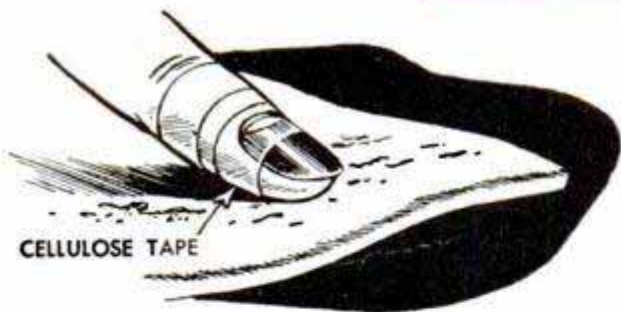
Furniture you can build p 143





FLOWERPOT SAUCERS that are both attractive and waterproof can be made quickly from disks of aluminum foil. Disk is cut slightly larger than base of the pot and formed between two jar lids, crimping the edge

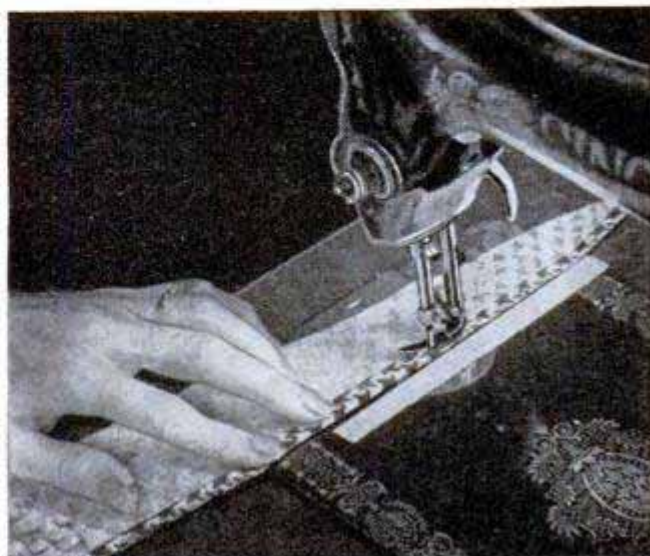
Solving HOME PROBLEMS

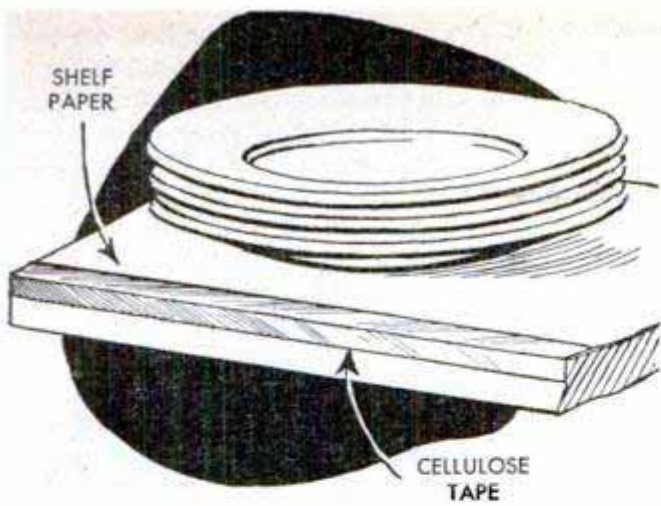


REMOVING LINT FROM CLOTHING is done in a jiffy with cellulose tape. Wrap the tape, sticky side out, around the finger and then stroke the fabric lightly

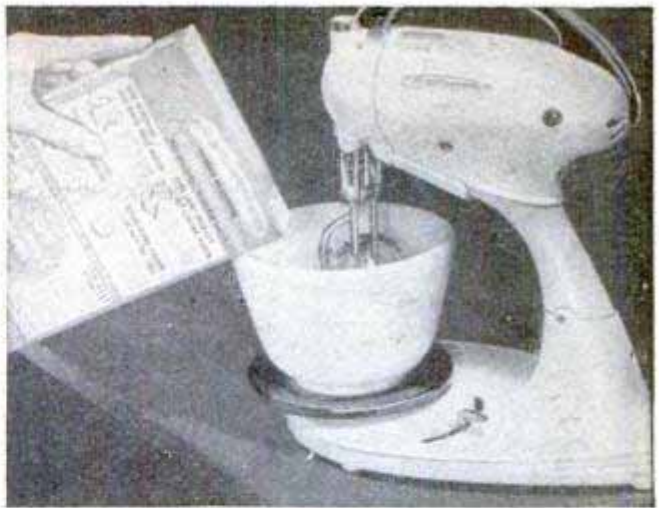
TO INSURE THOROUGH POPPING of popcorn, pour the kernels in a glass jar, cap tightly and chill in the refrigerator for at least an hour before popping

STRAIGHT SEAMS ARE EASY TO SEW if a strip of adhesive tape is used as a guide. Stick the tape to bed of machine and guide seam along edge of tape

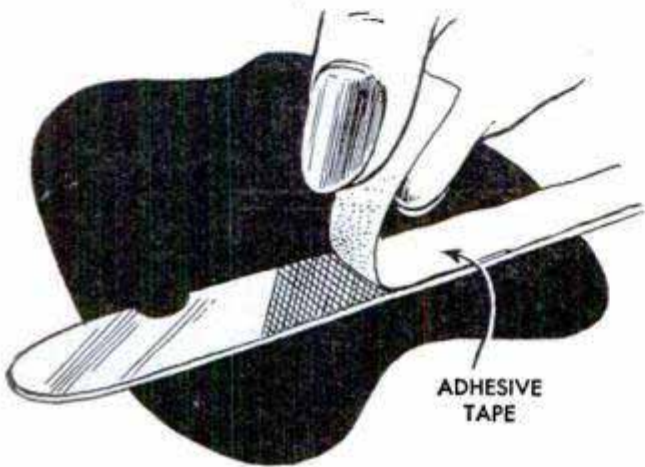




EDGE OF SHELF PAPER REINFORCED with cellulose tape gives longer service without becoming curled or frayed. Tape also minimizes chances of tearing



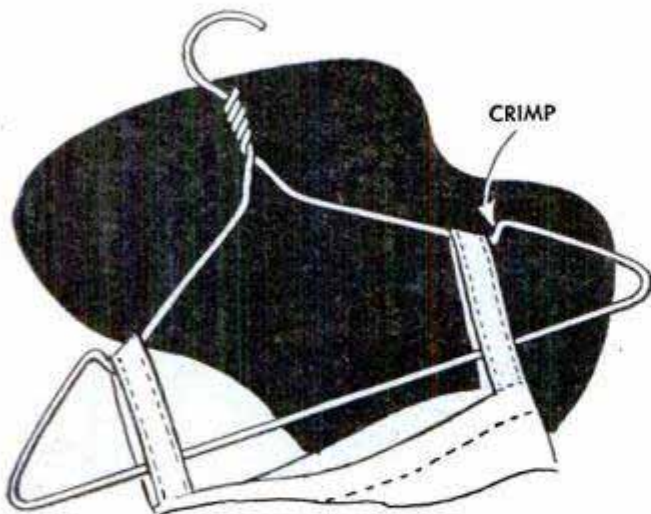
BEATERS CAN BE WASHED right in the bowl of an electric mixer by adding soap-and-water solution to bowl. Run the mixer at low speed



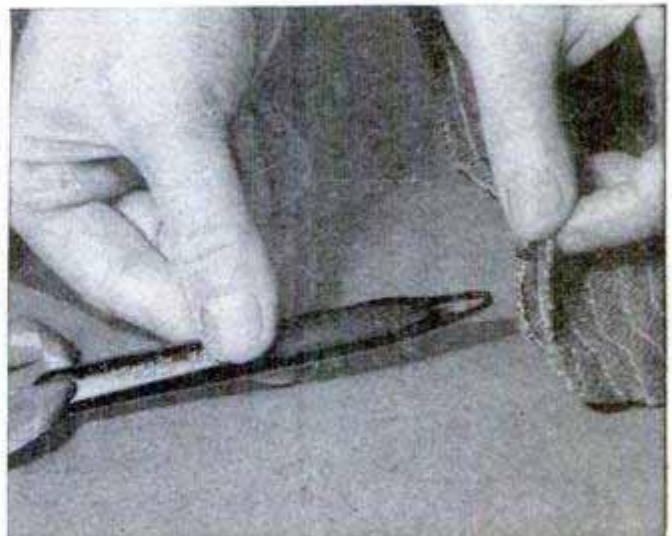
ADHESIVE TAPE CLEANS GRIT from the teeth of a fingernail file. Tape is pressed over the teeth of the file and pulled loose, repeating if necessary



HIDDEN GARBAGE CONTAINERS held with metal brackets on inside of sink doors are out of sight and yet always conveniently at hand



FOR HANGING SLEEVELESS DRESSES, crimp the arms of a wire coat hanger so the straps will not slip off. Wire is crimped easily with a pair of pliers



HANDLE OF DISCARDED TOOTHBRUSH forms excellent tool for threading ribbon through drawstring top. Handle is cut off and rounded

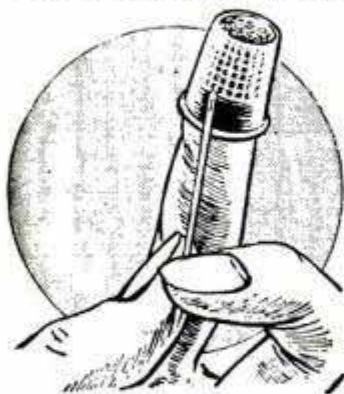
Novelties Lettered With Noodles



Teen-agers in many parts of the country are going overboard for these clever initialed noodle pins. A pin can be made in a few minutes by cementing alphabet noodles to a wooden or colored cardboard backing, the wood being stained or the noodles colored to gain a variety of attractive combinations. Sections cut from ice-cream sticks or small tree branches form excellent backings, or they can be made by gluing together pieces of toothpick cut to the proper length. After the front portion of the pin has been completed, it is cemented to a scrap of wood or plastic. The latter is grooved on the underside and fitted with a safety pin for attaching to the garment.

Frank W. Dresser, Philadelphia, Pa.

Thimble Aids Threading Needle



Holding the eye of a needle against a yellow or white thimble makes the opening easier to see for threading. The light-colored background will be sharply visible against the metal surrounding the needle eye.

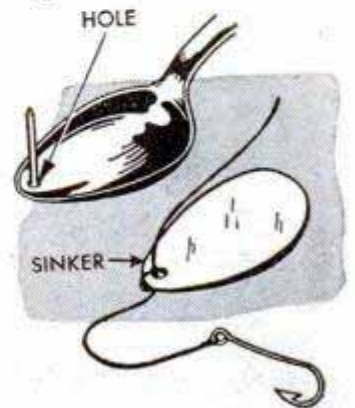
Salt Removes Fresh Ink Stains

It's a good idea to keep a container of table salt in one of the drawers of your writing desk, as the salt can be used to remove ink stains providing it is applied im-

mediately. As soon as ink is spilled on the rug, sprinkle the spot liberally with salt. After the salt has soaked up a considerable amount of the ink it is swept up and fresh salt applied to the spot. The second application of salt is removed and then foamy rug cleaner is applied to the remaining spot. Even stains from permanent-type inks can be removed if this treatment is applied before the ink has had a chance to dry.

Teaspoon Forms Perfect Mold For Casting Fishing Sinkers

Filling an old aluminum or steel teaspoon with molten lead is a quick way of making snagproof sinkers. First drill a hole near the tip of the spoon and press a nail through the hole from the underside. The nail should be a snug fit in the hole. Pour the lead into the spoon and, after it hardens, pull out the nail with pliers. Then tap the lead from the spoon and you will have an oval-shaped sinker with a hole for the line near one end. If still larger sinkers are desired, use a tablespoon for the mold.



Striped Luggage Identified Quickly

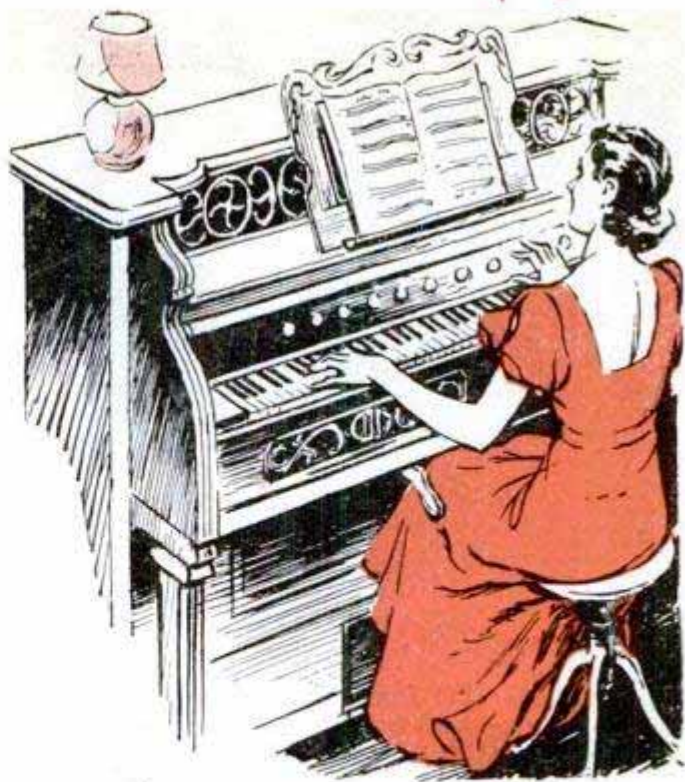
To save time and confusion when retrieving your luggage at an airport or railroad station, mark both ends of each bag with a clearly visible stripe. If the stripes are located the same distance from the bottom on all pieces, the group of luggage is extremely easy to spot, as shown in the photo. Use white or colored cloth-tape or aluminum paint and make the stripes wide enough to be unmistakably identified from a considerable distance.

Robert Hertzberg, Jackson Heights, N. Y.

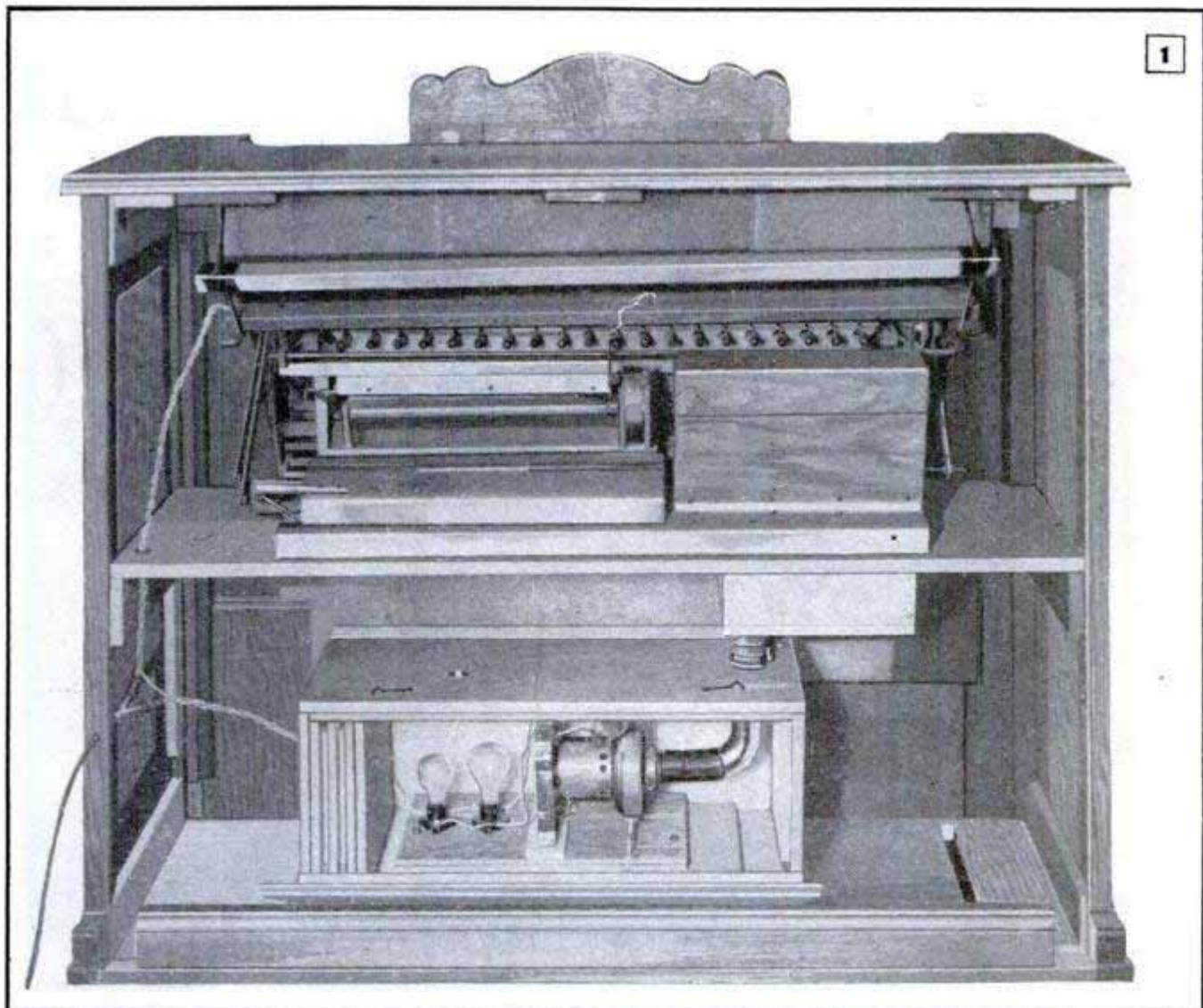


Motorizing An Old REED ORGAN

WHY PERMIT that heirloom organ to gather dust in the storeroom or basement when you can easily motorize the foot-operated bellows mechanism and enjoy reed-organ music at its best? On most old organs of the foot-operated type very few changes are necessary to adapt the instrument to a motor-driven bellows. You'll need a vacuum-cleaner motor of the type having the fan housing attached directly to the motor housing, as shown in Figs. 1 and 4. It's a good idea to have this unit on hand before you begin work. Then turn out the screws that hold the back of the organ cabinet in place and remove the back entirely so that you can get at the works from both the front and back of the cabinet. Nearly all old organs are fitted with two bellows, a large and small one, mounted separately. Remove these carefully to avoid damaging any other parts. Usually, the reed-and-valve



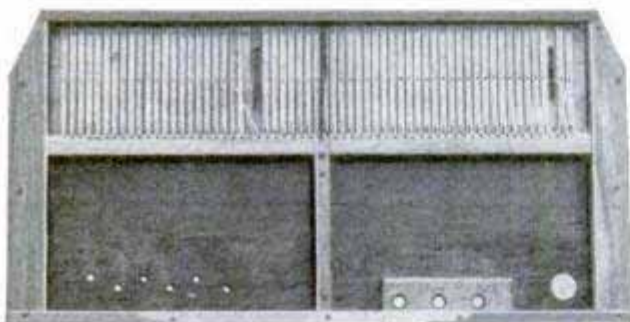
On old organs of the type shown below, air was supplied to the reeds by pumping the treadles. Very few basic changes are necessary to install a motor-driven exhaust blower, thus relieving the organist of the labor of operating the bellows by foot power alone





2

The opening in the front of the organ where the pedals were removed is filled in with wood finished to match the rest of the cabinet as closely as possible

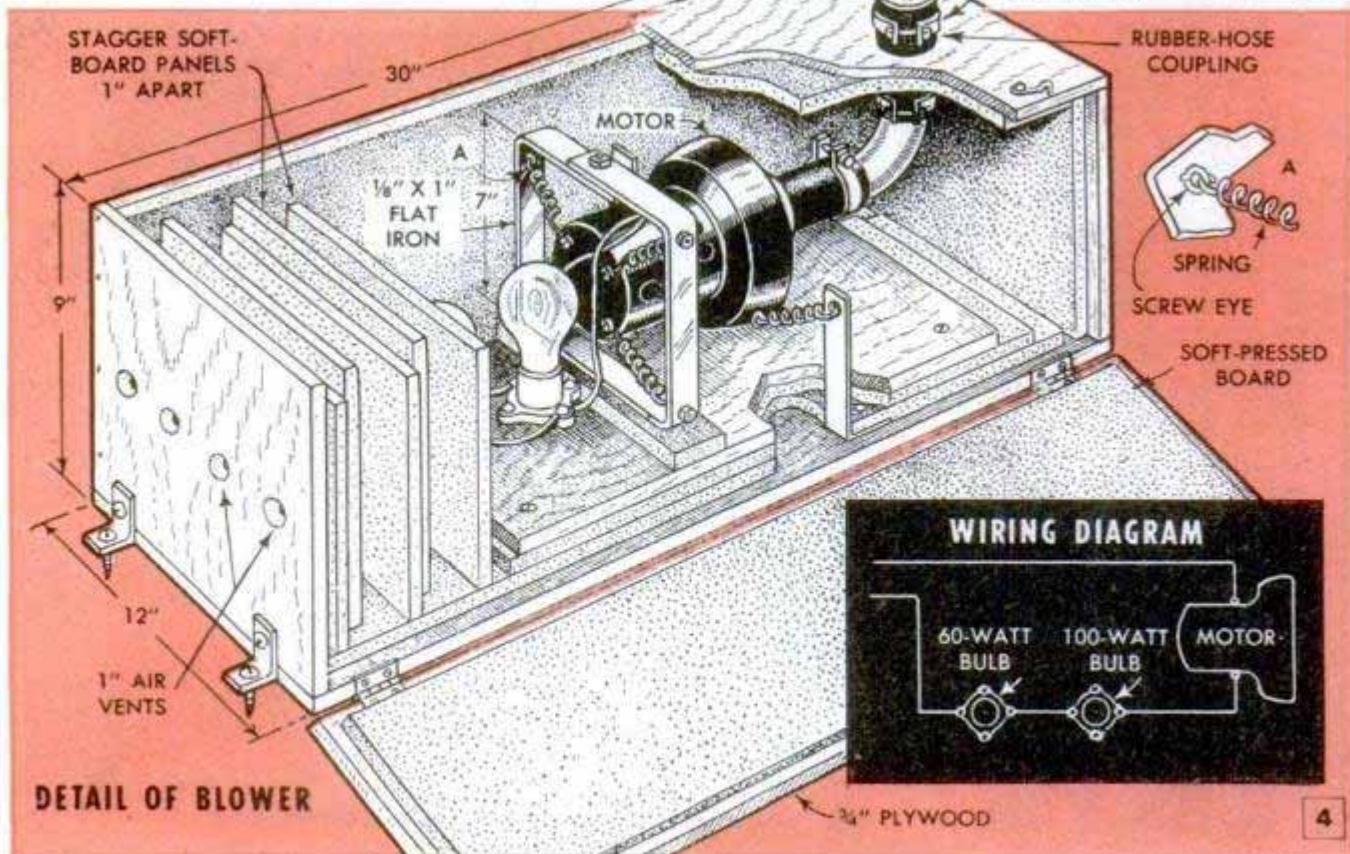
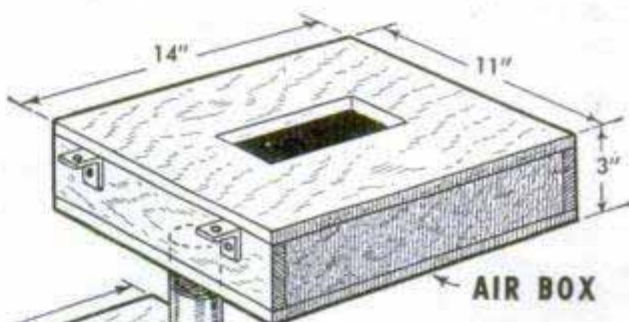


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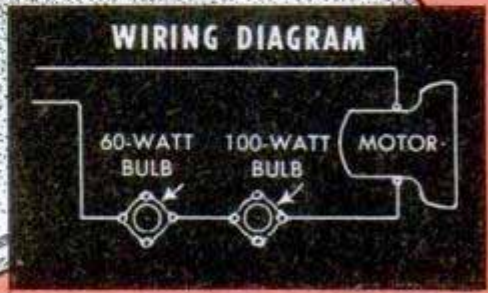
Above, the underside of the valve-and-reed shelf must be covered with a plywood panel to replace old bellows assembly. Below, blower unit is shown

assembly and also the air duct, Fig. 3, are supported by the bellows frame. This must be covered on the underside with a 1/4-in.-plywood panel. When removing the bellows it may be necessary to prop or brace the reed assembly and the air duct temporarily in place. The air duct originally provided for passage of air from the reeds and it is essential to retain this unit intact. Be especially careful not to damage it during removal.

In the conversion to motorized operation, both the air duct and the reed assembly are supported on a plywood shelf installed in the cabinet as in Fig. 1. The shelf is supported on cleats screwed to the ends of the cabinet. An opening is cut through the shelf to permit air to pass from the air duct to the air box, or wind box, from which it is withdrawn by the vacuum-cleaner unit and exhausted through a labyrinth as in Fig. 4. A new air box must be made as in the upper detail in Fig. 4. It must be of airtight construction and the opening should be dimensioned according to the requirements of the particular organ you have. Bore a



DETAIL OF BLOWER



4

hole in the bottom of the air box near one end and force-fit a short length of 2-in. thin-wall brass tubing in the hole. Then glue and screw the box to the bottom of the shelf as in Fig. 1. Just how the air duct and reed assembly are attached to the shelf will depend on the construction of these units. If possible, attach the parts to the shelf with screws and glue. In any case, the joint must be made airtight; if no other method can be used, apply adhesive tape to close open joints.

Fig. 4 details the construction of the blower unit. First, build a plywood box of approximately the dimensions given (these may have to be altered somewhat to suit the space available) and line it, top, bottom, ends and sides, with softboard as shown. The motor unit is spring-mounted in flat-iron brackets attached to the auxiliary plywood bottom of the box. In attaching the coil springs to the motor, it may be necessary to drill and tap the end housing for small screws. Detail A shows how the springs are attached in the four corners of the rectangular bracket. The fan housing is supported on two coil springs attached by means of short screws inserted through the spring eyes and turned into holes drilled and tapped in the bottom of the housing. Build the labyrinth in one end of the box as shown and drill four 1-in. air vents in the end of the box. Then wire the motor as in the wiring diagram. The 60 and 100-watt lamp bulbs are wired in the circuit to serve as resistors and reduce the speed of the motor. The motor is controlled by a toggle switch mounted on a panel near the keyboard within easy reach of the organist. Locate the blower unit in the bottom of the cabinet and anchor it firmly with screws driven through angle brackets. Connect the air box to the blower with light rubber hose and an elbow as shown in Fig. 4. Then replace the back panel.

The treadle opening in the front of the organ cabinet should be closed with a single panel cut from wood that can be finished to match the cabinet, Fig. 2. As a rule, the organ cabinet will require refinishing and generally one will be well repaid for the extra work as the cabinets of the better-grade instruments were made from fine cabinet woods with elaborately carved and scrolled parts. In refinishing, remove front panels, the music rack, keyboard cover and other parts readily removable and finish these separately. Usually, refinishing is simply a matter of softening the old finish with a suitable varnish remover and then scraping, sanding, staining and varnishing the parts to restore the original grain and color of the wood. Of course, if the wood is open-grained, such as oak or walnut, it may also be necessary to apply a wood filler.

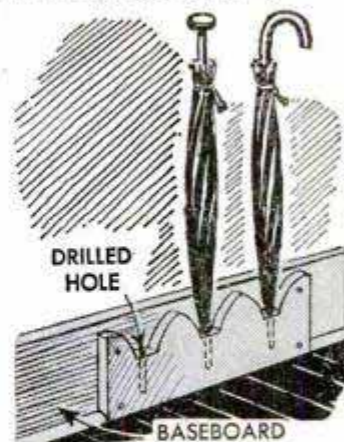
Brush Container of Clear Plastic Permits Even Drying



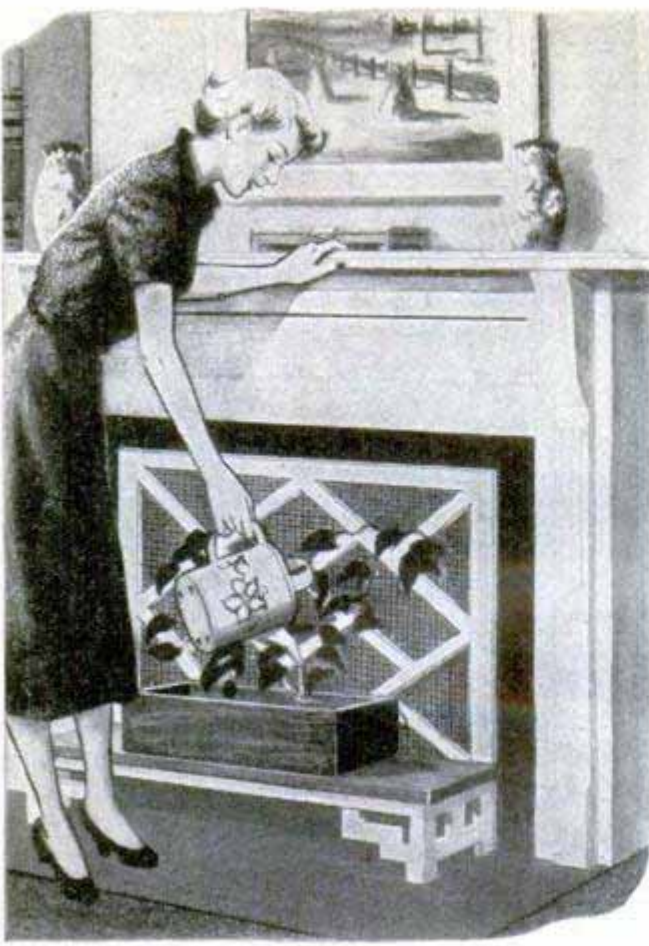
This handy container of clear plastic stores artist's brushes horizontally so they will dry without paint seepage into the ferrule. The box is ventilated to speed drying and, being transparent, allows the contents to be seen at a glance. The box is made from sheet plastic bent around two endpieces and cemented in place. The plastic lid slides in grooves cut lengthwise in the sides of the container just above the endpieces. The grooves are cut before bending the plastic. Note that ventholes are drilled in one end of the lid and a small block of plastic is cemented near the other end to provide a handle to facilitate opening the lid.

Umbrella Rack for Baseboard

A neat-appearing and convenient umbrella rack is had in a jiffy by nailing a length of board to the baseboard of the front hall or closet. The board is band-sawed as shown and drilled between the scallops to receive the umbrella tips. The bottom edge of the rack can be shaped to fit over the shoe mold or the latter can be cut away so the rack fits flush with the flooring. After installation, the rack is painted to match the baseboard. Be sure that the umbrellas are completely dry before standing them in this rack.

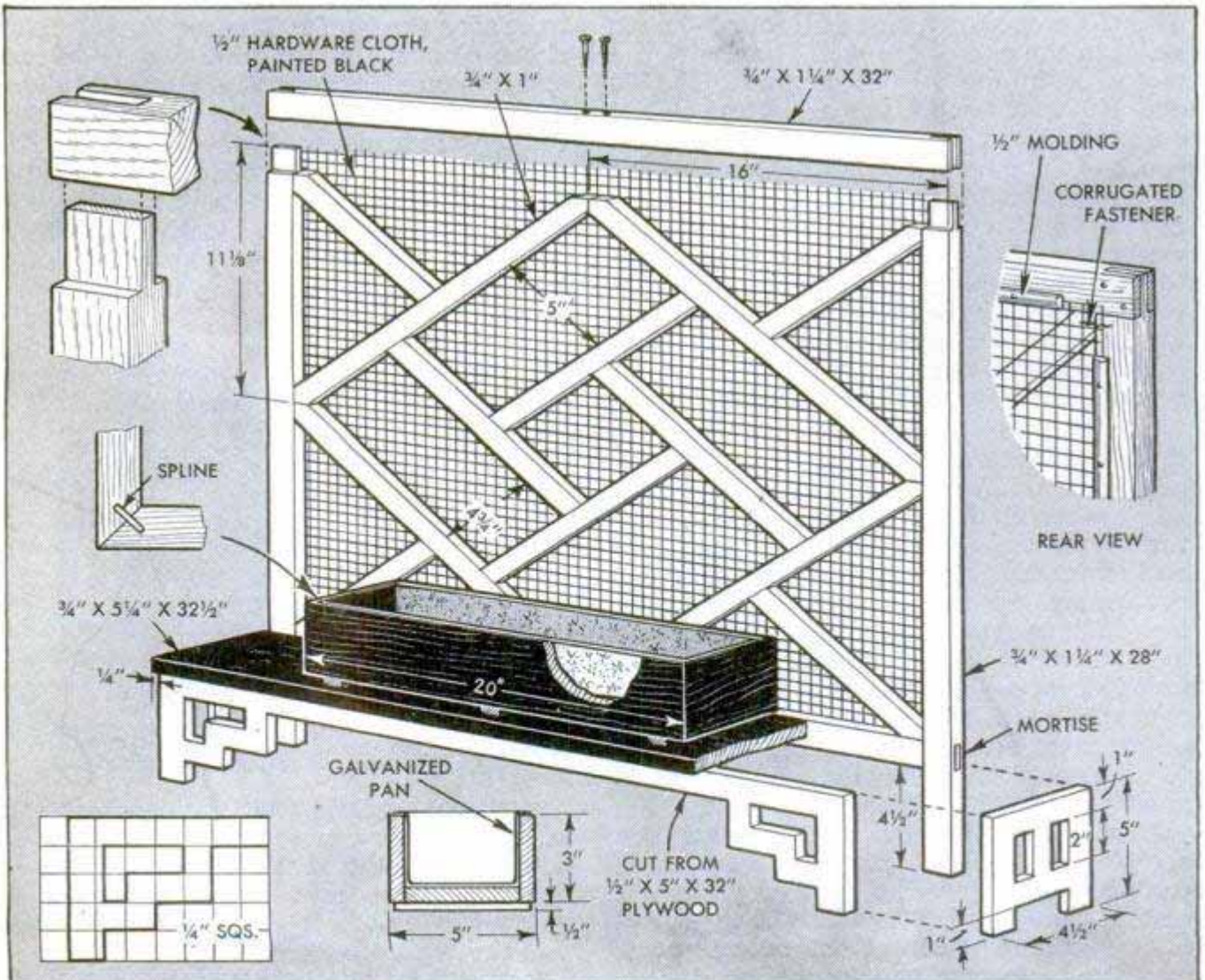


Chinese-Modern "FIRE SCREEN"



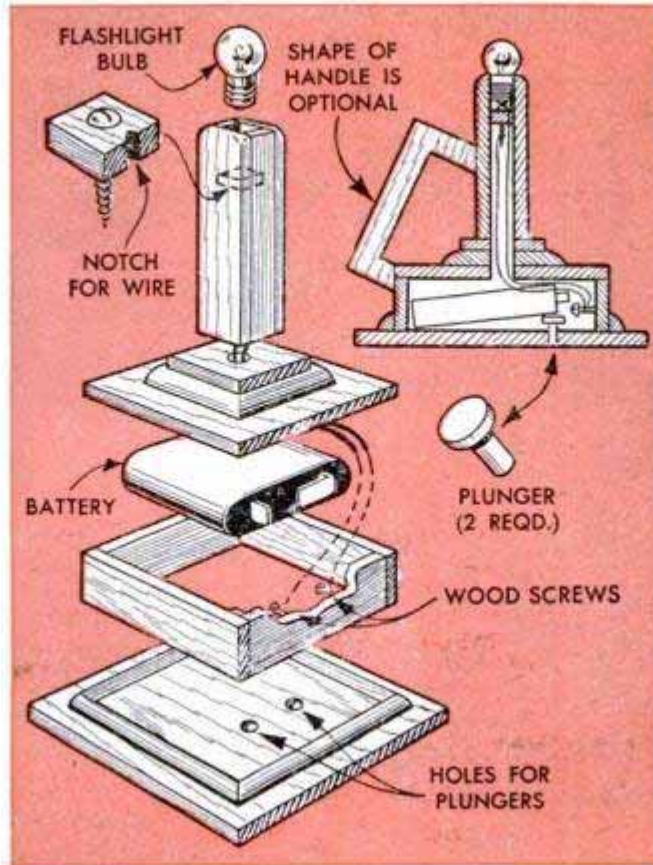
FROM a decorative standpoint, the blackened interior of an unused fireplace is an eyesore, especially during spring and summer months when color is necessary to give a new lift to old surroundings. That's when you need this attractive trellis "fire screen" to camouflage the opening. Chinese in motif both in color and design, the screen, when augmented with a growing or artificial vine, provides a smart summer treatment for an uninviting fireplace. The outer framework of the trellis is mortised at the corners. Then the diamond shape in the center is fastened with long screws and the remaining parts with corrugated fasteners. The back of the trellis is covered with hardware cloth which is painted black to contrast with a Chinese-red framework. The base and shelf of the screen are cut from plywood, and the wooden flower box, mitered and splined at the corners, is fitted with a copper lining. The flower box and shelf are painted black to set off the red.

Furniture You Can Build p. 23



Kept within easy reach on a bedside table, this handy little night light turns on as soon as it is lifted. Two plungers fitted in the base raise the battery away from the contacts when the light is resting on the table. When it is picked up, the plungers drop and lower the battery, allowing the terminals to make contact. No dimensions for the lamp are given, as these are determined by the size of the battery used. Note, however, that there must be no side play for the battery so the terminals will not slip off the brass-screw contacts. Also, the height of the battery case must be sufficient to permit the battery terminals to clear the contacts completely. On this type of battery, one terminal usually will extend across

Novel Night Light With Convenient Handle Is Switched on Automatically When Lifted

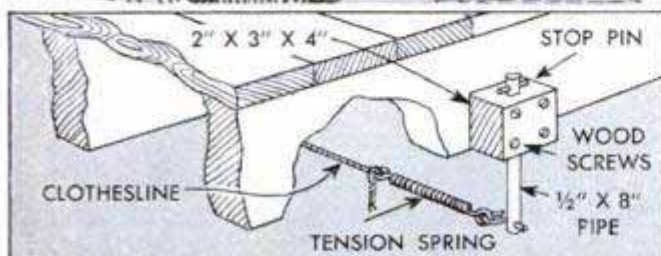
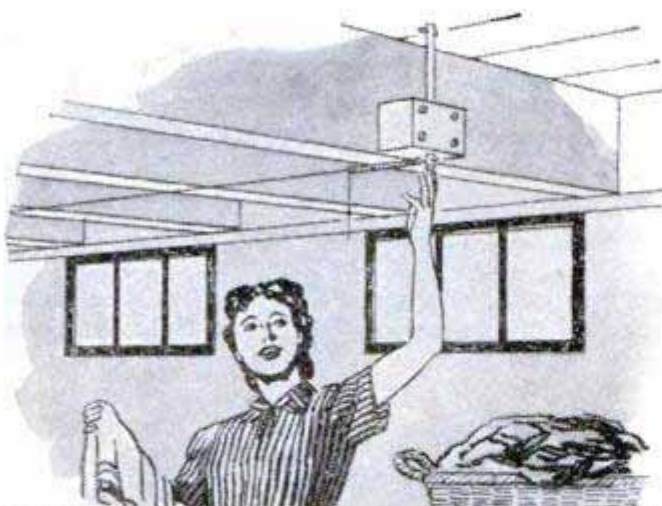


the face to the second terminal, and the long one should be cut off as shown. The contact for the base of the flashlight bulb is a brass wood screw driven through a square piece of wood which is glued inside the lamp upright. The wood is notched for a wire which makes contact with the threaded portion of the bulb. The entire

unit is of simple box-type construction and can be made of plywood or scraps of solid stock, using quarter-round beading to enhance the design. The plungers can be turned from wood or metal or made by gluing a disk cut from a 1/2-in. dowel to a length of 3/16-in. dowel.

Peter Adamidis, Cairo, Egypt.

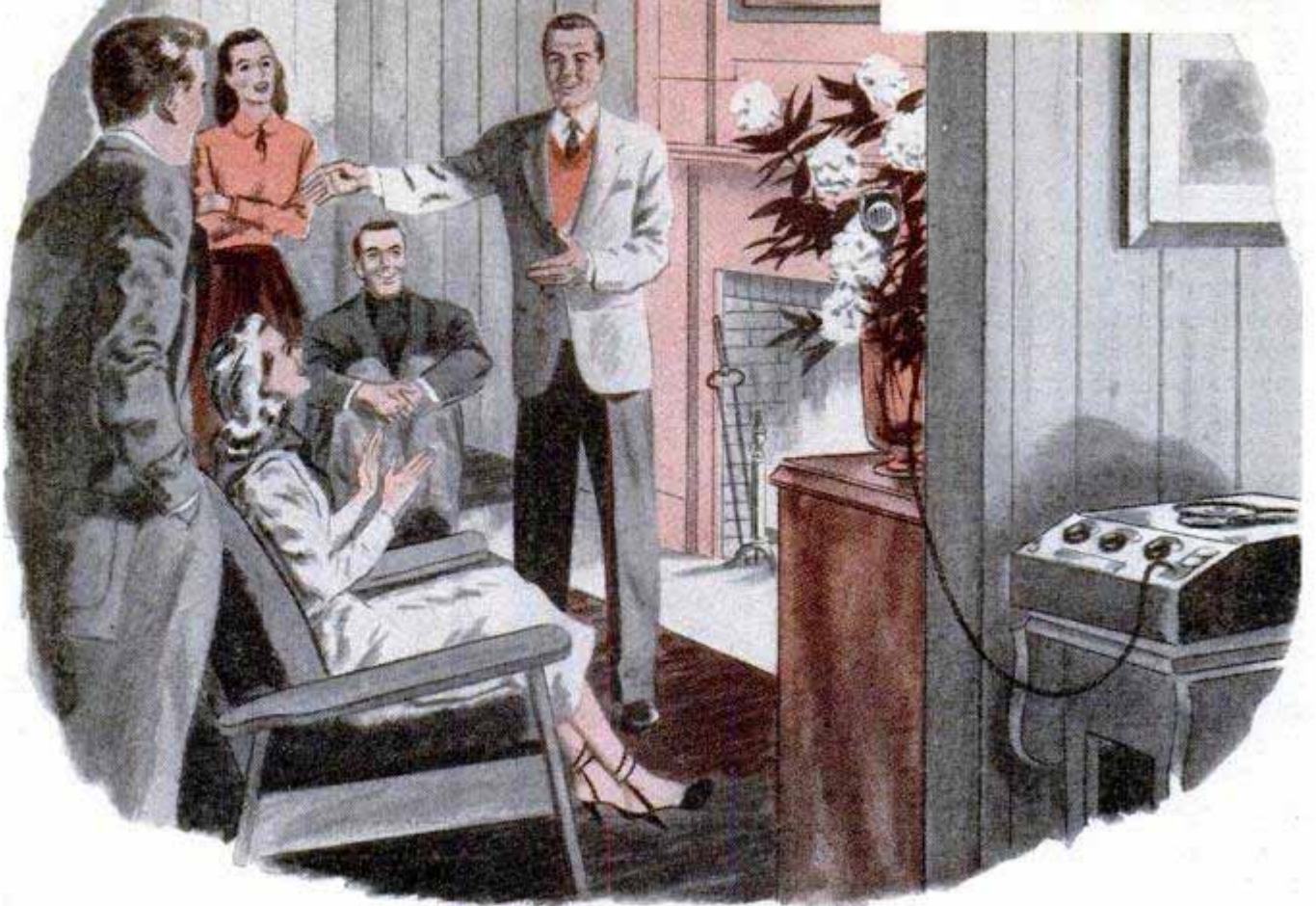
Retractable Clothesline for Low Basement Stored Against Ceiling Joists



If there is not room in the basement for a separate area used exclusively for hanging wash, it usually means that the clothesline must be taken down after every washing. To save time, one homeowner installed this retractable clothesline which is a permanent installation and is merely pushed up against the ceiling joists and out of the way after the wash is taken down. Each end of the line is fastened to a length of pipe which slides up and down in a wooden hanger. The latter is a piece of 2 x 4 drilled for the pipe and mounted on the side of a joist with wood screws. A stop pin keeps the pipe from being pulled out of the hanger. Note that a tension spring is installed at one end between the line and the pipe to hold the line taut.

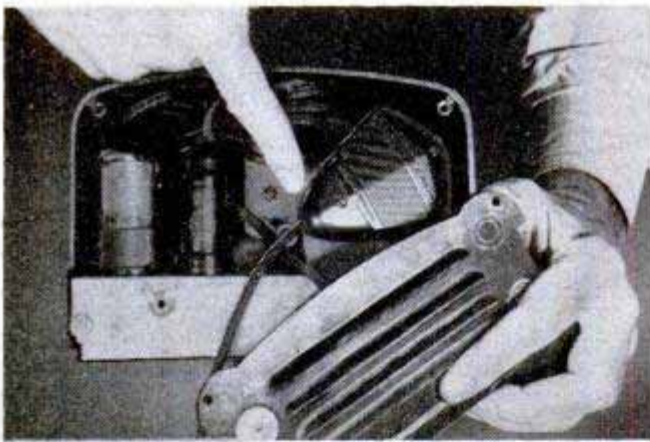
Joseph L. Jehlicka, Chicago.

☐ The interior of a refrigerator can be deodorized by washing it with soapy water containing a teaspoonful of dry mustard.

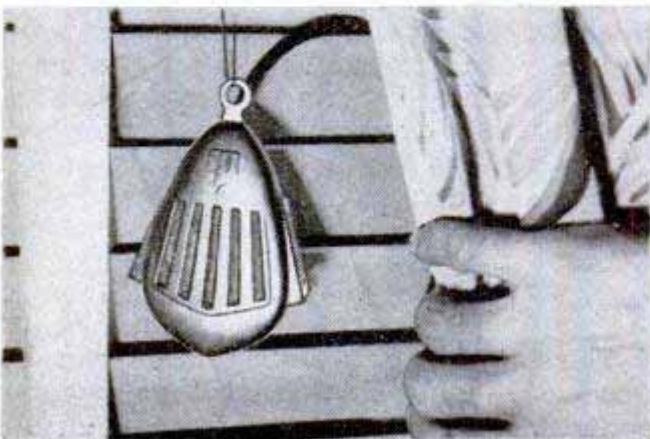


By M. G. Winterton

AS A SURPRISING climax to your next informal party, play back a candid recording of the evening's conversation. Without a doubt the playback will provide some lively entertainment, especially if you have carefully planned the recording beforehand. Of course, in making candid recordings the trick is to carry out the whole procedure undetected by your guests. With a small group this is easy to do, but recording large groups requires a planned program. Acting as host, you also can fill in as master of ceremonies, directing the conversation to hold the attention of all and keep them grouped together before the concealed microphone. Usually the recorder can be located in an adjoining room where it is not likely to be discovered, but concealing the mike in the average home calls for some ingenuity. Sometimes a small radio set will solve the problem. Just remove the back of the cabinet, fold the radio cord inside, place the mike in the cabinet and there you are. Floor-length draperies and draw curtains offer good hiding places for both mike and cord. The cord is not likely to attract attention if carefully placed along the baseboard, around a doorjamb or run from the wall outlet to the radio set in



Above, often a small radio set can be used to conceal the microphone. The radio power cord is folded and placed in the cabinet and the mike cord takes its place. Below, draperies hide the mike effectively

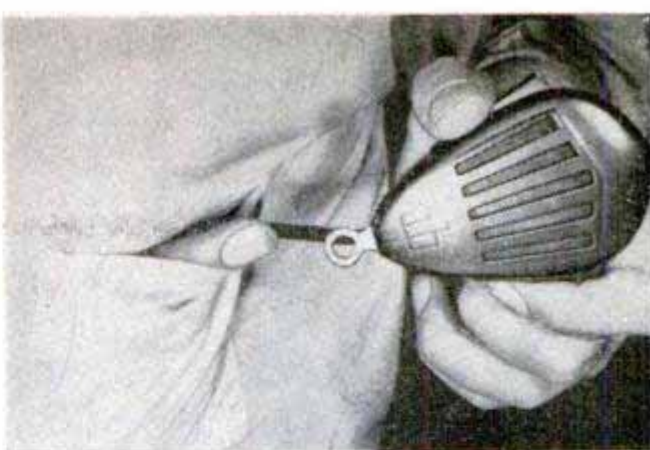


RECORDINGS

which the mike is hidden. If any of the guests attempts to turn on the radio you can always explain blandly that the set is temporarily out of order.

Ordinarily, a lamp offers the best place for concealing the microphone, particularly if it is a small lamp of the novelty type. It can be placed anywhere in the room, and, even if unlighted, it is the least likely of any of the common household objects to attract the attention of the guest who may suspect that you are up to something unusual. Methods of concealing the microphone will depend on the construction of both the lamp and the microphone, but the photos at the right suggest two practical ways of doing it. In one instance, a dummy "lamp" is made from the mike stand by covering the base of the stand with the bottom cut from a tin can. The column of the stand is covered with a decorated paper tube and the setup is finished off with a small cloth lamp shade. The open top of the shade is covered with matching cloth. Another method makes use of a novelty lamp with a tubular shade. Fold the lamp cord into the base and attach a wire bracket to the base in such a way that it will provide a support to which the mike can be fastened with a rubber band. On some occasions it is possible to conceal the mike in your shirt pocket. This works especially well when recording conversation of the players and comment of the kibitzers at a lively card game and for picking up idle, off-the-record chatter around the basement playroom. Here, you either must be seated or standing behind a table or counter in order that the mike cord can be concealed in the clothing.

Although the microphone, which comes with the recorder as standard equipment, generally can be used for candid recording, the nondirectional mike is more versatile, as it will pick up sound from all directions. Of course, distance and background noise must be considered in planning the setup. The flat, semidirectional mike, shown in several of the photos, also is satisfactory where the sound comes from one general direction over a wide angle, as from a large group. In handling larger groups, try to locate the concealed mike so that everyone present can be induced to cut his share of the record at relatively close range. At large gatherings it seldom is practical to record everything being said at any one time. Although not essential for good recording, a preamplifier, shown in one of the photos, will increase the range of the recording set.



A small mike can be concealed in your shirt pocket. Cut a small slit inside the pocket for the mike cord



For candid recordings of small groups, mikes mounted on stands usually are disguised as occasional lamps

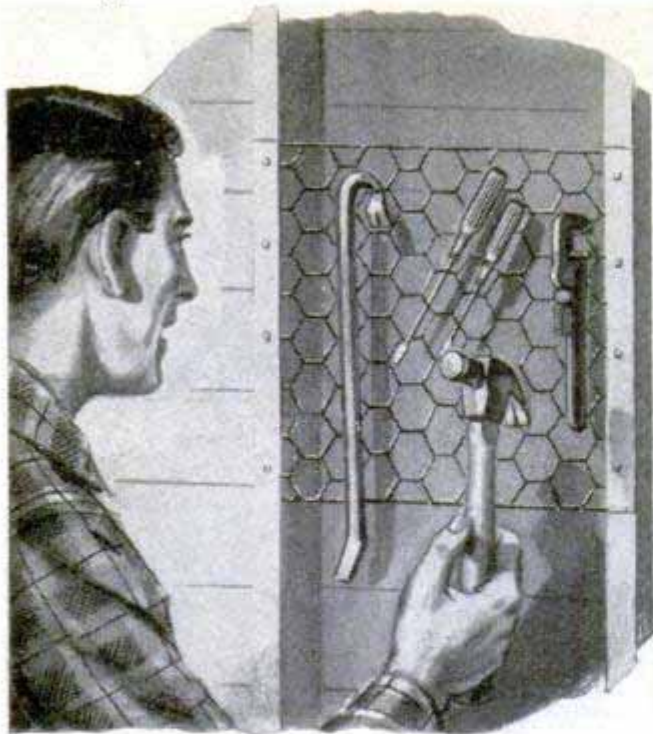


Above, a novelty lamp is just the thing for concealing the mike. Hide the lamp cord in the base as shown

Below, sometimes a preamplifier can be used to good advantage to increase the range of the microphone



Poultry Wire Forms Tool Rack



Fastened to the studs of a garage wall, a piece of poultry wire provides a handy rack for hammers, wrenches and other hand tools. Even screwdrivers and chisels can be hung on the rack by threading their blades between the sections of the wire. The wire is held in place by thin wooden strips nailed to the edges of the studs so that the nails engage the wire mesh.

Coloring Easter Eggs Facilitated By Ring-Type Dipper



You can do a better job when coloring Easter eggs by dipping them with a simple rack bent from stiff wire. Most of the excess dye will drain from the egg when it is removed from the solution, minimizing the dark rings that

otherwise form when the egg is placed on a paper or cloth to dry. Using scraps of wire or sections cut from wire coat hangers, form one rack for each color of dye to be used.—R. F. Donovan, Jersey City, N.J.

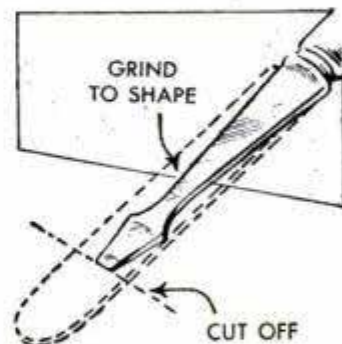
Lengthening Rivets for Reuse

When repairing a camera tripod, I discovered that new rivets of the proper size could not be purchased. As the old rivets were removed by filing off their heads, each one was shortened by approximately the diameter of the shank. I was able to reuse

them by laying each rivet on a small anvil and using a light machinist's hammer to lengthen it by hammering the center portion of the shank. No hammering was done near either end of the rivet, so the only reduction in diameter was near the center. This method, of course, can be used only on rivets that are long enough to make hammering practicable.—Ed Packer, Chicago.

Screwdriver Made From Knife

Instead of throwing away a broken or worn out kitchen knife, use it to provide an extra screwdriver for the shop. Cut the knife blade to the desired length and grind the remaining portion to shape, making the tip of the blade the required size.



S. S. Palestrant, Bronx, N.Y.

Ribbon Sewed to Handbag Holds Door Keys

To eliminate rummaging through your handbag for the house-door keys, tie them to a ribbon so they can be pulled from the bag in a moment. Select a ribbon that matches the handbag and loop one end around the handle, sewing it tightly in place. Then thread the keys on the ribbon or lace them to the free end. The ribbon should be long enough to permit inserting the key in the lock without difficulty.

Michael Ligocki, Gary, Ind.



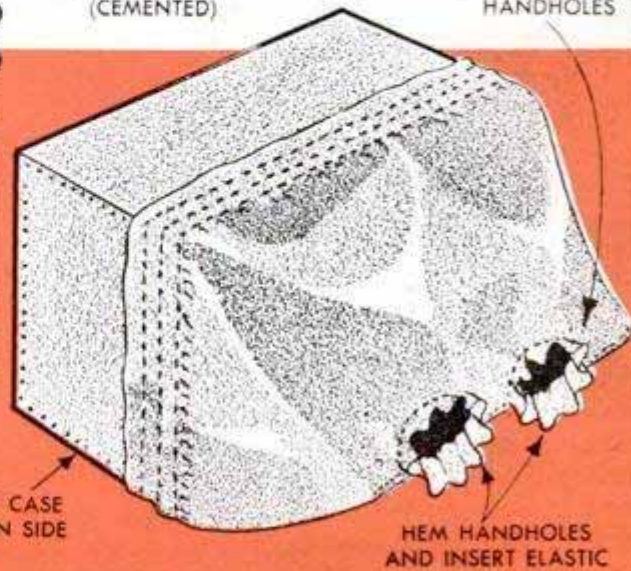
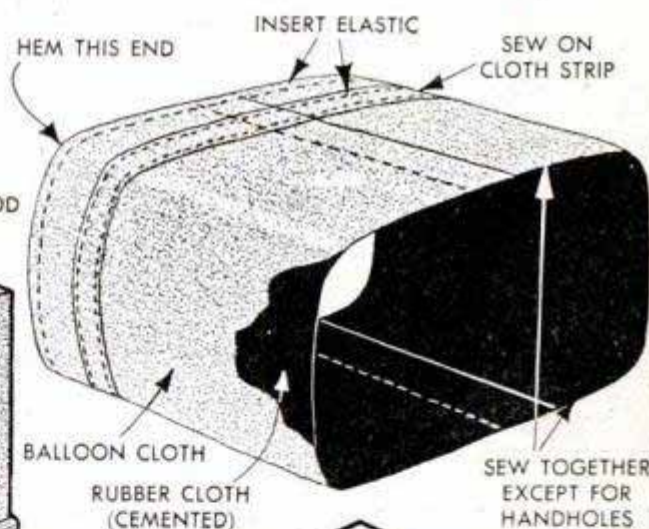
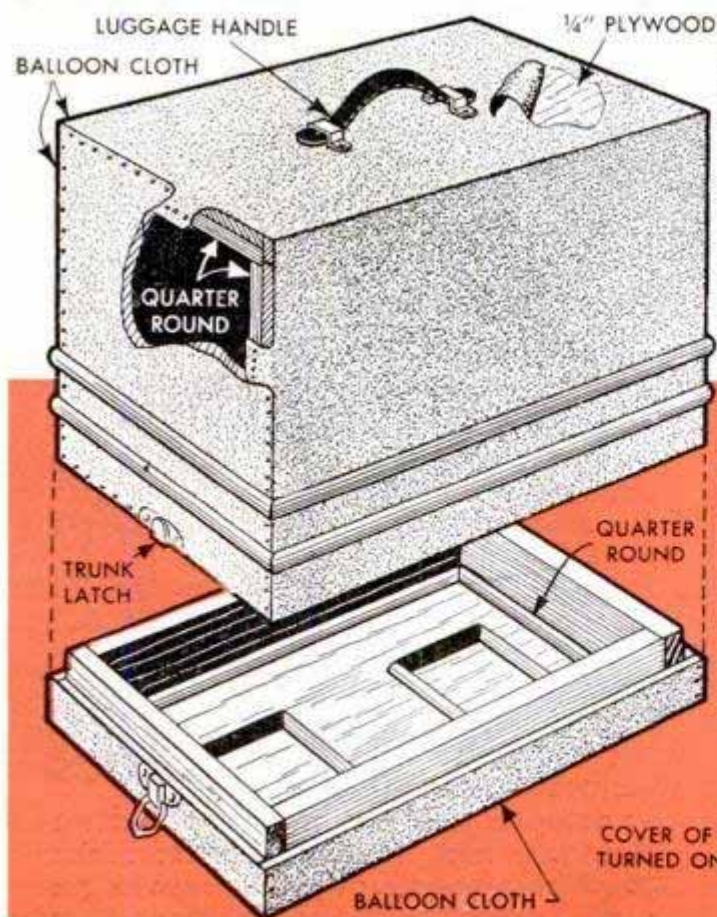
On-the-Spot DARKROOM

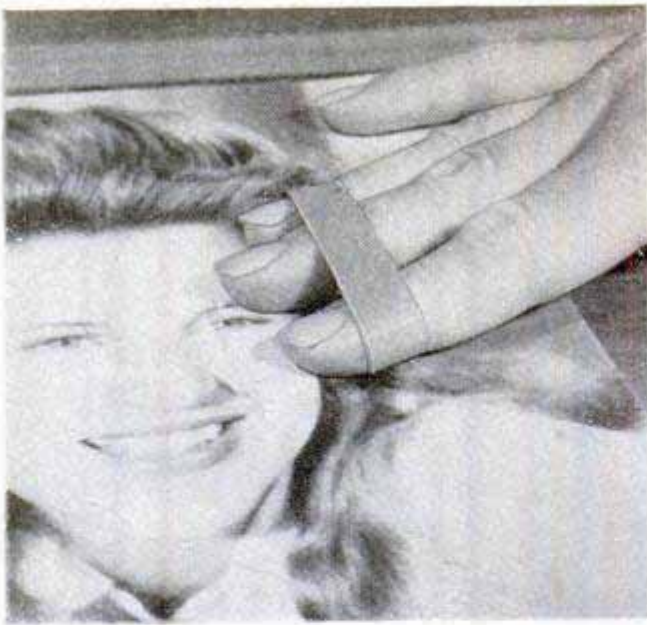
WHEN it is important that you come back with a picture and the chance of retaking the same shot later is out of the question, an on-the-spot darkroom will enable you to see the results right away. This portable one doubles as a carrying case for all the processing equipment needed, with room to spare for the camera. The details below show how the two-part case is built from $\frac{1}{4}$ -in. plywood and made light-tight by covering the outside with balloon cloth. Elastic in the hem around the handholes makes the trap lightproof and allows the film to be loaded into the tank without the slightest danger of fogging it.

Austin H. Phelps, Omaha, Neb.



In any photographic work requiring the developing of exposed film on the spot, a portable darkroom unit of camera-case size is an essential part of the photographer's equipment. This one provides both developing facilities and space for camera and film





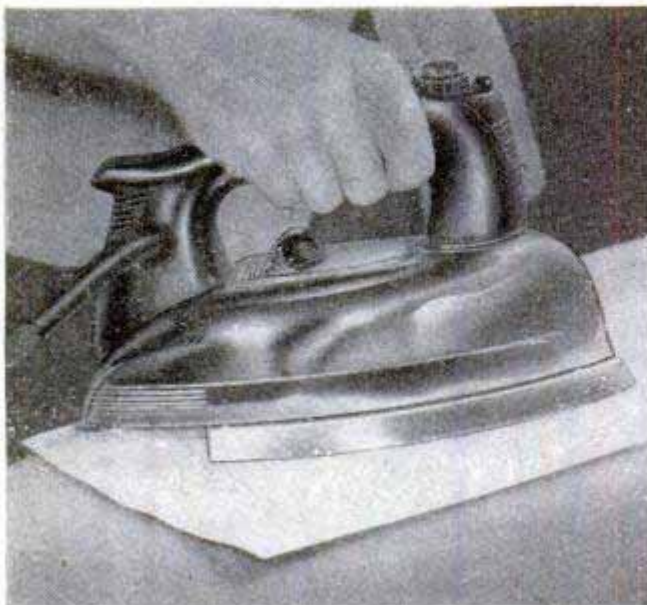
Removing Lint From Matte Prints

Lint from drying blotters sometimes sticks so tightly to the surface of matte prints that it is almost impossible to brush off. A quick way to remove these stubborn particles of lint is to tap the surface of the print gently with the sticky side of a strip of cellulose tape. The tape can be handled easily if wrapped around the fingers as shown in the photo.

Virginia Hanson, Santa Monica, Calif.

Curled Prints Pressed Flat With Household Iron

If your darkroom equipment for processing photos at home does not include an electric print drier, the household iron can be put to work to press the curl out of blotter-dried prints. Simply place the print face down on the ironing board and press the back with a medium-warm iron. If a steam-type iron is used, the result will be a print as flat as starched clothing.



Baking Soda Neutralizes Hypo In Developing Tank

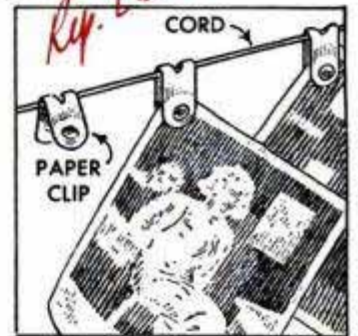
To make sure that any traces of hypo left in a roll-film tank will not contaminate the developer the next time the tank is used, I always rinse the tank with baking soda before putting it away. To do this, place a pinch of common baking soda in the tank, fill it with water and place the reel in the tank. Let it stand for a few moments and then wash the tank and reel in running water. Washing will usually remove all traces of soda, but even if some remains, the soda will not contaminate the developer as will the acid from hypo.

Richard Hanscom, Elmhurst, Ill.



Paper Clips Furnish Hangers For Drying Negatives

When drying a number of cut-film negatives, use paper clips to suspend them from a length of cord. These clips are inexpensive, and are easily slipped over the cord and clamped to the negative. Also, they make a smaller hole in the corner of the film than standard hangers.—Jeanne Stasack, Chicago.



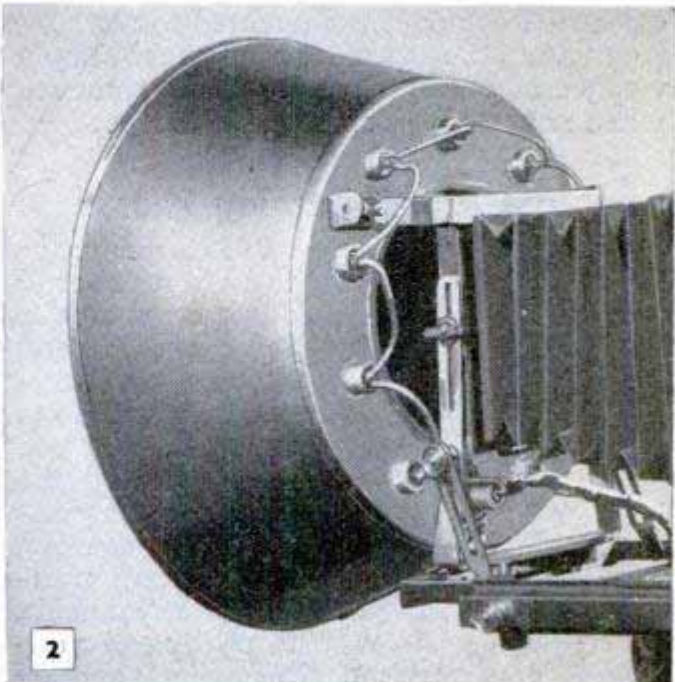
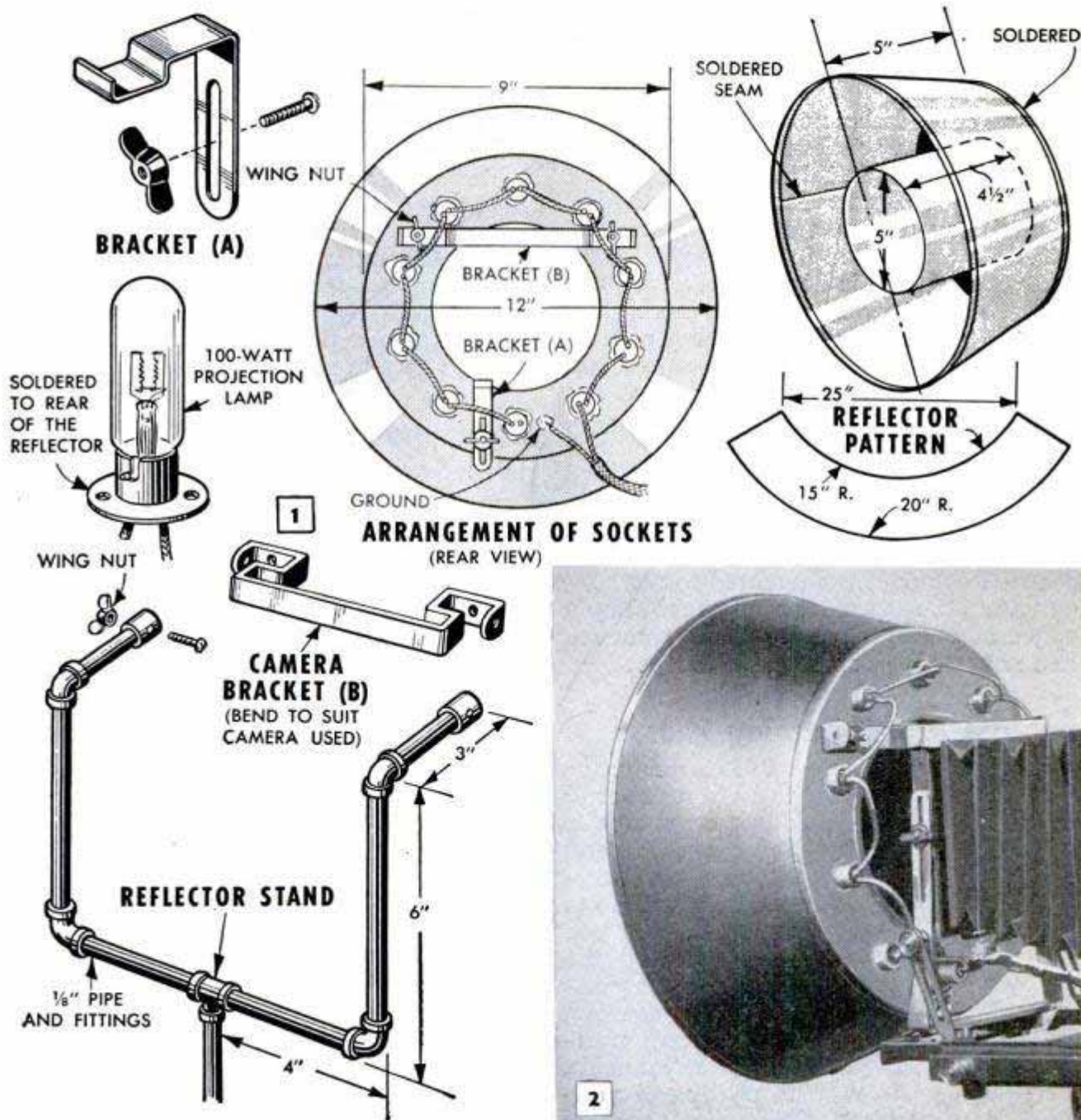
Wax Paper Seals Developer Bottle To Prevent Rapid Deterioration

Few persons realize how rapidly stock developer deteriorates when the bottle in which it is stored is not capped tightly. Contamination from the metal cap itself, caused by corrosive action of the chemical, also contributes to early deterioration. A simple way to assure a tight seal and protect against corrosion is to place a couple of pieces of wax paper over the mouth of the bottle before capping.

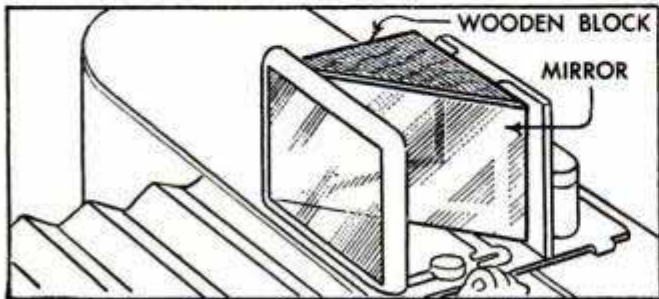


SHADOWLESS REFLECTOR

There are no harsh shadows in your pictures when you shoot them through this "cake pan" photo reflector. Encircling the lens, the reflector floods the subject evenly from all angles. The original was designed to hang right on the tilting front of a view camera, Fig. 2, by means of brackets A and B, Fig. 1. However, a floor stand of $\frac{1}{8}$ -in. pipe and fittings can be made to support the reflector in front of the camera. In either case, bracket B is bolted to the rear side of the reflector as shown in Fig. 1. Ten auto taillight sockets are installed in the bottom of the reflector. Holes are made for these in the metal and also in an insulating ring of sheet asbestos which is pressed in the bottom of the reflector before the sockets are soldered in place. Note how the sockets are wired in series, using regular asbestos heater cord. Each socket is fitted with a 100 or 300-watt projection lamp.—Del Naylor, Chicago.



Auxiliary Right-Angle Viewer Makes Candid Shots Easy



Taking candid shots of camera-shy children and adults without their knowledge is a lot of fun with this little right-angle viewer. Inserted in the regular view finder, the auxiliary one permits the camera to be focused and aimed in the normal manner, except that it is done from a side position. To the unwary subject, this makes it appear that the camera is being pointed in another direction. Thus, the subjects are completely at ease, their expressions are natural and their antics sometimes are surprisingly funny. The viewer consists of a small triangular-shaped block of wood which is cut to fit the camera view finder. One face is cut at a 45-deg. angle and a small piece of mirror taken from a woman's discarded compact is cemented to the surface. As the auxiliary viewer simply wedges in place, it can be easily removed when not used.—Bob Hurst, Chicago.

Template Aids Trimming Photos



If it is necessary to cut a number of different photos to the same size and shape, use a sheet-plastic template to speed the job and save marking the print. As the plastic is transparent, it is easily positioned on the print. A coating of rubber cement applied

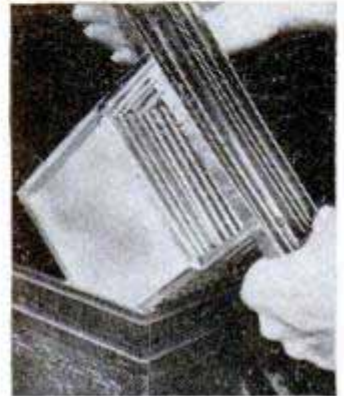
around the edges of the template will keep it from slipping out of place while the photo is being trimmed.

Testing Condition of Hypo Solution

When in doubt as to the condition of a hypo bath, you can test it quickly with a 20-percent solution of potassium iodide. Using a medicine dropper, place a drop or two of the solution in the hypo bath. If a white precipitate forms, the hypo should be discarded—if not, the quality of the hypo is still satisfactory.

Agitation Improves Negatives

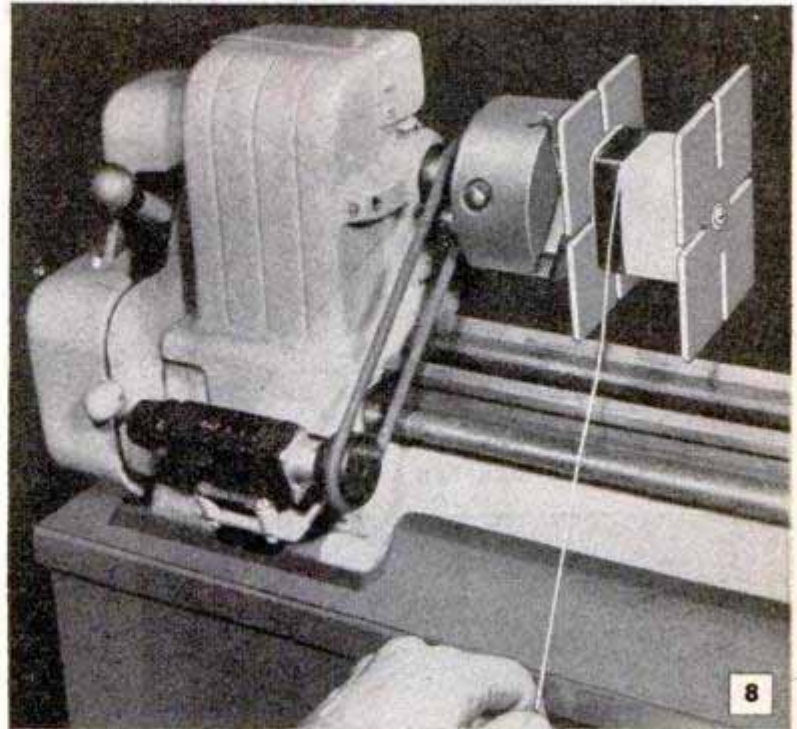
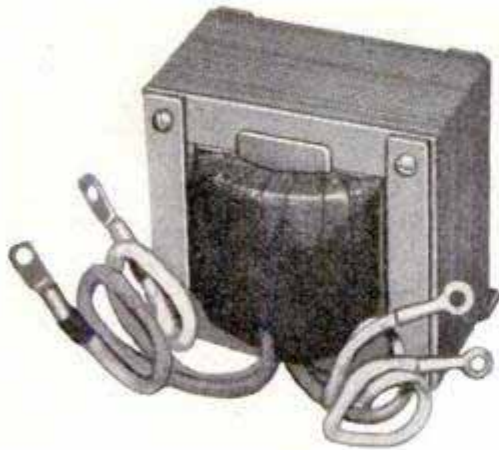
For consistently good results when processing negatives, it is important to agitate the film during development. One of the best methods of agitation is to lift the film entirely out of the developer and allow it to drain for a few seconds. This should be done once every minute during the period of development, as it insures that the film comes in contact with fresh developer after each draining. If draining the film is adopted as a standard procedure, the results will always be the same.



Ferrotypes Tins Cleaned Thoroughly With Soapless Detergent

Ferrotypes tins may be cleaned thoroughly without leaving an oily soap film if they are sponged with one of the soapless detergents now in general use. Work some of the detergent into a water-soaked sponge to make a rich lather and then rub the lather over the tin. Rinse the tin with clear water when finished.





Make your own TRANSFORMER

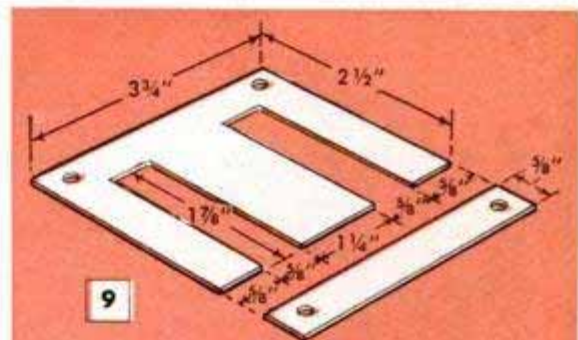
By Harold P. Strand

PART II—BUILDING

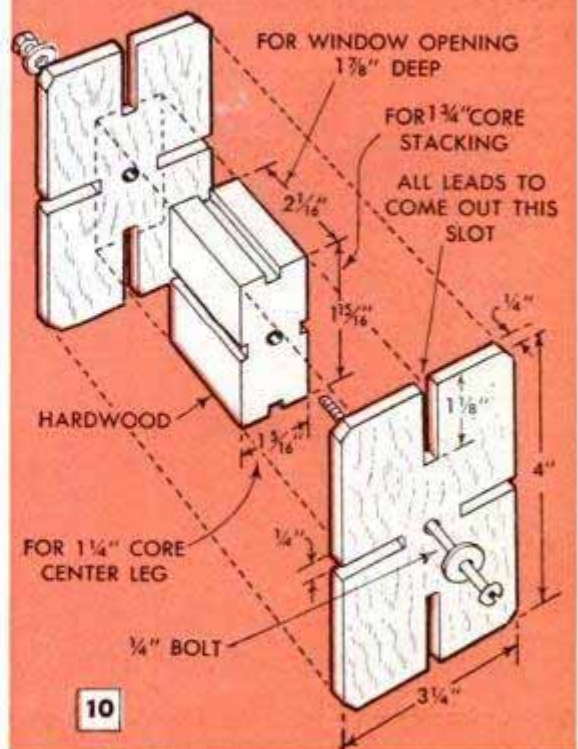
AFTER careful study of basic transformer design given last month in Part I of this story, you are ready to take up the actual building of a transformer. Although the information can be applied to the design of many other sizes and types of transformers, the calculations given will be used as an example.

The first step in building a transformer is the selection or making of the laminated iron core. Standard E-shaped pieces of iron for this purpose may be purchased or the iron from a burned out transformer may be used. The core can also be made of sheet-metal strips. In either case, the estimated size of the finished coil must be known, so the window openings of the core can be checked for sufficient clearance. The coil will consist of primary and secondary windings of wire, several layers of insulating paper and a wrapping of white cotton tape applied around the completed coil.

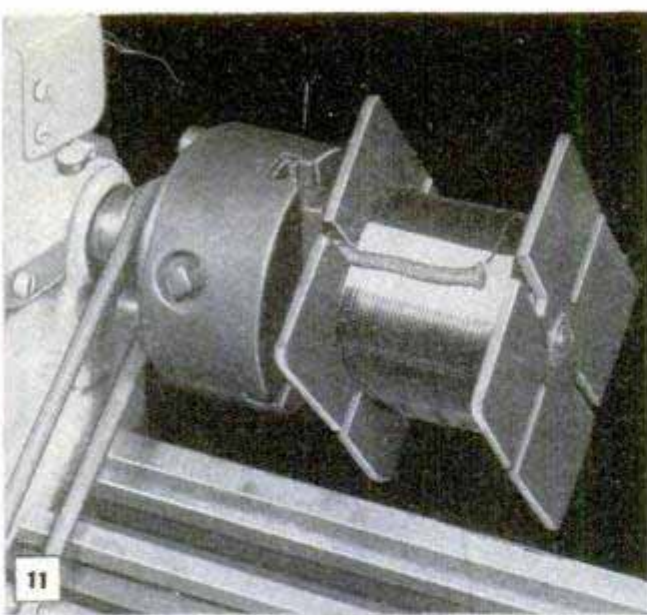
To calculate the cross-sectional area of the wire coils, refer to the table, Fig. 7 of Part I. The No. 19 wire to be used for the primary is listed as having 665 turns per sq. in. Dividing the 300 turns needed by 665 gives .451 sq. in. The No. 23 wire is listed as having 1600 turns per sq. in. Dividing 636 by 1600 gives .397 sq. in.



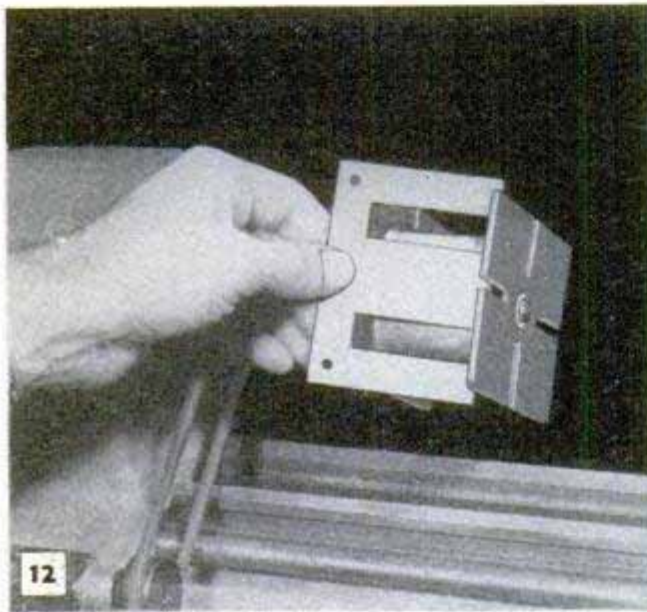
9
E-SHAPED LAMINATIONS SALVAGED FROM OLD TRANSFORMER



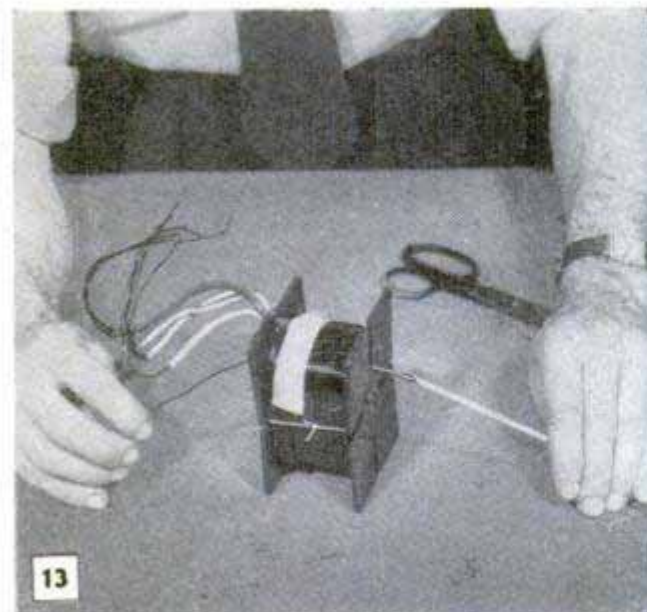
10



11
Finish end of primary-coil wire is laid over a piece of tape for added insulation where it crosses coil



12
For a quick check to determine how much room is left for secondary coil, hold a lamination against coil



13
Use a piece of wire with small hook bent on one end to draw coil-tying string through slots in form

Adding these two figures makes a total of .848 sq. in. required for the wire coils. An additional 25 percent of the area needed for the wires (in this case, .212 sq. in.) will take care of the space required for insulating material. This will give a grand total of 1.06 sq. in. of window space needed for the completed coil. Since the window openings of the core iron selected for this transformer, Fig. 9, are $\frac{5}{8} \times 1\frac{7}{8}$ in. or 1.17 sq. in., the coil should just fit, provided the turns of wire are wrapped tightly and are close together.

To wind the coil, a form as shown in Fig. 10 will be needed. The dimensions of the form should be carefully figured in relation to the size of the laminations. The dimensions given are suitable for the laminations shown in Fig. 9. The coil can be wound by hand or with a hand drill clamped in a vise. However, considerable time can be saved if the form is mounted in a lathe equipped with a turn counter. The counter, shown mounted on the lathe bed, Fig. 8, is driven by a tight-fitting rubber vacuum-cleaner belt which fits over a 1-in.-dia. wooden pulley on the counter shaft and a groove turned in the hub of the lathe chuck. Both pulley diameters must be the same size to assure an accurate turn count. The center block of the form is first wrapped with one turn of flexible armature paper of .010 in. to .015 in. thickness. The start end of the wire coil, which should be about 6 in. long, is fitted with a sleeve of cotton insulating material.

After winding on the 300 turns of the primary coil, snip off the wire, allowing about 6 in. for a lead. Cover this with cotton sleeving and run it out from the coil through a slot in the narrow side of the form as indicated in Fig. 10. A piece of tape is then placed across the top layer of wire and under the lead wire, Fig. 11, for added insulation. A quick check can be made at this time by holding one of the E-shaped laminations against the coil as in Fig. 12, noting the diameter of the coil in relation to the window openings of the core. Next, place one turn of insulating paper around the primary windings, and over this the 636 turns of the No. 23 wire for the secondary coil. A piece of cotton sleeving should be used around both leads of the secondary coil and carried out through the slot in the narrow side of the form. Some transformer designs call for a fairly heavy wire with only a few turns involved. If the wire is too heavy to wind easily, two wires having a cross-sectional area equal to that of the single wire may be paralleled or wound side by side for easier winding. A neater and more uniform winding will result if a hammer and a

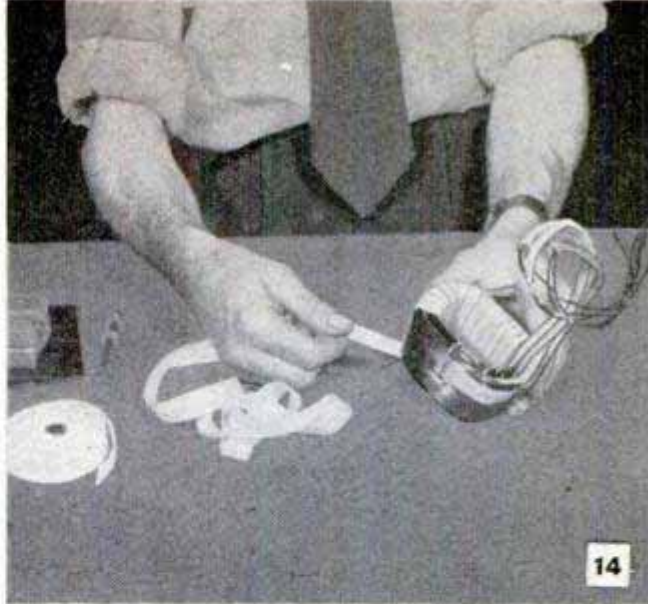
block of wood are used to tap the turns in place after winding each layer. Another block of wood placed under the form and resting on the lathe bed will offer a support while tapping the turns of wire.

After both coils are wound, the form and coils are removed from the lathe and four lengths of string drawn through the four slots and grooves of the form with a wire as shown in Fig. 13. The coils are then tied tightly together and the form separated. Care must be taken when knocking out the center block to avoid disrupting the shape of the coils. After this, the coils are wrapped with $\frac{3}{4}$ -in. white, cotton coil tape as in Fig. 14. Cut and remove the strings one at a time as the strings are approached with the tape and secure the end of the tape with a needle and thread. Dipping the coils in insulating varnish is the next step. Use air-dry varnish and allow the coil to remain submerged for about five minutes so that it is thoroughly impregnated. Then hang it up to dry for several days in a hot, dry place. If the coil, after drying, is too large to fit the window openings of the laminations, reinsert the center block of the winding form and compress the coil in a vise between two pieces of wood, as in Fig. 15. Before assembling the core laminations, place thin pieces of fiber on the sides and edges of the coil that will be covered by the core.

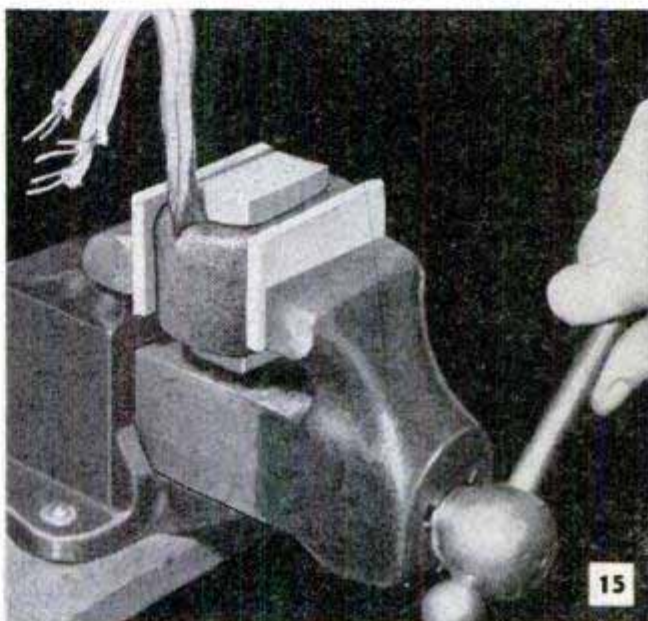
The laminations are stacked around the coil in alternate positions. This is done by placing the center portion of an E-shaped lamination in the core opening, as in Fig. 16. A straight lamination is then butted against the edges of the E-shaped lamination on the opposite side of the coil. Then, the center portion of the second lamination is inserted in the core opening on the opposite side from which the previous E-shaped lamination was placed. Thus, the sets of laminations are assembled alternately until the full height is reached.

Next, four angle brackets are made from $\frac{3}{16}$ -in. flat iron. Two holes are drilled in each bracket to correspond with those in the laminations. Bolt the angle brackets to the core so the bent portion of the brackets will serve as feet on which to stand the transformer. To prevent a hum in the transformer due to loose laminations, cut two pieces of hard fiber the width of the lamination center legs, and force them down between the latter and the coil at both sides. Terminal lugs soldered to the ends of the four lead wires complete the transformer. When properly designed and built, a transformer should operate with moderate temperature rise and draw but little current from the line at no load.

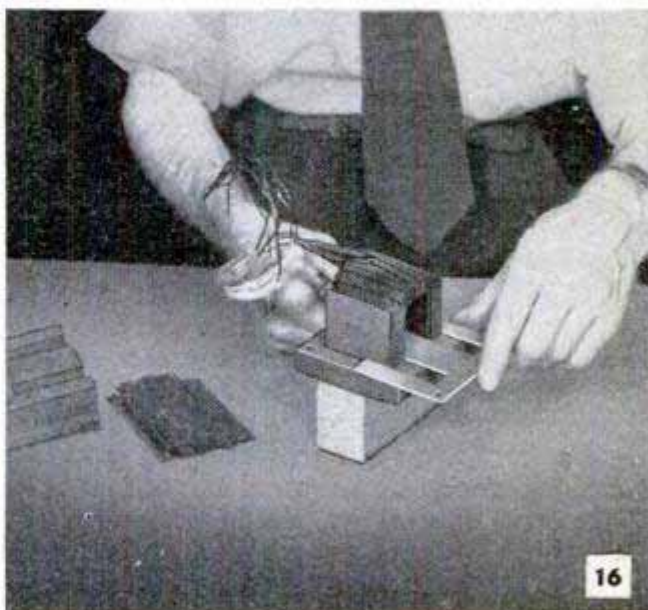
THE END



Completed coils are taped together with white cotton tape. Remove the tie strings as tape approaches them



If outside of coil is too large to fit window openings of laminations, compress between jaws of a vise



In assembling core and coil, alternate positions of the straight and E-shaped laminations from side to side

Concrete Service-Entrance Ramp Poured on Hollow-Tile Fill



Needing a low, all-weather ramp leading to the service door of his small store, one merchant saved both time and material costs by pouring a concrete slab over a fill made from discarded hollow tile. To retain the loose fill while the concrete slab is poured, hollow tile are laid up in mortar to form two sloping walls, using broken sections of tile on the second course and also at the lower end of the walls to give the required slope. Although the width of the ramp can be made to individual requirements, the original was made sufficiently wide to accommodate a medium-sized hand truck. Gauge the width of the fill accordingly. After the mortar has set, the fill is completed with pieces of broken tile, brick and small stones packed tightly together in the space between the retaining walls. Then a form is made and fitted over the top of the fill to retain the concrete, which is troweled smooth after it has partially set.

A. M. Wettach, Mt. Pleasant, Iowa.

Pins in Hinged Edge of Door Insure Against Intruders



A locked door that opens outward will do little to bar the entrance of an intruder, as it is a simple matter to remove the door if it is hung with loose-pin

hinges. When a door of this type leads to the back room of a store, an office or a storeroom, it can be made considerably more burglarproof by pinning the hinged edge of the door to the jamb. Drill two small holes in the edge of the door, one near the top and the other near the bottom. Then drive a steel pin or large nail in each hole,

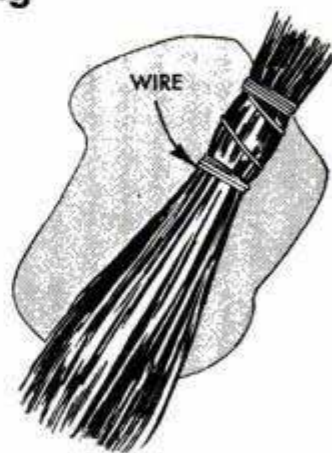
cutting the heads from the nails if the latter are used. Finally, drill corresponding holes in the jamb to receive the ends of the pins, which should extend far enough to engage the holes when the door is closed tightly.—Dr. Bernard Matzen, Napa, Calif.

Special Watering-Trough Brooms Facilitate Cleaning

To facilitate sweeping litter from watering troughs, one poultryman made several small whisk brooms from the straws of a worn-out broom. He bundled the straws together and wrapped one end of the bundles with wire to form

a handle about 1½ in. in diameter. Wire unwound from the old broom can be salvaged and reused to bind the new ones.

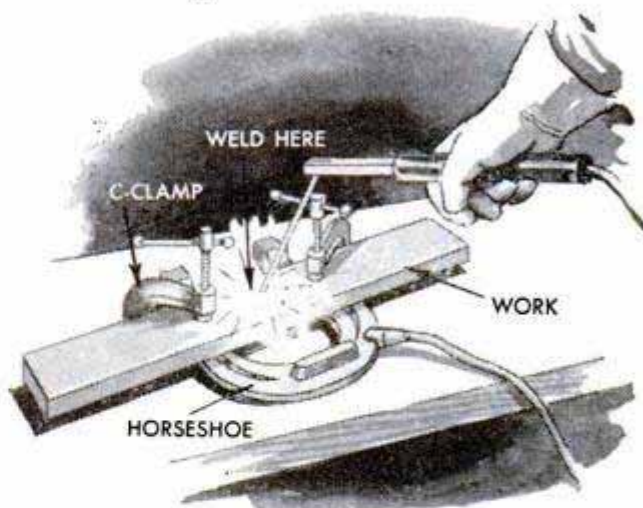
Hi Sibley, Nuevo, Calif.



Connecting Rubber Tubing

Tight-fitting hose or rubber tubing is easier to slip over faucets or glass-tubing connections if the inner surface is lubricated with glycerin. Apply the latter to about the first ½ in. of the tubing.

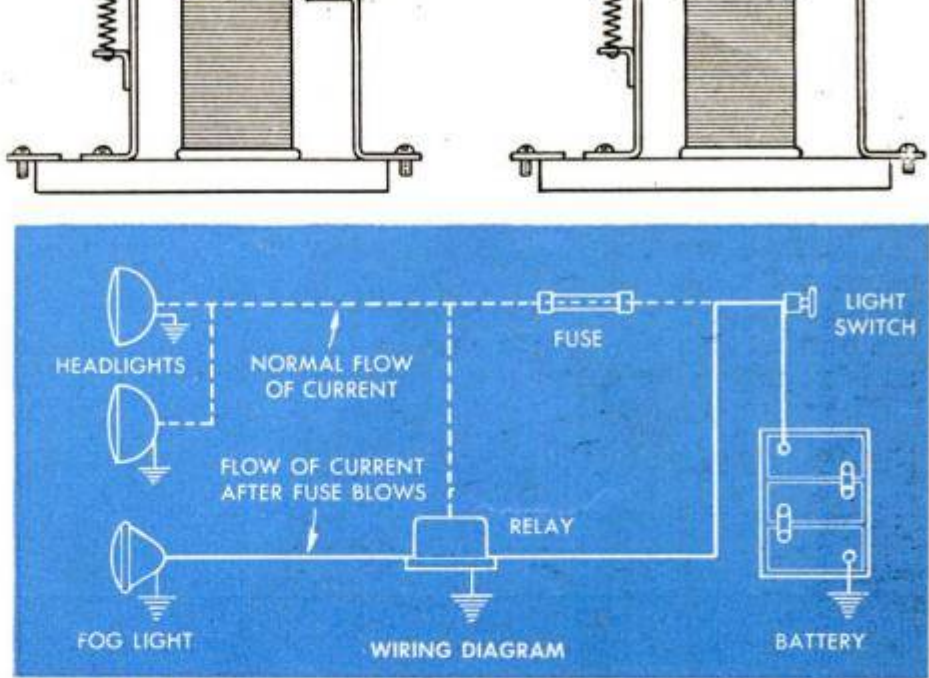
Clamping Jig for Butt Welding Provided by Horseshoe



Two small C-clamps and a horseshoe form a jig for holding small pieces that are to be butt-welded. Simply assemble the jig as in the sketch, checking with a straight-edge to make sure that the workpieces are in line, with the ends butted squarely together before tightening the clamps.

Herbert E. Fey, New Braunfels, Tex.

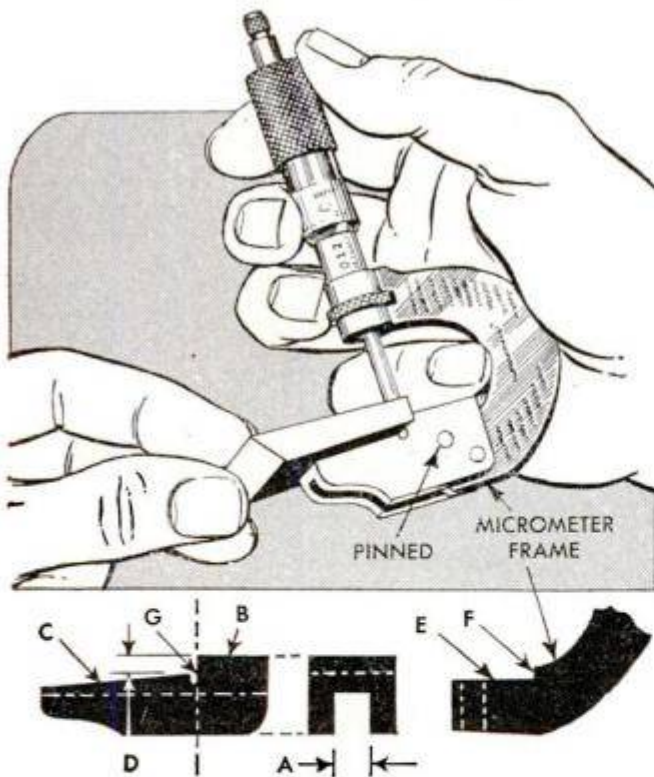
blackness. To prepare for just such a situation, one driver used a modified relay to turn on the fog lights automatically if the headlights fail. The fixed contact arm of the relay is lengthened and the points changed as shown. With current flowing through the headlight circuit, the relay coil is energized, holding the arm down and the points open. The instant current stops flowing in the headlight circuit, the relay arm is released, moving upward to close the fog-light circuit.—A. J. Seymour, Jr., Salmon Falls, N. H.



Addition of Special Anvil Adapts Micrometer for Measuring Tapered Parts

Job machine shops confronted with the problem of checking measurements on small lots of tapered parts, such as gibs, often find the solution through a simple adaptation of an ordinary micrometer. Usually, blueprints and specifications of such parts require that the finish dimension be checked at the small end of the taper, and adaptation of the mike to this work re-

quires only the substitution of a special tapered anvil in place of the regular anvil. The substitute anvil is made from tool steel and the frame of the mike is altered by first removing the regular anvil and grinding a shouldered flat, E-F, on the frame to serve as a seat for the tapered anvil. Next, a groove is milled lengthwise in the underside of the anvil piece, the dimension A on the milled groove being equal to the thickness of the mike frame. Then the piece is slotted to form surface G and milled to form surface C. The slotting cut should be deep enough to form a chip clearance between surfaces C and G as shown in the left-hand detail. Now, the partly finished anvil is seated on the mike frame and holes are drilled through the anvil and frame and reamed for taper pins. At this stage the anvil is hardened. After the anvil is pinned in place on the frame of the mike, the milled flat, B, is surface-ground to 90 deg. with the micrometer spindle and the angle flat, C, is finish-ground to the degree of taper required. Surface G is ground to bring its center line exactly on the axis line of the micrometer spindle. Then distance D is measured and an amount equal to this distance is removed from the end of the micrometer spindle by grinding. To assure accuracy in the altered micrometer, the finish grinds on measuring surfaces must be held to close limits.



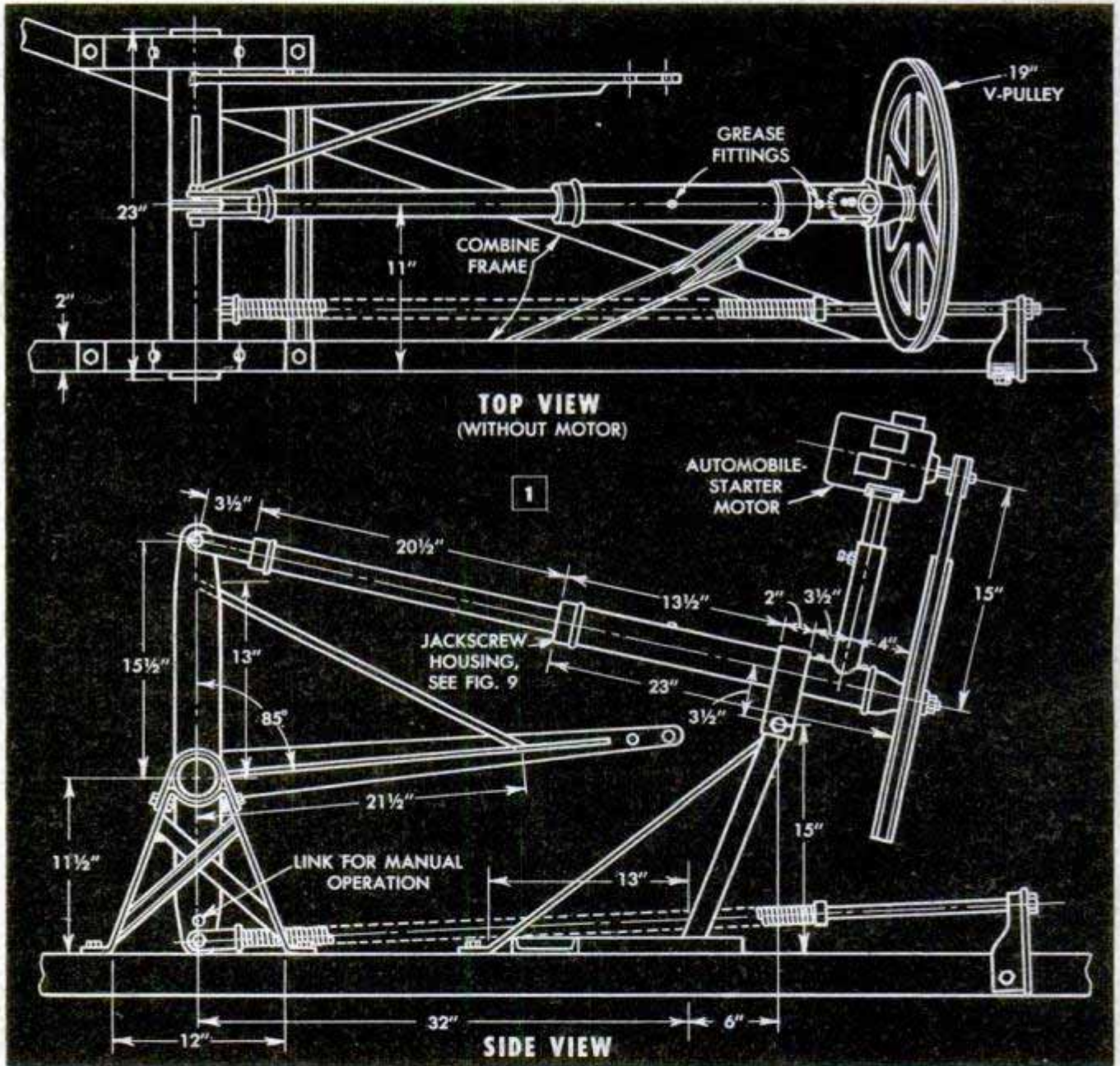
D. E. McDonald, Ansonia, Conn.

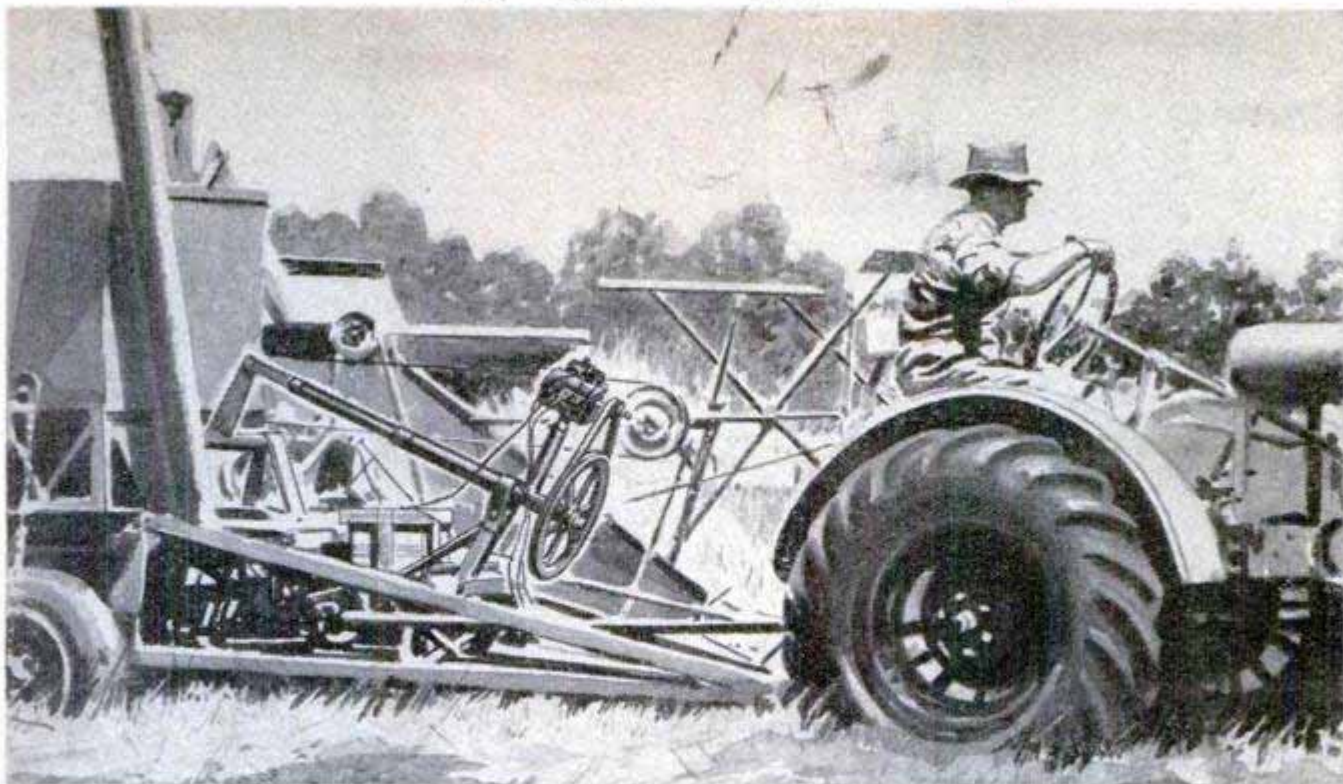
THE HARDEST WORK of operating a tractor-towed grain combine—twisting and straining repeatedly to raise or lower the cutter bar—is eliminated with this simple electric control unit, which is operated by the flick of a switch. The unit consists of an old car-starting motor belted to a threaded shaft, which moves one end of the unit horizontally to actuate the raising-and-lowering mechanism of the cutter bar.

The method of mounting the unit on the combine will be determined by your particular machine. Any method can be used if you keep in mind the fact that the movable end of the unit must be attached to

the raising mechanism in a manner similar to that of the lever for manual operation, which is disconnected. In some cases, it may be possible to connect the shaft to the arm of the mechanism where the lever linkage was removed. In the original installation, it was necessary to weld another arm to the mechanism as in Fig. 10.

A careful study of the top, side and front views in Figs. 1 and 8, the cutaway view, Fig. 9, and the perspective view, Fig. 10, will give you a good idea of the assembly. Figs. 2 to 6 inclusive give other views of the unit mounted on the combine. The blue portion of Fig. 10 shows the new parts that





There is no twisting or straining to raise or lower the cutter bar when this electric control unit is used

were added to the original installation, and Fig. 9 details the screw portion of the assembly. When rotated by the starter motor, a threaded shaft inside the assembly moves a length of pipe in or out, depending on the direction of rotation, to actuate the raising-and-lowering mechanism of the cutter bar.

The outer housing of the assembly is a length of 2-in. pipe with a cap at one end and a reducing fitting at the other. The cap is bored in the center to take a length of 1 $\frac{1}{4}$ -in. pipe as a sliding fit, and the reducer is fitted with a bronze bushing made to screw into it. A length of 1-in. shafting to provide a jackscrew is turned to a diameter of $\frac{7}{8}$ in. at one end to form a spindle, which fits into the bushing, the length of the spindle being determined by the length of the bushing plus the thickness of a large pulley hub. The latter fits on the end of the spindle where it is keyed in place and belted to a smaller pulley on the motor shaft. The other end of the shaft is threaded for a distance of 5 in. to take a "nut" of similar length, which is made of bronze. The nut floats with a $\frac{1}{16}$ -in. clearance inside the smaller pipe where it is held by a pin and a pipe cap, the latter being bored for the shaft. The opposite end of this smaller pipe, which is a sliding fit inside the larger one, also is capped and a clevis or linkage welded to it for attaching to the arm of the fulcrum or lifting mechanism. The starter motor is mounted on this unit by means of a telescoping support, which is made of pipe as shown in the lower right-hand detail of Fig. 10, and then welded in place.

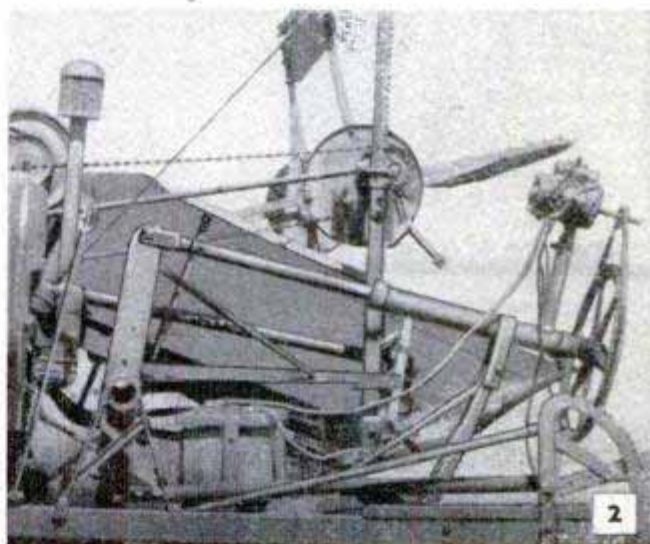
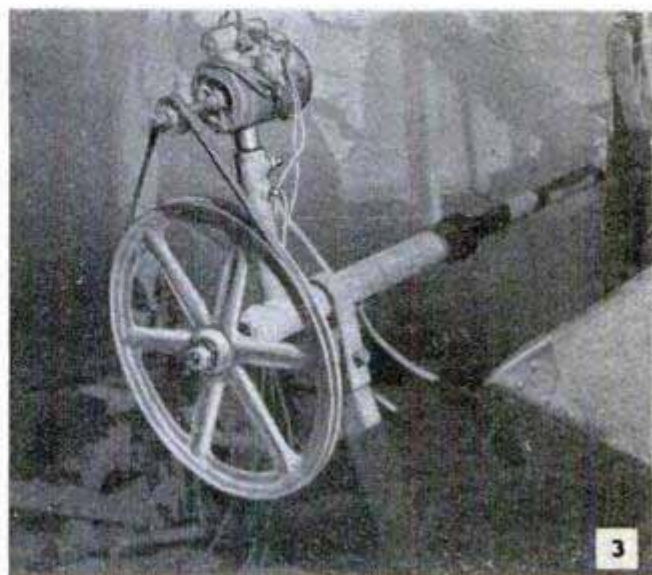
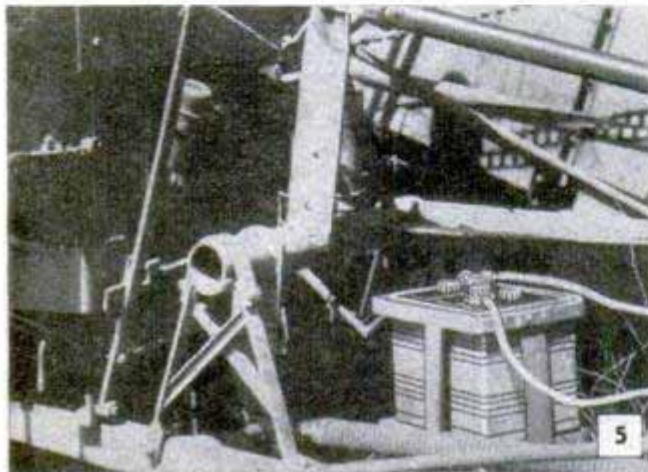


Photo above shows side view of control unit mounted on tongue and frame of combine. Photo below shows close-up view of motor and pulley on control unit

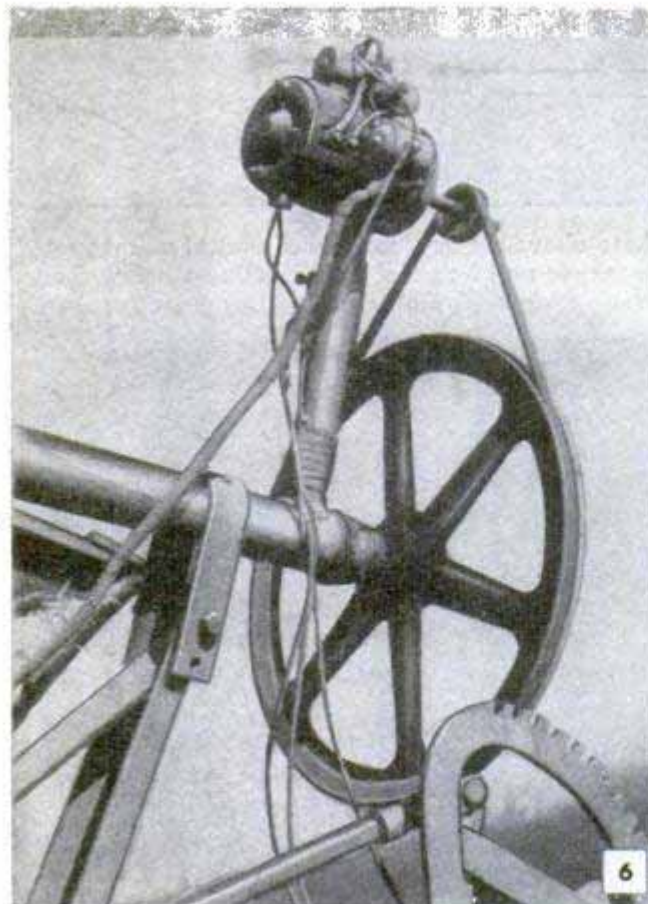




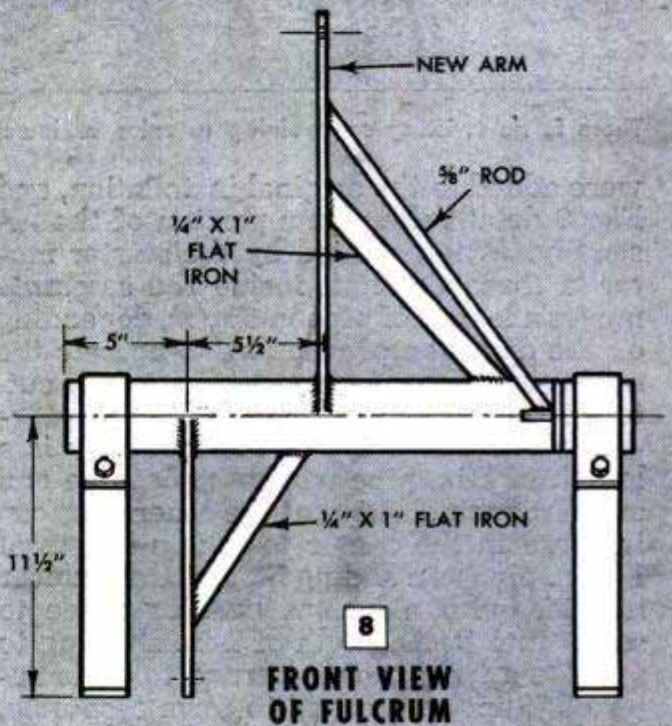
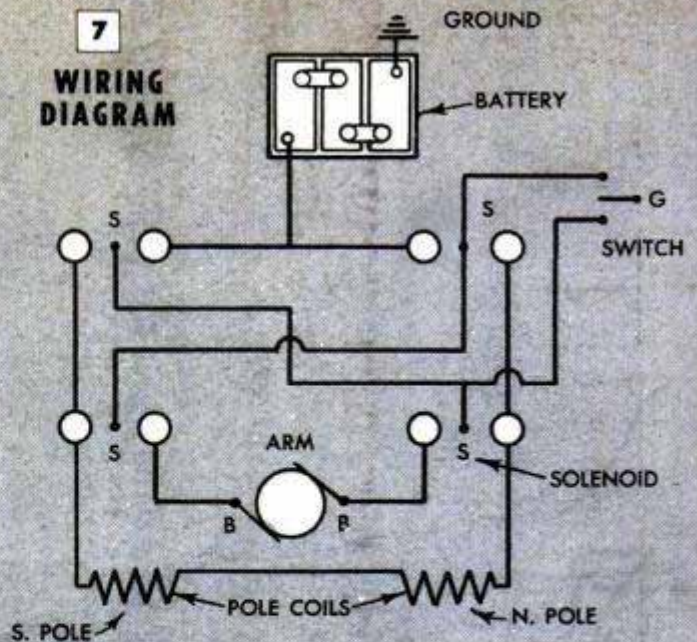
The photo gives a good idea of how the control unit appears from the front, and the photo below shows the location of the auxiliary battery



Below, good view of the motor and pulleys used to operate the control unit. The size of the large pulley determines speed at which the unit will operate



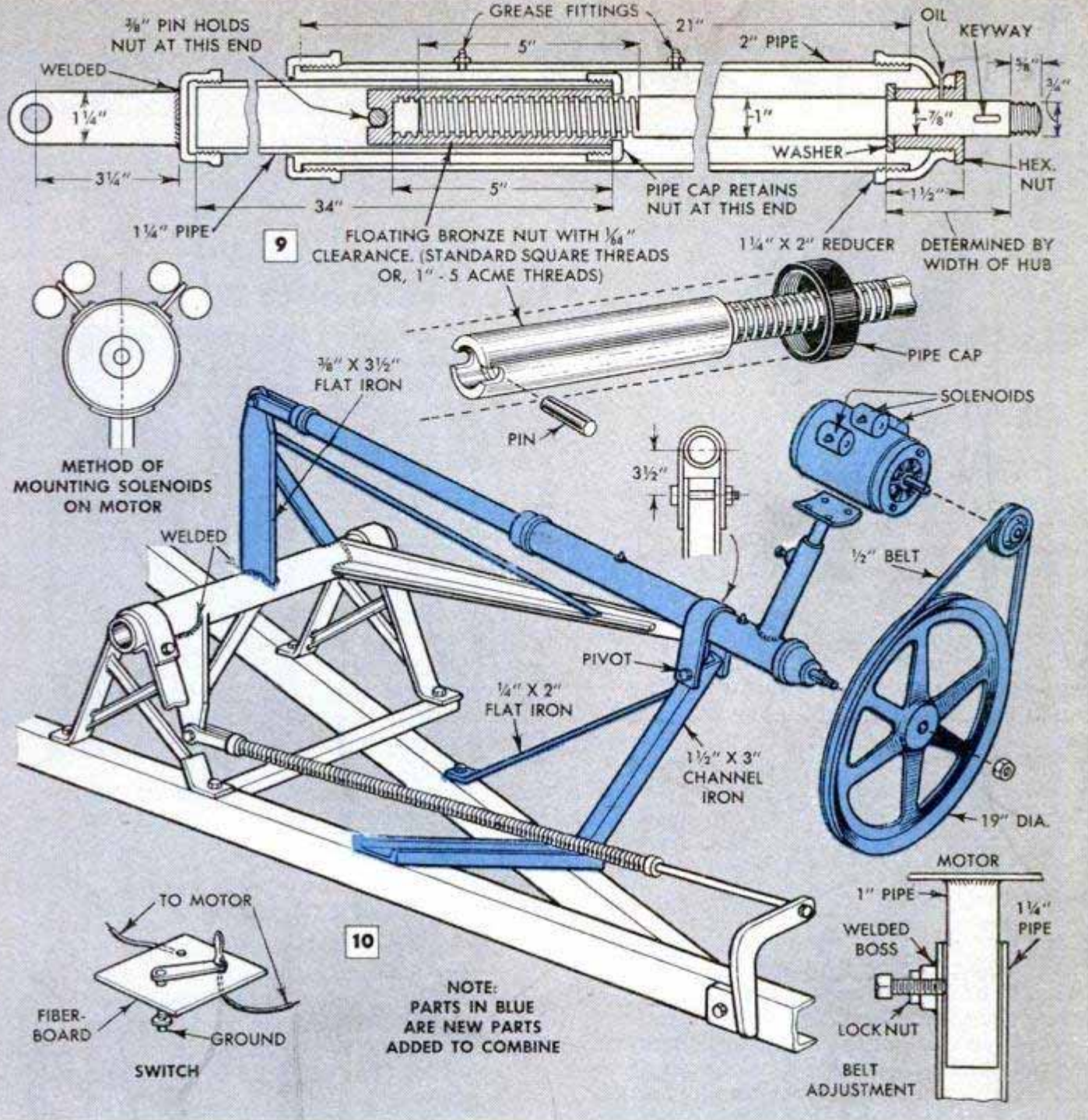
7
WIRING
DIAGRAM



This type of support permits adjustment of the motor height to maintain correct tension on the belt.

Electricity to operate the starter motor is provided by a 6-volt storage battery, which is mounted on the combine frame, as pictured in Fig. 5, and charged by the tractor generator. The tractor battery could be used, provided it were heavy enough to take care of the extra load, but this would necessitate running two heavy starter cables from the tractor battery to the starter motor. Since these cables are quite expensive, it is better to use a separate battery.

The starter motor used must be of the type that can be reversed. The one used in the original installation was taken from a model-A Ford car. The wiring diagram for reversing the motor is shown in Fig. 7. If



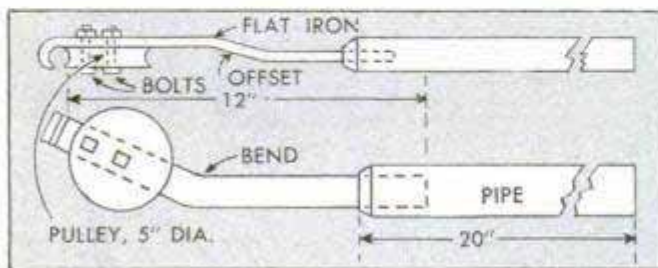
you do not feel capable of doing this job yourself, your local garage mechanic or electrician should be able to do it. Notice in the diagram that four solenoid switches are used instead of manually operated switches, the solenoids being mounted on the motor housing. This is done to avoid running a number of wires to a reversing switch mounted within convenient reach of the tractor driver. With this hookup, it is only necessary to run two wires to the reversing switch on the tractor. This switch is made as shown in the lower left-hand detail of Fig. 10. It is nothing more than a piece of fiberboard fitted with two brass-screw contacts and a brass lever, the latter being grounded to complete the circuit.

In this way, only three wires are required from the tractor to the combine, two to the

switch and starter motor and one from the tractor generator to the battery on the combine. However, it will be necessary to use a heavy insulated wire to ground the frames of the tractor and combine together to complete the battery-charging circuit. When connecting the battery on the combine, ground the same side of the battery to the combine frame as is grounded on the tractor battery. With a hookup like this, you have two separate electrical circuits handled by one generator, hence the reason for grounding the frames of the combine and the tractor together.

If the control unit does not operate the cutter bar rapidly enough to suit you, use a smaller pulley on the jackscrew. A pulley 19 in. in diameter was found suitable on the original installation.

Bending Thin-Walled Conduit



An electrician designed this bender especially for making short-radius bends in thin-walled conduit without crushing or folding it. The shank of the bender is made from a length of flat iron. One end is forced into a 20-in. length of pipe and welded to form a suitable handle. The other end of the shank is heated and bent around a rod of the same radius as the conduit. Next, the shank is bent edgewise and offset bends are put in as indicated. Then a grooved pulley, or better, a rope sheave having a round-bottom groove of the same radius as the conduit, is attached to the shank with two bolts. In use, the bender is slipped over the end of the conduit and the handle is pressed downward to start the bend. By "inching" the bender along the conduit and applying the necessary bending pressure at regular intervals, uniform bends of almost any required radius are made easily.

Adolph Sprenzel, Chicago.

Spring-Cushioned Drawbar

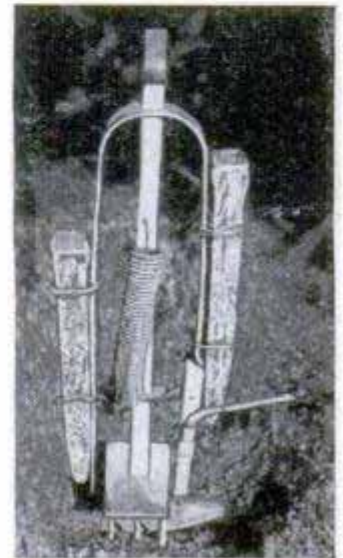
When operating certain types of tractor-drawn farm equipment over rough ground or in terraced fields, a spring-cushioned drawbar snubs the violent forward and backward thrust on a loose-pinned hitch and also eases the tractor into the load



without a sudden jerk when starting. It is especially useful on tractor trailers hitched either singly or in tandem. As pictured, two heavy L-brackets are bolted to the drawbar. The ends are drilled to take the rod which carries the coil springs and an eye or clevis-type yoke at the outer end. The springs bear against the brackets and also against stops on the rod to give both forward and backward snubbing action.

Mole Trap Weighted With Spikes

One farmer wired two spikes from an old spike-tooth harrow to his mole trap and thus considerably increased the effectiveness of the trap. Because of the recoil of the lighter trap, the animals often were able to wriggle free of the prongs. However, with the addition of the spikes, which weigh approximately two pounds each, much of the recoil is overcome, giving the trap a fast, positive action.—A. E. Holden, Angola, Ind.

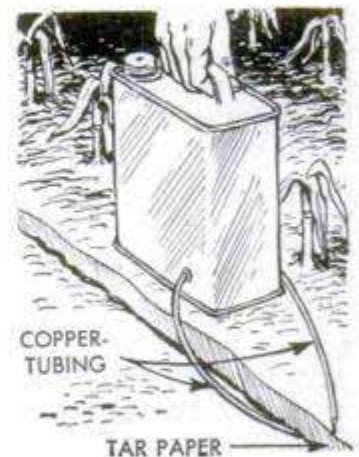


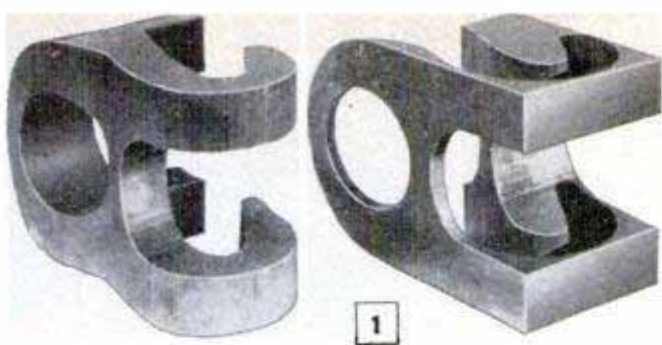
Cleaning Rubber Stamps

Rubber-stamp lettering that becomes clogged and blurred can be cleaned quickly by stamping it a few times on the sticky side of a piece of cellulose tape. Stamp pads can be cleaned by pressing tape against them.—A. E. Howell, San Diego, Calif.

Creosote Dispenser for Cornfield

To keep chinch bugs out of a cornfield, use this handy dispenser for quickly applying creosote to a tar-paper "fence." The dispenser is made by soldering two lengths of copper tubing to the sides of a gallon motor-oil can near the bottom. These are bent to direct a stream of creosote to each side of the fence simultaneously. The cover of the can is punctured to permit the entrance of air and allow the creosote to flow freely.





1

BANDSAWED "CASTINGS"

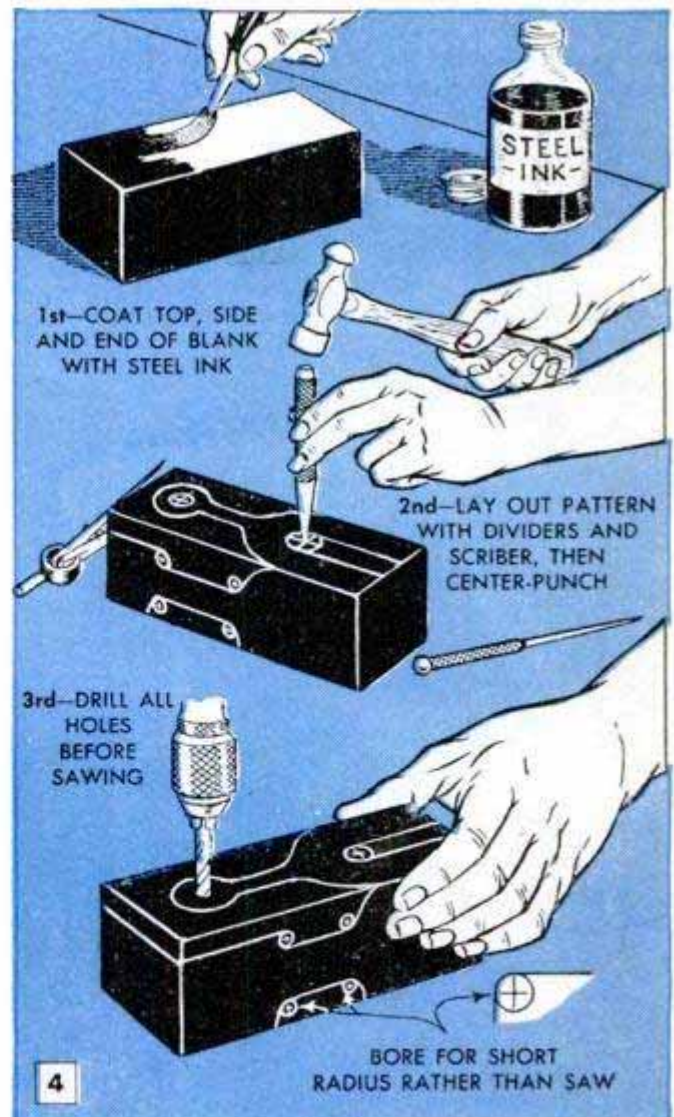
By Alexander Maxwell

MANY PARTS that normally would be cast or forged can be produced quickly in the small machine shop, and even in the home workshop, simply by cutting them out with a bandsaw. Bandsawing is especially helpful where only a single part or, at most, only a few identical parts must be made from steel and nonferrous metals. The speed with which the average job can be done cuts production costs to the minimum. Intricate work involving short-radius compound cuts can be done on any small bandsaw by using the proper blade and reducing the wheel speed in accordance with recommendations which have been worked out by manufacturers of metal-cutting blades.

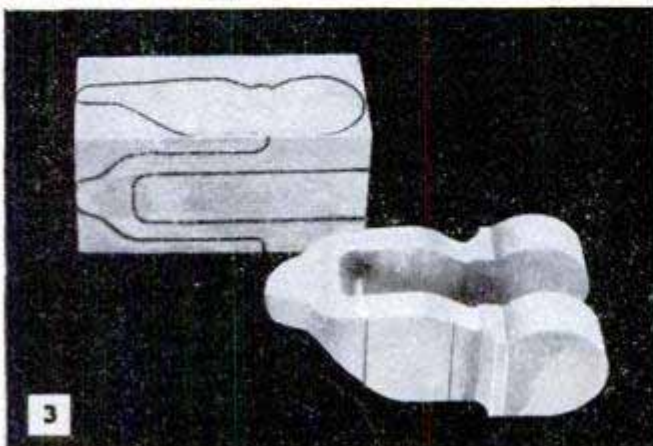
Typical examples of bandsawed metal parts are pictured in Figs. 1, 3, 8, 10 and 13. Note the intricate compound cuts, the neatly turned fillets and the precise short-radius cuts which have been produced in forming these parts by bandsawing. In some cases, the work will not even require filing or grinding unless, of course, it is necessary to ream bore sizes, break (round) corners or finish-grind a flat to serve as a working surface for succeeding operations. In most cases, sawing is done



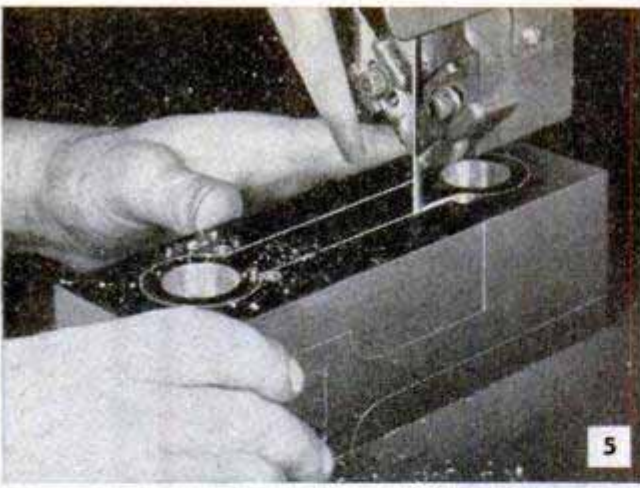
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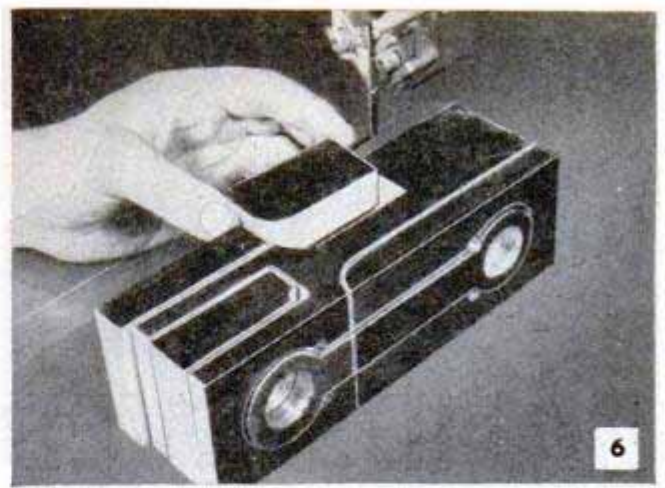
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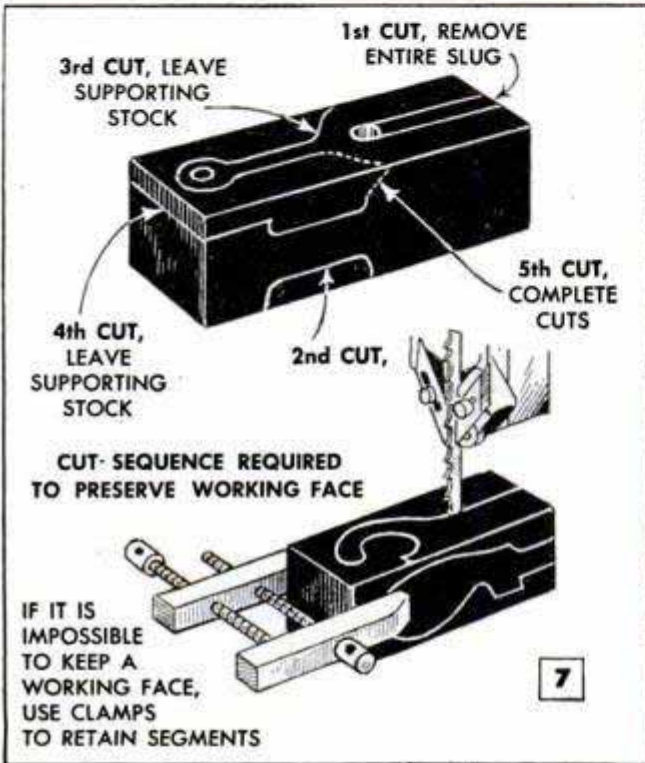
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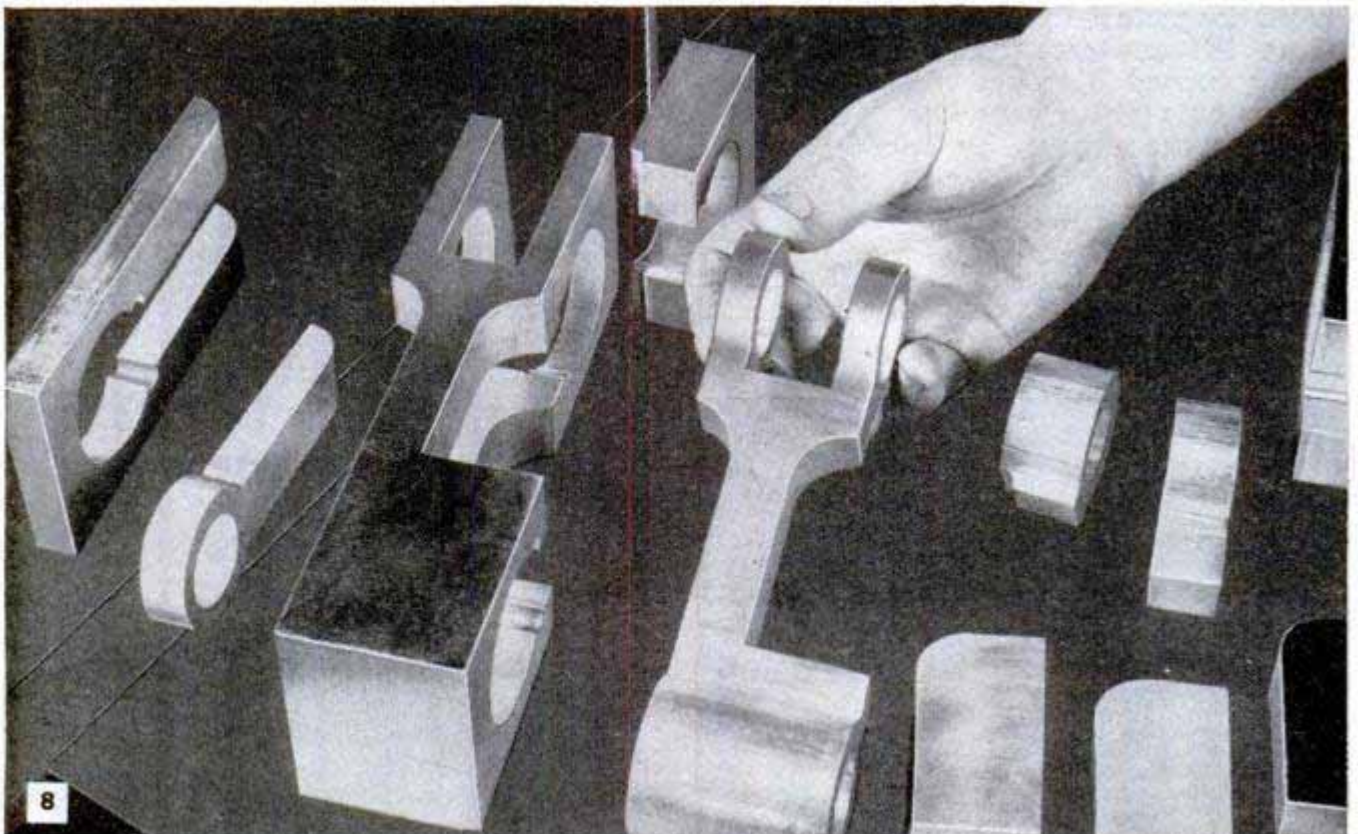


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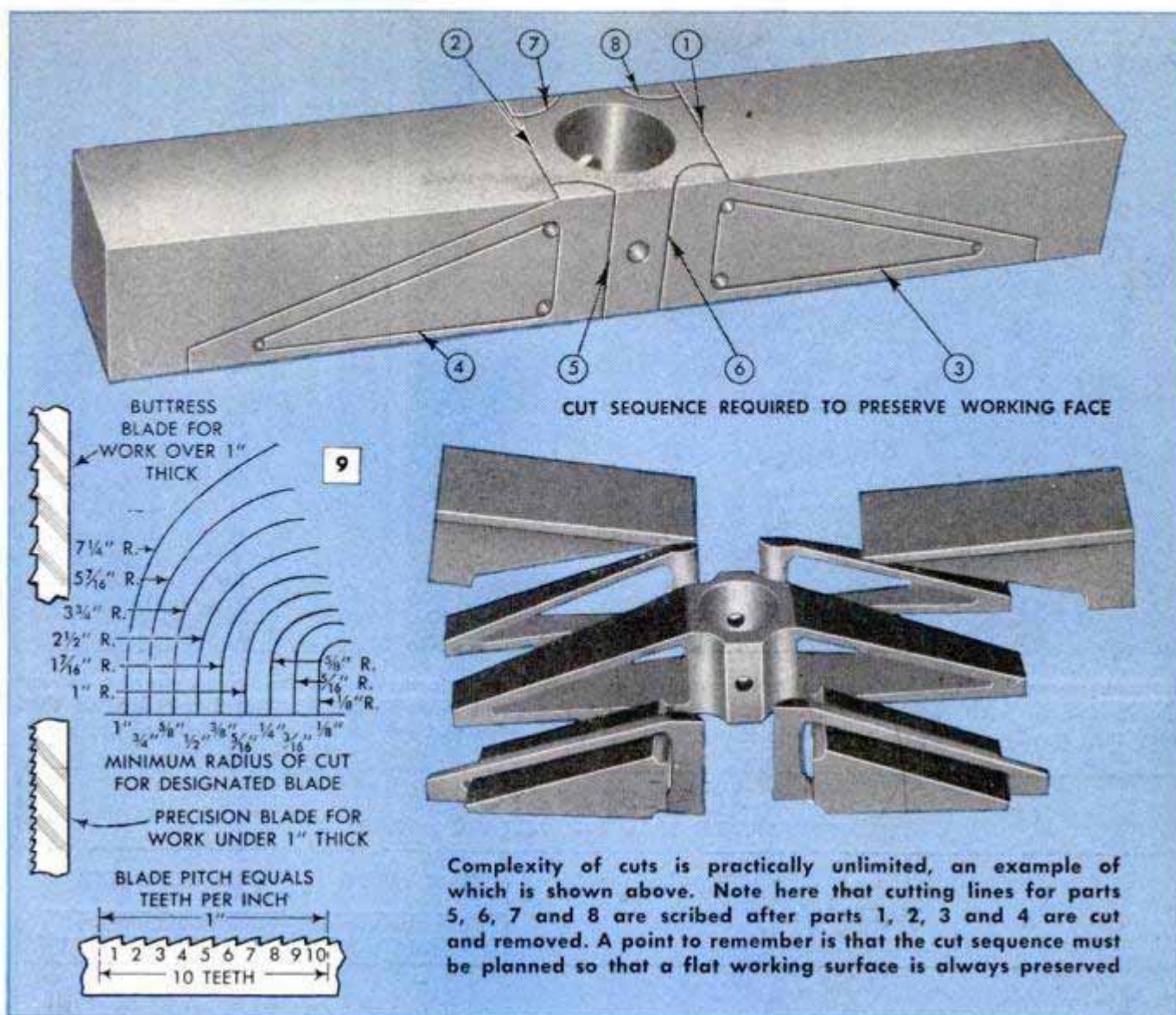


7

freehand as in Fig. 2, but on some types of work, particularly larger parts where involved short-radius cuts are necessary, special jigs and fixtures must be used to assure uniformity, Fig. 13. In freehand operations the sawing technique is simple but rather tiring for the operator, as the trick in producing clean cuts is in maintaining a constant and uniform pressure on the work. The importance of uniform pressure is shown in the left-hand detail in Fig. 2. Each saw tooth performs exactly like any edged metal-cutting tool when cutting thick stock. As each tooth engages the work it lifts a chip, curls it and carries it all the way through. If the pressure is uniform, the chips will be uniform in size and the edges of the work will be smooth but, if the pressure varies, or if the work is stopped momentarily, the blade will vibrate sidewise, causing a ridge to form on the side of the saw cut. Maintaining con-



8

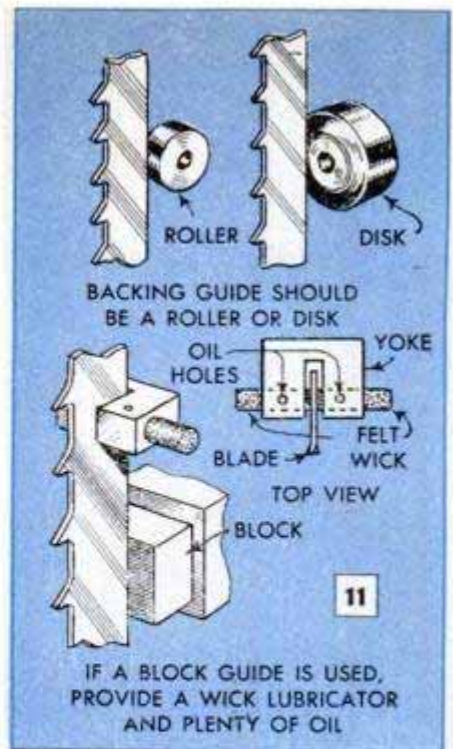
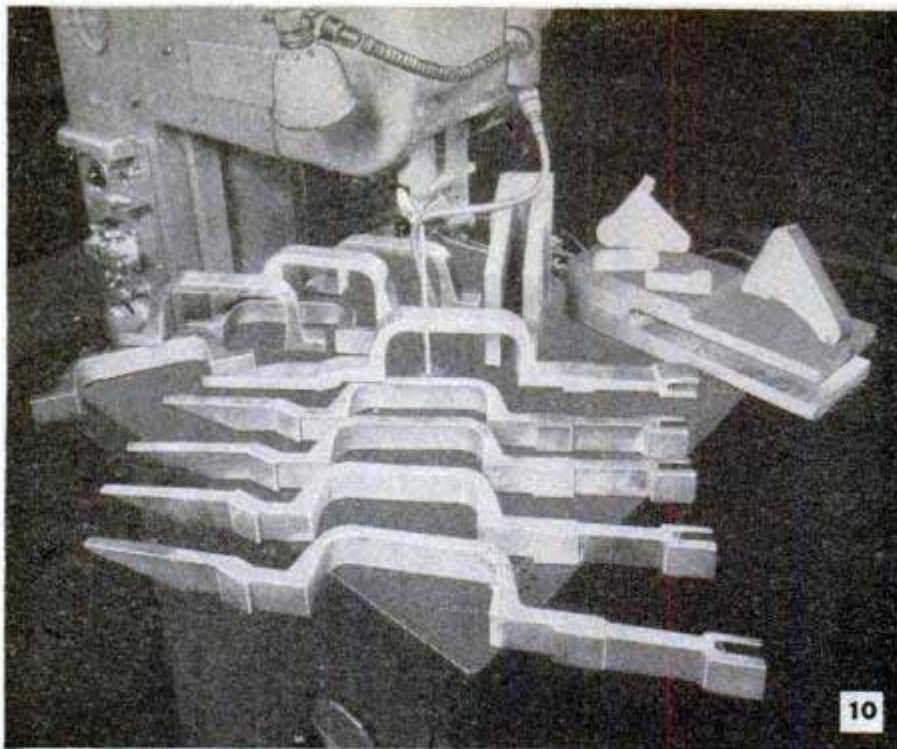


stant cutting pressure is especially important when making cuts on a radius, as the blade is then subjected to lateral thrust and tangential stress not encountered in the straight-line cut.

On some types of work the complete layout can be made on the blank before any cuts are made. On other jobs, only a part of the layout can be made before cutting. Figs. 4 and 7 detail typical layout procedure. In the first step, Fig. 4, the metal blank is coated with a preparation known to the trade as "steel ink," a quick-drying purple lacquer through which the layout lines are scribed with a sharp-pointed scriber or dividers. The contrast between the dark-purple ground and the brilliance of the scribed line on the metal makes the layout line easy to follow. Radii less than the minimum turning radius of the band-saw blade are formed by center-punching and drilling before sawing. The minimum turning radius for blades ranging from 1/8 to 1 in. wide is given in Fig. 9. In making cuts which must pass successively through the work in two directions, it is necessary to plan the procedure so that there will always be a flat working surface in contact

with the table, Figs. 5, 6 and 7. Otherwise, there is danger of the work twisting or rocking on the table and kinking the blade. In most cases, pieces removed by sawing are clamped back into place as in the lower detail, Fig. 7, thus preserving the original bearing surface of the blank until all separate cuts have been completed. In Fig. 9, the cuts are numbered in the order in which they must be made to preserve a working face. Inside cuts, that is, those which cannot be started from an outside edge, are made by breaking or cutting the blade, passing one end through a turning hole and then rewelding. After the cut is finished, the blade is again broken, withdrawn from the work and rewelded. Production machines are provided with built-in welders designed especially for this purpose. Separate blade welders are available for shops not equipped with machines having built-in welders.

The left-hand details in Fig. 9 show two types of metal-cutting blades in common use. The buttress, or skip-tooth blade, in the narrow widths is used for work over 1 in. in thickness, while the regular blade, with the standard tooth spacing, is used on



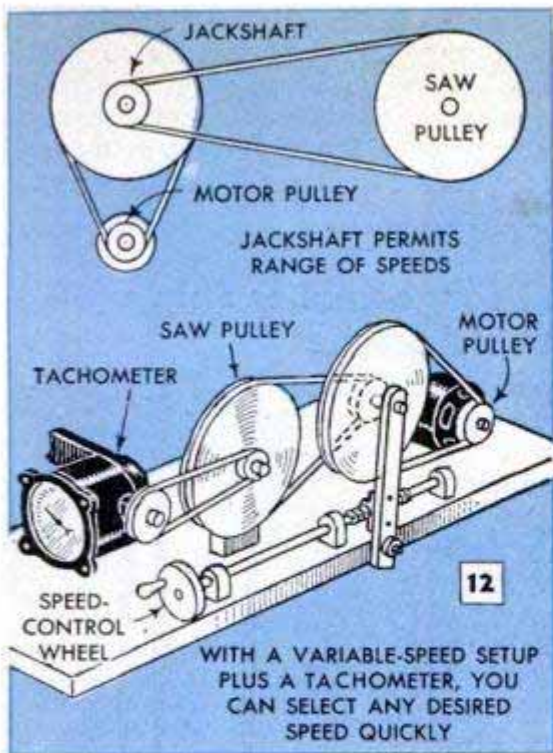
Intricate work having short-radius turns requires a careful setting of the blade guides. Before setting the guides, be sure the blade is correctly tracked on the band wheels. Set the backing rollers so that they turn slowly when the machine is idling. Set the guide pins to bear on full body width of the blade

CHART I

JOB SELECTOR
SAW SPEEDS, 50 TO 1500 FEET PER MINUTE

MATERIALS	SAW PITCH				SAW VELOCITY			
	Work Thickness				Work Thickness			
	1/16"	1/4"	1"	3"	1/16"	1/4"	1"	3"
STEELS—S.A.E.								
Carbon Steels #1010-#1095.....	24	14	10	6	250	200	175	150
Manganese Steels #T1330-#T1350.....	18	14	12	8	200	150	125	100
Free Machining #X1112-#X1340.....	18	14	10	6	250	200	175	150
Nickel Steels #2015-#2515.....	18	14	12	8	175	125	100	75
Nickel Chromium #3115-#3415.....	18	14	12	8	125	100	75	50
Molybdenum Steels #4023-#4820.....	18	14	12	6	150	125	100	75
Chromium Steels #5120-#5150.....	18	14	12	6	150	125	100	75
Chromium Steels #51210-#52100.....	24	14	10	6	100	75	50	50
Chromium Vanadium #6115-#6195.....	18	14	12	8	175	100	75	50
Tungsten Steels #7260-#71360.....	13	14	12	8	150	100	75	50
N. E. Steels #8024-#8949.....	18	12	8	6	175	175	150	150
Silicon Manganese #9255-#9260.....	18	14	10	6	175	125	100	50
CASTINGS								
Gray Cast Iron.....	18	14	10	6	200	150	100	75
Malleable Cast Iron.....	18	12	8	6	200	175	150	125
Meehanite.....	18	10	8	6	150	100	75	50
Nickel Iron, Cast.....	18	12	10	6	200	150	100	50
Steel, Cast.....	18	14	12	8	225	200	150	75
Swedish Cast Iron.....	18	12	10	6	200	150	100	75
ALUMINUM AND ALUMINUM BASE ALLOYS								
Aluminum (Pure, Rolled or Forged).....	18	10	6*	6*	1500	1500	1100	750
Duralumin 14ST.....	18	10	8*	6*	1500	1500	1200	750
Duralumin 17ST.....	18	10	6*	6*	1500	1500	1500	1500
Duralumin 24ST.....	18	10	6*	6*	1500	1500	1500	1500
Aluminum (Cast).....	18	10	6*	6*	1500	1500	1200	750
OTHER METALS AND ALLOYS								
Babbitt—Lead.....	14	8	6	6	1500	1500	1500	1500
Brass (Soft).....	18	14	8*	6*	1500	750	350	300
Bronze—Aluminum.....	18	12	10	6	500	300	225	150
Bronze—Ampco.....	18	12	10	6	200	150	100	75
Bronze—Manganese.....	18	12	8	6	300	250	225	150
Bronze—Phosphorus.....	18	14	10	6	500	300	200	150
Bronze (Tobin, Naval Brass).....	18	12	10	6	300	250	225	200
Beryllium Copper.....	18	12	8	6	400	300	250	150
Copper (Med. Hard).....	18	10	6*	6*	1100	700	500	200
Magnesium.....	14	10	6*	4*	1500	1500	1500	1500
Gunite Castings.....	24	18	12	8	300	175	125	100

* Use buttress Nos. 2 and 3 pitch only on aluminum as indicated by asterisk. Use No. 3 buttress on brass, copper and magnesium as indicated.



work less than 1 in. in thickness. Note also in Fig. 9 that the blade pitch is designated as the number of teeth per inch. Chart I gives general data on blade pitch and blade velocities required to handle a wide range of metals available in stock sizes. This chart is not intended to supplant manufacturer's specifications which may vary from it, but is included merely to give a general idea of the requirements.

On small bandsaws designed primarily for woodworking, it is necessary to make a careful adjustment of the blade guides before cutting metal. Nearly all small machines are fitted with roller guides above and below the table. On some of these, the back of the blade runs on the periphery of the roller while on others the back of the blade bears against the side of the roller. The upper details in Fig. 11 show the two types. On some older machines the back of the blade bears on a fixed pin. In this case it will be necessary to provide wick lubricators as in the lower details, Fig. 11. It also is important to track the blade and adjust the roller so that the stationary guide pins, which bear against the blade from both sides, give full support to prevent the blade from twisting or "running out." Adjust the roller in or out to bring the full body width of the blade between the guide pins, allowing only the set points of the teeth to clear the corners of the pins.

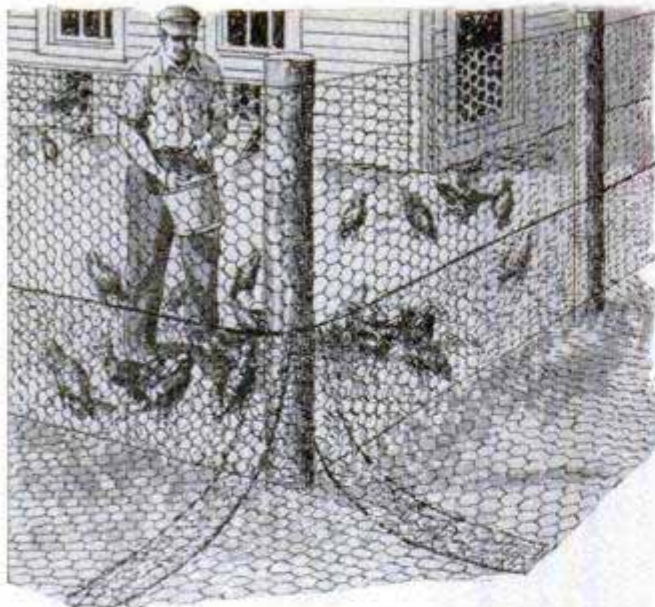
CHART II—BANDSAW BLADE SPEEDS

REVOLUTIONS PER MINUTE (APPROX.)	SIZE OF BANDSAW WHEELS			FEET PER MINUTE
	10"	12"	14"	
				50
				75
				100
50				125
		50		150
			50	175
				200
				225
100				250
		100		300
150			100	400
		150		500
			150	600
				700
300	250		200	750
450	350		300	1100
500	400			1200
550	500		400	1500

FIGURES CORRECT WITHIN 10 PERCENT + OR - WHICH IS CLOSE ENOUGH

Chart II outlines the average speed-reduction requirements and Fig. 12 suggests methods of reducing the band-wheel speed. The lower detail shows a multiple-pulley speed reducer utilizing an expansible pulley for speed variation. The unit is belted to a tachometer which indicates the speed of the bandsaw pulley.

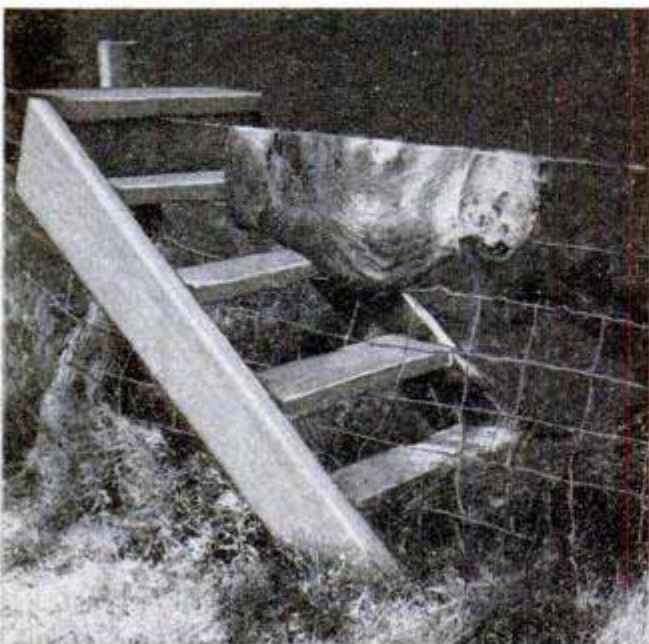
Wire Guard Excludes Predators From Poultry Runs



To prevent foxes, weasels and other predators from gaining entrance to his poultry runs by digging under the fence, one poultryman attached mats of woven wire to the outside of the fences with staples and lengths of smooth wire. Arranged in the manner pictured, the mats effectively prevent small animals from digging under the fence and also keep them from getting near it, as no solid foothold is obtainable on the slanting portion of the wire mats.—John Krill, North Lima, Ohio.

Stair-Step Stile for Farm Fence

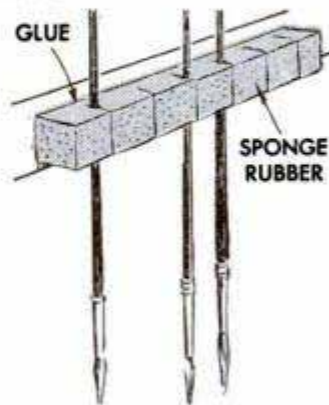
Climbing over a high wire fence is made easy by this stair-step stile. As you can see from the photo, it's built just like an open stair unit, the treads being cut from 2 x 8-in. stock and spiked to 2 x 10-in. runner planks. Lower treads are passed through the wire mesh while the upper ones go through the



spaces between the individual strands, the top tread being nailed to the fence post. The treads are spaced equally on each side of the wire and the top barbed-wire strand is covered with a piece of canvas or a burlap sack to protect the user from the sharp-pointed barbs.

Slits in Sponge-Rubber Strip Hold Artists' Brushes

A strip of sponge rubber glued to a taboret or drawing board provides a convenient holder for artists' brushes. A slit is cut partially through the thickness of the rubber for each brush which is simply pressed into the



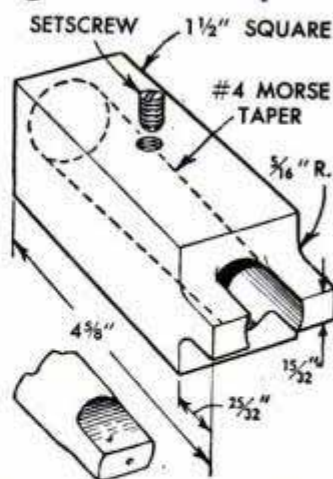
slit when not in use. With this holder the brushes can be stored in a bristle-down position, thus keeping water from softening the glue in the heel of the brush and prolonging its life.—Fred Linn, Chicago.

Inserting Hectograph Ribbon Without Soiling Hands

It is not necessary to soil the hands when inserting a hectograph ribbon in the typewriter. Just fasten a leader of ordinary ribbon to the end of the hectograph ribbon using cellulose tape, and thread the leader in the machine.

Jig Aids Machining Flats on Taper

When Morse tapers are turned in a shop that does not have a milling machine, this useful jig permits a shaper to be used to machine the tongue at the end of the taper. The jig is made to the dimensions given in the detail and carefully bored and reamed to fit the Morse taper. When machining the flats on the taper, both sides of the jig are chalked to prevent metal accidentally being removed from the jig. The setscrew keeps the taper from turning in the jig while it is being machined and any marks left by the screw are removed before using the taper.—Earl R. Goddard, Denver, Colo.

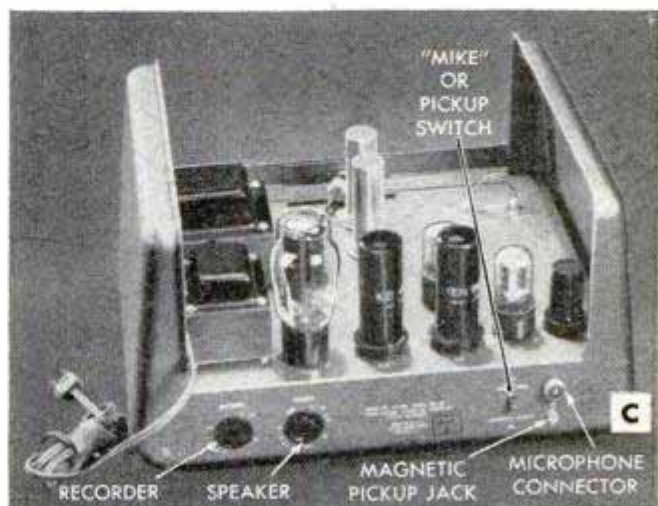


HELPFUL HINTS FOR 1950

A—Producing large-size images from TV screens of nominal dimensions, this glareless, flat and extremely thin lightweight screen utilizes the Fresnel principle of magnification. Advantages are claimed to include good optical quality and freedom from edge distortion. The magnifying element of the screen is a thin sheet of Plexiglas into which hundreds of tiny circular grooves are pressed. It includes a glare filter and enlarges the image from a 10-in. TV tube up to the size received on a 16-in. tube.

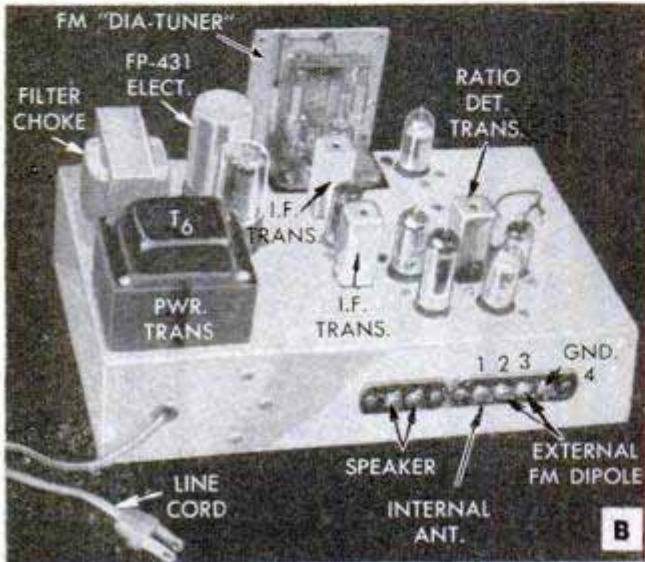
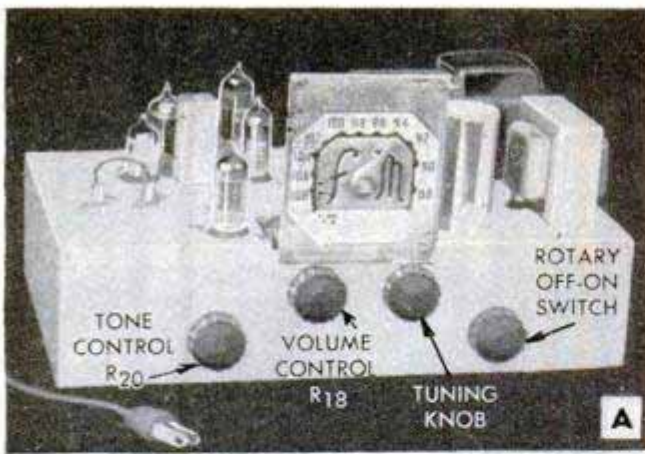
B and C—High-fidelity amplifier, specially designed for those critical experimenters who assemble their own combination phono-radio sets. With the increased number of FM stations now on the air, and the wider use of microgroove records, a high-fidelity audio amplifier of the type shown in the photos is desirable. No technical knowledge is necessary to make interconnections. Photo B shows the simple controls, and photo C is a rear view with the top cover removed. Output impedances permit connection to any type of speaker, and to magnetic cutting heads of disk recorders. Push-pull 6L6 tubes give high output at low distortion.

D—Tiny hearing aid, demonstrated recently at Radiolympia in London, also includes a radio receiver for receiving one broadcast program.



1950 "LITTLE GIANT"

By L. M. Dezettel

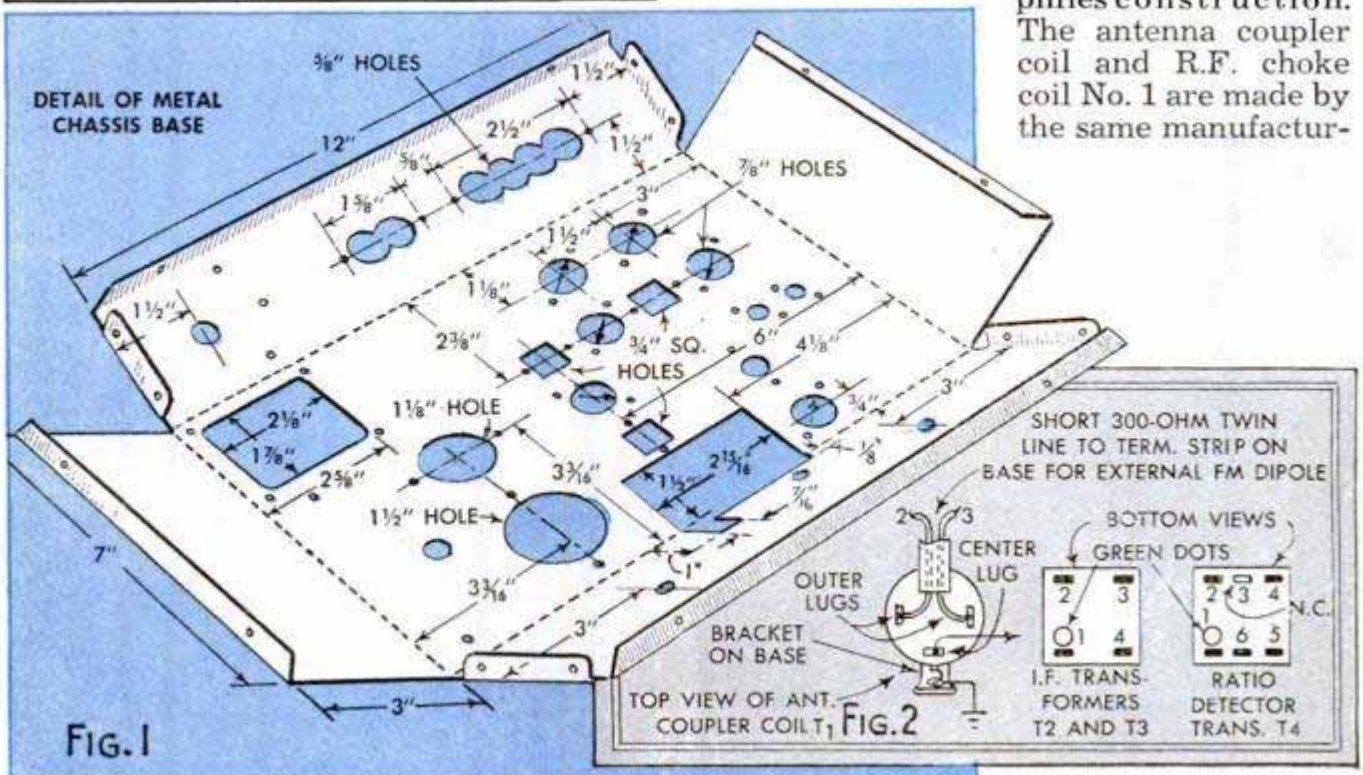


RESISTORS

R1 — 470 ohms, 1/2-watt carbon	R15 — 6800 ohms, 1/2-watt carbon
R2 — 2200 ohms, 1/2-watt carbon	R16 — 6800 ohms, 1/2-watt carbon
R3 — 4700 ohms, 1-watt carbon	R17 — 1 megohm, 1/2-watt carbon
R4 — 4700 ohms, 1-watt carbon	R18 — 500,000-ohm volume control, audio taper 1/4" (Molly U-48)
R5 — 4700 ohms, 1-watt carbon	R19 — 470,000 ohms, 1/2-watt carbon
R6 — 100,000 ohms, 1/2-watt carbon	R20 — 200,000-ohm tone control
R7 — 68 ohms, 1/2-watt carbon	R21 — 270,000 ohms, 1/2-watt carbon
R8 — 4700 ohms, 1/2-watt carbon	R22 — 470,000 ohms, 1/2-watt carbon
R9 — 470,000 ohms, 1/2-watt carbon	R23 — 330 ohms, 2-watt wire-wound
R10 — 68 ohms, 1/2-watt carbon	R24 — 3000 ohms, 10-watt, wire-wound
R11 — 4700 ohms, 1/2-watt carbon	R25 — 700 ohms, 10-watt, wire-wound
R12 — 220 ohms, 1/2-watt carbon	R26 — 3900 ohms, 1/2-watt carbon
R13 — 3.9 ohms, 1/2-watt wire-wound	
R14 — 22,000 ohms, 1/2-watt carbon	

DEFINITELY the most popular construction article for the radio student and experimenter is the one describing the "Little Giant" model that always appears in the March issue of Popular Mechanics Magazine. It is designed to include new features of special interest to advancing students and experimenters. Although this model is not intended for beginners, it is simple to build. The receiver to be described tunes the entire FM band from 88 mc. to 108 mc. While it does not include AM broadcast reception, figures show that FM broadcasts now cover a greater area of the United States than AM. The band from 88 mc. to 100 mc. is for worldwide broadcasting use; therefore, this complete FM student receiver may be used in any country where FM broadcast programs are available. Nearly all programs carried on AM are duplicated on FM.

This complete FM receiver may be housed in a table-type cabinet or it may be incorporated into a combination console. The outstanding feature that makes it comparatively easy to build is the availability of the completely prewired and aligned front-end FM tuner. This FM "diatuner" is a permeability-tuned unit made by the Aermotive Company and is available from all radio supply houses. It comprises all of the parts and wiring shown in the white block in circuit diagram Fig. 3. As only four connections are necessary to incorporate it in the circuit, it greatly simplifies construction. The antenna coupler coil and R.F. choke coil No. 1 are made by the same manufactur-

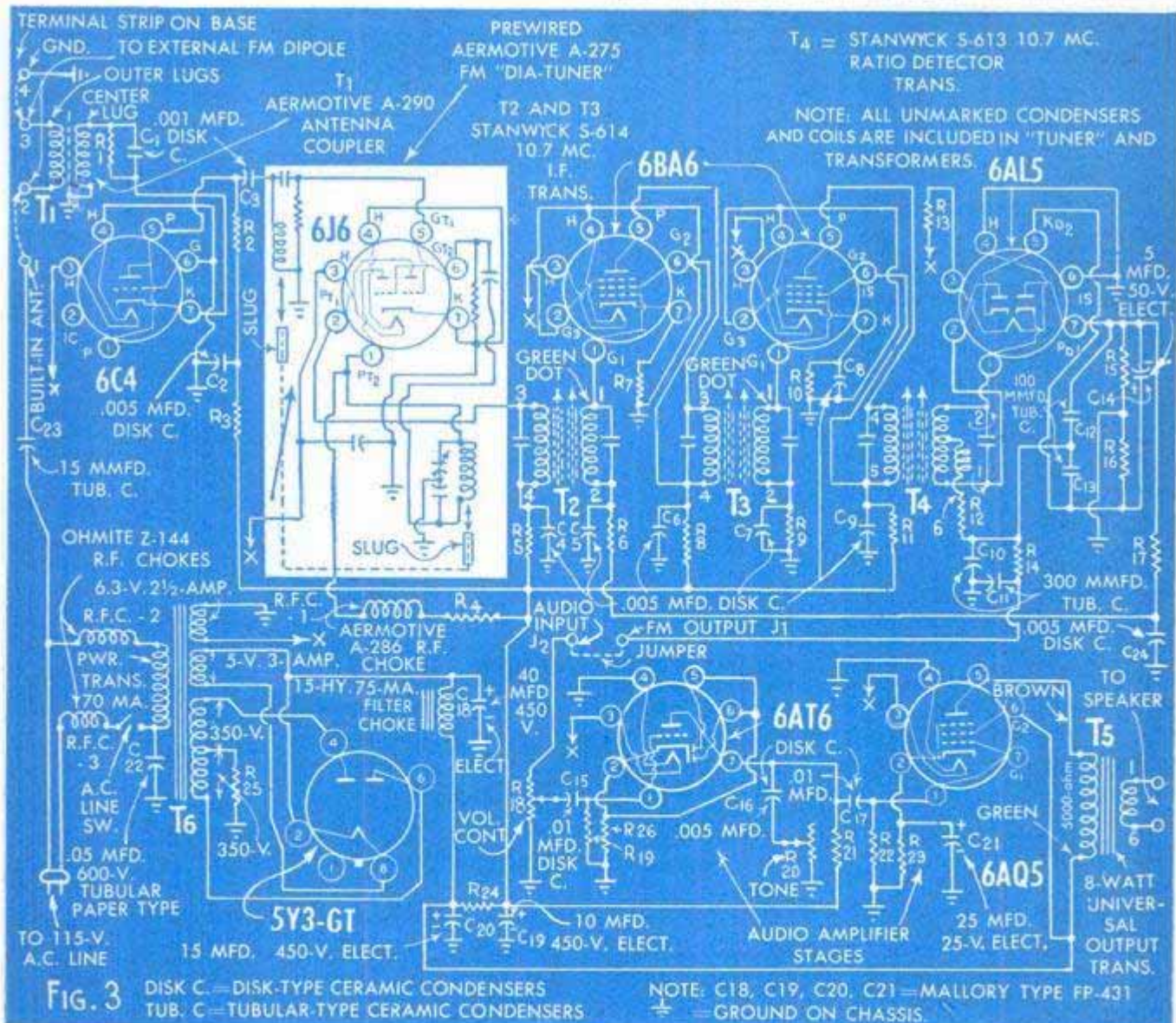
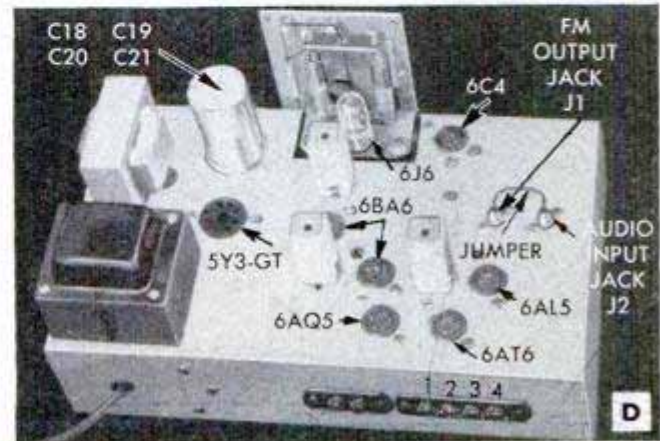


IS A COMPLETE FM RECEIVER

er. The Stanwyck midget-type transformers, T2, T3 and T4 shown in Figs. 2 and 3, are available from all parts houses. Additional features include choice of built-in antenna or a standard outdoor FM dipole. Of special interest is the recently available disk-type ceramic condensers which are used in place of the older and larger tubular paper-type condensers. They are flat and about the diameter of a dime. Their small size saves space and permits the use of the shortest possible leads, which is important in the high-frequency FM circuit. Some very small tubular ceramic condensers are also used.

When mounting the tube sockets on the metal chassis base, detailed in Fig. 1, arrange them so that they are keyed in the positions indicated by the arrows. Follow the parts layout just as identified in photos A, B and D. Assemble the dia-tuner last so as to reduce the possibility of damage to it. Chassis cutouts for the dia-tuner and power transformer can be made with a coping

(Continued to page 234)

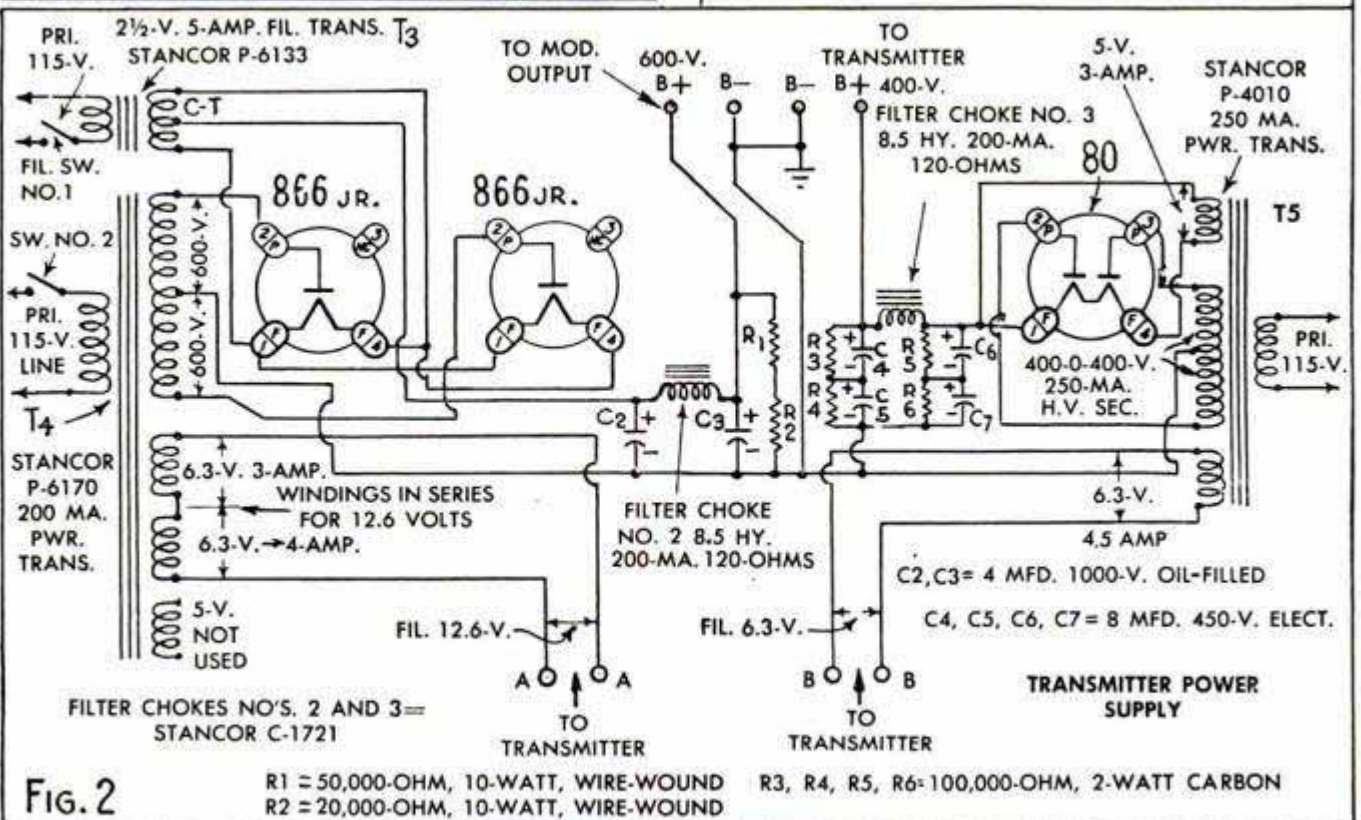
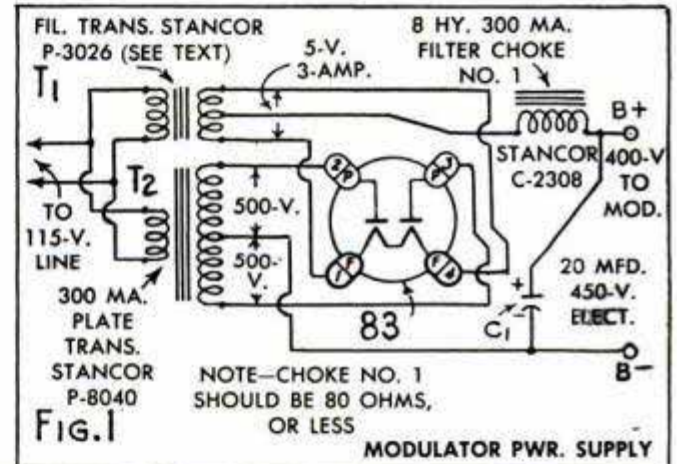
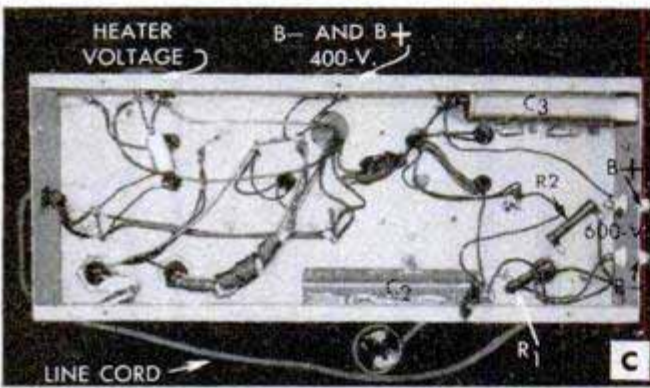
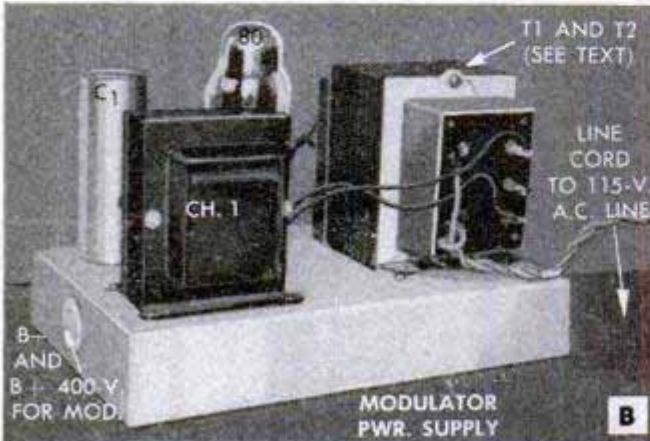
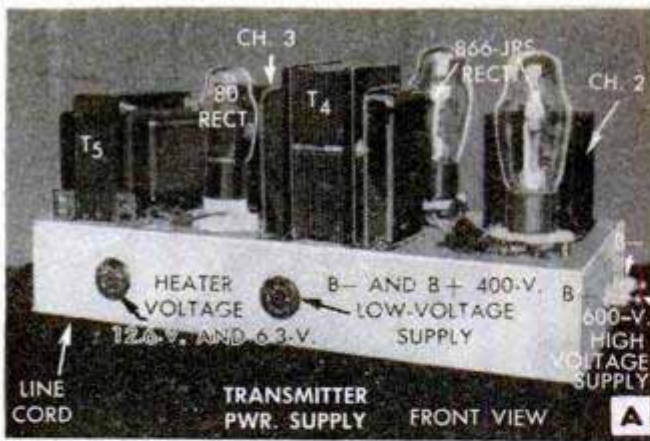


Power Units for Phone Transmitter

PART II

ALTHOUGH it is quite possible that many amateurs have suitable power-supply units to operate the 160-meter phone transmitter described in the February issue, others may not. The units illustrated in photos A and B are employed in the original rig. Photo C is an underside view of the large transmitter power-supply unit. The sheet-metal chassis base of this unit is 3 x 7 x 17 in. and the base for the separate modulator power-supply unit is 2 x 7 x 11 in. Both of these bases are standard sizes and are available from radio-parts houses. These units supply plate voltage for the modulator, and both plate and heater voltage for the R.F. section of the transmitter. Dual electrolytic condensers C4, C5, and C6, C7 are directly back of T5 in photo A.

(Continued to page 236)



R1 = 50,000-OHM, 10-WATT, WIRE-WOUND R3, R4, R5, R6-100,000-OHM, 2-WATT CARBON
R2 = 20,000-OHM, 10-WATT, WIRE-WOUND

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PROJECTOR,
MODEL 2A**

**KODASLIDE
PROJECTOR,
MODEL 1A**



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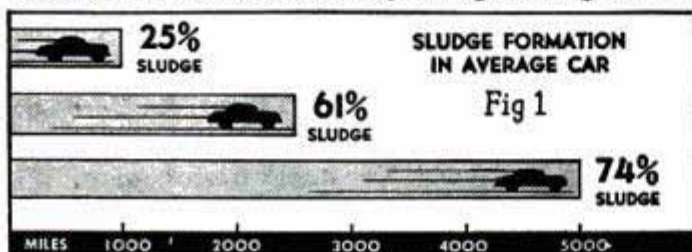


Care and Feeding of Engines

BY S. P. CORP

HOW OFTEN TO CHANGE OIL?

Within the past year there have been many conflicting recommendations on how often to change oil. One magazine article suggested that every 4000 miles is often enough under normal conditions. The point most often missed is that the average car owner does most of his driving between home and work. The engine does not have time to warm up enough. Sludge forms.



This sludge is potentially dangerous to your engine, no matter how efficient your oil filter. The best insurance against such danger is to change oil every 1000 miles.

WHAT ABOUT TIRE PRESSURE?

Many drivers are confused by conflicting advice on the new low-pressure tires. If you were told to keep this pressure at 24 pounds, remember that that means 24 pounds in a cold tire. A tire with a cold pressure of 24 pounds may have 29 pounds when hot. If you have tires checked while hot, and have the 29 pounds pressure reduced to 24, you will be running on under-inflated tires, and will notice rapid tire wear or uneven wear. If you have your low-pressure tires inflated while hot, inflate them to 29 pounds. They will have only 24 pounds when they cool off.

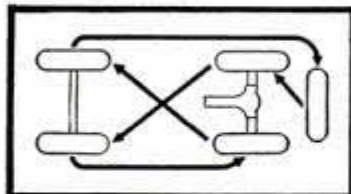


FIG. 2

WATCH FOR EXHAUST SMOKE

If you buy a used car, or if your new car has gone more than 20,000 miles, watch for exhaust smoke—an indication that you need new Sealed Power Piston Rings. There is a set of Sealed Power Rings specifically engineered to do the best possible job in your engine, whatever the make, model, or engine condition. No other ring equals the Sealed Power MD-50 Steel Oil Ring for oil control, even in badly tapered and out-of-round cylinders. To save oil, save gas, and restore engine power, get new Sealed Power Piston Rings when your exhaust smokes!

SWITCH TIRES FREQUENTLY

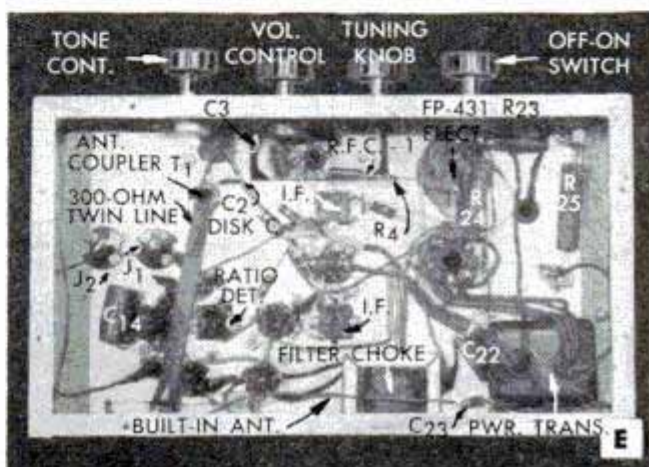
Due to different kind of wear on front and rear, it is important to switch low-pressure tires frequently, following the method indicated in Fig. 2.

1950 "Little Giant"

(Continued from page 231)

saw. The square cutouts for the R.F. transformers and ratio detector are easily made by means of the now available square punches that work by tightening a screw. Tube-socket holes can be made with similar round punches. Photo E shows the arrangement of the parts and wiring under the chassis base. If your power transformer has a filament center-tap lead in the form of two twisted wires, solder the ends together, then tape and coil this unused lead.

Alignment is best done with a high-resistance voltmeter or a vacuum-tube voltmeter. Connect the negative lead of the voltmeter to the negative side of the 5 mfd. 50-volt electrolytic condenser C14, and the positive lead to the chassis. Adjust the two



I.F. transformers for maximum reading on the voltmeter. These transformers are "slug-tuned" and require the use of a small insulated screwdriver. The trimmer slugs are reached through the top and bottom of each can. The bottom slug only of the ratio detector transformer should be adjusted for maximum voltmeter reading. These adjustments are, of course, made with a signal tuned in at the loudest point, or at maximum reading on the voltmeter. At the same time, adjust the small compression trimmer condenser on the top of the dia-tuner for maximum signal. The negative terminal of the voltmeter is connected to the junction of the 22,000-ohm resistor R14, the 220-ohm resistor R12 and the 300-mmfd. condenser C10. The positive terminal of the voltmeter remains on the chassis. Trim the top slug in the ratio detector transformer T4 counterclockwise as far as it will go without coming completely out. Now slowly turn the slug clockwise until the voltmeter begins to deflect. Deflection may be either above or below the zero reading. If it is below, reverse the polarity of the voltmeter. Continue to turn the slug until you

(Continued to page 236)

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obtain a maximum reading and it starts down again to zero. Optimum tuning is this zero point. When the proper adjustment is made, you should be able to tune through a station and hear a feeble station as you enter into peak tuning, then some distortion and next the maximum volume of the station. Then you pass through a path of distortion again and another feeble signal from the same station. After this, it goes out altogether. The center signal, or the loudest and clearest signal, is the proper one for listening in any FM set.

When using the built-in antenna, connect jumper wires from 1 to 2 and from 3 to 4; be sure to remove these jumpers, which are shown in Fig. 3, when you are using a standard outdoor FM dipole antenna. The jacks J1 and J2 are ordinary RCA-type phono plugs and jacks with a jumper wire connected to the plugs. This arrangement permits the builder to use a separate high-fidelity audio amplifier instead of the two built-in audio stages if desired. The built-in two-stage audio amplifier can also be used as an amplifier for a record player or an AM tuner if required. The PM speaker can be any size from 8 to 15 in. depending upon baffle and cabinet facilities. Photo C shows the set in operation on top of a Jensen bass-reflex speaker cabinet in which a 12-in. PM speaker is installed. Detailed student mate-

rial list R-387 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

Power Units for Phone Transmitter

(Continued from page 232)

The modulator unit has its own built-in power supply (which furnishes both screen voltage for the modulator tubes and plate and screen voltage for the speech amplifier tubes). The modulator plate supply can be simple as shown in diagram Fig. 1. A combination plate and filament supply transformer is shown in photo B but the separate Stancor transformers specified as T1 and T2 in Fig. 1 are advised as they are easier to obtain. A ceramic four-prong socket is mounted in the end of the chassis base to carry the power-output terminals to a standard four-prong cable plug. The large power-supply unit for the R.F. section is really two power units in one as will be noted in diagram Fig. 2. A separate filament transformer T3 is used for the 866-Jr. rectifier tubes. Filament switch No. 1 should be turned on to heat up these tubes before throwing the transmitting plate switch No. 2. All other filaments and plates can go on with switch No. 2. Detailed student material list R-386 covers the complete four-unit transmitter.



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Masterpieces in Miniature

(Continued from page 100)

the tiny hog truss himself, spliced it and secured it in genuine Egyptian fashion.

While these ships are old and interesting, Crabtree considers them "easy." Some of his more elaborate models would give a watchmaker nightmares.

The "St. Albans," a British ship launched in 1686 and bearing the extreme ornamentation of the era, has 270 minute carved figures set in the hull. A hundred cherubs, about 1/4 inch high, flit along stern and quarter galleries alone. Crabtree chipped, chiseled, carved and shaved away for three years, putting in thousands of hours before the last piece was in place. Under the cupids and the British coat of arms on the stern, are rows of windows of real glass set in tiny metal frames. Intricate gilt wreaths circle each gun port.

Even more elaborate is the Venetian galleass, a ship dating back to 1660, which combines the features of a sweep-driven slave galley and sailing ship. Decorating the hull of this gem are 359 sculptured figures in bas-relief. Babies' heads, no more than 1/16 inch in diameter, adorn the stanchions. The galleass has scuppers 1/16 inch in diameter. On the original, these scuppers were lead lined. So Crabtree lead lined his, too. He even wove eye-splices on the thread-thin shrouds, because that's what appeared on the real ship.

Crabtree's passion for accuracy knows no bounds. On his 42-inch French galley, containing 162 carvings, the 1/4-inch-high balusters were crowned with babies' heads back to back. This meant carving two sets of features on each tiny head! There are dozens of such balusters on the ship. Even the 40-odd sweeps for propelling the ship are adorned with carving. Under the scarcely discernible overhang on the ladder steps, he incorporated a molding, so fine it cannot be seen with the naked eye.

The ultimate in the realism department, however, is the fur and skin used on the models. Crabtree needed the fur to dress his little stone-age man, the skin for a drum on which the coxswain beat rhythm for the French-galley slaves. No purchasable leather or fur was fine-textured enough to suit Crabtree and he refused to use substitute material. So he killed a mouse, skinned it and tanned the hide.

Some may feel that's carrying things pretty far, but it's just such details that make Crabtree's ships so superior.

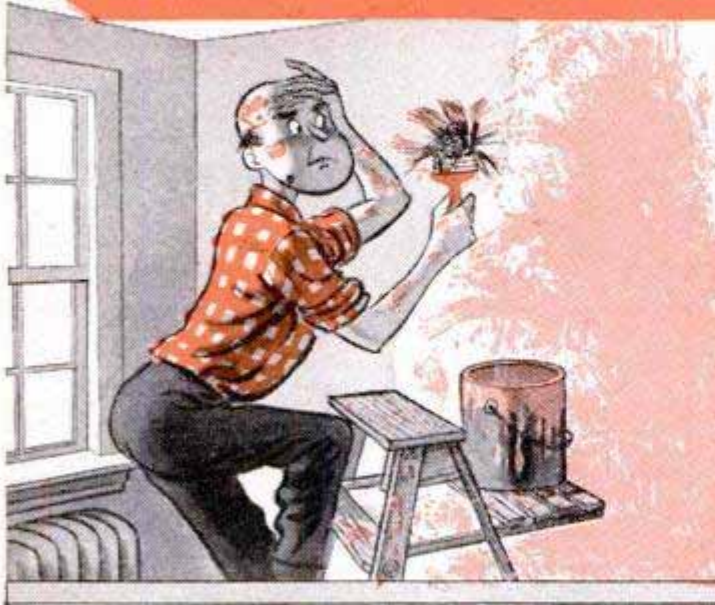
On several of his models, the planking has been left off one side of the hull to show accuracy of construction below decks.

(Continued to page 244)

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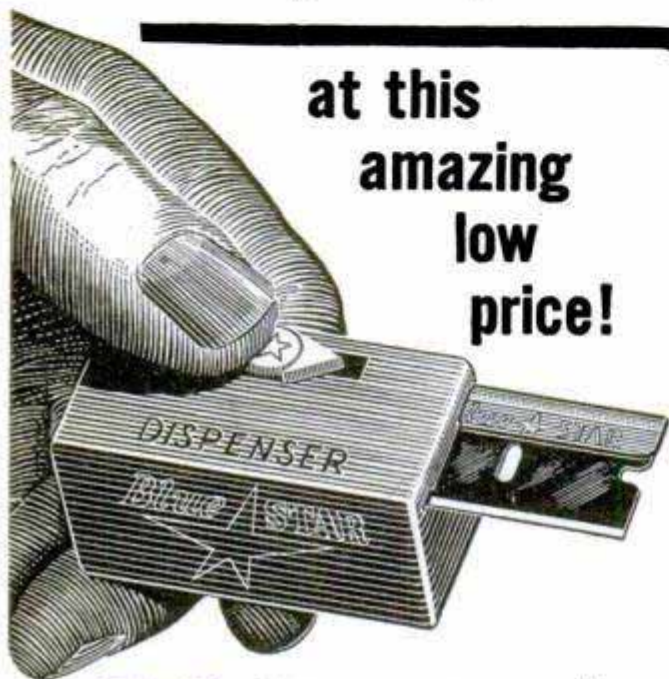


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Sweating Window

Q—We have a large picture window in the living room of our new home. The sash frame is of metal. In cold weather the window sweats and water runs onto the floor making it necessary to use a mop frequently. Several floor tiles have been loosened as a result of constant dampness. What causes this, and what can we do about it? — W. M., Jefferson City, Mo.

A—Briefly, moisture will condense on any surface that is colder than the air in contact with it. For this reason, moisture from the air in the room condenses on the glass panes of your picture window because the glass is much colder than the warm air in the house. Installing a storm sash usually will cure this trouble, or at least will minimize condensation to the point where it is no longer a problem. When installing the storm sash, seal the edges with felt strips about $\frac{3}{4}$ in. wide and use turn buttons as fasteners. In some cases it will help to direct the blast from a small electric fan against the window. Place the fan directly in front of the window and about 4 to 6 ft. from it.

Spots on Papered Walls

Q—My home is newly papered throughout except ceilings in the kitchen and living-dining room. In all but one room light-brownish discolorations with irregular edges show on the walls in several places. I've thought that this possibly was due to moisture but a local paper hanger says the spots are caused by too much alkali in the plaster mixture and that there is no way to remedy the trouble without repapering. Who is right? Is there any way to correct this tendency?

D.F., Columbus, Ohio.

A—We think you are both right, at least partially. As a rule, there is no practical way to remove the discolorations that you describe without damaging the wallpaper. Probably the best thing to do is remove the paper. After removing the damaged paper, coat the bare walls with a zinc-sulphate solution, about 1 lb. to each gal. of water, and allow to dry at least 48 hours. Some paper hangers

(Continued to page 242)

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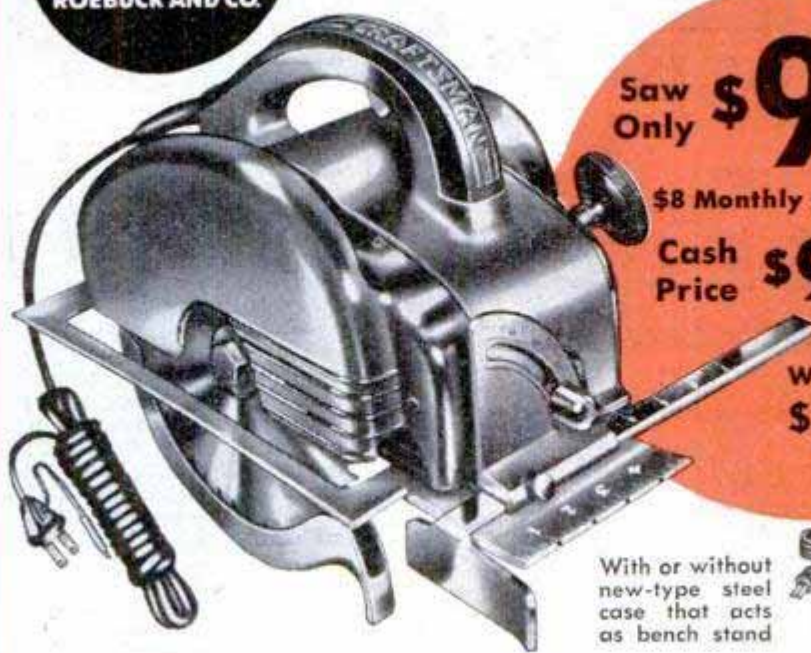
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recommend as an added precaution that the walls be coated with aluminum paint and then sized before repapering.

Warped Table Leaf

Q—I have a drop-leaf table I would like to refinish. This table is very old, the finish is checked and grimy and one leaf is warped, or cupped, badly. I tried to straighten it with a heavy weight but without success; in fact, the piece began to split at the center, due, I suppose, to the application of the weight. Is there a way this can be done to restore the leaf?

F.G., Raleigh, N.C.



A—Although you did not say, we are assuming that, because the table is described as old, it is built of solid wood and that the large surfaces are not veneered or built up by lamination. If this assumption is correct then probably the best and surest procedure is to remove the warped leaf and rip it lengthwise into strips about 2 in. wide. If the leaf has a curved, molded edge, keep the strips in order. Measure the width of the saw cut, or kerf, and keep track of the number of saw cuts made, as a matching strip must be fitted when the leaf is reassembled. The width of the new strip must be equal to the combined width of the saw cuts plus whatever planing is necessary in squaring the edges. Now, joint (plane) the edges of each strip square with the face. Assemble the original strips in order and from this determine the required width of the filler strip. Cut this slightly longer than required and see that the filler strip matches the original as nearly as possible in color and graining. Glue the pieces together edge to edge with waterproof glue and clamp until dry. When dry, sand the surface smooth on both sides. True the molded edge with sandpaper and a wood rasp until the curve is true and the mold is of the original shape. Then refinish the leaf with whatever color and type of finish is desired.

Loosening Tight Sash

Q—I want to paint my house this coming summer and I must do all the preparatory work and painting myself. How does one loosen upper sash that stick so tightly they cannot be pried loose without danger of breakage? I've tried all the methods I know without success. I don't want to paint the frames without lowering the sash. — J.F., Toronto, Ont., Can.



A—As a rule, this is quite easy to do with a putty knife. Force the blade of the knife between the sash frame and the stop and draw it along both the stiles and the top rail. Do this inside and outside to break the paint film that has hardened between the frame and the stop. Usually the sash will loosen and slide quite easily after this treatment. Sometimes the sticking is due either to swelling of the wood or settling of the building, which warps the window frame slightly. In this case it may be necessary to pry out the outside stops in order to loosen the sash without damaging the wood or breaking the pane. If removal of the stops is necessary it's a good idea to replace them with new ones as the film built up by repeated applications of paint will have increased the sectional size of the stop considerably. Before replacing the sash, determine what has caused it to bind and if possible remove the cause by planing or other alteration to prevent further trouble.



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Dynamically balanced armature eliminates vibration • Oilless (oil-sealed) bearings • Patented automatic chuck lock pin • Snap-type sliding switch • Cord protector • Shockproof bakelite housing • Dust-filtered air-cooling system • Weighs 13 oz. • Plugs into any 110-120 V. AC outlet. Backed by over 13 years' use in plants of General Electric • Ford • Remington Arms • Nash-Kelvinator • Westinghouse • Douglas Aircraft, etc. . . . plus a money-back Guarantee if not delighted after 5 days' trial.



PRE-WAR PRICES STILL PREVAIL

MOTO-TOOL KIT No. 2, with 23 accessories including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case. . . . **\$23.50**
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Portable DRILL PRESS



This 12" high, precision drill press is ideal for model making, wood carving, routing, etc. Utilizes No. 2 Moto-Tool.

Only **\$9.95** (Less Moto-Tool)

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DREMEL MFG. CO., Dept. 110-C, Racine, Wis.

FUN FOR BOYS FROM 8 TO 80

DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS



BLADE FACES 4 WAYS

SAFE! AS A HANDSAW

JUST GUIDE IT!

Only **\$5.85** with 3 saw blades



Plans for making six useful, decorative projects packed with each Dremel Electric Coping Saw.

For men who harbor a hobby or do their own repair work . . . for boys who like to make things . . . no other tool will give so much pleasure and satisfaction in the home or workshop for the small amount of money invested as a Dremel Electric Coping Saw. It works in any direction . . . delivers 7,200 strokes per minute . . . so easily, there is no effort . . . so smoothly, work needs no sanding. Saws through 3/4" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only two moving parts, never needs oiling. Operates on 110-120 v. AC. Thousands and thousands of satisfied users.

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3

TOOLS IN ONE



Only **\$14.85** POSTPAID

PATENTED

Dremel Electric SANDER POLISHER-MASSAGER



Works Easily in Awkward Places



Sands Flat Surfaces Evenly



Makes Play of Wax Polishing



Soothes Tired Muscles

Say goodbye to hand sanding and polishing! This miracle machine is so easy to handle, a child can use it. Craftsmen and housewives find (1) As a sander, it takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. Its straight-line, (non-rotary) action will not burn or scratch surfaces. (2) As a polisher, it does a professional job on waxed surfaces of cars, furniture, etc. (3) As a massager, it's ideal for tired or sore muscles.

LOOK AT THESE DREMEL FEATURES

Dremel Sander delivers 14,400 strokes per min., weighs only 2 1/2 lbs. It's foolproof (has only two moving parts . . . never needs oiling). Dremel Sander operates on 110-120 Volt AC. Thousands and thousands of satisfied users prove its value.

SATISFACTION GUARANTEED

Dremel Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. If your dealer cannot supply you, use coupon to order direct from factory. Money back if not delighted after 5 days' trial.

Dremel Mfg. Co., Dept. 110-C, Racine, Wis.

If Your Dealer Cannot Supply You USE THIS HANDY ORDER FORM

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- Enclosed find \$_____ (check or money order) in full payment for items checked below.
- Enclosed find \$2. Ship items checked below C. O. D. I'll pay postman balance plus postage and fee.
- Dremel Sander **\$14.85**
- Dremel Coping Saw **\$5.85**
- Moto-Tool No. 2
- Moto-Tool, **\$16.50**
- Kit No. 2, **\$23.50**
- Drill Press **\$9.95**
- Send FREE Catalog on Moto-Tool Dremel Sander Dremel Coping Saw

Name _____

Address _____

City _____ Zone _____ State _____

His model of "Catherine," royal yacht of Charles II, is that way to show the 17th century framing with single timbers. Double frames didn't appear until 100 years later. Such details are vital to Crabtree.

This particular ship, incidentally, has extremely fancy carving. It took Crabtree nine months to do the stern carvings alone. Thirty-five figures decorate the British coat of arms, plus the usual cherubs flapping around in trailing draperies. Some of the detail work on these carvings is so fine that a soiled finger rubbed over them would fill in the grooves.

The delicate work of such carving entails plenty of nervous strain. On the real fine finishing work, which he often does under magnification, Crabtree can only spend about 35 minutes at a time.

The builder does not wear glasses, nor does he use a magnifying glass until the final touches are being applied. "If you used a glass on the features and outlines," he explains, "your carvings would be all out of proportion."

Fine carving also calls for special tools. Crabtree has an elaborate shop in his home at Kissimmee, Fla., but most of his vital implements he carries with him in a cigar box. These are tools devised and made by himself, since commercial knives are much too crude. Most of his knives and chisels

have been made from dentists' picks and hair-bladed surgeons' scalpels. For his microscopic finishing work on super-delicate carvings, he uses a chisel made from a dental tool. This implement has a blade measuring $\frac{1}{2000}$ inch across the broad side. Even Crabtree, with his eagle eye, needs a bright light and a magnifying glass to determine which is the broad side.

A jeweler's drill and lathe are part of his shop equipment. Painting of the carvings, done by Mrs. Crabtree (who also is sailmaker for the Crabtree shipyards), is accomplished with a camel's-hair brush boasting a total of three hairs.

It's typical of Crabtree that he wouldn't be satisfied with the kind of wood you can buy. "The commercial variety is no good," he declares. "It's not seasoned properly, and usually is too brittle, lifeless and coarse-grained for fine work." The master builder spent years experimenting with 140 different kinds of wood for various uses on his ships before he found what he wanted.

Apple wood, he decided, was best for hull planking, because it is close-grained, bends true and won't split. Fire thorn heartwood, cut in the forests of Oregon, is Crabtree's favorite carving medium. It's extremely dense and won't chip while being worked. Elm is used for sharp curves,

(Continued from page 246)

**LOWEST-PRICED
COMPLETE
POWERCYCLE**

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DELIVERED

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**3-SPEED TRANSMISSION
KICK STARTER**

**100 MILES
PER GALLON**



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THE NEW MODEL 50

UTILITY TESTER



Compact—Measures 3 1/8" x 5 7/8" x 2 1/4"

A NEW KIND OF INSTRUMENT FOR TESTING ALL ELECTRICAL CIRCUITS AND APPLIANCES SUCH AS—

- RANGES
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 - SHAVERS
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 - FANS
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- and MOTORS

[ALL MOTORS—single phase, multi-phase, universal, squirrel cage, induction, in fact every type of motor from fractional H.P. to 2 H.P.]

THE MODEL 50 UTILITY TESTER:

- Will test condensers for both opens and shorts.
- Will accurately check and locate the exact cause of failure in 3 way heat control switches.
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- Will measure the actual current consumption of any appliance or utility either A.C. or D.C. and will measure it while the unit is in operation. The reading will be direct in amperes. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Will measure the actual voltage and indicate whether the current is A.C. or D.C. and if the frequency is 25 cycles or 60 cycles.
- Incorporates a sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens.
- Will indicate excessive leakage between a motor and a line up to 10 Megohms.
- Will indicate when a three phase motor is running erratically due to a "blown" fuse.
- Will test Thermostats under actual working conditions.
- Is the ideal trouble-shooter as it will instantly locate opens, shorts and grounds.
- Will test all bulbs, radio tube filaments, pilot light lamps, all fuses including cartridge, screw, etc., fluorescent bulbs, etc.

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TRY BEFORE YOU BUY! Yes, you need send no money with order or pay anything on delivery. Simply fill out this order form and mail it today. Try the Model 50 for 10 days. If completely satisfied, remit \$13.90. If not, return the instrument—no explanation necessary.

The Model 50 Utility Tester comes housed in a round cornered molded bakelite case. Complete with all test leads and operating instructions—only ...

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PM3

Please rush one Model 50 Utility Tester. I will either remit \$13.90 after a 10-day trial or return the instrument via Parcel Post.

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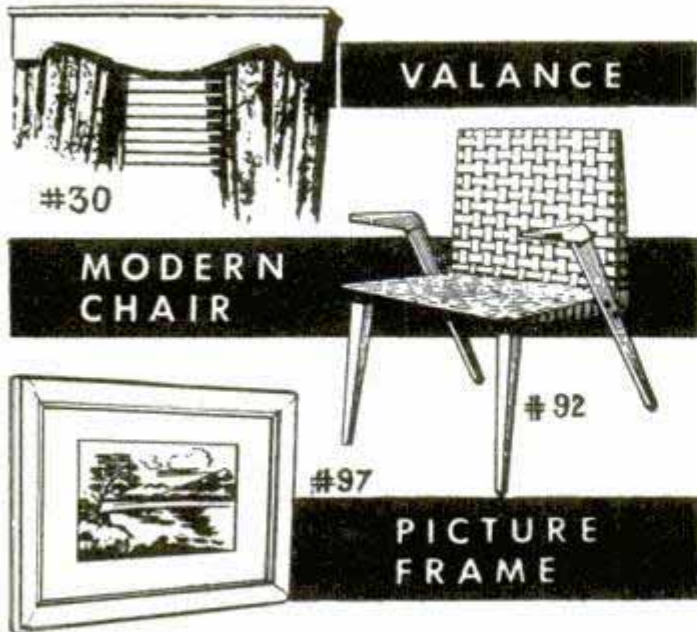
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THE BORDEN CO. • CHEMICAL DIVISION
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and cascara he uses sometimes for deck beams. Laurel, English and French walnut and lime wood from the West Indies also find their way into Crabtree's ships.

All of these woods, of course, Crabtree cures himself so he'll know they're right. First he water-cures the wood in a creek for two or three weeks to remove all acids. Then it is dried out in a cool place with a little ventilation. After drying, the builder cuts his logs into miniature lumber and puts it away for about three years until the wood is seasoned to perfection.

The business of earning sufficient money to support a wife and an expensive hobby might have thrown anyone with less determination than Crabtree. He never let it bother him. Whenever he had to have cash, he found his services much in demand. Hollywood needs models for miniature sets and Crabtree has made many of them. "It's a nice vacation to do that junk," he says, "but it's crude set stuff, lacks important detail and would ruin a man for good work if he kept at it."

After working so many years on old ships, Crabtree has become an authority on antique vessels. He has hired out as technical advisor for such movies as "Mutiny on the Bounty," "Captains Courageous," "Captain Caution," "Reap the Wild Wind" and others. During the war he was a naval architect in the Kaiser shipyards. By adapting principles used by the ancients, he patterned and lofted the big doors on landing craft—a problem that had stumped the experts for months.

Today, however, it's no longer necessary for Crabtree to fret about prostituting his art for money. The fleet is enough of an eye-stopper so that big-city department stores pay huge sums to rent it for display. The Crabtrees have had a special truck built to accommodate their precious cargo as they tote it around the country on tour. This year they hope to set up a private museum in Florida and charge admission for a look at the handiwork.

Carting the delicate ships around the country is not Crabtree's idea of fun. It's risky and uses up time that he would rather spend building new models. The fleet is insured for \$100,000, which, the owner points out, wouldn't begin to replace the labor that went into them. Crabtree feels that all the money in the world couldn't pay for them, anyway—which is one reason none has ever been for sale. When a big merchant line offered to pay him a fabulous sum to make some old ship models, he agreed to do it if they'd let him retain ownership.

"It's this way," he says, "would you sell your own child?"

A DOUBLE-BARRELED OPPORTUNITY TO

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NEW HOMES



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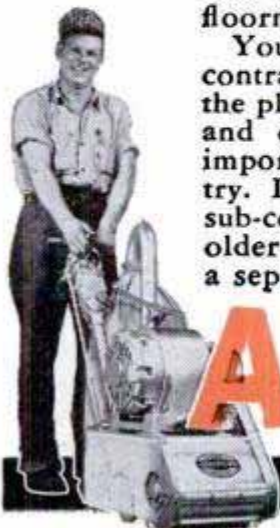
Another booming year is ahead in the building industry—and here's a double-barreled way for *you* to CASH IN!

Start your own business as a floor surfacing contractor with American Machines—and you will find hundreds of new and old homes are year 'round prospects for your services! No special schooling needed. No long waiting to get going in a business of your own. You can start sanding floors and make money as your own boss *the very first day* your machines arrive! Earnings of \$25 and more a day are not uncommon among men like yourself who have become floormen.

You'll be proud to be a floor surfacing contractor and take your place alongside the plumber, the electrician, the painter and other building craftsmen as an important cog in the construction industry. In new construction you work as a sub-contractor and when resurfacing older homes you will usually operate as a separate businessman.

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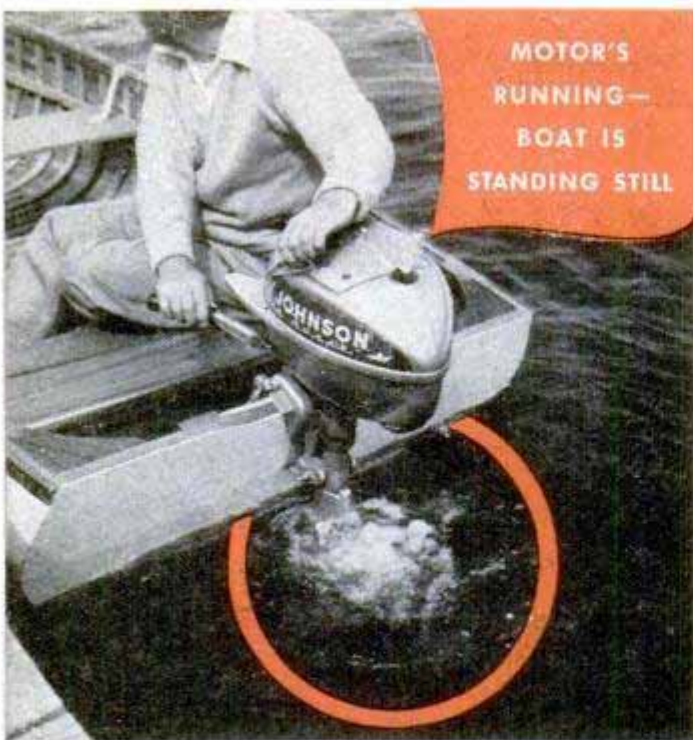


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See your Johnson dealer. Look for his name under "Outboard Motors" in your classified telephone directory. *1950 Johnson prices are lower!*

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SEA HORSES

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NEW MODEL TN. Johnson Neutral Clutch and Full Pivot Reverse. Alternate Firing. Dual Carburetion. Sure-fire Shock Absorber Drive. Vari-Volume Pump. Synchro-Control. Ready-Pull Starter. S-l-o-w Trolling—24 other features. *And no increase in weight or price!*



*OBC Certified Brake H. P. at 4000 r. p. m.

Look a Typhoon in the Eye

(Continued from page 139)

approximately 5000 feet. From 1000 feet to 5000 feet were tiers of circular cumulus clouds giving the effect of seats in a huge stadium.

"The wind was estimated at about 35 knots in the center. No calm water was seen because of the undercast.

"After the navigator had taken a loran fix and the weather observer had taken his observation, a sounding descent was begun to 1500 feet, using the eye as the let-down area."

Up to now Beverly has been behaving like a lady. But now she is a lady who has been trifled with, and as the B-29 swings in smooth circles within the solidity of her internal walls, she is preparing to vent her wrath with all the howling furies she can summon from hundreds of miles around.

The barometric altimeter reads 4100 feet. Over the intercom comes the sharp voice of the weather observer, "True altitude 1500 feet."

The radar operator cuts in, "Weak spot in the wall at 305 degrees."

Lykins banks sharply in the tight circle at the foot of the cone. As the gyrocompass reaches 330 degrees he rolls out of his bank heading 305 and level. "Hold on," he says grimly.

It is like hitting Niagara Falls. The plane sags under a wall of water. But Beverly is no puny Niagara with forces moving only in one way. The powers in the twisting crosscurrents and the vicious updrafts are each in their own right so staggering as to reduce by comparison the potency of Niagara to a finger leak in a dyke. Lykins is hurled into his shoulder straps so viciously his feet cannot find the rudder. A wrenched second later he is slammed into his seat, his hand nearly torn from the control column. A bolt of lightning sears past their eyes, blinding them to the weak blue of their fluorescent instruments. The copilot reaches a weighted hand to turn up the lights, and another crushing blow smashes against the nose from below. The copilot's hand, still on the knob, is snatched downward, and not until later does he see he has torn the rheostat from the instrument panel.

Lykins is trying to hold the speed of the plane to within safety limits. At times she seems racing to destruction. At other moments the wings shake with an approaching stall. She is flipped on her side and then wrenched in the opposite direction. Beverly is playing now, and both pilots have not time enough to man the throttles.

(Continued to page 250)



Only **ATKINS**
 makes "Silver Steel"
SAWS



That's an important fact to remember when selecting saws—for any purpose... because "Silver Steel" Saws—developed, perfected and manufactured only by Atkins—are made of the finest, toughest, longest-lasting steel ever alloyed for sawing operations. They are backed by 93 years of continuous research and scientific advancement! Tell your hardware dealer you want Atkins "Silver Steel" Saws.



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... OF ALL FINE SAWS—THE FINEST ARE "SILVER STEEL" SAWS

GET THE FACTS—
 the all-new **IDEAL LAWNMOWER SHARPENER**



A Complete Lawnmower Shop in One Machine!

Here it is, after four years of research and development, the **COMPLETELY NEW IDEAL LAWNMOWER SHARPENER**. Designed and built to sharpen post-war and pre-war hand and power lawnmowers with precision and speed, the **NEW IDEAL SHARPENER** includes a tapered-cup grinding wheel for sharpening bed knives and a "lapping-in" reconditioner as standard equipment. *Power mowers need not be dis-assembled, engines and handles remain in place during sharpening.* Chain hoists or ropes are not needed to support heavy mowers, the **IDEAL** supports the entire weight of the mower within its rugged cast-iron frame. The **IDEAL SHARPENER** is a complete lawnmower shop all in one machine. Send for the **IDEAL CATALOG** describing the new **Model 300 IDEAL LAWNMOWER SHARPENER** and the other machines we manufacture for the lawnmower serviceman.

Model 300 — the result of 48 years experience
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FLOODLIGHT LANTERN

*Prices as low as \$9.95 in U. S. A.



"My Coleman Lantern adds more hours of fun, with plenty of good light in camp at night," says **ANDY DEVINE**, sportsman and picture star, and owner of Sportsmen's Tavern, Big Bear Lake.



"I wouldn't be without my Coleman. You need it for a brighter camp light and longer outings," says **JOE GODFREY**, founder of the Sportsman's Club.



"You need adequate light when you haul big ones aboard—that's why I use Coleman," says **JOHN HIGHTOWER**, noted outdoorsman.

Floodlights 100-ft. area—20 times as bright as wick-type lantern. Storm-proof. Safe. Ask your dealer.

GOOD EATS Quick...Anywhere

Cooks like a city gas range. Lights instantly. Folds up; carries like a suitcase. Safe. Prices as low as \$9.95 in U. S. A.



Folding Camp Stove

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The Coleman Company, Inc., Dept. 208-PM, Wichita 1, Kans. Please send me FREE booklet, about Coleman Lanterns and Camp Stoves.

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ADDRESS.....

CITY..... STATE.....

The third pilot unbelted himself from his observer's seat and lurches forward. An updraft crushes him to his knees, and a forward pitch tosses his head into the aluminum tubing of the captain's seat. Another twisting dive slams his ribs against the copilot's seat, but he gets a death grip on a cross brace. One big hand closes over the four throttles and the speed is brought under control.

But Beverly is not through. She shakes the B-29 until the rivets pop out of the flight deck. The aerial camera is torn from its rack, dashed against the ceiling and hurled to the floor. The radio operator's earphones are torn from his head and then thrown back into his face. The navigator's kit is emptied of maps, and they float in the air, obeying no laws of gravity.

Back in the cabin the two scanners, battered by flight lunches, Thermos bottles and life rafts, watch in consternation as sheets of aluminum torn from the wing fairings go flashing by in the brilliant glare of the Aldis lamps they have directed over the wings.

Says Lykins in his report:

"It is impossible for me to describe accurately or to exaggerate the severity of the turbulence we encountered. To some it may sound utterly fantastic, but to me it was a flight for life. I have flown many weather missions in my 30 months with the 514th Reconnaissance Squadron. I have flown night combat missions in rough winter weather out of England, and I have instructed instrument flying in the States, but never have I dreamed of such turbulence as we encountered in typhoon Beverly. It is amazing to me the ship held together as it did."

Suddenly it is all over. Beverly has lost her plaything. When turbulence has been reduced to ordinary cyclonic intensity, the crew has time to take stock of what has happened. The period of extreme violence has lasted six minutes. Present altitude, 6000 feet, a climb of a thousand feet a minute while trying to fly level, and in spite of downdrafts, some of which exceeded a thousand feet. The inside of the plane looks as though Beverly had blown through it instead of around it. The navigator crawls around on the floor, retrieving his gear. Green grass flickers across his loran screen, and then the signals come marching in, straight and true. He takes a fix and gives the heading for Clark Field, north of Manila. At 11:35Z the B-29 is on the ground again, staggering slightly as she rolls to a stop on the long runway.

The B-29 lived through that one by a narrow margin. Hundreds of rivets had

(Continued to page 252)

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AS
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BURKS Dual System gives you completely automatic service from deep or shallow wells. New folder explains this, also LIFE-LOK feature. Shows why BURKS is best buy. Self Priming—One Moving Part—Dependable Service. Write for literature—prices.

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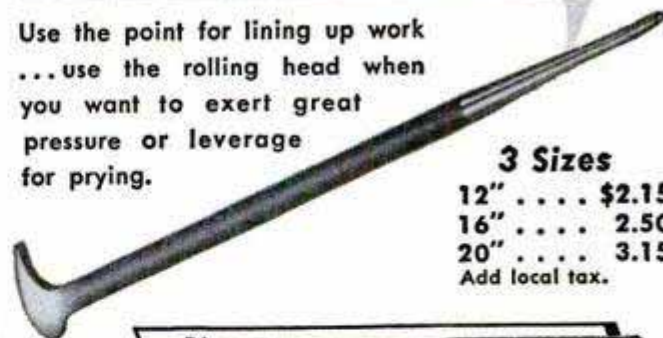
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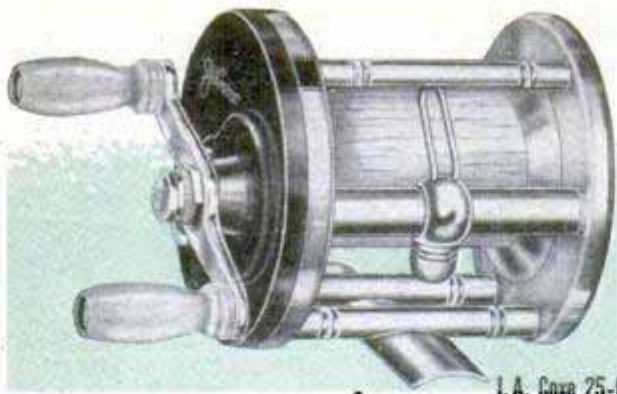
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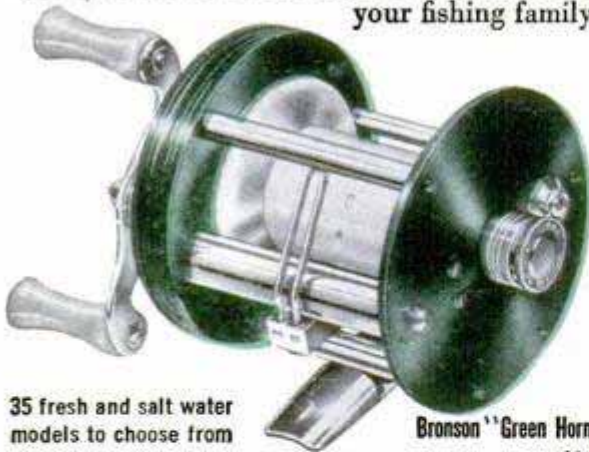
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been popped from her skin. The flaps were twisted. Great gaps showed in her fairing, and the R.F. unit in the center section of the bomb bay had been torn from its moorings. The fuselage was twisted. Whether she will ever fly again still remains to be seen after a survey of her internal structure is completed.

Beverly roared on out to sea, obeying no laws of meteorology. A nice trough developed into which she could drift northwest into China as do most of her sisters, but she broke through it. A steering wind at the 600-millibar level was guiding her north when suddenly she turned on it and ripped it to bits. Then when it looked like no power on earth could stop her, and the poor Aleutians were going to lose some more breakwaters, a great mass of polar air tore the heat out of her in great gouts of rain. When last seen on the weather map, she was just a mild speck in a cold winter.

The lakes of water carried by Beverly and the billions of tons of sea water she displaced were all wasted on the open sea. But it was only her own strange whims that kept her from assaulting the land with the same vicious force that destroyed 20,000 boats and killed a quarter of a million people in Bengal. A twist to the west, and she could have duplicated the typhoon that washed over Honshu in 1934, killing 4000, or she might have equalled the damage of her predecessor who hit India in 1942 and killed 40,000.

Modern structures and even great battle-ships mean nothing to typhoons like Beverly. In 1944 one caught the U. S. fleet off Japan, damaging 28 ships and rolling over and sinking three destroyers. More than 800 officers and men were lost in that blow. A few months later the heavy cruiser, Pittsburgh, had her bow cut off as though hit with a giant ax. Two other heavy cruisers were knocked out of commission, the great aircraft carriers Hornet and Bennington had their flight decks smashed to kindling wood, and 28 other ships of the fleet were too battered to continue the mission.

Only the warnings of the typhoon trackers prevented greater loss when the worst typhoon in 20 years struck Okinawa in October 1945, killing 43 Americans and leaving 50,000 homeless. All that was loose was blown away, and then the ropes and anchor chains were torn from everything thought secure. Almost all food was lost, and 130 vessels of all kinds were sunk, crashed into the beach, or swept far inland.

Sometimes not even taking refuge in storm cellars will help. The typhoon that hit the Philippines in 1911 dropped 46 inches of rain in 24 hours (approximately

(Continued to page 254)

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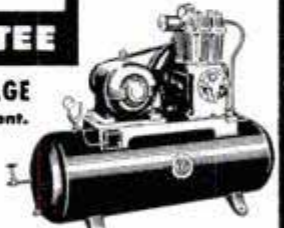
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New York's annual rainfall) and then backed up to drop four feet more in the next three days. An eight-foot lake covered all level ground.

Last year, with the seismograph boys bringing their new science of storm detection through earth tremors to perfection, and the typhoon trackers riding hard on all storms, the damage was greatly reduced. But that only applies to ships and aircraft that can be moved out of harm's way. In January 1948, Karen nearly washed away the island of Yap, the only food left being the taro roots deeply embedded in the ground. Libby moved in on Okinawa again, doing \$10,000,000 in damage, but this time no lives were lost. Ione slammed into Tokyo with a heavy toll of life and damage.

All told, the 514th has flown more than a hundred typhoon-tracking missions in a single year with eight storms developing into full-fledged typhoons. The average is 25 a year. There is no such thing as a typhoon season; it's just that they get a little worse in August and September. Nor is there such a thing as a typhoon belt. In general, typhoons seem to show a tendency to drift northwest, dissipating over North China, but any one of them is just as apt to take off for the Aleutians or North America, or to turn around and go back where it came from. Some just can't make up their minds, like the one that blasted Okinawa in 1945. It went by, backed up for a second crack, and then just lay there in indecision, its trailing cone of intense wind flicking back and forth over the island like the tail of a stalking cat.

The typhoon, from the Chinese *t'ai fung* (great wind) or the Arabic *tufan* (tempest) does not qualify as such until its velocity reaches 75 miles. Some have been known to reach 175 miles per hour.

Technically, there is no difference between a Pacific typhoon, an Atlantic hurricane, an Australian willy-willy, or an Indian Ocean cyclone. All are born of the warm, moist air girdling the earth at the equator, a stagnant belt known as the doldrums. If they move north, they pick up the spin of the earth at about 15 degrees latitude and begin to twist in a counter-clockwise direction. If they move south, the spin is reversed to a clockwise direction. Some hold that the Pacific typhoon is more violent than the Atlantic and Caribbean hurricane, but if this is so, it is only because typhoons have vaster areas to get up momentum before encountering obstructions. The hurricane that wiped out Galveston, killing 6000 in 1900, or the one that roared over Florida in 1928, blowing

(Continued to page 256)

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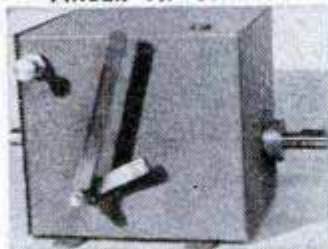
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the water right out of Lake Okeechobee and drowning 2000 persons, can hold their own in any typhoon league.

Only in the last five years has man had the means and the courage to study typhoons inside out and from top to bottom. The airplane, radar and the seismograph are revealing a lot of their mysteries, but so far nothing is known why they behave as they do, and go where they go. The seismograph is the latest instrument to be brought into play in tracking the typhoons. The Rev. J. E. Ramirez, while at work at St. Louis University, was first to notice that heavy storms produced enough earth tremors to be picked up by a sensitive seismograph, and in 1943 the Navy began experimental work along his suggested lines. Today, microseisms reveal the presence of small storms as far as 300 miles away, and the giant typhoons can be detected more than 2000 miles away. With several seismographs taking bearings on the disturbance, its path can be followed minute by minute with an accuracy of 20 miles.

In the meantime, the typhoon trackers and the hurricane hunters continue to slice through the tempests in their study of typhoon anatomy. It is doubtful that ever again will any existing planes make a low-level assault such as Lykins' attack upon Beverly, but much still remains to be learned at the upper levels. Maybe somewhere between 10,000 feet and 50,000 feet will be found the secret of where the storm is going next.

Thanks to their work, the death toll has been reduced from 80 lives per \$10,000,000 damage to four lives. It is true that this picture is not entirely accurate, property values having increased tremendously, billions of dollars in crops and industries having been developed in the Pacific within the last 20 years, and more billions along our Gulf Coast. But by the same token there has been a huge increase in population density. And, thanks to the warnings, property damage has been greatly reduced by proper precautions, and the heavy loss in shipping has been nearly eliminated by getting ships and airplanes out of the threatened area.

Whether or not ways can be found to prevent typhoons remains to be seen. Since the typhoon's power is based on its latent heat, it may be vulnerable to attacks by Dry Ice, but one dry comment to this is that there isn't that much Dry Ice in the world.

Until some way is found to stop them, the Navy has prepared detailed instructions on how to sail through a typhoon, the instructions applying to all craft up to battle wagons. In full they read: **STAY WELL OUT!**

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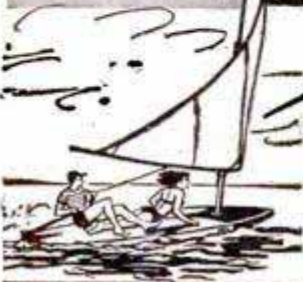
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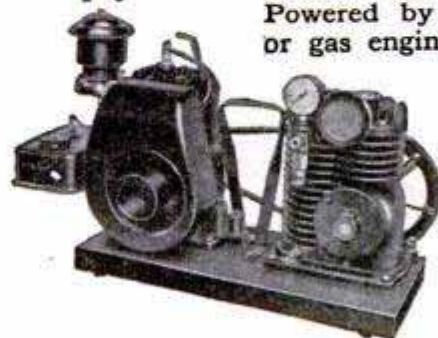
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Inventor in a Carriage House

(Continued from page 85)

It's a far jump from inventing a diaper to analyzing a jet engine, but Rand has made it. One of his instruments records the complicated contours of jet rotor blades and other irregular objects. Tracer points analyze the blades, and this information then is fed to an oscilloscope where it is reproduced as an image on the screen.

For a Cleveland surgeon Rand developed a respirator that he says "breathes for a patient during an operation better than the patient can breathe for himself." The machine alternately squeezes and releases an anesthetic bag, and can be regulated to meet the needs of any case.

Another product of the medical-research program is a mechanical heart that maintains the patient's normal circulation while an operation is being performed on the regular heart—actually a mechanical heart that "beats" outside the body.

A third remarkable surgery aid is a heart massager that does a better job than a surgeon's hand. Occasionally, during an operation a patient's heart will stop, and the surgeon will attempt to start it by massaging with his hand through an incision. While a surgeon can forcibly cause the heart to contract by squeezing it, he has had to depend on the heart's willingness to expand to get the blood back into it. Rand's device consists of two vacuum cups, each at the end of a long handle. The surgeon presses a cup against each side of the heart, squeezes it to expel blood, then moves the cups apart so their suction can dilate the heart walls.

Built into one cup is an electrode controlled by a switch in the handle. When the heart appears to be capable of working on its own, the surgeon presses the switch and the heart receives a stimulating electrical shock that may stir it to normal action. In one experiment, this massager was used to maintain circulation in a dog whose heart had been stopped for five hours. The heart was shocked into operating normally.

Still another aid from the laboratory is a plastic-film mattress which prevents bed sores. It is divided into compartments which can be inflated and deflated independently. An automatic pumping device controls this action, changing the mattress pressure on each part of the patient's body at three-minute intervals.

Rand has developed an electrical power unit for a wheel chair. The control system permits the patient to start, steer and stop the chair by moving only a finger tip or even only his tongue.

There's no need for a night watchman

(Continued to page 260)

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when the Rand robot watchman is on duty against fire and burglars. If a sensing element such as a thermostat or a photoelectric cell closes the circuit, a battery throws current into the robot. The robot then closes the telephone circuit, waits for a dial tone and dials a number by means of a cam. It then waits for an answer. If it gets a busy signal, it hangs up and dials again. After having made contact with the police or fire department, it speaks a message which has been previously recorded on a wire recorder. After the fire or police department has received the message, the robot must be called back or it will continue to make the call every three minutes. The robot does just about everything except draw a revolver on a burglar or throw a bucket of water on a fire.

To the outsider, Rand's carriage-house laboratory seems a tinkerer's paradise. Machinery, electronic equipment and all sorts of instruments are everywhere, yet there's no hurry or confusion. There's an old saying around the laboratory that people who work there work themselves straight out of one job and into another. But there are always new projects brewing in Rand's mind, ideas that will become inventions in the old carriage house.

When Oil Wells Run Dry

(Continued from page 159)

The principle common to all the retorts is to burn the residual oils and carbons in the spent shale to provide the heat or hot gas that in turn heats the raw shale and drives off its oil.

This crude oil is then pumped to a small flexible refinery unit for thermal cracking operations. Here the diesel oil used by the mining equipment is produced, as well as the gasoline for the plant's automobiles, burner fuels, coke and intermediate stocks.

Shale oil has excessive amounts of sulphur, nitrogen and oxygen compounds and its conversion into high-quality products is more expensive than is the refining of most crude petroleum. This, however, is balanced by cheaper production costs. It's cheaper to mine and retort the shale than explore for petroleum and dig wells.

The Bureau of Mines is also studying the production of liquid fuels from agricultural residues such as corncobs, seeking ways of extracting additional petroleum from exhausted oil fields, and testing methods of converting the hydrocarbons in coal into liquid fuels. Started as an emergency measure during the war, the whole program has brought assurance to the United States that this country won't run out of liquid fuels for perhaps 1000 years to come.

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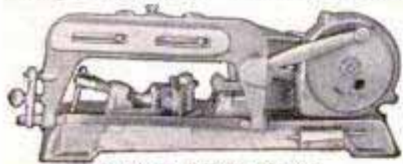
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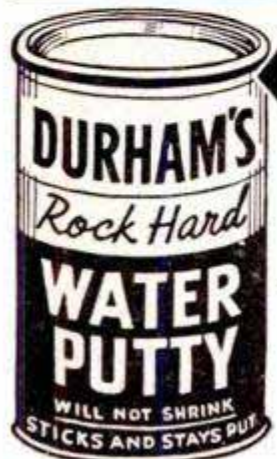
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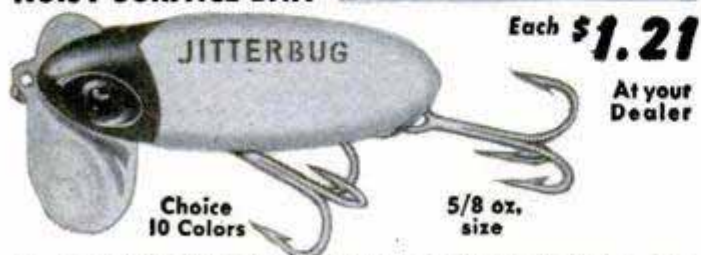
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Boom in Tongue-Twisting Metals

(Continued from page 154)

Swedish army surgeon, Karl Mosander, back in 1839. Like most of the rare earths, lanthanum is seldom seen pure, is commonly used in the form of colorless salts. During the 1930s, chemists found that using lanthanum in camera lenses made for clearer, sharper photographs. During World War II, lanthanum went into the aerial cameras used in photographing enemy installations from high in the sky. Now lanthanum lenses are appearing in the better cameras sold to amateur photographers.

Neodymium, one of the elements discovered by Karl Auer when he was still an earnest student, began his researches with only enough of the rare earth containing minerals to fill a child's hand. Now it can be produced in varying grades of purity for industry. It serves as a brilliant coloring material for expensive glassware. The raspberry and amethyst colors it creates cannot be duplicated anywhere. It's expensive though, the neodymium alone in one colored goblet could cost anywhere from \$5 to \$15. In smaller amounts, neodymium cuts out unwanted yellow colors in glass. And a good pair of sunglasses may contain some small amounts of this rare earth. It has a great ability to filter out ultraviolet rays from the sun which are hard on the eyes.

Various mixtures of the rare earths also have important industrial uses. One mixture, called didymium, is what is left when cerium is taken out of the rare earths in monazite sand. Industrially, didymium is used to make glass colorless, in nonglare lenses, and—like neodymium which it contains—to cut down on the ultraviolet rays which pass through sunglasses. Other mixtures include most of the heavier rare earths found in monazite, as well as cerium. The chloride salts of this mixture can be applied to textiles to make them waterproof. Furthermore, they are also valuable in killing mildew that might settle on the textiles. The fluorides and oxides of this mixture go into the cores of the carbon rods used to produce arc lights. They help make the light that results when electricity jumps between the rods a brilliant white. Pound for pound, this use of the fluorides and oxides in the cores of arc-light carbons is probably the most important single use of the rare earths.

One mixture of rare earths, called cerium oxalate, is used in medicine. It helps prevent nausea.

There are a good many production headaches in getting the rare earths out of the monazite sand. For one thing, they all tend

(Continued to page 264)

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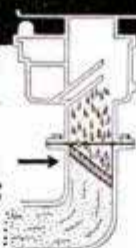
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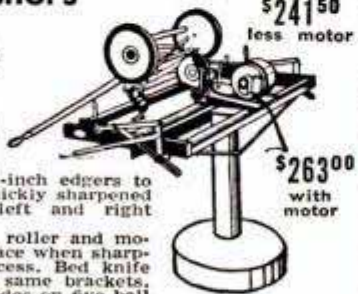
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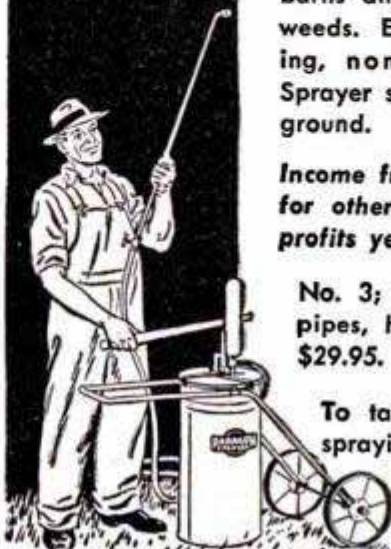
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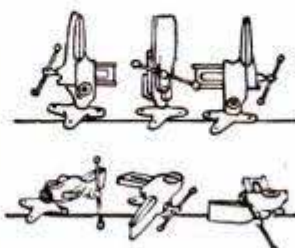
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to behave alike, although Doctor Kremers says that under certain conditions, cerium, samarium and ytterbium can be made to act like chemical individualists. This helps speed separation. And, in the meantime, he isn't talking too much about just how the earths are pulled out from the mixture in the monazite.

The rare earths, incidentally, are hip-deep in the atomic-energy program. The 1947-1948 report of the Atomic Energy Commission, issued recently, cites the progress in preparing purified forms of the rare earths. So far, purified forms of lanthanum, cerium, praseodymium, neodymium, samarium, gadolinium and ytterbium have been prepared. The AEC reports that the demand for these substances from other laboratories is greater than the supply. Furthermore, it says, "It now appears that they (the rare-earth metals) may have a bright commercial future as alloy metals in the manufacture of high-temperature structural materials and other specialized products."

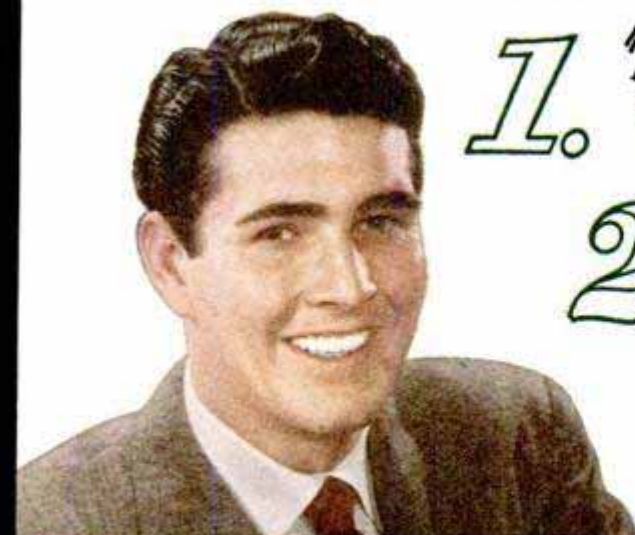
And a scientific controversy on a now-you-see-it, now-you-don't basis is still raging around one of the rare earths. This element is number 61 in the periodic table. In recent years it has operated under three different aliases, illinium, florentium and promethium. Illinium was the name given it by Prof. B. Smith Hopkins of the University of Illinois, who discovered it through the hotly debated magneto-optic effect, which many scientists distrust. Florentium was the name given it by Prof. Luigi Rolla of Florence, and his discovery has been doubted. Promethium is the name proposed by the team of atomic scientists who created radioactive isotopes of the element in the laboratory. So far, it doesn't seem to have turned up in nature. They obtained their samples of the element by bombarding neodymium with the atomic particles called neutrons. The form they discovered doesn't last long, has a radioactive half-life estimated at 3.7 years.

In spite of this argument, however, and the technical difficulties in extracting the rare earths, one thing is certain. Future generations of chemistry students are going to have a much better acquaintance with this family of elements than their fathers ever had. What was once a brief detour in high-school chemistry classes may become a broad paved highway for chemical engineering.

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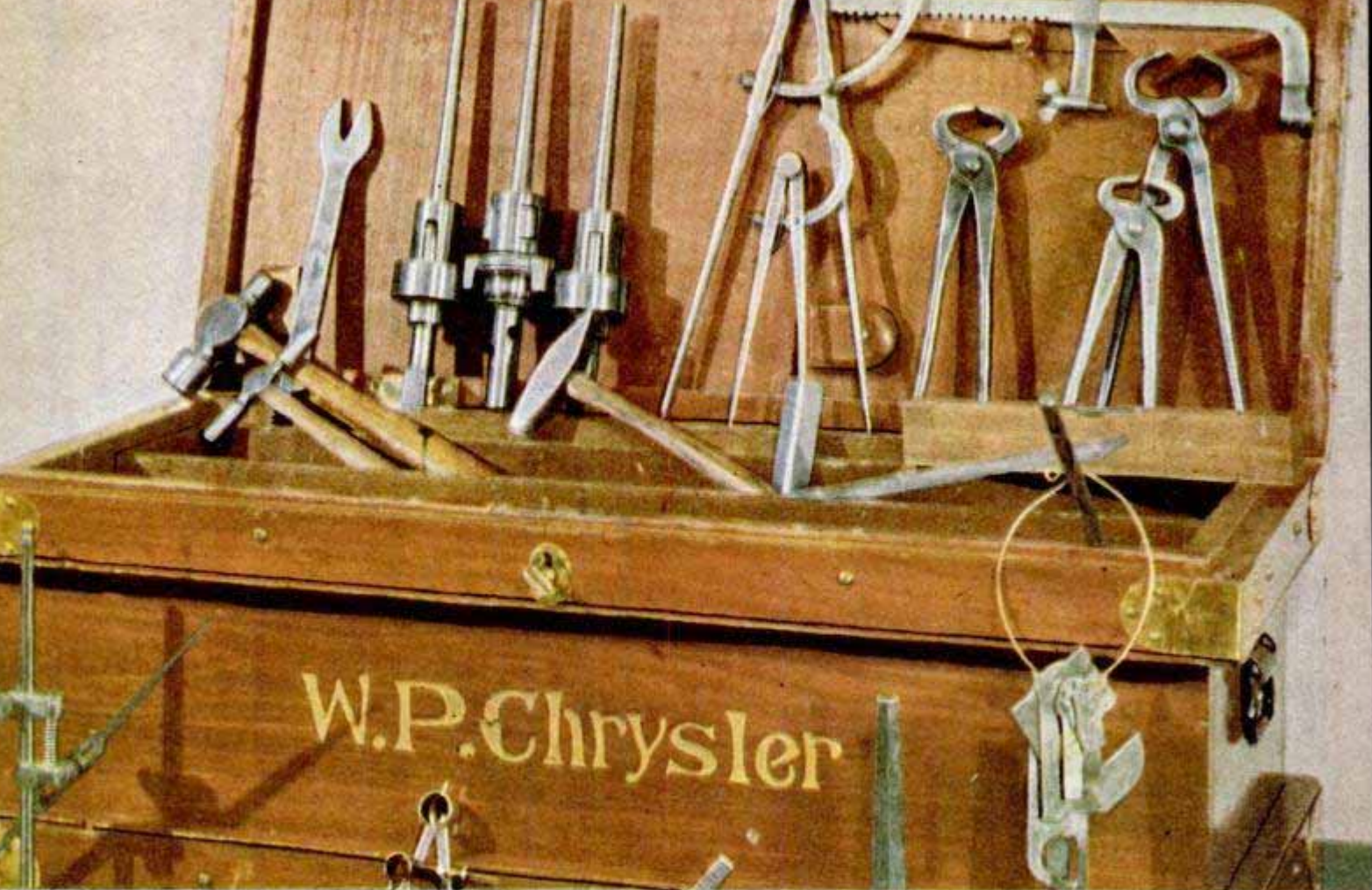
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As he shaped them, he shaped a dream as well. It was a special American kind of dream—free-ranging imagination anchored to solid things like common sense, working a little harder, making things a little better. And asking no odds.

It led Walter Chrysler to success in railroading when he was young. It led him to study the automobiles of the day. Why couldn't a man build *better* cars than any known—nimble, safer, more comfortable, handsomer?

So, 25 years ago, Walter Chrysler introduced the first Chrysler car. What he did changed the whole pattern of American motoring. He changed it with high-compression engines, 4-wheel hydraulic brakes, all-steel bodies, new ways of distributing weight for better riding . . . many originations the entire automobile industry eventually followed.

As Mr. Chrysler's birthday, April 2nd, approaches and as Chrysler Corporation this year observes its own 25th anniversary, it is fitting to pay this tribute to Walter Chrysler and his genius.

And the tools of his earlier mechanic's days? I remember when he found them in his mother's house. It was long after he had asked me to work with him. He brought the tools back from Kansas. A few of them needed fixing and he asked me to fix them. It was a compliment I have never forgotten.

The qualities Mr. Chrysler put into his own tools still mark the great organization he founded. He built not merely material things; he inspired men with a zeal to carry on his splendid ideals.

Chrysler Corporation is still young enough to feel his inspiration. He wished this company always to be a producer of fine automobiles of great value.

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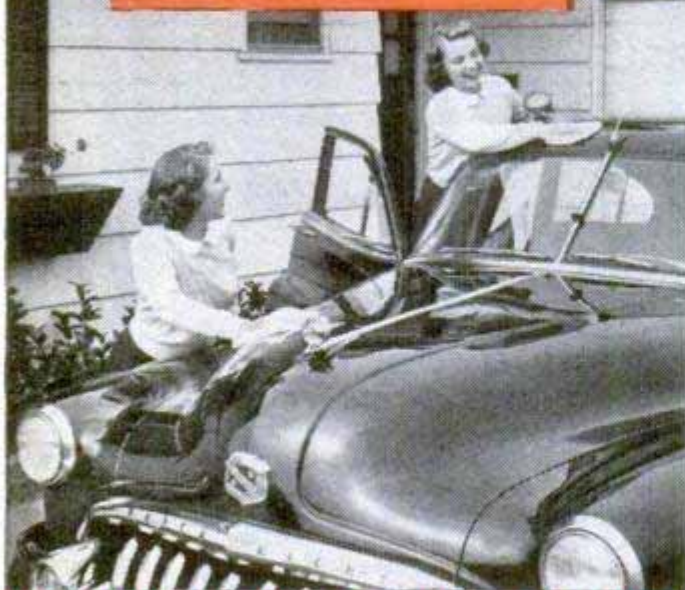


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Motorists Wise **SIMONIZ.**

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The sooner you Simoniz your car the better!

FBI Road Show

(Continued from page 169)

the first "murder." Scientific analysis would have shown they came from the "killer's" coat. The other important evidence which the students failed to exploit was a pocket comb, containing hair. This could also have been used scientifically to strengthen the case. The lesson was well taken by the otherwise alert students, who blamed lack of coordination and cooperation among themselves for the slip-ups.

Generally, the sample crimes staged at the traveling schools are of the type that the particular area has been experiencing most frequently. For instance, when California had a plague of bank robberies, many of the schools held in that state staged holdups to demonstrate action to be taken when an alarm is sounded.

Demonstrations are conducted on the raiding of a place known to harbor criminals or the trapping of criminals as they emerge. One example, which has for its moral the value of patience, depicts a city street scene in front of a theater.

The police have a tip that a wanted man will attend the movie that night and officers are strategically placed at all exits to the theater, with the entrance, where the action is most likely to occur, covered from all angles. The criminal shows up at the theater and buys his ticket, but not an officer makes a move. Why?

Simply because it is better to trap a man coming out of a theater than going in. A man leaving a theater ordinarily is still thinking about the movie, is a bit turned around in directions and is partly blinded by the abrupt contrast in lighting.

So the police just stand and wait until their man steps out of the theater. A signal is given by the officer in charge and the police move in.

In this case, the criminal spots the closing jaws of the trap and instinctively reaches for his gun. The police have the jump on him, physically and psychologically, and cut loose with their guns. The criminal falls dead on the pavement.

This is not something out of a movie scenario, but a page from real life—the capture and killing by FBI agents of John Dillinger on July 22, 1934, in front of the Biograph Theater in Chicago.

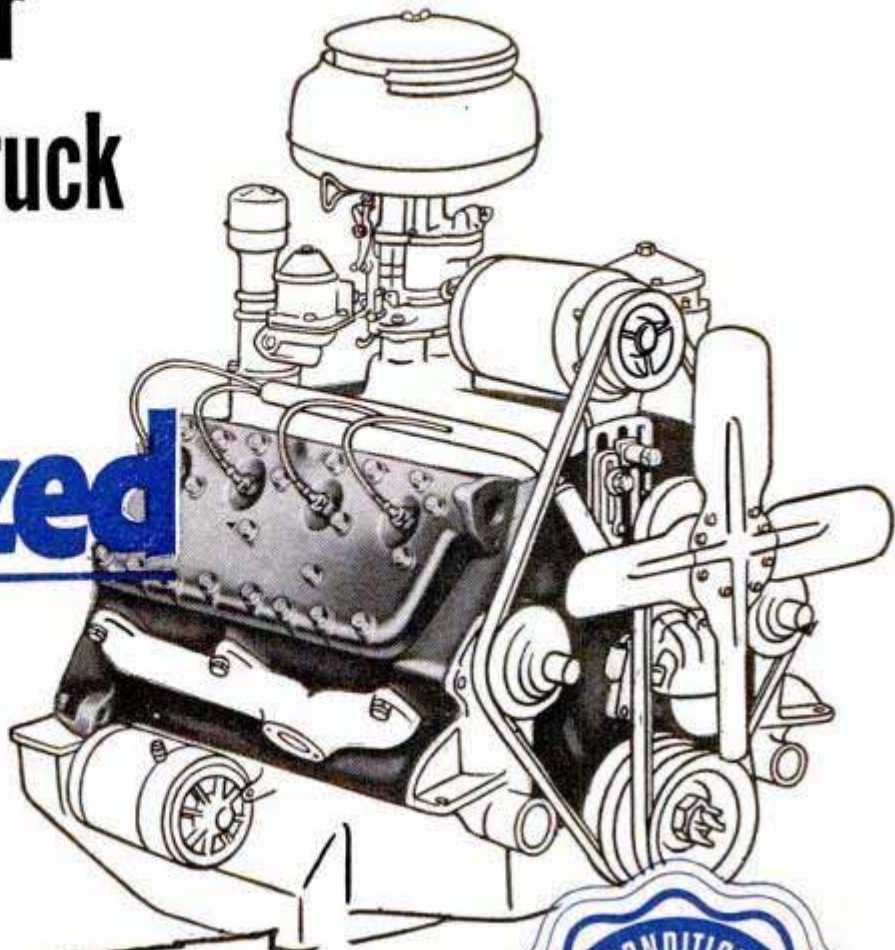
The police are also taught how to handle a clue when they find it. They learn how to pick up a sample of dried blood from a concrete floor. (It's really simple. The blood is scraped up with a knife and put into a pill-box, or a wet piece of filter paper—a white, moistened blotter will do—is applied.)

(Continued to page 268)

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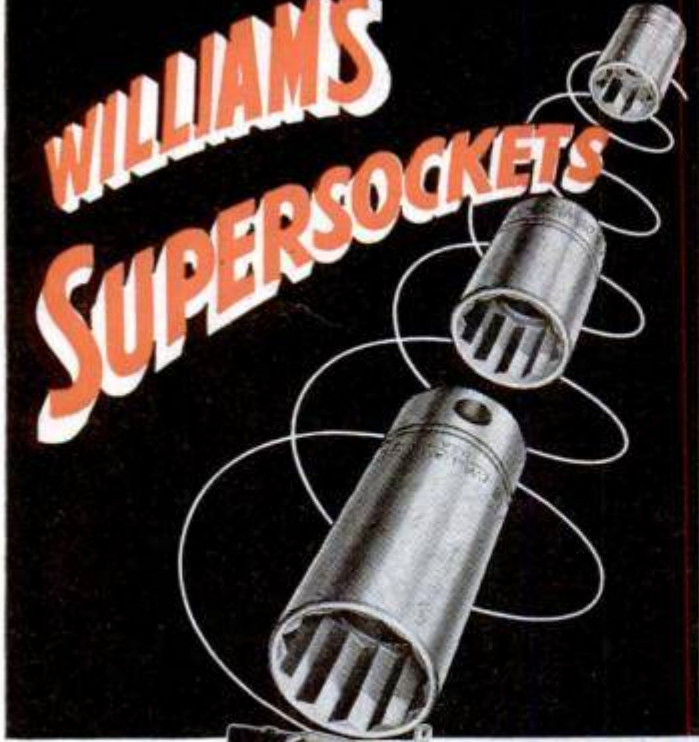
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J. H. WILLIAMS & CO., Dept. M, BUFFALO, N. Y.

Major stress is placed on fingerprint work and many of the schools run by the FBI are devoted exclusively to it. From every section of the nation, during the first six months of 1949, a total of 400,089 fingerprint-arrest records were received by the Identification Division of the FBI, and 59.4 percent represented persons who already had fingerprint-arrest cards on file in Washington. These figures pertain to fingerprint-arrest records only, and in no way relate to civil identification files at the FBI.

The police also learn jujitsu. That's the easy method of sending a 200-pound tough spinning on his ear. The FBI has not only adopted the ancient Japanese tricks, but has added a few of its own—especially for disarming a criminal.

And highly significant is the fact that this training program is not a one-way street.

"I learn something from every school I conduct," was the typical comment of W. G. Banister, agent in charge of the FBI office at Butte, Mont. "We encourage the exchange of ideas and experiences, and this is one of the most valuable features of the traveling schools."

Manhattan's Aluminum Venus

(Continued from page 121)

stick rows of little brass "shims" into the Plasteline along the desired dividing lines before applying plaster. Then the mold is removed in sections.

Flaws inside the mold are carved out by the sculptor. The inside of the mold is then shellacked and coated with green soap as a separator so the cast won't stick to it. Then the pieces are bound together, and liquid plaster is applied.

When the cast has set, the mold is chopped away with mallet and chisel.

"All this represents lots of time and work," Williams points out, "but we still had no statue—only a lot of plaster casts."

In the gloomy confines of a Long Island foundry, however, men stripped to the waist were even then sweating out the tedious process of converting a plaster statue into one of hollow aluminum. There are two common methods of casting a metal statue; sand casting, or the "lost wax process" in which molten metal replaces a wax replica of the image embedded in a silica-plaster mix. Williams chose the latter for his statue. Here's how it works:

The plaster cast is covered with clay an inch or so thick. Over this goes another layer of plaster, divided by shims so it can be removed in two or more pieces. Holes are left in each section here and there. When hard, this outer shell is removed.

(Continued to page 270)

Only wide-gap Auto-Lite Resistor Spark Plugs give you

SMOOTHER PERFORMANCE DOUBLE LIFE and GREATER GAS SAVINGS

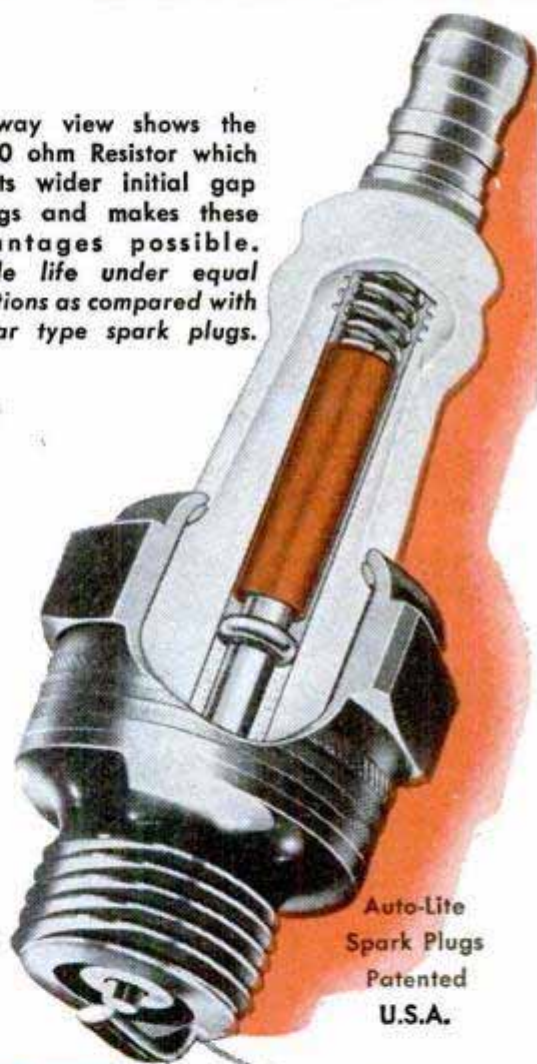
Cut-away view shows the 10,000 ohm Resistor which permits wider initial gap settings and makes these advantages possible. Double life under equal conditions as compared with regular type spark plugs.

MILLIONS of car owners from coast to coast are switching from narrow-gap spark plugs to the sensational new wide-gap Auto-Lite Resistor Spark Plug. They want smoother performance—money-saving gas economy—improved starting in extreme cold weather. They want the *Built-in Resistor* that doubles spark plug life and reduces interference with radio and television reception.



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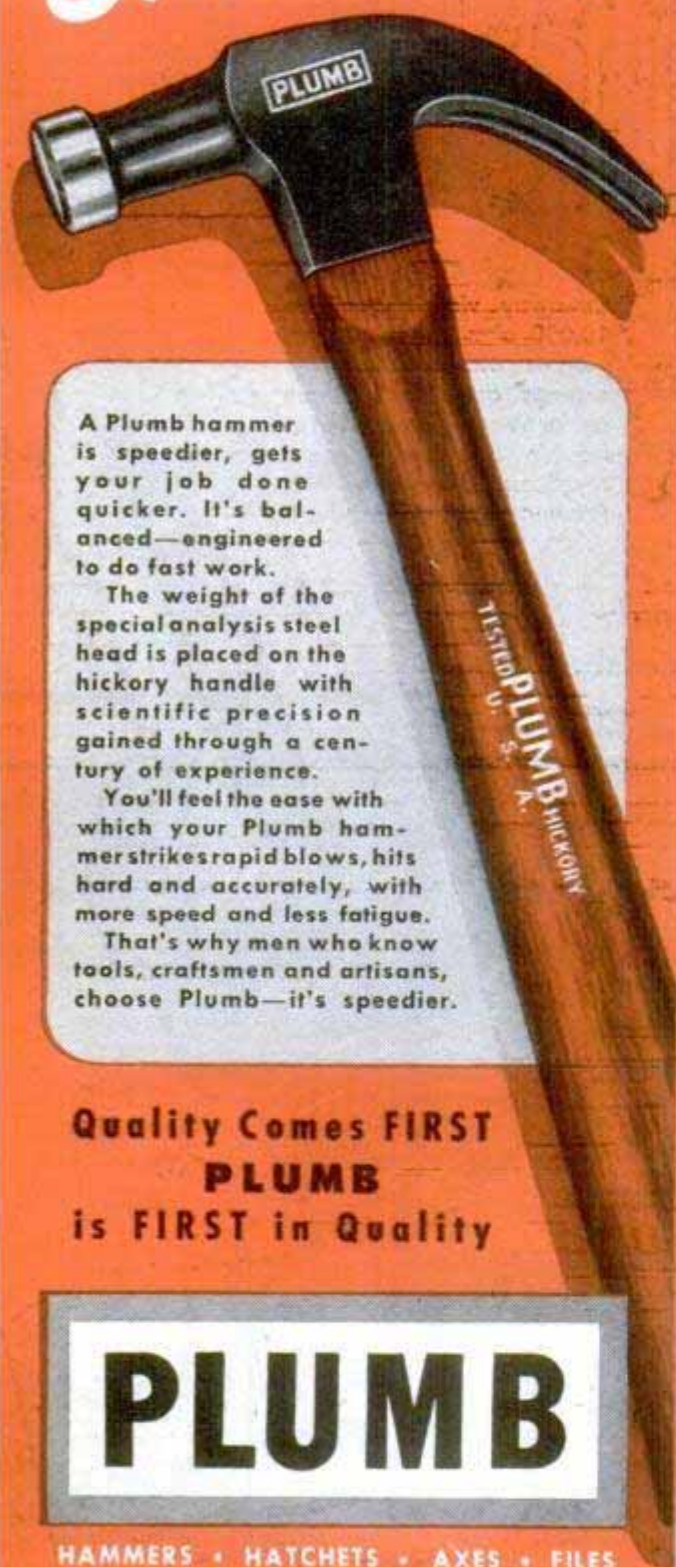
AUTO-LITE *Resistor* SPARK PLUGS

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The clay is lifted off the cast carefully, and the outer casing is put back in position, covering the original plaster cast like a tent. This time there's space between its inner surface and the surface of the cast—where the clay used to be. Through a pouring hole that was provided for in the outer casing, the men pour liquid glue to make the "glue mold." When this coagulates, it looks and feels just like rubber.

Now the outer casing is removed again, and the glue mold is stripped off the plaster cast. Unsupported, it collapses like a wobbly, boneless rubber man. But not for long. The outer casing goes back on it, holding it in proper shape, like a corset. Its inner surface, of course, is a perfect impression of the statue part that has been removed. Over this interior the men now brush melted beeswax in all the nooks and crannies, until it is $\frac{1}{16}$ inch thick. Then melted wax is poured in and swished around, until the wax layer is built up to $\frac{1}{4}$ inch thick.

The hollow interior is now packed with a mixture of silica—a sort of fine, powdery sand—and plaster in a semiliquid solution. When it dries it hardens.

The outer plaster shell is pulled off and tossed away—like everything else in this odd business. So is the glue mold. All that's left now is a fine, $\frac{1}{4}$ -inch-thick replica of the statue piece in pure delicate wax, surrounding a hard core of plaster.

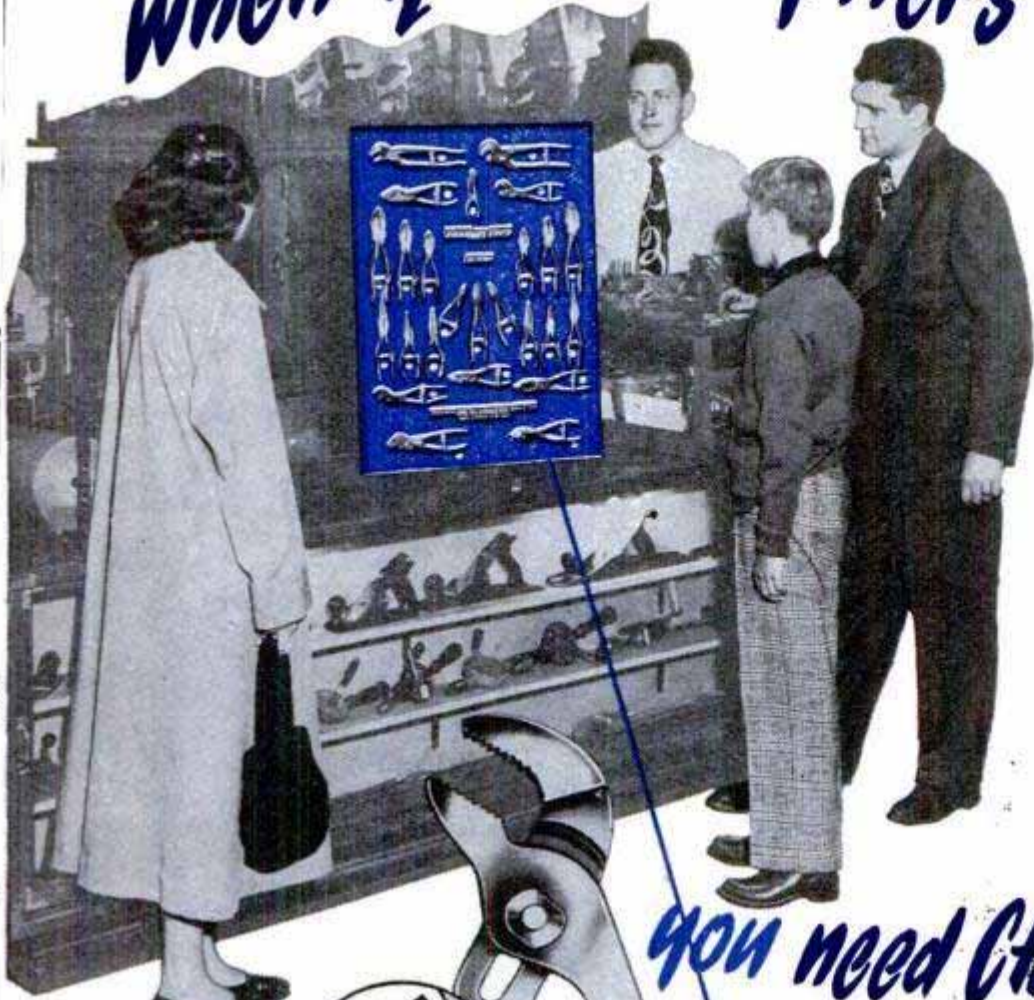
Next step involves covering the whole outside of the piece with a heavy layer of the plaster-silica mix. But before this outer shell goes on, rows of nails are driven through the wax and embedded in the hard core. Their heads are left sticking out, like pins in a cushion. This is so that when the wax is melted out, the outer shell will be rigidly attached to the core.

Now a brick kiln is built around the case, and a fire started under it. The wax melts and runs out through holes, or "gates," which are channeled to a principal opening.

Those gates serve another purpose, too. When thoroughly cooked, the case is removed from the furnace, uprighted, packed in sand and molten aluminum is poured through the principal opening into the space vacated by the wax. The metal, too, runs through all the gates. If the gates weren't there, air wouldn't escape from the mold spaces.

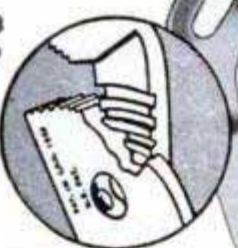
No such disasters occurred on "Venus and Manhattan." As fast as completed aluminum casts came from molds, they were bolted together, all the seams flattened. On November 2, "Venus and Manhattan" emerged in full splendor over the doorway of the new Parke-Bernet Galleries. Williams heaved a deep sigh and went up to his country home to collapse for awhile.

When you use pliers . . .



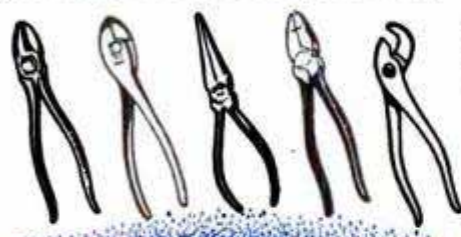
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“Sure think the Shift is the biggest improvement since the outboard was invented. I own a 1-16.”—Louis Vandervest, Green Bay, Wis.

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Broncos With Rubber Tires

(Continued from page 111)

aviation editor of the Portland Oregonian, was wheeled into driving one of the double-bottoms. Johnny Castner, the new champ, had heard that Lev was a B-29 pilot during the war. “If you can handle a 50-ton plane with four 2200-horsepower engines,” he told the reporter, “what’s a 35-tonner with only 200 horses?”

Richards was game. He donned a parachute for effect, climbed aboard and gaped. Besides a nightmare of instruments, he found himself confronted by two gearshift levers, which give the big baby 12 speeds forward and three in reverse.

He found it takes two hands to shift. Veteran drivers stick one arm through the wheel while shifting and steer with an elbow. Richards said he did it with his teeth. “There’s really nothing to it,” he maintains, “— if you’re part octopus.” On the diminishing alley, he noted that after he made his “bomb run,” he’d mowed down enough poles “to build teepees for the whole Pendleton Roundup.”

It took Richards 15 minutes to do the course. Castner has made it in less than three. “But,” says Lev, “you must remember, he missed every target.”

Any driver will tell you, though, that the everyday feats he performs with his lumbering charge far exceed anything he’ll ever have to do in a rodeo. This is especially true of the semitrailers and double-bottoms. Handling 35,000 to 74,000 pounds of rolling freight on wet or icy mountain highways takes the best drivers in the world—and these are the boys. Jackknifing is always a threat on icy roads.

“Going up an icy hill with no traction,” explains a tractor-trailer man, “can spell trouble. You can feel her grind slower and slower until she starts back. Then she ‘jacks’ and you do one of two things: get out or ride her down and try to ditch her.”

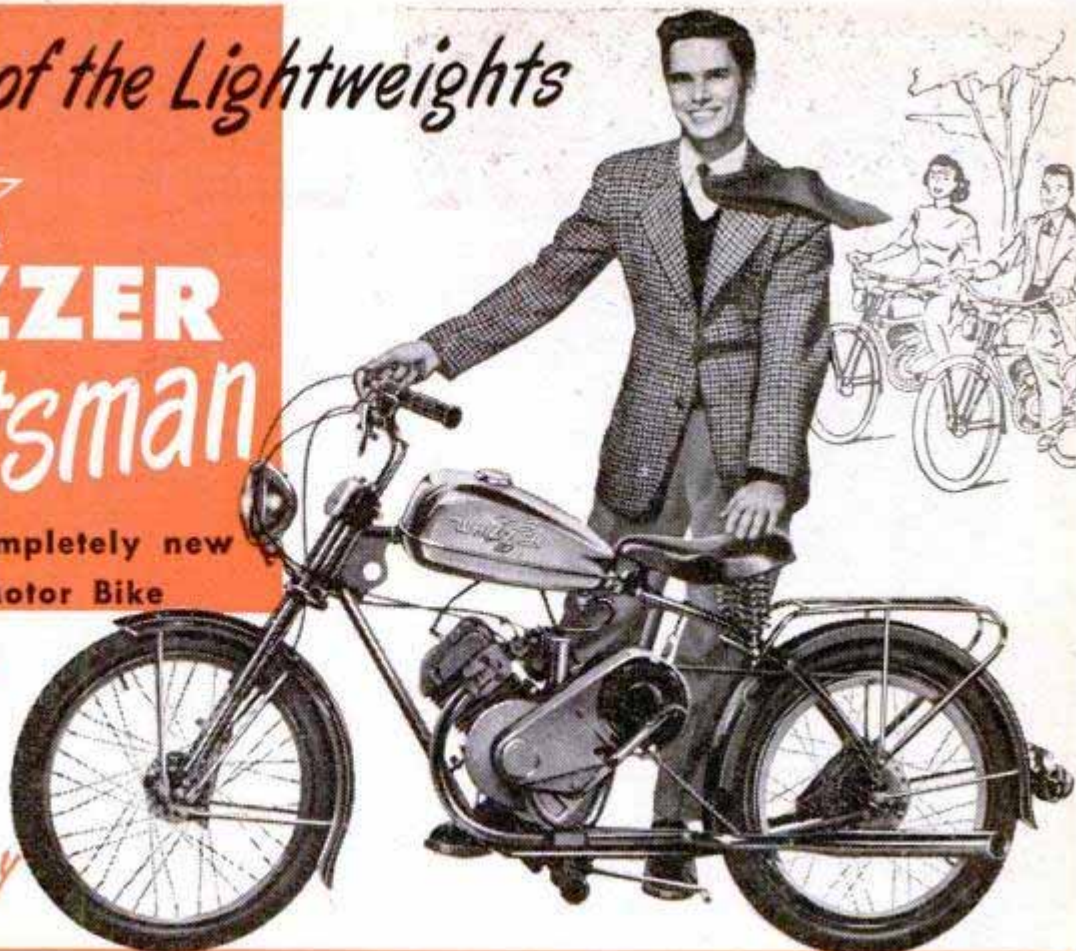
Oddly, it’s safer coming down a slick hill than going up, if the road is clear. Experienced drivers can usually feel the trailer behind them start to sway if it’s getting ready to jackknife. Icy or not, the remedy is simple but hair-raising. “Just pour on the water,” explains a veteran, “and pull the tractor out ahead.”

The tippability of trailers has been lessened recently by the invention of a new “fifth wheel,” or swivel coupling on the tractor which slides under the “box” and hooks onto a coupling pin. The fifth wheel is hung on a “rocking shaft” to permit the coupling to rock fore and aft so the tractor and trailer will snake over bumps and

(Continued to page 274)

New Star of the Lightweights

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gullies instead of riding rigid. On a tight turn, though, the shaft on older types didn't turn with the trailer and the trailer rocked sideways. The new fifth wheel turns with the trailer, so that the rocking shaft is always parallel with the trailer axle.

Another fifth-wheel problem was that when a driver unhooked for repairs en route and left his trailer on the roadside, highjackers could come along with a standard tractor, hook on and ride away with the trailer full of booty. Today, there is a "pin lock" that caps the trailer pin like an inverted mushroom to foil thieves.

Pleasure drivers, probably to excuse their own carelessness behind a wheel, have a bad habit of blaming trucks for accidents. Actually, trucks are responsible for less than 16 percent of all the accidents on the road. Few drivers in the world are safer, more courteous or clearheaded than the men in the big rigs. Once in a great while, a big trailer may "get away" on a hill. When this happens, the driver does not "clip telephone poles" or plow into traffic. If there's a clear road ahead, he may try to ride it out. Some men, by weaving the front end, have set the big box swaying until finally it whipped over, snapped loose and crashed into the woods. Then they ditched the front end. Dozens of drivers have deliberately crashed their entire rigs to avoid hitting foolish pleasure drivers and have gone to the hospital or cemetery for their pains.

Every "gear grinder" at the Boston Rodeo can remember a buddy who wound up dead because of a careless motorist. "People don't realize," they'll tell you, "that it takes a full 90 feet to stop a loaded rig going 40 miles an hour after the brakes are applied. We allow 500 feet between us and the next car. Motorists cut in too soon."

Truck drivers would like to have people who are overtaking them dim their lights. "Their brights are blinding us from three different mirrors," they point out.

"Truck drivers," one fellow put it, "are conservative drivers." When you see them wheel their 20 to 65-foot rigs around a rodeo arena as though they were handling scooters, you begin to thank your lucky stars that they are. They can gauge the power of their engines down to the last horse and their judgment of distance is better than a cat's whiskers. They'll tell you within a layer of paint whether or not they can get through a hole. And if they say "yes," you know they can do it.

So, if you're one who figures the truck driver for a grizzled, lantern-jawed bulldozer pusher—trot around to the rodeo in your state this year and watch your mind change.



New scintillation counter, using electron tube developed at RCA Laboratories, gives faster, more accurate measurements of atomic radiations.

What can you hear through an ear of grain?

When agriculturists want to learn what nourishment a plant is getting, they inject radioactive materials into the soil and trace their absorption with sensitive instruments. Industry and medicine also use this ingenious technique.

Until recently, scientists *heard* what was happening, followed the passage of atomic materials with a clicking Geiger counter. Now a more sensitive instrument—a new scintillation counter made

possible by a development of RCA Laboratories—can do the job more efficiently.

Heart of this counter is a new multiplier phototube so sensitive that it can react to the light of a firefly 250 feet away! In the scintillation counter, tiny flashes, set off by the impact of atomic particles on a fluorescent crystal, are converted into pulses of electrical current and multiplied as much as a million times by this tube.

See the newest advances in radio, television, and electronic science at RCA Exhibition Hall, 36 West 49th Street, New York. Admission is free. Radio Corporation of America, Radio City, N. Y.



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Please send me information and FREE sample of Lumite Screening.

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PM-3

Suicide Simon

(Continued from page 116)

presses the button. Ordinarily, it takes only 10 seconds to do this. Once it took him as long as two minutes.

The dynamite-laden box is no place for a sissy. Simon has a physique that looks as if it were hewn from granite. When you shake hands with him, you feel that you are shaking the hand of a marble statue. He hardened his body in 17 years of high diving. He used to saturate his clothing with gasoline, set it afire and jump 100 feet into a tank of water. But he broke his neck and other bones so many times that he decided to try something less hazardous.

Three years ago, he saw Captain Frakes, ex-Hollywood stunt man, blow himself up with dynamite. The dynamite bug hit him right away. Frakes, however, wouldn't tell him how he did it. "If Frakes can do it," Simon told himself, "I can do it."

He bought some dynamite and detonator caps and took them to his winter quarters in El Jobean, Fla. That winter he experimented, first with five steel plates, then three and two, until the dynamite worked the way he wanted it.

After wasting almost a box of explosives, he used a milk bottle to test the pressure inside the plates. When it did not break, he crawled into a wooden box himself and set off the dynamite. The blast sent him spinning like a whirligig for over 20 feet. If he had not known how to roll and tumble, the blast might have killed him. As it was, his bones ached for weeks. He made changes and found that a quarter stick of dynamite did not make enough vacuum. It hurt him more than a full stick did. Now he uses a stick and a half.

His first public appearance was in a Jacksonville park. He has appeared in many other places since then. Recently, he decided to take out some insurance. Lloyds of London charged him \$40 per thousand a month for high diving, but did not show any interest to insure him in his dynamite stunt. Another company offered to insure him for 10 percent of his salary, but Simon refused the offer.

Suicide Simon works at blowing himself up only three months a year. The rest of the time he likes to go alligator hunting in the Everglades, fish for snook and jewfish in the lazy Miakka River and entertain the guests in his 28-room hotel at El Jobean.

This year, he is trying out another idea to make people think he is crazy. He is building a jet-propelled rocket to carry him about 1500 feet in the air and drop him off with a parachute. Sounds suicidal? Well, at least he'll come down by parachute.

ASSEMBLE YOUR OWN MOWER
 . . . We Furnish All Parts,
 Completely Finished and Painted,
 Including NEW CLINTON 1.8-2 H.P.
 VERTICAL ENGINE
SAVE 40% **\$69.60**
 F.O.B. FACTORY



Here's your opportunity to save some real money on a high-class quality product.

CAST ALUMINUM BASE
 This is a modernized streamlined and nicely finished product. Two-tone baked enamel. Full 20" cut, hardened steel, one-piece cutting blade with safety clutch. Ball bearing, rubber tired wheels.

CUTS TALL GRASS
 Will mow to carpet smoothness tall rough, grass. Cuts close to fence. Three cutting heights. Can be assembled in 30 minutes. Easy to operate. Guaranteed satisfaction or money back. Clinton engine alone retails for \$60.00. Price mower complete . . . \$69.50 f. o. b. factory.

No C. O. D.'s. Cash or money order must accompany order. Order today!
 Reference: Fourth National Bank

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**TWO Lights-
 ONE Lantern**

\$4.65 less battery



800-ft. spotlight — and brilliant floodlight. Safe. Convenient. Sturdy. Uses standard 6-volt dry battery. At hardware, sport, or electric stores.
 DELTA ELECTRIC COMPANY, MARION, IND.

Delta POWERlite 2-LITE ELECTRIC LANTERN

2 BUYS FOR YOUR WORKSHOP



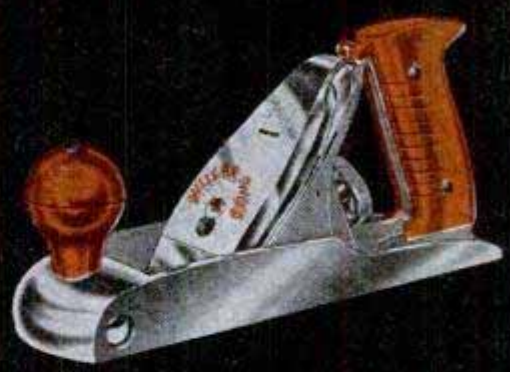
FAMOUS "MALLDRILL"
SPEED and POWER for any material! Use it with attachments for drilling metal, wood, masonry, plastics, sawing with portable saw attachment (below), etc. A terrific value!
 As illustrated . . . **\$15.00** only
 (with Jacobs Gear Chuck) . . . **\$18.00**



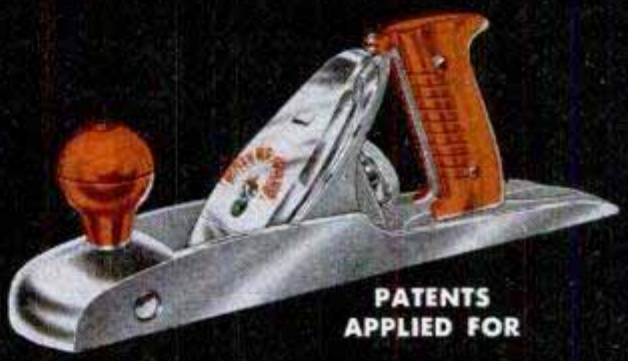
PORTABLE SAW ATTACHMENT
 Converts any 1/4" drill into a portable saw with 1 1/8" cutting capacity!
 A welcome addition to any tool shop!
 Now you can have a real portable saw for only **\$9.95**

ALL SHIPPED F.O.B. NEW YORK CITY — add 50c for postage and handling per item—ENCLOSE CHECK OR MONEY ORDER. NO C.O.D. 10 DAY MONEY-BACK GUARANTEE.

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PATENTS APPLIED FOR

If you want the very last word in performance, you'll get it in these two new streamlined beauties. They are loaded with new features never before available in a bench plane — better balance . . . more positive clamping . . . easier adjustments . . . unbreakable handles . . . roomier, surer grip . . . finer performance in every way. See them, try them, buy them at your hardware dealer's today.



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GREENFIELD MASS.

SAY YOU SAW IT IN POPULAR MECHANICS

Make \$20 to
\$30 a Week
**EXTRA
MONEY**



MACHINE SAW FILING PAYS UP to \$2 or \$3 an HOUR

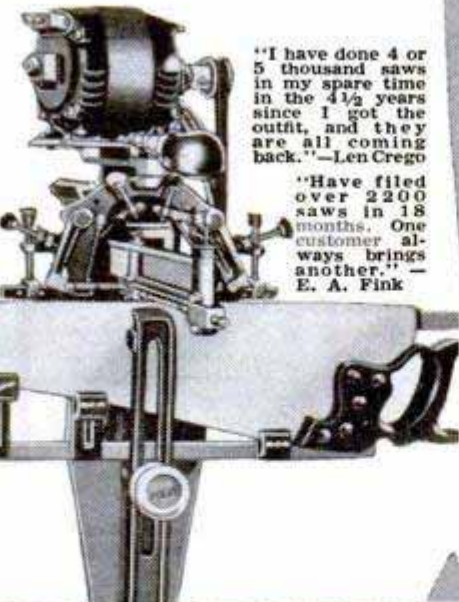
Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$2 or \$3 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

SEND FOR FREE BOOK "INDEPENDENCE AFTER 40!"

Shows how you can get business from home owners, farmers, carpenters, schools, factories, etc. With a small investment, no overhead, no stock of goods to carry, you can get right into a cash business—and possibly later on develop into a full-time repair shop. Send coupon today for Free Book. No salesman will call.

"Each saw I filed got me six more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer." — William C. Baldwin



"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back."—Len Crego

"Have filed over 2200 saws in 18 months. One customer always brings another." — E. A. Fink



SEND COUPON FOR FREE BOOK

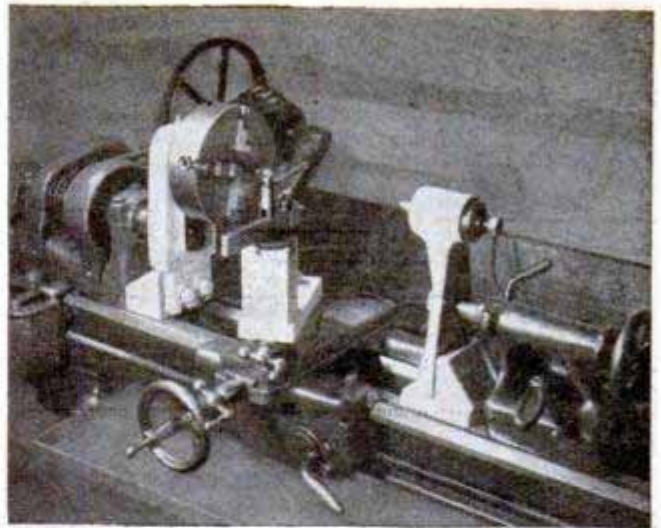
FOLEY MFG. CO.

316-O Foley Bldg., Minneapolis 18, Minnesota

Send FREE BOOK—"Independence After 40."

Name _____

Address _____



Center-Raising Attachment Increases Lathe Capacity

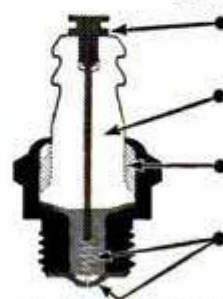
Small lathes, with from 9 to 12-inch capacities, can be converted to take work from 17 to 20 inches in diameter with a center-raising device. There are three gears in the headstock end and the gear ratio is unchanged by the converter. The tailstock and tool post are also raised so that feed mechanisms operate normally.

Chemical Reduces Danger Of Lethal Radiations

Atomic scientists at the Argonne National Laboratory have developed a method of protecting animals against death from normally lethal X-rays. The chemical used in the protective treatment is cysteine and is given orally or intravenously in a single dose within an hour before exposure. Since its administration immediately after exposure is not effective, it is believed that the cysteine, in some unknown manner, prevents cell constituents from destruction by the X-rays. Experiments show that 70 to 80 percent of the animals treated with cysteine survive an irradiation which kills about 80 percent of the untreated animals.

CHAMPION V-GLOW PLUGS

for model engines only



CHAMPION TERMINAL—assures better center electrode seal and provides sturdier electrical connection.

CHAMPION-CERAMIC INSULATORS—proved dependable in millions of Champion Spark Plugs.

CHAMPION SILLMENT SEAL—prevents excessive compression leakage between insulator and shell.

CHAMPION "THERM-O-FLEX" CONSTRUCTION—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

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DELTA MILWAUKEE

®

Delta-Milwaukee 14" Band Saws can be found in shops of all kinds — wherever accurate cutting must be done easily and economically.



Hobbyists who want the best in power tools equip with a Delta-Milwaukee 14" Band Saw.

\$115⁸⁵*

without motor or switch

Double table-supports help you get greater accuracy—even on big, heavy work... with a DELTA-MILWAUKEE® 14" Wood-cutting Band Saw

Cuts wood, felt, corrugated board, paper, other materials

Two trunnions — widely spaced — one on either side of the blade — support the table of the Delta-Milwaukee 14" Band Saw. This gives you a steadier surface to work on. The table stays rigid, at any angle. You're able to saw more accurately.

That's only one reason why this Delta-Milwaukee machine is first choice of those who know fine tools. There are many other quality construction features:

- Ball bearings are used, giving trouble-free performance — and they are lubricated for life.
- The table is big — 14" x 14". It has a 3/8" x 3/4" miter-gage groove. Tilts 45° right and 10° left.
- Blade guide controls can be adjusted safely at the front of the table.
- Aluminum wheels are carefully balanced, so that the blade is true-running.
- Upper and lower wheels are completely guarded, to protect you. Guard covers saw blade at rear; sliding guard covers all but working surface of blade in front.
- Rip gage is available for ripping.

Have your nearby Delta distributor tell you more about these features for safety, accuracy, economy, and convenience. Inspect the Delta-Milwaukee 14" Band Saw there now — and see his complete Delta-Milwaukee line.

Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.



One of the 2 trunnions that are spaced 9 inches apart to support table.

Widely used wherever folks insist upon high-quality tools:

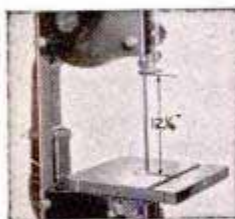
- Cabinet Shops
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- Home Workshops
- Hotels
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- Theatres
- Upholsterers
- and other places!

Upper wheel has blade-tension adjustment. Index shows correct tension for various widths of blades.

You can independently adjust blade guides and blade supports with micrometer accuracy.

\$235⁷⁵*

without motor or switch rod



Simple attachment increases capacity from 6 1/4" under the guide to 12 1/4". Can be added any time.

Two machines mounted together — to save space, time, and money DELTA-MILWAUKEE SAW-JOINTER COMBINATION

Circular saw and jointer mounted on one steel stand and driven by same motor. Both may be operated singly or together. 10" circular saw cuts 3 1/4" stock. Rips to center of 50" panel. Jointer surfaces boards 6" wide; cuts rabbets 1/2" deep. Both tools have lubricated-for-life ball bearings. See this dual-purpose machine at your Delta distributor.

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2. DRILL PRESS WOOD-SHAPER MODEL #60. Heavy-duty shaper. Exclusive pilot bearing eliminates side thrust, chatter, vibration—assures smooth cutting action. Complete, as pictured, with **\$12.95** 6 pair blades.



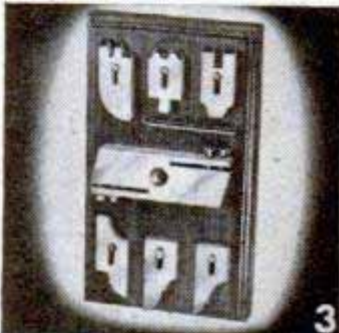
WOODSHAPER #60

6. ALADDIN LATHEMASTER. Fool-proof factory method of woodturning, adapted and priced for the home workshop for the first time! Even beginners can't go wrong because Lathemaster measures as it cuts. Now one woodturning tool does everything—comes with standard chisel blades as well as new form cutters. Hardwood handle, chrome-plated shank, interchangeable blades of shaper steel. Complete, as pictured, mounted on attractive wood tool rack **\$9.95**



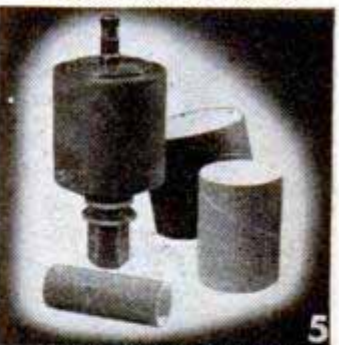
ALADDIN LATHEMASTER

3. CIRCLE SAW WOOD-SHAPER, MODEL #SA-10. Solid steel. Absolutely safe—blades locked in position with screws all the way through. In ordering, state diameter of your circle saw shaft. Complete, as pictured, with 6 pair blades and tool rack . . . **\$14.95**



WOODSHAPER #SA-10

5. THREE-IN-ONE DRUM SANDER. 1", 2", and 3" drum sander all in one! "Telescoping" diameters easy to change. Pilot bearing eliminates side thrust, chatter, vibration. Complete with sandpaper sleeve for each diameter **\$6.95**



3-in-1 DRUM SANDER

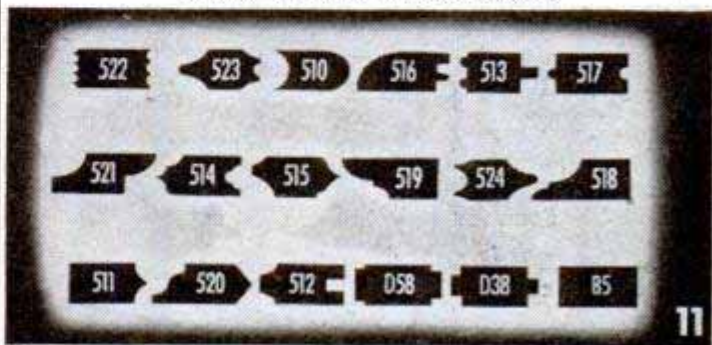
11. ALADDIN WOOD-SHAPING BLADES. Specially-selected shaper steel brought to correct hardness to hold keen edges indefinitely. Exclusive money-saving feature: Aladdin blades are double-ground so you can make two standard cuts with each blade. Note that woodshaping tools #60, SA-10 and Lathemaster come only with blades pictured with each tool; when ordering extra blades, order by blade number. All blades shown below, **\$1.00** each. (\$2.00 per pair)—except B-5 (\$.75 ea.), ready-hardened blank blade you can grind to shape desired.

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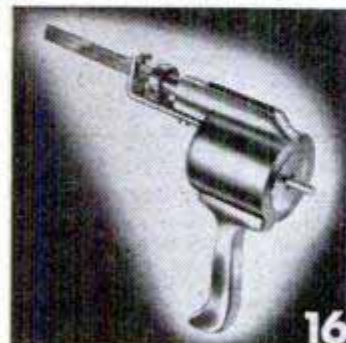
POPULAR MECHANICS

We've promised you Tomorrow's Tools today—now
MEET THE NEW BULL SAW!

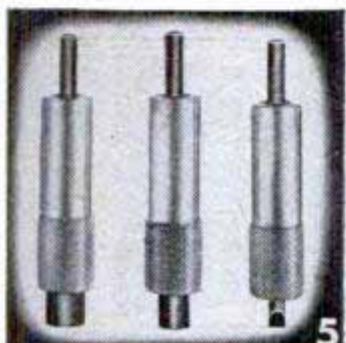
Convert your electric drill into a powerful, portable saw for only **\$9.95**



BELT SANDER



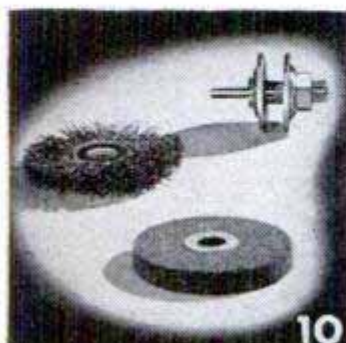
BULL HACK SAW



BULL DRIVER



BULL HOLE SAW



UTILITY ACCESSORIES



Your electric drill becomes a portable saw with power to spare when you attach the new Bull Saw! It's sturdy, rigid—yet light enough for *one-hand* operation. New visual guide lets you see where you're going; new extra wide shoe plate keeps saw blade on the straight-and-narrow. Blade of high-carbon steel . . . one-piece safety guard of polished aluminum . . . double bearings for long life. Fits rigidly on any 1/4" electric drill. Depth of cut: 1 1/8". **OUR GUARANTEE:** *This tool is as outstanding in design and performance as the Bull Buffer.* Complete, ready to use **\$9.95** as pictured

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IF YOU ALREADY OWN A BULL BUFFER,

you can make your own Bull Saw for only \$7.50! Here's how: Order the saw housing (photo 13) and attach it to the angle-head of your Bull Buffer, following the simple directions we send you. That's all—it only takes a minute to change your Bull Buffer into a powerful, portable saw! The housing you need comes complete, only **\$7.50**

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Includes (a) Bull Buffer (photo 2), the famous right-angle polisher-sander, complete with rubber pad, sheepskin bonnet, and 2 sanding discs, and (b) Saw Housing (photo 13) that fits on Bull Buffer angle-head to give you a powerful Bull Saw. \$19.90 value—but it's yours for only **\$14.95**

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Who wouldn't be a "handy guy" with these NEW BULL TOOLS!

8. SHOPCHIEF BELT SANDER. Convert your electric drill into a portable belt sander! Handles like a plane. Interchangeable pressure plates and sanding belts do all the work from roughing to finishing. Big, rugged—almost 19 sq. inches of sanding surface! Complete, with 3 pressure pads and 2 sanding belts, **\$19.95**

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Think of it!
In this one fine
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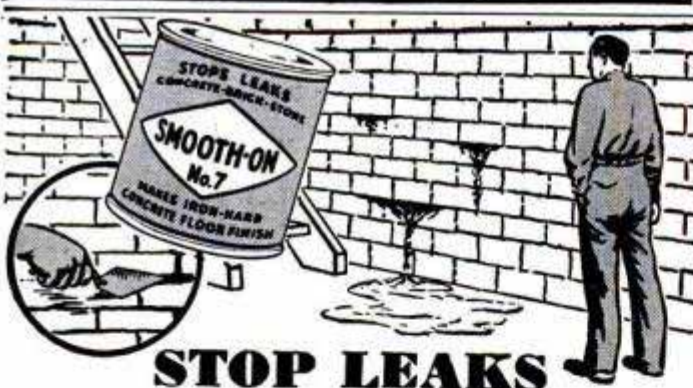
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**Safe Boats With
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Keep passengers perfectly dry—even at high speeds. Catalog also shows two new models of "Take-Along" Boats. Two big factories—save you freight.

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TOOL OF 1000 CRAFT USES! ONE-HAND PRESSURE releases internal spring-hammer. The professional tool for EASE, SPEED, ACCURACY in punch-marking, staking of metals, plastics, etc. These tools are gov. surplus, at under dealer cost. Fixed pressure unit, \$1.00. Adjustable pressure unit, \$1.75. Postpaid. 10 Day Money-back Guarantee. No C.O.D. **ASBURY TOOL SALES CO., Dept. P-1, Asbury Park, N. J.**



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WAR SURPLUS WINCH

Pulls Over 3,000 Lbs.

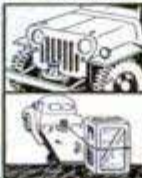
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Precision engineered for particular home-hobby craftsmen. GENIE 22-in-1 Tool performs 9 different types of operations: It notches, saws, cuts V-shapes, drills, cuts razor thin, chisels, cuts holes, carves on all kinds of materials.

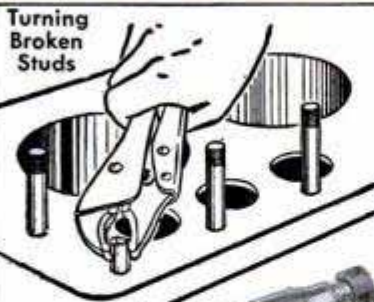
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Motors made for BETTER SERVICE Motors made for LONGER LIFE

Hoover Electric Motors perform like champions and last for years because they're built like motors costing far, far more. Stator cores are laminated electrical silicon steel, with coils dipped in high-grade varnish and baked under infrared lamps. Such processing is typical of workmanship that has made Hoover Cleaners famous for forty years. It's one reason folks say, "Whatever your workshop requirements, hitch up a Hoover and hitch up the best!"

A typical Hoover capacitor-start motor for hard-starting, continuous-duty applications. Split-phase and polyphase motors are also available.



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- Capacitor-start, split-phase and polyphase types
- Ratings from ¼ to 1½ H.P., some with double-end shafts
- Single or dual voltage, 1725 or 3450 R.P.M.
- Ball or sleeve bearings
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HOOVER MOTORS



THE HOOVER COMPANY
North Canton, Ohio
Kingston-Conley Division
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ELECTRIC "SAFETY" PAINT-STRIPPER

Instantly softens and strips off old paint, varnish, putty, from wood, without fire-hazard. Eliminates need of heavy sanding or filling. Operating cost 2¢ to 3¢ per hour. Wt. 1½ lbs.

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Used by professional and lay painters for stripping houses, interior trim, wooden boats, canvas canoes, antique furniture, etc. Also in lifting or laying composition tile on floors, linoleum, patches on roofs or boats. Removes painted or unpainted wall paper.

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for years of active service, "Safety" has finest quality heating unit. Ceramic embedded nickel-chrome wire, with nickel lead-ins through porcelain insulators. Four sharp stripping edges. Idle-rest built in. Use "Safety" as you might a torch. You'll like it! Safe, fast, silent, clean, economical and convenient, "Safety" is the result of 10 years' work. Guaranteed against original defects. Detailed instructions with each tool. Order from your dealer, or direct.



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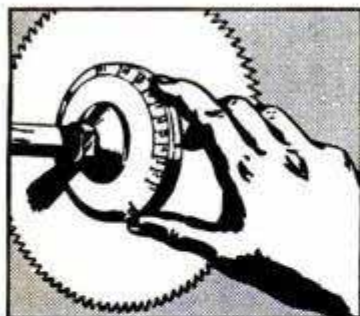
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DESIRED CUT

Cut accurate, parallel grooves—any width, any angle. Just dial desired width with Micromatic adjustment. Cuts smooth and clean—no burning or chewing to mar fine wood. Just four simple washers. Available in 5 sizes—½", ¾", 5/8", 1", 1 1/8". Free booklet on request. See your dealer or write direct. Absolutely guaranteed! In Canada, send money order for \$4.95 (duty and sales tax extra).

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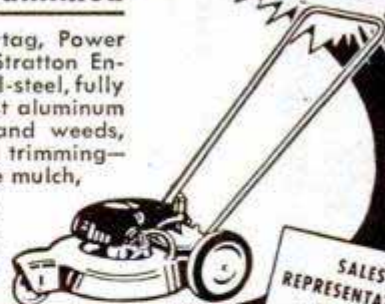
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Only \$74.63
DEALER'S PRICE

Powerful—Streamlined

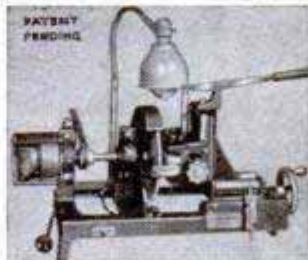
Complete with Maytag, Power Products or Briggs-Stratton Engine—18" rotary tool-steel, fully guarded blades—cast aluminum body. Cuts grass and weeds, wet or dry—does all trimming—chops grass into fine mulch, eliminating raking. Send check with order, or specify C.O.D. Write Dept. M-3 for literature.



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JUVENILE WHEELS (No bearing, solid tires)
4" 40c 6" 65c
5" 45c 8" 75c
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8 x 1.25 1.85 10 x 1.25 2.20
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Lug Base, Semi-Pneumatic tire
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10 x 2.75 6.80 4.00 x 8 13.10
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115 Volts
60 Cycle A.C.
(ITEM #267) **IDEAL FOR:** Home Lighting, Hunting Lodges, Stand-by Electricity, Running All AC Electrical Appliances including: Fans, Motors, Electric Razors, Refrigerators, Incubators, etc. 750 Watts at 1800 RPM using 1 1/2 HP gasoline engine.

O-150 Voltmeter with Regulator; 1" diameter shaft with keyway for direct or belt drive, carried in two bearings, one bronze and one ball-thrust bearing. Protection for emergencies to operate oil burner, stoker, freezer, water pump, and lights. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping wt. 60 lbs.

59.50
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AN OUTSTANDING VALUE

PNEUMATIC AIR DRILLS

Made by Chicago Pneumatic Tool Co. Light, powerful, compact, pistol grip, trigger control. Ideal for shop use where air pressure is available.



ITEM #80. Equipped with 1/4" Jacobs key chuck. Overall dim. 6 1/2" long, 5" high, 1 1/2" thick. Wt. 3 lbs. F.O.B. Chicago. **14.95**

ITEM #81. Larger size, equipped with 1/2" Jacobs key chuck. Overall dim. 7 1/2" long, 5" high, 2" thick. Wt. 4 lbs. F.O.B. Chicago. **19.95**

NOW . . . It's Easy to Weld with this handy **ARC WELDER**



250 AMP. MODEL 252
Designed for many years of trouble-free service. Handles anything from light gauge sheet metal to 1/2" plate (ITEM #65)

FOR ANY WELDING JOB, LIGHT OR HEAVY
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.

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over \$300.00. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16" to 1/4" rods. Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7 1/2 H.P. electric motor or a 10 H.P. gas engine. Use two V-belts, or flat belt (on pulley). Continuous welding rating—200 amps.; intermittent rating—250 amps.; 0-30 volts. Now . . . AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Ship. wt. 107 lbs. Only one or two jobs will pay for entire welder. F.O.B. Chicago **99.50**

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. (ITEM #66) F.O.B. Chicago **10.50**

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The perfect oil filter to keep your motor oil or hydraulic fluid clean at all times. Protect your pump or engine with this unit. Just turn the handle and the element is clean. Standard 3/4" inlet and outlet ports to accommodate 12 gallons per minute. Shipping weight 4 lbs. A \$13.00 Value.

(Item #70)
4.95

WATEROUS PUMP



Rated 500 gallons per minute at 120 P. S. I. This high efficiency pump is designed for front end mounting on General Motors, Dodge, Studebaker and Ford trucks and comes complete with gear box and power take-off for easy mounting and attachment to crank shaft. Net weight of pump 500 lbs. Shipping weight 1200 lbs. F.O.B. Chicago. EACH

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For Spraying D. D. T., 2,4-D, Sulphur Compounds, etc. BRAND NEW. Pressures up to 200 lbs. and 14 gallons per minute—at 1200 R.P.M. Will not rust, pit, foul or freeze up. Use rubber hose inlet, 3/4" pipe outlet. Equipped with double mounting bracket. Weight 24 lbs. Dimen. 8"x7"x10". Standard 1" manganese bronze shaft with keyway. U. S. Govt. Acquisition Cost \$62.00. NOW **15.00** F.O.B. Chicago

(ITEM #250)
15.00
F.O.B. Chicago

and performance data with each pump.

NEW AIRCRAFT QUALITY

HYDRAULIC EQUIPMENT

UNCONDITIONALLY GUARANTEED



LOGAN HEAVY DUTY HYDRAULIC CONTROL VALVE

Has built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes. 3/4" pipe thread connections. Overall dimen.: 12 1/2" H x 8 1/2" D x 8" W. Ship. wt. 17 lbs. Govt. Acq. Cost \$100.00. An Excellent Buy. F.O.B. Chicago. **21.95**

(ITEM #37)

ITEM #16—Double acting cylinder, 1 1/2" bore, 27" stroke. (Will lift 1760 lbs. in 2 seconds with Logan Pump.) Wt. 8 lbs. A \$53.00 hydraulic cylinder value for only **12.95** postpaid

ITEM #17—Double acting cylinder, 2 3/8" bore, 8" stroke. (Will lift 4400 lbs. in one second with Logan Pump.) Will withstand 1500 P.S.I. against wall. Wt. 7 lbs. A \$65.00 value **14.50** postpaid

ITEM #15—Double acting cylinder, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder, (will lift up to 7000 lbs. in 3 seconds with Logan Pump). Wt. 12 lbs. A \$78.00 value **19.50** postpaid



VICKERS MF9 HYDRAULIC PUMP or MOTOR

COMPLETE WITH MOUNTING KIT READY TO INSTALL **19.90** \$75.00 value
Pump is compact, powerful, rated 1,000 P.S.I., 507 cu. in. per revolution, 8 gal. per min. at 3750 RPM. Change rotation by reversing flow. Delivers up to 6 H.P. Requires 1 1/2 to 6 H.P. to drive directly or by pulley. **BRAND NEW.** Mounting kit has been especially designed to provide maximum utility and ease of mounting MF series Vickers Pumps. Brackets are constructed of heavy steel plate; shaft is made of 1/2" steel with one end splined to fit pump; other end of shaft has machined flat for mounting a standard pulley with 1 1/2" hole. Shaft runs in oilite bronze bearings. **14.95** postpaid

MOUNTING KIT ONLY (ITEM #18) \$ 4.95 postpaid
BOTH AS COMPLETE UNIT (ITEM #39) \$19.90 postpaid

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes . . . including actuating cylinders, control valves, tanks, pumps, fittings, hose, and data on hydraulic applications. Use these positive, highly efficient, smooth pressure hydraulics on presses, arbors, lifts, brakes, plastic dies, auto frame alignment, etc., etc.



(ITEM #42)

LOGAN HEAVY DUTY HYDRAULIC PUMP

BRAND NEW . . . for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 H.P. Has 1 1/2" pipe thread inlet, 3/4" pipe thread 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



(ITEM #29)

ITEM #31—Double acting cylinder, 3 1/2" bore, 11" stroke. (Will lift 9600 lbs. in 2 seconds using Logan Pump.) Wt. 15 lbs. A \$92.00 value. **22.50** postpaid

ITEM #61—Double acting Hanna air cylinder, 5" bore, 26 1/2" stroke, 40 1/2" overall length closed. With 100 lbs. input will lift 1900 lbs. Net wt. 89 1/2 lbs. Gov't. acq. cost \$101.85 **39.50** F.O.B. Chicago

ITEM #83—Hand hydraulic pump with built-in 4-way control valve. **12.95** POSTPAID

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. input is 12,560 lbs. using Logan Pump. Ship. wt. 30 lbs. **AN EXCELLENT VALUE for F.O.B. Chicago 32.50**

HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for 3/8" pipe and 50c ea. for 1/2" pipe.

HYDRAULIC CONTROL VALVES

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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. Brand new. Ship. wt. 6 lbs. A \$60 value **postpaid 10.95**

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**AUTOMATIC GRIP
SCREWDRIVERS**

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New Models FOR RECESSED HEAD SCREWS



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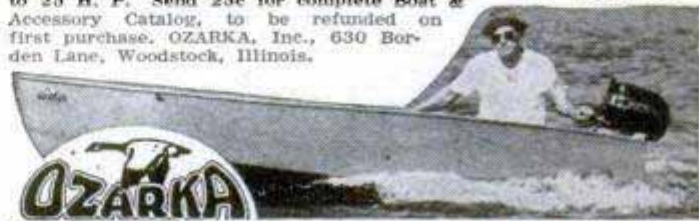
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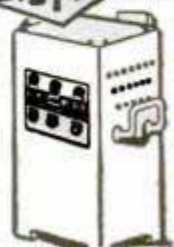
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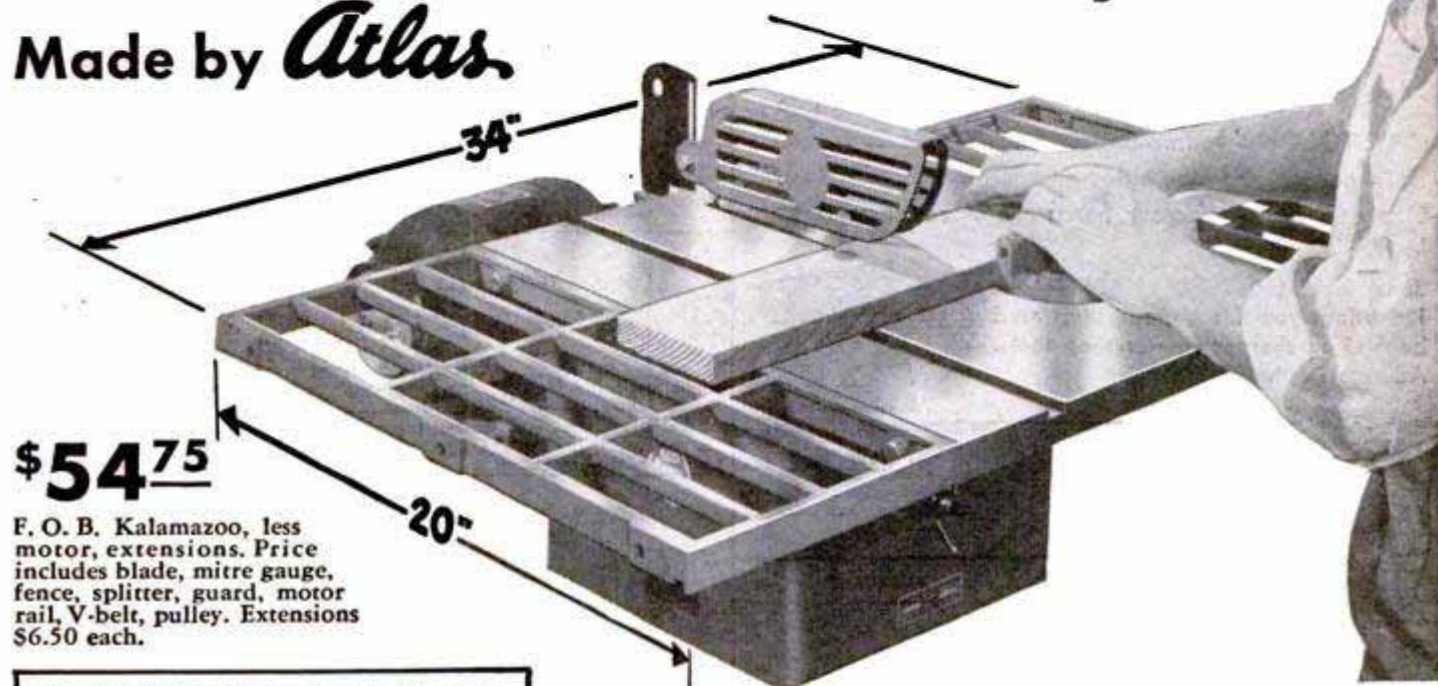
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F. O. B. Kalamazoo, less motor, extensions. Price includes blade, mitre gauge, fence, splitter, guard, motor rail, V-belt, pulley. Extensions \$6.50 each.

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Here — at low cost — is a saw that gives you the capacity you need for any type of construction for your home, the accuracy you need for fine model and furniture projects, and the quality manufacture that assures a lifetime of useful service.

You'll value the big grey-iron table of this new Power King — its solid support for long or wide boards and big panels. You'll value its *permanently* smooth, easy-sliding, *precision-ground* surface — the quick-adjusting, *full-length* rip fence, the convenient *front controls* for blade height and angles, and the tilting arbor, with sealed ball bearings. Only in saws costing much more do you find *all* the quality features that Atlas engineers have put into this new Power King No. 3102.

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Put the SEA SHELL together and save half the cost of a ready-made rowboat. It's fun! Only ordinary hand tools needed. Kit includes pre-cut waterproof plywood and wood parts, screws, oarlocks, seam compound, full instructions. Beam 4 ft., depth 16 ins. Sailboat conversion kit available.

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Model 50M. Just add electric motor or gas engine. Concealed blade for safety. 3 cutting heights, 1½", 2½", 3½". 18" blade. Cuts to within ½" of sidewalk. Ball-bearing rubber tired wheels. Wt. 43 lbs.

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35"
FLEXIBLE
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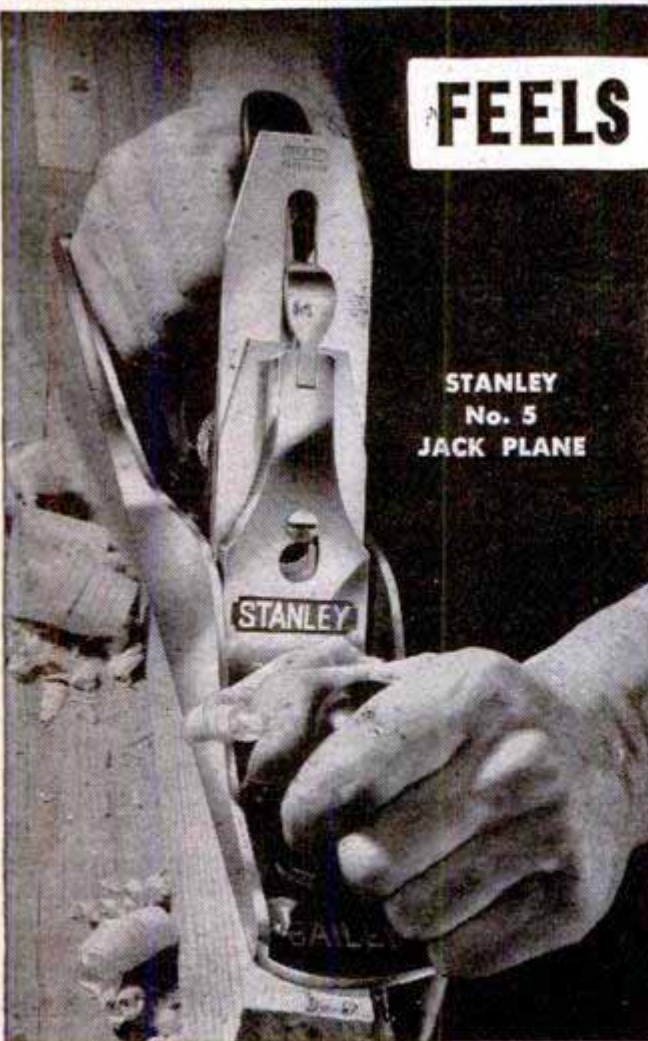
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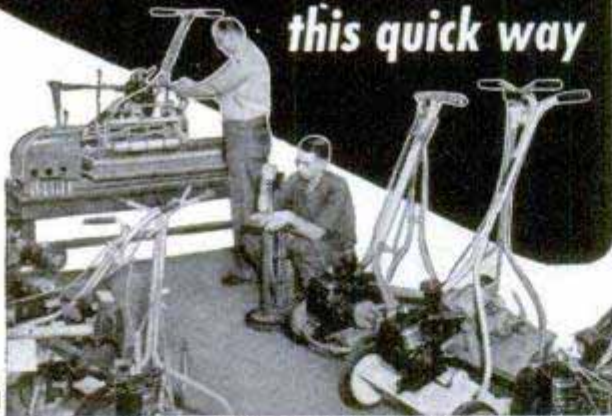
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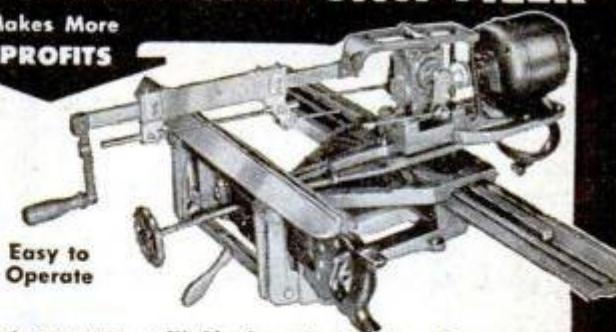
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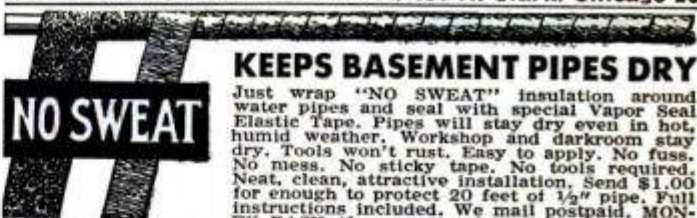
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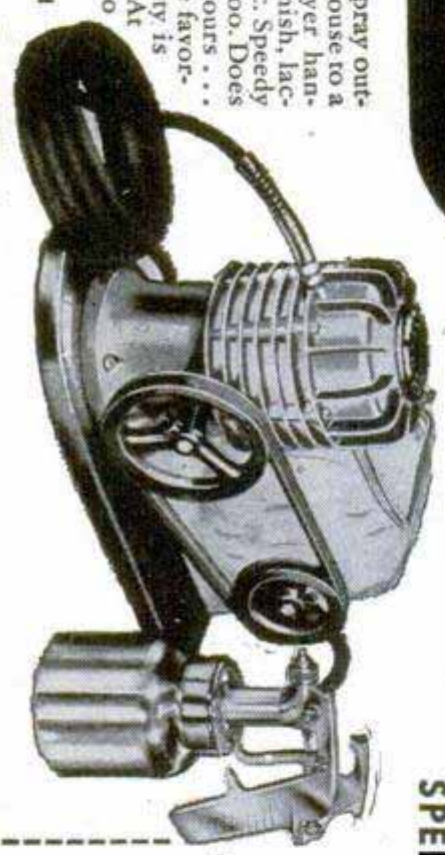
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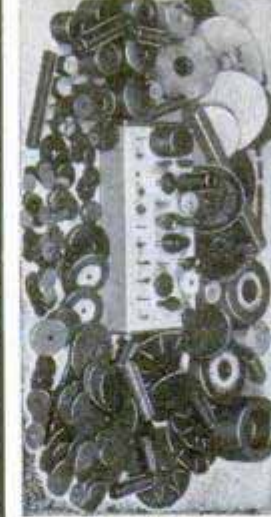
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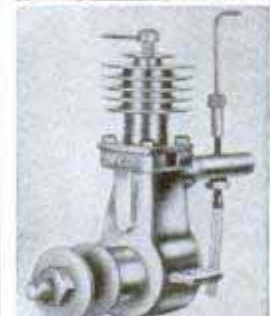
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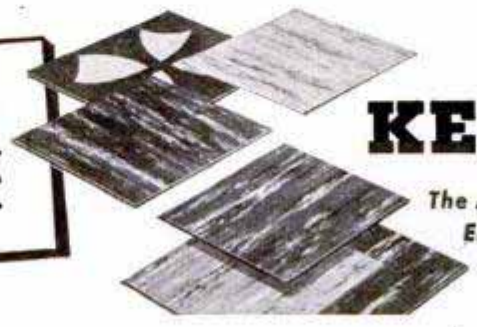
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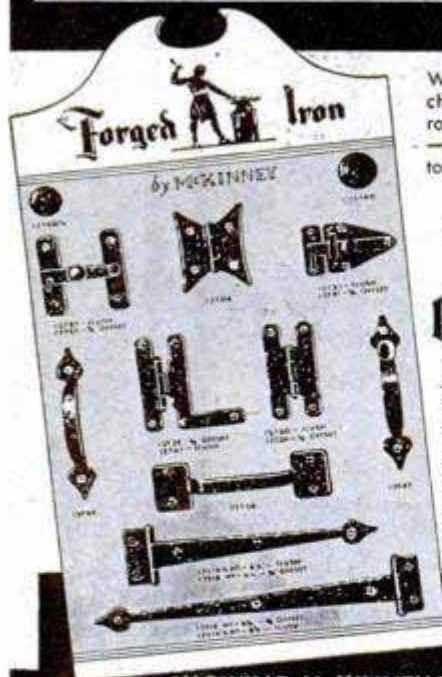
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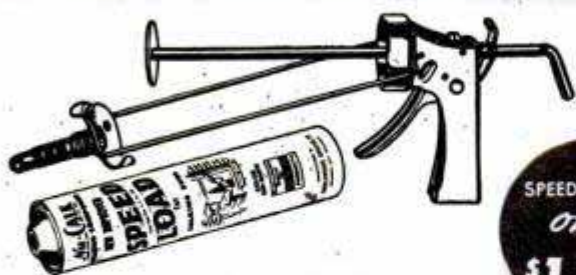
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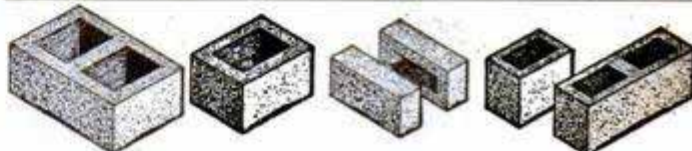
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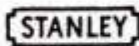
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ONLY
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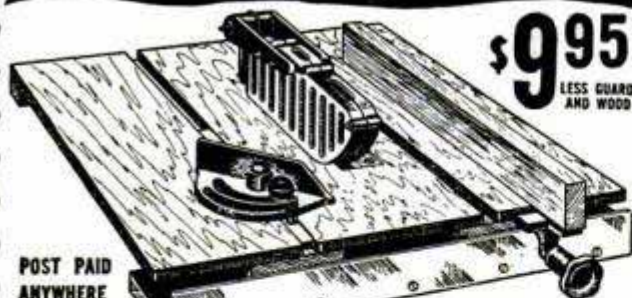
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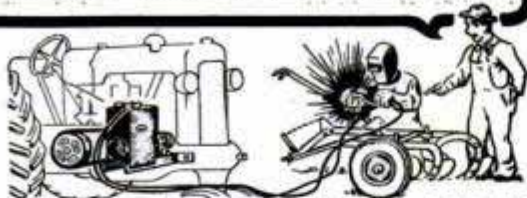
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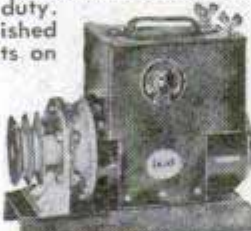
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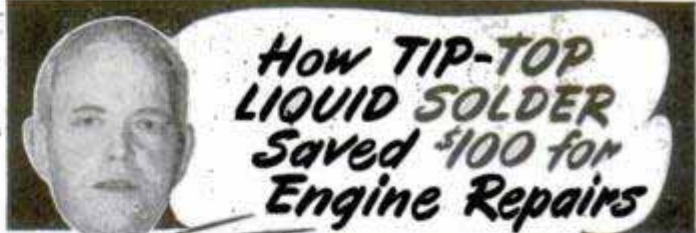


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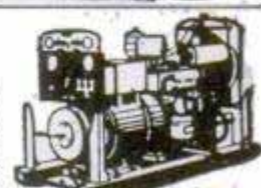
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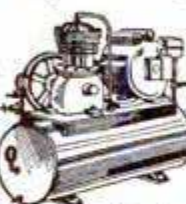
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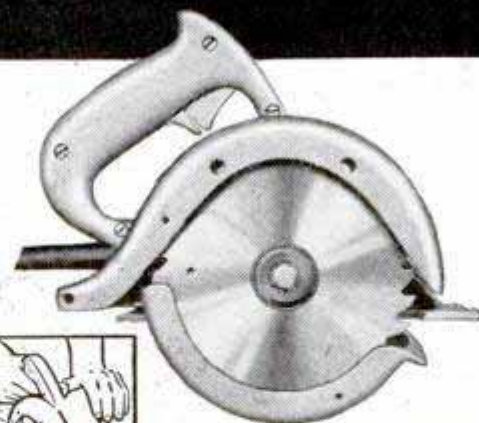
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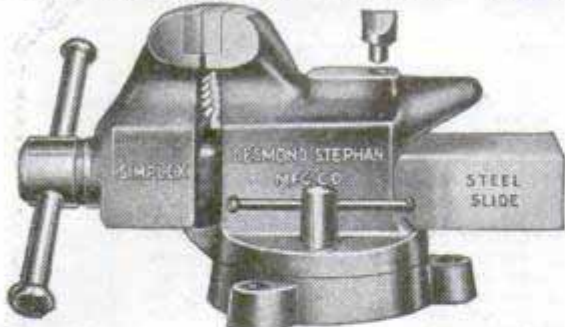
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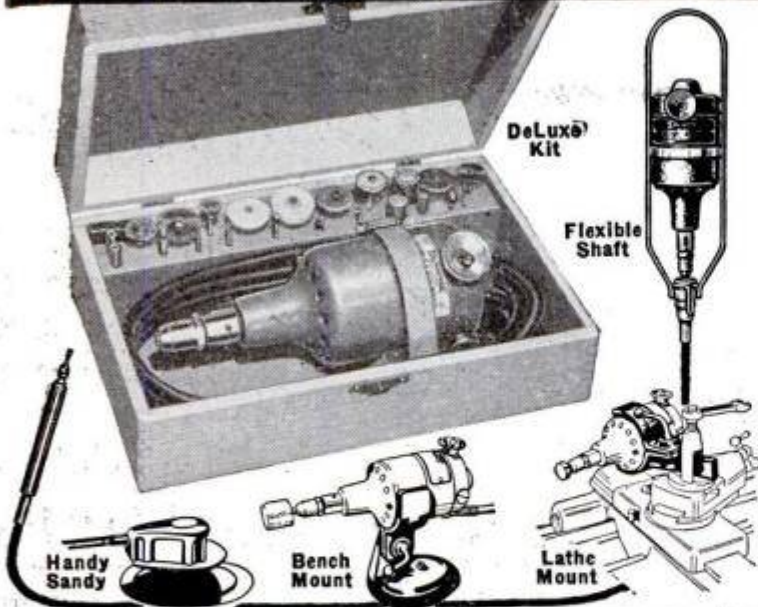
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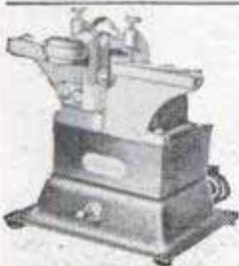
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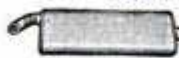
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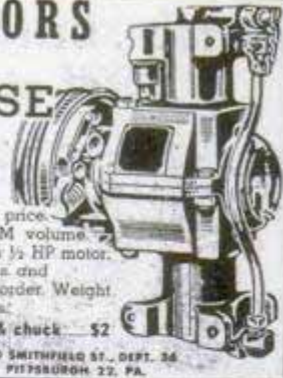
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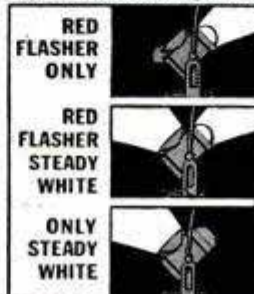
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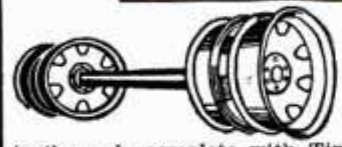
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VICKERS UNLOADING VALVE. Brand New—by passes full amount output of the pump while the cylinder is not in operation. Takes starting load off of electric motor driving the pump. Price **\$4.95** postpaid

PARACHUTE, 24 foot, white nylon, with harness, nylon strings, etc. App. 60 s. yds. material for drapes, clothing, etc. Used, clean, only **\$15.00**

AVIATION TYPE SUN GLASSES

Lens: 4 base ground, polished recessed green glass. Frame: gold plated, cable temples & sweat bar & nose pads. Carrying case with belt loop. Sizes: large or medium. Guaranteed against breakage: postpaid. **\$1.95**



AIRPLANE WIRE ROPE
EXTRA FLEXIBLE, CORROSIVE RESISTANT

Size	Strands	App. break lbs.	Per foot
3/32"	7/7	920	.04c
1/8"	7/19	2000	.06c
5/32"	7/19	2800	.08c
3/16"	7/19	4200	.10c
1/4"	7/19	7000	.13c

No. CODs. Postage prepaid. Min. order \$2.00. Discount 10% 100 ft. or more.

AIRPLANE GENERATOR, P-1 type, 200 amps, 24V; use for welding, lighting, etc. Good used condition, FOB. Ship. weight, app. 60#. reduced to **\$15.**

CO2 FIRE EXTINGUISHER

Hand type, filled with CO2 and reconditioned. Shipped Express only, shipping wt. 15#. only **\$9.95**

FAIRCHILD A10 SEXTANT, \$5.95

AAF War Surplus, included is the A10 Sextant, wood carrying case and battery case. These are used condition, no operational warranty given; they are just as received. We do guarantee a good bubble assembly. **\$5.95**

FAIRCHILD A10-A SEXTANT, w/case, as above, \$7.95
Sextants prepaid for 75c additional.

\$4.95 BOX CAMERA, \$1.50

Built to sell for \$4.95; metal box camera. Takes 12 pictures per standard #620 or 120 load, picture size 2 1/4 x 2 1/4". All new. Postpaid. **\$1.50**
Leatherette carrying case with strap, 50c extra



AIRCRAFT CONTROLLER (DC MOTOR)

24V DC, .01 hp, rpm 7000, torque 200 psi, reversible, stroke .45 seconds; by Barber-Colman, #2066, size 3 1/2" x 8". Reconditioned. Shipping wt. 5#. **\$2.95**

FLAP ACTUATOR W/DC MOTOR

24V, 11,000 rpm, Lear #108, low speed take-off. Reconditioned. Shipping wt. 5#. **\$3.95**

All F.O.B. Houston. Send Check, cash, Money order

AERO PARTS SUPPLY, Dept. PM-2

8102 LOCKHEED ST. HOUSTON 17, TEXAS

PISTON TYPE COMPRESSOR



EASY PROFIT IN PAINT SPRAYING

Paints walls, ceilings, screens, furniture and machinery faster, better. All complete as shown less motor. Carry anywhere. Fully guaranteed. Could be used with 1/2 H.P. motor or less. Price \$35.00 less motor F.O.B. Chicago. \$5.00 deposit balance C.O.D. or see your dealer. With motor \$55.00.

IDEAL AUTOMATIC PUMP CO., Dept. P.M. 8
801 W. Washington Blvd. Chicago 7, Ill.

WAR EQUIPMENT MAIL SALE!

Buy Direct By Mail—SAVE!

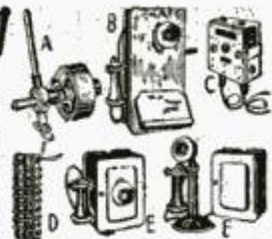
SAVE 50% to 75% on gigantic close-out sale of 100s of guaranteed items. All shipping charges prepaid.

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SHARPEN ONCE IN 12-YEARS! (UNDER NORMAL USE)

These remarkable tools tipped with TUNGSTEN CARBIDE will astound you with their performance. They work FREE HAND equally well in wood, plastic or soft metals—and at the same time hold their razor-like edge almost indefinitely. Tests show that they will turn wood or plastic for days and days CONTINUOUSLY without showing any signs of dulling. They are the finest tools available at any price. Beautifully finished 5" blade—flush ground, polished tip—flame brass tube ferrule—9" hardwood handle—over all length 14"—25 tools to choose from: round & square nose from 1/8" to 1/2"; 1/4" and 3/16" cut off; 1/2" x 30° skew, spear, r. & l. skew, turning and parting. Amazingly Low Prices! Write at once for free literature.

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Dual Purpose Spray Gun! Uses only 25 lbs. Air Pressure

● Thousands of uses in Home, Shop, Industry: Makes Auto Interiors Clean & New, Lines drawers, Marproofs lamp bases, Refinishes any object. All in colorful Flock, Etch & Frost windows, glassware, etc. Removes Paint & Rust from Autos, Tools. Guaranteed! Send \$19.75 or write for free information. Flocking supplies!

BLASTO SPRAY GUN MFG.
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NONE BETTER! SUPER DRILL GRINDER

Sharpens round shank drills from 3/32" to 1/2" in diameter, up to 6" long. Grinds old drills like new in 4 different point angles, using hand or power grinding wheels. Money-back guarantee.

Price only **\$2.95**
At Dealers or Postpaid

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REYNOLDS CIRCULAR SAW GRINDER

Produces top quality results in fraction of time usually necessary for resharpening, jointing, gumming and tooth forming. Any hook or pitch of tooth and depth of cut is quickly adjusted. Both hands are free to control position of saw while grinding. Write now for free circular!

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YOU'LL BE AMAZED by the work you can do on your first job! Plugs into any convenient properly wired 110 volt A.C. or D.C. line. Follow simple directions. Work on iron, steel, bronze, brass, aluminum and other metals. Save money doing own repairs. Make money repairing for others. Thousands of users among maintenance and repair men, farmers, tinmiths, engineers, home and auto owners, etc. Pays for itself over and over. Order on ten-day trial or send for details.

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FOUR-WAY WELDER CO., 2326 So. Michigan Ave., Chicago 16, Dept. F2-CA. Please send as checked below.

Four-Way Welder on 10-day trial. I enclose \$9.95, or I enclose \$_____ as a deposit. Ship C.O.D. for balance.

Illustrated and described details on Four-Way Welder.

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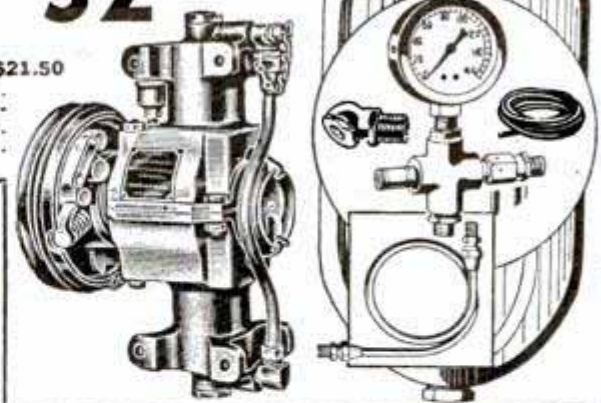
"Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

Compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 52 lbs.

Equipment less Compressor, \$12.50. Compressor separately, \$21.50
Compressor has 2" bore, 1 1/2" stroke, ball bearing, 3.27 CFM at 600 R.P.M. Capacity up to 6.54 CFM. Size 9"x11 3/4"x6 3/4". Wt. 26 lbs. Ideal for spraying paints, insecticides, etc., inflating tires, operating air tools, and other uses. All new equipment. U.S. government surplus. Replacement parts available. Amazing buy. Don't miss it.

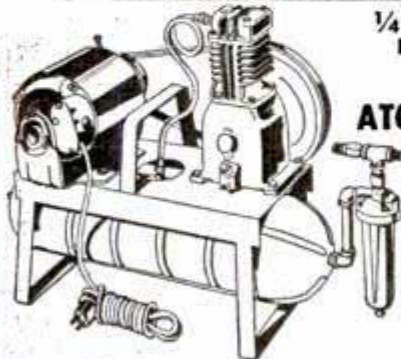
Model T-1 Brand New - 2 CYLINDER PISTON TYPE. Operates with 1/2 H.P. Motor or equivalent gas engine.

\$32.50



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1/4 H. P. HEAVY DUTY MOTOR
EXTERNAL ATOMIZING GUN



Paint Sprayer mounted on 6 x 24 inch tank, 1/4 H.P. 110 V. 60 cy. Heavy duty motor with overload relay, 10 ft. cord and plug, V belt drive. Piston type Compressor with 2 Compression rings, 1 oil ring, 2 inch Bore, 1 3/4 inch stroke, displacement 2.86 C.F.M. at 60 lbs. pressure. Safety Valve. Gun external atomizing. Flat and round spray, quart cup; maintains 35 to 40 lbs. working pressure. Oil and water extractor, 1 air gauge, 20 ft. heavy duty 2-braid air hose carrying handle.

with leak proof fittings, complete with Net weight 54 lbs., ship. wt. 60 lbs.

\$57.50

COMPLETE OUTFIT

Outfit less motor, Wt. 30 lbs. \$47.50
Compressor only, Wt. 14 lbs. 17.50
Spray gun and 20 ft. hose, Wt. 7 lbs. 12.95

Portable Automatic Paint Spray Unit

Spray paint your home, car, garage, etc.



Complete outfit Including Spray Gun. \$150.00 Value.

\$89.50

Same unit, stationary, \$79.50

Use also for spraying insecticides on plants and flowers. 1/2 H.P. heavy duty capacitor motor. AC 110/220 volt, 60 cycle, 2 x 1 3/4 inch piston type compressor, splash feed lubrication, 12 1/2 x 24 inch tank, automatic pressure switch, CFM 2.8 at 100 lbs. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, spray gun with 20 ft. air hose and air chuck for inflating tires, V belt drive, mounted on 2 wheels, ball bearing, with 29 x 10" pneumatic tires. Portable, with handle. Shipping wt. 90 lbs. Regular \$150.00 value. ONE YEAR GUARANTEE. Only \$89.50 complete.

PARTS SOLD SEPARATELY

Compressor	17.50	wt. 16 lbs.
Automatic pressure switch	7.50	wt. 3 lbs.
Regulator, gauge and filter	8.50	wt. 5 lbs.
Spray gun	9.95	wt. 4 lbs.
Tank, wheels and base	17.50	wt. 32 lbs.
20 ft. hose	2.95	wt. 6 lbs.
1/2 H.P. Cap. motor	22.50	wt. 28 lbs.
Air gauge	1.75	Adjustable pop valve
1 1/4" check valve	2.75	wt. 2 lbs.

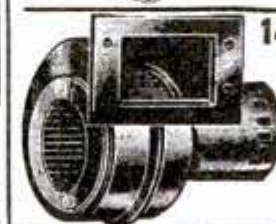
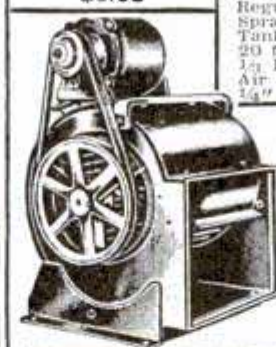
"Wellworth" BLOWER at a Bargain Price

Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, drying, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13 1/2" x 11 3/4"; inlet 8 3/4". Height 19". Width 18". Depth 14 1/2". C.F.M. 1 1/4" S.P. 1600; outlet vel. 1575; motor 1/4 H.P. with overload relay; cord & plug, 110 v. 60 cy. AC. Ship. Wt. 67 lbs. Special price. \$39.50

140 CFM "WELLWORTH" BLOWER

Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 3 1/4 x 4" mounting flange with 2 1/2" square discharge. 3 1/2" dia. blower wheel powered by direct-connected 1/15 H.P., 110 V., 60C., A.C. motor with cond. box and 20' leads. 7 1/2" wide less flange by 7 1/4" fl. x 6 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 6 lbs. \$14.20

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USED, GUARANTEED LIKE NEW.

Chicago Pneumatic Lever Type AIR DRILL

With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. Only \$14.95

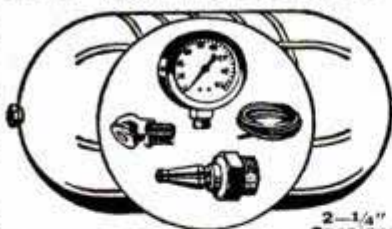
Ingersoll Rand AIR DRILL
With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. Only \$14.95

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Ideal for work on fenders and auto bodies
SPECIAL PRICE \$10.95
Same as above, brand new \$22.50

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Air receiver, stainless steel, 12 1/2" x 24", 400 lb. test. Ideal for carrying on trucks, autos and wherever compressed air is needed. Equipped with 500 lb. air gauge, tire chuck, 3 ft. highest air hose, air inflation valve with core for retaining pressure in tank, and fittings.
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Shipping wt. 20 lbs.
Tank only \$4.95



2-1/4" Openings

6 FT. STOW FLEXIBLE SHAFT
Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor, rubber covered housing; for 1/2" motor shaft; for 1/2" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$29.00 Value, \$14.50. Wt. 8 lbs.

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You pay less and get a larger, higher pressure, higher capacity, heavy duty coolant-type, recirculating pump. Also extensively used on evaporator coolers. Will deliver 60 gal. per hr. at 8 ft. head and 300 GPH at no head. Heavy duty 1/30 H.P. totally enclosed, 110V., 60C. motor with long life oiling. Noncorrosive shaft and pump. 10 1/2" high, 3/8" I.P.T. Ship. wt. 12 lbs. \$15.95



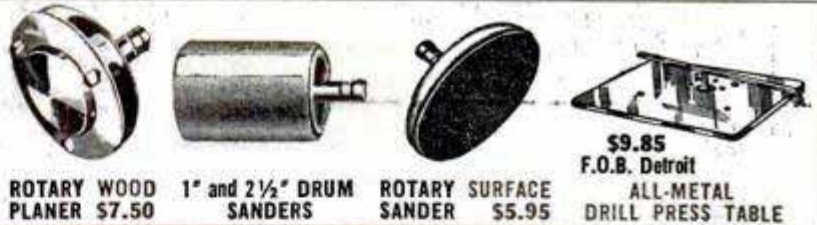
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WELLWORTH TRADING CO.

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BARRON Drill Press TOOLS



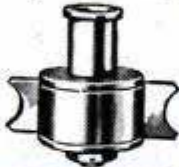
ROTARY WOOD PLANER \$7.50 1" and 1/2" DRUM SANDERS ROTARY SURFACE SANDER \$5.95 \$9.85 F.O.B. Detroit ALL-METAL DRILL PRESS TABLE

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Unbreakable Amber Handle
SCREW DRIVERS



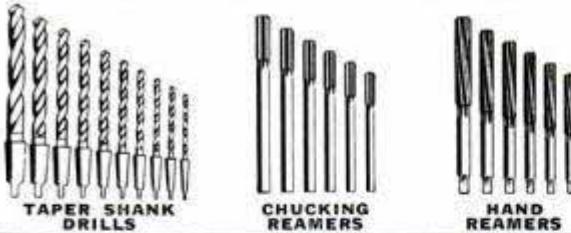
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Hard soldering and welding problems solved immediately with this new, improved flux. Guaranteed to work on all metals including Stainless Steel, only exception aluminum and pot metal, or your money refunded. Send \$1.50 today for your Flash Flood Flux or write for free circular.

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GADGET MIX - Rivets, Spacers, Bolts, Screws, Gears, Wheel bearings, Springs and C.lamps.
No. 106, 5 lbs. **1.19**

BEARING MIX, No. 170A. Approx. 20 needle, Ball & Roller Bearings, New & Used. Sizes: 1/2" to 4". Some of these cost Gov't \$10 a piece. Never such a value!
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For set of ten Reamers ... **4.49**

PLASTIC Mallet CLEAR PLASTIC with 2" dia. x 4" head & 12" handle. For soft metal or plastic work where non-marking or light tapping is desired. **79c**

15" MONKEY WRENCH Adjustable Jaw - Opens to 4" Drop Forged. Auto Type. Cadmium Plated **89c** Black **79c**

PIANO HINGE Overall Width Length Price Ea. 1 1/2" (5/8" side) 72" alum. \$1.00 2" (1" side) 9" alum. **\$1.75**

PALLEY SUPPLY COMPANY
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DEPT. PM3 GLENDALE 1, CALIF

No 100 WINCH HOIST
A sturdy, dependable hoist, originally used as bomb hoist in B-29's. Capacity 2500 lbs. with 24 to 1 gear ratio. Has bronze worm gear and drum has 19 ft. of 1/4" flex. steel cable with hook on end, and two speed handle. Ideal for shops, garages, tow-trucks, boats. **\$21.99**

New Westinghouse AIR COMPRESSOR
Thousands now in use for spraying, inflating, industrial use, trucks, tractors - air tools, laboratory, garage, etc. Lightweight but powerful, can be run by H.P. Motor or Gas Engine. Operates in either direction of operation. Gives approx. 3.27 CFM at 600 RPM, 6.54 CFM displacement at 1200 RPM. Has 2 inch bore, 1 1/2" stroke. Suggested pressure 75 P.S.I. Size: 9" x 12" x 16 1/2". W. approx. 23 lbs. **AT THIS NEW LOW PRICE 23.95** Motors, Tanks, Fittings to adapt this unit also available **AT GREAT SAVINGS TO YOU!!**

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Stainless Steel, Shatterproof & Rustless. Ideal for painting, cooking, spraying, ocean buoys, underwater fishing, or diving.
G-1-12 1/2 x 24 inches. 2100 Cu. In. capacity **NEW 4.75**
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A-6-5 1/2 x 15 inches. 280 Cu. In. capacity **USED 2.25**
A-4-5 x 8 inches. 104 Cu. In. capacity **NEW 1.35**
NOTE: All tanks listed are used and guaranteed serviceable and free from leaks or dents.

FIRE EXTINGUISHER
Kiddie Lux CO2 Type. Built to Gov't spec. Shatter-proof, heavy case. Fully re-charged, with horn. No. 601C - 2 lb. wheel control **11.75**
No. 602A - 7 1/2 lb. \$35 Value. **19.25**
No. 603 - 10 lb. A. \$65 Value. **25.75**
No. 605-A - 15 lb. New. Break disc Type. A. \$75 Value. **29.75**
No. 605-B - 15 lb. Wheel Control Type **32.95**
No. 605-C - 15 lb. New. Squeeze Grip Type. \$85 Value. **39.95**

AIRCRAFT CABLE
Rust resistant alloyed steel, extra flexible, preformed - 7 x 19 strand on reels.
1/16" 3c ft. 1/4" 8c ft.
3/32" 4c ft. 9/32" 9c ft.
1/8" 4 1/2c ft. 3/8" 12c ft.
5/32" 5c ft. 1/2" 15c ft.
3/16" 6c ft. 1/4" Bronze 14c ft.
1/8" Stainless Steel, per. foot. 12c
Aircraft control cable 18 ft. long, 3/16 in. diam. with turnbuckle ends. **99c ea.**

OXFORD BRG & TOOL SCRAPERS
Complete set of 8 Tools packed in Grained Wood Case
Contains 1 ea. 8", 10", 12", 14" half round scraper, 1-6" Three square Scrap. er. 1-12" Double end Scraper. Made of Finest Tool Steel. SET Forged, Tempered, and Hollow Ground. An Unheard of Price! **\$2.49**

New CLAMP
Carpenters, Cabinet makers, Wood workers you need this one! Opens to 8" with 2 3/4" thumb screw. All Steel sturdy and dependable. Handy for gluing, etc. **ONLY \$1.59**

METAL SNIPS-Hard steel blades. Compound action. Expansion spring & lock device. Right and Left hand types. **\$2.59**

TWO HEAT SOLDERING IRON
World's Hottest Iron Value!
Two soldering irons in one with button heat control. Push the button-Select 150 or 300 Watt heat for light or heavy work. Complete with tip, bench holder, 5' asbestos cord, 110V AC. **\$3.95**

HANDY REPAIR KIT
Here's one for every purpose! 6 useful tools... a steel trimming knife-pair of genuine WISS Heavy Duty scissors - a sealing roller for cementing fabrics, 2-1/2" half round files & a burnishing brush. Ideal for wallpaper, insulation, etc. Comes in compact cloth roll. A 9.95 Value For. **3.29**

U.S. NAVY BATTLE LANTERN
A powerful lamp complete with 2 1 1/2 volt dry cell batteries. Size: 7" x 7" x 4" **32.9**

Sperry Aircraft Directional GYRO COMPASS
Dial is 360° swing calibrated 1/10° (6 min). Panel Mount 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. Complete with reset caging knob. Gov't. overhauled - **ONLY \$4.99**

D. C. GENERATORS
Suitable for adaption to home welding units, portable and rural lighting. Use as power plant on boats, etc.
TYPE AMPS VOLTS PRICE
P1 200 27 1/2 **17.95**
R1 300 30 **29.75**
E5A 50 12 **14.95**
Used but Guaranteed Condition

D. C. METERS
AMMETERS VOLTMETERS
0-30 0-30 0-120 0-30 **\$3.95**
-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 1/2" face.
SHEETS - Required for use with D.C. Ammeters 30-60-120-240 **\$1.00**
SOLD ONLY WITH METERS.

NEW ELECTRIC MOTORS
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 1/2 ft. Heavy Duty Cord **\$8.49** ..
No. 502 - 2 HP-24V. DC Motor Used **8.95**

OXYGEN & ACETYLENE REGULATORS
OXYGEN REGULATOR -- Bottle Press. Gauge - 0-3000 PSI. Regulating Press. Gauge - 0-400 PSI
ACETYLENE REGULATOR - Bottle Press. Gauge - 0-500 PSI. Regulating Pressure Gauge - 0-50 PSI.
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Send for Catalog and List of Other Sizes, Types of Pneumatic Tools.

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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 road, farm & shop machinery, presses, etc. Cost Gov't \$390.00 **22.50**

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BENDIX HYDRAULIC HAND PUMP
Provides an instantaneous source of tremendous power for almost any heavy work. Double action stroke. Delivers .30 cu. in. per cycle at 3000 PSI. Max. press. 5000 PSI. Built-in Reservoir cap. 2 1/2 qts. 3/8" pipe outlets. Has Pressure Release Valve. 7 1/2" dia. by 23 3/16" overall ht. Weight 15.2 lbs. A \$40.00 Value for... **\$15.95**
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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. Includes 2-4" Spline Shafts for input & power take-off - Cost Gov't approx. \$400. **\$27.50**

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Bevel gear 1 1/2 to 1 reduction, size 7" x 6". A Life-time Value. **\$3.95**
VTG-2 - Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4 1/2" dia. 26 tooth. 3/4" Alum. spur gear. **\$6.49**
(Both above gear boxes have lever control for engaging & disengaging positive clutch. Dust proof housing. Lubricated bearings. Both can be adapted to Vickers Transmission.

VALUABLE GEAR BARGAINS!
8 to 1 ratio, spindle drive #110 **\$2.98**
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GT-1 Containing approx. 50 Bronze Spur & Pinion Gears - ranging from 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm & worm gear drive sets, 40 N.D. ball bearings from 1/2" to 1 1/2" dia. watch springs, bushings, posts, face plates, housings - Micro Switches, 2 miniature, controlled clutches, etc. 19 lbs Of Pleasure and profit. A Tremendous Gadget Mine. **ONLY \$8.49**
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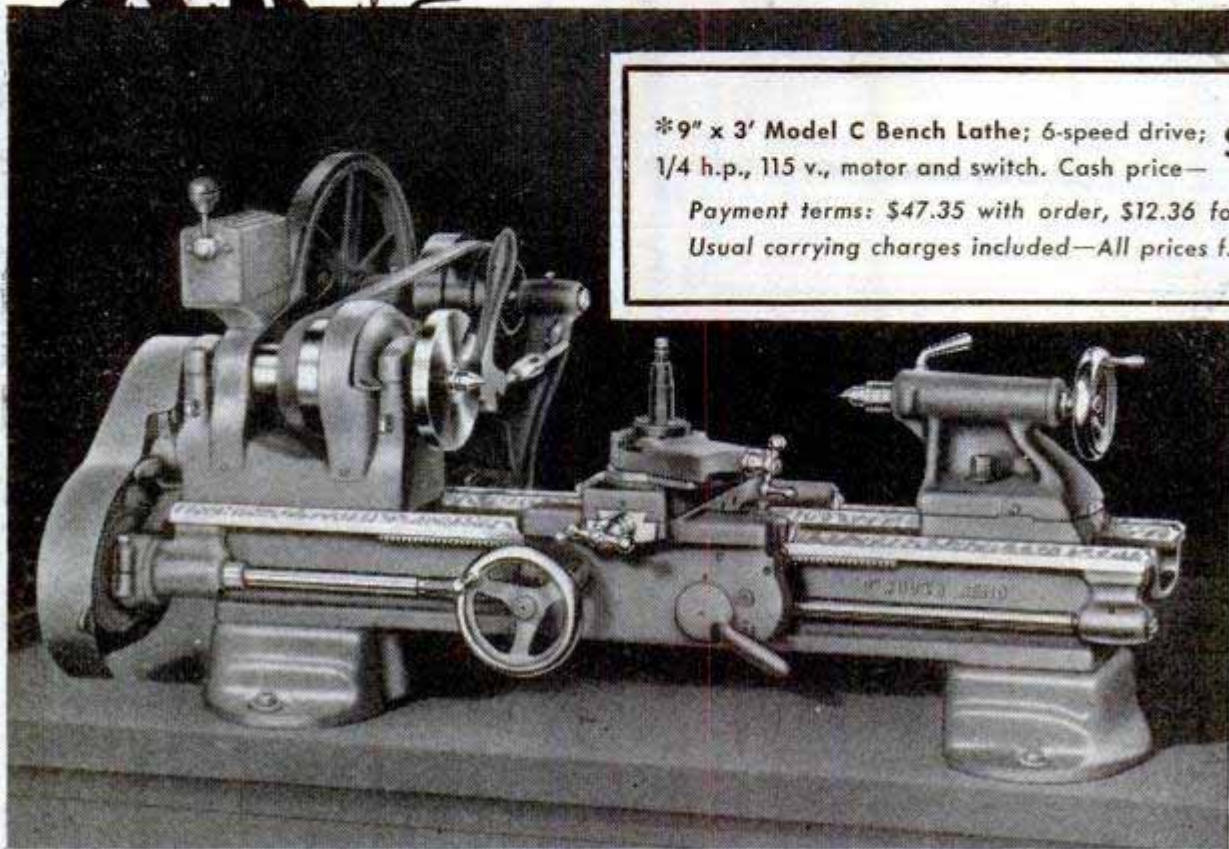


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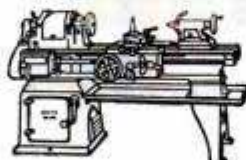
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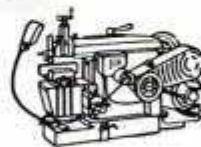
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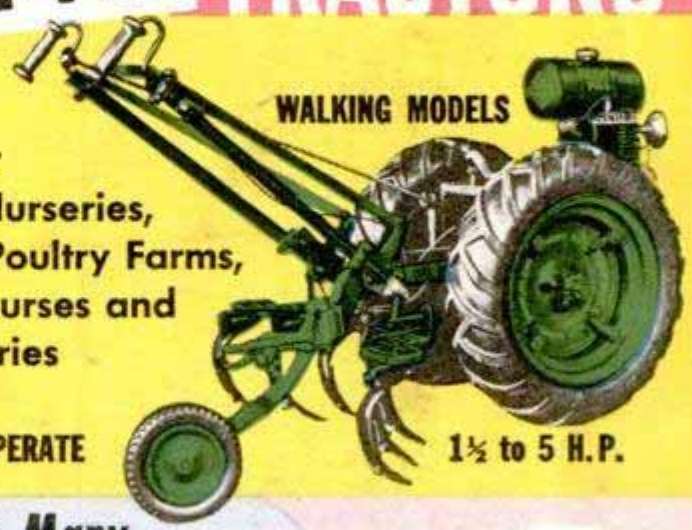
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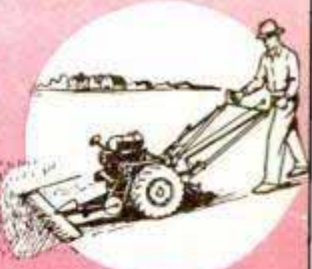
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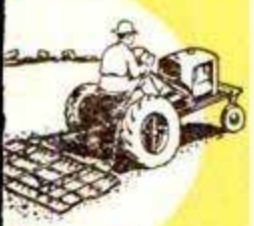
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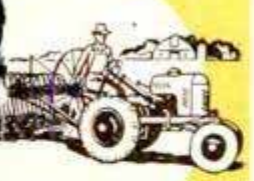
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