

# POPULAR MECHANICS

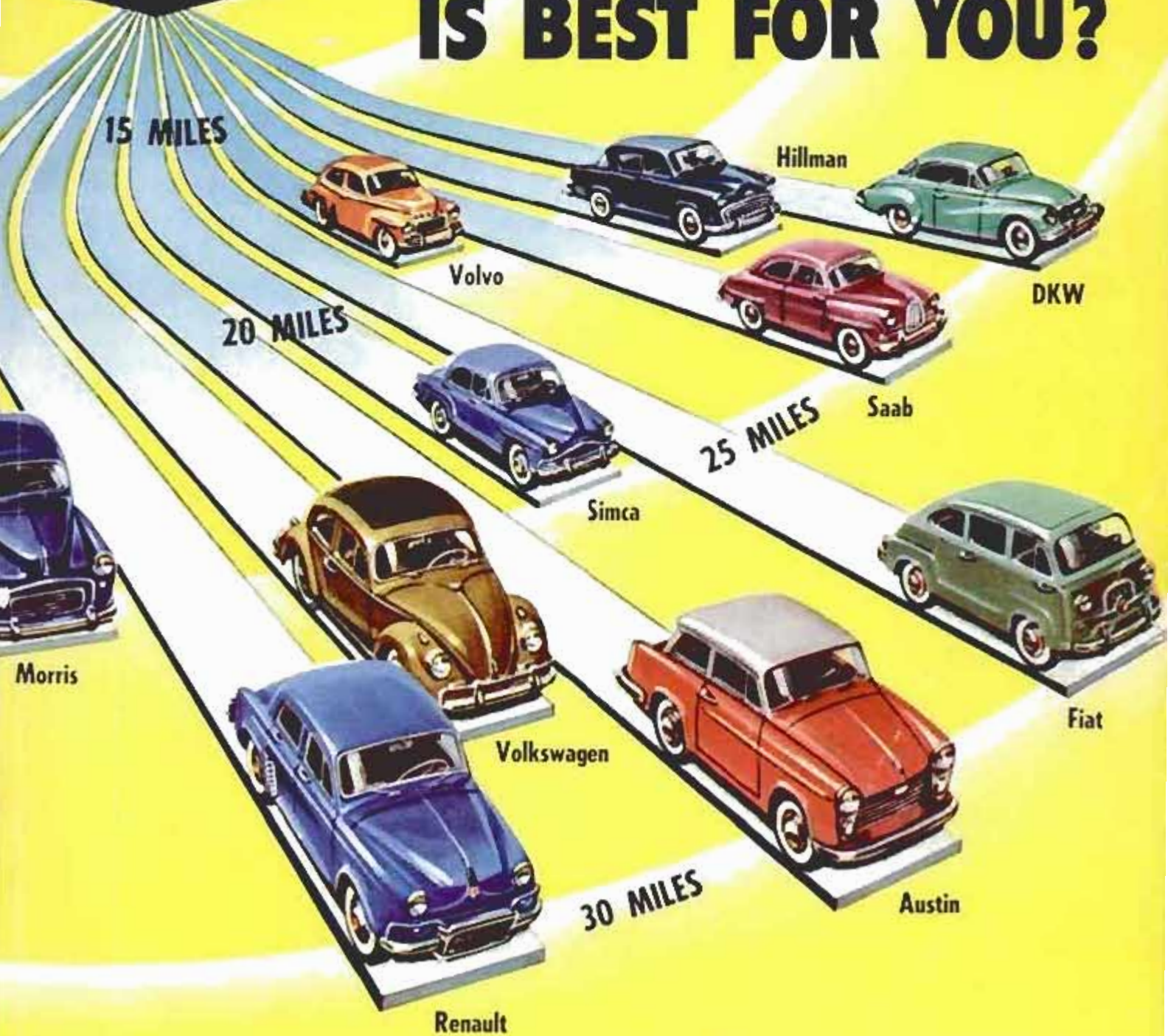
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SEPTEMBER 1959

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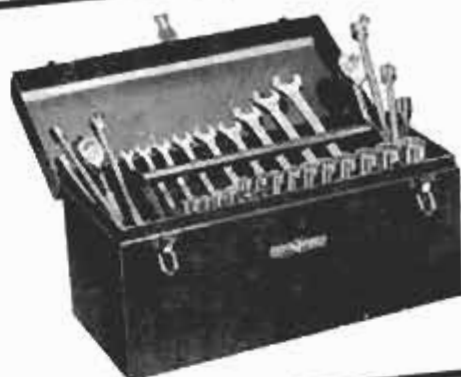
# STEP UP TO PROTO

Here are 4 of the many job-planned tool sets waiting for you at your Proto Dealers, including Hardware, Builders Supply, and Auto Parts stores all over the country.

## SET NO. 9910

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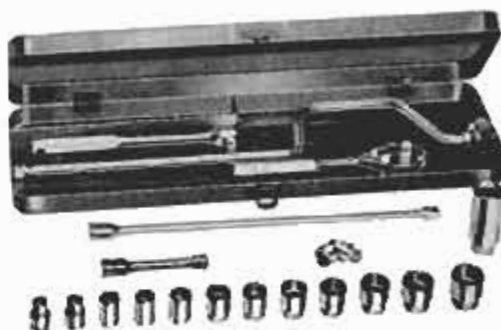
Contents:  $\frac{3}{8}$ " Sq. Dr. Ratchet,  $7\frac{1}{2}$ " Ext., 12" Ext., 12" Hinge Hdle. Sockets, 12 Pt.— $\frac{3}{8}$ ,  $\frac{7}{16}$ ,  $\frac{1}{2}$ ,  $\frac{9}{16}$ ,  $\frac{5}{8}$ ,  $\frac{1}{2}$ " Sq. Dr. Ratchet, 5" Ext., 10" Ext., 15" Hinge Hdle. Sockets, 12 Pt.— $\frac{1}{2}$ ,  $\frac{9}{16}$ ,  $\frac{3}{8}$ ,  $\frac{1}{16}$ ,  $\frac{3}{4}$ ,  $\frac{13}{16}$ ,  $\frac{7}{8}$ ,  $\frac{15}{16}$ , 1,  $1\frac{1}{16}$ ". Combination Wrenches:  $\frac{3}{8}$ ,  $\frac{7}{16}$ ,  $\frac{1}{2}$ ,  $\frac{9}{16}$ ,  $\frac{5}{8}$ ,  $\frac{11}{16}$ ,  $\frac{3}{4}$ ,  $\frac{13}{16}$ ,  $\frac{7}{8}$ ". Tool Box w/Tote Tray.



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Contents: Opening Sizes— $\frac{5}{16}$ ,  $\frac{3}{8}$ ,  $\frac{7}{16}$ ,  $\frac{1}{2}$ ,  $\frac{9}{16}$ ,  $\frac{5}{8}$ ,  $1\frac{1}{16}$ ,  $\frac{3}{4}$ ,  $\frac{13}{16}$ ,  $\frac{7}{8}$ ,  $1\frac{1}{16}$ , 1,  $1\frac{1}{16}$ ,  $1\frac{1}{8}$ ,  $1\frac{1}{4}$ ". Vinyl Kit.

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**NOTE:** Proto guarantees the performance and quality of every tool.

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Chicago: 200 E. Ontario St., Whitehall 4-0100;  
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Francisco: Russ Bldg., 235 Montgomery St.,  
Yukon 2-0823.

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. Richard E. Berlin, President; Richard E. Deems, Executive Vice-President; Fred Lewis, Vice-President and General Manager; John R. Miller, Vice-President; G. Harry Chamberlain, Vice-President; G. O. Marquon, Treasurer; R. V. McCauley, Secretary. Single copy in the United States and Canada, 35 cents; subscription rates in the United States and possessions, Canada and countries of the Pan American Postal Union, 1 year \$3.50; 2 years, \$6.00; 3 years, \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both your old and new addresses. Second-class postage paid at Chicago, Illinois, and at additional mailing offices. Entered as Second Class Matter at Post Office Dept., Canada. Registered as Second Class Matter at the Post Office at Mexico, D.F., Mexico, June 20, 1950. ©1959 by Popular Mechanics Company. All rights reserved. Printed in the United States of America.

FOREIGN EDITIONS:	MECANIQUE POPULAIRE (French)	MECANICA POPULAR (Spanish)	POPULAER MEKANIK (Danish)	POPULAR MEKANIK (Swedish)	POPULARE MECHANIK (German)
Volume 112	SEPTEMBER 1959			Number 3	

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## Next Month...

**HOMES, HOMES, HOMES . . .** Leading off our annual Home Section is the exciting PM Indoor-Outdoor House, designed by one of the nation's leading architects. We think you'll agree it's one of the finest houses ever presented. Also in the big 50-page Home Section you'll find 11 other articles ranging from tips for home planners to "Landscaping for Year-Round Effect" . . . And watch the October issue for your first look at the details on the first of the Detroit small cars



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## Now! For the man who can't afford battery failure!

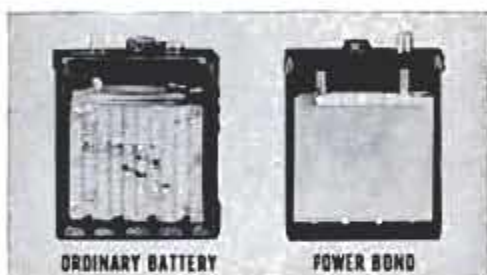
Auto-Lite sta-ful with Power Bond is the battery for the man who *must* be there, who can't afford to trifle with time, who just can't afford battery failure. Power Bond, an exclusive Auto-Lite development, eliminates plate-destroying vibration, a major cause of battery failure.

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Ordinary battery plates (left) have lost vital power-producing materials and failed after only 55 hours of vibration testing. But the amazing Auto-Lite sta-ful with Power Bond (right) shows no damage at all after 1000 hours in the same test. Plates are still intact and delivering full starting power!



# AUTO-LITE. sta-ful. with POWER BOND.

DRY CHARGED . . . FRESH WHEN YOU BUY! FOR MOST 12-VOLT SYSTEMS

# Over the Editor's Desk



Add the urge to travel—whether it's on a sidewalk or a tollway, a chain of lakes or the sky—to the built-in ingenuity of the do-it-yourself addict and you come out with a variety of interesting vehicles. From our editor's mailbag we collected the homemade craft pictured with the paragraphs that follow:

## Big Jeep

Inspired by an article in *PM* of September, 1957, George C. Henderson of Detroit built this special Jeep station wagon.



It has front-wheel drive, 100-inch wheelbase, four-wheel hydraulic brakes, direction signals "and all the usual trimmings." Mr. Henderson reports 20 miles per gallon with the four-cylinder engine. He changed the gears in the axle from 5.38 to 4.56 to 1 ratio, which reduces the r.p.m. somewhat and saves gasoline. The project cost \$420, not counting about 60 days of labor for which Mr. Henderson did not charge himself as, he writes, "I am on Social Security so I have nothing to do."

☆

## Little Jeep

Another Jeep—this a father-and-son project—was adapted by Milton Pirett of



(Continued to page 8)

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Name.....

Address.....

City, Zone, State.....

(Continued from page 6)

Damascus, Md., from plans he found in the *PM* book, "The Boy Mechanic." The Piretts made changes in the steering mechanism to achieve a closer turn with a simple auto-type cable steering. They added a 1-1.5 hp. Briggs and Stratton engine with hand throttle and clutch, and positive-action brakes, both clutch and brakes having foot pedals. The motor is rear-mounted, and the ratio from motor to wheel is 9 to 1.



### It Follows Him Around

Master Sgt. Lawrence D. Cox started building an airplane in 1953. He was on



duty, then, at Elmendorf Air Force Base, Alaska. He finished it five years later at Walker Air Force Base, N. Mex. Our last report was that it was being dismantled for transfer to Pease Air Force Base, N. H. Sergeant Cox estimates he spent about \$800 for material and power plant, but he can't guess the man-hours invested. All parts except the engine, engine mounts, tail wheel, hubs and propeller were handmade. The plane has been given a federal certificate of airworthiness.



### Detroit Supplied the Parts

Nick Kuntz of Flasher, N.D., built this tractor from an assortment of parts most



(Continued to page 10)

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Building Contractor with Drawing  
Building Estimator  
Building Maintenance  
Carpenter-Building  
Carpenter Foreman  
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Lumber Dealer  
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Reading Struct. Blueprints

## ART

Advertising Layout & Illustration  
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Commercial Art  
Commercial Cartooning  
Fashion Illustrating  
Figure Drawing & Painting  
Magazine Illustrating  
Show Card & Sign Prod'n  
Show Card Writing  
Sign Painting & Designing  
Sketching & Painting

## AUTOMOTIVE

Auto Engine Tune-up  
Automobile  
Automobile Body Rebuilding and Refinishing  
Automobile Electrical Technician

Automobile Technician  
Diesel Engines  
Diesel-Gas Motor Vehicle Engines  
Gas Engines  
Internal Combustion Engines

## AVIATION

Aero-Engineering Technology  
Aircraft & Engine Mechanic  
Aircraft Mechanic  
Aviation Engine Mechanic  
Reading Aircraft Blueprints

## BUSINESS

Business Administration  
Business Correspondence  
Business Law  
Business Management  
Business Management & Marketing  
Business Management & Production  
Canadian Business Management  
Clerk-Typist  
Commercial  
Condensed Business Practice  
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Managing a Small Business  
Office Administration for Engineers  
Office Management  
Professional Secretary  
Programming for Digital Computers  
Purchasing Agent  
Retail Business Management  
Retail Merchandising  
Shorthand  
Stenographic  
Typewriting

## CHEMICAL

Analytical Chemistry  
Chemical Engineering  
Chemical Engineering Unit Operation  
Chemical Laboratory Technician  
Chemical Prod'n Foreman  
Elements of Nuclear Energy  
General Chemistry  
Industrial Analytical Chemistry  
Industrial Chemistry  
Paper Making  
Professional Engineer—Chemical  
Pulp & Paper Engineering

Pulp & Paper Making  
Pulp Making

## CIVIL ENGINEERING

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Construction Engineering  
Highway Engineering  
Mine Surveying & Mapping  
Principles of Mapping  
Principles of Surveying  
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Railroad Engineering  
Roadmaster  
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Sewage Plant Operator  
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Surveying and Mapping  
Water Works Operator

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Architectural Drafting  
Drafting & Machine Design  
Electrical Drafting  
Electrical Engineer Drafting  
Industrial Piping Drafting  
Junior Mechanical Drafting  
Mechanical Drafting  
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Industrial Supervision  
Personnel-Labor Relations  
Supervision

## MECHANICAL

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Junior Mechanical Engineer  
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Mechanical Engineering  
Professional Engineer—Mechanical  
Quality Control

## PETROLEUM

Natural Gas Production & Transmission  
Oil Field Technology  
Petroleum Production  
Petroleum Prod'n Eng'g  
Petroleum Refinery Operator  
Petroleum Refining  
Petroleum Technology

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Plastics Technician

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Air Conditioning with Draw's Air Conditioning  
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Domestic Refrigeration  
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Marketing  
Real Estate Salesmanship  
Retail Salesmanship  
Sales Management  
Salesmanship & Sales Management

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Electric Welding  
Forging  
Foundry Practice  
Gas and Electric Welding  
Gas Welding  
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Practical Millwrighting  
Reading Shop Blueprints  
Resistance Welding Technology  
Rigging  
Safety Eng'g Technology  
Sheet Metal Worker  
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Tool Engineering Technology  
Toolmaking  
Welding Engineering Technology

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Power Plant Engineering

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Stationary Diesel Eng'g  
Stationary Diesel-Electric Engineering  
Stationary Fireman  
Stationary Steam Eng'g  
Steam Engine Operation

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Carding Technician  
Cotton Manufacturing  
Cotton Warping & Weaving Supervisor  
Cotton Warping & Weaving Technician  
Hosiery and Circular Knitting  
Loom Fixing Supervisor  
Loom Fixing Technician  
Spinning Technician  
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Synthetic Fabric Warping & Weaving  
Synthetic Yarn Throwing & Warping  
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Textile Engineering  
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(Continued from page 8)  
of which originated in Detroit, Flint and South Bend automobile factories. The front end, for example, started with a Model T and the differential was borrowed from a 1947 Studebaker. From axle to axle center measures 48 inches. With a Briggs and Stratton motor, and with an independent power takeoff for a rotary mower, the tractor really works.

### Crusette, British Style

Back in May 1954 we published plans for building the "Crusette," a 12-foot utility outboard. J. J. Nichols, one of our readers in Willenhall, Staffordshire, England, liked it and built the boat with modifications to



suit his needs. His "Willy Nick" is 14 feet long and accommodates six passengers. He added the fins as an afterthought and reports his boat makes seven to eight knots.

### "The Spook" Has Four Legs

Sixteen-year-old Jerry Ewing of Culver, Ind., wanted to build something "just to be different." He came up with a quadricycle, but it didn't start that way. It began with an old bike frame stretched out to a one-seat bicycle with a 9-foot 3½-inch wheelbase. Nicknamed "Long John," it



(Continued to page 12)



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didn't quite satisfy him, so he produced "The Spook" from four bicycle frames and an assortment of old pipe. Its wheelbase is 6½ feet and its width 4½ feet, with pedals and relaxed seating for two. Both rear wheels have brakes. And, Jerry adds, it doesn't cost a drop of gasoline!



### Watch 'er Climb a Hill!

This "hot rod" is proudly driven by 10-year-old Landy Dale Schubert of Tacoma, Wash., whose dad built it for him. Landy says it has everything—lights, horn, clutch, differential, brakes, coil springs and a



front-mounted motor. Writes young Mr. Schubert: "It will climb a steep hill."



### Back-Yard Racer

This three-wheeler has a lot of background. Chassis and wheels once belonged to a 1946 Cushman ice-cream scooter. The rest, auto junkyards; the rear end is a



1941 Ford hood cut in half and welded. The sides, sheet metal. The grille, aluminum. The front, once a Dodge truck hood. The seat came from a Crosley station wagon. Joseph DeBellis of W. Moorestown, N.J., who built it for his 11-year-old son, says it can do 25 to 30 miles per hour on a straightaway and he provided a small track in his back yard for the boy and his pals.

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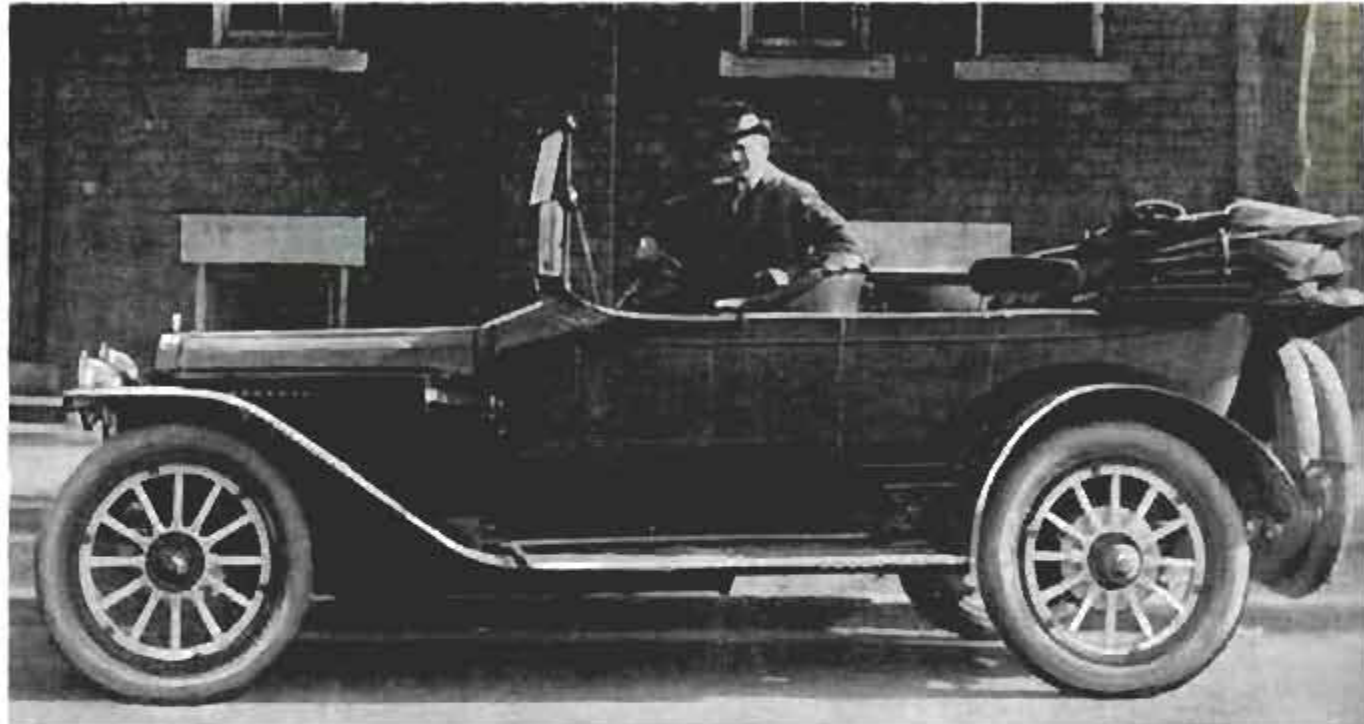
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practical, too. Under its hood an air compressor stood ready to inflate those tremendous 37-inch tires should one go flat, as it usually did. The top, big as a tent, could be put up and down by one man, or so they said. The make? See page 222.



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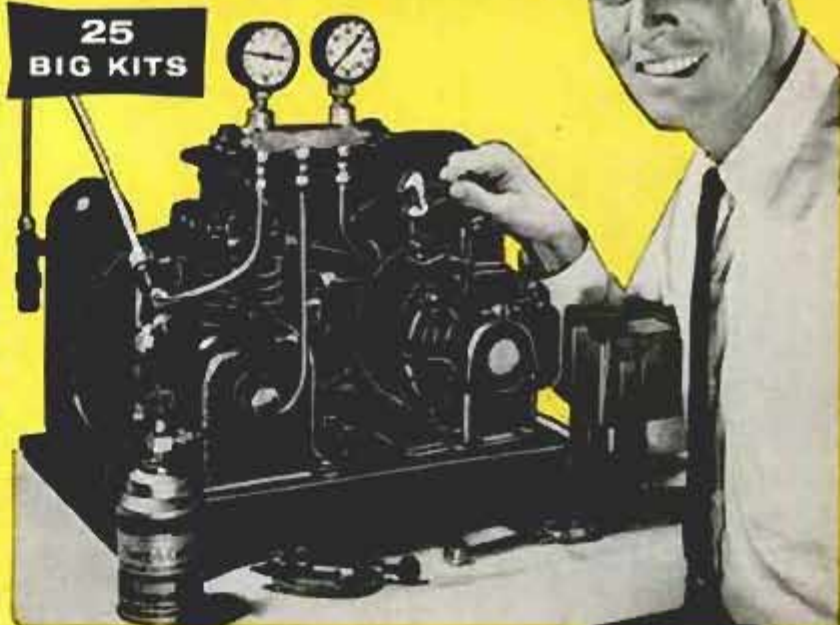


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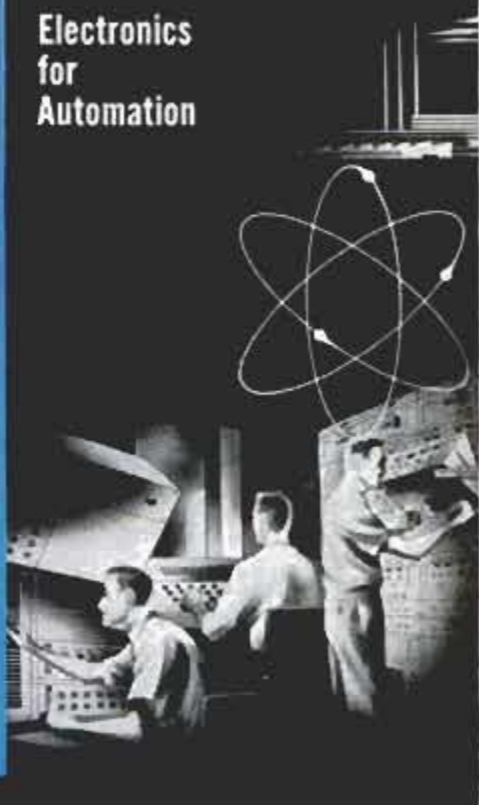
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BY M. R. WARNER

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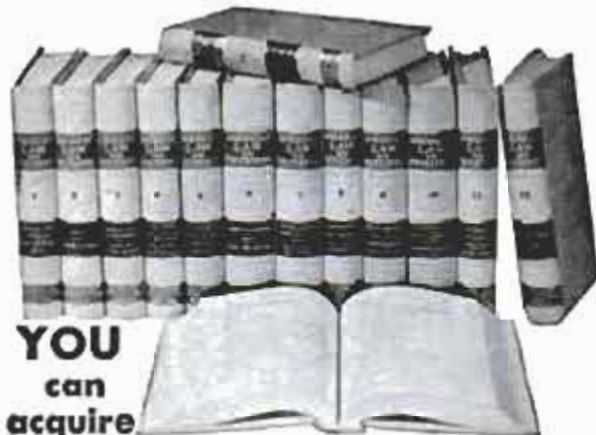
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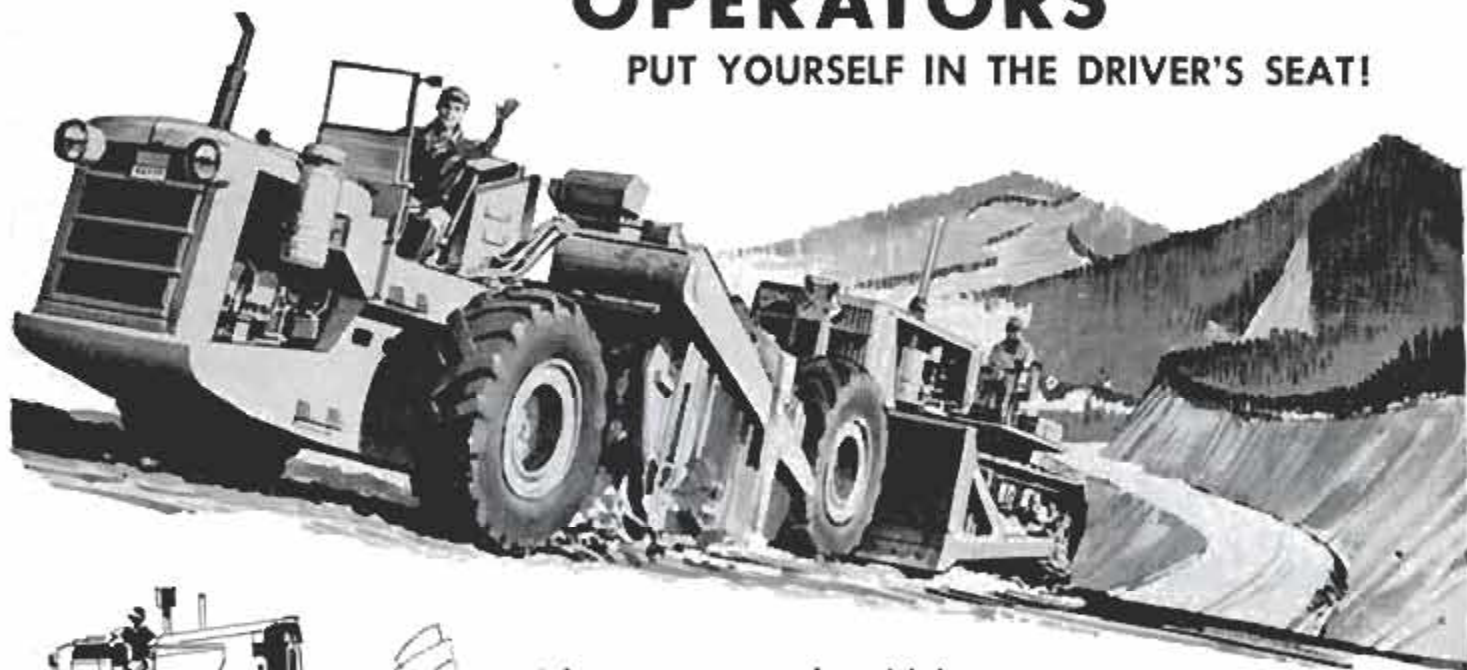
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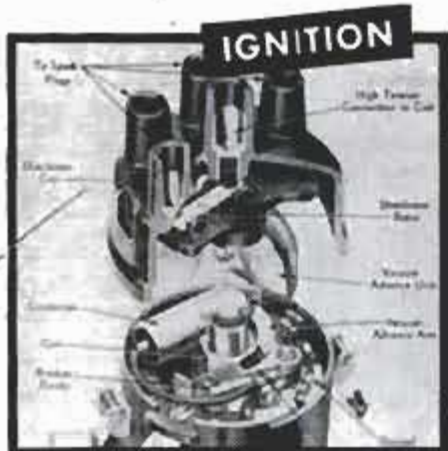
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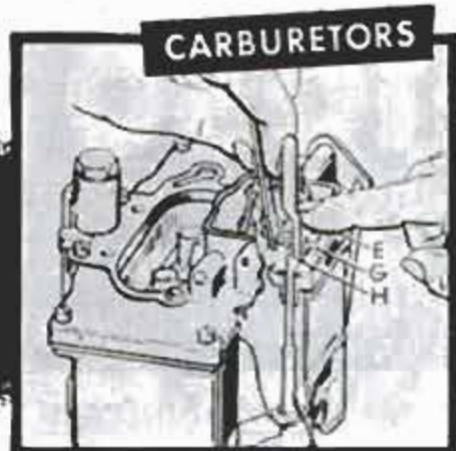
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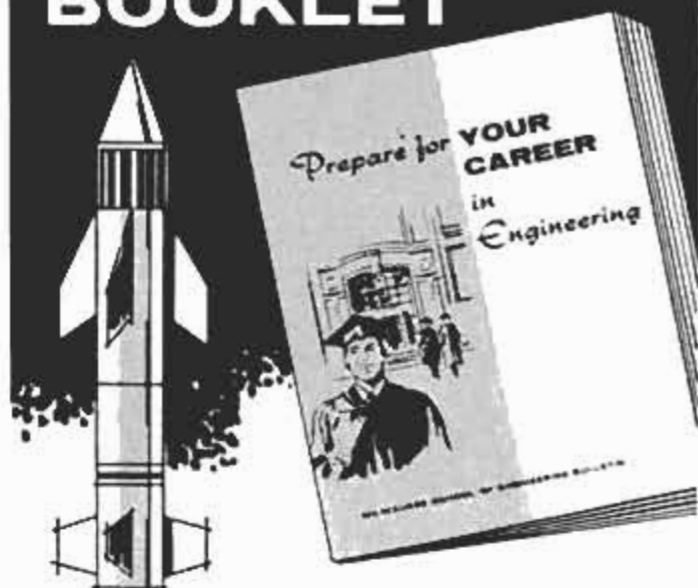
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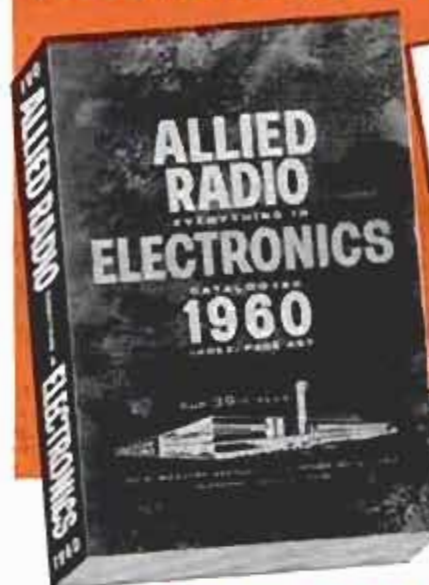
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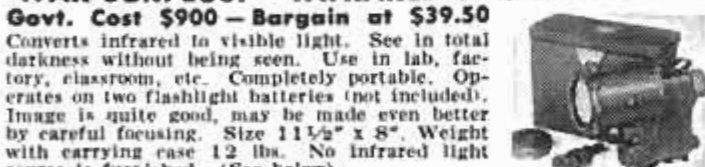
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**IMPORT** For profit. Our facilities at your service. Free air mail particulars. Boisclair Buyer's Service, Box 377, Gelsenkirchen, Germany.

**FRANCHISED Dealerships** available. The Putt-Nik Fun Cart. Most competitively priced and popularly accepted of all carts. Nationally advertised. Write now to Putt-Nik Sales, Inc., 1430 West Peachtree St., Atlanta 9, Ga. Manufactured by Cummings Enterprises, Washington, Ga.

**SIX Mailorder trade magazines,** 25¢. Thompson, Box 94-PM, Salinas, California.

**DOLLS! Dolls! Dolls!** We teach you to repair, make, sell, all kinds. Study at home. Earn while you learn. Free information. Doll Hospital School, Studio PM-99, 11826 San Vicente Blvd., Los Angeles 49, Calif.

**FREE.** New, profitable imprint circulars. Possible \$5.00 monthly bonuses! Details, 10¢. Jones, Box 78-22, Brooklyn 33, N. Y.

**FREE!** Name brands catalog! Your own high profit business. Sell name brands, full or part time. No inventory, no investment. More than 2,000 name brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi, stereo radios-phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 floors of name brands. Million dollar inventory. Orders shipped complete in 24 hours! Send for free, beautifully illustrated catalog now! Separate wholesale price list. H. B. Davis Corp., Dept. 11, 145 W. 15 St., New York 11, N. Y.

**MAILORDER!** Succeed with your own guaranteed profit mail order business. No inventory. We dropship and show you how to make big profits. Write Gifftime, 919 Walnut, Dept. GPM, Philadelphia, Penna.

**LEARN** Sewing machine repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Shipping from Chicago, New York, Los Angeles. Write today! Taylor Service, Box 2126, San Bernardino, Calif.

**IF** You like motorcycles and money then send for Harley-Davidson dealership book on how to become a franchised dealer of motorcycles and a new line of motor-scooters. Here's a chance to own your own business with a very modest investment. The youth market is beginning to explode and the next few years promise a chance to cash in on it. Write for free illustrated dealership book today. Harley-Davidson Motor Company, Dept. P. Milwaukee 1, Wisconsin.

**EARN** Money at home raising fishworms for us! Backyard, garage, basement. We buy your crop! Inquire: Oakhaven 38, Cedar Hill, Texas.

**BUY** Direct from factories. Appliances, cameras, watches! Free details! Cam Company, 6810PM-20th Ave., Brooklyn 4, N. Y.

**BUSINESSES,** Resorts, motels, investment property, ranches. Our special service dept. at your disposal. No obligation. World's largest. 58 years' service. Strout Realty, 7-MB S. Dearborn, Chicago 3, Ill.

**BIG** Money raising fishworms and crickets. Free literature. Carter Farms, Plains, Georgia.

**QUICK** Profits, with no capital! Take orders for magazines your neighbors like, want. Make cash on the spot! We show how with free kit. Get yours now. Write McGregor Magazine Agency, Dept. 311, Mount Morris, Ill.

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**\$34.70 TWO** Hours. Manufacturing concrete products. No selling. Carlayne Castings, 1803 Fremont, Rapid City, South Dakota.

**TO \$100.00 Weekly.** Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

**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.

**PIANO** Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Ill. (Founded 1935).

**WANT** To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes, disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 6234 Broadway, Chicago 40, Illinois.

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**I** Want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

**INCOME** With garden golf. Motivated archery ranges. Brockway, Box 3924, Portland 8, Oregon.

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**11,000 NEW** Prospects daily. Baby record books, shoes, albums. Sell mailorder. Use our literature. Write: No-Co-Ro, Capitola, California.

**COPUBLISH** Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

**FREE** Catalog. Contains hundreds of businesses, farms and income properties throughout U.S., Canada. Specify type and location desired. Deal direct with owners. U. I. Buyers Digest, 1608 Hillhurst, Dept. PM-3, Los Angeles 27, Calif.

**BRONZE** Baby shoes; Instructions, equipment and mountings for genuine electroplating process. Largest supplier of all plating equipment, supplies. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First, Los Angeles 33, Calif.

**MAKE \$46** From square foot plywood; jig saw necessary. Free details. Woodart, Bridgewater, Mass.

**MARKETS** Everywhere. Make artistic concrete birdbaths, pottery. Best coloring. Home workshop. Hundred varieties. Hollywood Cementcraft, 8527-S Wonderland, Hollywood 46, California.

**LIQUID** Molding rubber, free sample. Shellcraft supplies. Chaney's, 1907-A East Road, Jacksonville 11, Fla.

**FIX** Typewriters. Free repair course. Home operated. Remit 25¢ for book explaining free course and agency appointment. Athey, Tarentum, Penna.

**MAKE** Money by mail! Free details! Hunholz, 902 Eighth, Wamego, Kansas.

**MANUFACTURER** Fishing lures, plastic, none better. 26 models pennies. Free circular. Quaker, 3514-24 N. Lawrence, Philadelphia 40, Penna.

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

**EARN** Good money sharpening chain saws, scissors, cutters, knives. Free manual. Treyco, North Tonawanda, N. Y.

**ROBINSON'S** Sewing Machine Service Manual. 579 illustrations. 144 pages. Earn to \$5 per hour. Price \$6.25. Lee Robinson, Book Nook Bldg., Walla Walla, Wash.

**RE-Cast** junk batteries into new. Latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

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**HAVE** A profitable business of your own selling the "World's Most Usable Pictorial Bible." Let our 26 years experience help you. International Book Company, Dept. M., P. O. Box 118, Wichita 1, Kansas.

**MAIL** Order business. Avoid losing money through errors of judgement. Read, "I was wrong about that", by Arthur Sizemore. Send for free copy. John Bishop, Box 153B, Ojai, California.

**BE** Appointed state notary public now. Details. Stationers, 515 East 33rd, Kansas City 9, Missouri.

**BAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Montgomery, 3605 South 15th, Minneapolis 7, Minnesota.

**PROFITABLE** Mailorder operation! Write: Vikari, 468PM 3rd Avenue, Salt Lake City 3, Utah.

**\$3.00 HOUR**—Home, sparetime, assembling pump lamps. Easy. Free details. Ougor, Caldwell, Arkansas.

**ADVERTISING** Line, markup plus production commission. Cooke Company, 3-1 Chome Yurakucho, Chiyodaku, Tokyo, Japan.

**OPERATE** Profitable mail order business. Write Hunt Enterprises, 978 Terrace Dr., Salem, Oregon.

**YOUR** Own successful business can bring \$1,000 monthly by mail at home. Free details. DeLang Research, Box 52-D, Burlington, Iowa.

**YOUR** Own business! Sharpening scissors. Steady profits. Blackhaws, Sheldahl, Iowa.

**RAISE** Angora, New Zealand rabbits, fishworms on \$500 month plan. Free details. White's Rabbitry, Delaware, Ohio.

**WHOLESALE** Catalog free — shoes, shirts, pants, hosiery, etc. Bostonian, 40-CA Harrison Avenue, Boston 11, Mass.

**GIANT** Homework opportunities 25¢. Kengee, 1105 Morning Glory, Durham, N.C.

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**WEAVE** Rugs. Make good profits. No experience necessary! Free catalog, sample card, and low prices on carpet warp, rug filler, looms, parts, inexpensive beam counter. If you have loom, give make, weaving width please. OR. Rug Company, Dept. 9972, Lima, Ohio.

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**AMAZING** Successes through franchises! Secure your own profitable franchise business. Alert yourself to nationwide opportunities. They are published each month by National Franchise Reports. This is the pioneer franchise reporting service recognized nationally as the clearing house of franchise information. Send today for free, interesting literature. National Franchise Reports, MP-528, 333 North Michigan, Chicago 1.

**MAKE** Big easy profits making costume jewelry at home in spare time! Quick, easy to make, easier to sell! Details free! Don-Bar, 3511 W. Armitage, Dept. J-192, Chicago 47, Illinois.

**HOME** Mail business. Magazine 35¢. Davies, Box 54PM, Hammond, Ind.

**CAMERA** Profits. Five plans, photo markets Only \$1.00. Grote, P. O. Box 266, Bronx 51, New York.

**\$150.00-\$200.00 WEEK** Repairing typewriters. Send \$3.95 for course. Typewriter, Box 317, Walden, N. Y.

**FREE** Catalog. Sell costume, religious jewelry. 200% profit. Sample \$1.00. John Clark, Box 40, New York 12, N. Y.

**REPAIR** Hydraulic jacks. Illustrated repair manual \$3.98. Free information. Hydraulic Parts Supply, Box 4104, El Paso, Texas.

**CIGARETTES:** Make 20 plain or filter-tips for 3¢. Facts free. Moberly, Box 831, Owensboro, Kentucky.

**\$200.00 MONTHLY.** Spare time. With table saw, bandsaw or jig saw. Write. Holiday House, 7228 4th Plain, Vancouver, Washington.

**FREE Home money-making plan!** Merrill Hilstad, Box 182F, Hatfield, Penna.

**PRACTICAL Mallorder.** Start small. Money-maker, 722 East Silver Spring, Milwaukee 17, Wisconsin.

**EARN \$5,000-\$15,000 Yearly** at home in respectable field. Only 3 hours weekly attention needed. No public contact, no experience necessary. Exceptional but true. Rush \$1.00 for complete detailed plan. Satisfaction or refund. Columbia Enterprises, Ltd., 9268-PM Piney Branch Road, Silver Spring, Maryland.

**HAVE Big paying home mallorder business!** Many new, sparetime moneymaking opportunities now available! Details free! Steinger, Box 181-PM, United, Pennsylvania.

**SELL To stores.** Big profits. Samples \$1.00. Refunded first order. Creative Products, Box 423, Connerville, Indiana.

**FORTUNE.** Bronzing baby shoes, growing miniature trees, manufacturing rubber stamps. All instructions, \$1.00. Davis & Sons, Box 1511, Levelland, Texas.

**BIG Profits** from amazing catalog plan. Work home. Rowe, 2317P Marshall, Chicago 23, Ill.

**WIN Contests.** Latest contests, helps. Contests, 25 Earl, Red Bank, N. J.

**NEW Publishing franchise plan.** Highly profitable, continuous income. Full-sparetime, men-women. Operate from home. No capital, equipment, experience needed. Free details on exclusive rights. Calendar, 181-5 Apple Tree, Winnetka, Illinois.

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**INVISIBLE Reweaving:** \$5 in one hour possible reweaving burns, tears, moth-holes. Spare-full time. Free details. Skill-Weave, Dept. SC-169, 335 W. Madison, Chicago 6.

**START Big-pay business** at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-2-H, Chicago 26, Ill.

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**SNAKES** Are worth up to \$25.00, each. Lizards \$8.00. Turtles \$25.00. Toads and frogs \$1.75. We buy all kinds, sizes. Full details and collectors brochure 25¢. Biological Exchange, 1211L Wagner Lane, El Paso, Texas.

**WE Pay \$3.50 lb. dried.** Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We pay \$3.50 lb. Free book. Mushrooms, Dept. 173, 2954 Admiral Way, Seattle, Wash.

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

**YOUR Own, easy-to-start, home mail-order business.** Sparetime. Fascinating; profitable! Information free. Alfano, 19-PM Pine, Closter, N. J.

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**\$340.00 MONTHLY** With jigsaw. Details. Elkman, 346F North Summit, Sioux Falls, So. Dak.

**BIG Money raising** fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

**SELL Titania gems.** Far more brilliant than diamonds. Catalog 10¢. Diamonite, 2420-M 77th, Oakland 5, California.

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**MAKE Money writing** short paragraphs. Information free. Barrett, Dept. C-27-D, 7464 No. Clar., Chicago 26.

**MEN — Women!** Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.50. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-2-H, 1512 Jarvis, Chicago 26, Ill.

**11 MONEY Making methods.** Each worth big money to you. Free details. Griffin, 322 W. State, Ithaca, N. Y.

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

**BIGGEST Money makers** in the field. Acme saw and lawn mower sharpeners. Free literature. Max Mfg. Co., 138 Stockton Ave., San Jose 26, California.

**MONEY In your spare time.** Become a notary public. One collar brings full details. JoMar, P.O. Box 142, Baltimore 1, Maryland.

**CATHOLIC Religious articles** including large Catholic Bible. 50% discount. Start your own business. Catholic Guild, 11 Harding Ave., White Plains, N. Y. Samples and kit \$1.00.

**OPERATE Home mail-order business.** Vosacek Printing, 4444A Ute, San Diego 17, Calif.

**TWO Hundred dollars per week lifetime income.** Self-employment, security, independence, free guidance. Five dollars starts you. MacRay Chemicals, Littleton 1, New Hampshire.

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**LATE, Modern manufacturing formulas.** List free. Moon Chemical, Martville, New York.

**FORMULAS For latest money-making discoveries.** New! Good! Valuable literature free! Miller, Chemist, 1517-D, Tampa, Florida.

**FORMULAS;** All kinds, latest, best. Literature free. Kemixal, Park Ridge, Ill.

**OPPORTUNITIES, Unlimited!** Latest specialty formulas, analyses, development, consultation. Monthly report of newest products. Exciting details, free. Alpha-Midwest, LaPorte, Indiana.

**6 LOW-Cost, high profit formulas.** Proven money makers! Ford Chemical Co., Box 8665, University Station, Knoxville, Tennessee.

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**MAKE, Sell signs** (plastic letters). Dixie, Lakeland, Fla.

**LAMINATING Supplies.** Price list free. Solomonson, 46 Cornhill, Boston 8, Mass.

**NEW Liquid casting plastic, clear, colors.** Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. K-101, Woodstock, Illinois.

**SIMPLIFIED Plastic molding, repairing.** trial unit \$2.00. Hallmark Dental Co., Box 1924, Detroit 31, Mich.

**NEW Do-it-yourself casting and molding plastics!** No experience or machinery necessary. Send 25¢ for big 64-page catalog. Castacraft Corp., Dept. O-22, P.O. Box 555, Palo Alto, California.

**PLEXIGLAS.** Square foot cost, 1/16", \$1.20; 1/8", \$1.52; 3/16", \$1.86; 1/4", \$2.21; 3/8", \$3.23; 1/2", \$4.36. Colors add 10%. Send 15¢ for postage. Aristocrat Plastics, 23 Sussex Avenue, Newark, N.J.

**BOXES, Plastic.** Free list. Althor, 170 Bay 23 Street, Brooklyn, N.Y.

**LEARN Plastics fabrication** for spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 12, Oregon.

**NOW, Electric plastic laminating kit.** Profit. Pleasure. Burr, 330 East Center, Kalamazoo, Mich.

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**LABORATORY Chemicals and apparatus.** Catalog 50¢. Atlas Chemicals, Box 22, Rupert, Idaho.

**FREE Introductory offer.** Student chemicals, apparatus, biology supplies. Catalog 25¢. Bio Chemical Products, 30 Somerset St., Belmont 78, Massachusetts.

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**EXPERIMENTERS:** Terrific bargains galore, catalog 25¢. Hagenow Laboratories, Manitowoc, Wisconsin.

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**CATALOG, 3000 illustrations.** \$2.00. Laboratory Materials, 7315 Vincennes, Chicago, Illinois.

**ROCKET Chemicals, supplies for amateur research.** Catalog 25¢. Central Rocket Company, Box 890, Waupaca, Wis.

**CHEMICALS And apparatus for industrial, analytical, and private laboratories.** Catalog 25¢. Dept. M-50. Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

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**SENIOR Metallurgist** in the field of research in physical metallurgy dealing with studies of transient loads having high magnitude and short duration. A better understanding is being sought of shock wave transfer and fracture mechanics, particularly in the light metals. Permanently established research program. Located in town of 6000 pop. Excellent year-round climate with exceptional outdoor recreational facilities. Write Personnel Manager, New Mexico Institute of Mining and Technology, Campus Station, Socorro, New Mexico.

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**CUSTOMER—Making gift free!** Introduce thrilling, new Christmas card line by giving friends fine, imported gifts for only 39¢. Easily make \$50 to \$250 spare time. Experience unnecessary. 2 assortments on approval. Name-imprinted samples and gift free. Midwest, 1113 Washington, Dept. 443-L, St. Louis 1, Mo.

**NEW Car thief signal.** Lightning seller. Samples sent on trial. Northwest Electric, 225, Mitchell, S. Dak.

**EXCITING New jewelry item.** Tremendous profits. Complete details free. Blyt-mann Company, Box 2401-A, San Francisco 26, California.

**CHRISTMAS Cards** with customer's name imprinted. Broad-appeal personal designs and big-volume business designs all in one attractive presentation album that actually sells for you! These deluxe cards pay deluxe commissions. Earn \$300 to \$500, plus bonuses, easily between now and Christmas, even in spare time. Sales experience unnecessary. Old-established manufacturer. Free sales kit includes sample album and complete, easy-to-follow selling instructions. Send for kit now and pocket profits next week! Write Process Corp., Dept. 4B, 1954 S. Troy, Chicago 23, Ill.

**MEN! Make extra money** selling fast-selling line; reasonably priced toys, gift wraps, greeting cards, collector's items, household gadgets. Work your own hours. Extra income without changing jobs. Take orders from colorfully illustrated free catalog of 785 money-makers. No big investment. No experience needed. Samples on approval. Write: North Star, 9-734 Finch Bldg., St. Paul 1, Minnesota.

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**60% PROFIT** On cosmetics — Famous nationally advertised Hollywood cosmetics pay 60%. Make \$25 day up. Hire others. For free samples, details, write Studio Girl, Glendale, Calif. Dept. 1299G.

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**SELL Portraits** painted in oils. Write Portraits, 402-D Hazlett, Baltimore 29.

**150% PROFIT** Selling amazing Spark Booster: Pep up cars, trucks, tractors like new! Install in one minute. Instantly improves performance; mileage; prevents plug fouling! Guaranteed \$2.00 postpaid. Broehm Products, M-2569 North 12th Street, Milwaukee 6, Wisconsin.

**BIG Profits** selling unique dictionary. Write Harrigan, 97 Warren Street, New York 7, N. Y.

**MAKE Extra money fast**—Show friends, others big value \$1.00-\$1.25 Christmas, year round greeting card assortments, gift wrappings, exciting gifts, household items, costume jewelry, stationery, toys. Profits to 100%. Bonus to 7%. Write for newest assortments on approval, free album name imprinted Christmas cards, free gift offer, details. Hedenkamp, 361 Broadway, Dept. PM-60, New York.

**EARN To \$25,000** first year selling phonograph records. Our new plan shows how. Boone's, 6647 Michigan, Chicago 37.

A Blizzard of winter sales, sell greatest idea yet for winter driving. Amazing Ice-Trak-Shon stones give traction to spinning wheels on ice and snow. Every car owner a prospect, a natural for volume service-shop sales. Now is the time to get going. Introduce yourself to wide line of product opportunities with our organization. \$1 brings you eye-catching sales sample, complete facts. Write Chemical Institute America, 14 Longworth St., Newark 2, N. J.

**2 SALES Daily** make \$150 weekly! Automatic new bed warmer you sleep on; out-sells electric blankets 10 ways. 9 of 10 demonstrations sell on assured sales plan. Electro Warmth, Dept. PM-959, Danville, Ohio.

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**EARN \$12,000 Yearly**—only two sales daily. World's best seller. The Holy Bible. Illustrated, Protestant or Catholic. Margareta's, P.O. Box 92, Hazleton 7, Penna.

**DRESSES 18¢, Blouses 39¢, skirts 69¢ (used).** Free catalogue. Ace, 196-PM DeGraw, Brooklyn 31, New York.

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**QUICKEST Money** with new Christmas cards. Show free sample exclusive 21-card \$1.25 assortment; make 75¢ on each, \$45.00 on only 60. Over 400 assortments, gifts, \$1 up. Leading \$1 box on approval. Personal album free. Cardinal, 1400 State, Dept. 51-G, Cincinnati 14.

**RUN A Spare-time** greeting card and gift shop at home. Show friends samples of our new 1959 Christmas and all occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 151, Ferndale, Michigan.

**MEXICAN Art goods!** Free sample! Send 14¢ stamps mailing. Sylviak, Apartado 9036, Mexico City.

**LORD'S Prayer** sachets—Lord's Prayer beautifully printed on gilt-edged envelope containing finest oil-base sachet in assorted popular fragrances. A self-seller. Send \$1. for sample dozen, refundable on your first order. Make up to 300% profit, and more! Canham Sachets, 257 South State Street, Elgin, Illinois.

**BIG Profits.** Stamp social security plates, key protectors. Sample 50¢. Catalog free. General Products, 188-PM State, Albany 10, N. Y.

**EASY Handwork** makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

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**GOLD Or silver** letters, numbers. Windows, doors, trucks. 1" to 6". 500% profits. Free samples. Atlas-T, 544 West 79th, Chicago 20.

**AGENTS — 300% Profit** selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 1217-D West Newport, Chicago.

**YOUR Ad** in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A" right now. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

**YOUR Own business**—Used suits \$1.50, overcoats 65¢, mackinaws 35¢, shoes 12½¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8.

**SELL Champion, AC, Autolite** spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles. 100% profit. Free sample. Lee Plugs, 1608-E Roberts, Houston 3, Texas.

**TREMENDOUS Profits!** Every man, woman and child a customer. Used suits \$1.50, pants 35¢, dresses 20¢, shoes 20¢. Operate from store, home, car. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

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**BUY Wholesale:** 100,000 nationally advertised products. Appliances, cameras, sporting goods, housewares, watches, typewriters, tools, clothing, etc. Discounts to 60%. Buy-Rite, Box 258, Hawthorne 2, New Jersey.

**NEW Multicolor** wholesale catalog! Housewares, appliances, clothing, silverware, cookware, luggage, binoculars, shavers, radios, phonographs, cameras, projectors, recorders, typewriters, sewing machines, furniture, power tools, toys, sporting goods, watches, diamonds, jewelry, automobiles, etc. Name brands. Huge discounts. Postcard: Selbyco, Decatur 160, Illinois.

**FREE—500 Address** labels. Details, catalog 25¢ deposit. Pink-Paw Co., 1038 Hickory, Altus, Oklahoma.

**VIBRATING** Massage motor, 8 foot U.L. approved cord and switch complete, \$3.98 postpaid. Attach to chair, lounge, etc. Vimco, Inc., Box 498, Centralia, Ill.

**CHURCHES, Clubs, salesmen** discounts to 75%. Catalog \$2.00. Refundable on first order. The Dollar Stretcher, Box 1555, Indianapolis, Indiana.

**SALE.** Most items under wholesale. Catalog 25¢, refunded first order. Charles Carnus Co., Manistique, Mich.

**OREGON Chain** for all chain saws. 25% discount. Write: Barnett Equipment, So. Glens Falls 1, N. Y.

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**BOOTS.** Handsome western styles. Free catalog. Austin Boot Co., Box 5303J, El Paso, Tex.

**USED** And new watches \$2 up. Free list. Southern Watches, 5-PM So. Wabash, Chicago 3.

**LARGEST Wholesale** supply source in U.S.! Furniture, clothing, appliances, housewares, automobiles and accessories, tools, sporting goods, hobby supplies, farm equipment, imports, new products, bargain merchandise. Free details. Associated Wholesalers, Box 2068-DD, Sioux City 4, Iowa.

**HANDMADE** Wellington and cowboy boots. Free catalog. Ysleta Boots, Box 815, Ysleta, Texas.

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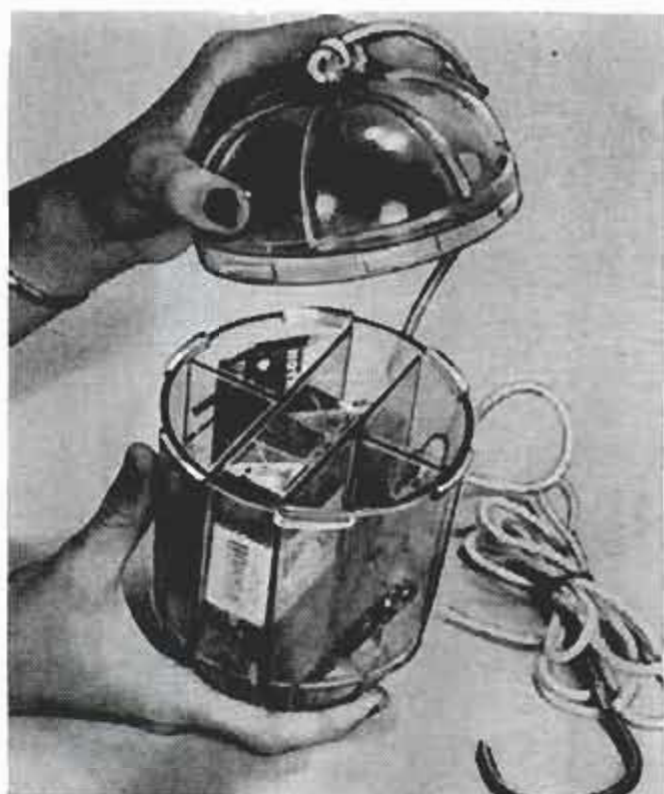
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Jack's former job was a hard, unrewarding one.



Jack greets his family after a day at the office.

# THE JACK EVANS STORY

Jack's home-study assignments proved to be the best preparation for future progress in his chosen field.

*B. Richard*



Jack Evans is a successful young man by anyone's standards—a beautiful wife, two fine children, an attractive home, a good job, an unlimited future. Jack Evans has everything an ambitious young man could want.

But it wasn't always this way with Jack. He wasn't "born with a silver spoon in his mouth." Everything he has today he worked for—and most of all he studied for it, building a background in his field that served as a base for his "future unlimited."

Jack graduated from Lincoln High School in Lincoln, Illinois in 1950. He had a steady job lined up and planned to marry his high school sweetheart just as soon as he saved some money. Just as it did with thousands of others, the Korean conflict interfered with Jack and his plans, and his marriage was postponed for several years while he was overseas.

When Jack left the service he thought he "had the world by the tail"—a good job waiting for him, newly-married to an attractive wife, and it didn't matter much that he and his wife lived with her par-



This attractive home is a direct result of the increased earning power education brought him

## ... **FUTURE UNLIMITED**

ents. It was inconvenient—sure, but Jack was ambitious. He was sure that in a short time he would be able to afford an apartment of his own or maybe even a small home.

But the coming of his first child upset Jack's dreams. It became more and more difficult to stretch his pay check out from one week to the next. These were tough times for both Jack and his wife. Chances for a home of their own seemed farther away than ever—his rosy future seemed to be fading more and more out of reach. Raises weren't forthcoming, and his job as an accounting clerk with a good-sized local manufacturer seemed to be leading him exactly nowhere.

Although Jack didn't know it at the time, he was approaching a decisive turning point in his career . . . a point at which he came to realize that all the hard work in the world would be of little help to him in his present job. He knew he'd stay right at the same desk for years to come without much increase in income.

Exactly how or when Jack arrived at his decision isn't important; the fact was, Jack came to realize that in order to achieve his

(Continued to page 260)

As Senior Accountant, Jack's earning power has increased greatly along with more responsibilities



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Coatings like *Weather-Foil* with their fade-proof colors stay new-looking for years. In fact, weathering actually intensifies the colors. One coat hides any roof surface—built-up composition, asphalt shingles, tar paper, slate—even well-

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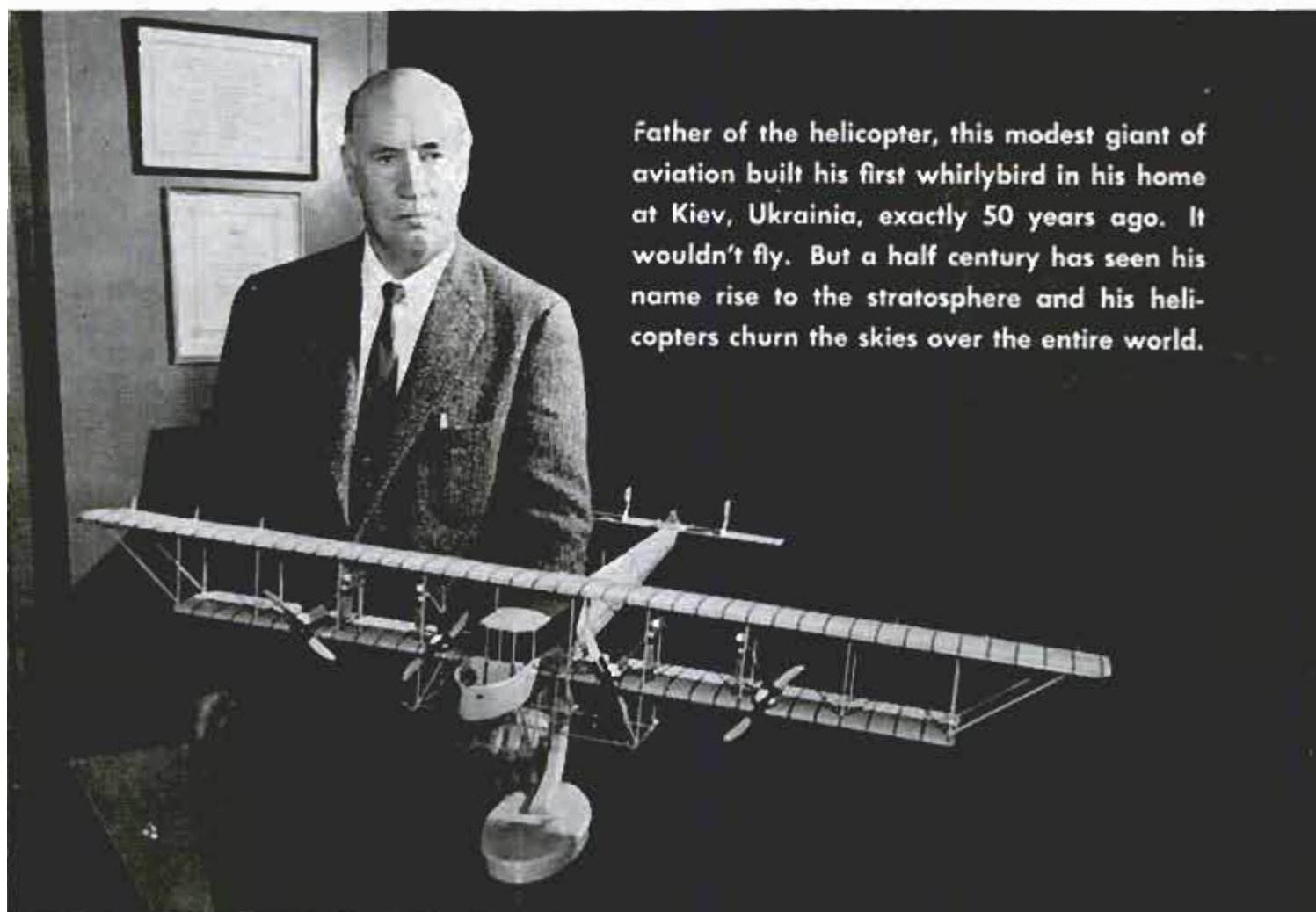
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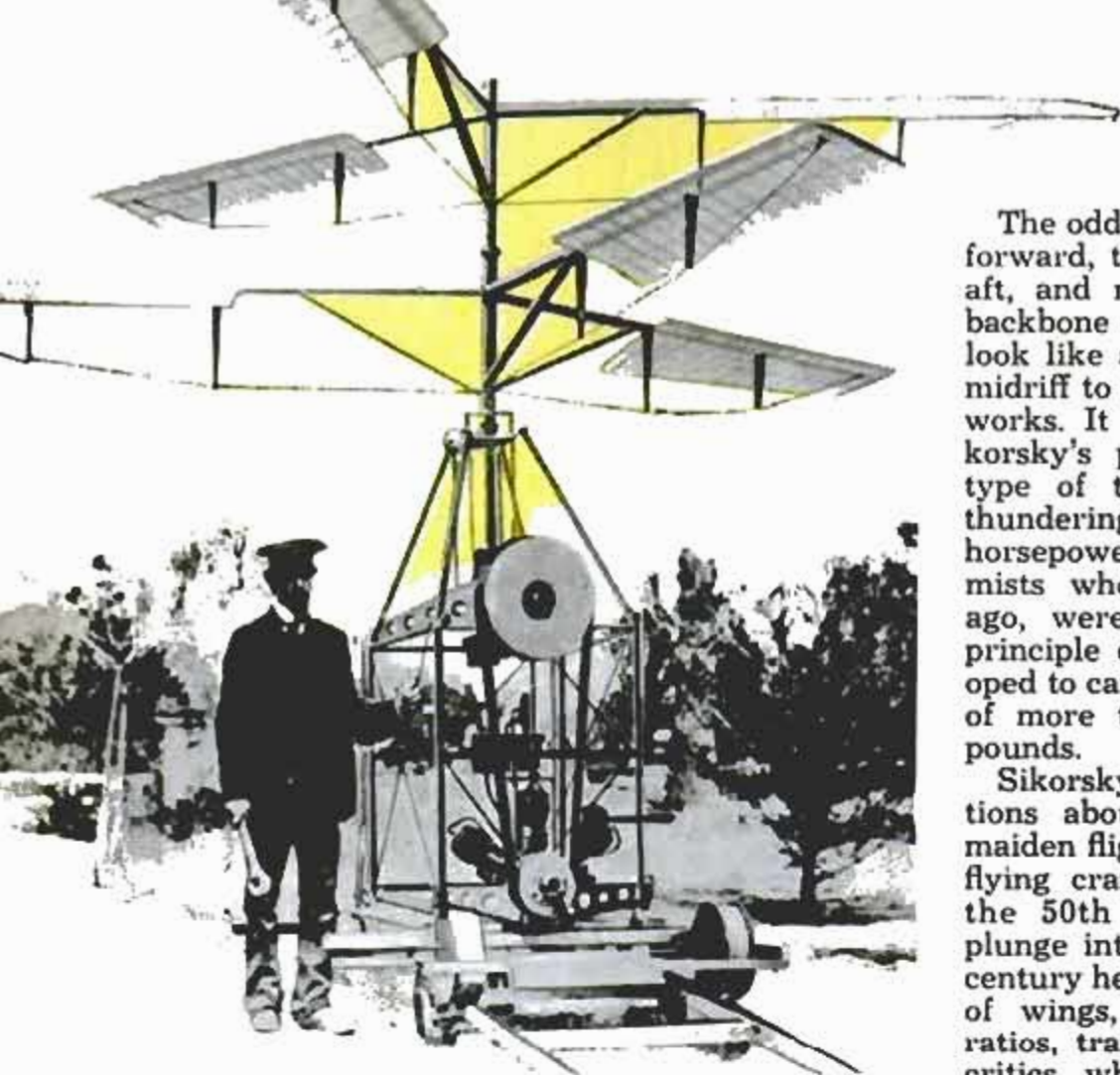
# PM Salutes Igor Sikorsky



Father of the helicopter, this modest giant of aviation built his first whirlybird in his home at Kiev, Ukrainia, exactly 50 years ago. It wouldn't fly. But a half century has seen his name rise to the stratosphere and his helicopters churn the skies over the entire world.

*By Richard F. Dempewolff*

**O**NE OF THE wildest-looking contraptions ever designed to defy gravity in a big way hoisted itself by its bootstraps straight up off the test aprons of United Aircraft's "Sikorsky Division" in Stratford, Connecticut, a few weeks ago. Like some dinosaur-size three-headed dragonfly, the 80-foot, 10-ton helicopter rose gently under the spinning umbrella of a five-bladed "fan" 72 feet in diameter. Skimming slowly a few feet above the ground, it paused and hovered above an eight-ton steel assembly to which several men hitched a steel cable dangling from the craft. As if toting a feather, the huge whirlybird lifted the mass of steel and made off with it.



This was the beginning. By 1909, at the age of 20, Sikorsky had built two helicopters. The first wouldn't fly. The second lifted its own weight, 400 pounds, but the pilot's weight was too much

The odd craft, with deep cabin forward, towering tail assembly aft, and nothing but a skinny backbone connecting them, may look like a big fish that lost its midriff to a passing shark, but it works. It is Igor Ivanovich Sikorsky's production-line prototype of the "flying crane"—a thundering, twin-engined, 3600-horsepower answer to the pessimists who, only a few years ago, were sure the helicopter principle could never be developed to carry a practical payload of more than a few thousand pounds.

Sikorsky is used to dire predictions about his ventures. The maiden flight of his "impossible" flying crane this spring marks the 50th anniversary of his plunge into aviation. For half a century he has wallowed in a sea of wings, struts, lift-to-weight ratios, transmission grease, and critics who said "it can't be done." He emerges today, at the age of 70, dripping with honors, fame and a string of successes that, one by one, have silenced the critics—well-meaning and otherwise. His eyes still light with an amused twinkle when he recalls that his first attempt, as a

Czar Nicholas of Russia is greeted by Sikorsky on observation deck of the world's first four-engine plane



19-year-old, to build a vertical-lift aircraft inspired a prominent aeronaut of the day to write an article on the subject, entitled: "The Wrong Way."

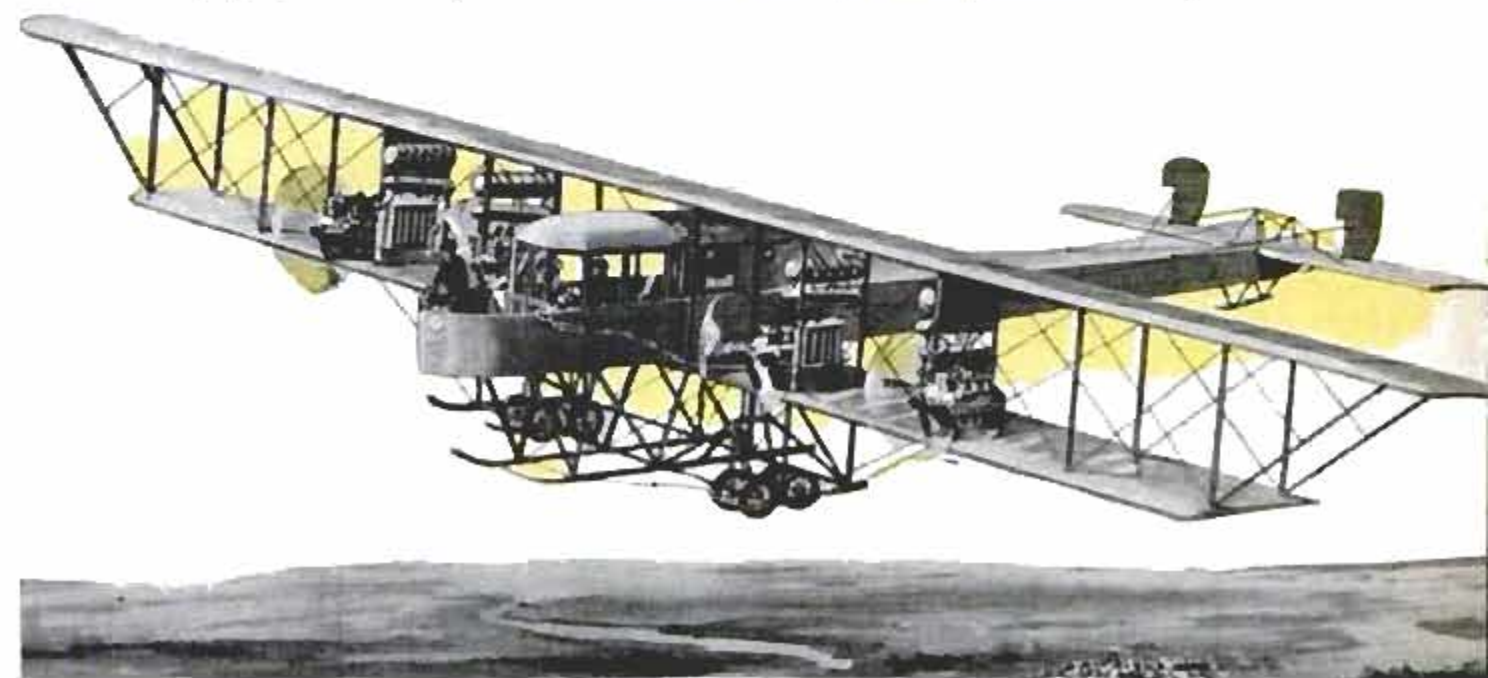
The first helicopter, built in a room of the Sikorsky family home in Kiev, Ukraine, where the inventor was born on May 25, 1889, was hardly recognizable as an aircraft. It had a wooden frame, like a big box. On one side was a 25-horsepower motor; on the other a seat. On two vertical tubular shafts, one inside the other, were mounted a pair of counter-rotating two-bladed rotors supported by piano wires, by means of which the young inventor could adjust the pitch of the blades. A belt drive on wooden pulleys turned the 15-foot fans. "It's true that it did not fly," he admits, with a faint note of sympathy for the little machine, "but it tried to."

Actually, the roaring, shuddering rig developed 357 pounds of lift—just 100 pounds shy of its own weight. A second copter, one year later, was able to lift its own 400 pounds but couldn't manage with the pilot aboard. With more power, and better rotors, Sikorsky thought he might do it. But reliable power in those days was a myth, and intuition told him the time was not

right for real success with the helicopter. Sikorsky's intuition is something he respects with a feeling akin to reverence. So helicoptering was shelved temporarily. He turned to the more popular wings and propellers that seemed likely to carry men aloft sooner.

When young Sikorsky entered the field in 1908, real flying was just a furrow on the brows of competent engineers, and a gleam in the eyes of many dreamers. The Wright brothers, Bleriot and a handful of others

This was really flying. The four-engine Grand of 1913 had an open balcony in front of its glassed-in cabin



1959: Sikorsky's S-60 "sky-hook," revolutionary flying crane without a cargo cabin. It can carry a six-ton load



1914: the Ilya-Mourometz-B, used for observation and patrol in World War I, lands with men atop fuselage

had constructed aeroplanes that managed to sputter and wobble through the air for a matter of minutes instead of seconds. But most of the motorcycle racing drivers and mechanics who turned to "flying" for added thrills and chills in and around Paris—hub of the budding aviation business—were content to "rouler" their quivering contraptions. This consisted of flapping along a pasture runway and hopping precariously five feet off the ground occasionally. The "planes" were wood with sized-fabric coverings, Sikorsky recalls, and the experienced pilot was one who had "broken plenty of wood in the field."

Engines were complex, temperamental collections of moving parts that coughed, spluttered and stalled out, or refused to start at all. While scouting a suitable motor for his first helicopter, Sikorsky asked one Paris "expert" (an impressive wood-breaker) which engine was best. "None is best, they're all bad," he was told. "Then which is least bad?" the inventor persisted. "The one with the least parts," was the prompt answer. This advice led Sikorsky to the Anzani, a simple, three-cylinder development of a motorcycle engine, which not only powered most of his first aircraft, but also carried Louis Bleriot safely across the English Channel on his famous flight.

For two years, working day and night with the help of volunteer schoolmates from the Kiev Polytechnic Institute, young Igor set out to master the problem of flight. A generous Sikorsky family backed its respect for his ideas by financing him with hard-earned savings, and finally mortgaged the house to keep him going.

First try was the S-1, a fragile-looking pusher-type biplane with bicycle-wheel landing gear. It would taxi erratically across the meadow, but stolidly refused to fly. "The aerodynamics were pure guesswork, and we needed more power," Sikorsky shrugs. Undaunted, the little band of students and craftsmen went back to the drawing board.

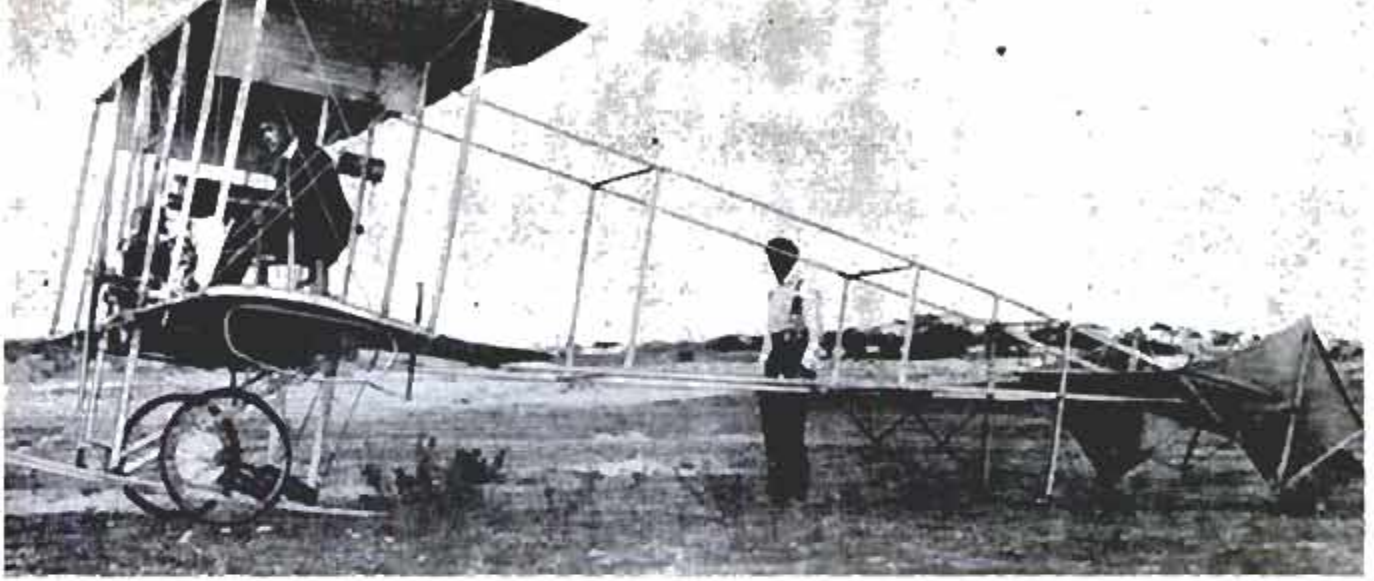
Using S-1's wings and a bigger Anzani power plant up forward, a new S-2 took shape. Sikorsky put in days of ground maneuvering to "feel out" the controls. Then, one morning he gave it full throttle, found himself in the air—and in an odd predicament: "Never having been in the air," he explains, in a masterpiece of understatement, "it became necessary to learn quite quickly how to fly." He did.

But after half a dozen short hops totaling eight minutes of flight in as many days, S-2 finally soared 80 feet in the air, stalled out and splattered itself in a thousand splinters across a ravine. Sikorsky, unhurt, crawled from the debris and went back to sketching new plans.

One by one, "S" planes were built and improved. S-5, a big 50-horsepower biplane built of homemade parts, plumbing hardware, motorcycle wheels, kitchen-door springs (for shock absorbers) and more family loans, really flew. In it, Sikorsky won his first pilot license.

A year later, at the age of 22, he broke the world's flying record for speed (70 miles per hour) in his S-6-A, and swept the field at the Moscow Aircraft Exhibition. As a result, the Russian Baltic Railroad Car Factory signed him up as designer and





Sikorsky is at the controls of his first successful airplane. It flew for eight minutes in eight tries, then crashed from 80 feet. Its bicycle-wheel undercarriage had shock absorbers adapted from kitchen-door springs



First Sikorsky plane built in America was the S-29, its frame of angle iron and pipe salvaged from junk yards. It crashed on its maiden flight due to overload of passengers he hadn't the heart to refuse a ride

The S-29 was salvaged and sold in 1923 and newer versions began to make money for the inventor's small aircraft company. The S-38, below, a sturdy twin-engine seaplane, became highly popular in the late 1920s





chief engineer of aircraft—with orders to produce at least one new plane design each year.

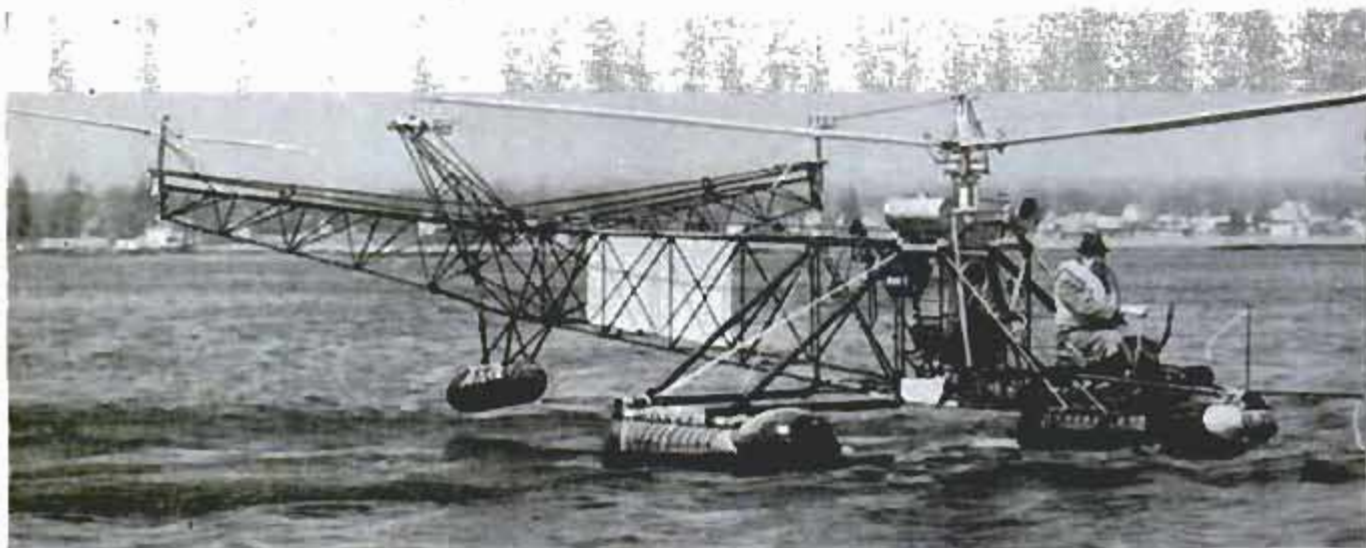
Young Igor was in his element. His first design, he calmly announced, was to be the biggest, most thundering airplane ever created. It would have not one, but *four* engines. A closed cabin—unheard of then—would envelop pilot and passengers in luxuriously paneled, windproof comfort. There would be outside observation decks.

Before *The Grand* was even on paper, headshakers and wags predicted its doom: "It will never fly. Four engines are totally unmanageable. The wings are completely wrong. Even Nature has set a limit on the weight of flying creatures, or the ostrich would fly. No airplane can ever lift so much weight."

Sikorsky's thin, drooping moustache, gentle eyes and his famous fedora hat with brim turned up fore and aft, give him more the look of a pensive professor than a canny

Sikorsky uses a telephone to coach the pilot flying his first military helicopter at Bridgeport, Conn.

Three tail rotors provided stability and control for early version of the VS-300, one of Sikorsky's first





First serious bid for vertical flight was the VS-300, shown above still anchored to the ground for safety

genius with a genuine love of people, who probably has more practical aeronautical engineering tucked away than any man alive. Fellow workers, however, are well aware of the stubborn tenacity and lion-hearted courage with which he can tackle an idea he feels is right. Critics of *The Grand* were quietly ignored unless they had constructive offerings. "Most were guessing," he says. "They did not know. I did not know, either, but my intuition told me it would fly—why not?"

Igor Sikorsky believes that "intuition" includes the practical ability to visualize a finished structure and its capabilities before it is born—plus the rare insight to fit the "vision" into its proper place in time. While *The Grand* was a-building, he prowled the factory after hours, meditating over the parts of the big plane as they took shape. "In those days," he explains,

"it was believed that to lift more pounds you simply increased wing area regardless of shape. So, a short, broad wing then should lift as much as a long thin wing of the same area. One night when everyone had gone home, I looked at the broad, short wings for *The Grand*. I did not like the 'feel' of them, and so we changed them to long and narrow. This horrified many people. Today we know that 'lift' comes from the vacuum formed by air rushing over the top of the wing—and the more leading edge, the greater the lifting surface. Then, we knew no such aerodynamics, but my intuition said those stubby wings would not work, and it was right."

Needless to say, *The Grand*, first four-engined plane in history, flew. In it, Sikorsky made some of aviation's first real cross-country flights, tried blind flying (without instruments), and stood on the

Fame came with the 40-passenger flying boat used by Pan-American Airways on its pioneer overseas routes





Full-size model shows what 1960 travelers can expect. The S-61 gas-turbine craft will carry 25 passengers

outside observation decks to marvel at the cloud forms sailing past. More four-engined "Ilia Mourometz" planes followed *The Grand*, and made a historic record in Russian sorties over Germany during World War I.

In 1919, after the Red Revolution, Sikorsky, bereft of all possessions, left his country for France. A year later he migrated to the United States to endure a stretch of "starvation days" for several years.

By 1923, with a handful of Russian refugee friends who pooled their meager assets, he was building another plane. The

S-29, a sturdy twin-engine craft, was born in an abandoned barn near Roosevelt Field on Long Island—and slowly grew from an assortment of bits salvaged from junk yards. Because of too many over-used parts, plus the fact that Sikorsky hadn't the heart to put off the hoard of "volunteer" passengers (most of whom helped build the ship) for the maiden hop, S-29 labored into the air and promptly crashed.

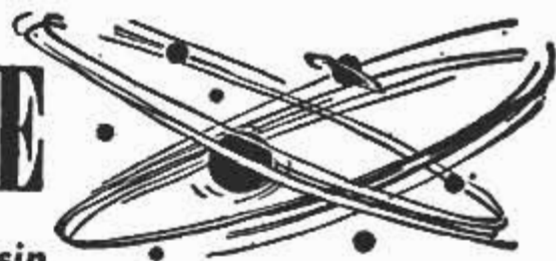
But no crash ever did more than delay Sikorsky. Within months, more subscriptions and hard work had put the battered plane back in the air. Captain Roscoe

(Continued to page 224)

The hull of this turbine-driven amphibious whirlybird, unveiled this year, weighs less than the land type



# AN EYE ON SPACE



By Dr. Dan Q. Posin

PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY  
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM

ONCE UPON A TIME some Earthlings invented the idea of an "atom."

"The atom is an tiny particle in a great emptiness," said the Greek thinkers. "Here is an atom, there is another. They are in nothing—in an emptiness, in a void. Sometimes they get together and make big things, like cats and trees. But in general there is only the atom in a void." Clearly, as far as the atom is concerned, the Greeks had a void for it.

Later, other scientists said, "The atom doesn't really exist, but the idea is useful. It helps us understand nature."

Then one day a scientist announced, "Remember those 'imaginary' atoms? Well, I just broke one."

So Earthlings now were confronted with real atoms in a void. But of course the void still remained, as empty as ever. "The vacuum," said Earthlings only a few years ago, "is a pure nothing. You pump out the air and then you have it—you have nothing. You have emptiness."

But is the void a void? Recently scientists have been learning some facts about the void that are just as startling as those they learned about the atom, facts that may be of untold significance as Earthlings start their exploration of space.

It turns out, for example, that the void has magnetism in it. Some of the magnetism is unchanging, like that of a bar magnet; some of it varies like the magnetism produced when a current varies. In addition to magnetism, the void is also filled with electrical fields, some unchanging, some varying. Electrical and magnetic fields travel through space together, each giving rise to the other in an unending cycle of death and regeneration.

Where do the electromagnetic fields come from? They come from the stars, from lightning on the planets Earth and Jupiter, and from the great turmoil of galaxies in collision. We know, for example, that the electromagnetic energy emitted in *one second* from a pair of galaxies in collision could supply all the energy needs of the planet Earth for *one trillion years*—if all this energy could be captured.

The vast void—the vacuum—also is filled with X rays from the sun and from other stars, sunlight, starlight and cosmic rays, which are tiny electrical particles and bursts of energy or gamma rays.

Einstein, moreover, showed that *matter itself* can be converted into energy, into waves of electricity, magnetism, light, X rays and gamma rays. Thus matter may be converted into waves, travel through the vacuum, and be plucked out of it for use as matter elsewhere!

Though an Earthling may pump the gross matter out of a confined space (a laboratory instrument, for example), that space still has matter in it, matter in its wave form. This matter is impalpable to the touch and is unaffected by the instrument's pump, but it is there, *and is extractable*.

So Earthlings are beginning to understand that the "empty" space is alive and hopping with energy. Soon they may learn how to extract great quantities of energy for extended space flights, learn to pick up energy from the "nothing" along the route. And they may learn, too, how to send vast energies through the emptiness to manmade devices soaring through the heavens.

"Matter" now is understood to be concentrated or "frozen" energy. Man may transform the matter of rocks, gases, liquids, portions of the moon, an asteroid or a planet, into wave energy through the processes of fusion or fission, or by the total annihilation of substance.

# Where Should A Small Car's Engine Be?



## IN FRONT?

**T**HE BATTLE RAGES. Detroit is watching the most vicious infighting in years. Not in a generation have companies taken such potshots at each other.

**At issue: Front versus rear engines.**

The battle is to prove one right, the other wrong; one stable, the other unstable. Nobody seems willing to admit that both may be right, that there's room for both.

So rough and tumble has it become, so rabbit-punchy are the blows, that even anonymous mailings are being used. Unsigned material arguing against the rear engine has been mailed to auto writers in plain envelopes with no clue as to the sender.

**The knifing started a few months ago when Ford used TV commercials to prove that arrows go straighter when the heavy end is in front rather than in the rear.**

Chrysler, ostensibly to sell Simcas, distributed pamphlets entitled, "The Advantages of Front-Engine Cars."

Presidents of both Chrysler and American Motors issued statements that their cars have and will continue to have engines in front "where they belong."

Chevrolet, its future wedded to the rear-engine Corvair, saw the climate growing inhospitable. There was too much at stake here to remain silent, so Chevrolet presented its case. After all, neither Ford nor Chrysler had even seen the Corvair much less driven one. Declaring a design unstable simply from rumor is far from scientific, Chevrolet felt.

**Speaking for Chevrolet was Maurice Olley, former director of research and development and now an independent consultant, recognized as an authority on suspension systems.**

Olley's main point is that a light, economical car should be designed from scratch to provide the same ride, the same handling, the same braking when loaded as when the driver is alone in the car. It should not be simply a big car scaled down because of the difference in the weight-to-load ratio.

In the big domestic car with 4000 pounds total weight, adding either 150 pounds (driver alone) or 800 pounds (four riders and luggage) makes comparatively little difference, the total package being so heavy. But in a small 2400-pound car, those 800 pounds amount to 33 percent, a more serious problem. Anybody who has ridden in an imported light car is aware of the ride differences when unloaded and when heavily loaded.

As for weight distribution, here, too, things are different in small cars. A conventional front-engine light car with 55 percent of its empty weight on the front wheels may have as much as 55 percent of its weight on the rear wheels when fully loaded. This is because most of the payload rests on the rear axle.

**For this reason, Olley explains, Chevrolet decided to give the new car the same weight distribution empty as loaded. It was designed with a 40-percent-front, 60-percent-rear distribution when empty since passengers and luggage add weight to a car in about that proportion. The Corvair has a 40-60 distribution whether empty, partially loaded or full. Handling and ride are the same at all times.**

Can a car with a heavy rear end be stable on the highway?

Ford says it cannot and uses a tail-heavy arrow wobbling in flight to prove it. In a car that has more weight in back, side forces from cornering and from cross winds generate a centrifugal force that may make a car hard to control. The car tends to "steer" itself deeper into the corner, making it necessary for the driver to turn the wheels in an opposite direction to correct this "oversteer." This is the classic argument against rear-engine cars.

In addition, some argue that the absence of a heavy, solid engine in front of the driver makes the car less safe, that rugged engine mounts absorb collision energy and prevent injuries. One Chevrolet competitor explains it by saying that "the sheet steel of the body can absorb relatively little energy and collapses like an accor-



## IN REAR?

dion. When this occurs, the impact is carried directly to the passenger compartment."

Olley makes no claim at being a safety expert, but he does say that some experts believe crumpling sheet metal will prevent, not cause, personal injuries by absorbing much of the force that now throws the passengers through the windshield.

As for the rear-heavy car being stable on the highway, Olley says the wobbling arrow proves nothing. Cars don't operate in free air. A car must run on wheels, must turn corners, stop safely and go up hills on ice. An arrow needs none of these attributes.

You make a rear-heavy car stable, Olley says, by following two rules: Don't overload the rear tires (if you do, the car has no firm fulcrum to turn on and it wanders); the other is that the front end must have slightly less cornering power than the rear end. Both of these requirements are satisfied by new tire engineering. Low-profile, long-cord tires, mounted on wide rims, have cornering power more nearly proportional to load than was possible three years ago. The lightly loaded front wheels have less cornering power than the heavily loaded rear wheels; therefore they have a slightly bigger slip angle in front than in the rear, giving the car a desirable sense of direction and providing the important margin of "understeer." There is no "oversteer" in the Corvair, Olley says.

The problem of not overloading the rear tires is solved by giving them about 10 pounds more air pressure than the front tires (16 pounds in front, 26 pounds in rear). Wheels, incidentally, are 13-inches (on the Falcon and Valiant also).

How can engineers argue that rear-heavy cars are unstable, says Olley, when almost all the station wagons with more than two persons in them are rear-end heavy? What about a Greyhound Scenicruiser which carries 72 percent of its weight on the rear and is as stable as a battleship?



## DETROIT LISTENING POST

By Art Railton

Ford's reply is that back in 1953 this same Maurice Olley (then a Chevrolet executive) delivered an SAE paper in which he stated that rear-engine cars "are a poor bargain, at least in the form in which they are at present built . . . it appears impossible to make a car with heavily loaded rear tires handle safely in a wind even at moderate speeds."

Olley admits to have held this opinion in 1953, but says tires are different today. Anyhow, he adds, everybody should learn something in six years if he intends to stay up-to-date.

In stating the advantages of the rear engine, Olley released many details about the Corvair (although Chevrolet claimed he was discussing a "hypothetical" car).

It has a flat six-cylinder aluminum engine that weighs about half as much as a standard cast-iron V8. Its flat design makes it wide and low, so wide that it won't fit in the narrow canyon between the front pivoting wheels, but does fit neatly between nonsteering rear wheels.

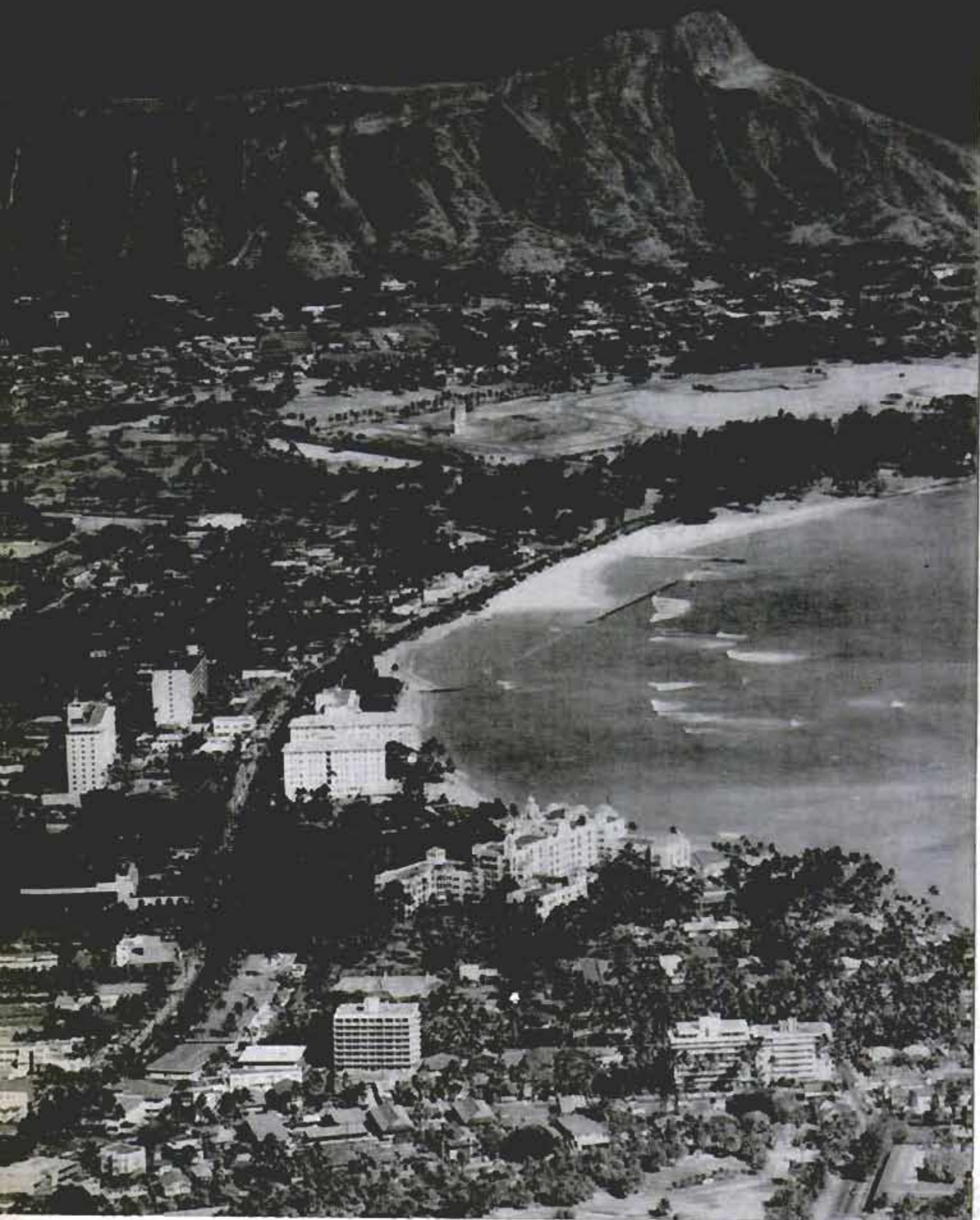
Cooling is by fan only (the fan is laid horizontally atop the engine to reduce height and permit a low rear deck). The engine gets the same amount of cooling whether the car is moving or stopped. No power is lost pushing air through a radiator and under the hood. Olley says it takes 25 horsepower at 75 miles per hour to push air through what he calls "the cave of winds" under the hood of a front-mounted water-cooled engine. There's none of this waste in the Corvair.

Being air-cooled, it requires no radiator, no hoses, no water pump, and in winter no antifreeze. He did not mention that it does have an oil radiator and that a tiny portion of the cooling, therefore, is by liquid, in this case, engine oil.

With the engine-transmission package at the rear, the floor hump is eliminated. Good seat height and legroom are available across the full seat width. The car can be made lower without sacrificing headroom. Springing is by coils on all

(Continued to page 256)

# *The Other Side of*





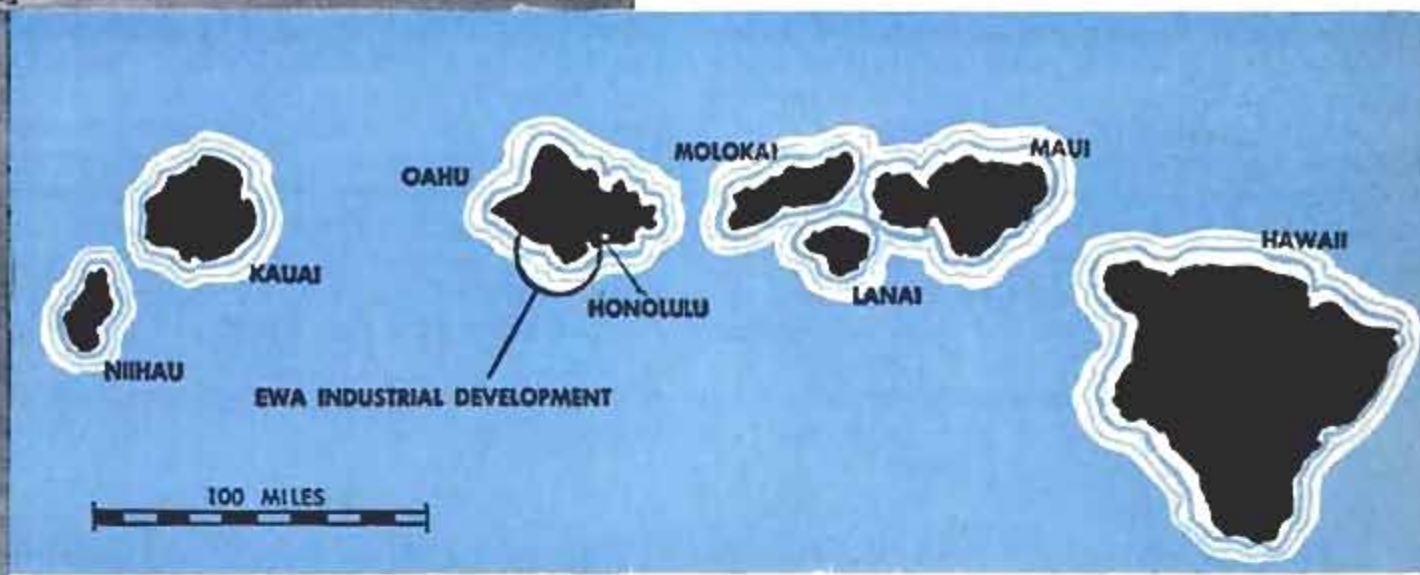
# Paradise

**There is more to our 50th state than the hula, the beach at Waikiki, palms, volcanoes and tourist dreams. There is industry and agriculture, too**

**By Richard M. Botts**

**T**AKE A CHUNK of lava and coral about the size of Connecticut, put it in the middle of the Pacific Ocean, add some year-round balmy weather, season it with a good crop of tourists, toss in some Federal spending and top it off with an industrious and highly mechanized agricultural and industrial economy and you have Hawaii—our newest, boomiest, 50th state.

Actually, when we say Hawaii, we really mean a series of five big islands and a lesser number of smaller ones that lie in a close-knit nest some 2300 miles off the California Coast. The heaviest population concentration is on the Island of Oahu, where Honolulu and Waikiki Beach are



located; to the northwest is the island of Kauai, to the southeast are Molokai, Maui and the volcanic island of Hawaii.

However, the newcomer who arrives in Hawaii and expects to find grass shacks and natives sleeping under coconut trees is in for a rude awakening. Instead of grass shacks, the visitor finds modern buildings, up-to-date roads and a jam of new cars. Instead of sleepy natives, the visitor is greeted by aggressive, modern, wide-awake businessmen. Push aside the curtains a bit more and you'll find that Hawaii's booming economy is mainly built on sugar, pineapples, Federal spending and a seven-month-long tourist season. Its drive is sustained by a growing population that includes native Hawaiians; ex-Yankee



whalers who dug in their roots over 100 years ago; Chinese, Japanese and Koreans who emigrated from the Far East; and a host of other nationalities. Such a melting-pot population seems to bring out the best in each group and the result is a colorful and dynamic economy. Today's Hawaii has one of the highest standards of living in the world—its agricultural workers are the highest paid in the world, and the natives claim that as the 50th state it will have the largest area of any state in the Union, although they admit there is an awful lot of it under the Pacific Ocean.

Strangely enough, it is the weather that makes two of Hawaii's most important industries—agriculture and tourism—possi-

ble. The Hawaiian Islands lie in an area of the tropics that is quite similar to Cuba or Acapulco, Mexico, but the heat and humidity of similar tropical areas are not Hawaii's problem because of two things—first, the waters from the Bering Sea to the north lower the temperature of the ocean area of Hawaii some 10 degrees below that of other regions of similar latitude and, second, the persistent trade winds “air condition” the islands to an average 78 degrees in summer and 72 in winter. Thus Hawaii's crops grow 12 months a year and the sugar and pineapple industry can work on a year-round basis; and tourism booms with a “two season” year—a haven for those escaping the winter cold, and an





Arrive in Hawaii expecting to see grass shacks and sleepy natives, and you'll be surprised by scenes like these: Efficient mechanized equipment helping raise pineapples (above left), sugar cane (below left), and papayas (below); the ancient hulas being performed for modern TV cameras (below right); bustling modern shops along Waikiki Beach (right); a modern factory producing textiles in native motifs (above right); even the traditional catamarans (above) have gone modern with moonlight sails and all the dinner-aboard frills of the large ocean-going cruise ships





Henry Kaiser's new Hawaiian Village Hotel stands on a section of Waikiki that was a swamp in 1954

attraction for visitors who want to get away from the mainland's summer heat!

Agriculturally, you will find a hustle and bustle and a mechanical efficiency that doesn't quite fit into the picture of Polynesian tranquillity. The two main sources of agricultural income in Hawaii are sugar and pineapples, and these bring in more than \$260,000,000 a year. Lesser sources such as coffee, and newer industries such as macadamia nuts, papayas for export, flowers, passion fruit and guava products make up an additional \$50,000,000 a year.

These industries are still in the "infant" stage of growth, but have considerable promise of expanding over the years ahead. The sugar plantations in Hawaii are all very efficiently operated. Because of a remarkably high degree of mechanization and fertilization, plus top management and constant research for better cane varieties and agricultural practices, Hawaiians are able to produce an astonishing 10 tons of sugar per acre.

In the cane fields, huge cranes with specially equipped "grabs" pick up chunks of

A third of the newest state's population lives in Honolulu, where the Aloha Tower (at left, below) stands on the waterfront to greet visitors

Industrialist Kaiser came to visit but stayed to develop





**Rugged Koolau Range separates Oahu's windward and leeward sides, but is being pierced by highway tunnels**

newly harvested cane and toss them into tremendous trucks which road off down the highway to the mill. The mills are modern and up-to-date, some even employing a complete hydro-separator system so that the cane wash water can be used again and again while the remaining soil-laden water is pumped onto rocky areas to produce new soil and agricultural land.

Sugar is not alone in its progress toward mechanization. Out on the pineapple fields, huge loaders move through the fields picking up the ripe pineapples on long con-

veyor belts and transporting them swiftly up a chute onto waiting trucks which whisk them to the canneries. Speed in this industry is a "must," as the ripe fruit must be packed within 48 hours after picking or it will spoil. One of the biggest unsolved headaches—how to plant the pineapple slip mechanically rather than by stoop labor—is expected to be solved soon.

### **Industry in Paradise**

On the industrial side of the picture, Hawaii's construction work will rise from

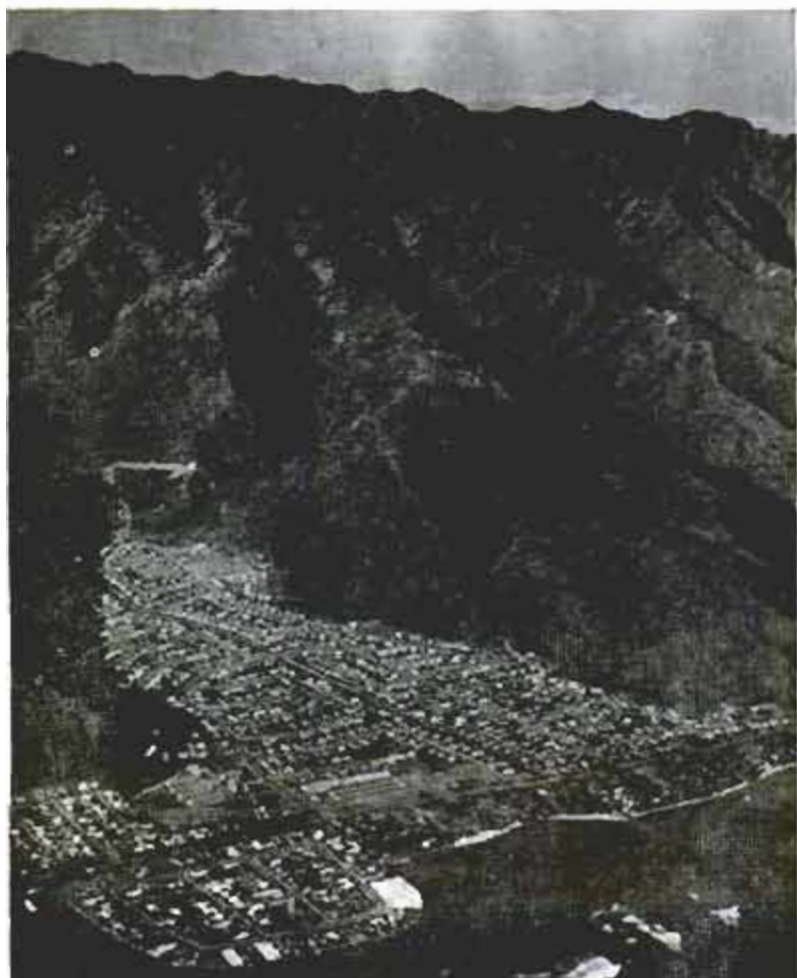
**Construction is booming all over Hawaii, and particularly around Honolulu and Waikiki. The \$16,000,000 Ala Moana Shopping Center, shown below, will be one of the world's largest; it's almost a self-contained city**





Honolulu is only nine airline hours from the West Coast; four-hour jet service will start late this year

Hawaii's standard of living is among the world's highest—the booming economy and growing population have meant many vast new housing developments like this one near Honolulu



the \$94,000,000 scored in 1955 to about \$200,000,000 in 1959. Most of the construction boom however has been on the island of Oahu, with very little spilling over to the neighbor isles. Take the Waikiki area, for instance, where construction is going on at a rapid pace. Prior to World War II it took five to seven days to reach Hawaii by ship from the West Coast; after the war the airplane gradually reduced this distance to the present nine hours. Now the dawning jet age will put Hawaii only four hours away from the West Coast and eight to nine hours from New York! The tourist industry which has been building up at a 25 percent-a-year rate is expected to take a big jump, and Waikikians are expanding in every direction to take care of this expected surge of tourists.

One who visualized the coming tourist rush was Henry J. Kaiser. Coming to Hawaii in 1954, he fell in love with Hawaii and decided not to miss the coming boom. Taking a small undesirable and half-submerged area of Waikiki, he put men and bulldozers to work

(Continued to page 248) 253



### Step-up Trampoline Serves as Diving Board

You can enjoy springboard diving, even from a float or raft, with this portable diving trampoline with a built-in ladder and diving platform. It's made of tubular steel with a double nylon bounce pad.



### "Sixth Finger" on Glove Serves as Trap for Ball

Fielders are now hauling in baseballs with a six-fingered glove. The "sixth finger," interlaced to the thumb and index finger, is actually a web that moves with the thumb and traps the ball.

### Portable Power Winch Handles Many Jobs

You can now move dirt loads or launch your boat in hard-to-reach fishing spots with a power winch that can be taken anywhere you go. The winch, equipped with a 1.75-horsepower gas engine, weighs 75 pounds. In use, it is fastened to any convenient tree or post, or anchored to a steel pin that is available. A hook on the end of the steel cable fastens onto posts, logs, rocks or cars that are stuck.



### Computer May Cut Air Accidents

Mid-air collisions may be prevented by a new traffic-control computer developed for the Air Force. The computer can check a pilot's flight plan to see if it conflicts with other flights, track the flight itself by periodic position reports from the pilot and automatically warn the pilot of any deviation from his course.

□ World production of food grains is increasing, but the increase is not enough to keep up with population growth.





## Right-Hand Drive Car Used to Check Meters

Police in Los Gatos, Calif., are checking parking meters with a small car equipped with right-hand drive and removable right front door. Eye-pins replace hinge-pins, making it convenient to attach or detach the door. Battery and radio parts ride in the car trunk.

## Fluorescent-Tube Research Produces New Designs and Single Socket



Fluorescent tubes that can be connected to a single socket like an ordinary incandescent bulb have been developed by Westinghouse engineers. The new design has a base at one end only and requires no wiring or socket at the other end. Another new design in fluorescent lamps is a U-shaped tube that has some of the advantages of a single base, since all wiring is confined to one end of the fixture. Neither design is on the market yet.

## Tiny TV Camera Can Be Swallowed

Medical patients may soon be asked to swallow a tiny television camera. The camera, which weighs only a quarter of an ounce, flashes clear pictures of internal organs on a screen. Expected to aid the fight against cancer, the camera was developed by members of the University of Melbourne (Australia).

## Italian Auto-Top Tent Fits Any Car, Makes "Canvas Bedroom" for Two

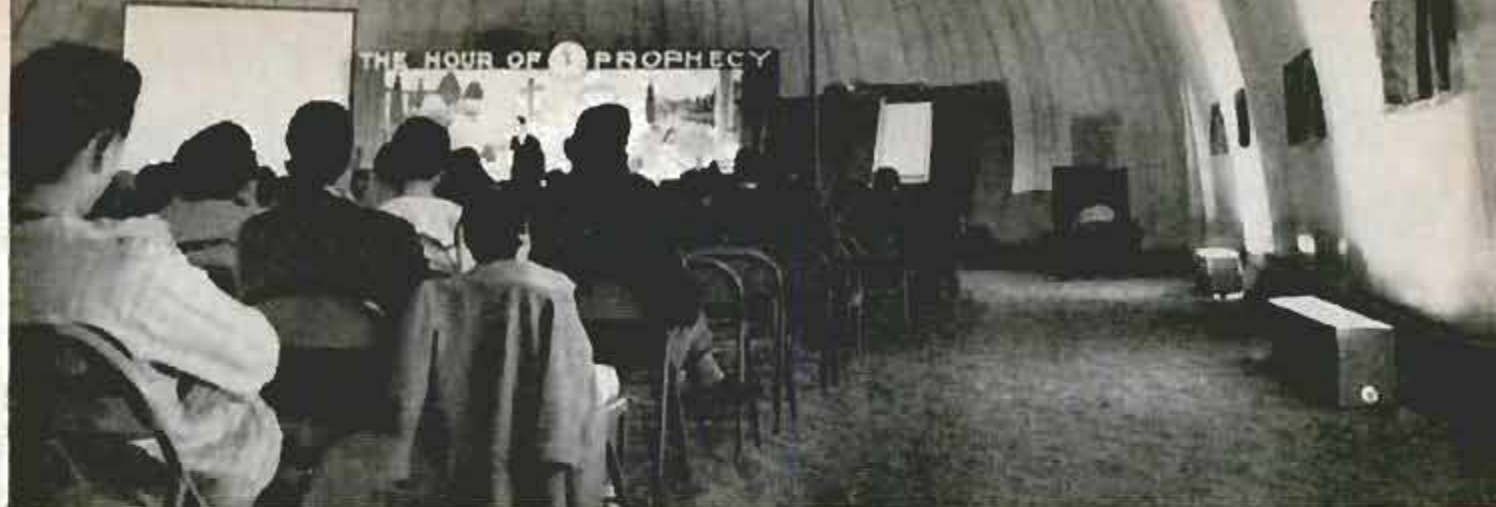


Demonstrated at the Rome (Italy) Fair, compact sleeping tent mounts on any car top like a conventional luggage carrier, but opens up and out to make a two-man tent.

## Germ Killer

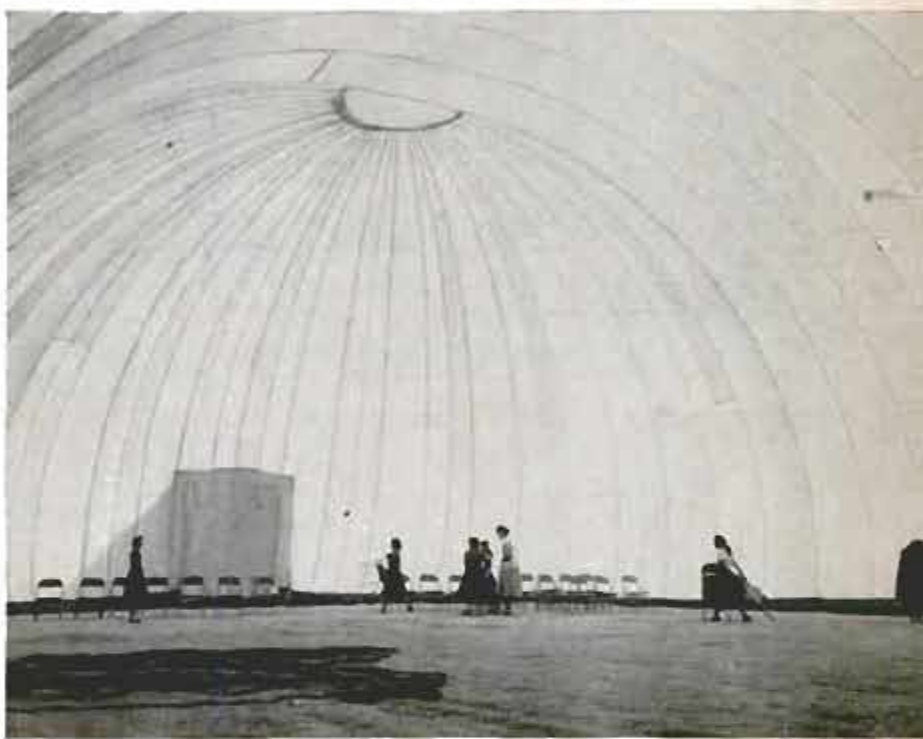
Fabrics can be permanently germ-proofed by dipping in a chemical solution soon to be marketed. The compound, an improved colloidal silver nitrate, can also be used for washing floors, walls and equipment, for sterilizing fruits and vegetables, and for killing moss and algae.





## Nylon Church

RELIGIOUS revivals are being held in a nylon structure supported by air coming from two blowers. The church can be inflated in 17 minutes and can house more than 1000 persons. Covered inside and out with a thin coating of vinyl, the structure is 125 feet long, 65 feet wide and 30 feet high when expanded. Sand is placed in a canvas trough around the edge of the nylon, and the trough is laced up. This weight keeps the edges down snugly in winds up to 70 miles per hour. Packed up, the church makes a bundle small enough to fit on the back of a truck.



POWER WAS SUPPLIED BY THE LEGS OF ONE MAN

HAESSLI-VILLINGER WHICH MADE SEVERAL SHORT FLIGHTS



DESIGN FOR A MAN-POWERED AIRCRAFT BY SHENSTONE. SPAN 60 FEET. GROSS WEIGHT WITH TWO MEN: 485 POUNDS



ALTERNATE POSITION OF PROPELLER

PILOT USES LEGS FOR PROPULSION AND ARMS FOR CONTROL

CREWMAN USING ARMS AND LEGS FOR PROPULSION

PROPELLER DRIVING RING

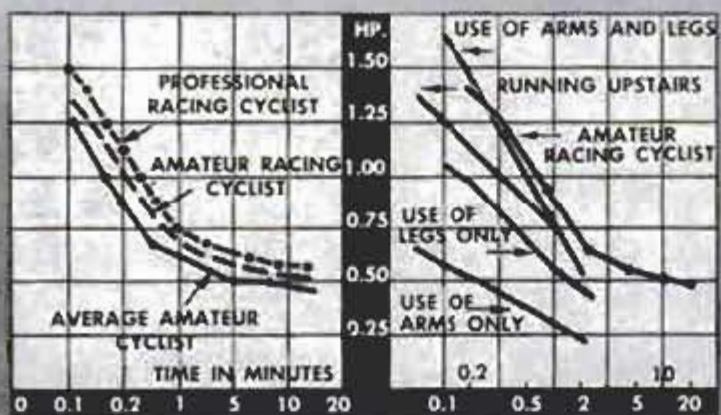
GEARBOX

ALTERNATE POSITION FOR PROPELLER



EXTREME LIMIT OF MAN'S MUSCLE POWER IS OF SHORT DURATION. GRAPH SHOWS HORSEPOWER IN RECORD PERFORMANCES DEVELOPED BY CYCLISTS

MUSCLE POWER DEPENDS ON ADEQUATE OXYGEN SUPPLY TAKEN INTO LUNGS AND TRANSPORTED TO BLOOD STREAM. GRAPH SHOWS POWER OF MAN



2 HP. FOR 30 SECONDS  
 0.9 HP. FOR ONE MINUTE  
 0.6 HP. FOR FIVE MINUTES  
 AN ESTIMATE OF DURATION OF FLIGHT ACCORDING TO THE AMOUNT OF ENERGY USED BY MAN  
 PROVIDING CREW WITH EXTRA OXYGEN, FLIGHT MAY BE PROLONGED FROM 10 TO 60 MINUTES  
 SCALE RANGES FROM ONE TO 60 MINUTES

NONWEILER'S DESIGN FOR A MAN-POWERED AIRCRAFT

PILOT USING LEGS FOR PROPULSION AND ARMS FOR CONTROL

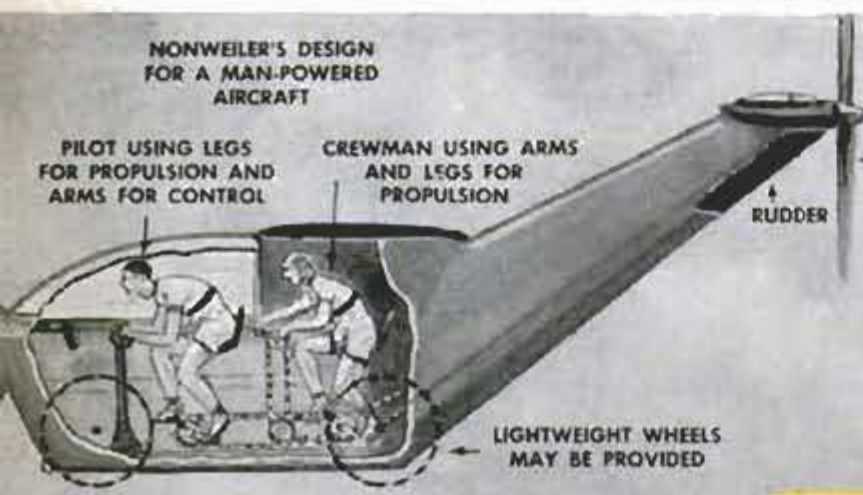
CREWMAN USING ARMS AND LEGS FOR PROPULSION

LIGHTWEIGHT TWO-BLADED PROPELLER

RUDDER

LIGHTWEIGHT WHEELS MAY BE PROVIDED

A DESIGN BY LIPPISCH WHICH GIVES GOOD AERODYNAMICS FOR LIGHT WEIGHT



CLUTCH

VARIABLE GEARBOX WITH BRAKE

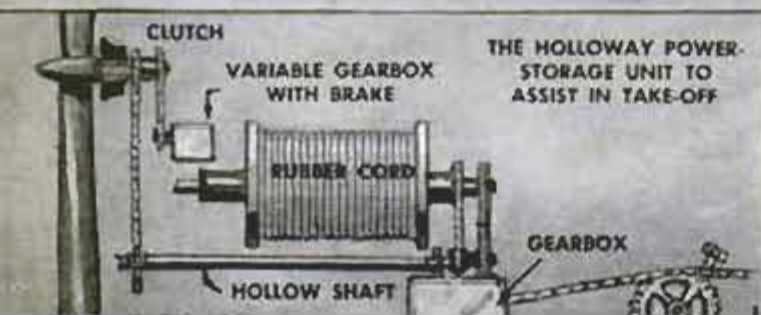
THE HOLLOWAY POWER-STORAGE UNIT TO ASSIST IN TAKE-OFF

RUBBER CORD

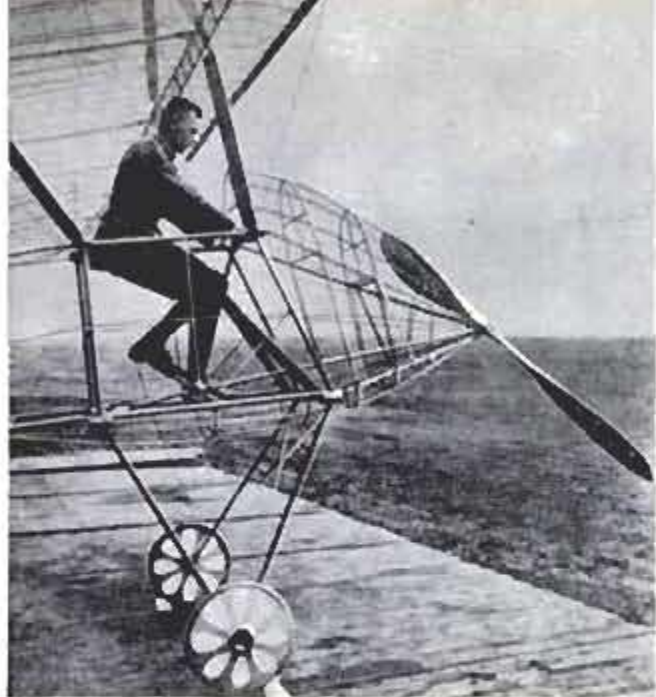
GEARBOX

HOLLOW SHAFT

LEG DRIVE



Diagrams show some principal designs proposed for the "flying bicycle," and breakdown of horsepower capable of being developed when man uses his own muscle power. Pedal-power, similar to that generated when riding a bike, would keep the vehicle in flight. Detail at lower left shows power-storage unit to assist in take-off



Early German man-powered craft was one of many designed, but few ever left ground



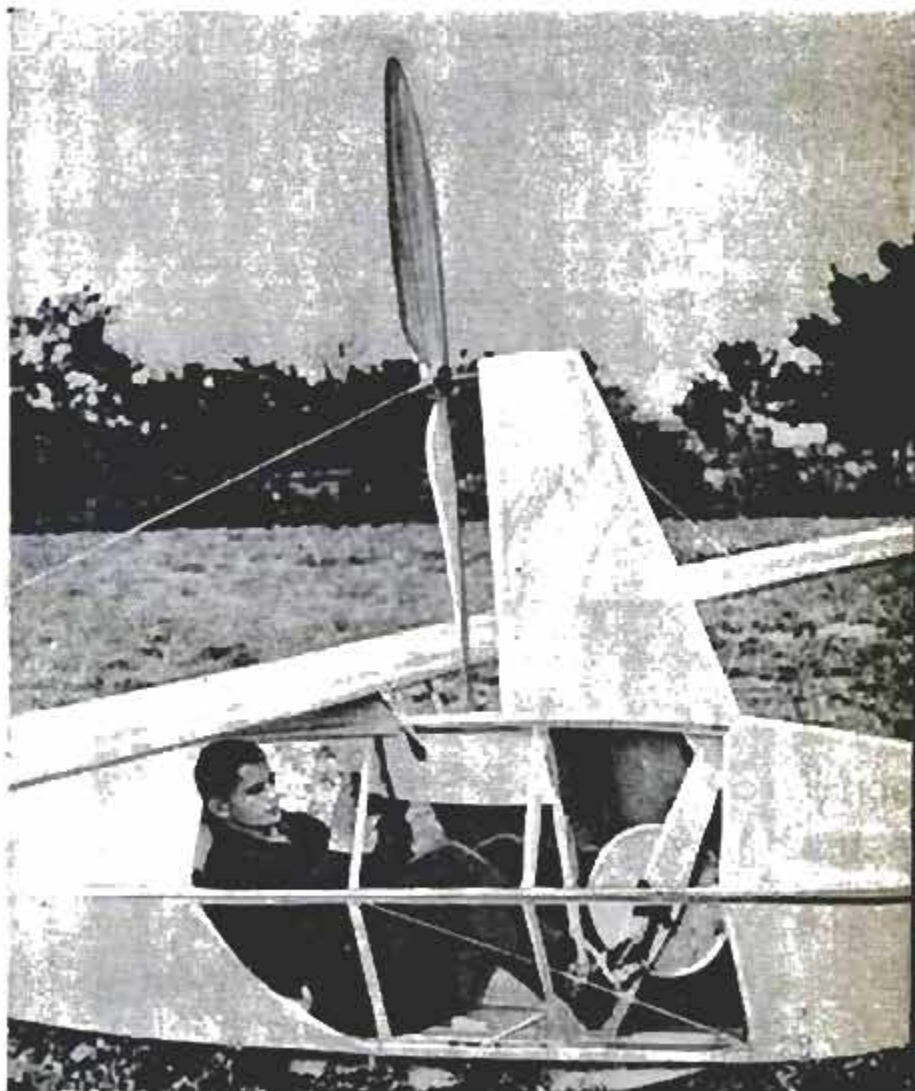
Dr. W. R. Wilkie (on machine) helps aviation scientists test amount of horsepower man can produce and for how long

## Here Comes The Flying Bicycle!

Copyright photos by Bernsen's International Press Service

**I**T MAY LOOK like a step backward, but man may soon be flying through the air on a pedal-powered vehicle—the flying bicycle. Dr. W. R. Wilkie, of the University College of London, after a series of tests, concludes “man-powered flight is possible.” He says that power required for men to fly is 0.4 horsepower, a level man can maintain for 5 to 30 minutes. The Aeronautical Society has given approval of plans to build a craft that will fly on the power developed by the arms and legs of two crewmen. Such a vehicle will be light with minimum drag, maximum lift. A power-storage unit or simple launching will get it off the ground. ★ ★ ★

One of the most notable of the manually powered craft built in Germany before the war was the Haessler-Villinger. This cockpit view shows how pedals produced lift. Craft is expected to be basis for designs of the future





DKW



FIAT



HILLMAN



MORRIS



RENAULT



AUSTIN

# Which Import

**O**KAY, SO YOU'VE decided to take the bold step—to buy an imported car. About a half-million Americans are making such a decision this year, so you're not alone.

But what next? Which car is best for you? Imported cars offer as much variety of design as American cars do similarity.

You can buy four-cylinder engines, three-cylinder, two-cylinder, water-cooled, air-cooled, two-cycle, four-cycle engines; coil-spring suspension, leaf-spring, torsion-bar, swing axles, unit bodies, frames, semi-units—just about any design in the textbook.

So what do you do? How do you make up your mind?

*Popular Mechanics* surveyed 2000 owners of 10 representative foreign cars—10 cars high among the best sellers, 10 cars representative of the variety of designs.

We asked the owners to tell you about their cars, to tell what they like and don't like. *PM's* test engineer, Dale Kelly, put the 10 cars through a standard test to get

performance data that you can use to make valid comparisons.

Right off, we might as well dispose of styling since this is important in the choice of any car (although perhaps less important to the foreign-car buyer).

Styling is an individual problem. Nobody can help you here. If you don't like the way a car looks, if you don't think you will ever like the way it looks, obviously that car is not for you. It may not be scientific to judge a car by its looks, but it's more rational than it sounds. You wouldn't buy a suit you didn't like to look at, nor should you buy a car that you don't like to look at.

Probably the most important single item to remember in buying a car (and one often overlooked) is the availability of good service and parts.

This is especially true of a foreign car. Many independent garages refuse to repair an imported car, many don't have ready access to a parts source for imports. Some will tackle a repair job but do not know how properly to complete it. Many



## How Do Owners Rate Them Over-All?



	Excellent	Average	Poor
Saab	96.9%	0.0%	3.1%
Volkswagen	94.0%	3.6%	2.4%
Volvo	93.3%	6.7%	0.0%
Renault	85.4%	13.8%	0.7%
DKW	85.4%	12.2%	2.4%
Austin	82.6%	17.4%	0.0%
Fiat	78.7%	20.2%	1.1%
Morris	76.9%	19.4%	3.7%
Hillman	70.6%	26.1%	3.3%
Simca	64.6%	28.3%	7.1%



SAAB



SIMCA



VOLKSWAGEN

# Is Best For You?

By Arthur R. Railton



VOLVO

first-time imported-car owners have been soured on the product because of an aggravating delay in parts and service. They were completely happy with the car itself, but parts and service difficulties turned them against it.

Let's face it, there are some "minuses" that you agree to accept when you buy an import. They include a less-roomy, often-cramped rear seat. They include luggage space that is adequate for the efficient packer, but allows no room for excess (in some cars even such "necessities" as a set of golf clubs and cart can't be carried). Accessories may not be as refined or as reliable as you are accustomed to (things like windshield wipers, heaters, defrosters, turn signals, rear side windows that don't go down, door locks). Acceleration and top speed are probably slower than you are used to, especially when fully loaded (an exception may be the Volvo).

But to compensate for these minor annoyances (and they may seem major to some), you get some advantages.

Included are lower first cost (sometimes as much as \$600 under the cheap American cars), lower operating cost (25 or more miles per gallon over-all), a minimum of the petty "bugs" that often accompany a more complex machine, a smaller dollar loss in depreciation each year, easier parking, more nimbleness in traffic, more room in the garage, and an opportunity once again to putter around with the mechanism yourself (however, some makes, like VW, frown on tinkerers).

You may also want to remember that Detroit's answers to the foreign car (the Corvair, Falcon and Valiant) will be out within a month or two. You may want to wait for them. However, they will not be directly competitive with most of these imports—they are larger, faster, more expensive, more stylish (and can be bought with automatic transmissions, incidentally).

With this general introduction, let's look at each of the 10 cars (alphabetically) and try briefly to report what *PM* learned about them from owners.

## Which Gives Best Gas Mileage Over-All?

	Miles Per Gallon*
Austin A40 2 dr. sedan-wagon	32.0
Renault Dauphine 4 dr. sedan	31.5
Fiat Multipla 4 dr. station wagon	31.0
Volkswagen 2 dr. sedan	28.0
DKW 2 dr. Hardtop	26.0
Saab 2 dr. sedan	26.0
Morris Minor 1000 2 dr. sedan	26.0
Simca Aronde 4 dr. sedan	25.0
Hillman Minx 4 dr. sedan	22.0
Volvo 2 dr. sedan	20.0

\*Based on a 50-mile road test, combining city and country driving.





# Which Owners Are Most Satisfied?



## NEXT CAR WILL BE:

	Same Make	Other Foreign	U. S. Make	Undecided
Volkswagen	49.1%	16.6%	14.8%	19.5%
Volvo	47.5%	18.5%	4.7%	29.3%
Austin	40.0%	20.0%	4.0%	36.0%
Saab	35.9%	27.2%	4.6%	32.3%
DKW	35.7%	23.8%	16.7%	23.8%
Fiat	30.9%	21.2%	14.9%	33.0%
Renault	30.5%	19.8%	16.3%	33.4%
Morris	19.4%	34.9%	17.1%	28.6%
Hillman	15.5%	29.5%	18.0%	37.0%
Simca	14.1%	20.2%	20.2%	45.5%

### British Austin

Owners of the British Austin are well pleased. None rates the car poor over-all (the only other car that can boast this unblemished record is Volvo). Austin dealers also are given a high rating by the owners with 66.7 percent describing dealer service as excellent.

Forty percent of the owners will buy an Austin again and another 20 percent intend to stay in the foreign-car market. Only four percent plan to buy an American car next time, 36 percent still are undecided.

Engineer Dale Kelly tested the brand-new Austin A40, a two-door sedan that looks much like a small station wagon. Italian styling gives it quite different appearance from previous Austins.

The A40 racked up the best over-all gas economy of all 10 cars, averaging 32 miles per gallon. It is important to remember that Kelly's over-all gas test includes considerable stop-and-go driving and is designed to be representative of the driving an owner would do. All the cars tested will average more miles per gallon than the

Kelly figures on long trips or at constant speeds—the economy figure given here will come close, however, to what you can expect to get in normal everyday use.

Luggage capacity of the A40 is about average with four persons in the car (average for a European car, that is, about half that of an American trunk). With only two in the car and with the back seat folded, capacity is greater than in a standard domestic trunk.

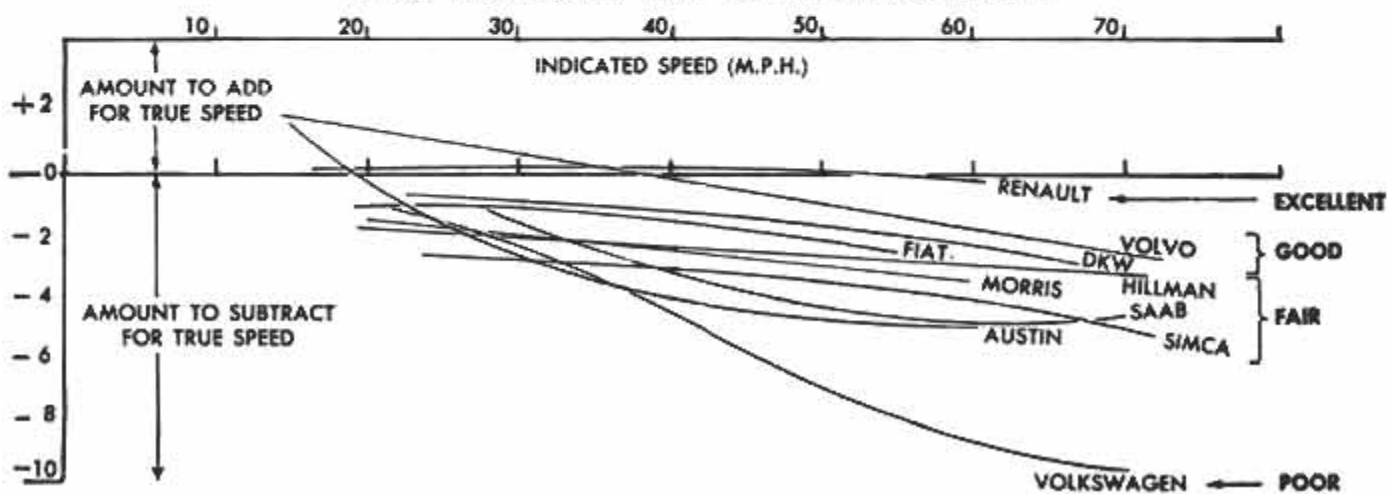
Here are quotations describing the likes and dislikes most frequently mentioned by the owners:

"Cost of operation is about 1.3 cents per mile. I get 27.5 miles per gallon."—Illinois sales manager.

"Handles well on slippery roads. Drove it every day this winter without one bad slide."—Pennsylvania engineering assistant.

"Smaller size for easier parking on streets and in garage. Also easier to keep looking nice. Washing and polishing easy. Not smothered in chrome."—California salesman.

### HOW ACCURATE ARE THE SPEEDOMETERS?



# Which Car Accelerates Fastest?



	0-40*	0.50*	0.60 <sup>0</sup>
Volvo	6.5	9.5	14
Simca	11.0	16.5	26.5
Saab	11.5	18.0	27.0
DKW	13.0	20.0	31.0
Volkswagen	13.5	21.5	41.0
Austin	14.0	21.0	34.0
Renault	14.0	21.0	.....
Morris	14.5	21.0	.....
Hillman	14.5	21.5	35.0
Fiat	25.0	50.0	.....

\*Figures are seconds representing conservative driving based on "red-line" acceleration.



"Neat interior workmanship."—California electrical supplier.

"Troublefree. 12-month warranty. Less depreciation."—Illinois executive.

"Would like more miles per gallon. I get 22 miles over-all."—Illinois salesman.

"Sluggish on acceleration for passing."—California insurance man.

"Had trouble getting parts on a highway breakdown on a holiday."—California teacher.

## German DKW

Owners of the German DKW don't seem to be bothered by the fact that its engine is a two-stroke design. This design has no valves (in the usual sense) and, like an outboard motor, it requires the addition of lubricating oil in the gasoline. Only one owner seems to feel it is troublesome enough to mention.

The car's front-wheel drive gives it excellent traction on ice and snow. It is larger than most of the other cars discussed here; only the Volvo is longer.

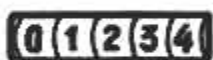
Its dealers do not rate very high with

owners. Only 45.2 percent are rated excellent, 14.3 percent are described as poor. Inadequate service is the most frequently mentioned complaint with 21.4 percent of the owners mentioning it. Economy of operation is the best-liked feature with 73.8 percent mentioning it.

Kelly's test of the two-door hardtop model showed an over-all gas economy of 26 miles per gallon. Luggage space is about half that of a 1959 American car. Its turn-circle diameter was the biggest of the 10 cars due to its larger size and to the front-wheel drive which limits wheel-turn. The DKW, in fact, requires more room to turn around than a 1959 Ford or Chevrolet.

This car is an excellent over-the-road car, providing a comfortable, quiet ride at relatively high speed. Among its advantages is a steering wheel that locks with the ignition, to discourage thieves. Among its disadvantages are rear-hinged doors that open at the front and will be whipped open by the wind if accidentally unlatched when the car is moving.

Here are some quotations from owners:



## ARE ODOMETERS ACCURATE?

For a true 100 miles, odometer read:

Austin	100
DKW	100
Morris	100
Saab	100
Simca	100
Renault	98
Fiat	102
Hillman	103
Volkswagen	103
Volvo	104



## HOW MANEUVERABLE?

Minimum turning circle diameter:

Fiat	28.5
Renault	31.0
Volkswagen	33.0
Morris	34.0
Simca	34.0
Volvo	35.0
Hillman	35.5
Austin	36.5
Saab	37.0
DKW	41.5



## WHAT ARE THEIR TOP SPEEDS?

Over 70 m.p.h.

Volvo  
Simca  
Hillman  
DKW

About 70 m.p.h.

Saab  
Austin  
Morris  
Volkswagen  
Renault

About 55 m.p.h.

Fiat



# How Do Owners Rate Their Dealers?



	Excellent	Average	Poor
Saab	73.0%	19.1%	7.9%
Volkswagen	66.7%	29.0%	4.3%
Austin	66.7%	25.0%	8.3%
Morris	55.9%	32.3%	11.8%
Fiat	53.8%	31.2%	15.0%
Renault	52.6%	32.8%	14.6%
Hillman	45.4%	41.2%	13.4%
DKW	45.2%	40.5%	14.3%
Volvo	42.9%	47.9%	9.2%
Simca	31.9%	44.7%	23.4%

"Most of all I like the over-all economy: low depreciation, gas, servicing and repair bills."—California salesman.

"Solid feel. Trunk lid operates like a refrigerator door and doors close without slamming."—California office worker.

"Comfortably holds four adults. Has large trunk. Keeps up with traffic even in the mountains with full load."—California electronics technician.

"Not enough dealers across the country for service on long trips."—California owner.

"Oil-gas combination makes tanking up a project. Difficult to change gears on occasion."—Ohio recreation consultant.

"Expected to get 32 miles per gallon, but get only 23."—California businessman.

"It hurts when you drive in for service and the service manager says: 'Another one of those foreign jobs. What a waste of time.'"—Illinois general manager.

"As it has front-wheel drive, I have had some trouble with tire wear and vibration."—Montana student.

"Heater takes too long to throw heat."—Missouri paymaster.

"Insatiable appetite for spark plugs."—California painter contractor.

## Italian Fiat

Fiat has such a wide variety of models that it is impossible to describe them all. Most popular at the moment is the 600, the smallest of the 10 cars surveyed. The 600 comes as a two-door sedan or as an unbelievably roomy Multipla body which will seat six persons arranged two-two-two, as in a bus. Kelly tested the Multipla. It averaged 31.0 miles per gallon over-all, ranking near the top in economy, just below Austin and Renault.

Luggage space is equal to the American standard with four persons in the car and is unbelievably spacious with only two aboard. The body style, however, is not designed for comfort nor speed. The front seat is directly over the front wheels but the ride is remarkably comfortable despite this. Getting in and out is apt to be awk-



# How Dependable Are These Cars?



## Broke Down on the Road:

Volkswagen	3.6%
Fiat	5.3%
Hillman	5.8%
Renault	5.8%
Volvo	5.8%
Austin	8.0%
Morris	8.7%
DKW	9.5%
Saab	10.9%
Simca	11.1%



# What About Luggage Space?

Number of one-cubic-foot cartons it will carry:\*

Fiat	15
Hillman	8
Volvo	8
Austin	6
DKW	6
Simca	6
Renault	5
Volkswagen	5
Saab	4
Morris	3

\*Average number of cartons for low-priced 1959 American cars is 14.



ward, especially for women. However, anybody who wants a versatile, multipurpose car for hauling either children or commodities around town, will be interested in the Multipla.

Owners rate the Fiat about average, with 78.8 percent calling it excellent. Dealer service, too, rates about average among the 10 cars. The most-frequently mentioned complaint of the owners is lack of power (this refers to the small 600 and the even smaller 500—the larger models would be more adequate).

Turn-circle diameter of the Multipla 600 is the smallest of all cars tested. Top speed is about 55 miles per hour, the only car not in the about-70-mile-per-hour range. This speed limitation is for the Multipla body and is not typical of all Fiats, not even of all 600 models.

Fiat doors open from the front, a feature which some owners find undesirable.

You can buy a Fiat with either front engine or rear engine, with either air cooling or water cooling. Fiat builds everything

from a sports car to a six-cylinder sedan, and is the biggest company in Italy.

Here are some comments from owners: "Gas bill dropped from about \$42 per month to only \$14."—South Carolina insurance man.

"Good handling. Surprisingly good road car although you have to plan your trips with a time-allowance factor."—Oklahoma clerk.

"Maneuverable. Easy to park."—New York psychologist.

"Well-made inside and out. Very comfortable, even on long trips."—Florida secretary.

"This Multipla is very versatile. Seats six. Able to haul bulky things like chairs, large boxes of food. A new car for \$1900, 35 miles per gallon."—Arizona engineer.

"Needs just a few more horsepower. Not much more, but for passing and climbing hills. It now has 22, think 28 would be fine."—Arizona supervisor.

"Not enough trunk space in the two-door 600."—Texas engineer.

## DO OWNERS FEEL SAFER IN THEM?

PERCENT OF OWNERS WHO SAY THEY DO:

DKW	95.2%
Volvo	95.1%
Austin	92.0%
Saab	90.6%
Renault	85.1%
Morris	83.8%
Hillman	83.5%
Volkswagen	83.2%
Simca	81.8%
Fiat	80.8%

## ARE THEY THE ONLY CAR?

ONLY CAR IN FAMILY:

Volvo	63.1%
Austin	60.0%
Saab	59.4%
Simca	57.6%
Renault	53.9%
Hillman	52.9%
Morris	52.4%
Fiat	45.8%
Volkswagen	41.3%
DKW	40.5%

## OWNED FOREIGN CAR BEFORE?

No, this is first import:

Renault	91.5%
Fiat	86.2%
Simca	85.9%
DKW	78.6%
Hillman	77.7%
Morris	77.1%
Volkswagen	74.3%
Austin	68.0%
Volvo	65.1%
Saab	61.0%

# WHAT DO OWNERS LIKE AND

<b>AUSTIN</b> Best-Liked Features	<b>DKW</b> Best-Liked Features	<b>FIAT</b> Best-Liked Features	<b>HILLMAN</b> Best-Liked Features	<b>MORRIS</b> Best-Liked Features
Economy of operation .80%	Economy of operation .73.8%	Economy of operation .89.4%	Economy of operation .83.4%	Economy of operation .84.7%
Handling ease .68%	Ease of handling .54.8%	Handling ease .53.2%	Handling ease .67.0%	Handling ease .64.7%
Easy to park .44%	Workmanship .23.8%	Easy to park .36.2%	Easy to park .37.1%	Easy to park .24.8%
Workmanship .24%	Easy to park .21.4%	Riding comfort .17.0%	Workmanship .16.5%	Workmanship .18.1%
Most-Frequent Complaints	Most-Frequent Complaints	Most-Frequent Complaints	Most-Frequent Complaints	Most-Frequent Complaints
None at all .20%	None at all .30.9%	None at all .35.1%	None at all .29.3%	None at all .31.4%
Not enough gas economy .12%	Inadequate service .21.4%	Insufficient power .21.3%	Inadequate service .16.6%	Insufficient power .16.2%
Insufficient power .8%	Not enough gas economy .16.7%	Not enough room .10.6%	Uncomfortable riding .10.7%	Uncomfortable riding .13.3%
Inadequate service .8%	Insufficient power .14.3%	Inadequate service .8.5%	Not enough room .10.0%	Not enough room .11.4%

"Heater puts little heat in front, too much in rear. Experienced mechanics and parts not readily available except in large cities."—Illinois soldier.

"Side winds give trouble. Tend to toss it about."—Ohio laboratory worker.

"Front doors open at front."—Oklahoma cable splicer.

## English Hillman

Hillman was one of the first European cars sold in the United States after World War II. However, despite its early start, it does not seem to have developed its service facilities as well as some latecomers.

Owners rate the car low on the list with 70.6 percent rating it excellent over-all; only one car ranked lower.

Dealer service also rates surprisingly low in view of the long time it has been sold over here. Only 45.4 percent describe the dealer service as excellent (three cars rank below it in this department).

Kelly's test of the Hillman Minx sedan shows an average over-all gasoline economy of 22.0 miles per gallon. Its luggage capacity is highest of all the sedan bodies tested.

A variety of Hillman models is available, including a handsome convertible and a roomy 4-door station wagon. All are closer to the American design and "feel" than any of the other nine cars tested.

Here are some quotations from owners:  
"Gas bill cut from \$40 to \$12 a month."—Pennsylvania mill superintendent.

"Pleasure to drive a car in which you don't have to break your neck in parking or any other maneuver."—Oklahoma draftsman.

"Exceptional coachwork and painstaking care during manufacture. I like a well-built piece of machinery."—Illinois serviceman.

"Handles well at high speeds. I drive 70 all the time."—Missouri cameraman.

"Surprising comfort for a small car. Four can sit comfortably with as much leg-room as in rear of American cars."—Missouri accountant.

"No esthetic fakery."—Texas psychiatrist.

"Despite fact that dealers claim they carry parts, it has been 10 weeks since a switch mechanism was ordered and to date it has not arrived."—California businessman.

"Not as comfortable as American cars. Shift works opposite."—Louisiana physician.

"Should have more headroom."—North Carolina teacher.

"Gas mileage is lower than anticipated. I average 20 miles per gallon over-all."—Georgia assistant superintendent.

## British Morris

Morris owners, like most imported-car owners, rank economy of operation as best-liked feature, with handling ease second. Kelly's test shows the Morris averaging 26.0 miles per gallon over-all, about midway in the lineup.

The most-frequent complaint is that the car has insufficient power, say 16.2 percent of the owners. This probably refers to the over-50-mile speeds because below that, the Kelly test shows the Morris as about average.

Dealers are rated high by the owners, with 55.9 percent describing them as excellent to rank fourth among the 10 cars surveyed.

Over-all, the Morris ranks eighth with 76.9 percent of the owners calling it excellent.

Of all 10 cars surveyed, the Morris perhaps comes as close as any to the sports-car feel so dear to many foreign-car owners. Its steering is precise, its suspension firm. Torsion bars are used in front, steering is by rack and pinion. If you'd like an intro-

# DISLIKE ABOUT THESE CARS?

RENAULT	SAAB	SIMCA	VOLKSWAGEN	VOLVO
<b>Best-Liked Features</b>	<b>Best-Liked Features</b>	<b>Best-Liked Features</b>	<b>Best-Liked Features</b>	<b>Best-Liked Features</b>
Economy of operation .88.6%	Handling ease . . . . .68.8%	Economy of operation .72.7%	Economy of operation .85.1%	Economy of operation .70.9%
Handling ease . . . . .60.2%	Economy of operation .67.2%	Handling ease . . . . .55.5%	Handling ease . . . . .62.9%	Handling ease . . . . .66.0%
Easy to park . . . . .29.1%	Road-ability . . . . .28.1%	Easy to park . . . . .34.4%	Workman-ship . . . . .29.3%	Workman-ship . . . . .37.9%
Initial low cost, depreciation . . .15.8%	Workman-ship . . . . .26.6%	Workman-ship . . . . .16.2%	Easy to park . . . . .26.4%	Easy to park . . . . .12.6%
<b>Most-Frequent Complaints</b>	<b>Most-Frequent Complaints</b>	<b>Most-Frequent Complaints</b>	<b>Most-Frequent Complaints</b>	<b>Most-Frequent Complaints</b>
None at all .32.6%	None at all .23.4%	None at all .18.2%	None at all .27.6%	None at all .27.2%
Not enough room . . . . .13.5%	Insufficient power . . . . .15.6%	Inadequate service . . .23.2%	Heater . . . . .19.2%	Inadequate service . . .16.5%
Heater . . . . .13.5%	Small rear window . . .10.9%	Not enough room . . . . .17.2%	Insufficient power . . . . .13.8%	Noisy engine . . . . .10.2%
Too light; road sway . 9.2%	Inadequate service . . . 9.4%	Not enough gas economy . . . . .10.1%	Too light; road sway .13.8%	Uncomfortable riding . 9.7%

duction to the sports-car way of life on a budget and have a family to accommodate, try the Morris.

Here are some quotations from owners:

"My monthly gasoline bill has been cut by two-thirds."—California office clerk.

"Easy to park and drive in heavy traffic. I honestly feel safer in my small foreign car than in the larger American car I once owned."—Maine secretary.

"Most of all I like the sports-car steering. Easy to handle."—Pennsylvania laborer.

"Care in workmanship. Little or no worry as to maintenance except prescribed in manual. Complete booklet."—Pennsylvania salesman.

"Low initial cost. I would not have been able to afford a new American car."—Rhode Island teacher.

"Now we take trips just for the fun of riding."—Colorado teacher.

"Not enough pickup for passing purposes."—Texas telephone man.

"Bumpy ride."—Illinois welfare worker.

"I am six feet tall and my left leg is a bit cramped."—Washington, D.C., detective.

"Poor heating system, especially defrosting."—Pennsylvania purchasing agent.

"Poor dealer service. Inability to get parts promptly. I tore a door panel two months ago and am still waiting."—California reporter.

## French Renault

Renault is breaking into the imported-car market fast and furiously. In the few years the Dauphine (which was designed for the American market) has been available its sales have soared until this year it is right on Volkswagen's tail for first place.

It is creating many new customers for imported cars, ranking highest among first-foreign-car owners, with 91.5 percent of Renault owners stating that it is their first foreign make.

Over-all, it rates just above the middle

of the scale with 85.4 percent describing it as excellent. It has a flattering "poor" rating, less than one percent of owners rating it as poor.

Dealers rank average, with 52.6 percent described as excellent, placing them sixth in order in the 10 makes.

Best-liked feature, say the owners, is gasoline economy with 88.6 percent mentioning it. Kelly's over-all gasoline mileage for the Dauphine is 31.5 miles per gallon, to place it second on the list, just below Austin.

Most-frequent complaint of Renault owners is that there is not enough room and that the heater is not adequate for cold weather (both being mentioned by 13.5 percent).

Here are some quotations from owners:

"I like its economy. Gas mileage good. I get 33 miles per gallon. Oil changes cost 50 cents. Grease job about 15 cents. I do it myself."—Ohio clerk.

"Convenience and ease of operation. Feels as if you jump in and are halfway to your destination before you could get our old sedan out of the garage and turned around."—Virginia federal employee.

"Car is a part of you. Like putting on a pair of pants."—Indian tool designer.

"Handles better on bad roads than some of our cars. Better traction. Takes corners easier."—Michigan machinist.

"Good construction with practically no rattles. Finish excellent."—Arkansas pilot.

"Should improve front legroom. Do away with wheel wells."—Delaware lab worker.

"Inadequate heating system for below-zero temperatures."—Maine owner.

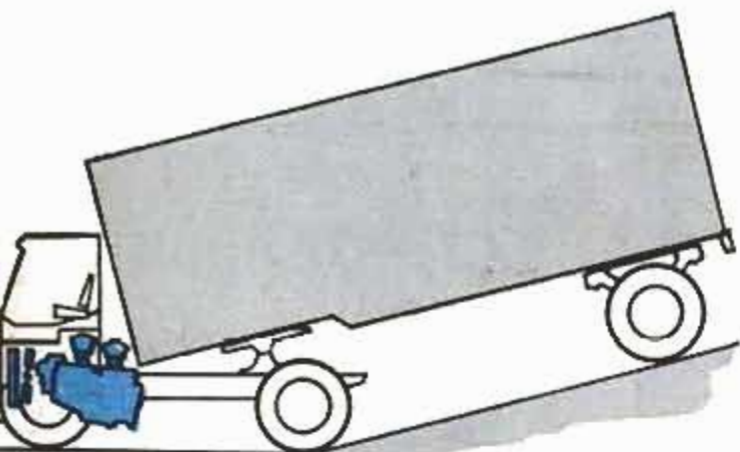
"Too light. Sounds like a tin can when doors are closed."—Tennessee teacher.

"Swerves in gusty wind."—Rhode Island technical specialist.

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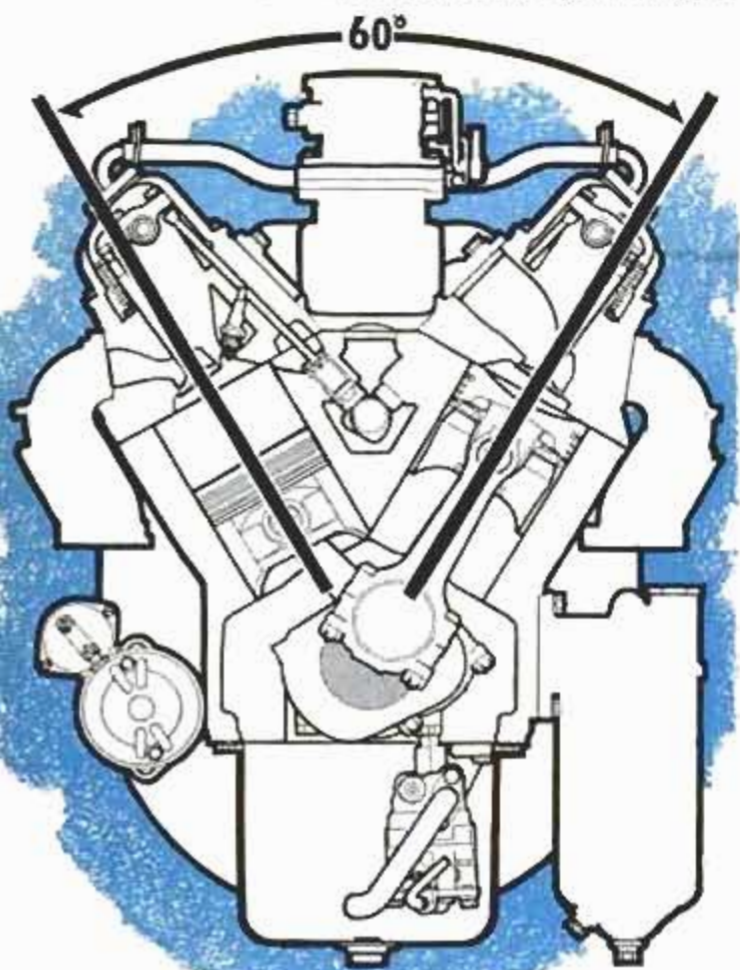


Left, the 305-cubic-inch V6, smallest of the line. Right, the 702-inch V12, made by tandemming two V6s



Even in undercab rigs, the big V12 retains clearance for sharp ramps. Shorter V6 fits neatly inside cab confines

With a 60-degree design, the narrow V6 fits between frame rails, leaving lots of steering room. Spark plugs are easy to reach from top of engine, valve lifters can be removed without taking off cylinder heads



## V6 Truck Engine: 150,000 Miles Without Overhaul

WITH THREE TIMES the durability of present designs, a new V6 gasoline engine for trucks is expected to cut into the popularity of the diesel among truckers.

The engines have a potential of over 150,000 miles of continuous use without major overhaul. Because the engines develop peak torque at much less than full throttle, valve life is increased sharply and fuel consumption is decreased.

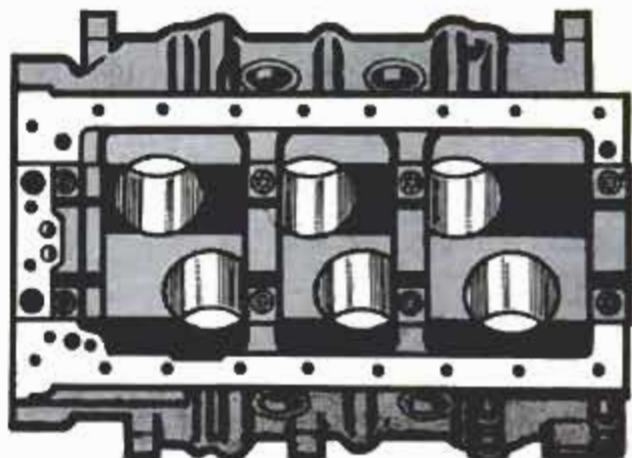
Maximum torque is developed at 1400 revolutions per minute, compared with about 2500 for a typical V8 design.

Developed by GMC Truck and Coach Division, the V6 design is also used on a 12-cylinder power package by combining two V6 engines, one behind the other.

Three sizes are to be built: 305, 351 and 401 cubic inches. The V12, called the Twin-Six, has 702 cubic inches.

Some features of the design include full-length water jackets through which three times more water circulates than in previous designs, an oil pump that moves twice as much oil as previously, a camshaft-lobe dip pocket for instant lubrication on starting, and ease of access to such parts as spark plugs and valve lifters.

Bottom view of block shows offset arrangement of banks. All engines are oversquare with short strokes



*With machetes, bulldozers and hand axes an army of 5000 men is carving a 1400-mile highway to pierce the Amazon heartland*



# ***JUNGLE ROAD KNIFES THROUGH THE LAST FRONTIER***

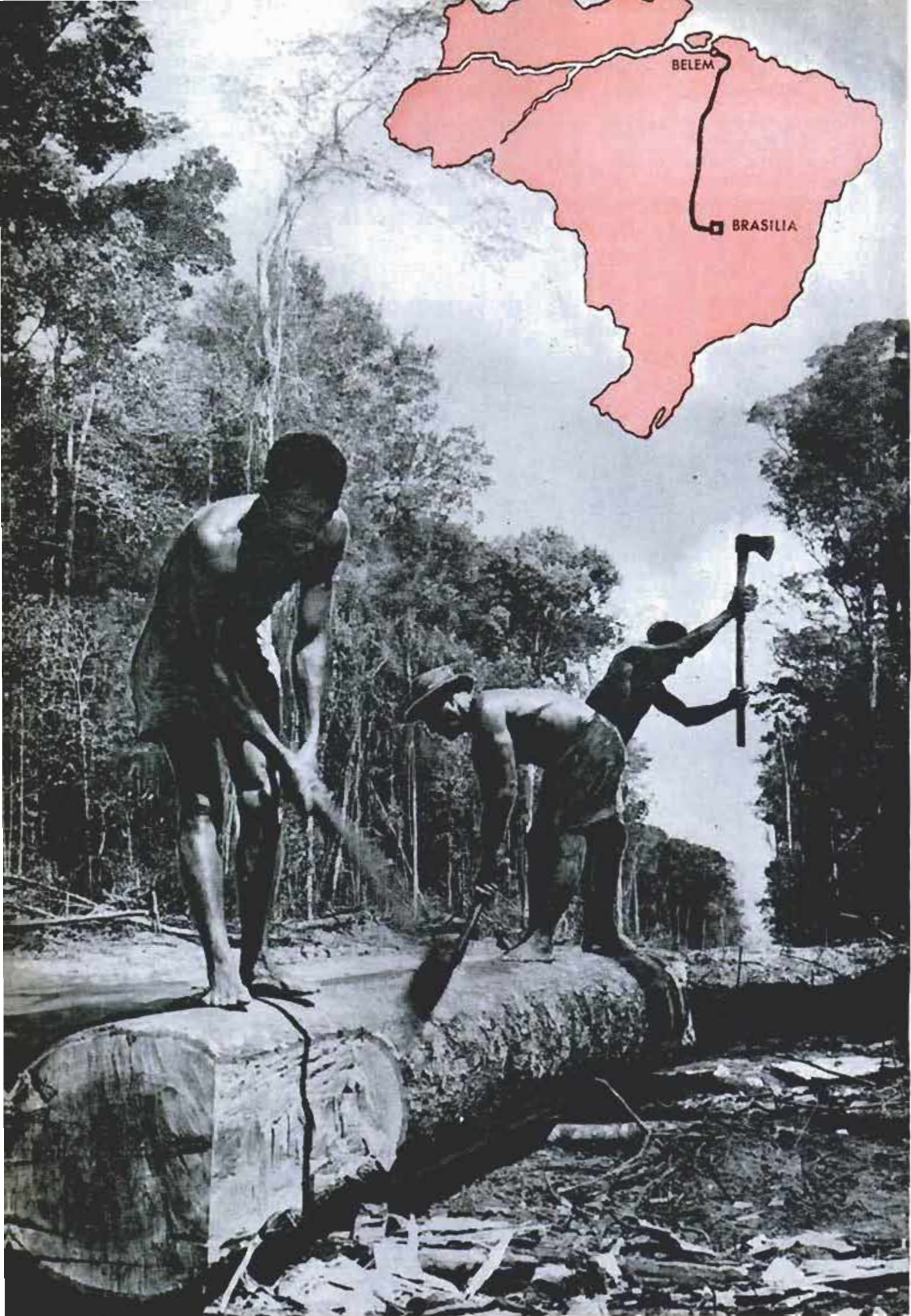
*By Thomas E. Stimson, Jr.*

**T**HE WORLD'S greatest jungle, the "green hell" of the Amazon that has withstood civilization for centuries, is finally being conquered.

The latest step in the conquest is a road that connects the Amazon basin for the first time with the rest of Brazil. The jungle highway starts at Belem near the mouth of the Amazon and stretches 1400 miles south, connecting with roads that lead to Sao Paulo and Rio de Janeiro. The

highway will be ready for traffic in 1960.

The Amazon is the region where you find grasshoppers as large as sparrows, flies that blister you when they bite, and the annoying "sweat bees" that have no sting, but instead, crawl through your hair and under your clothes and into your nose and ears. There are basilisk lizards that walk upright on their hind legs, vampire bats and deadly bushmaster snakes. There are anaconda snakes up to 40 feet long.



In the rivers are nine-foot catfish, electric eels and ferocious piranha fish that can strip the flesh from a swimmer.

Some native tribes in the upper watershed still use blowguns, and darts that are tipped with curare. Possibly true, possibly untrue, is the story that members of the savage Bat Tribe paint their bodies purple and their hair yellow when on headhunting expeditions.

The Amazon is the world's greatest river, with a flow equal to 20 Mississippi. It drains three million square miles of territory, an area larger than Europe, and its mouth is 20 times wider than the English channel. Ocean ships can steam for days upstream.

The hot, humid equatorial climate, the dense jungles, and such diseases as malaria and yellow fever are reasons why the Amazon watershed, encompassing 59 percent of Brazil's area, contains less than seven percent of the country's population.

Yet today, tourists who left New York less than 24 hours before are sightseeing at Manaus, the ancient rubber capital halfway up the river. At Porto Velho, literally twice as remote, a man by the name of Resky is agent for such luxuries as movie cameras and refrigerators. Daily airline schedules connect the principal towns.

In its drive to develop this last frontier, Brazil has created a special Amazonian commission known as SPVEA and has provided it with funds for fighting disease, reducing malnutrition, raising standards of living and developing potential industries. Participating in the program are such agencies as the United Nations and Rockefeller's International Basic Economy Corporation.

The new road is part of the development plan. To draw attention to the importance of this trans-Brazilian highway, SPVEA is rushing completion of the road to coincide with the opening of the new national capital at Brasilia next spring. An army of 5000 men is at work on the road today, some with hand implements, some at the controls of modern heavy-



Tree is rolled away after toppling across the roadway. Thirty subposts are being set up along the road for maintenance



Farmer uses empty paper cement bags for house roof. Rains harden small amounts of remaining cement to make sound roof

Along the roadway are jungle gasoline stations which consist of a barrel of gasoline which is pumped by hand into vehicle



Left, road workers use axes to cut timber for a bridge from the trunk of a tree



Party of local "caboclos" or small farmers prepare for a hunting expedition in the jungle. Most of them carry muzzle-loading shotguns. They keep their dogs on short leashes to "prevent fights"

Workers haul water atop their heads to camp after using the unfinished roadway as a trail to the nearest stream. Road is costing about \$35,000,000



duty, fast-moving roadbuilding equipment.

To get the story of this jungle highway I recently flew from Belem to a short dirt strip where I joined U.S. Ambassador Ellis O. Briggs on an inspection tour of one of the road camps. Later I returned to the same area in a little jungle-hopping Cessna and grabbed a ride on a supply truck for a trip along the road itself.

Among other passengers on the truck were half a dozen "caboclos" who were going hunting. These local people exist mainly on mandioca, corn and bananas that they grow in small clearings; most of them had never seen a truck or an automobile until the road was cut through their area.

What interested me was the muzzle-loading shotguns that some of them carried. The old weapons were fired by means of a percussion cap. There was no way of telling their age, but each gun was in fine shape, clean and oiled.

The hunters had a few dogs with them. An odd thing was that these dogs had claws that were long and pointed, almost needle-sharp. Living in the jungle, they never encountered hard ground or pavement that would blunt their claws.

Every dog was held tightly on a short leash, and I wondered why. My interpreter explained that otherwise the fierce beasts would try to kill each other.

The stretch of road that I traveled crosses an area explored only from the air in the past, and our truck made one stop at a new camp that had just been built by





Although many primitive building tools are used in construction of the road, modern equipment such as graders and bulldozers cut down the banks to widen roadway in preparation for paving it

people from the famed tropical zoo at Belem. They had gone into the unknown area on the chance that they could find new specimens. Already they had discovered a previously unknown variety of the toucan, a large-billed fruit-eating bird.

For lunch at the camp I had my first taste of mandioca, the starchy root of the cassava plant that is one of the chief foods of the Amazon. The substance looks like ground-up wood and that's exactly how it tastes.

It was raining in the late afternoon when we returned to the Cessna and the clouds were down in the treetops. We were weathered in and had to spend the night at the airstrip, sleeping in hammocks. To pass the evening we drove along a Jeep trail to the town of Irituia, an old river settlement that is served by a small cargo boat that occasionally comes up the river from Belem. Irituia is progressive. Its dirt streets are now lighted by street lamps that consist of naked 100-watt bulbs hanging from wires.

About a century ago an attempt was made to build a railroad in one part of the Amazon country, but the project had to be abandoned because the company ran

Airplane follows the road to one of the temporary landing strips which have been built every 50 miles along the road





Once on the dirt strips, the larger aircraft are turned around by hand. Planes often bog down in mudholes

out of men. Disease took its toll almost at the rate of one man for every railroad tie.

How, then, can a highway be built in virtually the same area? The answer is that conditions have changed and are still changing. First of all, the road commission and the contractors are using local labor, the small farmers who live in the jungle and are accustomed to its conditions. For another thing, sanitation has been improved vastly. The anopheles mosquito, the malaria carrier, is being eliminated. DDT has been so successful against mosquitos

that the number of malarial people in some small towns has dropped from an original 80 percent to less than two percent. Drinking water that is taken from muddy streams is boiled. Other health measures are being taken.

On the road itself there is a rolling hospital in the form of a large truck, complete to X-ray machine and operating table. It is used for emergency operations and for diagnosing illness; if necessary, a patient can be flown by light plane to the nearest

(Continued to page 242)

Temporary strips are used to drop food to workers. Below, men pick up bags of mandioca and corn



## Jar of Fibers Filters Water

Rust, sand and other dirt particles that sometimes reach household water supplies can be eliminated with a filter that fits on the cold-water pipe. The filter, consisting of cylindrical fibers housed in a plastic jar, is said to withstand temperatures up to 100 degrees F. To change a cartridge, the main valve above the filter is closed. Filters usually last about six weeks and are good until there is a noticeable drop in water pressure at the outlets.



## Bike With Detachable Bar Serves Brother and Sister

One bicycle manufacturer has found a way to end brother-sister squabbles over the same bike. The answer? A detachable bar that converts a girl's bike into a boy's bike. The bar can be used on a 20-inch size bike by connecting one end under the seat and the other to the handle-bar brace. According to the manufacturer, the bar fits securely enough to lift the bicycle. There's no need for the boy and girl to fight; they can both take their turns and feel right at home.



## Transistor Car Radio Built Into Mirror

Combined with the rear-view mirror, an all-transistor car radio is now being offered in Switzerland. No outside antenna is needed, but the radio requires an external speaker.

## Earth-Burrowing Rocket?

Have the Russians developed an underground rocket that burrows irrigation and pipeline tunnels? A Hungarian magazine recently reported that such rockets had been developed by Soviet engineers in a mountainous area near Afghanistan. American experts believe that the "rocket" must be similar to the well-known spalling equipment which uses oxygen-fed flame to flake away rock. They speculate that the Russian machine must have several flame-cutting heads.





### Loader for Superplanes

German inventiveness has come through with a practical method for hoisting heavy cargo up to the doors of today's super-size airplanes. A hydraulic loader lifts heavy loads in seconds. Resembling a huge ironing board in its raised position, the new elevator-on-wheels easily hoisted a Volkswagen sedan during a demonstration at Rhine-Main airport in Frankfurt, West Germany. The loader is capable of lifting a cargo of 3½ tons as high as 12 feet.



### Foam Strip Saves Finish

You can cushion any household item to prevent it from scratching a tabletop by applying strips of urethane foam plastic to the base. The stripping, ¾ inch wide and ¼ inch thick, is coated on one side with pressure-sensitive adhesive. It can also be used as weather stripping around doors, ventilators, and air conditioners.



### Radioactivity in Milk Measured by Detector

Scientists at the Los Alamos Scientific Laboratory use a large radiation detector to measure minute quantities of radioactive materials in milk. Dry-milk samples from 47 U. S. cities, 12 in Canada and 13 in other countries are studied to detect cesium-137, a major constituent of fallout from nuclear explosions. The detector can also measure the radioactivity in humans. Scientists say the machine has shown that the cesium count is high among humans in the same areas where it is high in the milk. Cesium's fallout partner is strontium-90. Cesium-137, however, enters body muscles and can damage reproductive organs, while strontium-90 damages mostly bone cells and is almost incapable of genetic injury. About 840 people were measured in the counter last year.



## Television Cameras Identify Workers

Closed-circuit television cameras are helping factory guards identify employees entering an auxiliary gate 350 feet away. Cameras at the gate pick up pictures of each worker which are shown on two television screens at the main gatehouse. One shows a split-screen image of the worker's face and badge. The other keeps him in sight as he passes through the turnstile in either direction. When proper identification has been made, the guard presses a button to open the electrically operated gate. An intercom system is used to answer any questions. Installed at the Gulf Oil Corporation refinery in Philadelphia, the system permits some 150 employees more convenient access to their working area, as they do not have to pass through the main gate. It also eliminates use of extra guards to watch the auxiliary entrance.



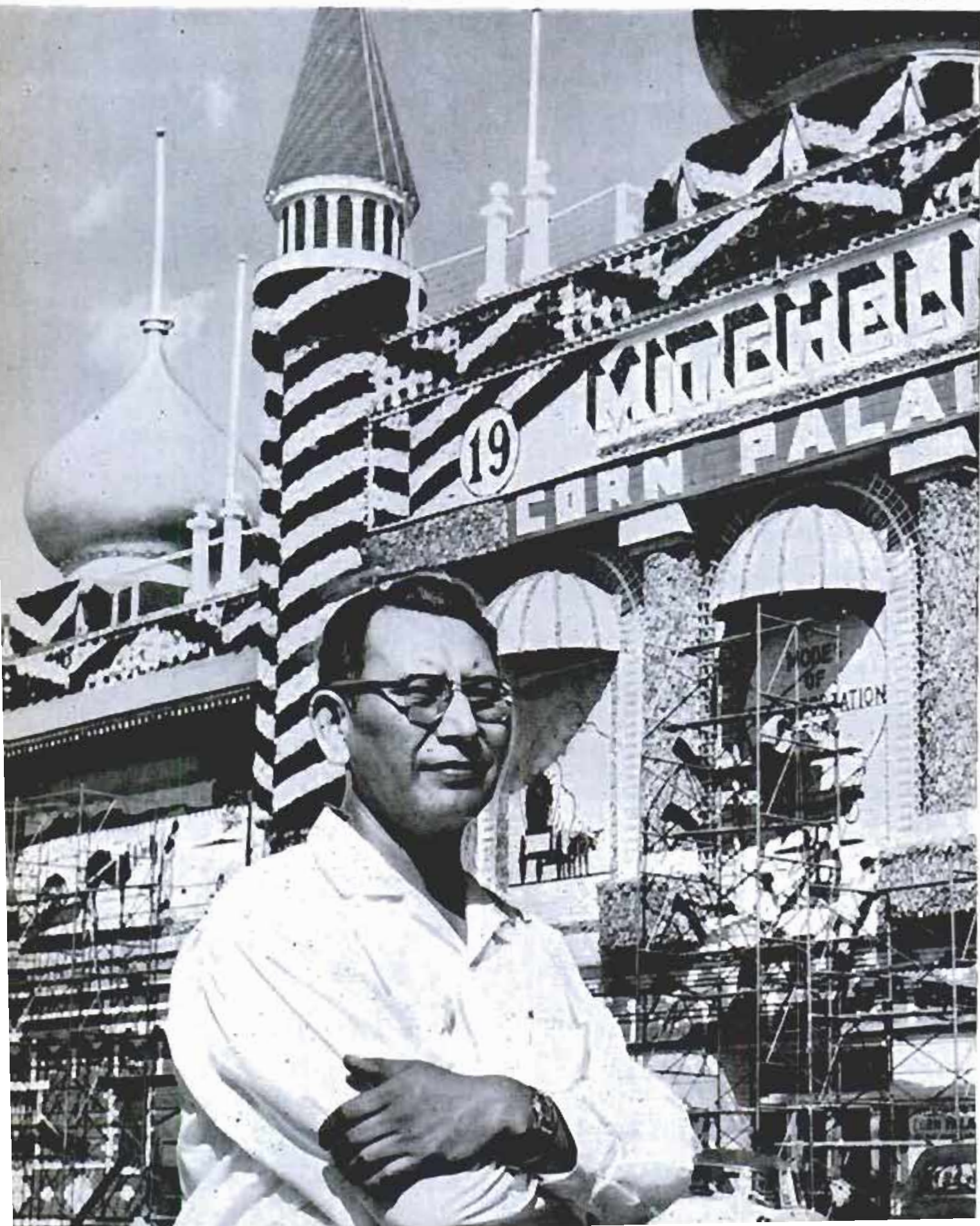
## Clear Chemical Coating Protects Color Transparencies

Color transparencies or black-and-white negatives can be protected permanently from air, moisture, heat, dust, wear and finger marks by dipping them in a new chemical coating. The coating also overcomes the tendency of film to become brittle with age. The slide is simply dipped into the liquid with tweezers and allowed to dry for about 45 minutes. The cost is less than a cent a slide, and the coating will neither distort the picture nor change color values. The coated film can be cleaned in hot water.

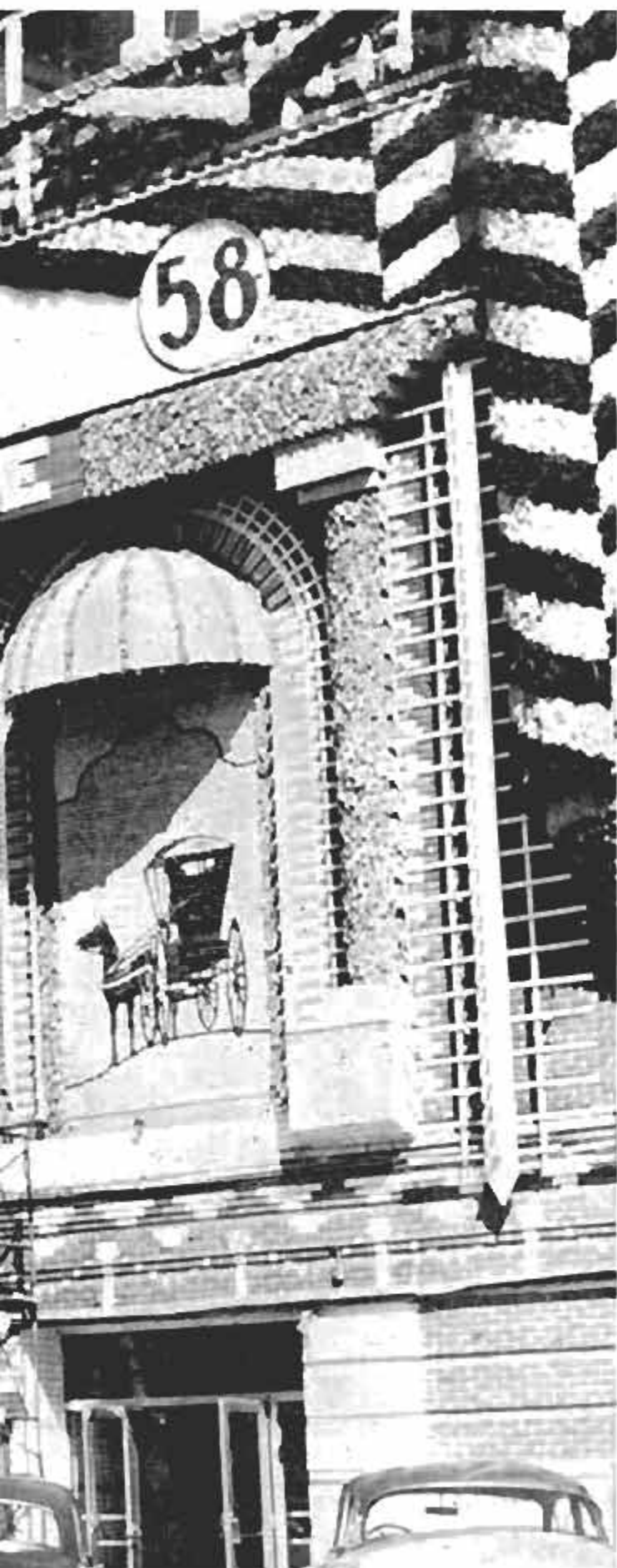


# THE PALACE THAT'S PAINTED WITH CORN

Oscar Howe, outstanding Indian artist, supervises work on his corn mosaics for the Mitchell Corn Palace



**WORLD'S ONLY CORN PALACE"** has been a trademark of Mitchell, S. D. since 1892, when two public-spirited citizens sparked a drive to build a cultural center for their growing city. Their earliest structure was a simple frame building decorated in geometric patterns with the dif-



ferent-colored corn grown in their area, but they dreamed of a building outstanding enough to be an attraction in itself. Those early ambitions were realized in the now-famous Byzantine structure which lures tourists from all over the country, and their early attempts at decoration are still reflected in the patterns of its brickwork.

But the most remarkable—and popular—feature is the practice of decorating the palace with colored corn, which has continued through the years and has developed into one of the most-unique mosaics in architecture.

### Indian Designs Panels

Since 1948, the big annual job of designing the 11 decorative panels on the two street sides of the building has been entrusted to the only Sioux Indian artist in the Middle West, Oscar Howe of Vermillion, S. D., who is recognized as outstanding among the 100 American Indian artists.

An art instructor at South Dakota University, Howe has won national awards in all major Indian art competitions, and his paintings are on exhibition in most major cities in the United States and in several foreign countries. In 1948, while teaching art at Dakota Wesleyan University in Mitchell, he was called in by the Corn Palace decorating committee when William Kearney, who was in charge of the decorations for years, fell ill and could not carry on. He has been designing the corn mosaics ever since.

### Designs Follow Regional Themes

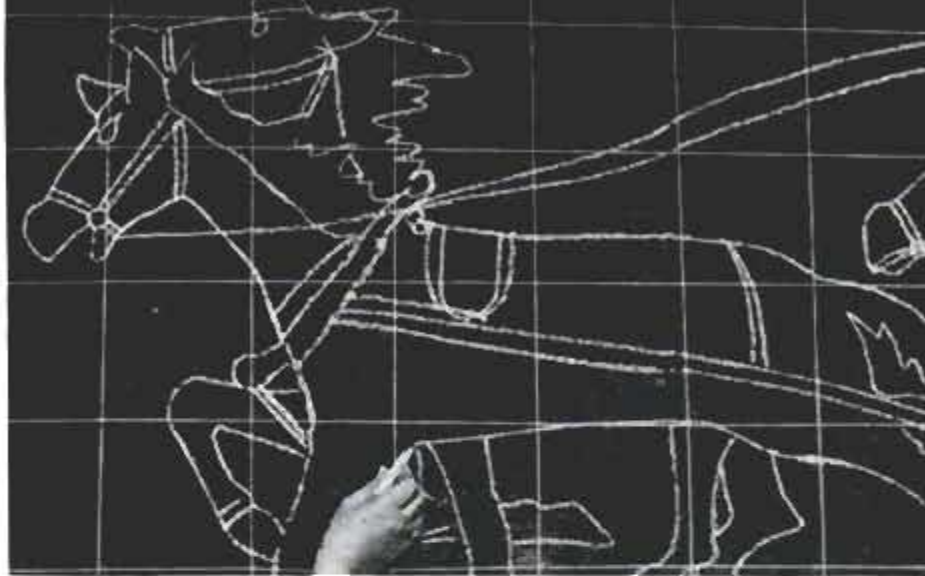
Three of the mosaic panels are 30 feet long and the remaining eight are 12 feet long. All are 12 feet high. All are keyed to an annual theme based on local life or history. The mosaics are executed in ears of red, yellow, brown, blue, white and calico corn grown especially for that purpose; in some years the job has required as many as a thousand bushels of corn. Great bunches of yellow-ear corn and dyed cornhusks complete the decoration of the building, which is timed for completion for the Corn Palace Festival, held during the fourth week in September each year.

The first three years after taking over the job, Howe designed the mosaics showing Indian culture. Next came scenes from the history of South Dakota; then themes based on the state's agricultural, business, religious and social life; one based on the 75th anniversary of the founding of Mitchell and an athletic theme. Then came the series shown on these pages—modes of transportation from 1892 to 1958.

Working in his home studio, Howe designs each year's new panels to scale, painting them in the bold corn colors that will



Heidi Howe watches husband finish a mosaic scale drawing



Hardest part of the job—Howe enlarges the scale drawing to a full-size pattern in chalk on gridded roofing paper to guide his workmen

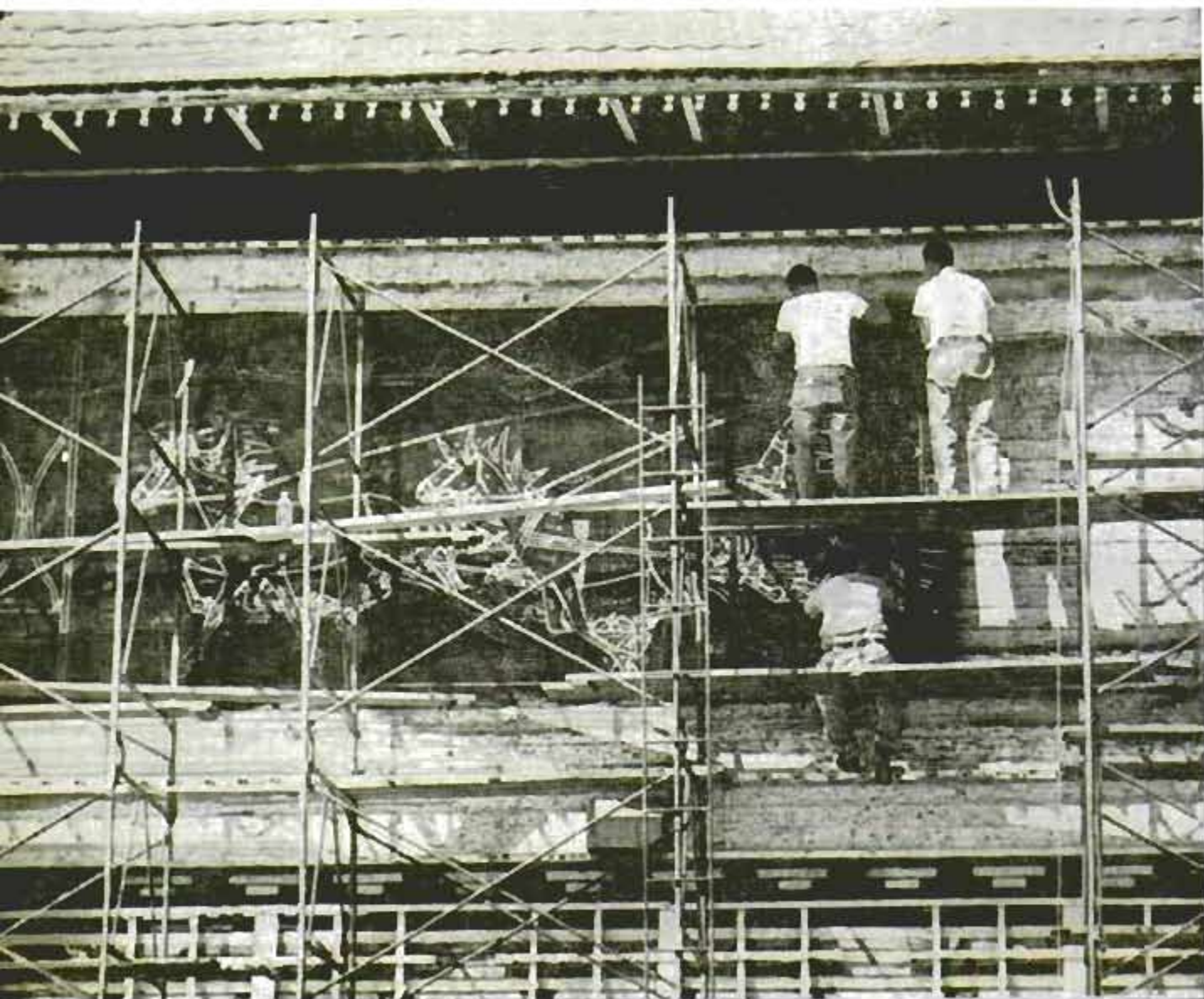
be used. After his proposed designs have been approved by the palace decorating committee, he begins the hardest part of the job—enlarging the sketches to full-size patterns for the decorating crew.

Working on a wall in the Mitchell Armory, he repeats the designs in chalk on

gridded-roofing paper, using the familiar craftsman's method of transferring squares. Each color section is marked for the color to fill it, so the workmen's job is much like working on a do-it-yourself oil painting with color-coded canvas.

The workmen attach those "black prints"

Workmen attach scale drawings to Corn Palace wall; mosaic this size will take about a week to finish







**Decorations** Foreman Sid Grinde splits the corn ears as needed to fill in the design



Following Howe's full-scale drawing and color guide, workmen nail split ears over pattern. Background is always yellow

to the assigned panels, and then begin nailing split ears of colored corn over the pattern, using three or four nails to each ear to hold it securely in place. It takes the crew about a week to finish one of the big panels, though several are worked on at the same time. Ordinary yellow field

corn is used for the background and is nailed in place first. Then the colored details are added. By the last week in September, the new mosaics are completed and the Corn Palace — perhaps the most colorful building in the Midwest—is ready for the festival. ★ ★ ★

**South wall of the Palace shows finished mosaic depicting modes of transportation from 1892 to 1958**





### Electronic Typewriter Operates by Light Beam

Remotely controlled to allow use by paraplegic patients, an electric typewriter is operated by directing a headlamp beam against a keyboard of photoelectric cells. Using neck and head muscles, which have the greatest residual control, some patients can type up to 30 words per minute and can communicate though otherwise paralyzed.



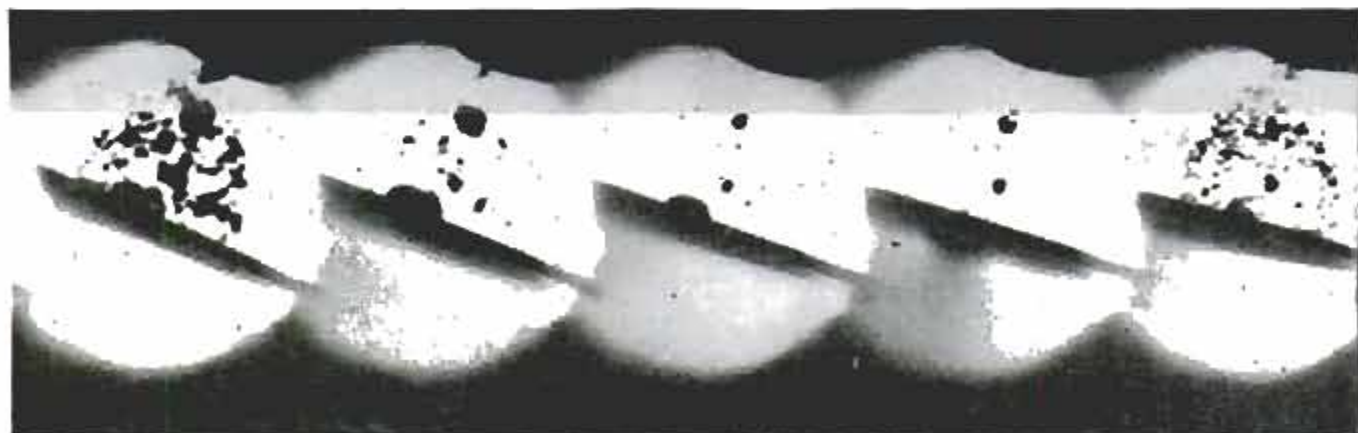
### World's Smallest Watch?

Believed to be the world's smallest timepiece, this tiny watch, mounted like a gemstone in a gold ring, was one of the displays at the 1959 Basel Watch Fair held by Swiss watch manufacturers.

### Superfast Movie Camera Photographs Bubbles on Propeller

Working at a shutter speed of one million frames per second, a camera developed by the California Institute of Technology has photographed the life history of the cavitation bubbles which cause metal fa-

tigue in ship propellers. The bubbles collect on fast-moving metal in water and create pressure waves of several thousand pounds per square inch when they break, causing strains that disintegrate the metal.





## Remember This Old-Timer? It's Back as a Crop Duster

Growth of agricultural aviation has revived interest in the 20-year-old Kellett autogiro. In crop-spraying operations it can fly close to the ground at speeds as low as 22 miles per hour, whereas most fixed-wing aircraft have a minimum speed of 70 miles per hour. The autogiro is comparatively inexpensive, and a qualified pilot can learn to fly it in three hours. Powered

by a 225-horsepower engine, it has a cruising speed of 100 miles per hour and a service ceiling of 14,000 feet. Take-off requires no runway, and landing can be accomplished in an area only slightly larger than the diameter of the rotors. In addition to agriculture, the craft can be used in power-line and pipeline inspection, aerial photography, forest-fire patrol and forest seeding.

## Pedal Blocks on Trike Never Scrape Sidewalk

Raising pedal height  $2\frac{1}{2}$  to 3 inches without decreasing lower pedal clearance, a new tricycle-pedal extension allows small children to ride big tricycles, increasing the useful life of the trike by at least two years. The pedals are kept in position by a tube which slides over a piston-type rod attached to the handle bars.

### *Number, Please!*

Whenever you write us to .

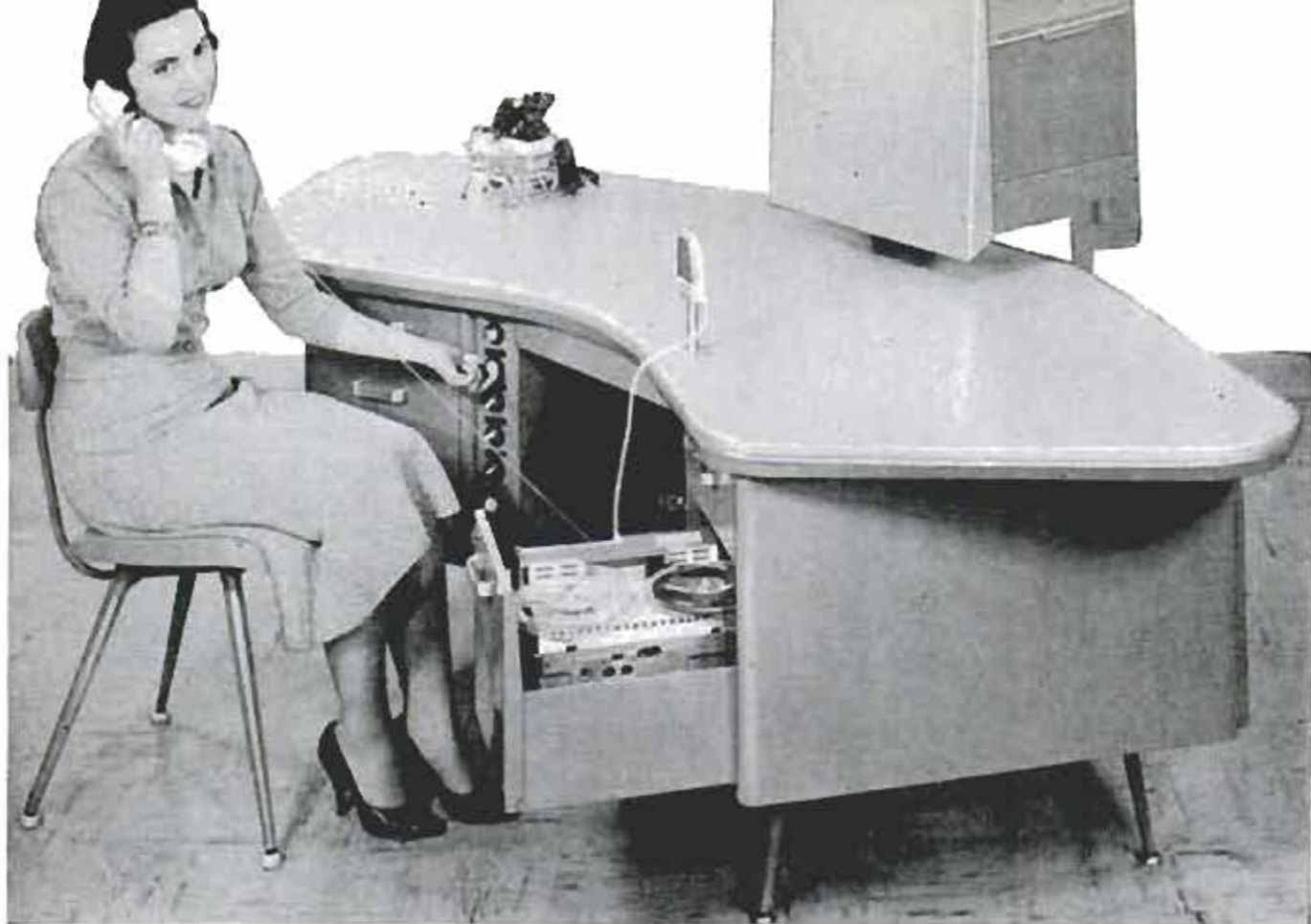
- Renew your subscription
- Change your address
- Order your own or a gift subscription

... In fact, whenever you write us,

**PLEASE INCLUDE YOUR CITY POSTAL ZONE NUMBER IN YOUR ADDRESS**

*This insures better delivery  
It helps you and it helps the postman.*





## Everything But the Apple Built Into Teacher's Desk

Designed for education of the future, an experimental teacher's desk has a built-in television set and gives the instructor electronic aids for her class. The TV set, adaptable for closed-circuit and direct telecasts, fits beneath the top of the desk when not in use. To bring it into position, the teacher presses a switch and it rises to the top of the desk with the 21-inch screen facing the students. Another switch puts it away. Electronic controls close the draperies and turn off lights. The desk also contains a tape recorder and a telephone.



## Chart Light for Boats Also Lights Cigarettes

Installed on the dashboard of your boat, a chart light also serves as a cigarette lighter. A chrome mounting plate simplifies installation. While reading a map or chart, the boater flips the switch on the cockpit light. When not being used as a light, the mechanism pulls out like an ordinary car lighter. It comes in both 6 and 12-volt models.

☐ In 1960, the United States plans to launch about 15 satellites and space probes and 100 sounding rockets.





Girl can easily balance herself on wooden ball, since it can move only backward and forward while following spiral rail



Kimpel designed this game for table or sickbed. Object is to hit other person's ball

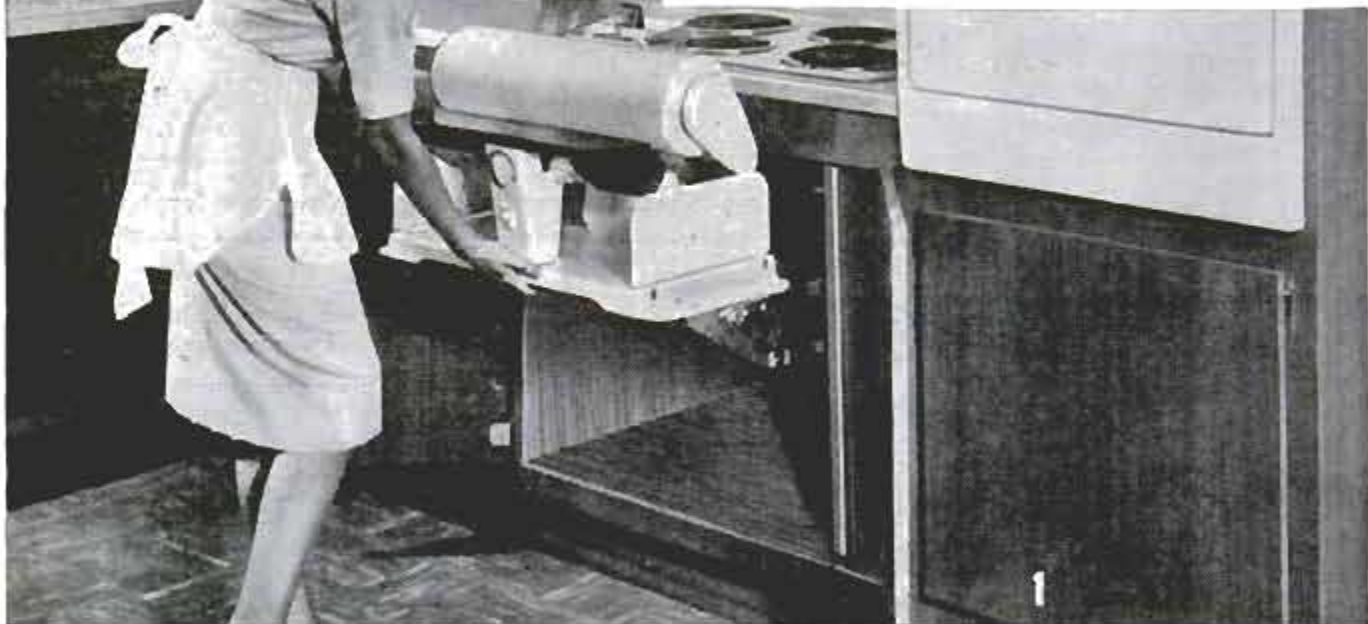
## Playground Goes Modern

RECREATIONAL equipment in Ulm, Germany has a new look. Designed by an architect named Joachim Kimpel, it stresses function and mechanics, and pushes psychology into the background. Kimpel's innovations include a climbing arch, a Ferris wheel that requires the body weight of just three passengers to keep it going, and a tug-of-war game in which contestants pull on rings instead of rope. The children of Ulm like the toys so much they call Kimpel their "Uncle Joachim."

Ferris wheel runs on three childpower. In tug-of-war, youngsters grab hold of rings



# WHAT'S NEW FOR Your Home



**1. AUTOMATIC IRONER** can be installed in any standard base cabinet now popular in kitchens. When installed, the ironer pulls up easily into working position. A slight push, after releasing catch, causes it to ease down slowly and disappear in the cabinet where it remains unseen when not in use

Ironrite, Inc., Mount Clemens, Mich.

**2. ELECTRICALLY-POWERED BABY CRADLE**, bottom left, eliminates rocking baby to sleep. When turned on, mechanism starts a gentle rocking motion and plays Brahms' Lullaby. Other attachments convert it into a nursery for play. A detachable horse replica converts combination cradle and nursery into a hobbyhorse

Stauffer Reducing, Inc., 1919 Vineburn Ave., Los Angeles 32, Calif.



**3. SALAD MAKER** comes equipped with five rust-resistant interchangeable steel disks that help prepare vegetables or fruits, nuts and cheese, from coarsely chopped to powder-fine. The mechanism slices, chops, shreds, grates and will even shave ice

Mouli Mfg. Corp., 91 Broadway, Jersey City 6, N. J.





4

**4. AUTOMATIC WASHING TOOL** turns water on and off without using nozzle. Turned on at faucet, water stops at sponge head, which connects to hose. When sponge is pressed lightly to surface water flows

Hopkins Mfg. Corp., Emporia, Kans.



5

**5. LIQUID CHARCOAL LIGHTER** causes stubborn charcoal to burn instantly for outdoor parties. Packed in a no-leak, no-spill, pushbutton can, the foam is sprayed over the grill and spreads flame over entire cooking surface

Defiance Corp., 170 E. Vernor Hwy., Detroit 1, Mich.

**6. BATTERY-POWERED MIXER**, right, can take care of small mixing chores around the house, boat or camping site. Useful for mixing chocolate drinks, eggs, baby foods or salad dressings, the mixer operates on a flashlight battery

Jet Corp. of America, Commercial Trust Bldg., Philadelphia 2, Pa.



6

**7. DIALED VEGETABLE SLICER** is equipped with one straight and one corrugated-steel blade. Dial on the machine adjusts the thickness of each slice. Vegetable is pushed forward by guard and slices drop into plate at end

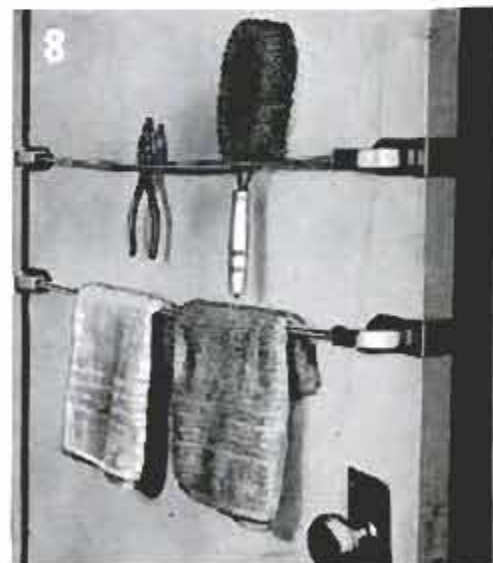
Popeil Eros., Inc., 14 N. Sangamon, Chicago 7

**8. SPIRAL UTILITY RACK** stretches across any door without nails or screws and provides extra hanging space for towels, laundry, clothing, household accessories and tools. It fits all standard doors, even sliding doors, from 22 to 36 inches wide

Direct Promotions, 114 E. 32nd St., New York City 16



7



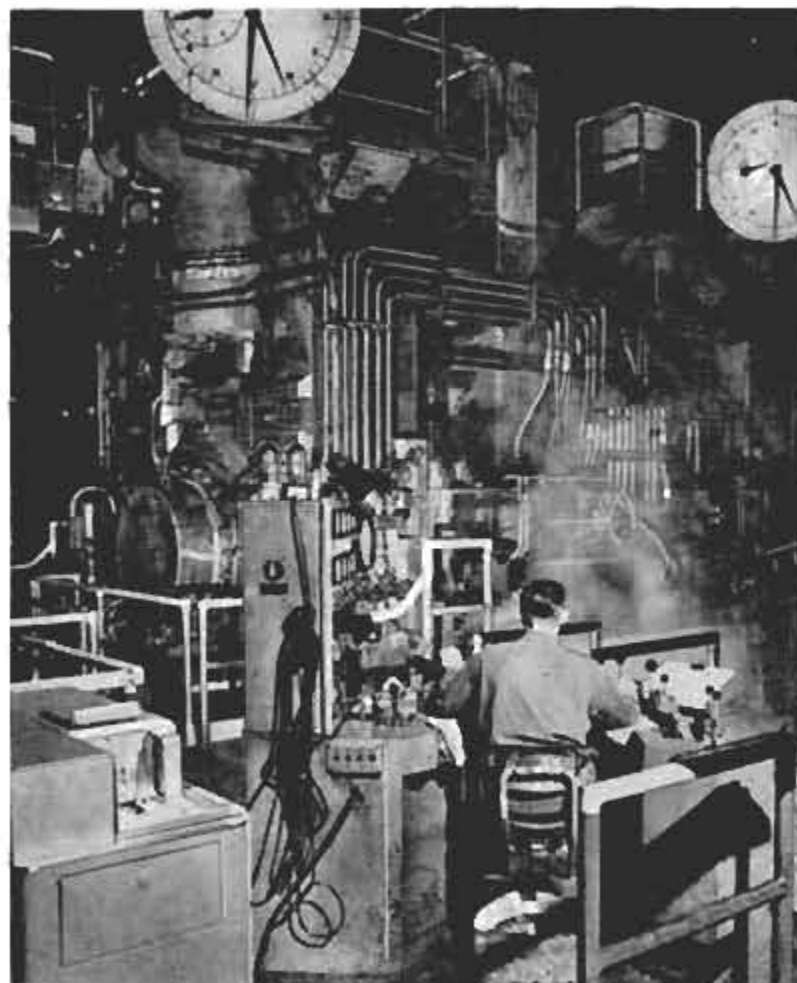
8



## One Hand-Lever Controls Speed and Gears of Tractor

Drivers of the new Ford tractors can change gears and speeds with just one hand lever. There's no clutch pedal, and changes can be made while the tractor is in motion. Ten forward speeds, two reverse

speeds and a "neutral" and "park" position are provided. Gear ratios and ground speeds show on a lighted dial. Forward speeds range from .6 mile per hour to more than 18 miles per hour.



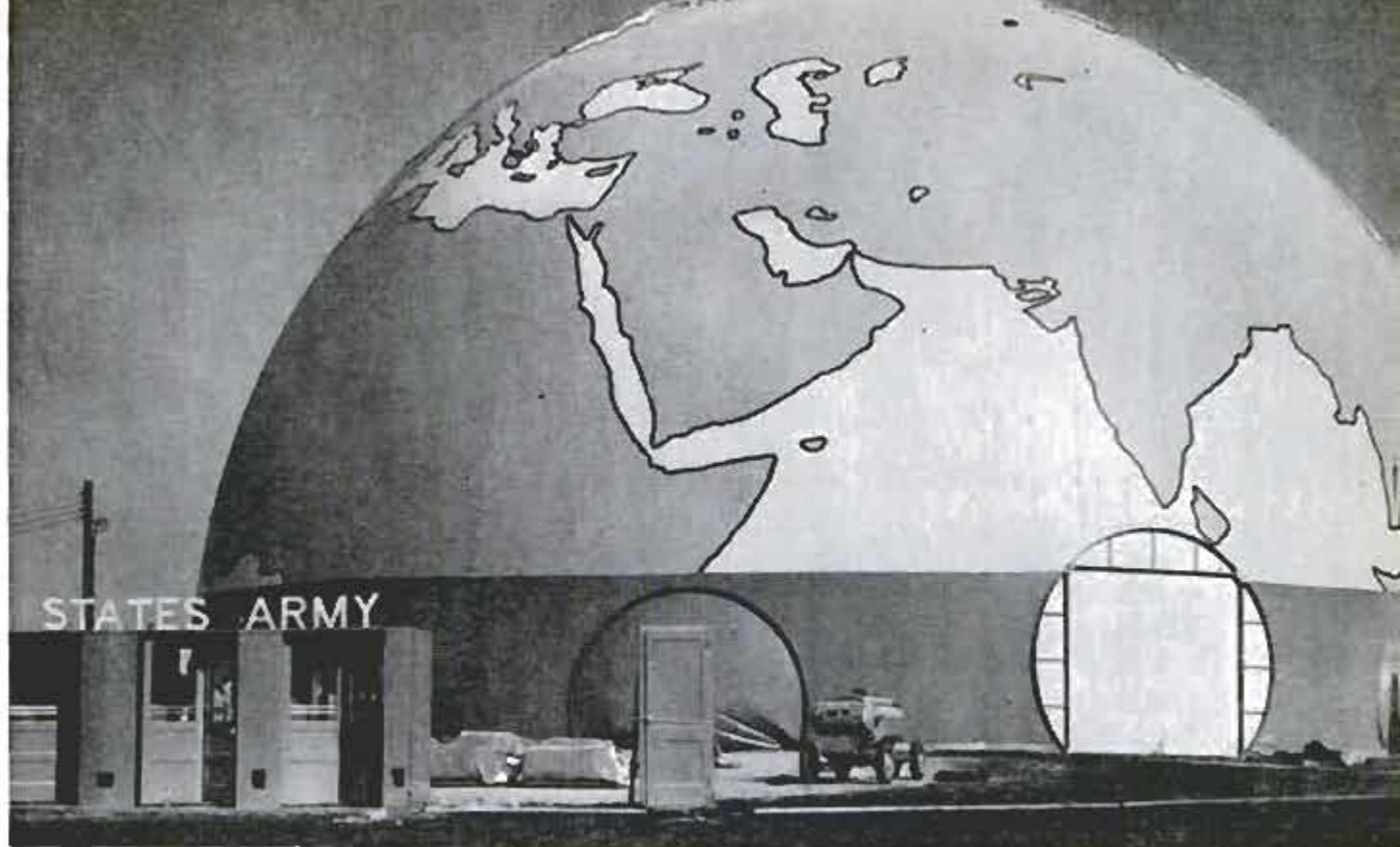
## IBM Cards Rule Mill Rolling Aluminum Slabs

Aluminum billets are worked into slabs on the first electronically controlled rolling mill to be used in the light-metal industry. An automatic system, following instructions on IBM cards, establishes mill speed and roll opening for a 160-inch reversing mill. The breakdown mill rolls 16-inch-thick billets into 3 to 4-inch slabs.

## "Pitcher" Hurls Bomb Away From Plane

Dropping bombs from supersonic fighter-bombers such as the Air Force F-105 presents a problem, since air pressure at speeds up to Mach II can force the bomb back into the bomb bay or bounce it against the belly of the aircraft. Republic Aviation has found one solution after 18 months of testing. A pneumatic-tube bomb "pitcher" uses 30,000 pounds of air pressure to throw the bomb clear at any speed.



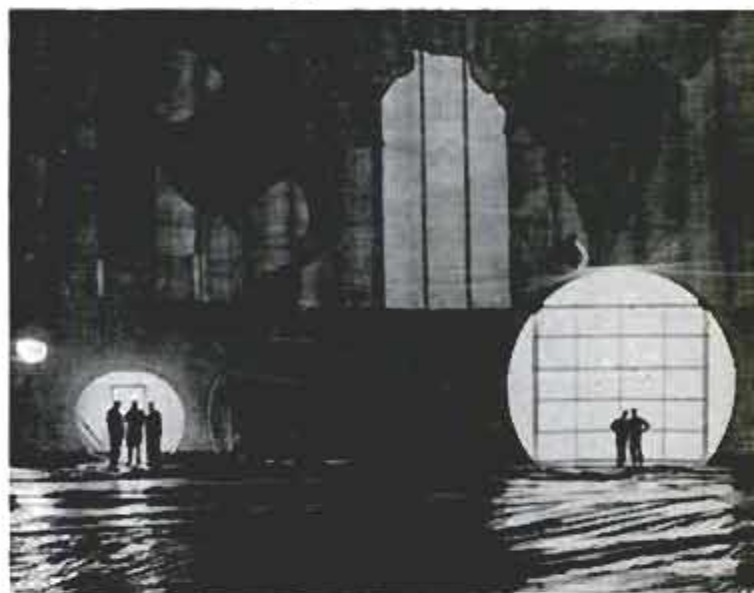


Fully inflated, the "Pentadome" will hold even the largest missiles in horizontal or vertical position

## Huge "Balloon" Will Shelter Largest Missiles

NINE STORIES HIGH and covering 17,500 square feet but erected in a single day, a huge air-supported structure is designed to shelter missile-maintenance operations. Made of 18,000 square yards of fabric, the shelter has no framework. It requires 1,060,000 cubic feet of air for support, but at only .03 pound per square inch pressure. Walk-in doors allow easy access; large loads enter through a 100-foot air lock. The completely portable structure forms the nucleus of a five-section shelter unit being tested by the Army Ordnance and Missile Departments.

Twelve electric-powered centrifugal blowers move a quarter-million cubic feet of air per minute to fill and support the huge vinyl-coated nylon envelope





Dorothy Collins makes test recording in husband Raymond Scott's home recording studio as Scott works dials

## MUSICAL HOUSE FOR

**T**HE HOUSE WHERE Composer Raymond Scott, Singer Dorothy Collins and their two children live in Manhasset, N. Y., is not a home in any ordinary sense. It is a 32-room musical labyrinth, and a testament to Scott's electronic genius.

A self-taught audio engineer, Scott has filled many of the rooms with electronic instruments that have confounded highly trained experts in his field. He uses them in his composing and recording chores.

Scott, who composes everything from musical scores for films to singing commercials, was formerly with "Hit Parade" where his wife still performs as a singer. Scott's creative talent for musical innovation has become well known through the Raymond Scott quintet, which has pioneered in unconventional sounds for more than a decade.

To create these sounds, Scott has developed some unusual electronic instruments which, along with a recording studio, a film projection room and a ham-radio setup,

make his home a musical showplace.

One of his instruments, called a "clavivox," is a piano-type keyboard instrument with two unusual features. First, it can slide smoothly in pitch from any note on the keyboard to any other without a break or hesitation. Secondly, it uses two foot pedals to make a humanlike vibrato control. It is said to be the only instrument that can produce this combination of effects, and very nearly duplicates the human voice.

For writing film scores, Scott has developed an instrument which he calls the "videola." From its place on top of the living-room piano, the mechanism operates a movie film in a projection room in another part of the house by remote control.

The movie is flashed on a television screen on the piano, so that Scott can watch the film as he composes appropriate music. A recording apparatus is hooked up to the videola, as well, so that he can stop, play back, listen, rub out and rewrite.

Scott also holds a patent on an automatic scanning radio, which tunes in on stations around the country and changes frequency by itself at any given interval, enabling him to catch most of the nation's disc-jockey shows in a brief span and find out what tunes are being played.

Among other instruments which Scott has developed are a device that automatically finds a selection in a particular recording tape and continues to repeat it as long as he wants it repeated, and a remote control instrument that enables him to make recorder selections from another part of the house.

Along with these special developments, Raymond's and Dorothy's mansion contains a completely equipped recording studio, a film-projection room and, in the basement, an immense workshop and storeroom, where all of the electronic innovations have been made.

In fact, Scott employs a full-time engineering assistant whose job it is to help build and maintain the equipment which he is constantly creating. The exact value of the electronic installations is unknown, but Scott estimates that it would cost him a "couple of



Dorothy and daughter Debbie listen as Scott explains the intricacy of equipment which he developed for his own needs

*By Alan D. Haas*

## A MUSICAL FAMILY

A Scott invention, the "clavivox" is a keyboard instrument that sounds quite similar to human voice

Another Scott specialty, the "videola" flashes movie film on TV screen to help musician write score





A ham-radio enthusiast, Scott has a complete radio unit for tuning in worldwide amateur broadcasts



Scott hears nation's hit tunes with automatic scanning radio that picks up stations around country

hundred thousand dollars" to replace them.

Scott's house has neither a hi-fi nor a stereophonic system because he thinks that "adequate modern-day reproduction" is all that is required. He believes that "in these days of elaborate high-fidelity installations,

there is too great an emphasis on the method of reproduction rather than what is being reproduced."

As might be expected, the Scott household, which includes Elizabeth, 1, Debbie, 4 and Dorothy, is filled literally with music. Dorothy can usually be found in the recording studio trying out a new tune, listening to a playback or trying to get her husband to explain what all the dials are for.

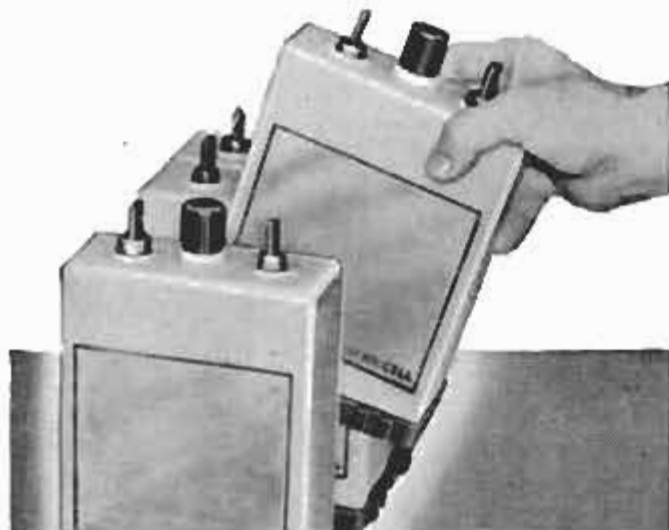
Despite her musical training, she confesses that she is mystified by a good part of the equipment which has turned her household into a conservatory of music. Debbie, already showing signs of following the family tradition, plays the piano remarkably well for her age. Elizabeth has not yet shown any preference for an instrument, but is rapidly developing into a good listener—she has very little choice.

Despite the many demands of their busy careers (Scott is writing a musical play along with producing television commercial jingles), Raymond and Dorothy have kept their family life alive, with music as the binding force. The Scotts are definitely in tune with each other. ★ ★ ★



Scott uses microscope to see that grooves are cut correctly on test record made in his home studio

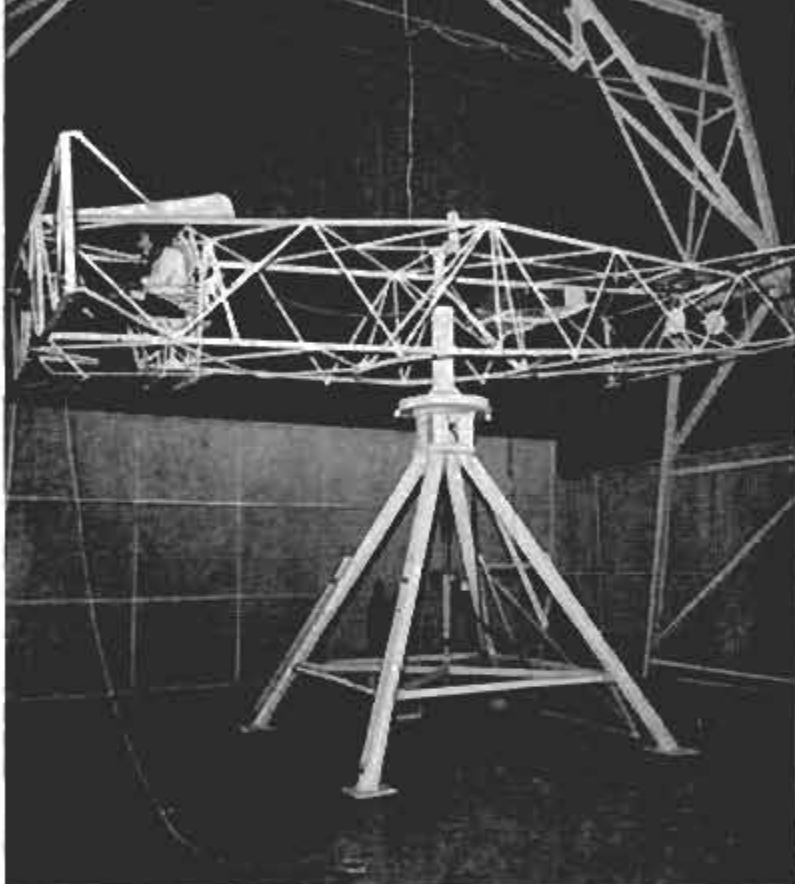
## Two-Volt Replaceable Cells Build Marine Battery



Now you can buy marine batteries with replaceable cells. Each of the interlocking plastic-case cells produces two volts, and groups of them can be arranged in nearly any configuration desired. Use of selenium in the battery units eliminates the problem of sulphation, which kills many conventional cells. The selenium also permits easier flow of current and maintains the battery charge during periods of idleness. Over-all weight of the battery is reduced by the use of plastic cell cases, plus selenium in the power circuits.

## Earthbound "Spaceship" Tests Control Systems

Balanced on a near-frictionless air bearing and moved by blasts of compressed gas, a reaction-control simulator was built by aircraft engineers to study the problems of controlling vehicles in airless space where conventional aircraft control surfaces are useless. By regulating the force and direction of the gas jets, the operator can turn the simulator into various positions of pitch, roll and yaw, duplicating many of the conditions expected in controlled space flight. In addition to the gas-jet systems, methods of control by flywheel inertia and gyroscopes will also be tried. Different sizes and weights of vehicles can be simulated by weighting the framework.



## "Squashed Up" Car Solves Parking Headache

Britain's auto market offers a plastic three-wheeler that can be parked in six feet of curb space. Called "Scootacar," the tiny vehicle has handle-bar steering and an eight-horsepower engine. It seats two adults in front and two children in back. Top speed is 50 miles per hour.

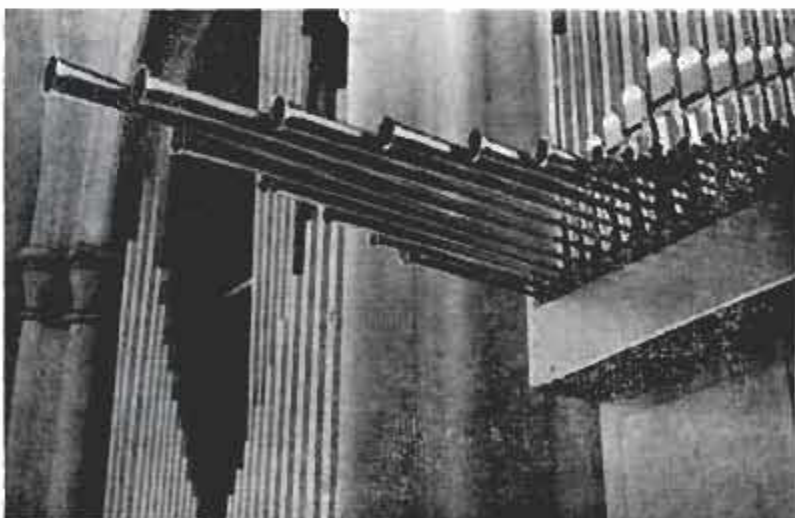


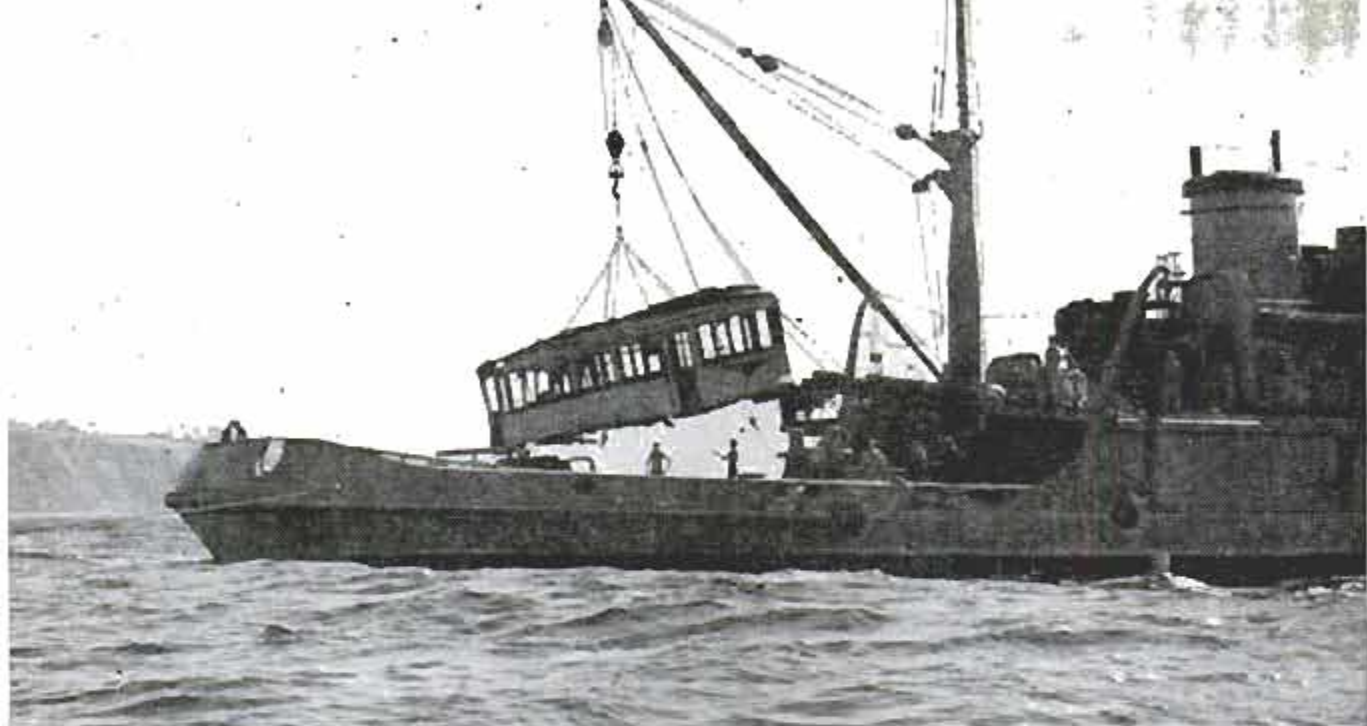
## Newsprint From Eucalyptus

Newsprint is now being manufactured from eucalyptus wood in Tasmania. The mill at Boyer is Australia's only newsprint plant and is reputed to be the only place in the world where hardwood is processed into newsprint.

## Horizontal Pipes Improve Organ Tone

Persons going into the newly rebuilt St. Matthias Church in West Germany for the first time are mildly taken aback when they notice the unusual arrangement of organ pipes. When the church was restored after destruction in World War II, a new set of pipes, called "Spanish trumpets," was placed horizontally instead of vertically. The arrangement is said to improve the tonal quality of the instrument significantly.





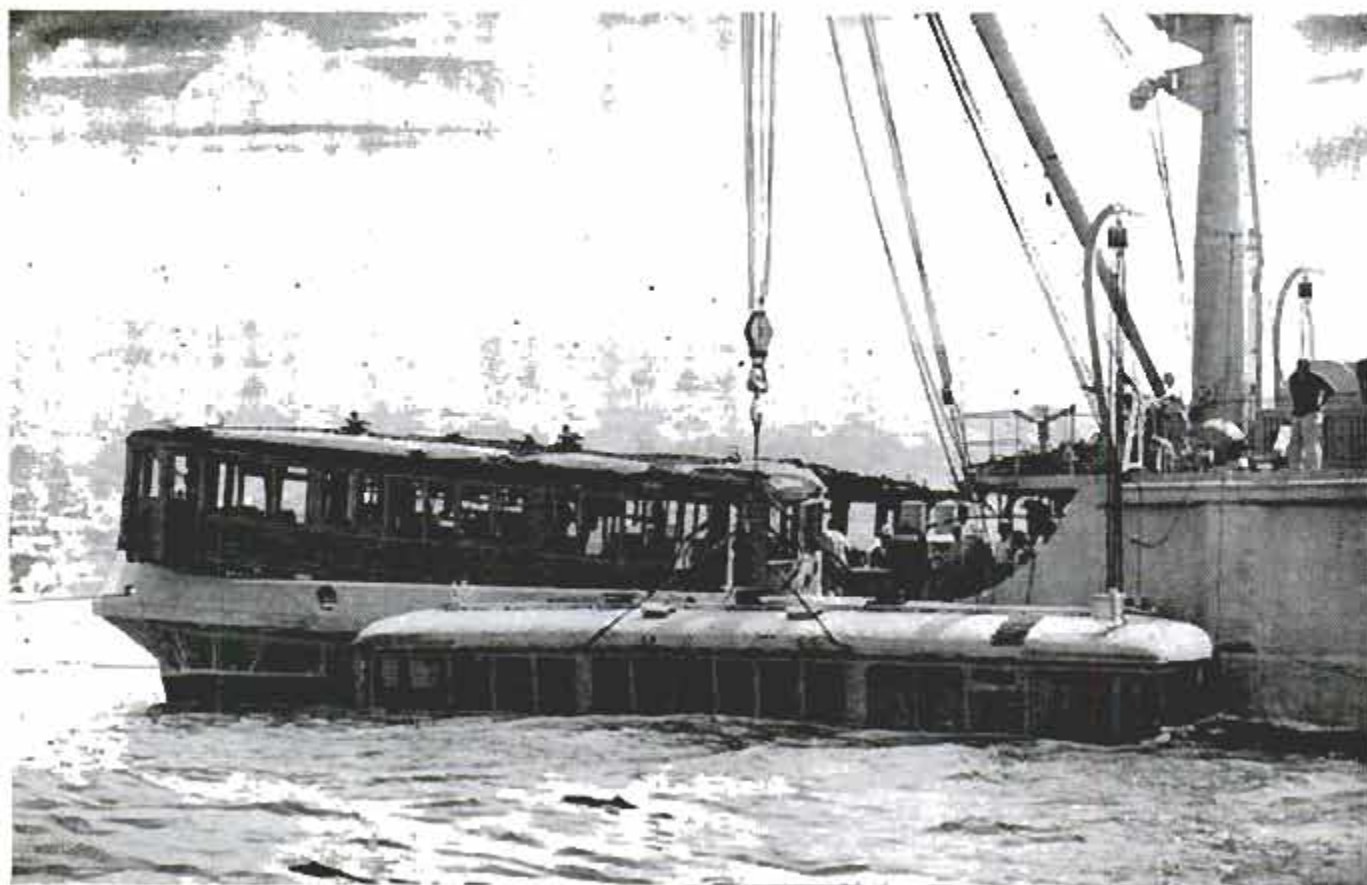
Derrick on a Navy tug hoists junked trolley car. It will be lowered into water as home to attract fish

## Old Trolleys Attract Fish to Once-Barren Waters

RELICS FROM TROLLEY LINES are proving to be castles for fish. Biologists on the West Coast have found that junked streetcars make attractive homes for fish in waters where they failed to gather before. Diving biologists, aware that fish congregate around wrecked ships, created an artificial reef from half a dozen six-ton streetcars by sinking them in 60-foot-deep

ocean waters off the Redondo-Palos Verdes coastline in Southern California. The result? Curious fish, among them, perch, kelpfish, seabass and yellowtail, have made the trolleys their homes. The trolleys were moved to the site by barge, then transferred to a Navy tug. A derrick lowered each trolley into the water—apparently to the delight of the fish.

One by one, a half dozen six-ton streetcars are placed in 60-foot-deep waters, forming an artificial reef



# Coming Next Month

## Annual **HOME** Issue

50 Exciting Pages  
of NEW IDEAS

The  
Indoor—



—Outdoor  
House



Planned around a swimming-pool patio, with strategically placed glass walls, uniquely spacious areas for luxurious modern living, and fresh ideas in every room, this beautiful home was designed by the nationally famous architect Edward V. Dart, with *Popular Mechanics* readers specifically in mind.

### FOUR PAGES OF FULL-COLOR VIEWS OF THIS HOME— *Along With Many Other Outstanding Features:*

- Ten simple things you can do to increase the value of your home
- Exciting news about the latest in home heating — electricity
- Tips on year 'round landscaping in all areas of the nation
- Putting your house in shape to sell
- How building codes affect wings and additions you plan to build
- How to estimate what YOU can afford to pay for a new house
- Parade of new ideas in home plans from all areas of the country
- How to hide basement eyesores

### PLUS A HOARD OF NEW IDEAS FOR HOMEOWNERS



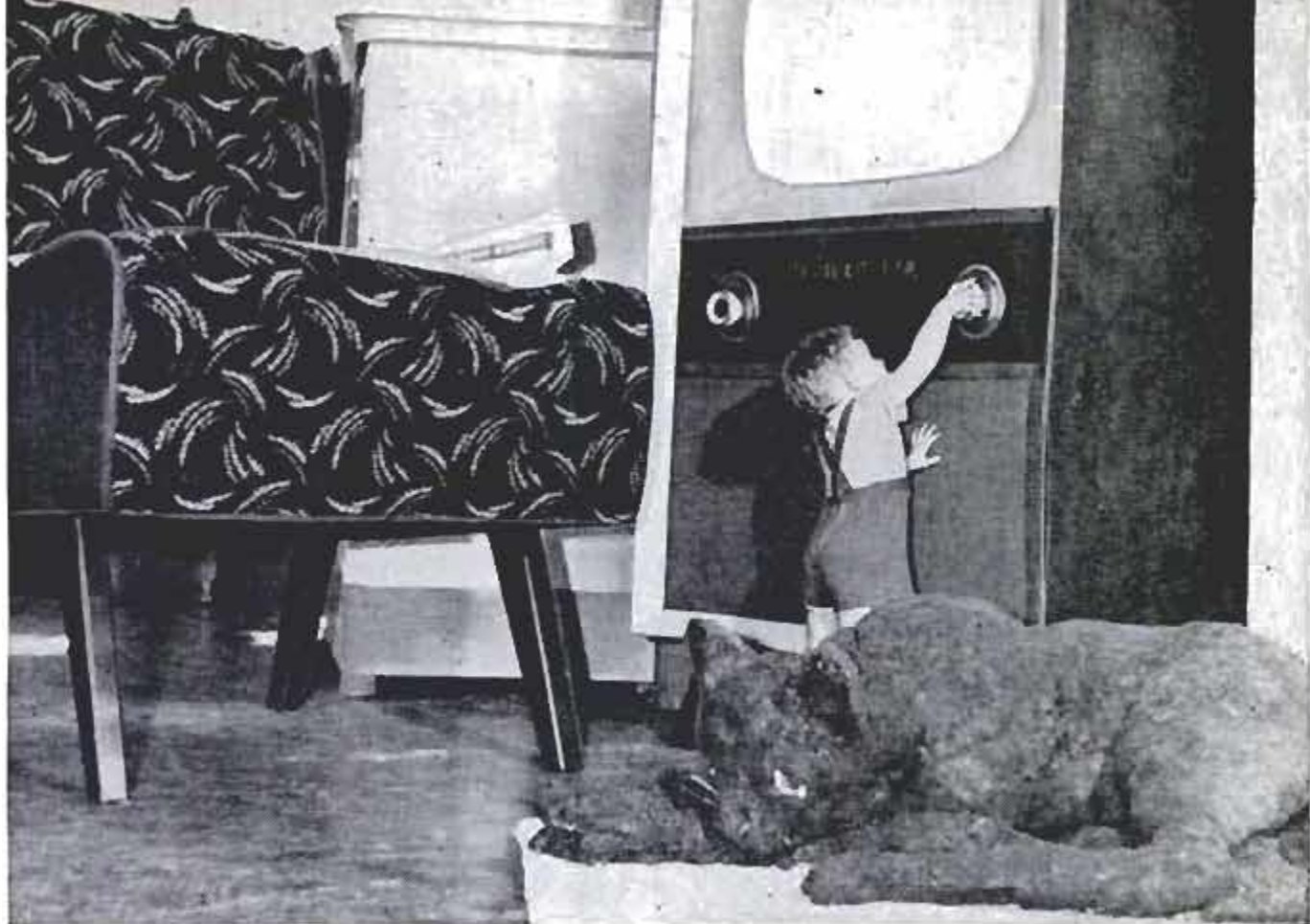
Giant "father" turns from newspaper to look at tot, who is wandering through exhibit designed for adults

## A CHILD IN A GIANT'S WORLD

**H**OW DOES IT FEEL to live in a child's world where people are giants, furniture is mountainous and distances are vast? In Nottingham, England, architect Paul Ritter has built an exhibit with furnishings  $2\frac{1}{2}$  times their normal size. Adults wander-

ing through the exhibit get a striking lesson in how the world appears to their youngsters. Occasionally it alters their "point of view" toward child rearing. And when a *real* three-year-old appears on the scene, as shown here, he's truly in a giant's world.

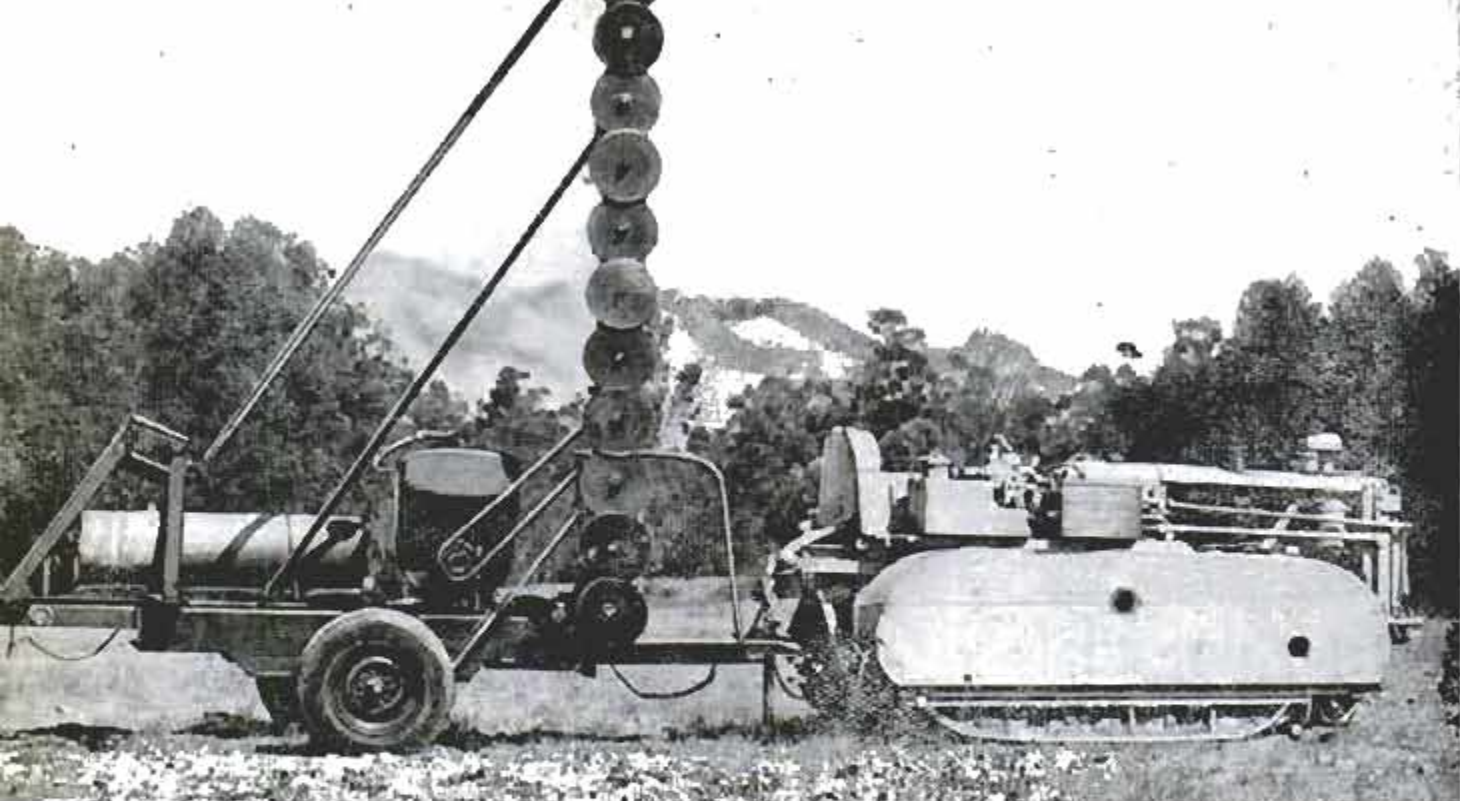




Three-year-old edges past terrifying tabby and stands on tiptoe to fiddle with "big screen" television set



To a tot, "small" household items are huge, and he sees bottom of a table more frequently than the top



### Machine Pruning Cuts Cost

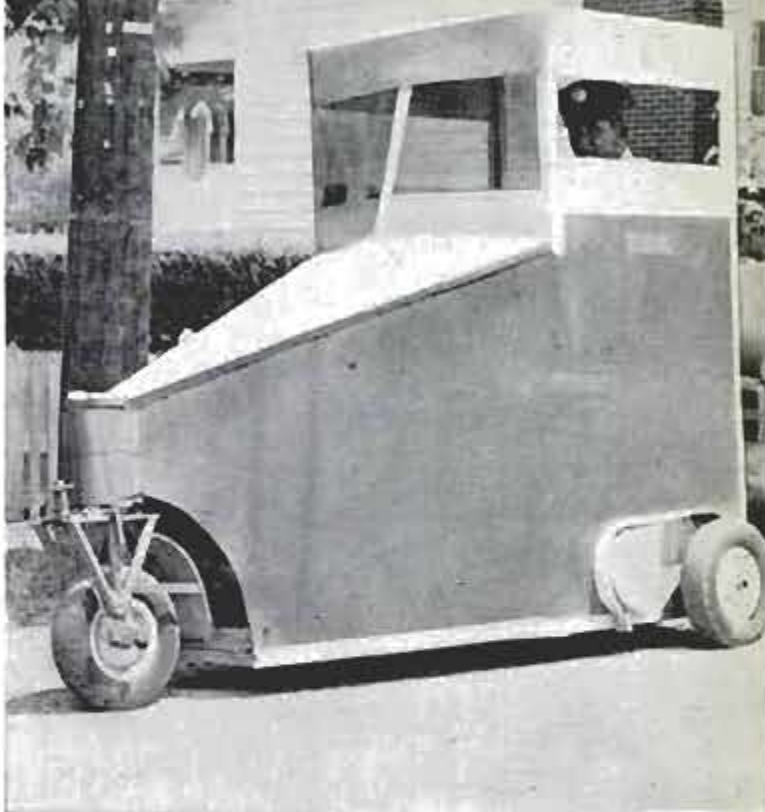
Hedging and topping machines are cutting citrus-pruning costs by 30 to 50 percent. The hedger shown above has twelve 14-inch saws and can prune lemons, oranges or grapefruit on two sides of a row at the rate of  $\frac{3}{4}$  to 1 acre per hour. At the left is a heavy-duty topping machine. The orange tree being topped has had four to five feet cut off.



### Sidewalks Steam-Cleaned

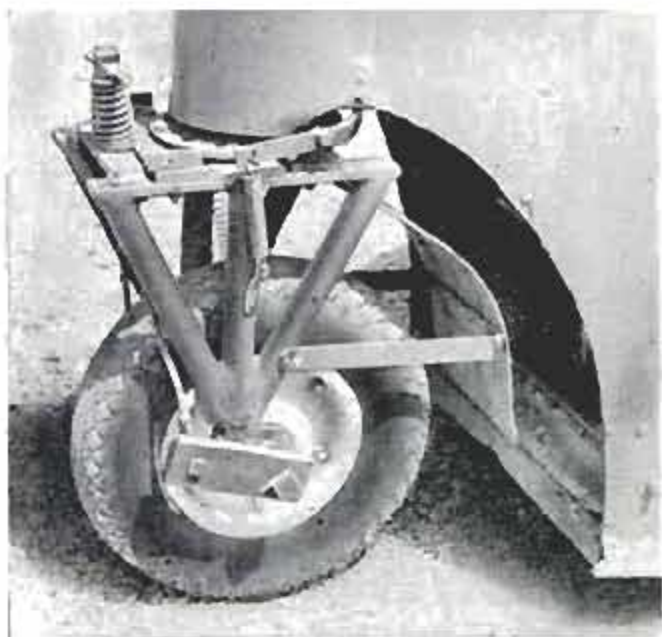
Downtown sidewalks in San Jose, Calif. have been steam-cleaned by two portable, oil-fired rigs that create steam in burners. Chemical detergents and caustics are added to the steam. Gums and tars on the walk are loosened by a solution composed of five chemicals. Then the steam operation cleans and bleaches the walk. Power is supplied by generators on the rigs.





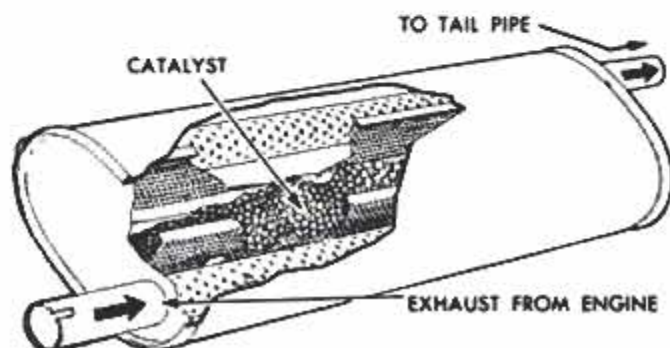
### Mailman Covers Route In Homemade Truck

Delivering the mail each day doesn't tire the legs of a Falmouth, Ky., letter carrier. He rides over his route in a miniature homemade truck. Put together from scrap parts of machinery, and powered by a 6.8-horsepower, air-cooled engine, the little truck was built with an eye on practicality. It has plenty of space for packages, the mail bag and a seat for the driver. The frame, made of one-inch galvanized pipe, is covered with strips of hardboard and aluminum. The steering system consists of a steering rod connected to a worm gear from a washing machine, which is attached to the front wheel.



### Converter Cuts Exhaust

Automobiles can now be equipped with a catalytic converter that reduces exhaust hydrocarbons, which are believed to contribute to smog formation. The muffler contains pellets coated with vanadium pentoxide, which eliminate a major part of the unburned hydrocarbons in the flow of exhaust gases. The device has standard exhaust and tail pipes.





Geological Survey party heads for testing ground in station wagon and "Squash Bug," a mobile laboratory

By  
Sterling  
Gleason

# THE "SQUASH BUG"

Dr. E. H. Bailey, left, geologist in U.S.G.S. party, sieves test sample that assistant has pulverized



**I**F YOU THINK the day of great bonanzas is past, the geologists and chemists of the U. S. Geological Survey have a surprise for you.

They're field-testing mineral-locating techniques that will open up a new frontier for prospecting—the uncounted "blind" ore deposits that show no visible clue at the surface.

U.S.G.S. is gunning not merely for individual ore bodies but for vast metal-rich districts that will be prime hunting grounds like yesterday's Cripple Creek and Mother Lode areas. Its geologists point out that we're still getting most of our key metals from last century's discoveries, made at spots where certain old formations lay exposed to view. Tomorrow's great strikes must come through new techniques that can penetrate below the surface.

U.S.G.S. is using new organic reagents that undergo remarkable changes of color when microscopic amounts of metal are added to them. At present most of the reagents are handled by highly skilled chemists, but, already, simplified kits that almost anyone can learn to use are on the market



Metal traces can be found almost anywhere. Twigs may contain telltale traces of metals below surface

# SEARCHES FOR PAY DIRT

for prospecting for copper, lead and zinc. A similar kit is standard equipment among Canadian prospectors combing the North Woods for nickel.

Geochemical prospecting is based on the principle that metals are scattered widely throughout the earth's crust. Metal traces can be found almost anywhere—if you have means of detecting them.

Gold? The world's full of it. There's probably some flowing out of your kitchen faucet. Simply boil down from one to forty billion gallons of tap water and you may recover an ounce of the precious metal.

Copper? You don't have to mine it; it's all about you. Almost any igneous rock, or soil derived from it, contains about 70 parts to the million.

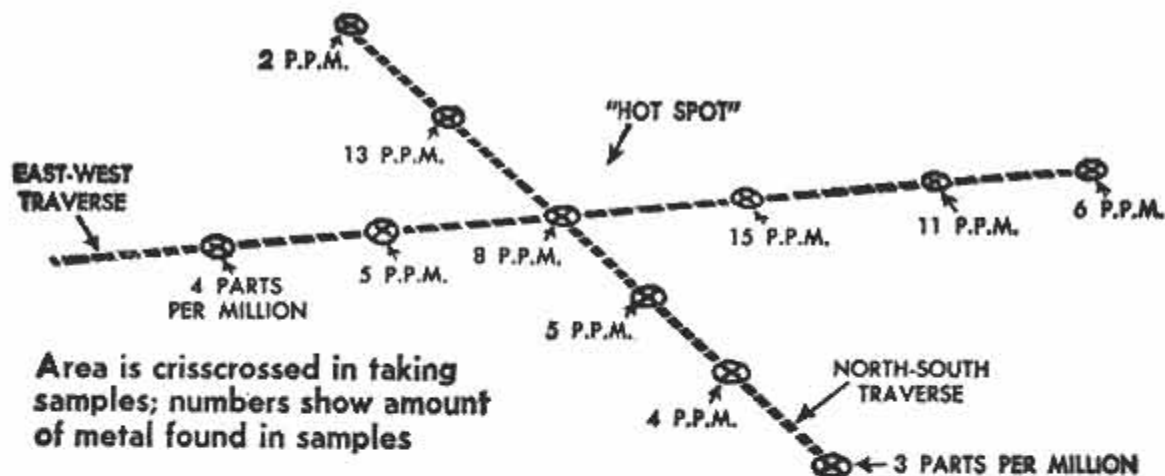
Aluminum is so common that soils generally average about 81,000 parts per million.

Uranium, mercury and platinum, however, you'll find in only a few parts to the billion.

You might suppose this abundance of clues would prove confusing, but U.S.G.S. finds that with the new geochemical

Careful use of complex reagents by U.S.G.S. teams gives delicate, incredibly sensitive tests for metals





wizardry, "blind" ore deposits are no longer so blind. Leakage from the depths seems to be common, sometimes carried through cracks caused by earth movement, freezing and thawing; sometimes waterborne by deep springs. Plant roots help by probing to bring up metals they need for growth, concentrating them in their leaves.

So U.S.G.S. is putting geologists and chemists into the field to perfect its colorimetric techniques. They are picking leaves of "loco weed," snipping pine needles and twigs of birch and juniper, scooping sand from stream beds, filling bottles with water from streams and bogs, spooning up weathered rock that by ordinary assays would appear barren. Systematically mapping these leakage traces, they can pick up "hot" trails leading to the parent ore bodies.

Recently I drove over a narrow road into

a range of mountains east of Lovelock, Nevada. A squat green truck stood on a promontory overlooking a vast plain that showed light-colored trails on its surface. These marked the dusty progress of trucks, some carrying high-grade iron ore, some carrying diatomaceous earth.

The green truck, I knew, was the "Squash Bug," the dream buggy of the U.S.G.S. geochemical section. It is a modern traveling laboratory for the new magic. It carries a generator, butane tank, ultraviolet lamp, a supply of highly purified water, and an extensive complex of shelves and racks holding bottles, beakers, filters and funnels. In this mobile field center a vast amount of testing is done in a short time.

I shook hands with Frederick N. Ward, geochemist. "This is a rich district," he ob-

(Continued to page 216)



To identify an unknown metal found in a sample, U.S.G.S. teams compare the color of the sample with standard reagent

## Vinyl Plastic Lamps Inflate Like Balloons

Made of tough vinyl film and purchased in a flat, deflated shape, the shade of this hanging lamp is inflated to shape by a mouth valve at the bottom, then hung from a rim at the top. The doughnut-shaped plastic "balloon" forms different shapes, depending on the amount of inflation. Quick and easy to assemble and hang, the lamp is ideal for outdoor use for patio parties, but can be used anywhere in the home. It comes with complete hardware and a six-foot cord, ready to hang. Tests for safety and durability showed that a 40-watt bulb could burn inside for six weeks without discoloring or overheating the plastic; bulb heat is diffused through a "chimney" at the top of the shade.



## Elevator on Wheels Raises Loads Anywhere

For direct loading of trucks or railroad cars, or materials handling to any high level, an elevating platform on wheels has been developed by a German firm. Working like a forklift with a platform, the elevator can be rolled into position, loaded and raised to any desired level. Hinged side plates stand up to form sides, fold down to bridge the gap when level is reached.



## Vacuum Attachment Speeds Barber's Work

Welded to his clippers, a vacuum attachment cuts haircut time in half and catches the clippings, in E. V. Wilson's barber shop in Judsonia, Ark.

## German Locomotives Trade Coal for Oil

Thirty big coal-burning locomotives of the German Federal Railway have been modernized by installing oil burners in their fireboxes and converting the coal tenders to fuel tanks. Results have been so good that the railway plans more conversions.





## Huge Antenna Tracks Missiles

Enemy missiles would be detected and tracked while still over enemy territory by a series of huge tracking antennas designed and built by Goodyear Aircraft for the Air Force's ballistics missile early warning system. A cutaway drawing of the installation is shown at left. The pedestal supporting the antenna is three stories high, and the protective radome is large enough to encircle a two-story house on a 100-foot lot.



## Midget Computer Aids Engineer

Ninety-five percent of the routine mathematical operations encountered by an engineer in normal design work can be performed by a transistorized analog computer. With the new computer, an engineer can work out, electronically, problems in addition, subtraction, multiplication, division, integration and other mathematical operations. In addition to making scientific calculations, the device will be used as an educational tool.

## London Schoolchildren Tap Out Tunes on Water-Filled Bottles



Hitting the bottle is the favorite pastime of some 200 pupils at a school in London. But no one is shocked, for the bottles contain only water, and they're hit with small wooden hammers by the youngsters. The bottles are filled with different amounts of water to produce different musical notes when struck. Each youngster has a bottle and two mallets. Clanking his instrument on signal, each player helps to make a tune, and learns elementary music as well.





# ***Get Ready for the Next Flood***

***—remembering disasters of recent years, the State of California has organized a school for flood fighters who'll be alert and trained if the rivers boil over again***

***By Leo Rosenhouse***

**N**ATURE'S unsavory reputation for going on a flood rampage, often with little or no warning, is well known to the men who work for California's Department of Water Resources at the state's Flood Operations Center in Sacramento.

These workers recall the Christmas flood of 1955 and grimly label it to be the worst disaster to strike at the West in recent years. Within a period of nine days, more than two thirds of the Golden State was drenched by upwards of 40 inches of rain, pushed by wind velocities reaching 110 miles per hour.

When it was all over, Californians were staggered by a death toll that topped 100 lives, and by property losses that skyrocketed well above the \$200,000,000 mark. But the flood damage that caused such devastation could have been far worse were it not for the efforts of thousands of flood fighters and levee patrols who sandbagged

and also guarded the flooding streams.

Mindful of the lessons learned from that terrible disaster, the California Department of Water Resources has lately set up a unique outdoor school for flood fighters in which engineers and other personnel whose job it is to battle and control floods can get themselves prepared for any forthcoming wet threat that may be among nature's bag of tricks.

Experts say the school will possibly save the West untold millions of dollars in conservation of property, and will also save lives.

Already, more than 200 engineers, men experienced in hydraulics, have been schooled in flood fighting by a "dry run" technique consisting of open-air classes held on sunny days and conducted by state flood-control experts. Classes are held at a riverbank laboratory along the Sacramento River, just west of Sacramento.



Students watch demonstration of how to fill mud box. Box is two parallel wooden walls held together with cross beams and stakes. Mud boxes hold back flood waters and take place of sand bags when solid fill is scarce

The school for flood fighters, which has attracted students from all parts of the nation, stresses preparedness and know-how in respect to floods. Classes look more like a get-together of shirt-sleeved office workers than the serious meeting of hydraulic engineers and other water-resource experts.

Because these men have dealt with flood problems most of their professional years, instructors find it takes but one day or more to brief them on emergency flood-control methods. The lessons learned aren't quickly forgotten. Most of the men respect the capricious behavior of a stream or river reaching flood stage, and are eager to tame high water.

"The purpose of the school is to train our engineers who may be called upon in a flood emergency to go out and offer advice and assistance to local flood fighters," says Carl Werner, chief of flood control operations.

"Much of the training is fundamental and easy to grasp. But, we can't afford to

assume that all of our engineers who might be summoned in a flood emergency fully understand this work. Hence, the training school for flood fighters."

### Controlling an Angry Stream

Flood-control operations men recently completed construction of a 50-foot training levee to demonstrate ways that engineers can safely control the angry behavior of a stream at flood level. Simulated situations encountered during the high-water season along California's rivers and lakes have been duplicated on this levee. These include sand boils, levee overflow and levee erosion.

Students are referred to as trainees, and in their "dry run" training learn how to cope with flood problems by actually playing a realistic role as flood fighters. They build and operate devices that successfully control water during a flood emergency. These devices may consist of something as simple as a sandbag, and training may involve the making of a sand-boil chimney



Practice session: Trainees learn how to prevent wave wash, which exists when waves, pushed by wind, strike at levee slope and tend to erode it. Panels laid on earth and held down by sand bags help prevent washout



**Operation of sand-bag chimney is explained to trainees. Device reduces flow of water and sand from boiler**

with filled bags or extend to the operation of mammoth earth-moving bulldozers and steam shovels.

Instruction at the school for flood fighters begins with a refresher course during the first few hours of school, when teachers review the ABCs of flood prevention. Trainees are reminded that preflood preparations are still the best insurance against trouble with high water during the rainy season.

The trainees are instructed how to clear

brush, trees and wild growth from levees that confine a tricky river; how to seal and fill animal burrows, caves and holes; how to repair and bond broken drains and levee structures and keep them in working order. Trainees are even lectured on the severe damage that livestock often cause to a delicate levee system.

Many an engineer at school is surprised to learn that wallowing pigs frequently pit the crown or slope of a fresh earth levee, leading to large holes and washouts during

**Real thing:** When washout was detected along Cache Creek levee shortly before it became raging torrent, technique taught at flood-fighter school came into play. Flood fighters quickly laid planks over eroded area





After break of Feather River, Yuba City, Calif., suffered big flood on Christmas, 1955. When Cache Creek threatened its levee on February 24, 1958, below, experts watched rise of stream to determine amount of wave wash occurring against levee. Truck carries public address system and flood lamp for night work





When Cache Creek reached critical flood stage, workers patrolled bank, feeling for washouts with feet

high-water flows. They are told that cows are also guilty of breaking down a levee with their hoofs and body weight. Advice is given to keep livestock off levees and restrict them by fencing.

At the school for flood fighters, trainees are taught that levee failures are the major reason for floods and most of the lessons are dedicated to correction of this problem.

Boils are a common cause of levee collapse and are usually caused by levee leaks produced by burrowing animals, mostly rats and gophers. Pressure produced by high water against a levee causes water to be "piped" through or under the burrowed hole with sufficient velocity to carry free-earth material toward the land side of the levee.

The condition causes a critical flood situation when sand and other material is suspended in the discharging water. It makes the levee subject to rapid deterioration and quick collapse.

### Sacks of Sand Do the Job

To control a boil, engineers are advised to build up a watertight ring around the boil with sacks of sand until material is no longer discharged from the boil. This procedure causes a decrease of velocity on part of the inrushing water and stops dangerous erosion within the levee. When several boils occur at once, flood experts advise that a sack sublevee be built around the nest of boils to a height that none of the boils will discharge with enough velocity to move earth material from the levee foundation. When time is too short for the use of sacks, an earthen cofferdam may be created by heavy equipment instead.

Spouting sand boils were partially responsible for the tragic Yuba City disaster during the Christmas flood of 1955. The Yuba and Feather Rivers licked frantically at the tops of the levees that were holding back these wild rivers. The breakthrough came as the river water made a sneak attack underneath the levee through undetected rodent holes.

When the levee broke, it did so with such suddenness that it seemed to explode! The roar of the collapse of the protective earth mound was heard in Yuba City. Minutes later, a gigantic crest of water rushed the snug town of 4000 persons, crushing homes, ripping up streets and wiping out dozens of lives.

"Sometimes men assigned to flood-control duty don't even have the know-how to fill a sand bag properly," explains Joseph Burns, a state hydraulic engineer assigned to help instruct trainees at the school for flood fighters.

"Sandbags should be but one third or one half filled to be truly useful," states Burns. "Put more sand into a bag than that and the average man has trouble lifting it. We teach that one end of the bag must be loose and free of sand so it can fold or lap snug against another bag. The lapping of one bag upon another makes an effective water seal."

Burns points out that the flood-control center maintains a stockpile of burlap sacks in strategic locations throughout the waterways of California.

"Even if we did run short of bags, we can always count on the farmer," says Burns. "Whenever a levee threatens to

(Continued to page 232)



## Seat on Truck Bumper Speeds Up Street Striping

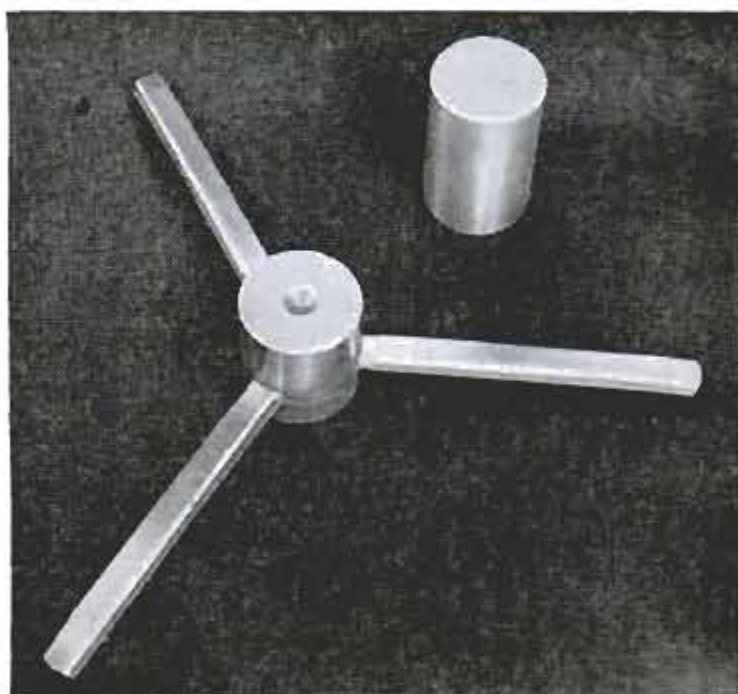
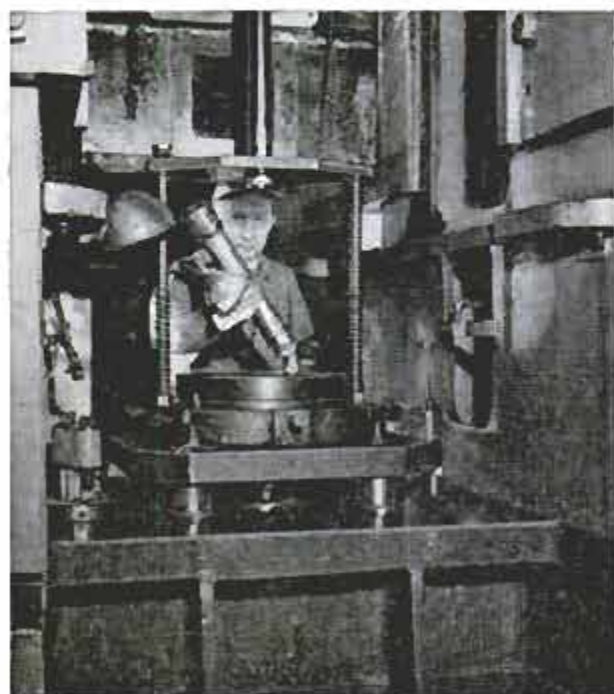
By mounting an implement seat bracket to the front bumper of a truck, the city of Newark, California, has increased the speed of its walking striping machine from three to seven miles per hour. The flag in front lets the truck driver follow the old line

while the striping operator guides his machine from his bumper seat. Since it's not attached to the truck, the striping machine can be easily swung around to paint crosswalks and parking lines. It also has a hopper to drop reflecting beads into the wet paint.

## "Toothpaste Tube" Method Forms Intricate Metal Shapes

Lateral impact extrusion, a process that combines extrusion and forging, is now in use for cold-forming intricate parts in one stroke of an impact press. Lateral extrusion produces a sideward flow of metal as well as the usual forward and reverse flow,

and results in products with wrought-metal strength, but in intricate patterns and to very close tolerances. It is especially well-suited to production of parts where projections radiate from a hub, as in the steering wheel core shown at right below.





## Moving Aerial Sidewalk Links Hotel with Annex

Spanning a busy intersection in downtown San Diego, Calif., a moving aerial sidewalk connects a large hotel with its motel annex 250 feet away, and allows guests and service employees to go from one building to the other without crossing the street. Designed by an elevator manufacturer, the sidewalk has two channels moving in opposite directions and separated by an island. High safety-glass panels on the outer edges protect passengers from winds while allowing a view of the business district below.



Union Tribune Pub. Co., San Diego, Calif.

## Infrared Analyzer Spots Air Pollution

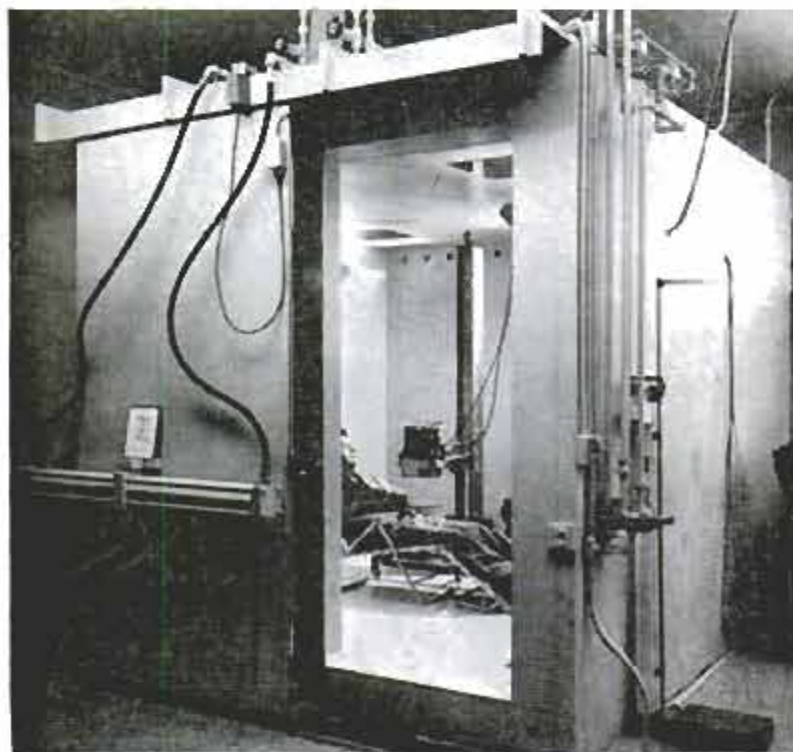
Carbon monoxide and other air pollutants are now being measured at streetside by the Department of Air Pollution of New York City. The department uses an infrared analyzer which can pick up and analyze automobile exhaust products in amounts as small as one part per million parts of air. The analyzer works with two infrared beams, one passing through a polluted air sample, the other through a comparison cell. Contamination is measured by the resistance to the beam as it passes through the sample.





## Motorized Gantry Crane Retrieves Landing Craft

Designed to straddle landing craft in the surf and carry them to repair shops ashore, this new landing-craft retriever is essentially a self-propelled gantry crane capable of standing in ten feet of water and of lifting 70 tons. The unit is 25 feet high and 36 feet wide, but has no steering system. It is steered by varying the speed of the wheels, which are individually powered and controlled.



## Radiation Monitor Room Built From Armor Plate

Ten-inch-thick steel plates, intended for a World War I battleship that was never built, were used to build a gamma-ray-proof room at the Hanford atomic plant in southeastern Washington. The steel, found in an Eastern shipyard, was chosen for its extremely low background radiation level (newer steel contains some radioisotopes from fallout). The room contains monitoring equipment used to test for radioactivity in the bodies of the plant's employees, and must be shielded from external radiation, since the equipment is sensitive enough to detect one microcurie of radiation, and its precise measuring ability would be upset by any outside radiation.



## "Ten Day Wonder" Silo Is Europe's Largest

Completed in only ten days, Europe's biggest silo towers high above the landscape at Corbehem, France. Built on 98 columns of prestressed concrete sunk 45 feet in the ground, it is 105 feet high and 102 feet in diameter, and will hold 25,000 tons of sugar.

## Computers to Plan Air Trips?

Air-safety experts foresee the day when computers will determine the best flight plan for a pilot who is planning a trip. The computers will analyze the weather, take into account the existing traffic, and come up with the route and altitude to be used.



# RADIO TV HI-FI

ELECTRONICS



## KIT-BUILT HI-FI TRIMS STEREO COSTS

By *Lothar Stern*

**H**OW MUCH of a complete stereo hi-fi system can you build yourself? Virtually all of it—thanks to a brand-new kit which supplies everything from an amplifier to a complete cabinet, in knocked-down easily assembled form.

The Heath Stereo System Package is new in a number of ways. It is the only complete stereo system available in kit form. It is the first kit which contains a set of components, each specifically designed to match the characteristics of the others. And it is the first system of any type to employ the CBS Laboratories-developed 2-in-1 amplifier circuit, which permits the amplification of a two-channel stereo signal in a single amplifier. The result is a system whose cost (not counting your own labor) compares with that of "commercial grade" stereo, but whose performance rivals that of more expensive, high-fidelity installations.

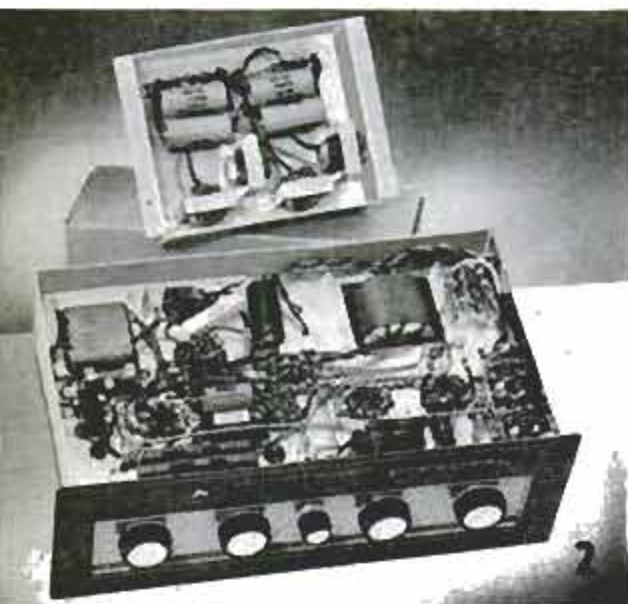
Stereophonic sound requires two signals, each independently amplified, and each reproduced through a separate speaker. For high fidelity, each speaker must reproduce

the entire range of sound frequencies, from the lowest bass to the highest treble.

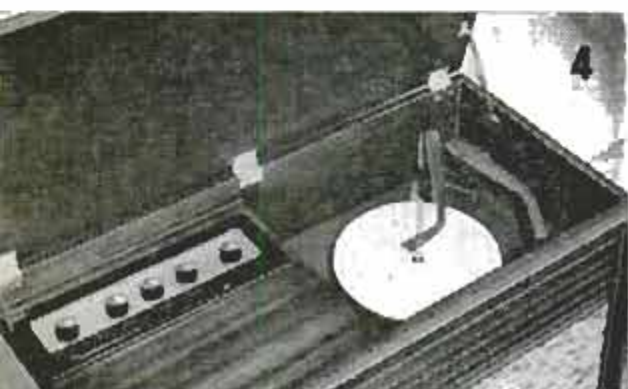
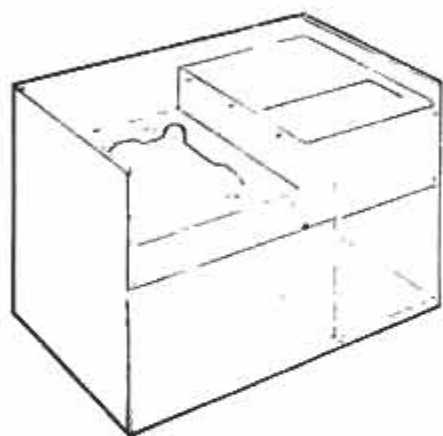
But wide-range speaker systems are expensive. What's more, proper reproduction of low frequencies demands relatively large speakers and enclosures which often present decorating problems. To circumvent these problems, the Heath Package follows the industry-wide trend towards the use of a "satellite" speaker system.

The satellite speaker system makes use of the experimentally proven fact that low audio frequencies are nondirectional and add nothing to the three-dimensional effect of stereophonic sound. In the Heath system, frequencies below 250 cycles are separated from both the left and the right stereo signals and are channeled to a single 8-in. low-frequency speaker which is mounted in the main cabinet. The remainders of the left and right signals, which carry the actual stereo information, are applied to separate left and right satellite speakers.

Since the satellites do not reproduce very low frequencies, they need not be as large or as expensive as full-range speakers.



Electronic components of kit, Fig. 1, include preassembled record changer with stereo cartridge, parts for amplifier and speaker network, and 3-unit speaker system. Under-chassis views of amplifier and speaker network, Fig. 2, illustrate wiring simplicity made possible by new 2-in-1 amplifier circuit



Similarly, since the woofer (the low-frequency speaker) need not handle the high frequencies, it can be designed especially for optimum response to the bass tones without the compromise usually involved in the design of a full-range speaker. The result is a space-saving, money-saving stereo speaker system capable of excellent performance.

But the really big difference between the Heath system and that of other manufacturers is in the stereo amplifier. Until the development of the CBS Laboratories' circuit, it was generally believed that the amplification of a stereo signal demanded two separate amplifiers. High-fidelity considerations made push-pull output stages and high-quality output transformers mandatory for each channel. The CBS circuit is unique in that it employs only a single push-pull output stage with an additional, inexpensive matrix transformer to provide the advantages of push-pull amplification for *both* stereo signals.

### How It Works

To understand the operation of the CBS circuit we must first take a quick look at how stereo records are made. In the universally adopted Westrex recording method, a cutting stylus is energized by signals from two magnetic elements. The signal applied to the left element drives the cutter into the right groove wall at a 45-deg. angle, while a signal applied to the right element drives the cutter into the left groove wall at a similar angle. The two magnetic elements are connected out of phase, so

Cabinet construction, Fig. 3, simplified by pre-cut, specially grooved panels, requires no special tools or clamps. Finished unit, Fig. 4, is attractive and functional. Amplifier panel reserves space for possible later addition of radio tuner

that a positive voltage on the left forces the cutter deeper into the right-hand wall, while a positive signal on the right tends to lift the cutter out of the left groove wall.

If identical signals are applied simultaneously to each of the two elements, as shown in Fig. 5A, the downward force of the left signal is completely canceled by the upward force of the right signal and no angular motion can result. But, while the vertical components of the two signals cancel, the horizontal components are in the same direction. These, therefore, combine to drive the cutter in a purely lateral (side-to-side) direction.

Now let's reverse the phase of the right signal so that this will tend to move the cutter deeper into the left groove wall, Fig. 5B. Under such conditions, the horizontal components of the two forces will cancel, while the vertical components will add vectorially to move the cutter in an up-and-down direction only.

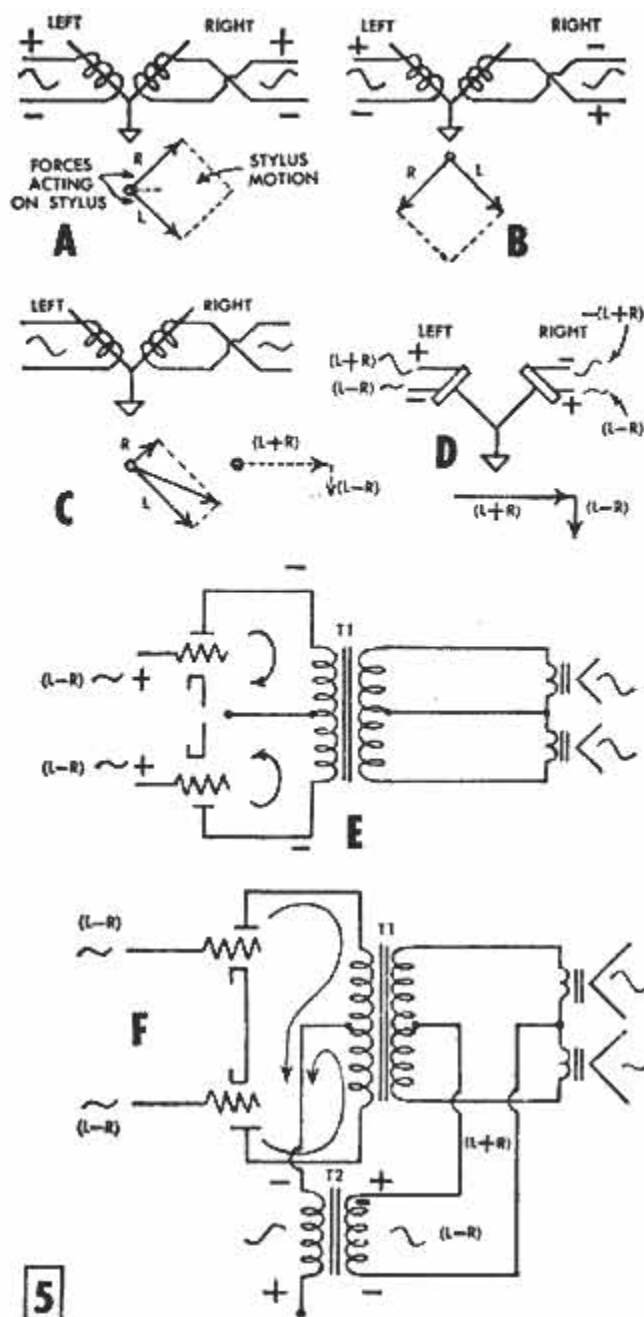
Neither of the above conditions is likely to occur in a true stereo recording. Normally, the two signals, like the two images of a stereo picture, will be similar but not identical. Such a condition is illustrated in Fig. 5C. In this case, the vertical components of the two forces, not being equal, do not cancel entirely, so that the resultant groove will be displaced vertically as well as horizontally.

Note, however, that the horizontal displacement, representing the *sum* of the horizontal components of the left and right signals ( $L+R$ ), is by far the stronger of the two. The smaller vertical displacement represents the *difference* between the two vertical components ( $L-R$ ), and provides only the stereo information.

The stereo pickup-cartridge is essentially the same as the cutter except that it performs the cutter's function in reverse. Instead of converting two electrical signals into mechanical stylus motion, the reproducing stylus is mechanically activated by the groove displacement and converts this into corresponding electrical signals.

Fig. 5D shows the electrical output from the two pickup elements resulting from a stylus displacement as in Fig. 5C. Each element produces a signal which is the result of two forces—a large horizontal force and a small vertical one. The net effect is as though each element actually produced two signals corresponding in phase and amplitude to the individual forces.

It is interesting (and important) to note that the elements of the pickup are connected *in phase*, as compared to the *out-of-phase* connection of the cutter elements. Thus, while two identical signals at the cutter produce a horizontal groove displacement, the latter produces two out-of-

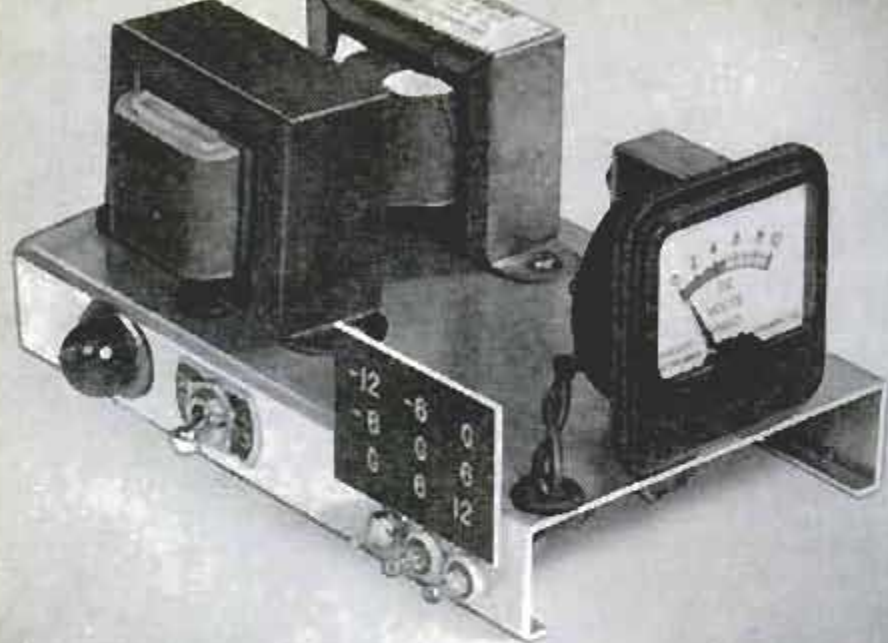


phase signals from the pickup elements. Conversely, while two out-of-phase cutter signals produce a vertical groove, such a groove produces two in-phase signals from the pickup elements.

Now let us apply the signals from the two pickup elements to opposite grids of a standard, push-pull-connected output stage, Fig. 5E, and determine the results. The two out-of-phase signals,  $(L+R)$  and  $-(L+R)$ , which are the result of the identical portions of the stereo signals, meet the requirements for push-pull amplifier action and cause a signal to be induced in the secondary winding of output transformer T1. If two speakers are connected as shown, each speaker will receive the same signal and produce the same sound.

The smaller signals,  $(L-R)$ , which are the result of differences between the applied stereo signals, are in phase at the grids of the tubes. These, therefore, pro-

(Continued to page 238)



*For Transistor Experimenters*



# Zener-Regulated POWER SOURCE

By Paul E. Mix

PROBABLY the greatest advantage of transistors over vacuum tubes is their ability to operate at low voltages and currents. This characteristic makes them ideal for portable, battery-operated electronic equipment, but it is precisely this advantage which becomes a major source of annoyance to hobbyists experimenting with new transistor circuits. All too frequently, troubles attributed to faulty circuit design are eventually traced to weak or defective batteries being used as a source of power. The obvious solution to this headache is to replace the batteries on your workbench with an electronic power supply capable of dependable, continuous operation.

The power supply presented here is unique in that it presents a number of *regulated* output voltages especially designed to operate, service and test low-power and medium-power transistor circuitry. It permits a steady current drain which is greater than that available from flashlight cells and mercury batteries, yet, like a set of new batteries, it maintains a constant output voltage, regardless of load current, over the regulated range.

Low-voltage regulation is made possible by the unique properties of silicon diodes, two of which are employed in this power supply. If such diodes are biased in the reverse direction, they represent virtually an open circuit until the applied voltage

becomes high enough to cause the diode to "break down." This is called the Zener voltage. When this voltage is exceeded, the Zener diode conducts heavily. Its action, therefore, is exactly like that of a gas-tube regulator except that breakdown of a diode can occur at a much lower voltage. The special Zener diodes have accurately repeatable breakdown points which make them ideally suited as low-voltage regulators.

The power supply used here employs a conventional, full-wave rectifier circuit, see Fig. 1, followed by a pi-shaped L-C filter consisting of C1, CH1 and C2. Two Zener diodes with breakdown voltages of about 6 volts are connected in series across the output. By connecting the load circuit to the appropriate output terminals, output voltages of 6, 12, —6 and —12 volts, at currents up to 140 ma., can be obtained.

Output meter, M, connected across one of the Zener diodes, serves as an overload indicator. Since the output voltage drops and the Zeners fail to regulate when the circuit is overloaded, see Fig. 3, the meter provides a visual indication and warning of excessive current drain. Slight overloads corresponding to about a ½-volt drop on the meter may be tolerated, but prolonged operation at an overload condition should be avoided.

Construction of the power supply, as illustrated in Fig. 2, is not difficult. The rectifier diodes, D1 and D2, the Zeners, Z1 and

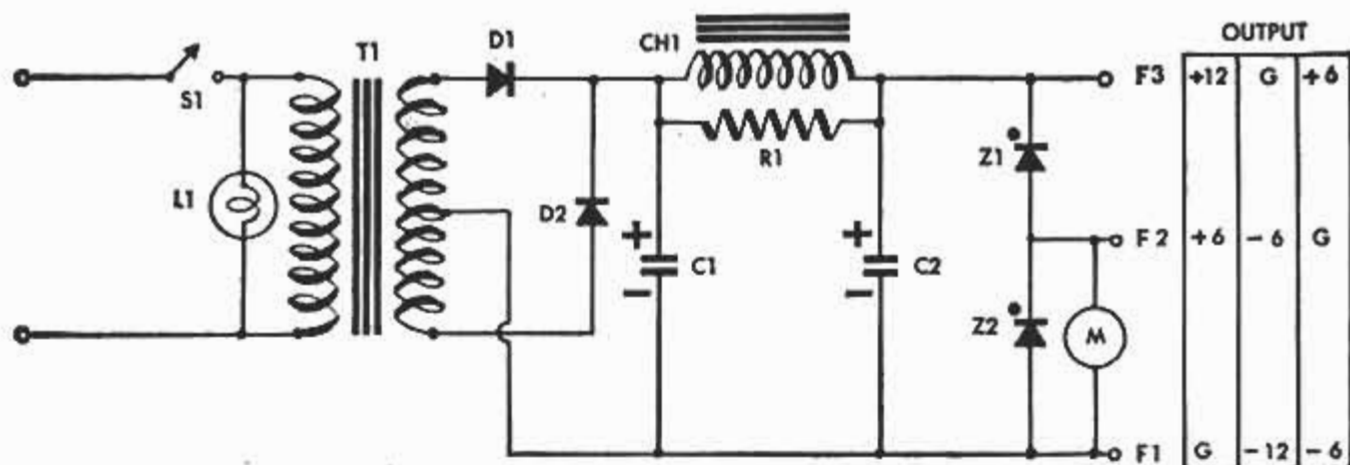


Fig. 1. Schematic wiring diagram of Zener-regulated power supply for experimental transistor circuits

Z2, and the filter capacitors, C1 and C2, are premounted with the aid of "flea clips" on a  $2\frac{1}{2} \times 3\frac{1}{4}$ -in. perforated Bakelite board. After the board is completely wired, including all leads underneath, as indicated by the dashed lines in Fig. 2, it is mounted to the main chassis with machine screws and nuts. Extra nuts between the board and the chassis serve as spacers to keep the flea clips from shorting out against the bottom of the chassis.

The remainder of the parts are fastened directly to the chassis and rubber grommets are employed to pass the wires from transformer T1, filter choke CH1 and the meter to their connecting points underneath. A knot in the line cord, just inside the chassis, serves as a strain relief.

Three insulated feed-through bushings provide readily accessible output-voltage terminals. None of these is grounded to the power-supply chassis so that any one of them may be used as the "common" terminal for the external load circuit. This permits either a positive or a negative voltage to be applied to the load. It is a good idea, however, to label the positive and negative terminals of the supply in some manner to prevent the inadvertent application of incorrect voltage polarity to the load. This is important because transistors are likely to be damaged by the application of "reverse" voltage.

Another safety precaution is the inking of the 0-5-volt portion of

(Continued to page 236)

Fig. 2. Pictorial diagram. Keep diodes insulated from each other and from other circuit parts. Mount meter above chassis

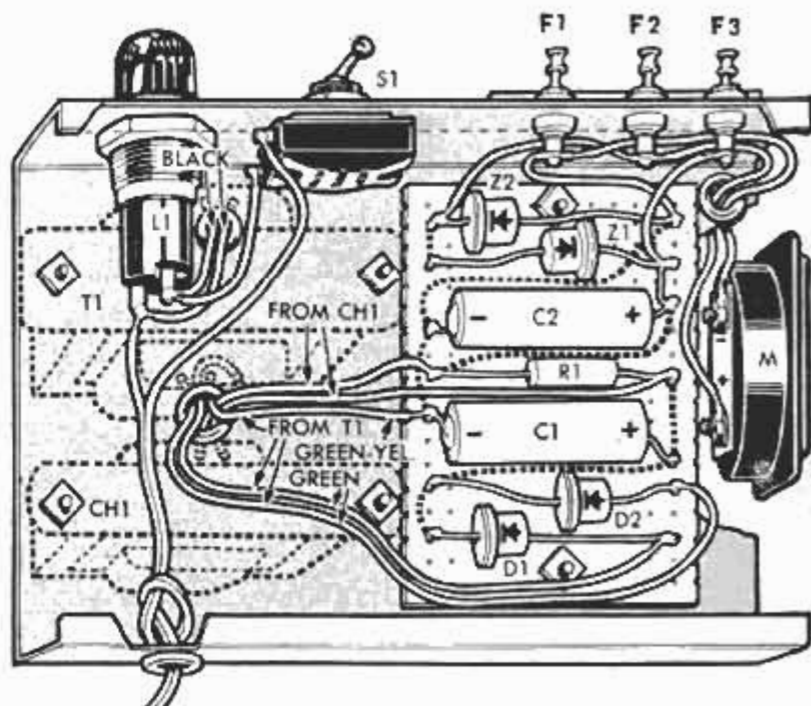
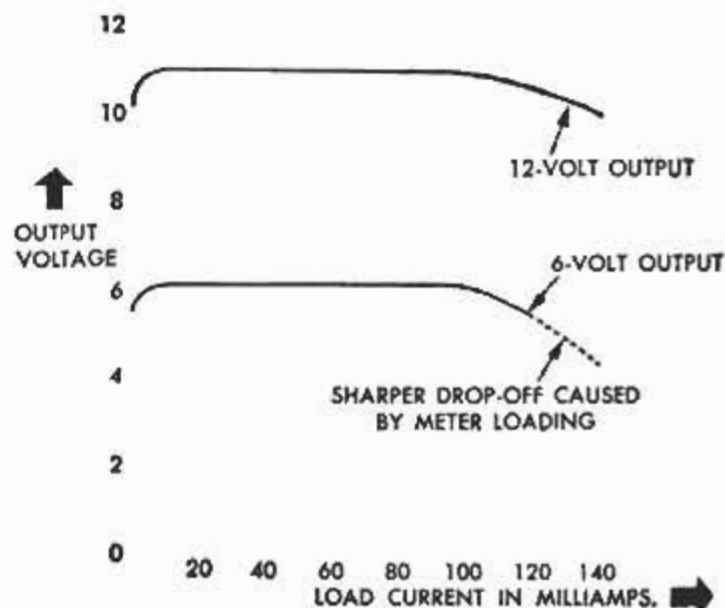
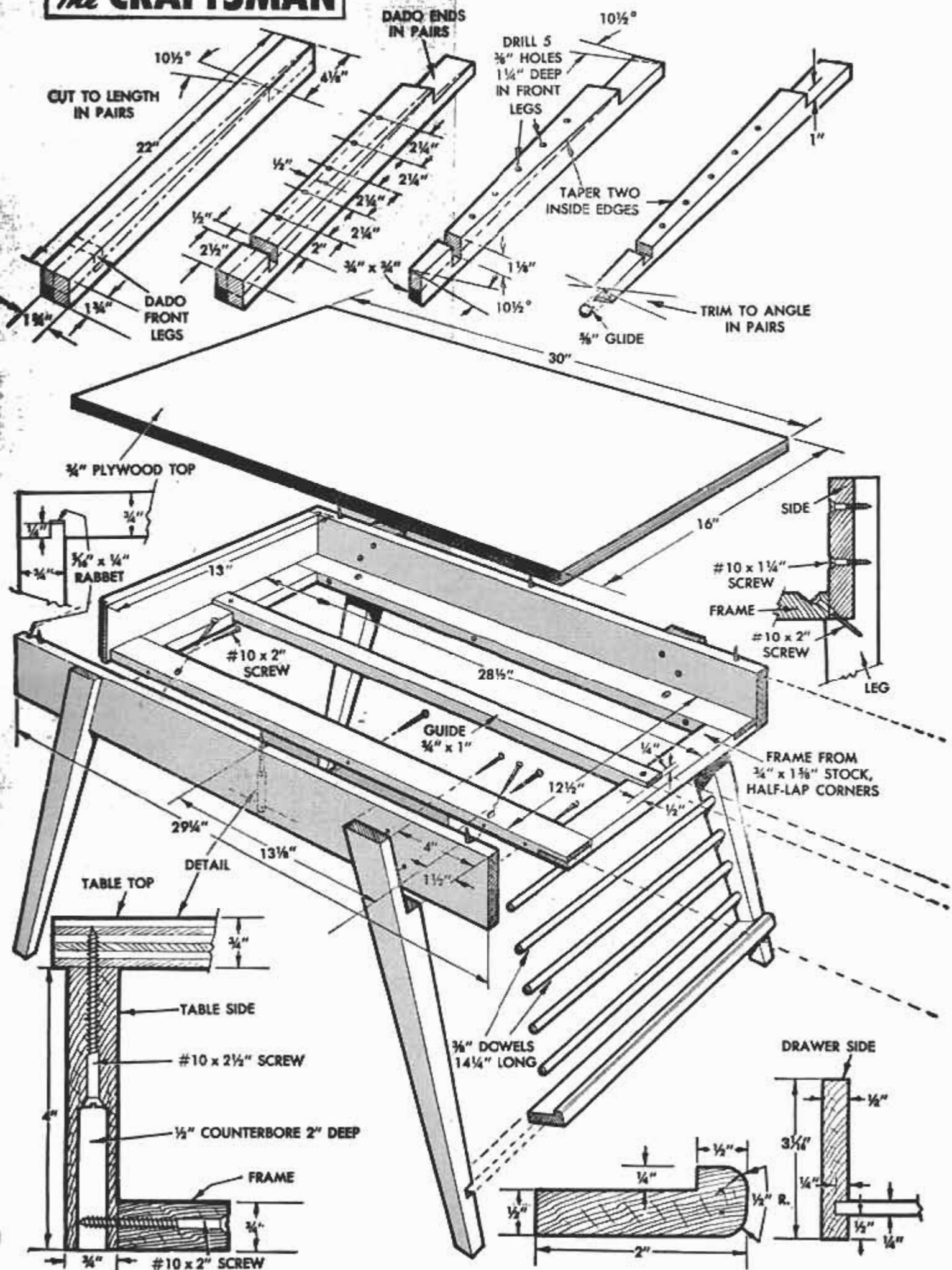


Fig. 3. Regulation curves show output voltage vs. load current





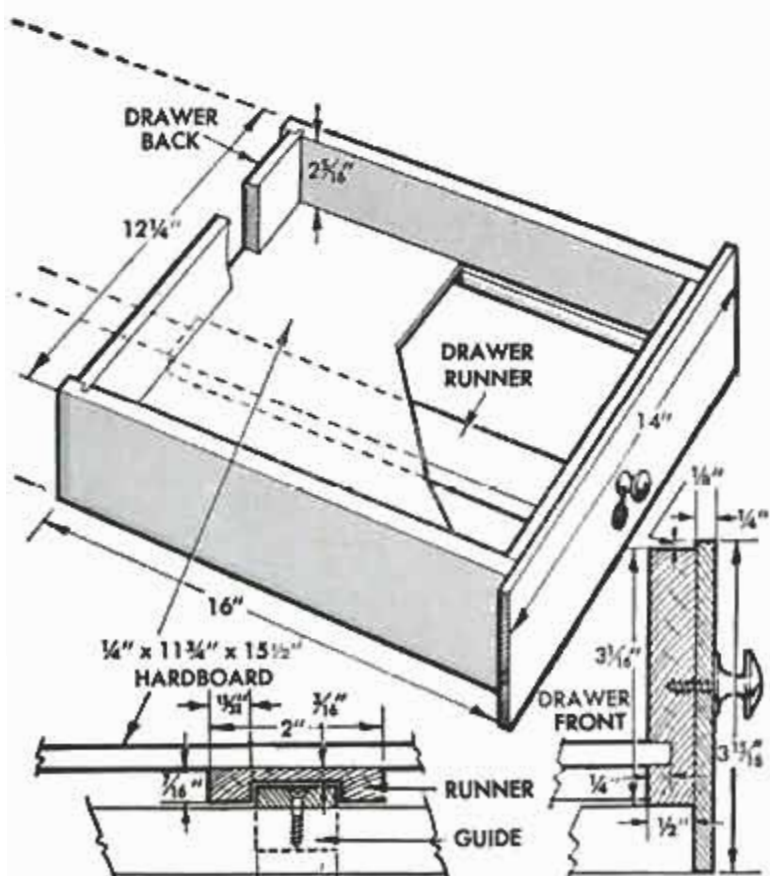


# TABLE FOR YOUR LAMP

By John Bergen

**F**EATUREING a magazine rack and a king-size drawer, this smart lamp table, with its straight lines, can be made with not much more than a hammer and a saw. In fact, the only other tools actually required are a brace and bit to bore the dowel and screw holes and a screwdriver to drive the screws. Start out by making the half-lapped frame first, then add the 4-in. aprons to three sides. Screw the 1-in.-wide drawer guide to the frame, then the table top. Screws in 2-in.-deep counter-bored holes in the aprons fasten the latter.

The legs are tapered on two inside adjacent faces only, and the half-lapped notches, as well as the dowel holes and tray dadoes, are cut before the legs are tapered. The legs are splayed in just one direction, and the tray and dowels, of course, must be in place before the front legs can be attached. The drawer front is rabbeted to lap the frame rail at the front and the ends of the aprons. The rest of the drawer is made in typical drawer fashion, running grooves for the bottom and gluing a runner to the underside to ride on the 1-in. guide. Allow sufficient clearance so the drawer will slide freely (and for possible swelling). While the drawer dimensioned is 16 in. long, it can be made the length of the table.





### Curtain Rod Holds Paint Sign

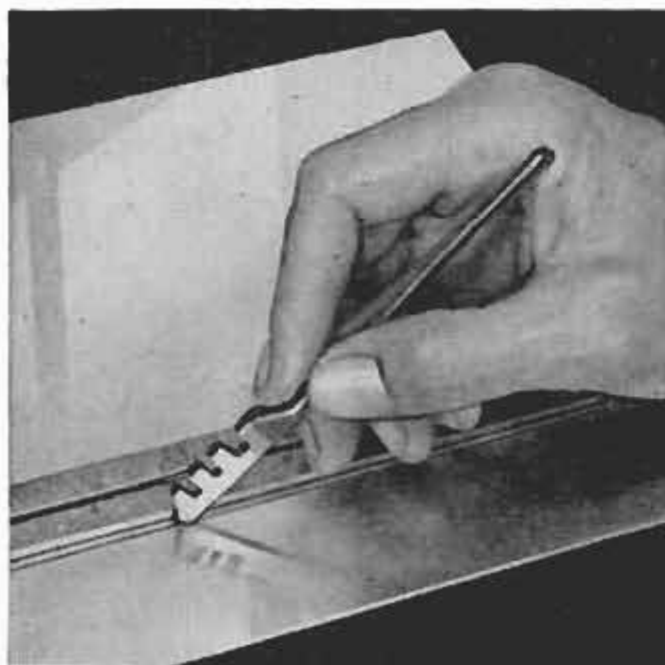
In schools and other public buildings, and in homes, too, when floors are to be painted or varnished and doors are left open for more ventilation, an effective method of displaying warning signs is on adjustable curtain rods. Suction cups screwed to the ends of the rods hold them between the jambs. Positioned so it is waist high to an adult, such a sign will be near the eye level of youngsters who would be most likely to run into a room without noticing that work was being done on the floor.

G. E. Hendrickson, Argyle, Wis.

### Tape Protects Decorative Nails

Prevent damage to furniture nails, or other types of nails with decorative heads, by crossing two strips of adhesive tape on the face of the hammer. This will not impair the striking impact of the hammer.

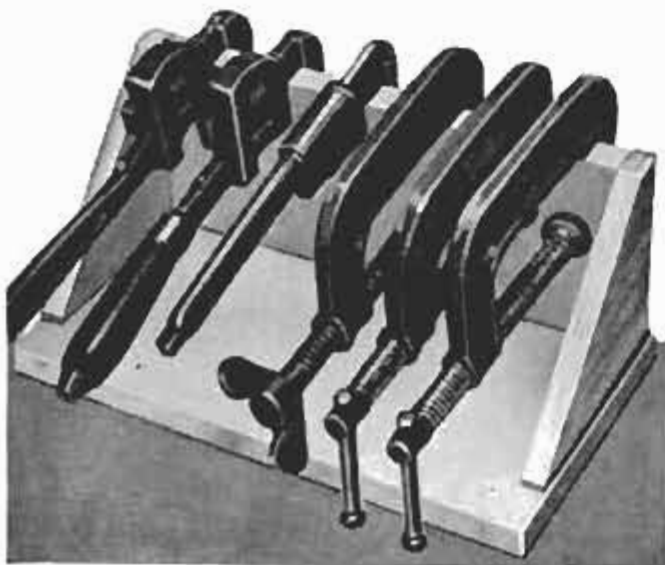
M. Robert Beasley, Jackson, Mich.



### Glass Cutter Scores Metal To Assure Sharp Bend

When a clean, sharp bend is desired in soft sheet metal, such as aluminum, copper or zinc, first score along the line of the bend with a wheel-type glass cutter. Use a straightedge to guide the cutter, making sure the straightedge is heavy enough so it does not flex sideways under pressure. Make the first pass with the cutter fairly light, then increase the pressure on succeeding passes until the score is deep enough to assure a sharp bend. It is best to clamp the straightedge in position to make certain that it does not shift away from the line. Heavy cardboard can be scored in a similar manner when it is to be bent at sharp angles to form a container, or perhaps a model for school work.

H. Hanscom, Elmhurst, Ill.



### Wrench-and-Clamp Storage Rack

Pipe wrenches, adjustable wrenches and C-clamps that too often become a jumbled mess in a toolbox or workbench drawer are stored neatly on this simple rack. Size and type of wrench or clamp are seen readily, and the fact that a tool is missing can be noted at a glance. The original rack has a 7 x 13-in. base of 1-in. stock with a 6 x 13-in. back. Two triangular pieces of 1/2-in. plywood are used for endpieces. Dimensions of the rack can be changed to suit, and scrap pieces of almost any kind of lumber or plywood of 1 in. or less can be used. The rack can be screwed to a bench top or left semiportable.

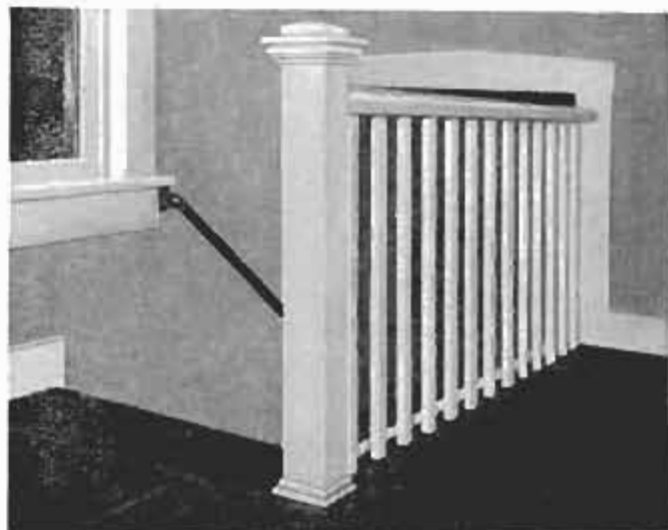




**By Grover Brinkman**

RAILINGS at the tops of stairwells tend to weaken with age, and can present a serious hazard, especially if there are active children or elderly people in the home. An excellent way of making this area safer is to replace the railing with a bookcase, which not only is stronger than the railing, but adds beauty and utility as well. Any style of bookcase can be used, as long as it is assembled strongly and fastened solidly to floor and wall. The unit shown has a rounded end on the top, with rounded shelves below to match. The lower end of the dowel that supports the shelves has a blind hole in it to receive a smaller dowel that fits in another blind hole in the floor. Any vertical member that is likely to be grasped by anyone ascending or descending the stairs should be reinforced also, to eliminate any chance of accidents. All joints of the bookcase should be screwed and glued, and provision should be made to permit driving screws through the base of the unit into the floor. Screw anchors are used to fasten the end

of the bookcase to the wall. The back, or stairwell side, of the bookcase is closed by a sheet of hardboard or plywood, to prevent books or other objects from being pushed through and dropping down the stairway. As an added safety feature, a small night light can be installed on the end of the bookcase close to the floor.



# DUMB-WAITER

## A HOME "WORKHORSE"

IS IT A "back breaking" job to "man-handle" objects up to your attic for storage? Does washday mean an aching back and tired feet for your wife, from carrying soiled laundry from the second floor down to a ground-floor utility room or basement laundry room? When it is necessary to carry awkward, heavily laden trays of refreshments to a basement recreation room, does this area sometimes seem more of a disadvantage than a place for fun? All these problems can be eliminated by installing a dumb-waiter. For some years these home "workhorses" have been considered rather old fashioned. They were replaced in some homes by a laundry chute that gives soiled laundry a one-way ride—down. When washed and ironed, the clothing had to be carried back upstairs. In many homes entrance to the attic is gained by using a "disappearing stairway" that folds up against the ceiling, out of the way. While this type of stairway saves space and is adequate to permit a person to walk up to the attic, it sometimes presents a problem when heavy items must be taken to the attic for storage.

For all these reasons the dumb-waiter is making a comeback. More and more of the units are being included as an accessory in new homes, and many are being installed in older homes. In new construction, architectural design permits the dumb-waiter to be installed so it takes a minimum of space, as in Fig. 2. Clever remodeling can produce the same space-saving result when a dumb-waiter is installed in a home that already is built, Fig. 1. Note in Fig. 1 that the dumb-waiter serves two floors and the basement. Food prepared in the kitchen is sent to the basement recreation room by means of an access door to the dumb-waiter shaft positioned at countertop height for convenience. Soiled laundry from the bedrooms and bathroom on the second floor is sent to the basement laundry room with the same ease. In some modern homes the automatic washer and dryer are located in the kitchen to minimize steps and eliminate the need for going up and down the basement stairs. The dumb-waiter in Fig. 1 could serve any of these situations equally well. While Fig. 1 does not show the dumb-waiter going to the attic, it would be a simple matter to extend the shaft to the



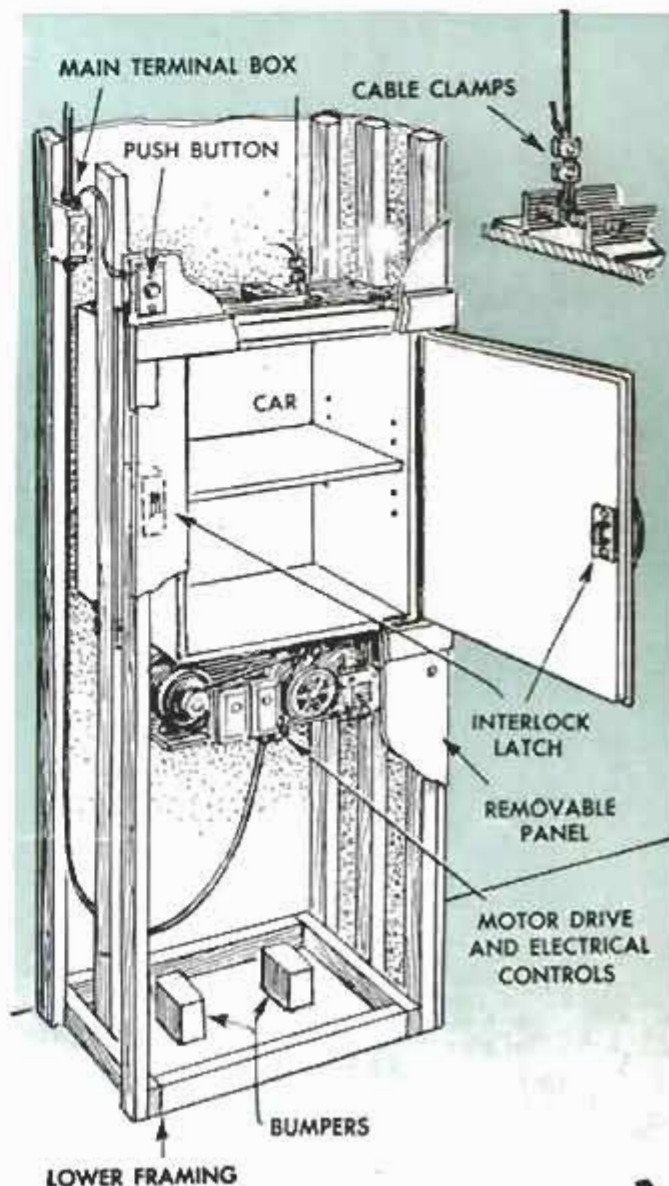
roof to permit delivering items to the attic area.

Dumb-waiters can be manually operated. An endless pull rope is run over a pulley, or sheave, at the top of the shaft to permit the sheave to be rotated. On an axle, or shaft, with the driving sheave is a traction sheave over which is run a rope from the top of the dumb-waiter car to a counterweight that moves up and down in the shaft, opposite in direction to the movement of the car. Counterweights are used with manually operated dumb-waiters to assure ease of operation. They usually consist of flat plates of metal sliding between guides on one side of the dumb-waiter shaft. Weight of the counterweight must be just slightly more than the combined weight of the dumb-waiter car and the maximum normal weight of material that is expected to be carried in the car. To stop and hold the dumb-waiter car at any position, a brake is required. For the manually operated dumb-waiter a mechanically actuated brake is located on the same shaft as the pull and traction sheaves. This brake usually is operated by pulling on a cord that can be reached from any floor served by the dumb-waiter. The brake consists of a drum keyed to the shaft, with brake shoes held stationary on supporting members. The action of this brake is much like the parking brake located on the driveshafts of some makes of automobiles.

In line with the modern trend toward electrically powered appliances in the home and motor-driven garage doors, the most popular types of dumb-waiters are those driven by electric motors. In these types simply pressing a button brings the dumb-waiter car to any floor, pressing another sends it on to any floor. Brakes used on the powered dumb-waiters are operated by solenoids that release the brake when power is applied to move the car. When the electricity is shut off by any of a number of switches in the circuit, heavy springs clamp the brake shoes on a drum and hold the car in position. Other features of electrically driven dumb-waiters are interlock latches on the doors at each floor, that prevent the car from being moved until the door is closed again. Upper and lower-limit switches stop the car at the highest and lowest doors, prevent the car from running past either of these openings, Figs. 3 and 4. Dumb-waiters of the types shown in Figs. 3 and 4 can be purchased as complete units and have such safety features as a slack-cable safety switch that prevents the car from dropping should the cable break or become slack. Fig. 2 demonstrates one type of installation where the upper door is fitted out of the way beneath a kitchen counter. This setup would be used



Photo courtesy Filinchbaugh-Murray Corp.  
Car of this commercial unit is lined with laminate to resist wear and make interior easy to wipe clean



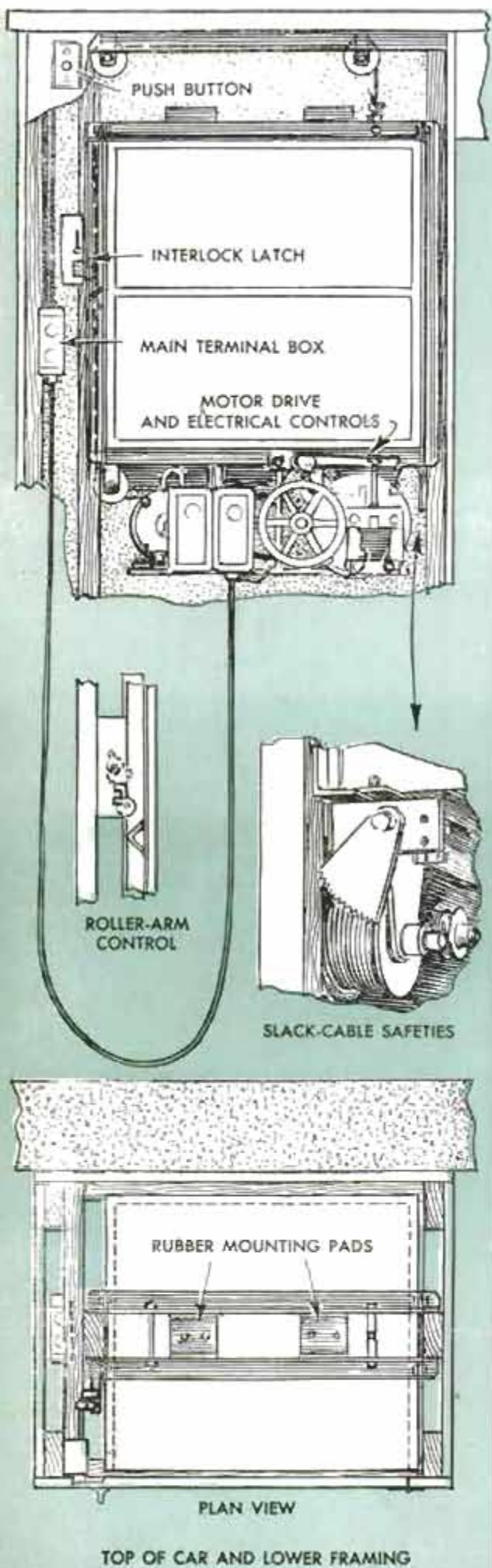
in a one-floor home with a basement. That carload of food is going to make the gang in the basement recreation room very happy, and the party-dressed hostess will not have to make several tiring and hazardous trips up and down the basement stairs.

Whether the dumb-waiter is a manufactured unit, or one assembled from parts purchased at an elevator-supply house and installed by a home craftsman, certain factors must be considered. The car of the dumb-waiter must be large enough to carry the loads it is intended to carry, yet it must not be so large that the required shaft takes up too much space in the home. Manufactured units of the types shown in Figs. 3 and 4 have the electric motor and other mechanism on the bottom of the car, traveling up and down with the car. Some types require the motor and mechanism to be at the bottom of the shaft; others, at the top. In the latter case it is necessary to have ample space above the car when it is at its uppermost limit, to accommodate the mechanism. Manually operated dumb-waiters usually have the mechanism at the top. Not only must there be room for this mechanism, but it should be readily accessible for servicing.

The car of the dumb-waiter is not simply suspended in the shaft on a cable, but must be positioned in wooden or metal guides that run the full length of the shaft. These guides prevent the car from twisting or tipping and becoming jammed in the shaft. In manually operated dumb-waiters there must be stops to prevent the car from contacting the mechanism at the top or the bottom of the shaft. If the mechanism is at the top of the shaft, springs or a cushioning device are located in the bottom of the shaft to prevent the car from striking heavily against the bottom of the shaft. The precautions also are necessary in dumb-waiters powered by electricity. In case of the failure of a limit switch the car must not be permitted to jam against the top of the shaft, nor the bottom. In the case of dumb-waiters of the type shown in Figs. 3 and 4, there must be an access door near the lower end of the shaft to permit servicing the motor and mechanism. This usually consists of a removable panel screwed in place for neat appearance and to facilitate quick removal. ★ ★ ★

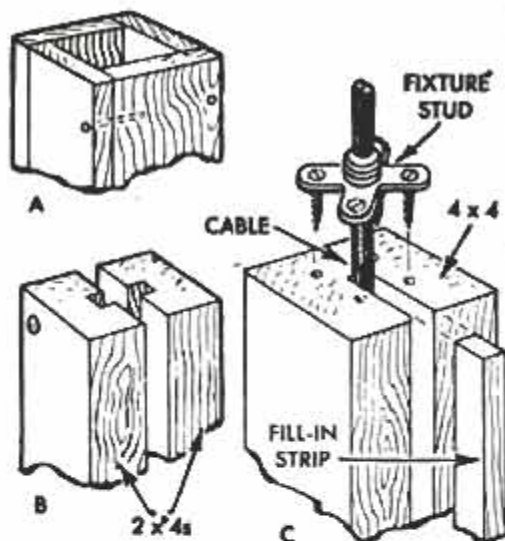
### Home-Movie Trick

When a home-movie script calls for a closeup of an effervescent drink, the bubbling effect can be simulated realistically with a headache tablet. Drop it in a glass of water and begin shooting as it starts to dissolve.

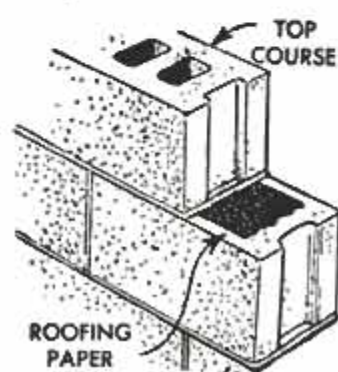


## Methods of Making Yardlight Posts

Here are three ways to fit a wire inside the wooden column of an outdoor light. First, as in A, build the column as a hollow post, using 1-in. lumber. Second, as in B, cut grooves in two pieces of lumber, then join them together. Last, as in C, cut a deep groove, insert the wire, then seal with a wooden strip. — William B. Eagan, Floyds Knobs, Ind.



## Paper "Seals" Masonry Wall



When the last course of a block wall is to be filled with concrete, lay a strip of tar paper on the preceding course. Cut the paper 1 in. narrower than the block to assure a good bond.

## Screws Stored With Faceplate



Tape will keep screws at hand for attaching work to a lathe faceplate. Just insert the screws in the holes and place strips of tape across heads to hold them in place when plate is hung up.

## Helpful Home Kinks

☐ Stains on a sink or bathtub can be removed with a paste made of hydrogen peroxide and cream of tartar.

☐ Paint lap marks that sometimes show on a ceiling after it has been painted are caused by the edge of the paint starting to dry on one section before the next section is started. To avoid this, paint as rapidly as possible and keep the sections to a size that will permit starting the second section before the first has started to dry.

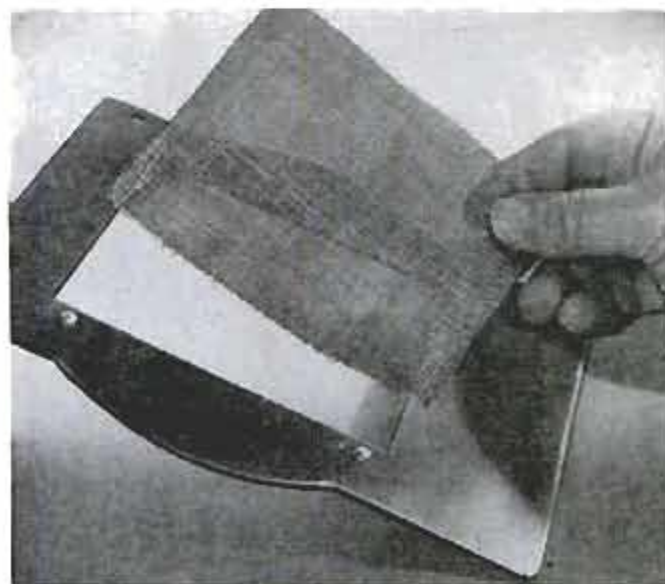
☐ Time and effort can be saved when painting a basement floor by using a paint roller fastened to a mop handle to eliminate the need for kneeling or bending down to contact the floor. Some manufacturers supply paint rollers with hollow handles that are threaded to receive handles supplied by the same company.

☐ When using quick-drying lacquers and spray paints, extra precautions should be observed. These paints should never be used near any kind of flame, such as gas stoves or heaters with pilot lights because the solvents are highly flammable.

☐ Electric food mixers are oiled more efficiently by inserting a toothpick in the tiny oilholes and letting a drop or two of oil run down it into the holes.

## Screening Assures Sharp Focus

Cut to the size of a negative, a piece of window screening makes a good focusing device for use in the negative holder of an enlarger. Its uniform over-all pattern can be brought into focus quickly, and it shows a brighter image than the usual focusing negative. If there is doubt about the covering power of a particular lens, screen shows immediately whether all of the format can be focused sharply or not.



# HOME USES *for* URETHANE FOAM

*Urethane foam is strong, odorless, washable, noncombustible and can be cut easily to any desired form*



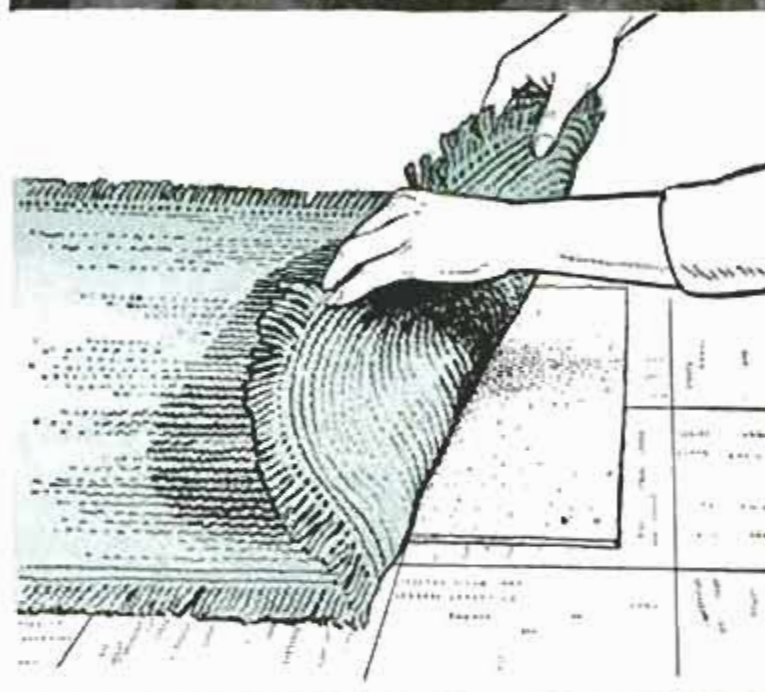
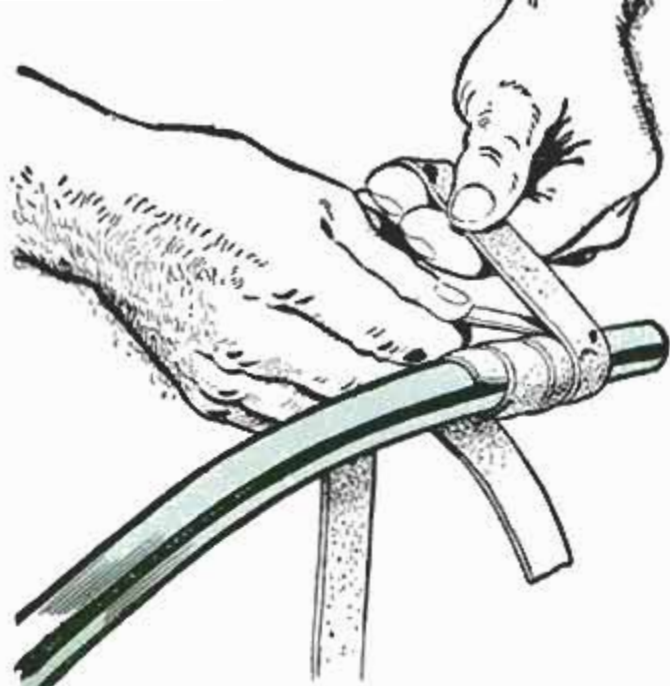
*By Jerry Parker*

**A**VAILABLE in a variety of colors in the form of sheets, slabs and adhesive-backed strips, urethane foam is ideal for many cushioning applications. Sheets may be cut with a sharp knife or scissors. Slabs that are 3 in. thick, or more, may be cut with a knife, or with a bandsaw when round shapes are to be cut as in the photo on the opposite page, top right. The material may be cemented, nailed, stapled or sewed, depending upon the means of attachment that best suits the needs of a situation.

Squares of 5-in.-thick charcoal-colored foam make comfortable seats for Oriental-style novelty parties, below left. Stacked, they can be used as a hassock. Use the slab material to reupholster furniture, or to turn a wide window ledge or raised hearth into a cozy seat.

Above, a sheet of 1-in. foam provides a comfortable pad for an outdoor lounge. The material is weatherproof, need not be covered and may be machine or hand washed when soiled. A disk of 1/4-in. foam on a turntable, drawing at left, protects

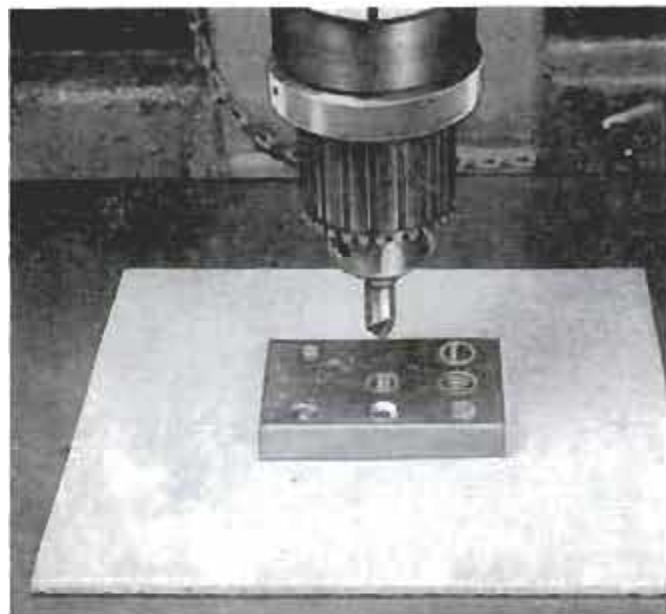




records and prevents them from slipping. The  $\frac{1}{8}$ -in.-thick foam sheets can be made into beautiful draperies that have high insulating value. Use these thin sheets also for headboard padding, place mats, shelf lining and holiday trimming. Use sheet foam to tame a throw rug that is inclined to send you reeling now and then. Simply place a  $\frac{1}{4}$ -in. sheet under the rug as in the drawing at right center of this page.

Nonslip handle grips that are easy on the hands may be made from adhesive-backed foam strips for garden implements and tools, as shown in the drawing at top left. Above, such strips also make nonslip pads for lamp bases, bric-a-brac, telephones and other items that have a tendency to scratch tabletops or to creep. Sharp edges on furniture that is moved about frequently, such as the teacart shown at right, can be covered with foam strips to provide "crash pads." ★★★



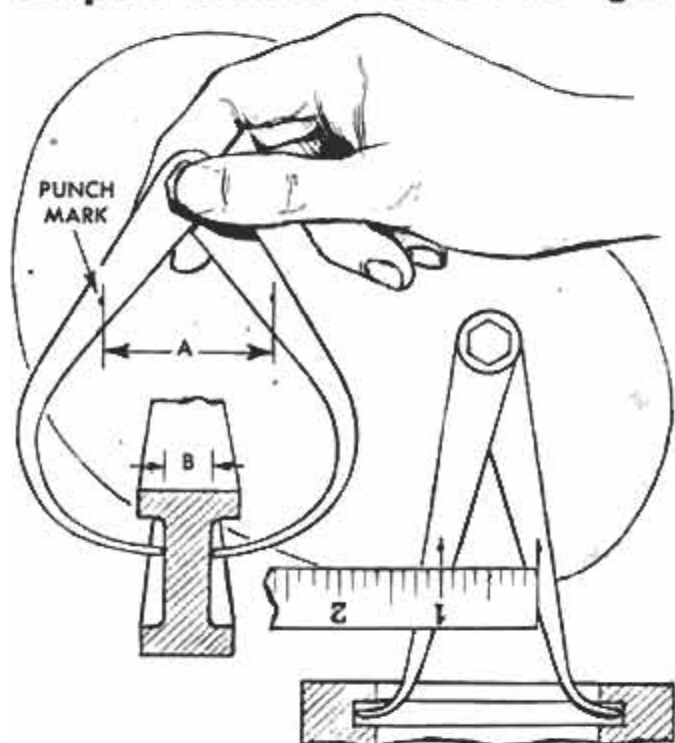


## Cork Sheet Cushions Steel Stock To Stop Drill-Press Chatter

When countersinking holes in flat-steel pieces on a drill press, tendency of the bit to chatter can be stopped by cushioning the work on a sheet of  $\frac{1}{8}$ -in. cork as shown in the photo at left. The cork absorbs the vibrations created by the action of the bit as it cuts into the metal, thereby eliminating the noise. Without the cork, or some other material that is equally as soft but firm, the piece being drilled simply vibrates against the drill-press table and the bit. Operate the drill press at its lowest speed; use a cutting oil and a very light feed.

H. J. Gerber, Stillwater, Okla.

## Calipers Used to Measure Flanged Parts and Cylindrical Grooves



Here is a way of using calipers for odd measuring jobs, such as determining the thickness of the web of an I-beam, or the diameter of an inside circular groove. An outside caliper is used for the former, an inside caliper for the latter. To do this, first make prick-punch marks high up on the flat sides of the legs to serve as reference points when transferring a dimension from the part to be measured as shown. Then, in the case of an I-beam, the legs of the instrument are closed on the web surfaces and distance "A" is measured with a machinist's scale. Next the caliper is removed and closed to distance A again. The span between caliper tips is then measured to get distance "B," web thickness. Measuring the diameter of an inside groove cut in a cylindrical piece is accomplished in a similar manner, using an inside caliper as indicated in the detail.

C. W. Woodson, Chicago



## Tape "Locks" Micrometer On Desired Setting

To use a small micrometer not having a spindle lock, as a gauge for continuous checking at the same setting, as when production work is being inspected, use the method of "locking" shown in the photo. A wide strip of cellophane tape, wrapped around the barrel of the micrometer so that it overlaps the calibrated thimble, holds the instrument at the desired setting until removed. When a micrometer is to be locked in this manner for a long time, the tape should be replaced occasionally to prevent the adhesive from drying out and sticking to the metal.

H. Hanscom, Elmhurst, Ill.

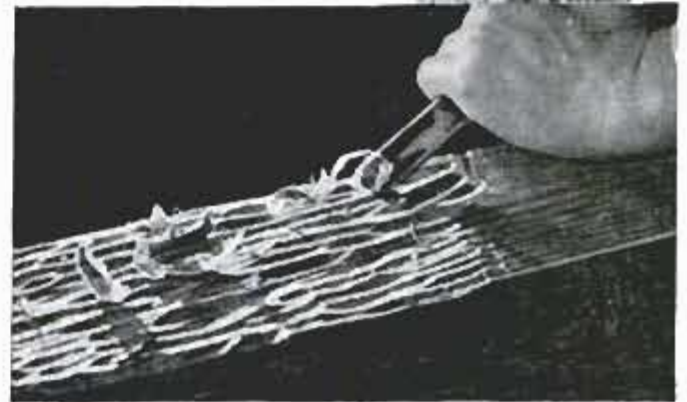
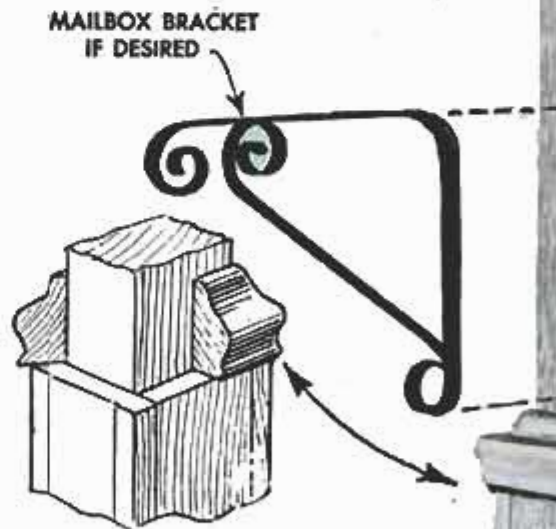
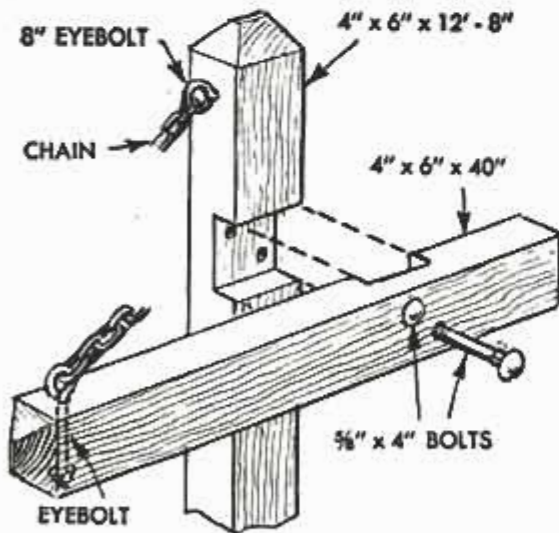


A SIGNPOST, by its homey, inviting charm, helps to identify the owner of the property on which it stands. Some posts simply give the name and house number in bold letters on an attached board. Others are more original and colorful, giving only a hint of the family name. For example on the board shown, the name "Trotter" is illustrated by a trotting horse painted on it.

The rustic post shown is sturdy, easy to make and inexpensive. The upright and crossarm are cut from a 16-ft. length of 4 x 6-in. fir. A pattern of shallow grooves chiseled on it with a  $\frac{3}{4}$ -in. gouge as shown in the photo below, right, gives the post a hand-hewn appearance. When cutting the notches for fitting the crossarm, make a series of sawcuts in the wood to be removed and chisel it out as in the photo below, left. The lower portion of the post is finished off as detailed. Assemble the post as shown and stain it as desired. An electric light and a mailbox may be attached to the post if desired.



By  
*William Palmer*

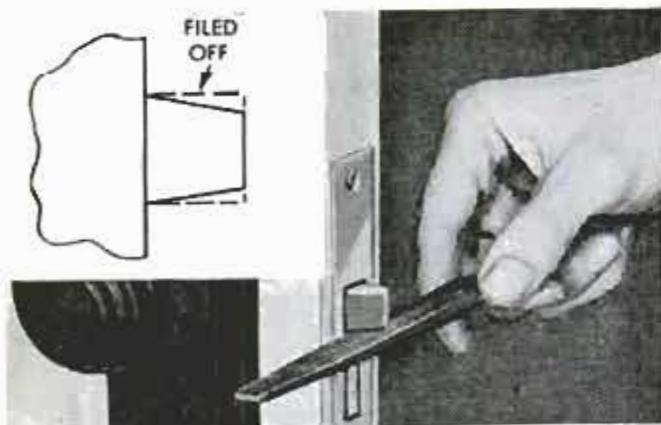


# Solving Home Problems



A **GROUND WIRE** attached to a portable barbecue having a motor-driven spit, will safeguard the chef from possible shock when operating the grill on damp ground or wet surface. Such a wire can be clamped to the metal grill and to a nearby sill cock. A short circuit, resulting from worn insulation, could cause a fatal shock if grill is not properly grounded

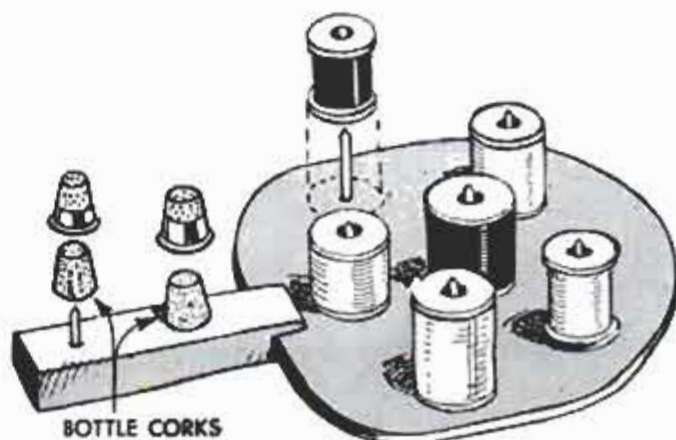
**WHEN A DOOR BOLT** won't align with the opening in the striker plate, simply taper the top and bottom edges of the bolt with a file. This is better than enlarging the hole in the plate and will alleviate any future misalignment trouble caused by the settling of either the door or the doorframe



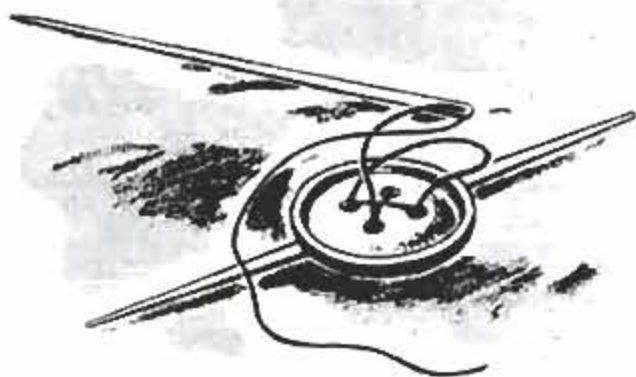
**IN CASE OF FIRE**, when it might be expedient to act in a hurry in saving clothing, it is wise always to see that coat hangers in a closet all face the same way on the rod. This permits the clothing to be grabbed in armloads and lifted off quickly



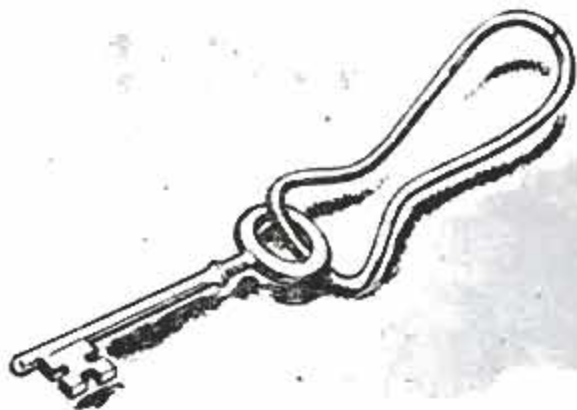
**NOVEL SPOOL CADDY** for your sewing box is improvised from a discarded table-tennis paddle. Spindles for the thread spools are provided by driving nails through the paddle from the back. Small corks nailed to the handle will store thimbles



**IF YOU FOLLOW** the common practice of putting homemade jelly in tumblers and then sealing with paraffin, a teakettle will be found the safest utensil for melting and pouring the paraffin. A length of string placed across each tumbler beforehand will provide a handy built-in handle later for removing the paraffin from the top of the jar



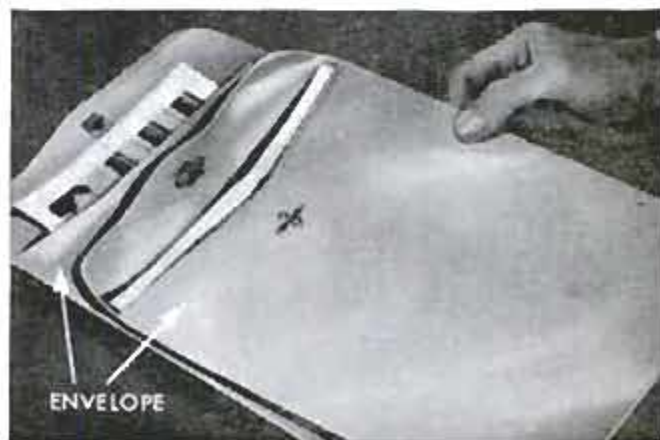
**SEWING BUTTONS** on heavy garments so they will be less difficult to button is accomplished by inserting a toothpick between the button and the cloth after the first loop stitch is made. A less tightly sewed button results, since the toothpick adds slack



**KEEPING TRACK** of a house key is less trouble when it is attached to a large ring. A cap-bottle opener is ideal for this as it not only makes the key more easy to find, but being with the key, the opener is always at hand in the pocket for use at a picnic

**NEAT HOLDER** for storing an electric razor in a medicine cabinet can be made from a metal adhesive-bandage box. Cut the box down so it measures 1 3/4 in. high and then cover the sharp edges, as well as the rest of the box, with colored tape

**BY CLIPPING THE FLAP** of one envelope to the metal clasp of the other, several Manila envelopes ganged together in this manner will make a convenient hanging file for sorting clippings. It's easy to detach any of the envelopes at any time from the group





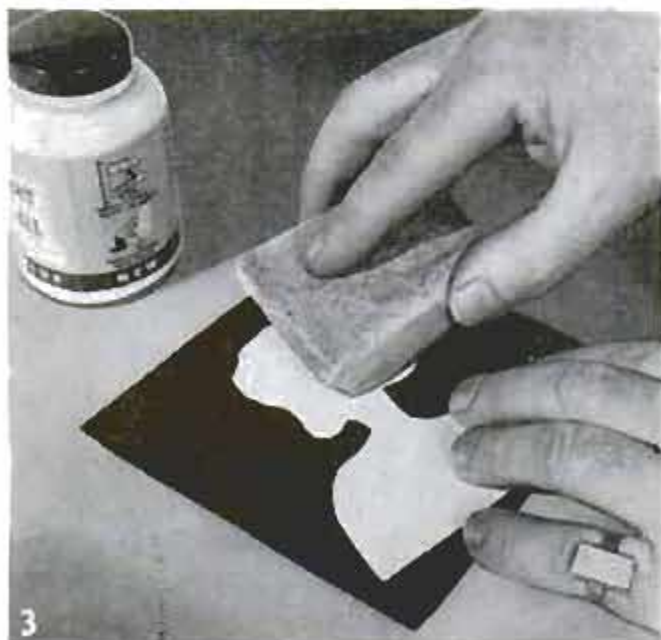
## GLUING HINTS



1. An easy way of attaching a letter or other insignia to a sweater is to spread white plastic glue on the back of the insignia and press it onto the garment with a warm electric iron. Either cloth or felt insignia may be attached in this manner

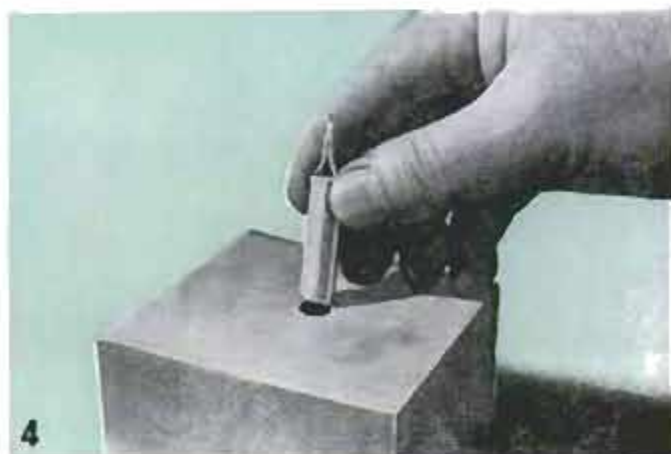


2. Loose crossrail of a chair can be reglued without having to pull members of the joint apart. First drill a small hole in the leg to take the tip of a plastic glue-bottle spout as shown. With the spout held firmly in the hole, squeeze the bottle to force glue into the joint, wiggling the members to get an even distribution of glue. Wipe off excess glue and fill the hole with plastic wood tinted to match



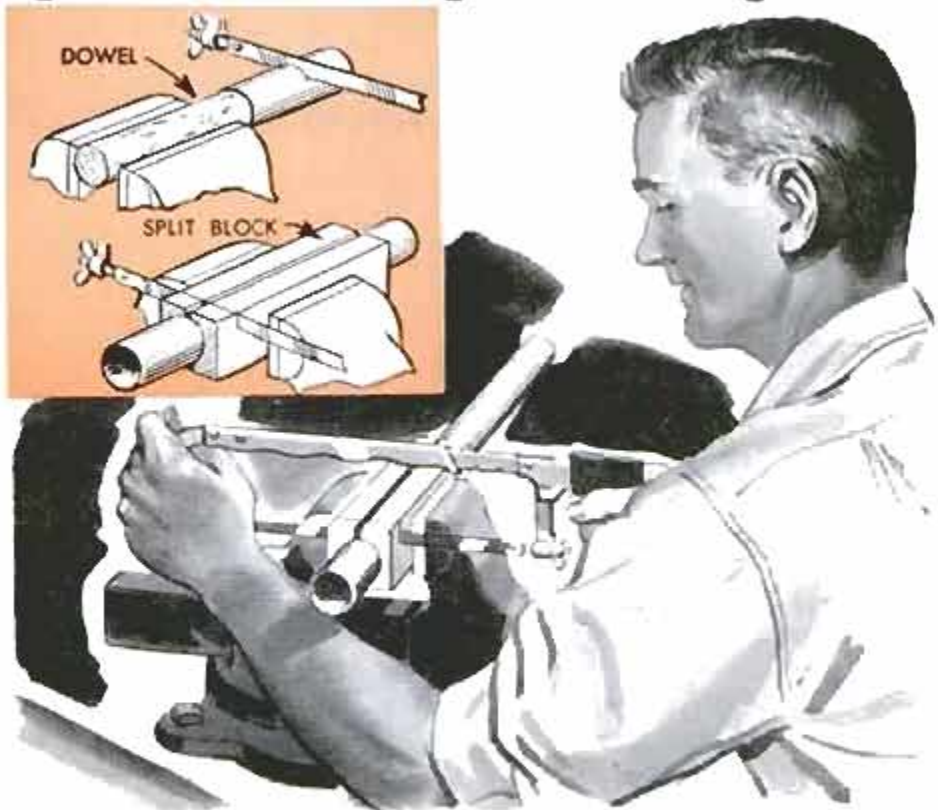
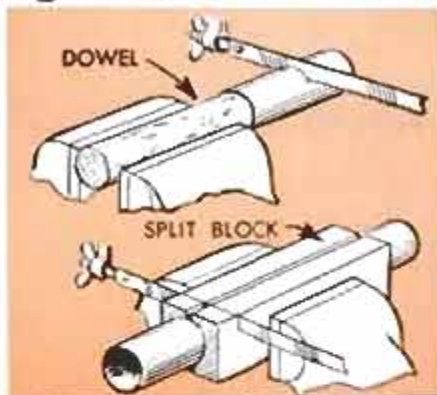
3. When gluing unglummed labels and decorations cut from thin paper, dampen them with a sponge immediately before applying the glue to assure a neat job. The moisture-expanded paper contracts as it dries, leaving a smooth, wrinkle-free appearance

4. Here is an easy way of relieving glue pressure in a dowel joint without having to cut a groove or flat surface on one side of the dowel. Wrap a length of lightweight thread around the dowel to be glued, apply glue and insert it as shown. Excess glue can flow through the spaces made by the thread which then becomes saturated and flattened. This method does not reduce contact surfaces as when a dowel is grooved or flattened, resulting in a stronger joint

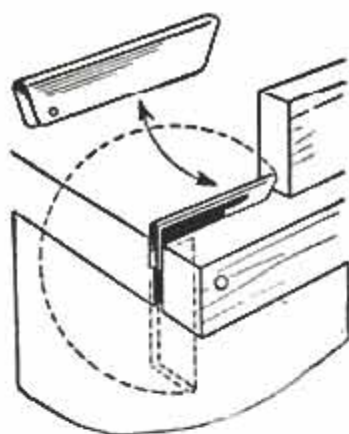


## Methods of Holding Polished Tubing For Cutting

There are two ways to cut polished tubing cleanly and squarely without marring the highly-finished surface, both of which allow the work to be held securely in a vise. By one method, the tubing is pressed over the extending end of a snug-fitting wooden plug, such as a dowel, and then clamped between the vise jaws. The cut is made with a fine-tooth hacksaw, sawing through both tubing and wooden plug. This prevents burring by slowing the cutting action of the blade, resulting in a fine cut. A second method is to clamp the tubing between split halves of a bored block and to saw through both as before.



### Bench Stop Pivots in Slot



Bent double, a sheet-metal strip, pivoted by a nail in a slot cut in the edge of your workbench, provides a simple workstop when edge planing. Stop swings down below surface of bench completely out of the way when not being used.

### Storage Cups For Brads



Picking up that last tack or tiny brad from a round-bottom container is far easier than from a square-bottom one. You'll find that the halves of a couple of hollow-rubber balls, tacked to a board, make perfect storage cups.

### Razor-Blade "Chisel" Is Aid When Scribing and Mortising Small Hinges

When cutting mortises for small butt hinges, you may find that a single-edge razor blade is easier to handle than a chisel in outlining the mortise. Having a wedge-shaped cutting edge, the razor blade makes a clean square cut with very little pressure. The reinforced back of the blade permits it to be tapped lightly with a hammer to outline mortise, after which a series of cuts, made across the mortise to the required depth, permits the waste to be neatly pared away, either with the razor blade or with a regular chisel. You'll find, too, that a razor blade is an ideal tool to use in scribing around the hinge when marking its location on the edge of the door. It will give a precise guide line to follow.

Henry Hanscom, Elmhurst, Ill.





Above, "boatport" attached to garage is easy to build. Roof consists of metal roofing fastened to frame of 2 x 4s, one side of which is supported by 2 x 4 nailed to garage, other side by pipe supports

Below, in addition to providing an inexpensive permanent shelter and adequate circulation of air, boatport leaves ample clearance on all sides of boat for doing maintenance work during lay-up period



Providing a good shelter and proper care at lay-up time is a sure way to

## LOWER

**W**HEN IT'S TIME to call it quits for another boating season, give your boat and equipment a break with proper lay-up and winter protection. A muster of all hands for a weekend of touching up paint, and thorough cleaning of boat, motors and equipment before storing them in a dry place will pay big dividends next spring. While inside storage is no problem for a boat that is small enough to keep in the garage, cruisers and heavy runabouts usually require a special shelter. This can take the form of a rigid shelter, such as the "boatport" illustrated on this page, or it can be a tarpaulin lashed down on top of the boat. Since the latter usually restricts air circulation, which encourages dry rot in a wooden hull, it is recommended that the rigid type of shelter be used. The latter not only costs less than a good tarpaulin, but it will last much longer. Being entirely free of contact with the boat, there is also ample space for doing repair and maintenance work during lay-up, Fig. 3.

Attached to one side of the garage, the boatport is easy to build, requiring only metal roofing, framing, and pipe supports for the open side as shown in Figs. 1 and 2. A 2 x 4 nailed to the side of the garage provides support for the other side of the roof. A receptacle can be installed on the outside of the garage and tapped into the garage wiring for the convenience of running power tools and for lighting.

A proper lay-up procedure should begin with a thorough scrubbing of the hull and



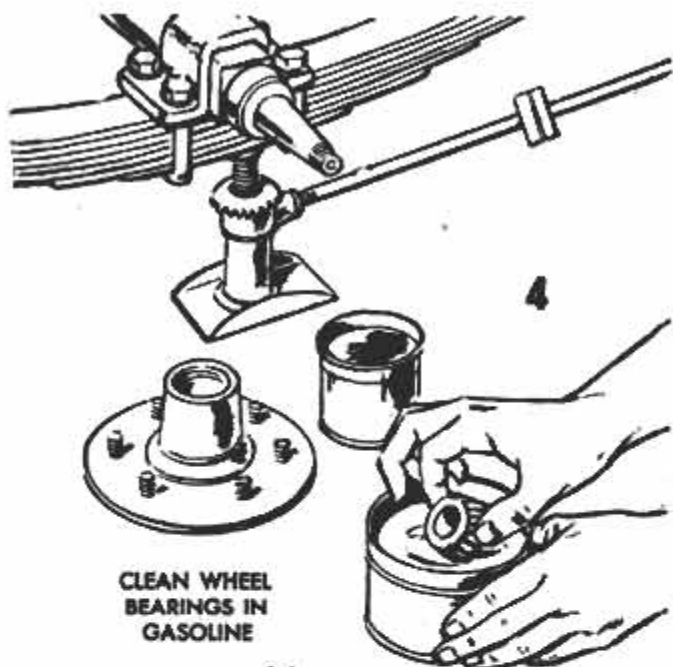
# YOUR BOATING

# BILL

By  
F. C. Clark, Jr.

superstructure. Be sure to scrub the bottom as soon as the boat is removed from the water. If you wait until the marine growth on the hull becomes dry, it is very difficult to remove. If the boat is to be stored on a trailer, the trailer should be completely serviced before loading. Clean and repack wheel bearings, Fig. 4, lubricate hitch parts, Fig. 5, winch, springs, keel rollers and other moving parts. Whether a boat is stored on a trailer or on a cradle, it must have well distributed support points (keel rollers and bunks or cradles) to prevent the weight of the boat from forcing the hull out of shape. Good tire care requires that the trailer axle be blocked up to take the weight off the tires.

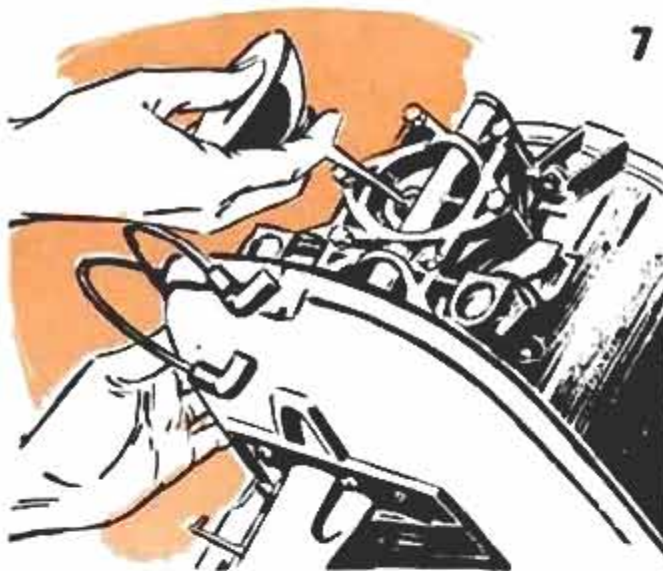
Next tend to the power plant. Motors that have been operated in salt water should be flushed with fresh water. An easy way of doing this for an outboard motor not recommended to be flushed with a hose is to run it in a 50-gal. steel drum of water while the motor is still on the boat, Fig. 6. To flush an inboard engine, connect one end of a garden hose to the intake side of the water pump and place the other end in a container with enough water for a few minutes' running time. Next drain the cooling system according to the directions given in your owner's manual. For an outboard this usually involves setting the motor in a vertical position and rotating the flywheel manually several times. To prevent formation of gum deposits in the fuel system, drain the lines and carburetor. Re-





Above, to clear salt water from motors, run them in drum of fresh water while still mounted on transom

Below, small amount of motor oil squirted in cylinder through spark-plug hole retards rust during lay-up



Below, use torque wrench to tighten cylinder-head bolts; be careful not to exceed recommended pressure

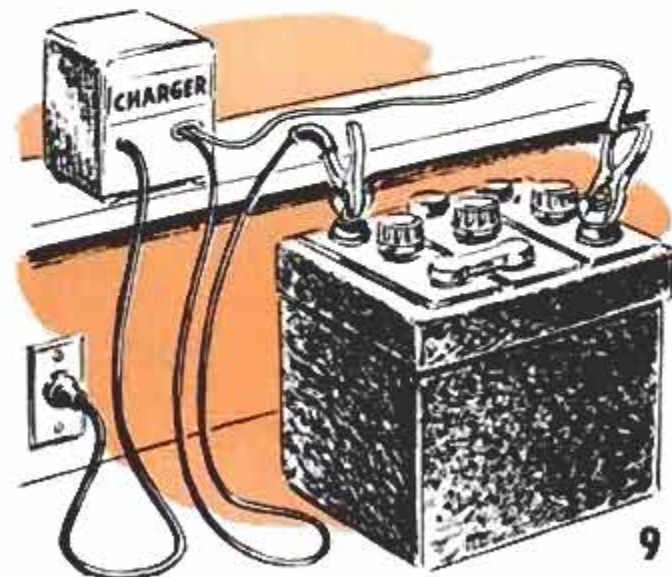


move the carburetor sediment bowl and wipe it clean. Use benzine to clean the filter element.

Another important job is to clean the spark plugs. With the plugs removed, squirt some clean motor oil into the openings, rotating the engine crankshaft several times to distribute the oil evenly. Coat throttle-linkage joints with grease to protect them from corrosion. Cylinder-head bolts may have loosened. Use a torque wrench to tighten them, Fig. 8, so the correct pressure can be applied as recommended by the manufacturer. Don't forget to drain and refill the lower-unit gear case. After you have completed servicing the motor, wipe a film of oil on all exterior parts and store it upright in a dry place. At the same time, don't forget to give the starting battery proper care during its hibernation period. Keep the battery in a cool, dry place and charge it as necessary, Fig. 9.

Turning to the interior of the boat, first remove all unattached equipment, gear and supplies to permit a thorough cleaning. Set these things aside for proper storage in the garage or house. A lightened boat will reduce the chances of hull members warping while the boat is in dry storage. Then clean the inside of the boat thoroughly, using detergents and cleaners that are not harmful to the surfaces to be cleaned. Be sure the bilges are free of gasoline and grease. Remove the drain plug when washing the interior and drain all cleaning solutions. Check over lines and anchors, being sure the rope is dry before storing it. Inspect the steering cable for worn spots. Additional cable guides may be necessary to avoid chafing. While performing all these prestorage jobs, it's a good idea to make a list of things you need to replace or add to the boat for the coming season. Keep the list handy so you will be reminded to tend to items as time and budget permit.

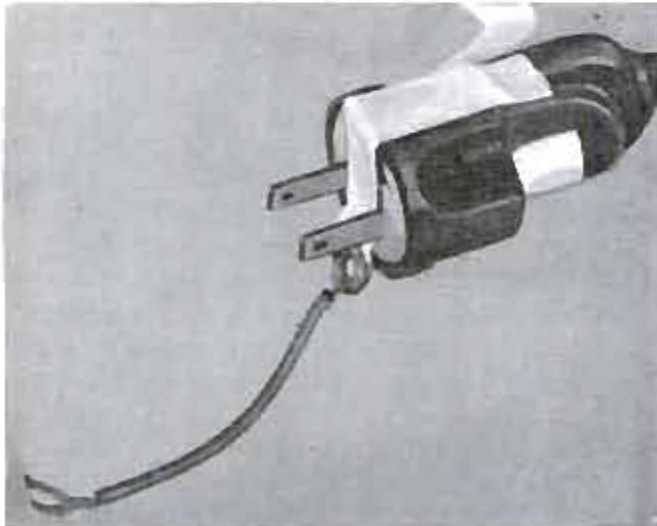
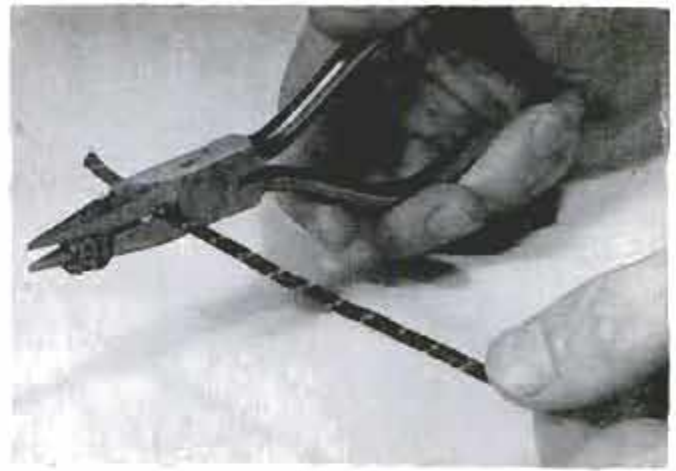
★ ★ ★





## Wire Stripping Easy With Adapted Pliers

You can do a better and faster job of stripping insulation from light-gauge wire when several turns of wire are wound around one jaw of the pair of long-nose pliers used for this purpose as shown in the photo. Acting as a stop, the wire prevents the cutting edges of the pliers from severing more than the insulation. The size and location of the wire turns determine the clearance between the cutting edges when the jaws are closed.



## Keep Grounding Adapter Handy By Taping It to Three-Prong Plug

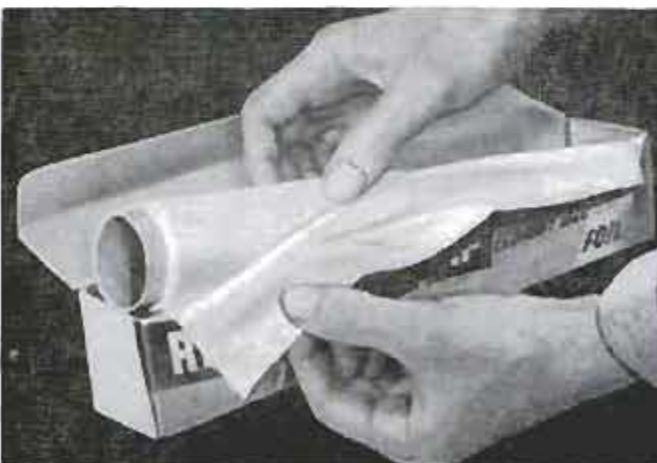
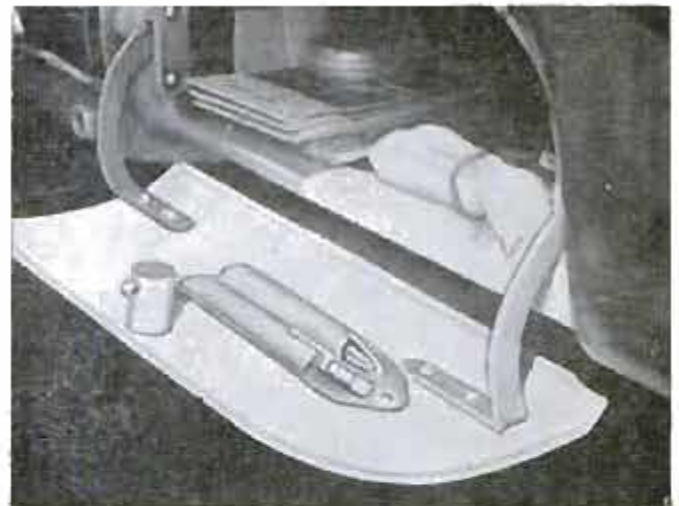
To assure that a grounding adapter that converts a 3-prong plug into a 2-prong plug is always conveniently at hand, one home craftsman taped the two together as shown in the photo at left. This is done by first applying a strip of tape that is long enough to overlap both plugs when centered between the prongs of the 2-prong plug. Then another strip is wrapped around the 3-prong plug circumferentially to overlap the ends of the first strip.

R. Hanscom, Elmhurst, Ill.

## Holder on Glove-Compartment Lid Keeps Pen and Pencil Handy

Here is a tip for motorists who are irked by having to search the glove compartment whenever they need a pen or pencil. Simply cement a small plastic holder to the lid of the compartment as shown in the photo at the right. The holder takes no usable space and always keeps a pen and pencil handy for instant use. Such holders are available at most stationery and variety stores.

Arthur R. Tanner, Jr., Poughkeepsie, N. Y.

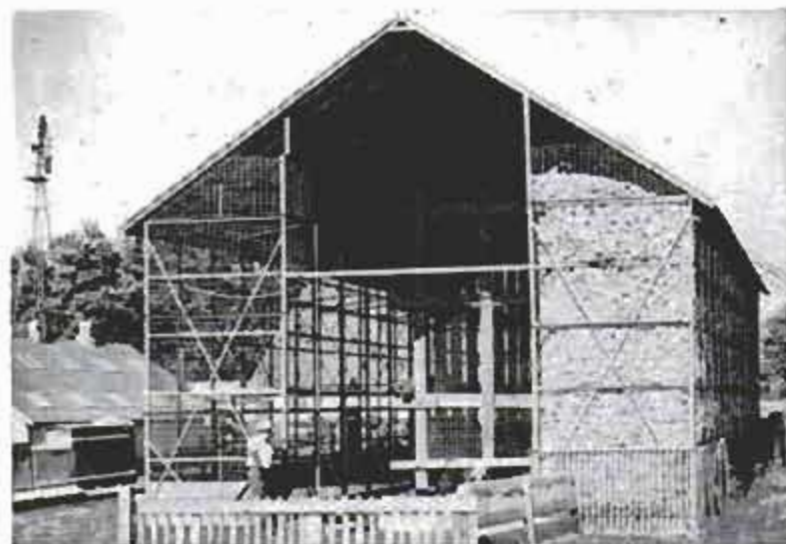


## Store Paper Towels for Car Use In Wax Paper Container

Rolled paper towels are kept conveniently at hand by a motorist who rolls them on an empty tube from an aluminum foil or wax-paper container. Enough towels are rolled on a tube to permit replacing it in the container for clean, neat storing under the front seat. The metal edge attached to most lids of such containers provides an easy means of tearing off towels when needed for cleaning the windshield, wiping hands and many other uses.



Creosoted poles braced with 2 x 4s form the framework of this corncrib that is divided lengthwise into three sections. The center section can be used for storing baled hay or straw, machinery or loads that might be caught in a rain. Siding extends about 4 ft. down from the roof for weather protection; below that the walls are covered with war-surplus steel matting. The roof is galvanized sheeting.



When necessary, ear corn also is stored in the center section of this welded-steel crib, increasing the capacity of 10,000 bushels. The walls of the crib were welded as units on the ground, then lifted upright with block and tackle. Steel brace rods and connecting corner angles then were welded in place. Rafters also are welded steel angles to which is attached corrugated galvanized roofing. Welded-wire mesh covers the walls from roof to ground on the side sections.

## IDEAS IN CORNCRIBS



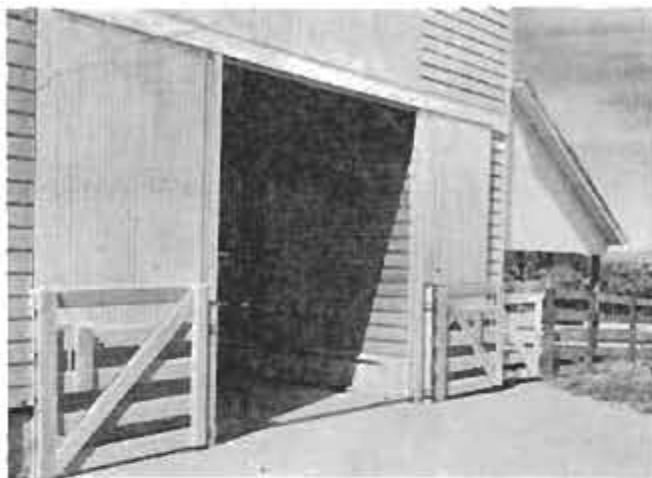
This combination hog shed and corncrib saves time and labor at feeding time, as ear corn is scooped through outside doors by farmer on catwalk, and dropped to the concrete floor of the pen below. The catwalk consists of planks nailed to alternately projecting floor joists. A scoop is located at the ladder which provides access to the catwalk at the far end of the building.



Building a 5000-bu. corncrib against the wall of the cattle shed reduced cost for both structures. Salvaged electric-line poles are set in concrete to provide both roof supports and wall members. Spaced slats are nailed to the poles several feet above the ground, with a number of doors positioned 4 ft. above the ground. Above this the walls are covered with wire fencing. A catwalk makes shifting the elevator easier.

## Closed Gates Permit Open Doors

Hung across the driveway of the granary this pair of heavy gates can be closed when the large sliding doors are open. This allows free circulation of air through the building for drying a fresh crop, while keeping out stray livestock. Gateposts are lengths of heavy steel pipe sunk in concrete. They are positioned far enough out from the building so that the gates in no way interfere with the sliding doors. When the gates are open, as shown, they are hooked to stops in the concrete.



## Tractor Attachment Applies Waste Oil to Control Road Dust

In Des Moines County, Iowa, Jack Gibson controls the dust on the road that passes his farmhouse by applying crankcase drain oil. Built in the farm workshop, and mounted on the rear of a tractor, the applicator consists of a steel oil drum fitted with a T-shaped assembly of pipe and fittings. The crossbar of the tee has  $\frac{1}{4}$ -in. holes drilled in it every  $1\frac{1}{2}$  in. Control of the oil flow is by a valve in the pipe between the oil drum and the crossbar. The tractor is driven at 2 m.p.h. when applying the oil.—A. M. Wettach, Mt. Pleasant, Ia.



## Efficient Edge Clamp Is improvised From Wire and Turnbuckle

If you do not have enough clamps, or if a clamp of sufficient size is not available, one can be improvised from a length of heavy wire and a turnbuckle. Extend the turnbuckle its full length and draw the wire as tight as possible when fitting it in the eyes of the turnbuckle. If the object to be clamped has a finished surface, use wooden blocks to prevent the wire from damaging it. A piece of thin plywood or hardboard should be placed also between the turnbuckle and the work, to protect the finish. Tremendous pressure can be applied with this improvised clamp, so it is best to use less force than would seem necessary.

Ken Murray, Colon, Mich.



☞ Use olive oil to loosen quickly a piece of paper stuck to a polished table top.



### Lead-Shot "Lock Washer" in Acorn Nut

Lead shot can be used to lock an acorn nut on a bolt or threaded shaft when the threaded portion is too short to permit using a lock washer. Enough pieces of shot are fitted in the nut so that when they are crushed by the nut, they jam it in place, but still permit the face of the nut to bear firmly against the object to be held.



### Magnetic Holder for Drill-Chuck Key

Placed against the column of a drill press, a high-strength-alloy horseshoe magnet provides a handy means of keeping track of a chuck key. Should the key be used on more than one machine, it is a simple matter to transfer both the key and magnet to a different location.

Walter E. Burton, Akron, Ohio



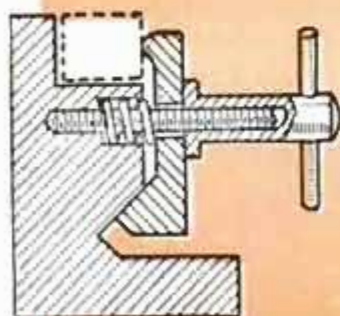
### Guard Protects Blades of Paint Scraper

You can eliminate the need for sharpening the blades of a paint-scraping tool of the type indicated, every time it is used, with this guard. It is made by slitting a length of small-diameter hose. When carried in a toolbox or dropped in a drawer with other tools, the guard will prevent the blades from becoming dull and nicked.



### Bench Legs Adjusted With Lag Screws

If the concrete floor of the basement or garage where you plan to locate a workbench is not level, you still can have a wobble-free work surface by using lag screws as leg levelers. Turning the screws in or out with a wrench does the leveling. To prevent splitting the legs, drill adequate-size pilot holes.



### Strap Clamp for Special Machining

When it was necessary to machine the top surfaces of a number of pieces, one workman made the strap clamp shown. Because of the angled lower edge of the clamp, tightening it causes it to pull downward as well as holding laterally against the fixture. The spring on the clamp screw assures quick releasing.

Federico Strasser, Santiago, Chile.



### Rope "Clamped" Quickly With Tubing

Short sections of copper or aluminum tubing provide a quick method of securing light ropes in loops, "whipping" the loose ends of the rope to prevent it from unraveling, and for splicing lengths of the rope together. The tubing is slipped over the rope, then both are placed in a vise and the tubing is flattened so the rope is clamped.



# Painting Over New Plaster

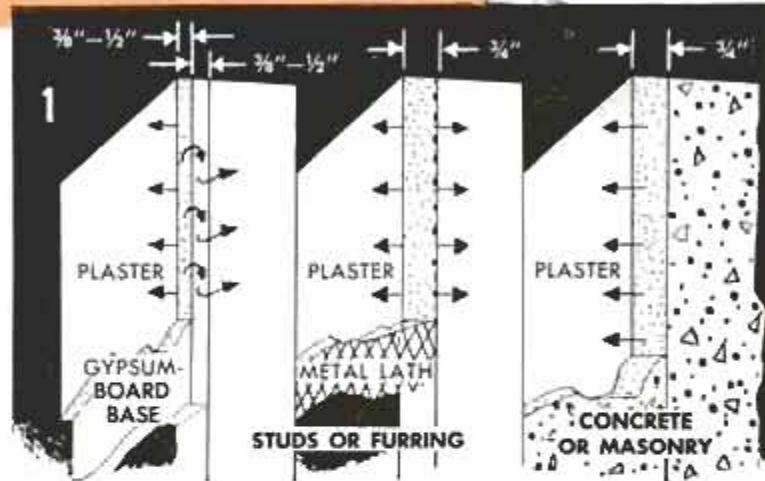
By E. R. Haan

**B**EFORE you start spreading gay colors on the interior walls of your new home, just make sure that the plaster is actually ready for painting in respect to dryness and surface condition. Then you can be reasonably certain that the paint job will be uniform in appearance and free from blemishes.

Too much dampness in new plaster may delay the painting or influence the selection of paint. Surface conditions, such as soft spots, chalkiness, efflorescence and the presence of hairline cracks, should be corrected. These conditions also may be influential in the paint selection.

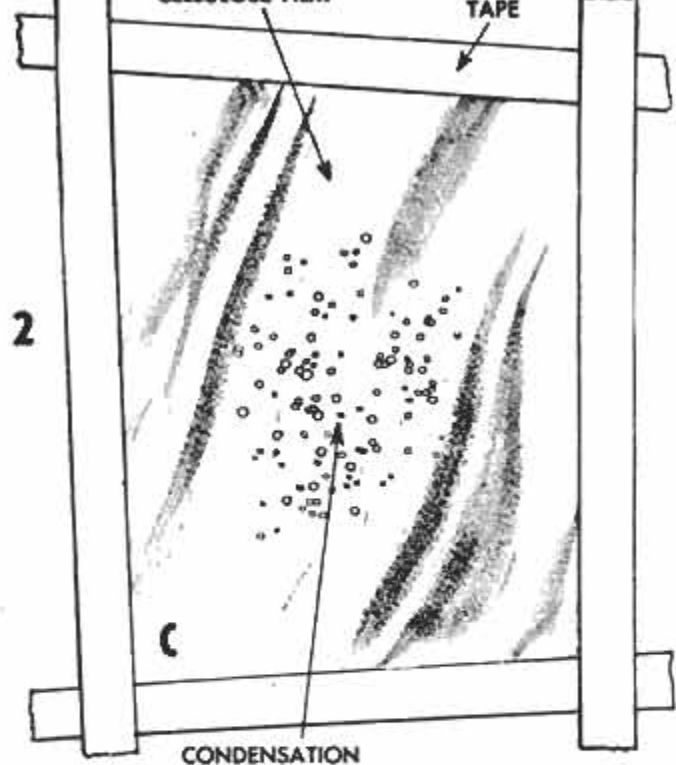
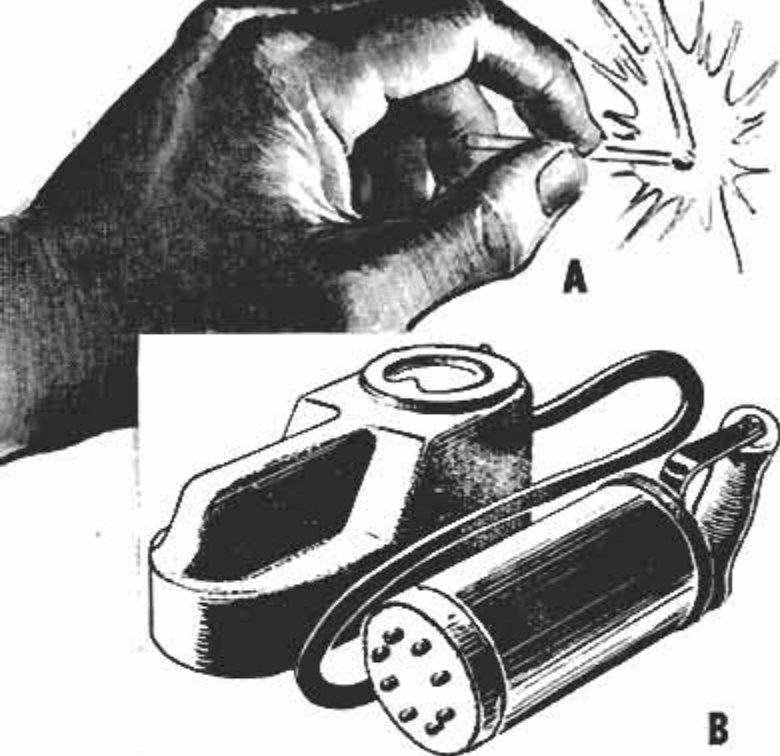
## Dryness of Plaster

If you are intending to use alkyd or oil-base paint, dryness of plaster is of utmost importance. For many years painters followed the rule of waiting six months to two years before applying oil-base paint to interior walls. Today, however, improved formulation of both plaster and paint have shortened this waiting period. For average conditions of varying humid-



ity, a 60 to 90-day drying period often is recommended. But when the relative humidity is not over 40 percent, and the temperature is not less than 50 deg. F., plaster on partitions or furred walls often dries sufficiently in three or four weeks. Dry air absorbs large quantities of moisture from plaster quickly, but humid air, which is already loaded with moisture, retards drying time considerably.

The drying rate of plaster varies with the type of wall construction. There is



less water to evaporate from a plaster coating on a gypsum-board base, Fig. 1, than from a thicker three-coat plaster covering on expanded metal lath. Plaster on frame partitions or that applied to a base over furring, dries from both sides. The slowest to dry is plaster applied directly to concrete or masonry.

#### Tests for Plaster Dryness

To determine accurately how dry plaster is, and whether it can be painted, professional painters often make use of a moisture meter, such as pictured in Fig. 2, detail B. Homeowners, however, can make other simple tests. If a match fails to ignite when struck on plaster, it is an indication that it is still too damp for the application of an alkyd or oil-base primer. Another test consists of taping a small sheet of cellophane or celluloid loosely to the wall, sealing the edges all around with strips of masking tape. If any condensation appears on the inside surface of the sheet in the course of a few days, the plaster is too damp for an alkyd or oil-base primer.

#### Painting Damp Plaster

When it is necessary to paint damp plaster, a single coat of water-base paint, preferably of the latex variety, usually will adhere but may not give the desired coverage. A single coat will still permit evaporation of moisture in the plaster to continue. Two coats of latex paint should not be applied to a damp wall since the paint film then becomes a moisture barrier, preventing further evaporation from the plaster. Moisture remaining in the

plaster builds up pressure under the paint and may cause it to loosen in spots unless sufficient evaporation occurs from the opposite side. Therefore, the second coat of paint is applied after the wall has dried completely. The pigments in some paints react to the alkali which is drawn out of the plaster by the moisture, resulting in spottiness.

#### Dry-outs and Sweat-outs

Some soft spots in plaster that have white, chalky surfaces are known as "dry outs." These are caused by too-rapid evaporation of water before the plaster has set. This condition can be remedied by spraying the area repeatedly as necessary with a solution of alum, 1 lb., dissolved in water,  $\frac{1}{2}$  gal., or equivalent proportions. A hand-operated garden sprayer can be used to apply it as in Fig. 4. The added moisture promotes crystallization.

Other soft spots known as "sweat outs" are damp and somewhat dark in shade as indicated in Fig. 3. These are caused by too-slow drying which allows the water to remain in the plaster after it has set. The condition sometimes can be improved by drying the wall with heat, or by applying lacquer to surface-harden these spots and permit painting. If this does not help, it may be necessary to remove the soft plaster and replace it.

#### Efflorescence and Chalkiness

Efflorescence, shown in Fig. 5, is a thin deposit of soluble salts from concrete or masonry to which plaster is sometimes applied, and is brought to the plaster surface by moisture. When such deposits are



3 "SWEAT OUT"—DAMP, SOFT SPOT, SOMEWHAT DARK



5

found, they are brushed off repeatedly over a period of time until they no longer reappear. Brushing is done dry, without any water. If necessary to paint over efflorescence, it should be done with latex paint. Similar white deposits on a plaster surface often result from water leaking through it, originating from a roof or wall leak. This can be stopped only by finding the leak and repairing it permanently.

Plaster that has a dull, nonreflective surface may be covered with a white, chalky film which rubs off easily. This condition is quite common and causes paint to peel. The chalky film is brushed off and then an alkyd or oil-base primer is used. A water-base paint will not adhere to a surface covered with this powder.

#### Oil Spots and Hairline Cracks

Any apparent grease or oil on plaster should be removed with a cloth saturated with white gasoline or benzine. When dry, the spot is washed with a detergent solution and then allowed to dry before painting. Sometimes hairline cracks develop in the finish coat of plaster and do not show up until the wall is painted. Such cracks can be filled with Spackle, using a putty knife on smooth plaster or a stiff-bristle brush on rough plaster. On smooth plaster, the Spackle is sanded when dry. Hairline cracks often can be obscured with a heavy-bodied paint over the primer.



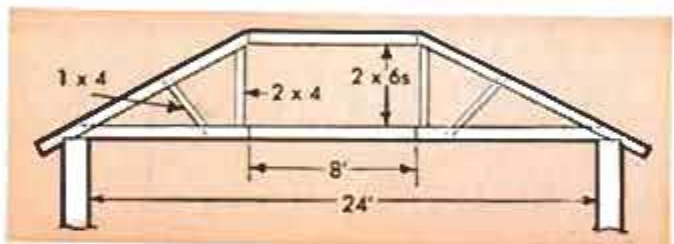
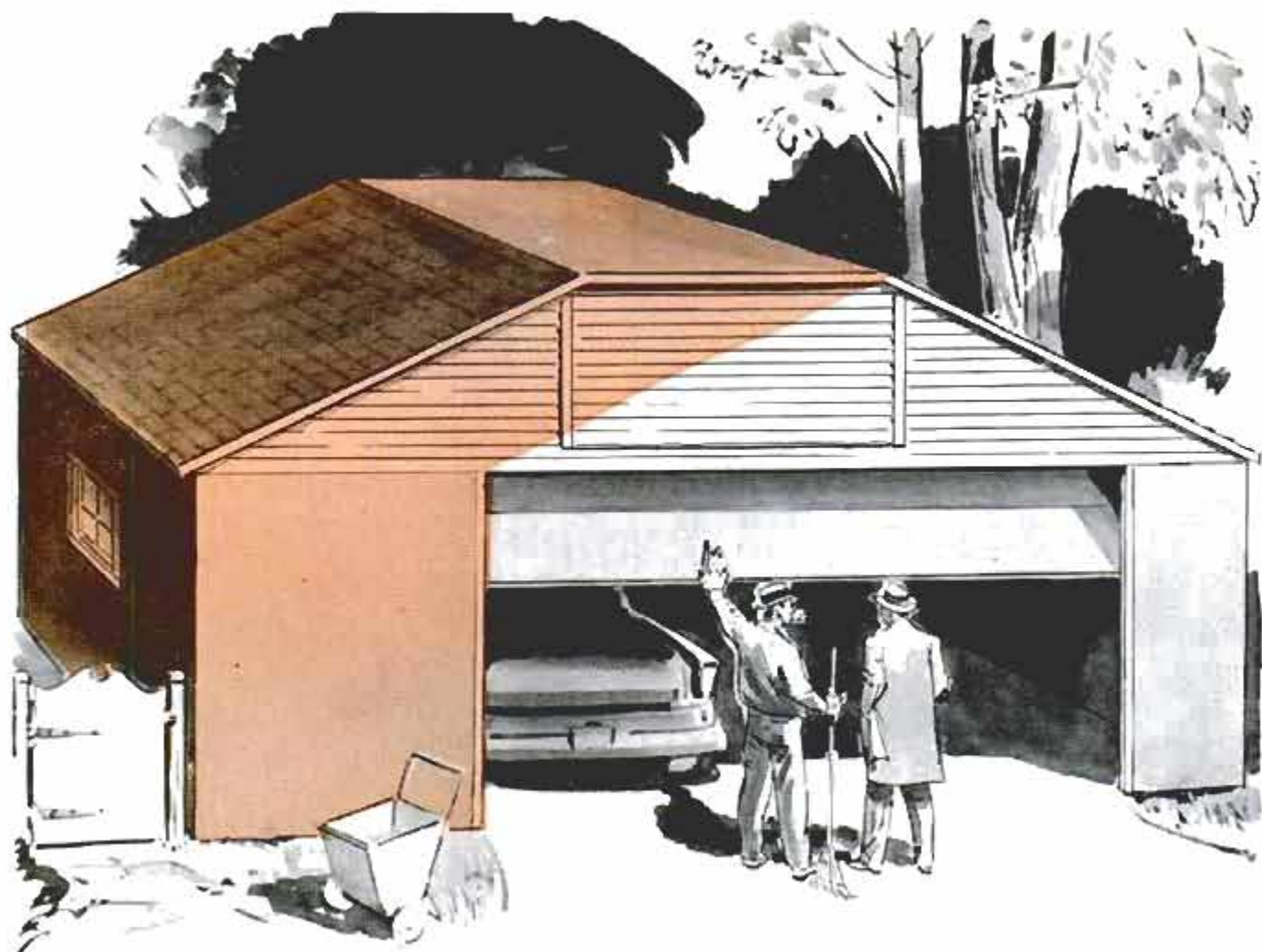
4  
"DRY OUT"—  
SOFT AND CHALKY WHITE

#### Painting

The first coat of paint is a primer sealer. This renders the plaster surface uniform so that there will not be varying spots of sheen and dullness. When using an alkyd or oil-base primer, it should be allowed to dry for at least a week before the top coat is applied. If the latter is applied too soon, peeling may result. An oil-base finish paint can be applied over a latex primer, but will not adhere properly to other water-base paints. It is important to mix the paint thoroughly before application and to keep it well stirred to assure good coverage and uniformity of color.

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## Expanded Garage Houses Second Car and Boat

IF A WIDER late-model car is crowding your one-car garage; if you need room for a second car, or simply require more storage space, then do as Everett Hedgcock of East Peoria, Ill., did and expand the garage. First step is to pour a new footing level with the old. The roof is shored up and separated at the ridge. Front and side walls then are pulled down, the loose half of the roof being supported on the back wall and shores, and new walls are built on the new footings. The free half of the roof now is moved to position on the new walls. In the original job, 2 x 4 rafters were spaced on 2-ft. centers as were the roof beams. A 2 x 6 was spiked to each rafter, and lengths of 2 x 4s joined them to the separated roof sections. Between the roof sections a length of 2 x 6 was positioned horizontally. The result is a sort of truss. An advantage of this type of construction is that an 8-ft.-wide deck is formed between the roof halves. Using a "haymow type" door at the front of the garage permits this deck to be used for storage of a boat. A doubled 2 x 8 header, set on edge and even with the top course of blocks, is used across the door opening to support the end truss.



## Spark Plugs Provide Lifting Rings For Hoisting Motor From Chassis

When it is necessary to pull a motor from a car, two spark plugs altered as indicated will provide lifting rings for the chain hoist. Just remove the insulators from the plugs and substitute short pieces of rod. Form an eye on one end and peen the other end, after inserting the rod into the plug to keep it from slipping out. Hook a cross chain into each eye and then hook the hoist chain into this chain.

Robert Beasley, Jackson, Mich.

**Keep windows open** during and immediately after using a washing machine, dryer or other moisture-releasing machine, and you will be less likely to have excessive humidity in your home.



## Plastic Sheet Under Automobile-Seat Cover Protects Upholstery

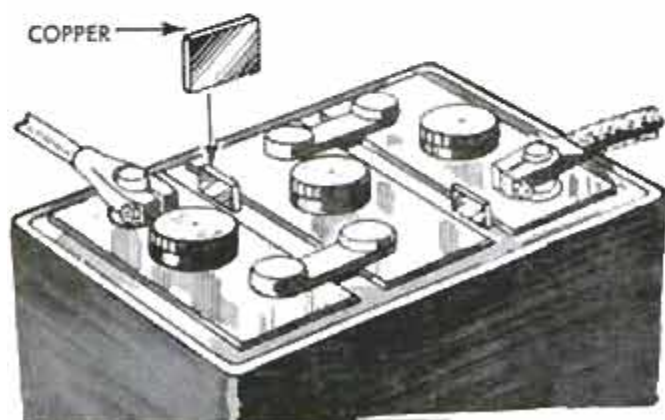
Woven plastic, fiber or cloth seat covers for cars protect the seats from surface dirt, but dust and spilled liquids will penetrate the covers and soil the seats. To avoid this, place a sheet of plastic film under the cover next to the seat. This will catch any liquid or dust that penetrates the cover, and is especially desirable if you have small children riding in the car. There are many types of plastic sheets suitable for this purpose. Be sure the plastic is worked carefully over the seat and tucked well in under the cover so that it will stay in place.



## Corrosion of Battery Terminals Prevented by Small Copper Pieces

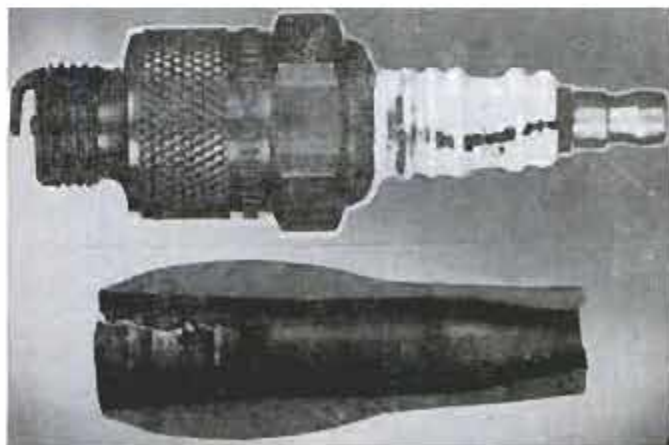
If you have experienced difficulty by having car-battery terminals corrode, try this stunt, which some filling stations in Texas use. Just insert a small piece of copper into the soft covering on the battery close to each terminal as indicated.

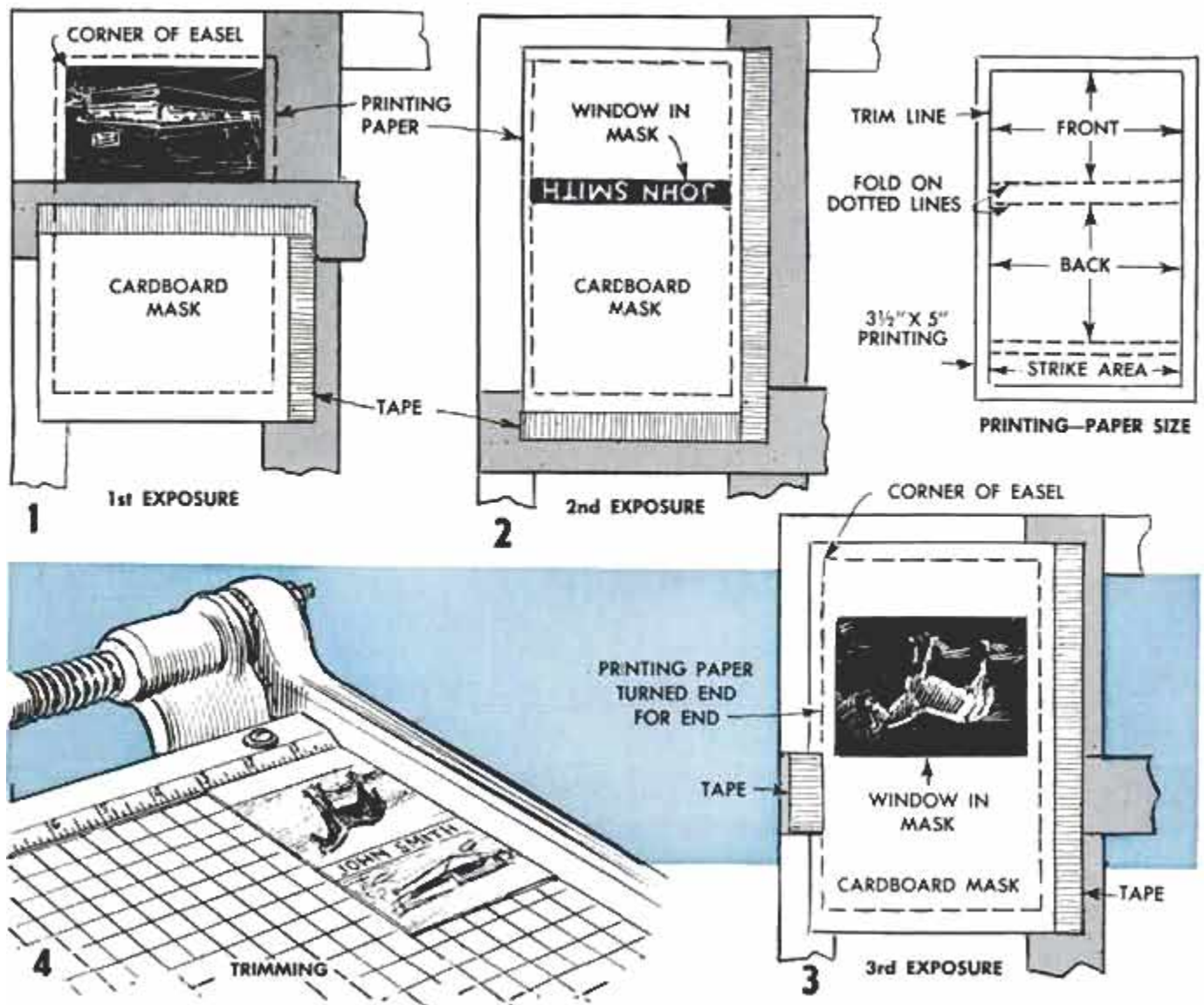
—C. V. Harris, Cincinnati, Ohio.



## Spark Plug Short-Circuited By Deteriorated Boot

According to Champion Spark Plug Company, spark plugs can be shorted by cracks in the rubber boots used to protect them against moisture. The photo shows such a plug. Note on the insulator how a carbonized path has been formed through the crack in the boot.





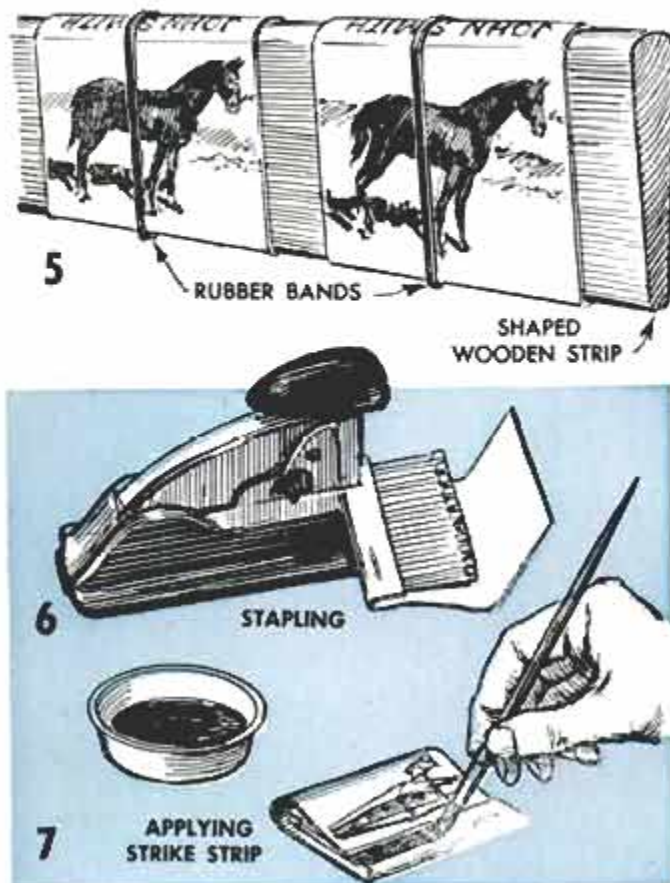
# CONVERSATION COVERS

By Hartwell J. Kennard

**P**ERSONALIZING your matchbooks with pictures of your children, home or trophy-winning trotter is sure to bring exciting comment from your friends when handed out as mementos. Any amateur photographer who has a darkroom and an enlarger can make photographic matchbook covers and have a lot of fun doing so.

The first step is to remove the cover from a book of matches and use it as a pattern in cutting the printing paper to size. The example given above is for king-size book matches which require 3-in.-wide covers. Notice that a border equal to the margins produced by your enlarger easel is allowed all around the paper for later trimming the covers to size. All your printing paper should be cut to size from double-weight matte or glossy stock.

While the steps pictured here show how you can print two pictures and a message or name on a cover, you can vary the procedure and limit the printing to a





## FOR YOUR MATCHBOOKS

single picture, positioned either vertically or horizontally on the cover. Cardboard masks are used to protect the printing paper during the three separate exposures. The front of the cover is exposed first and a mask is taped to the enlarger easel in the manner shown in Fig. 1. The negative is focused within the established margins and in an upside-down position. The negatives used should be of fairly equal density and it is best to make a test strip beforehand to determine the proper printing exposure. All the covers are exposed before the setup is disturbed and the paper is put back in a light-tight box while the easel is masked off for the second exposure. It is important, of course, to keep track of the part already exposed to later avoid double printing. A window is made in the second mask for printing a name or message across the fold of the cover, and Fig. 2 shows how it is taped to the easel to protect the rest of the cover while the second exposure is made. The third exposure is made with a mask

like that shown in Fig. 3. A window in the mask is positioned to allow space below it for adding a striking surface on the cover. In making the third exposure, the paper is placed end for end in the easel.

With the third exposure completed, all the covers can now be developed, fixed, washed and immersed in a print-flattener solution. After partial drying, the covers are trimmed, Fig. 4, and then "wrapped" around a wooden slat in the manner shown in Fig. 5. The wedge-shape slat should approximate the size and shape of the match filler to which the covers will be stapled. The covers are held on the slat with rubber bands and left to dry. The match fillers are obtained by taking matchbooks apart and stapling your photo covers to the fillers as in Fig. 6. A strike-surface mixture that can be painted on the covers is made by mixing amorphous (red) phosphorus, 10 parts, oxide of manganese, 8 parts and glue, 4 parts. The ingredients listed may be purchased from any chemical-supply house. ★ ★ ★

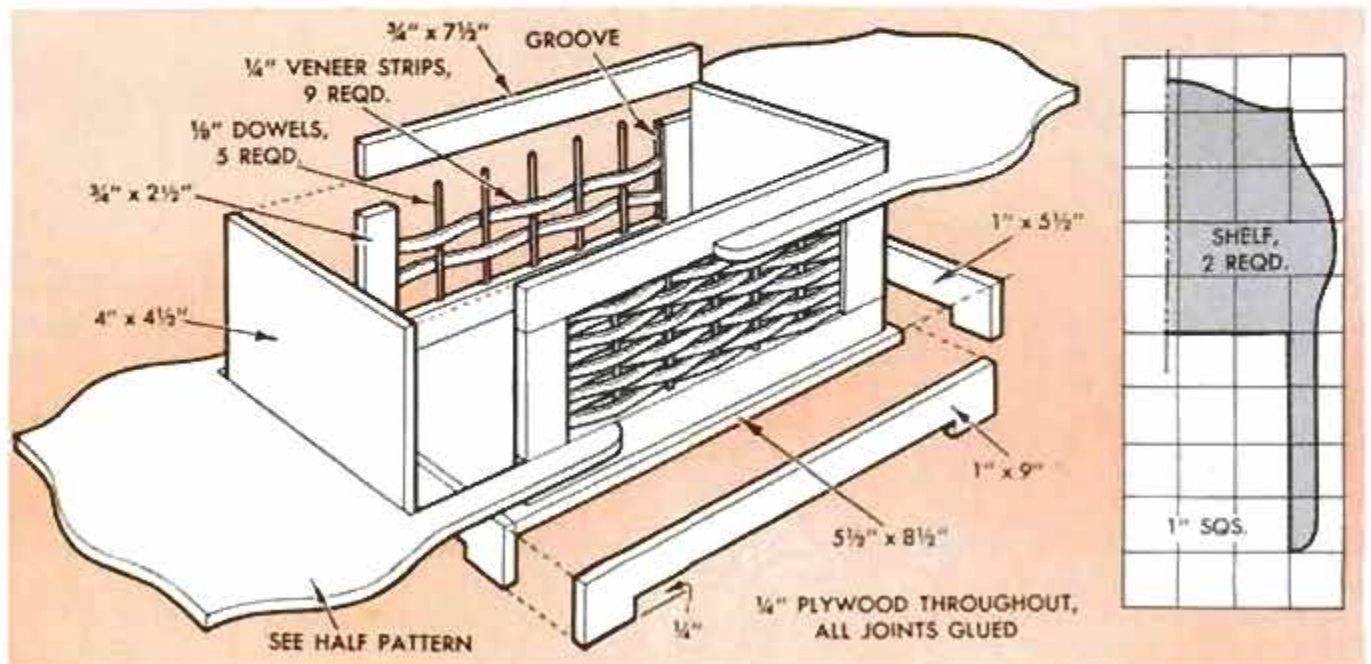
# Oriental Planter



By  
**Harry Zidman**

HERE IS A SMALL PLANTER with personality. It has two shelves that serve as pagodalike verandas on which Japanese figurines are placed, giving it the appearance of an Oriental import. Constructed of  $\frac{1}{4}$ -in. plywood, except for the basket-weave side panels, the planter can be made in a few hours. Glue only is used for fastening the joints. Before cutting the shelves to shape, make a full-size pattern from the squared half-pattern shown below. Cut and sand all parts before starting the assembly work. The sides are completely assembled before gluing them in place. To do this, drill holes in facing edges of the top and

bottom members to take the dowel ends, spacing the holes 1 in. on centers. Next cut  $\frac{1}{16}$ -in.-deep grooves in facing edges of the side members to take the ends of the veneer strips. After gluing the dowels and endpieces to the bottom piece, slide each of the veneer strips in place so that they pass on alternate sides of the dowels as shown. To make this job easier and to prevent cracking the strips, soak them in hot water for 5 min., before using. When the last strip is in place on each side, glue the top member to the ends and dowels. Enamel the box red, the base black and coat the rest with clear spar varnish.



## Ladder Bolted to Combine Hopper Permits Easier Inspection

Checking the amount and quality of the grain in a combine grain hopper can be done more quickly and with less chance of barked shins when a ladder is bolted to the hopper as shown. A section of wind-mill ladder could be used, or a ladder could be bolted or welded together from lengths of steel angle. Spacers are used between the tank and the ladder to provide ample toe room. Bottom rung of the ladder is positioned high enough to clear any normal obstructions.

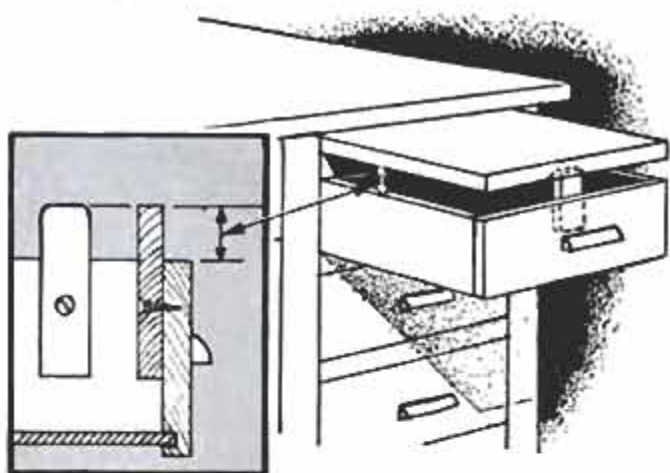
A.M. Wettach, Mt. Pleasant, Iowa.

Handling spark-plug leads roughly, if they are of the resistance type used in most late-model cars, can cause trouble. These leads consist of a carbon-impregnated conductor with an insulating cover. Short lengths of wire are forced into each end of the conductor to make contact with the connectors. To prevent pulling the wire from the conductor, grasp the molded spark-plug cap, twist it to loosen it from the plug porcelain, then pull it free.



## Modified Desk Drawer Provides Added Support to Slide

When the dictation slide of a desk is used frequently for supporting a typewriter or adding machine, it can be given added rigidity by using the drawer beneath it as a brace. Fit a wooden turn button on the inside surface of the drawer front as shown, so that it projects just enough to support the slide firmly. Locate the pivot of the turn button so that the portion projecting upward is longer than the lower part. This will assure that the upper end will drop down, but will not allow the opposite end to pivot up enough to lock the drawer when it is shut.



## Mock Automobile Crash Makes Eye-Catching Roadside Sign

Need an "attention getter" for a roadside business? Try this traffic-stopping "auto crash," actually a car cut in half and fitted flush against a wall. What appears to be broken siding is just a painted pattern. Keep the car clean and polished and air in the tires to maintain an authentic look.

Grover Brinkman, Okawville, Ill.

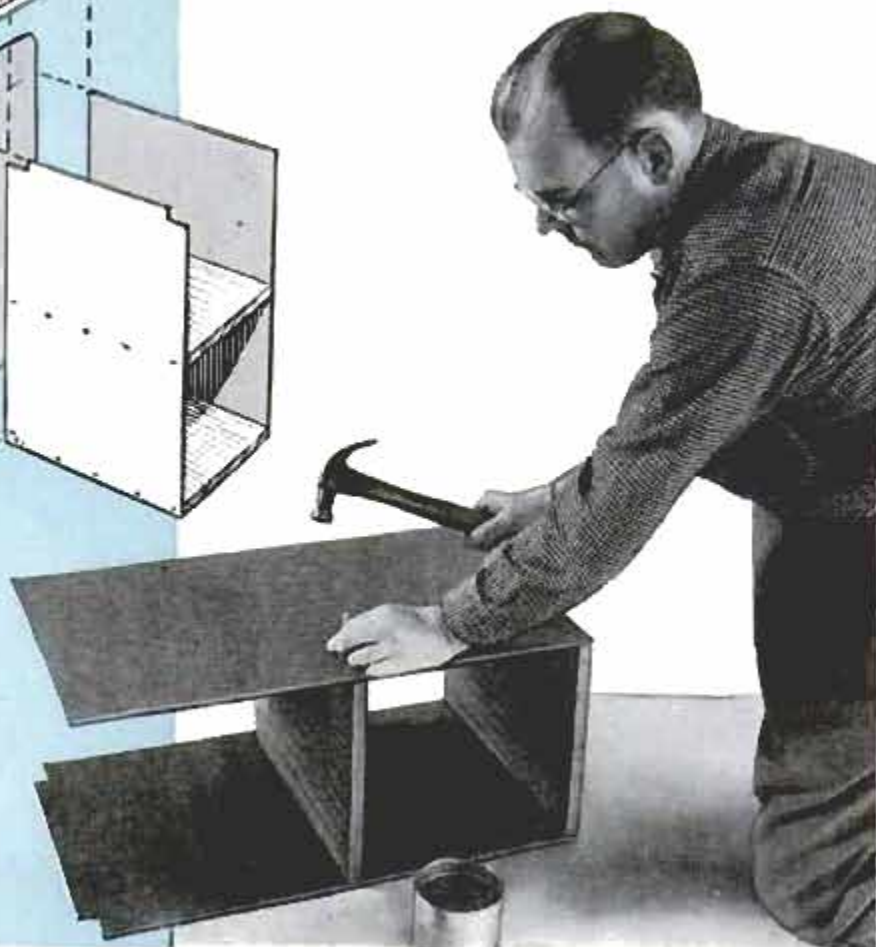
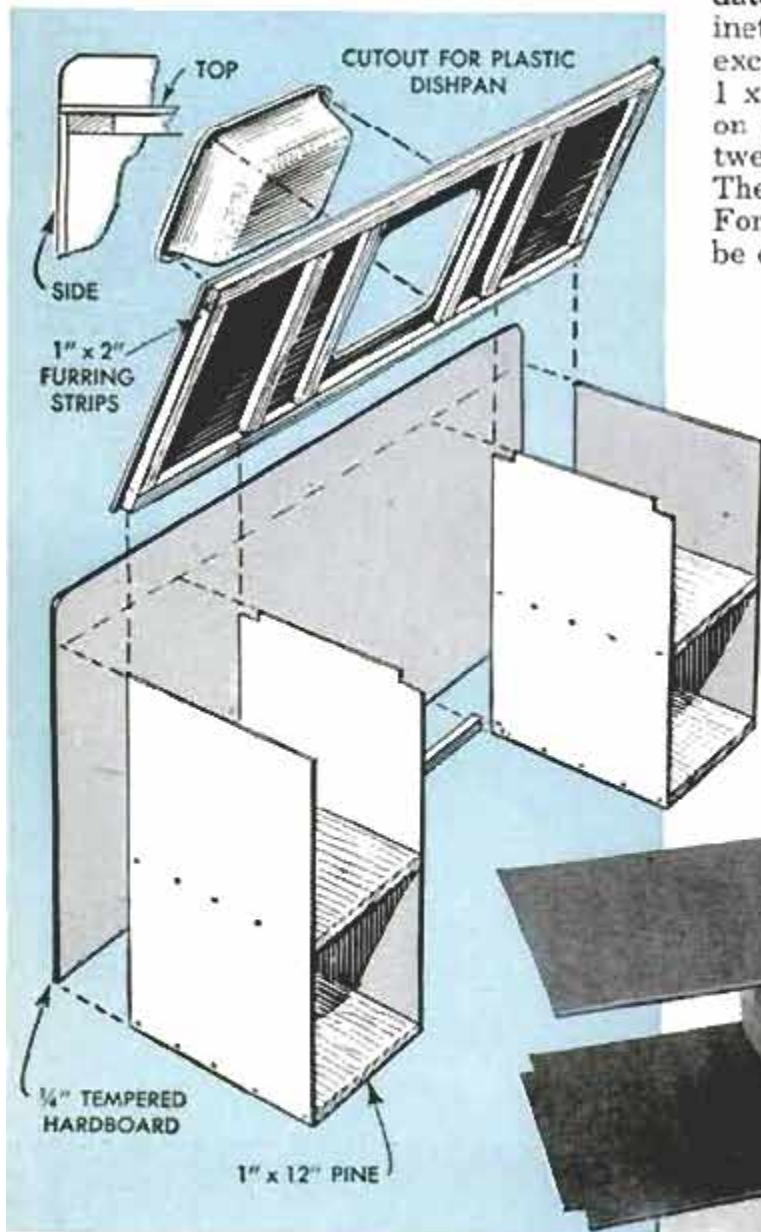
☞ Two or three clamp-type trousers hangers do a much more effective job of holding a heavy blanket on a clothesline for drying or airing as they grip more strongly over greater area than pins, and leave no marks.



# Make Her a Play Sink

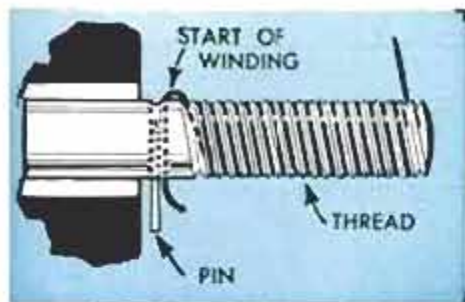
By Russ Whitaker

WHEN THE FUTURE housewife in your family decides to wash her own dishes after a tea party with her friends or dolls, do not discourage her because the kitchen sink is out of reach unless she has a chair on which to stand. Instead, build her a sink of her own that is just the right size not only for washing dishes but for preparing food as well. It is a cabinet sink, so there is room for storage of dishes, utensils and perhaps a few staples such as cocoa, sugar and canned milk. No dimensions are given, as the sink must be tailor-made for a specific child. A frame for the sink top is made of 1 x 2 furring strips. It is covered with a sheet of 3/16-in. hardboard, and an opening is cut in the center to accommodate a plastic dishpan. The rest of the cabinet also is made of 3/16-in. hardboard, except for the shelves that are lengths of 1 x 12 pine. A strip of 1 x 2 also is used on the lower edge of the back panel between the cabinets to act as a stiffener. The sink is painted with white enamel. For an added touch of realism the top can be covered with plastic laminate.



## Springs Hand-Wound On Bolt "Mandrel"

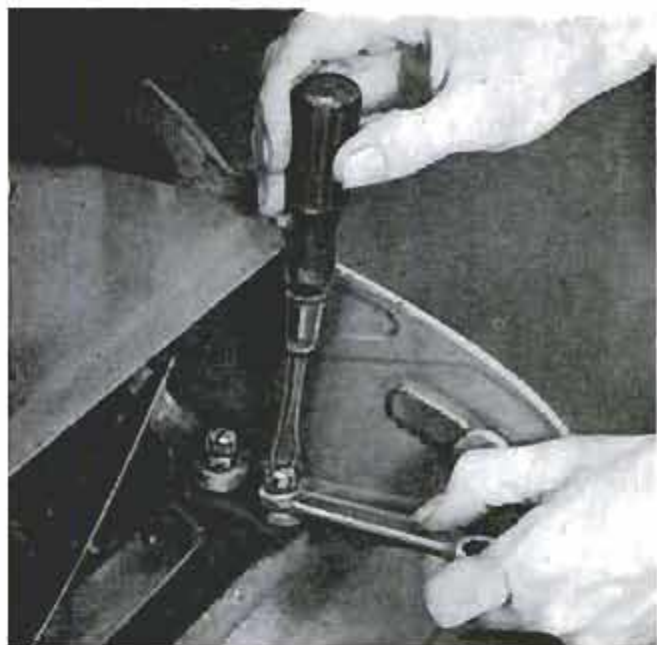
When a number of small-diameter springs, ( $\frac{3}{8}$ -in. in this case) were required, one hobbyist used a bolt as a winding mandrel. The head of the bolt is cut off and a hole drilled in the unthreaded portion. One end of the spring wire is wedged in the hole by a pin tapped into it. After the spring is wound, the wire is cut at both ends and the spring is "unscrewed" from the bolt. The wire is held under constant tension as it is wound.—Charles A. Oldroyd, Lancashire, England.



## Locknuts Hold Mower Adjustment

Spacing between the reel and cutter bar on a reel-type lawn mower is adjusted by means of two screws at each end of the blade. Once adjustment is made, the two screws are tightened against the blade so they apply pressure against each other to prevent them from rotating. Vibration, or a blow against the blade, sometimes will loosen the screws, and the setting of the blade will change. To prevent this, fit a locknut on each of the screws. After an adjustment is made, hold the screws with a screwdriver and tighten the nuts.

☐ Light frequent clippings are better than infrequent heavy cuttings to keep a hedge neat in appearance.



## Tandem Tractors With One Operator Pull Double Load

Two tractors coupled together help this Illinois farmer compensate for the manpower shortage at spring planting. Front wheels are removed from the rear tractor and its frame is pivoted to the drawbar of the front tractor with a ball joint. This assures easy maneuvering of the tandem unit at the headlands and also achieves a more uniform distribution of weight on the drive wheels.



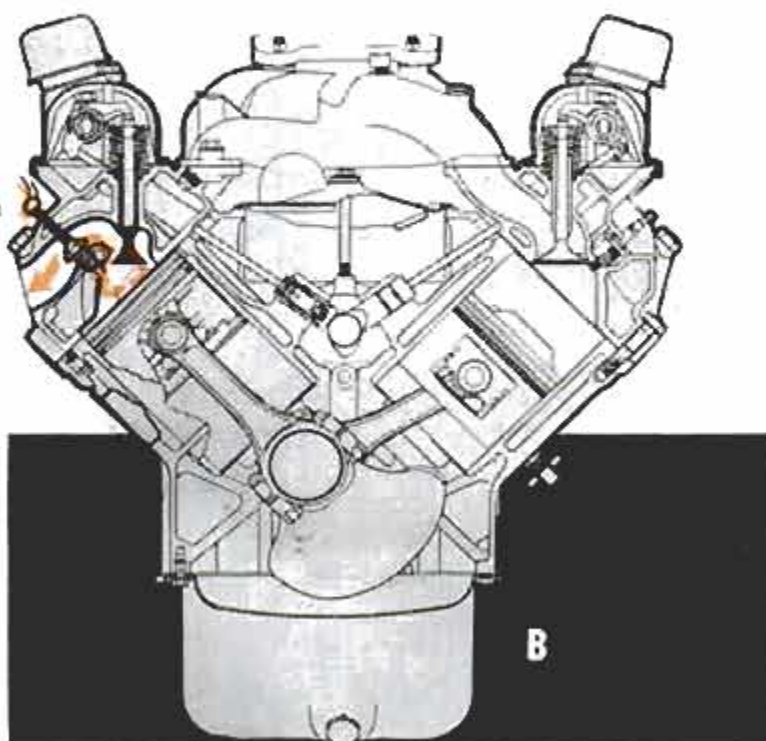
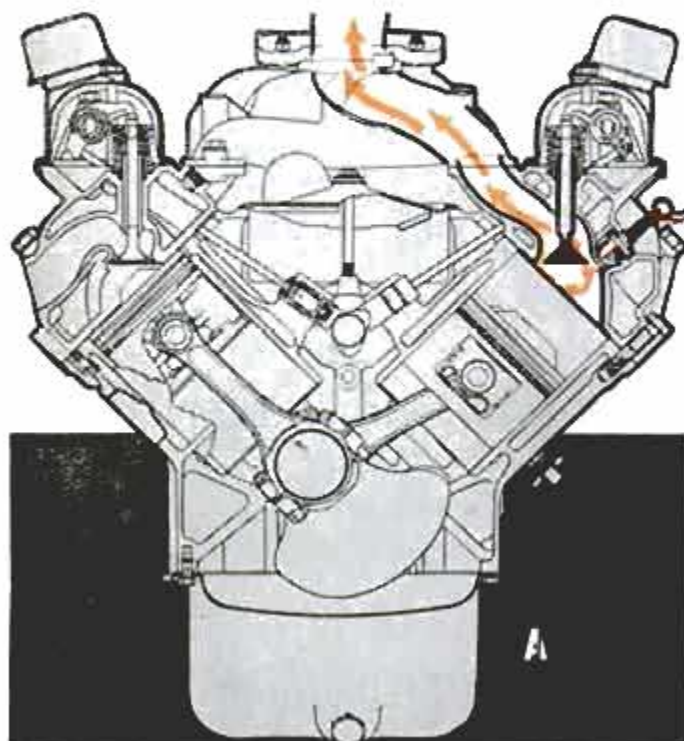
**D**ESPITE THE ARRAY of electronic instruments now available to an auto mechanic for testing ignition and carburetion, and even valve action, he still uses a simple instrument to determine accurately the mechanical condition of an engine. A compression tester, essentially an air-pressure gauge, is used before a tuneup to let a mechanic know ahead of time whether a particular engine will run smoothly after the job is done.

When a cylinder shows a below-specification compression, accurate tests can be made to determine what component or components of that cylinder are malfunctioning and need repair or replacement. A pressure tester used by some professional mechanics consists of a device that fits the spark-plug hole to permit applying air pressure to a cylinder after the piston is brought to top dead center and both valves are closed. A gauge in this device then tells the percentage of drop in air pressure—loss of efficiency—which indicates the seriousness of the malfunction. At the same time, air leaking from various parts of the engine pinpoint the malfunctioning components. Air hissing from the carburetor shows that an intake valve is leaking, Fig. A. If air escapes from the exhaust pipe, an exhaust valve is leaking, allowing air to enter the exhaust manifold and pass through the exhaust system, Fig. B. If the sound of escaping air is heard at the oil-filler pipe, it means air is leaking past worn piston rings and entering the crankcase. New rings, and probably a complete engine overhaul, are indicated by this air leak. As a final check, the radiator cap is removed and the water inspected for air bubbles. Their presence means a crack in



## WHY A

the head or block, or a leaking head gasket. If two adjacent cylinders have a uniformly low compression reading, it is a good indication that the head gasket is leaking between them. A home mechanic can make a pressure tester by breaking the insulator from a spark-plug base and brazing a tire valve to it. Also, there is available a manufactured unit that has a spark-plug thread on one end and an air valve on the other. This unit is available in various sizes, and





BURNED, PITTED OR  
WARPED VALVES

WORN PISTON RINGS,  
PISTONS AND CYLINDERS

WARPED HEAD OR  
LEAKING GASKET

# COMPRESSION TEST?

By Ed Packer

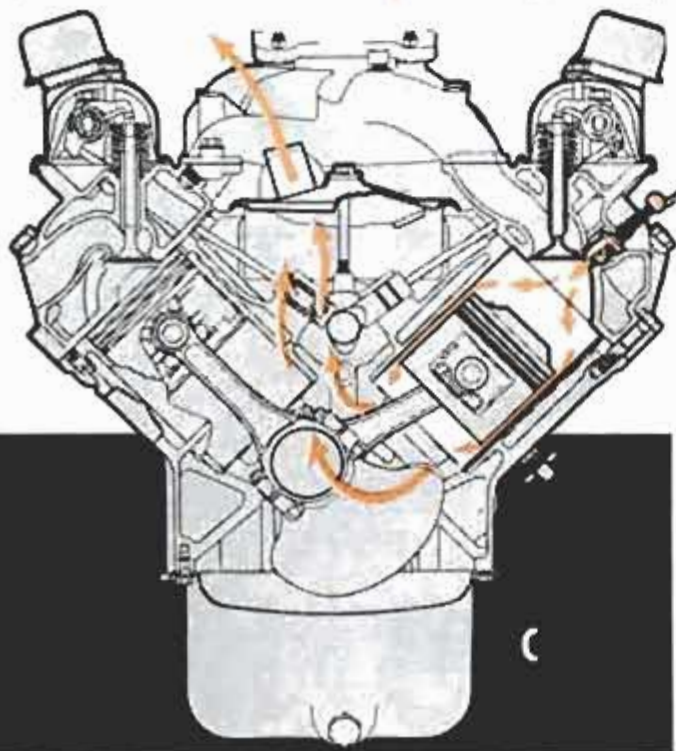
an extension tube can be used with it for engines that have deeply recessed heads, to permit connecting an air hose.

While pressure is produced in an auto engine by the upstroke of a piston, there also is a vacuum produced by the downstroke of the piston. This condition of negative pressure exists in the intake manifold through which the fuel-air mixture is pulled from the carburetor. As pressure,

or compression, is a factor of engine operation, so is vacuum. However, while compression is the result strictly of mechanical conditions, vacuum may be affected by carburetion and ignition. Thus, while a low and steady reading on a vacuum gauge can indicate low compression, it also can mean late ignition timing. A floating motion of the gauge needle from right to left means that a rich air-fuel mixture is present in the intake manifold. The rest of the vacuum-gauge readings show strictly mechanical faults inside the engine and, in some cases, will verify a diagnosis made with a compression tester.

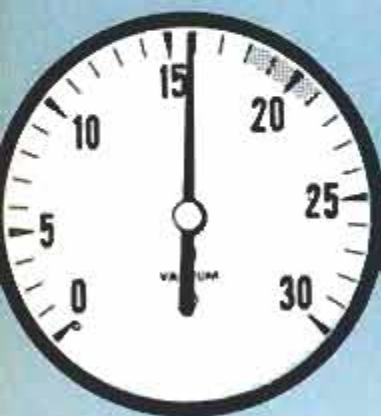
One example has just been stated, that of low vacuum agreeing with low compression. Another would be a three or four-point intermittent drop of the vacuum-gauge needle indicating sticky valves. If a compression test of one or more cylinders gave a moderately high reading on the first compression stroke of the engine, but did not increase, this also could indicate sticky valves. Usually the compression pressure will build up several pounds with each stroke. Generally, three compression strokes will produce the maximum pressure possible, although if an engine is worn, several strokes are required to pump oil to the rings to seal them enough to build up additional compression.

A number of factors must be remem-





RAPID VIBRATION OF NEEDLE AT IDLE SPEED INDICATES WORN INTAKE-VALVE GUIDES.



LOW AND STEADY READING INDICATES LOW COMPRESSION, AIR LEAKS OR LATE IGNITION TIMING.



RAPID VIBRATION OF NEEDLE WHEN ENGINE IS ACCELERATED INDICATES WEAK VALVE SPRINGS.



FLOATING MOTION OF NEEDLE FROM RIGHT TO LEFT INDICATES RICH FUEL MIXTURE.



THREE OR FOUR-POINT INTERMITTENT DROP OF NEEDLE INDICATES STICKY VALVES.

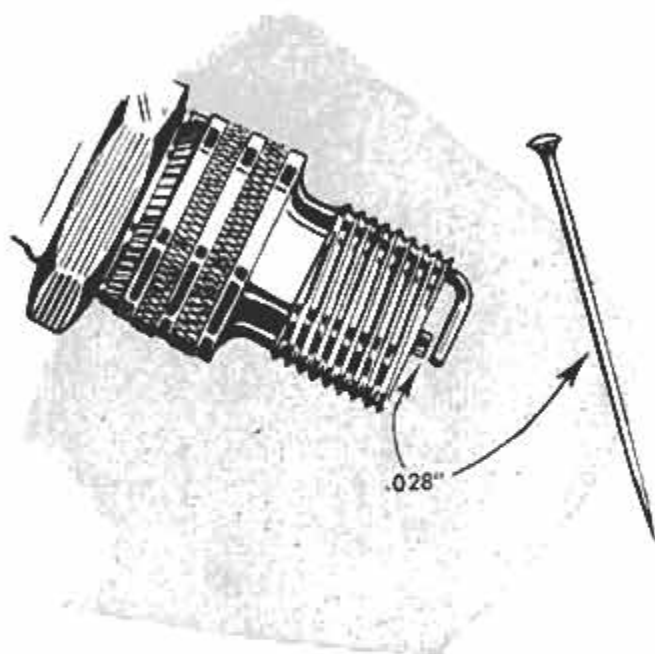
bered by the home mechanic when making tests of an engine. Because compression ratios have been increasing each year, compression pressures at cranking speed also have increased. Where 120 lb. once was considered high, 150 lb. and up now are considered normal. The manufacturer's specifications must be checked to determine the proper pressure. Because of the original high pressures, many engines will start easily and run smoothly when they are several pounds under the specified compression pressure. However, if there is a variation between cylinders of more than 10 lb., the engine will not run smoothly and there is a good chance that the engine will not start readily. Generally such a variation indicates the need for a valve grind.

Another reason for checking manufacturer's specifications is that vacuum readings will vary greatly between engines. So-called "low vacuum" engines will have a normal reading of 16 to 17 in. of vacuum as compared to most engines that have a reading of 22 to 23 in. of vacuum. The variation occurs because of camshaft design. If there is a large overlap in valve timing—that is, the intake and exhaust valves are open at the same time a greater number of degrees of crankshaft rotation—manifold vacuum will be low. These low-vacuum engines usually are rated at high horsepower. Engines of the "economy" type have mild camshaft grinds that produce a high vacuum in the intake manifold. Cars that have electric windshield wipers do not have a readily accessible vacuum line for attaching a vacuum gauge, but whether the engine is a V8 or inline type there is a pipe plug somewhere in the intake manifold. This plug is removed and replaced with a short length of pipe or a fitting to permit attaching the hose of a vacuum gauge. If a car has vacuum-operated windshield wipers, and there is a vacuum-booster pump—it will be combined with the fuel pump—the booster must be disconnected when taking vacuum readings. If this is not done, the gauge readings will be false, as the vacuum indicated will be that produced by the booster pump, rather than by the engine. ★ ★ ★

### Gap Spark Plugs With Care

When checking and setting the electrode gap on a spark plug, avoid exerting any pressure on the center electrode. Pressure on the center electrode, according to Champion Spark Plug Company, may damage the seal, causing compression leaks and pitting and burning of the plug shell. Always use a spark-plug tool and exert pressure only on the ground electrode.

## Straight Pin Used as Gauge To Set Spark-Plug Gap



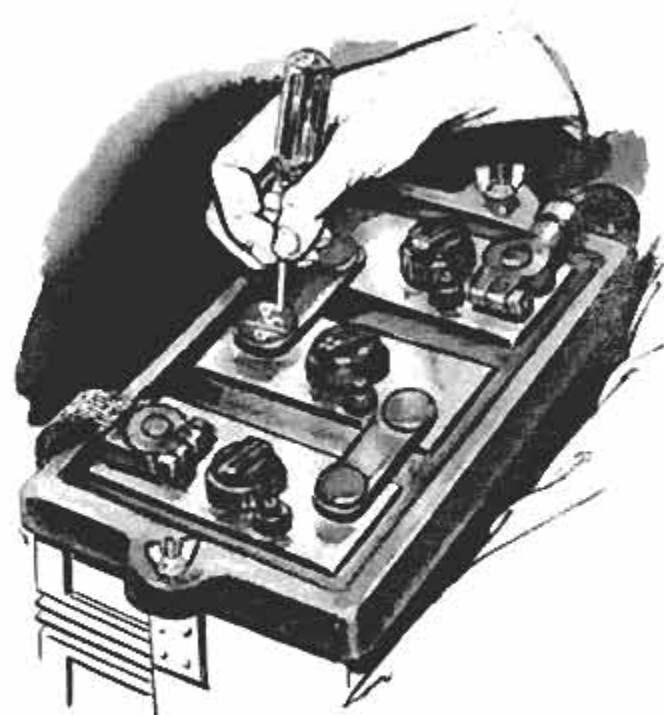
If the spark-plug gap for the engine of your car is .025 and no gauge is available, you can set the gap quite accurately by using a straight pin. The shank of a standard-size straight pin measures a uniform .028 in., thus if the plug gap is adjusted so the pin fits snugly in the gap, it will be nearly correct. When testing the gap with the pin, hold it lightly so that you can readily "feel" the correct measurement of the gap.

## Inexpensive Breakdown Insurance Provided by Spare Fan Belt

Kept in the trunk of your car, a spare fan belt or belts, if required, is inexpensive insurance against a breakdown miles from any garage. The big engines in modern cars will overheat quickly without the water pump in operation, and the many accessories will drain a battery in a short while if the generator is not being driven by the engine.



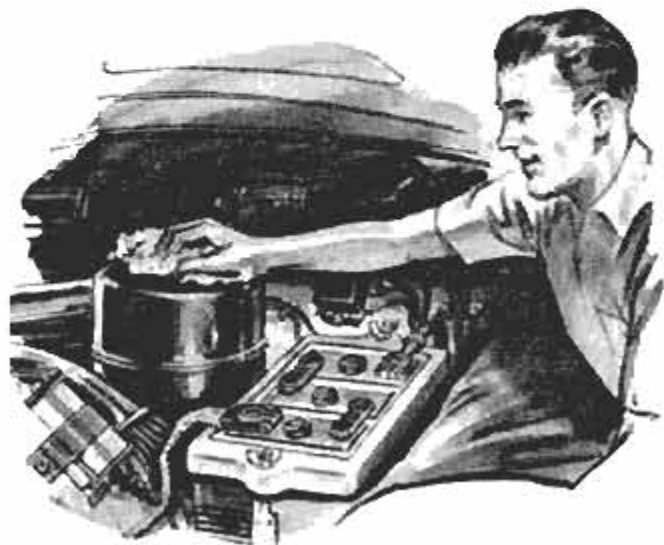
## Installation Date on Battery Is Preventive Maintenance



Both for purposes of checking the guarantee and to assure dependable car operation, it is wise to date the battery the day it is installed. If you have trouble with the battery a quick glance will tell you how long it has been in service. Also, if the date shows the guarantee is about to expire, it is time to buy a new battery.

## Auto Cleanliness Extended To Include Underhood Area

Whenever you wash your car, go a step further and clean under the hood. Wipe the oil and dirt from the air cleaner, then use the same cloth to clean the battery top. Discard this cloth, as it will have acid on it. Use a vacuum cleaner to blow through from the back of the radiator core to remove debris and insects.



WHITE CAST IRON



1

GRAY CAST IRON



2

LOW-CARBON STEEL



3

HIGH-CARBON STEEL



4

HIGH-SPEED STEEL



5



STREAM

SHAFT

FORK

SPRIGS

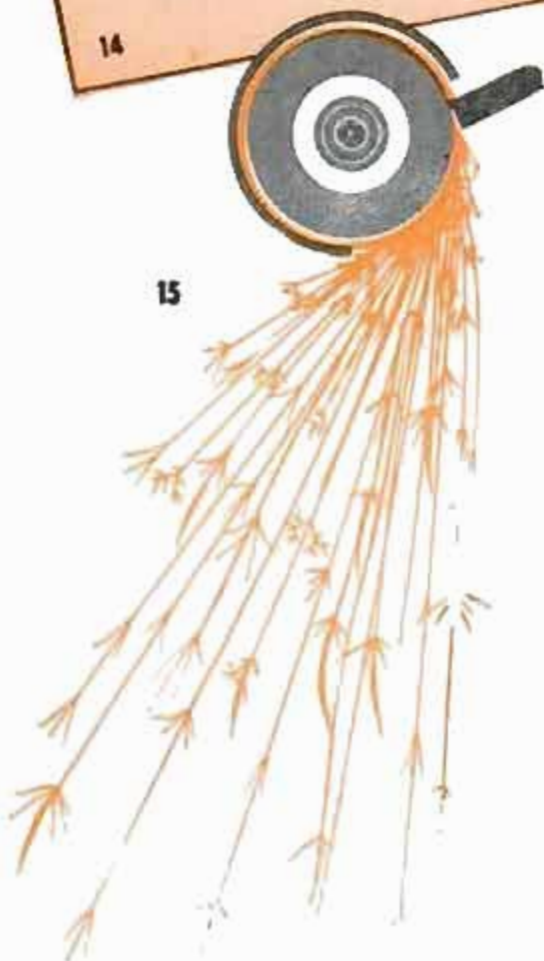
DASHES

APPENDAGES

BUD.  
BREAK. ARROW

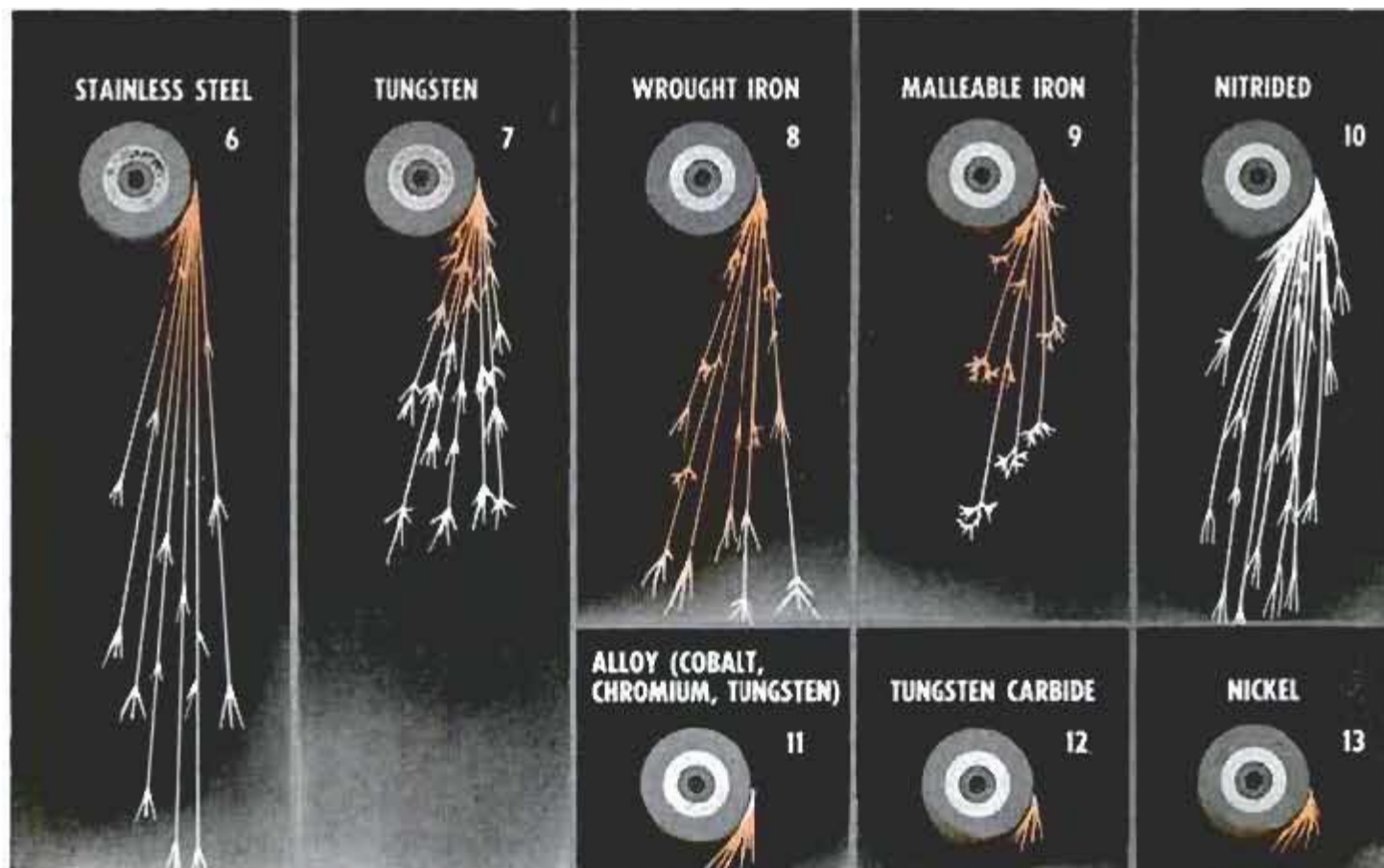
14

15



## SPARK CHARACTERISTICS

1. **WHITE CAST IRON.** Length of spark stream is about 20 in. Volume is small, color straw-yellow. Sprigs are small, repeating
2. **GRAY CAST IRON.** Spark stream is straw-yellow, length about 25 in. Sprigs are small, repeat along length of each streamer
3. **LOW-CARBON STEEL.** Color is white, spark stream moderately large. Length is 60 to 70 in. with forks, appendages
4. **HIGH-CARBON STEEL.** Stream is white, of fairly large volume with numerous small, repeating sprigs. Length 50 to 55 in.
5. **HIGH-SPEED STEEL.** Spark stream averages 60 in. long. Individual streamers are small, straw-yellow with only a few forks
6. **STAINLESS STEEL.** Stream is moderate in volume, straw-colored near wheel and white near end. Streamers end usually in forks
7. **TUNGSTEN (CHROMIUM).** Stream is of small volume, 35 in. or so in length, red near wheel, white near ends. Forks are repeating
8. **WROUGHT IRON.** Stream is yellow, about 65 in. in length. Volume is fairly large, streamers ending in forks, appendages
9. **MALLEABLE IRON.** Length, volume of stream is moderate, straw-yellow turning to white, ending in small, repeating sprigs
10. **NITRIDED (ALLOY STEEL).** Stream is large with curving streamers up to 50-60 in. long, white and ending generally in forks
11. **ALLOY (COBALT, CHROMIUM, TUNGSTEN).** Volume of stream is generally small with short streamers, usually red near wheel
12. **TUNGSTEN CARBIDE (CEMENTED).** Stream is very small, rarely more than 3 in. long and is light orange throughout length
13. **NICKEL.** Volume of stream is very small with occasional wavy streamers 2 to 3 in. long. Color is orange throughout



## SPARK STREAMS IDENTIFY METALS

By C. W. Woodson

**S**PARK TESTING is a quick method often used in shops and also by junk dealers and others for identifying unclassified metals. When testing is done by an operator experienced in "reading" the spark patterns the method has proved quite accurate.

The work can be done on any ordinary bench or pedestal grinder having a wheel speed of 3450 r.p.m. The pedestal grinder is, of course, best as it is possible to judge the length of the spark stream, as well as its characteristics, to better advantage. The grade of the abrasive wheel used can vary, as the important characteristics of the spark patterns of different metals will not be appreciably affected. However, in most cases, the degree of coarseness of the wheel will vary the length of the spark stream to some extent. As a rule a coarse wheel will give a longer spark stream with a given metal than will a fine wheel. The latter will throw a somewhat shorter stream but the sparks will have essentially the same characteristics. The wheel should be dressed before being used for spark testing. The test piece should be clean.

Pressure of the test piece against the face of the wheel should be light to moderate. Heavy pressure will cause the test piece to heat rapidly. This will increase the volume

of the spark stream and in some instances may affect the pattern, giving the effect of a higher carbon content in the test piece than it actually contains.

Locate the grinder so that the spark stream can be viewed against a dark background. Although in many instances the test piece can be held on the tool rest as in Fig. 15, it may be advisable, when testing metals giving off long spark streams, to remove the tool rest and shift the guard so that the test piece can be touched to the bottom of the wheel. This will result in a horizontal spark stream and may give a more accurate measure of its true length. To assure a normal spark pattern in which the bursts can be closely observed, make sure that the stream is not deflected by drafts. Air currents from a fan also will affect the formation of the sparks.

Fig. 14 details the common forms of sparks, or spark bursts, which ordinarily appear in the spark streams from various metals. Figs. 1 to 13 inclusive detail the appearance of spark streams from test pieces of the common metals. Due to the limitations of printing these cannot be taken as precise representations. The details are intended only to indicate in a general way the volume and character of the streamers and spark bursts.

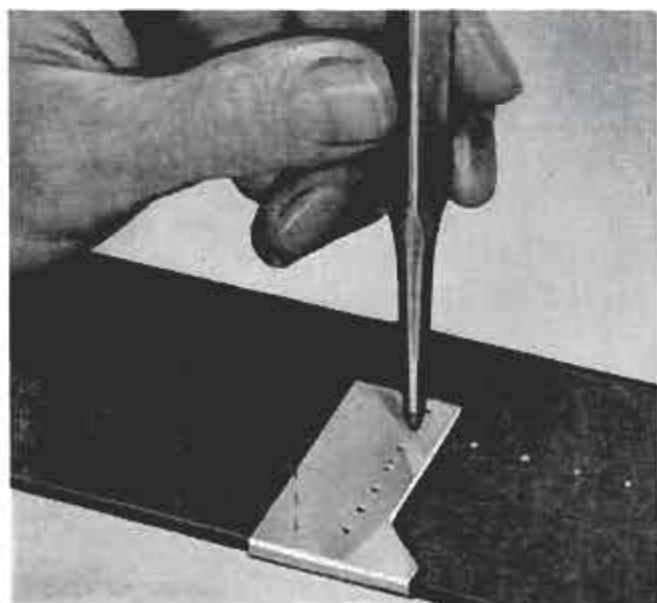


## Shingles Dip-Painted Before Applying

If you plan on painting or staining shingles before applying them, deeper penetration of the stain can be had by dipping them individually. Stain need not be thinned for dipping, but paint should be reduced with a quart of thinner to a gallon of paint. Use an old tub or pail and fill it so the shingles will be stained 2 in. beyond the area to be exposed to the weather. Drive a small nail through the thin part of each shingle, at an angle, so it can be hooked over a clothesline. Shingles should be thoroughly dry before nailing in place.—R. Dillon Kiniry, Woburn, Mass.

## Accurate Center-Punch Layout Assured With Simple Jig

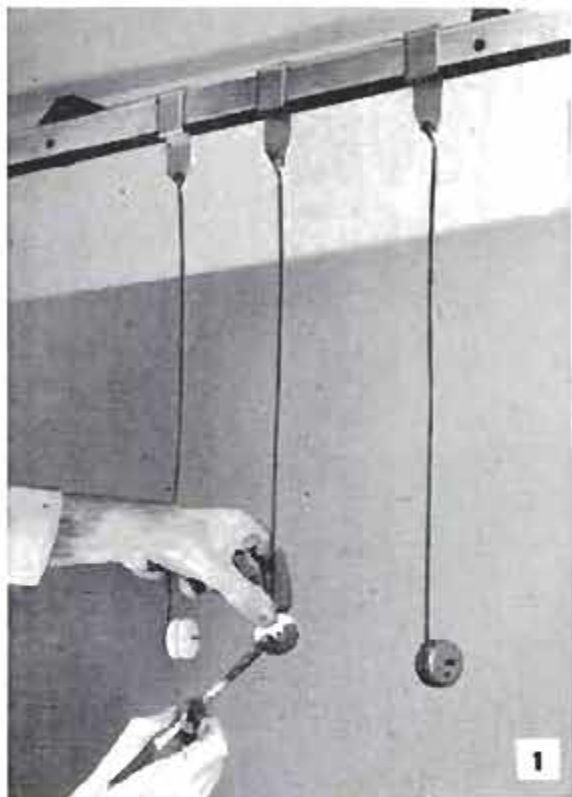
Making a center-punch layout on metal can be done more quickly and accurately with the aid of this simple jig. It is bent from light sheet metal in the form of a modified try-square as indicated, the leg, or flange, being shaped to fit the thickness of the metal. After the jig is bent to shape, a square is used to mark a line of equally spaced holes that are drilled to a size just large enough to accommodate the point of the center punch. Locating the holes a definite distance from the edge of the jig will permit it to be used also for spacing the punch marks.



## Sheet-Metal Cutting Tool Shaped From Auto Valve

Irregular curves can be cut in fairly heavy sheet metal with this cutting tool which is shaped from the exhaust valve of an auto engine. The valve is refaced to a knife edge, then a flat is ground on one side to provide a hammering surface. A wooden file handle is modified to accommodate the valve stem and the tool is complete. Use an exhaust valve in preference to an intake valve, as the former is of tougher steel and will hold a cutting edge longer. Discarded valves can be obtained from the scrap container at any service garage.—H. J. Gerber, Stillwater, Okla.

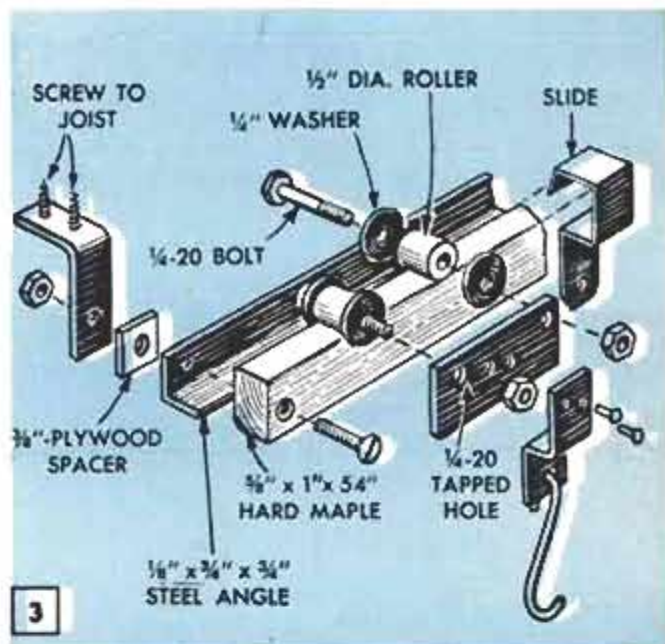




## TRACK-MOUNTED HOIST FOR THE WORKSHOP

THIS HOIST when attached to the ceiling over your workbench in the manner shown in Fig. 2, provides the equivalent of a third hand for holding various work. To accommodate a number of lightweight pieces of work for painting or other purposes, U-shaped clips to which lengths of wire are attached are provided as in Fig. 1. The clips are forced from  $\frac{1}{8}$  x 1-in. lengths of aluminum, allowing sufficient clearance for a sliding fit. Also, objects having a clamping device on them, such as the photofloodlamp in Fig. 4, can be clamped on the track when an overhead position is desired for the work.

The track is made from a  $\frac{3}{4}$  x  $\frac{3}{4}$  x 54-in. length of steel angle to which a  $\frac{5}{8}$  x  $1\frac{1}{16}$  x 54-in. length of hard maple is bolted as in Fig. 3. The track mounts consist of L-shaped brackets bolted on the back of the track and screwed to ceiling joists as indicated. The roller-equipped hanger for the hoist is made as detailed in Fig. 3. The rollers consist of two short lengths of  $\frac{1}{2}$ -in. rod center drilled to take  $\frac{1}{4}$ -in. bolts, and  $\frac{1}{4}$ -in. washers that are clamped against the roller ends when assembled to serve as flanges. The Z-shaped bracket from which the hoist is suspended is formed so that the lower flange is aligned vertically with the centers of the rollers. Any light-duty block and tackle may be used as a hoist, or it can be assembled from a length of rope and two single-pulley blocks equipped with becketts.



Below, photoflood lamp clamped on track provides ideal overhead lighting arrangement when photographing material or project displayed on workbench top

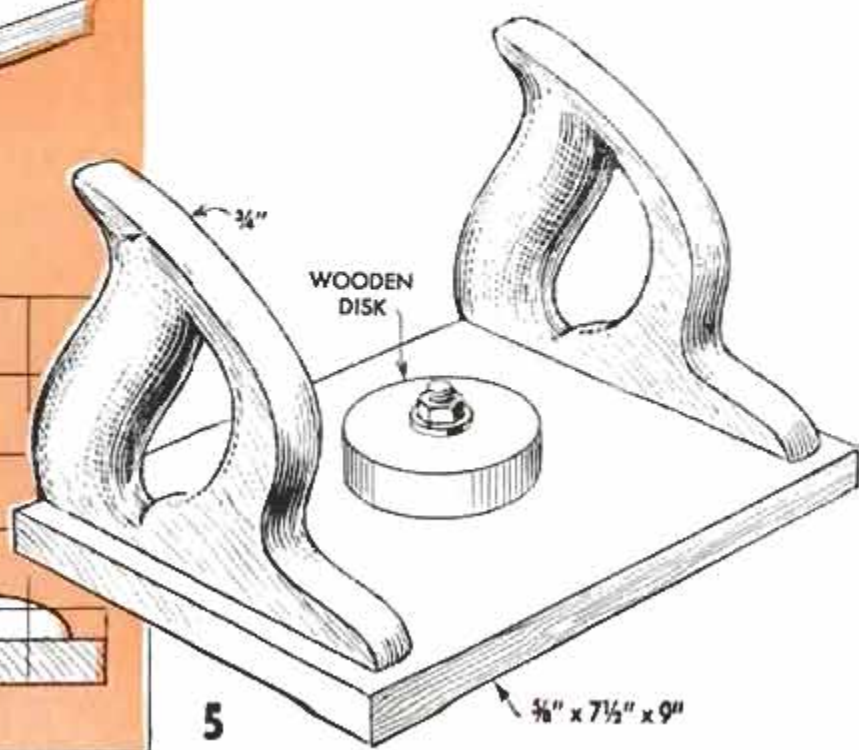
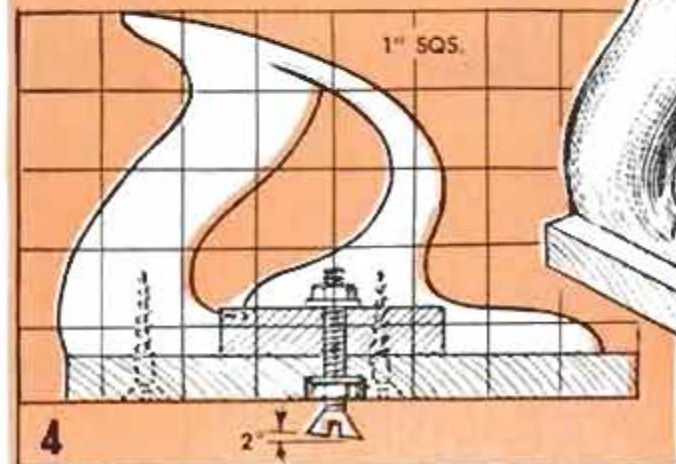
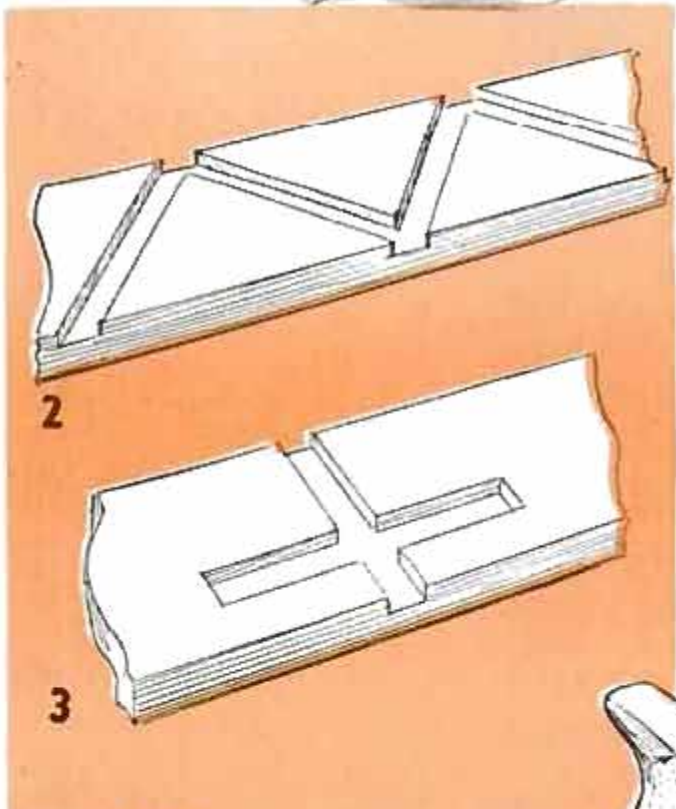


# ROUTER PLANE

**Has Adjustable Cutter  
Made from Stove Bolt**

By C. W. Woodson

SMOOTHING AND TRUING the bottom surfaces of sawed or chiseled grooves and mortises, whether they have closed or open ends, Fig. 2 and 3, is a simple job with this shop-built router plane. The cutter blade of the router is an ordinary  $\frac{1}{4}$ -in. flat-headed steel bolt, the head of which is filed at a 2-deg. angle so it presents a sharp, curved edge to the wood, Fig. 4. Two locknuts position the cutter for depth below a base cut from  $\frac{5}{8}$  or  $\frac{3}{4}$ -in. plywood. The blade is centered in the base, which measures  $7\frac{1}{2} \times 9$  in., Fig. 5. It can be made smaller or larger to suit individual requirements. Handles for the plane are cut from  $\frac{3}{4}$ -in. plywood or 1-in. hardwood. The latter is preferred, as it is easier to round and shape the wood to form a comfortable hand grip. Handles can be shaped by using the squared pattern in Fig. 4, or, if you have a favorite plane, its handle can be traced and used as a pattern. Countersunk, flatheaded screws are driven through from the underside of the base to attach the handles. A counterbore is required to recess the lower locknut on the blade. A wooden disk and a metal washer aid in holding the cutter firmly in place. The plane, Fig. 1, is used in a manner similar to that of a regular plane, except that two hands are used.





## Strips of Masking Tape Indicate Lengths of Bolts

Bolts, capscrews and other stock items kept in bins or stacked drawer units are easily checked for desired length by means of strips of tape attached to the drawer fronts. Without opening the drawers, the strips show the exact length of the bolts or screws. When desirable, other data pertaining to the contents can be lettered on the tape in ink. Strips are easily removed when bin contents are changed.

A coping saw fitted with a fine blade having 32 teeth per inch is just the thing to cut plastic tile, especially where you have to make short-radius cuts in fitting the tile around bathroom fixtures or pipes that come through the wall. Beeswax or paraffin rubbed on the sides of the blade will prevent it from binding in those short-radius cuts.



## Holder for Small Twist Drills

Remove the elements from a radio-tube base and you have a handy holder for those small twist drills that are so easily lost in a drawer or toolbox. Cut a strip of corrugated paper to a width slightly greater than the depth of the base. Roll the strip into a core to fit snugly inside the base. This will form pockets in which the drills can be arranged in order. Mount on a discarded tube socket screwed to the tool panel, or drill 6 holes in a suitable block to take the base prongs.

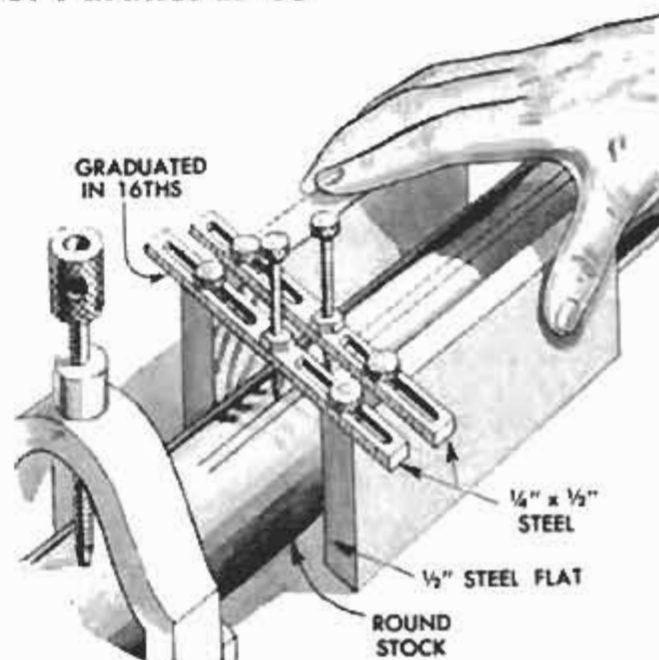


## Adjustable Jig for Accurate Scribing of Parallel Lines

This simple jig offers a fast and reasonably accurate means of scribing parallel lines on round and square stock. It's adjustable to suit varying widths and diameters. Consists of two threaded scribers with hardened points, two slotted bars, or carriers, two guides and the necessary thumbscrews. The scribers are turned through tapped holes in the slotted bars and are held in the desired position with locknuts. Slots in the bars permit adjustment, parallelogram-fashion, for varying sizes of work.

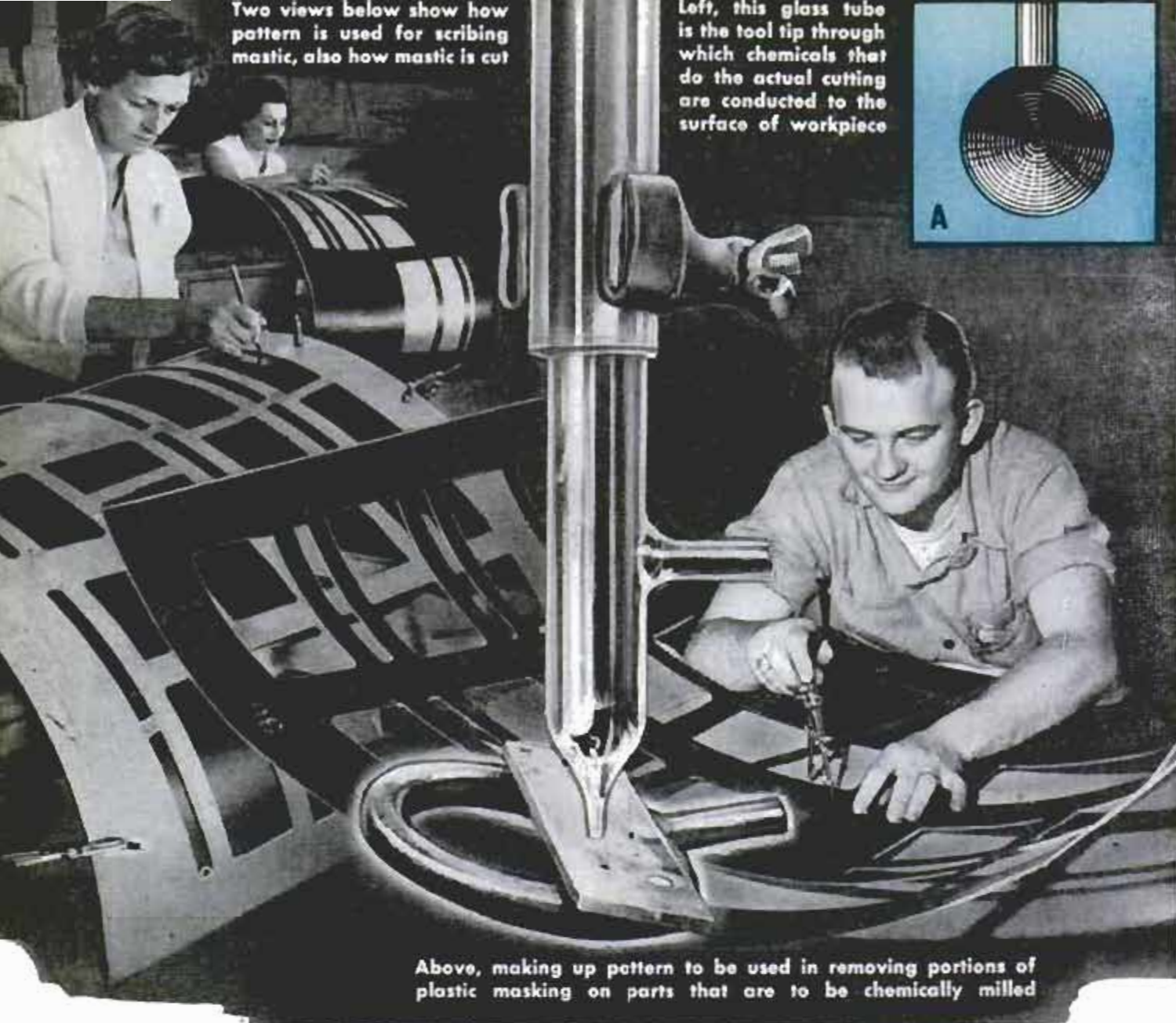
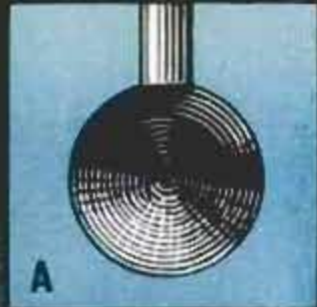
Bruce D. Stewart, Winder, Ga.

Those unsightly worn spots on the floor-mats of your car can be quite neatly repaired with shoe soles of the type having one face coated with an adhesive.



Two views below show how pattern is used for scribing mastic, also how mastic is cut

Left, this glass tube is the tool tip through which chemicals that do the actual cutting are conducted to the surface of workpiece



Above, making up pattern to be used in removing portions of plastic masking on parts that are to be chemically milled

### to drill, shape, mill, sharpen, superhard metals on tight production

**T**ODAY METALLURGISTS are developing fantastically tough metals for use in such new power units as rocket motors, jet turbines and atomic-pile plumbing. These metals withstand heat that would erode ordinary steels to dust, or reduce them to liquids in seconds. Some must not only withstand rock-melting heat, they must also take explosive impact without shattering or crumbling, and resist the corrosive action of newly developed chemical fuels.

These new metals, many of which ordinary tools will not even scratch, posed what at first appeared to be unsolvable machining problems. In early experimental work, special machining methods with

specially developed cutting tools were tried and discarded as the operations soon proved to be impractical, or too time consuming to be fitted into any modern production schedule. It was then that engineers remembered acids that erode, or "eat" into and through metals by chemical action. They came up with "liquid tools" that would machine almost anything machinable, and do the job on schedules that matched, and in some instances exceeded, the fastest methods developed in shops for work on the common metals.

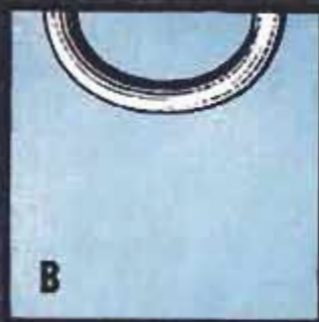
For example, Engineer **E. V. Howe** of General Electric's Schenectady, New York, laboratory demonstrates the speed and precision of liquid tools on an alloy bar of



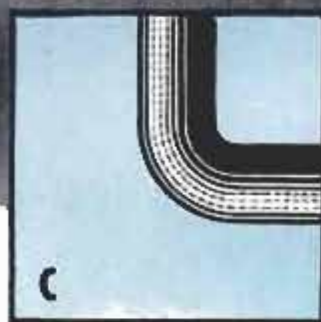
Spiral gear with lower portion chemically polished in minutes. Hand honing would take hours



Early laboratory setup for electrolytic milling. Work is rotated by geared motor under glass "tool" at right side of apparatus



B



C

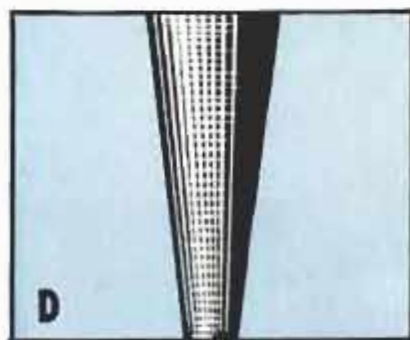
Grooves, contours are cut in superhard metals to precise dimensions. Work is simply turned under tool

Details A to D show graphically hole-forming versatility of electrolytic, or chemical, milling. Detail E shows how contours are formed by multiple jets

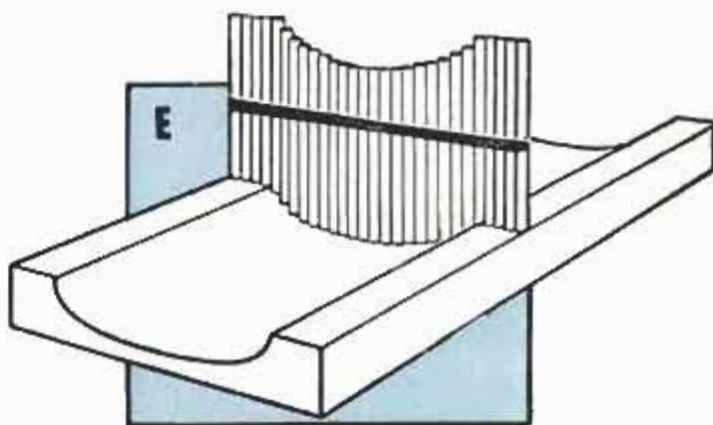
# CHEMICALS

## clean and polish schedules

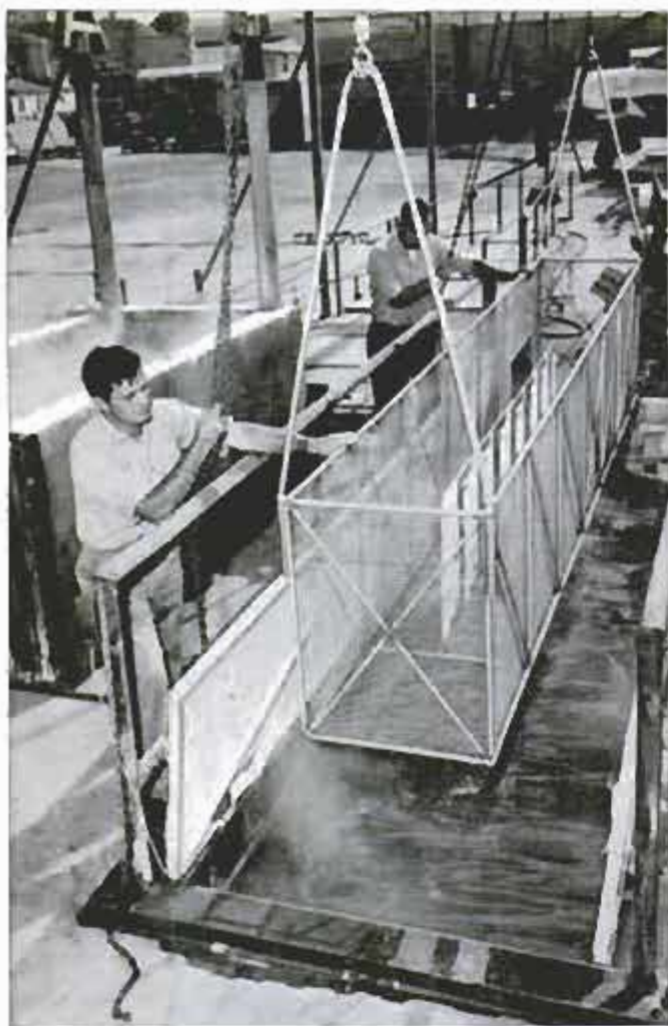
cobalt and tungsten carbide, one of the toughest of the tough metals. In this he has drilled two precision holes experimentally. The first one took nearly three days by conventional methods. The second hole went through in 15 minutes. Using liquid tools Howe can drill a hole in from one face of the work and enlarge it within the material; drill in and out on the same face of the stock; drill in on one face and out on an adjacent face, or drill a hole to a given diameter and degree of taper. See the details A to D inclusive. Hard alloys can be machined all over, grooved and shouldered to precise dimensions. By arranging tool tips side by side in a suitable holder as in detail E, almost



D



E

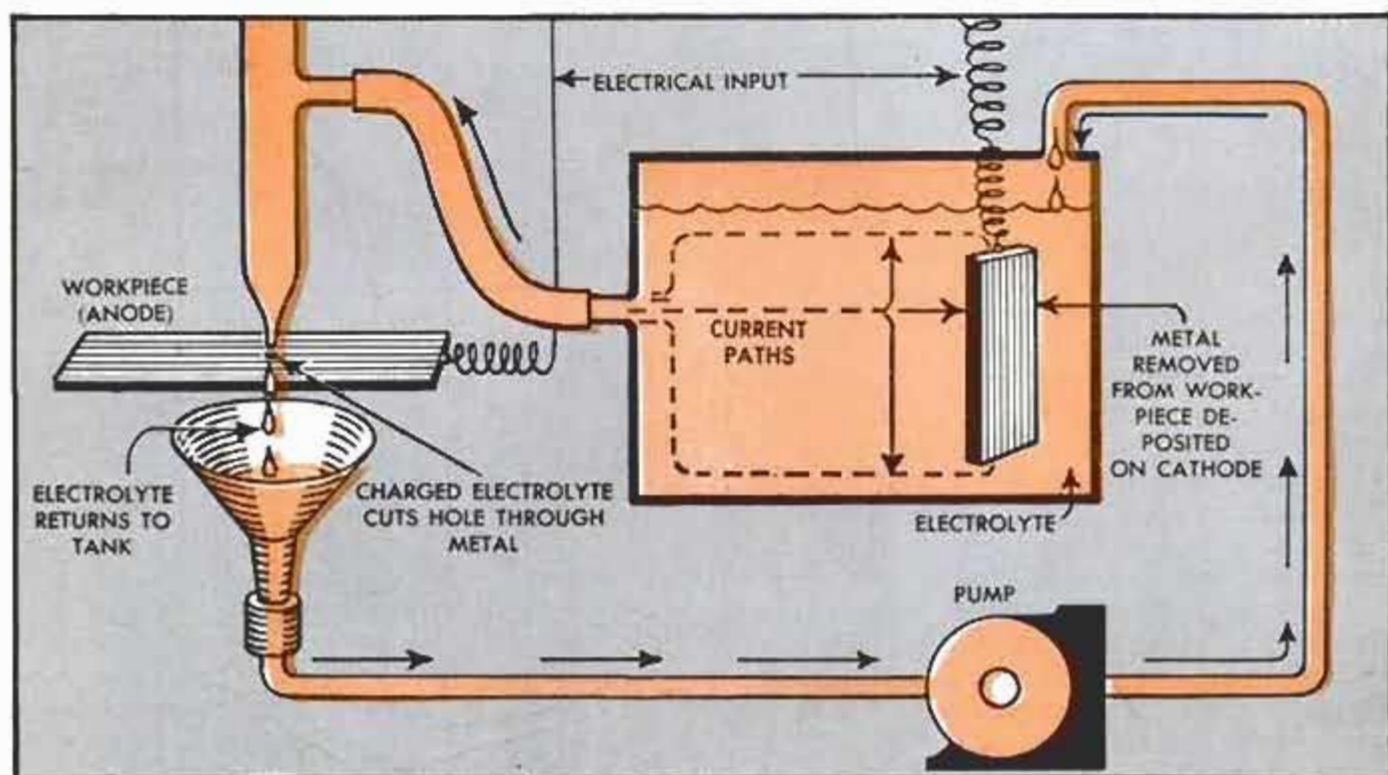


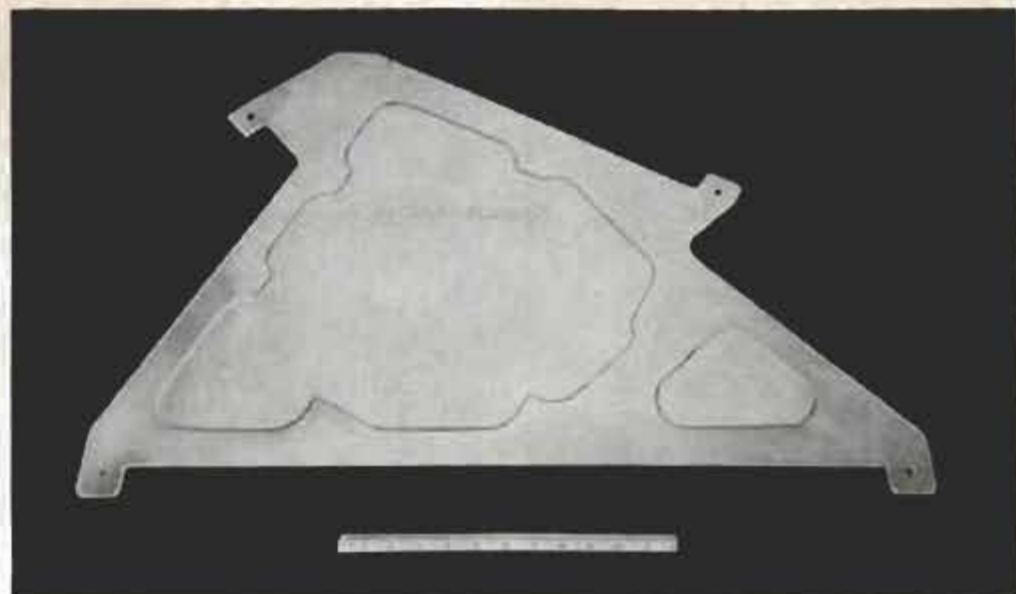
Large sheets of metal to be chem-milled are placed in a carrier and lowered into a tank containing liquid "tool." Time of immersion is closely controlled

Small parts are worked with the setup shown diagrammatically below. Here glass tip is used to concentrate work of liquid tool, as in drilling a hole

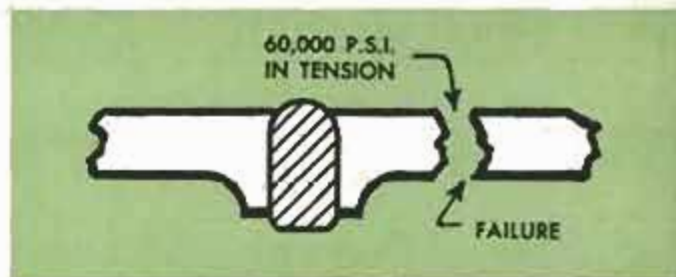
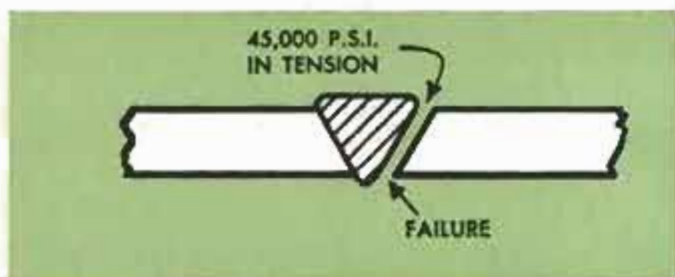
any desired contour can be machined on the face of the stock. Finished work can be given a polish which equals or exceeds in brilliance and smoothness that produced by ordinary methods of grinding and polishing. In many instances this can be accomplished in a fraction of the time required by conventional methods.

Described in simplest terms the process is electroplating in reverse. Particles of metal are removed from the work, which serves as the anode, and deposited on a cathode. Electrically charged combinations of sulphuric, hydrochloric and hydrofluoric acids with addition of various salts (electrolyte) are pumped through a system like that diagrammed below. The electrolyte, flowing through a shaped glass tube under closely controlled conditions, removes tiny particles of metal from the workpiece. The glass tube, which is necked down to form a small orifice at the tip, never touches the work. It serves only to direct the flow of the electrolyte which does the cutting. By using single or multiple glass tips in varying sizes and arrangements it is possible to duplicate almost any ordinary machining cut in the hard metals. In hole drilling and in certain other cuts, computing the speed with which the liquid cuts through the metal indicates the rate at which the tip must be advanced to produce a hole of a given diameter or a cut of a given depth. Curved holes, right-angle turns within the material, and other penetrations are made by using curved glass tips, flexible tips, or tips made with jets, or orifices, located on the side rather than at the end. According to the engineers who have carried out the extensive





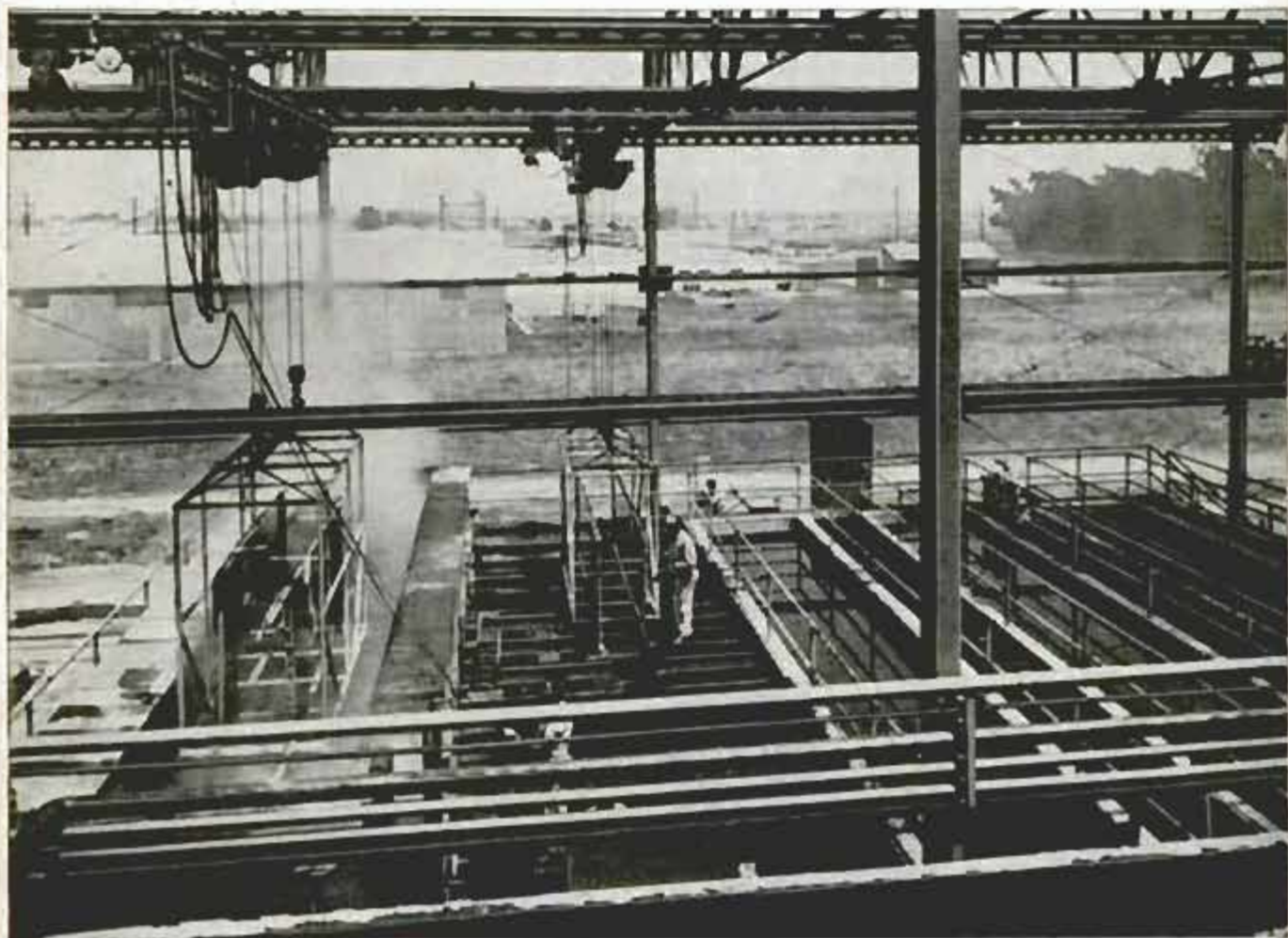
Left, spiral grooves cut on the outside of a rocket nozzle by chemical milling. The grooves serve as coolant passages after outer skin is attached. Right, recesses chem-milled in panel of thin sheet metal



Aluminum sheet fails at weld under tension. Sheet has not been milled. Compare with detail at right

Sheet similar to that at left milled after welding does not fail at weld, even under greater tension

Tanks sufficiently large for immersing large aircraft parts are located as pictured. Overhead hoists are provided for lowering and raising carriers in which parts are placed. Immersion time is controlled





Left, examples of electrolytic drilling and recessing in superhard metals. Cord shows how hole was drilled in from surface and out on adjacent side. Right, micrometer is used to check thickness after chem-milling

experimental work, the trick in attaining precise and uniform results is to determine the proper electrolyte for a given metal and then combine this with an electrical charge of just the right density.

By slowing or speeding up the progress of the tip at a constant rate, it is possible to "drill" holes to a uniform taper of almost any degree required. Once a uniform cutting rate has been established with a given setup, it is possible to duplicate certain parts to a semifinished or finished state with an accuracy comparable to those mass-produced by conventional methods from common materials.

Another process, similar in principle but differing in application, has been developed. Instead of confining the cutting action of the chemical tool to a very small area as is done in drilling and other operations with a glass tube, or jet, the material to be machined or milled is coated with a plastic masking, as the first step. The plastic coating is then cut away, using a pattern, or template, as a guide to those portions of the metal which are to be cut away. The workpiece is then lowered into a tank containing the chemical "tool," which cuts away the exposed portions of the metal, leaving uncut those sections protected by masking. The time of immersion is determined by a preset timing device. At the end of the predetermined period the work is lifted from the bath automatically. It is then rinsed in a neutralizing bath.

This simple method of cutting through

and recessing metals is now widely used by manufacturers in making huge airframes and also highly specialized parts for rockets. Not only does this new technique of milling with chemicals, or chem-milling, as it has come to be called, create shapes that are difficult or even impossible to machine by conventional methods, it produces many parts faster and cheaper than can be produced with ordinary machine tools. It has been found possible by these new methods to hold work to tolerances that compare favorably with conventional manufacturing practices. As a result chem-milling has been applied not only to the shaping and machining of superhard metals but to the softer metals such as aluminum, magnesium and carbon steels. Castings and forgings of some types are now shaped with chemical tools. Steel shipping containers, radar aerials, pump impellers, even decorative metal panels have been produced. Experimental work has been done in the field of reconditioning and sharpening edge tools.

At present the field of chem-milling still is greatest in the aircraft industry where machining speeds and weight reduction are of prime importance. As an example, every pound that can be removed from the parts of a rocket without impairing efficiency and necessary strength gives the missile an additional three miles of altitude with a corresponding increase in range. Tubing conveying fuel in rocket engines is first bent to the required shape and then is chem-milled to minimum wall

thickness. The ends of the ducts, which require extra strength for clamps, are masked during the milling process and retain their original thickness. As much as 20 lb. per missile can be saved in this way. Similarly, 100 lb. of unneeded metal is milled from bulkhead rings of the Lockheed Constellation series of aircraft, a saving that wasn't practical before chem-milling was developed, because of the high cost.

"Chemical milling had only a few uses when we developed it five years ago," says Manuel C. Sanz, chief of materials research at the missile division of North American Aviation. "Then we found we could do a number of tricks with it.

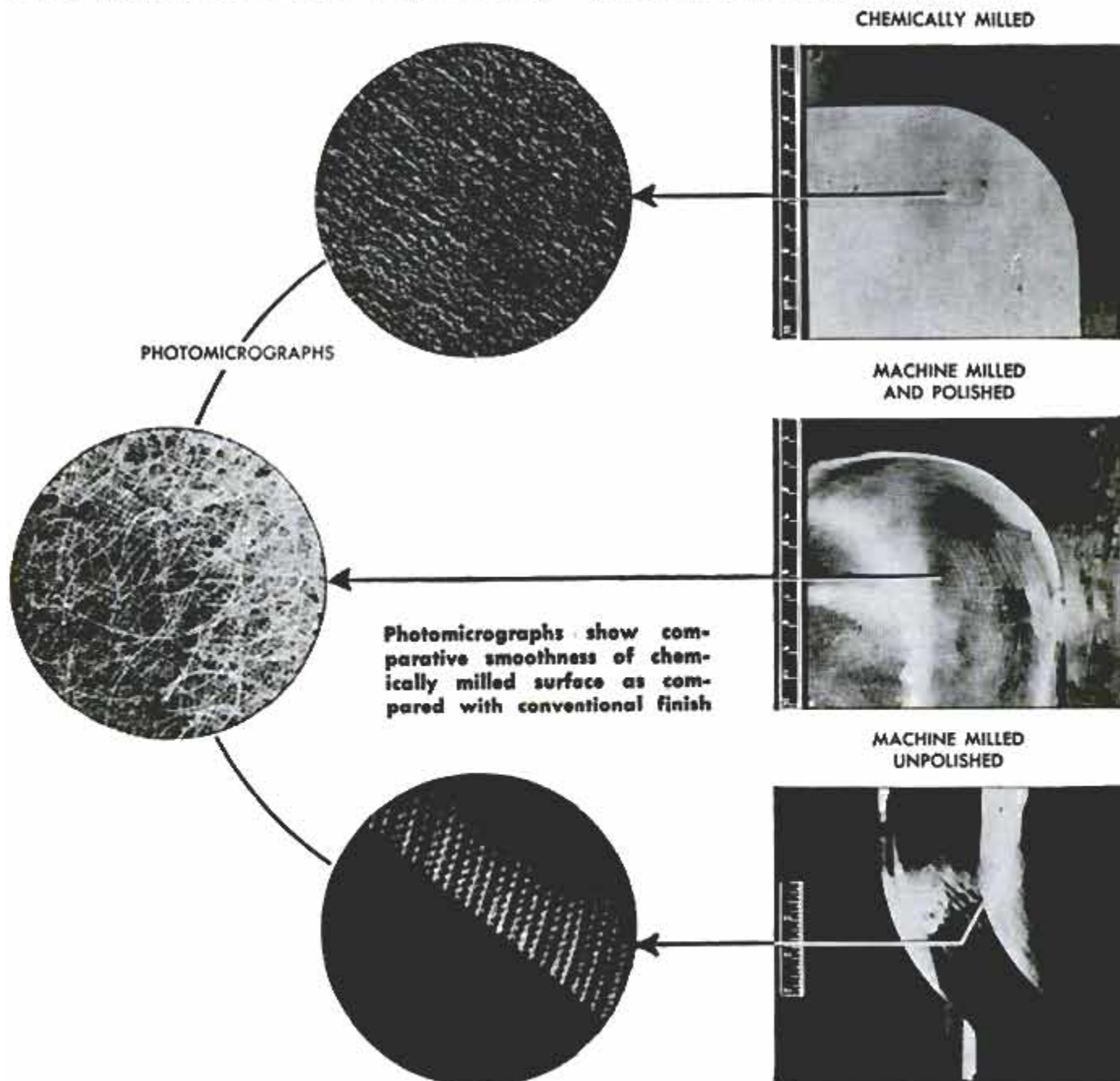
"We can taper the thickness of a sheet of metal simply by lowering the sheet very slowly into the chemical bath, a metering hoist lowering it at a preset rate. The depth of cut depends on immersion time so a very smooth taper is produced. A somewhat similar effect is obtained by

lowering the sheet in a series of steps, or by progressive unmasking.

"To produce a crowned shape we rotate a part and slowly immerse it at the same time. The outer edges are in the bath longer than the material near the center, hence more metal is removed from the edges.

"Of course, there are things that chemical milling can't do. It isn't going to put any standard tool out of business. But in its special fields it has been estimated that \$30,000 worth of chem-milling equipment can do the same amount of work as three milling machines costing perhaps \$600,000."

One of the greatest advantages of the process of chem-milling is that very thin material can be worked on one or both sides without any danger of distortion due to stress, or warping due to heat. This permits working complex shapes and intricate patterns at great savings over stamping, which calls for costly dies and a large investment in individual machines. ★ ★ ★



## Squaring Bracket Aids Work Setup

When setting up work in a milling vise there are times when you could use three hands, one to hold the square, one to hold the work against the square and one to tighten the vise. A fixed square, or squaring bracket, attached to the fixed jaw of the vise will eliminate the problem quite effectively. Mill a short length of steel angle all over and attach it to the fixed vise jaw with a socket-head set-screw. True the square with a dial-type indicator, tighten the screw and there you are.

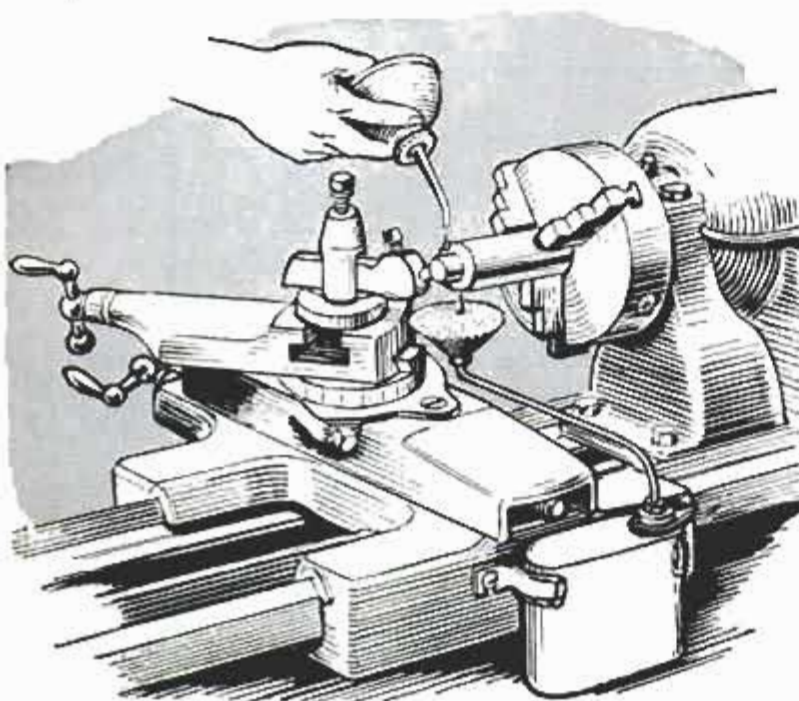
## Rubber Band Acts As Holder For Tailstock Wrench

If you have trouble keeping track of the tailstock wrench—even the socket-type wrench can get mislaid or fall to the floor occasionally—just loop a heavy rubber band over the wrench and the nut as pictured. The band won't interfere with the regular use of the wrench and it will always be at hand when you have use for it.

Beeswax or soap applied to a grinding wheel will prevent it from clogging when grinding aluminum or other soft metals.



## Simple Lathe Attachment Reclaims Cutting Oil for Reuse

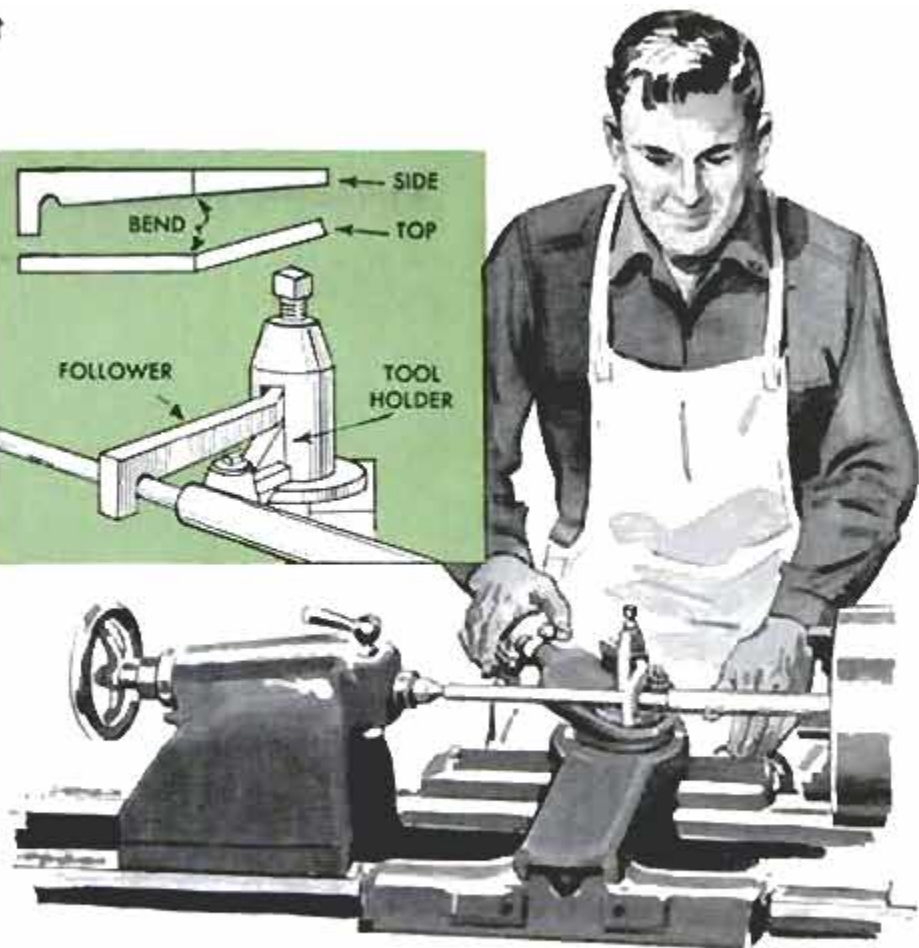
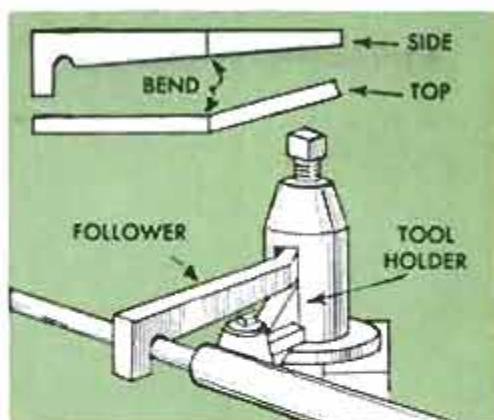


In shops where volume or nature of the work does not warrant fitting lathes with cutting-oil circulators, it still is possible to reclaim the small quantities of oil that may be used. A simple shop-made attachment that travels with the carriage can be put together in a few minutes, using an oval-shaped can with screw cap, a short length of tubing and a small funnel. Thread one end of the tubing and attach to the screw cap with two nuts. Screw cap onto the can and attach the can to the back of the carriage. Cut the neck from the funnel and solder the funnel to the free end of the tubing. Cover the funnel with fine screen to catch the metal chips.



## One-Piece Follower Rest Travels With Tool Post

This follower rest was improvised to handle a special job which involved the running of a long shoulder cut to approximately half the length of small-diameter stock. This made it essential that the rest follow the tool closely to prevent score and chatter marks. To meet these requirements, the rest detailed was made from a piece of brass about  $\frac{3}{16}$  in. thick, the lower edge being milled and filed to give the shape indicated. It is then bent so that when placed in the tool post between the toolholder and the clamping screw it will bear on the work just back of the cutting tool.



## Clamping Collar of Hardwood Supports Drill-Press Table

Ever have the drill-press table slide without warning to the lower end of the column? It can happen and there's only one sure way to prevent it. That's by means of a clamp collar, or pinch clamp, on the column below the table collar. Such a clamp can be made from hardwood or plywood, whichever material you happen to have at hand. Shape the collar as indicated in the photo, fit it with a small bolt and wing nut so that it can be clamped tightly to the column at any point.

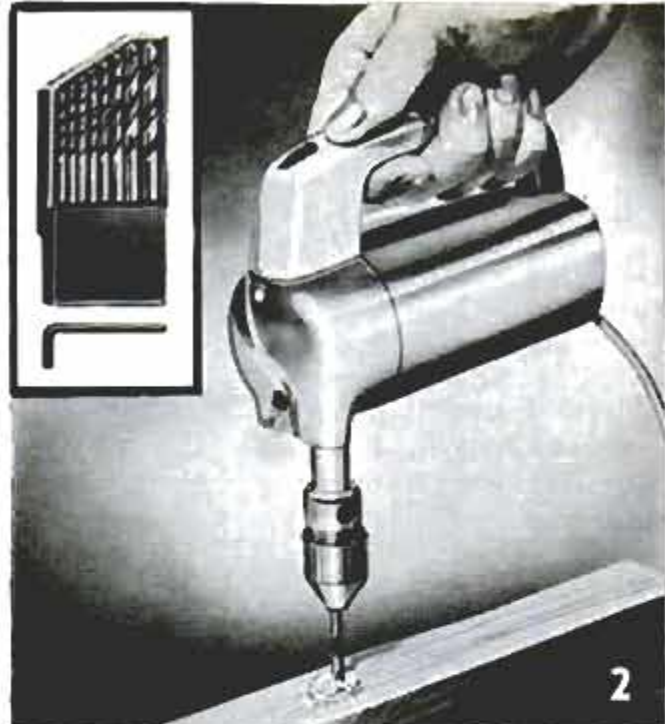


## Shop-Made Lathe Steady Rest For Large-Diameter Work

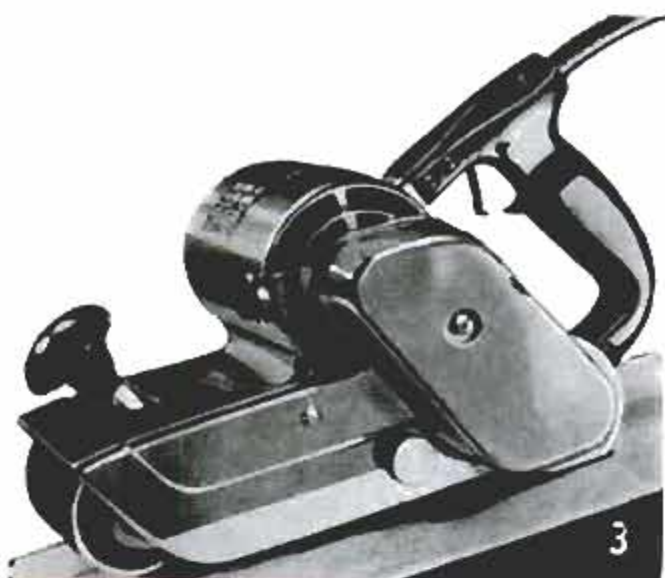
In one custom shop a job called for an internal groove to be cut near the ends of several pieces of tubing, each about 8 in. long. The diameter of the tubing being greater than the capacity of the regular steady rest, it was necessary to make a rest from structural-steel angle. One web of the angle was bandsawed to a radius slightly less than the outside diameter of the tubing. It was then bolted to the lathe bed and finished with a fly cutter held in the chuck.

C. W. Woodson, Chicago





# SHOPPING FOR TOOLS



**1. SANDING BLOCK** has the same feel and is of the same general size and shape as the ordinary hand-sanding block, but it's fitted with a sheet-metal pad coated on one face with tungsten-carbide abrasive. Sheet-metal pad won't tear or buckle and score surface. Individual abrasive grains are permanently affixed. Comes in two grits, No. 80 and 150

Millers Falls Co., Greenfield, Mass.

**2. ADAPTER** converts a kitchen mixer to a 1/4-in. portable electric drill. Conversion is accomplished by removing regular beater and inserting adapter. Assembly consists of adapter, key chuck and a set of 9 twist drills in sizes ranging from 1/16 to 1/4 in. Adapter is made in sizes and types to fit all standard mixers of stationary and portable types

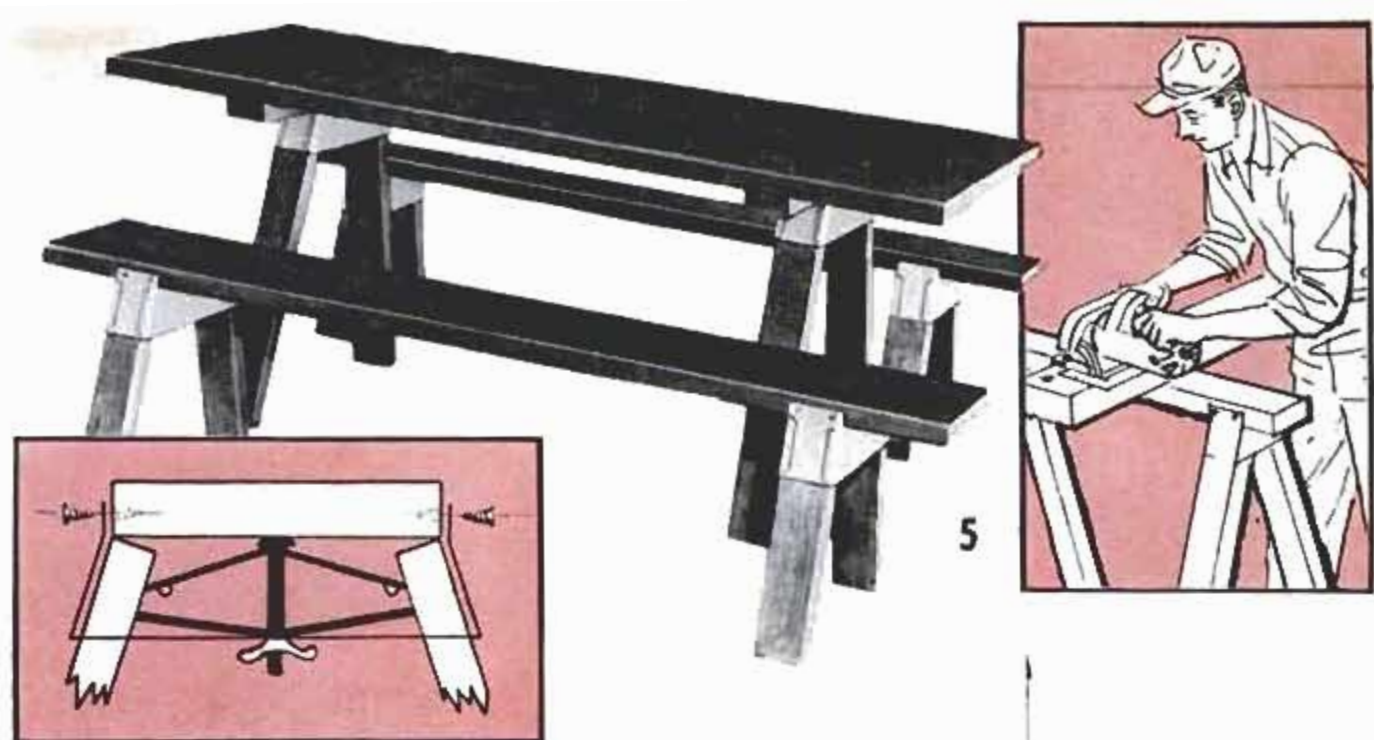
G. K. Stewart Co., 183 M<sup>h</sup> Curve Blvd., St. Paul 5, Minn.

**3. PORTABLE BELT SANDER** has two speeds, one for smoothing rough materials and one for finishing. High-speed position of switch gives a belt speed of 1100 feet per minute (f.p.m.). On the slow-speed setting the belt travels 800 f.p.m. Abrasive belt is 4 in. wide, covers a large area at one pass over work. Handle is molded plastic, shaped for easy grip

Skill Corp., 5033 Elston Ave., Chicago 30

**4. BALL AND ROLLER-BEARING CLEANER** combines cleaning action of both solvent and air under pressure. Handles any antifriction bearing from the smallest up to 5 in. in diameter, without disassembling or removing seals or shields. Cleaning solution is continuously filtered to remove all particles larger than 1/2 micron in size. Takes bench space -18 x 30 in.

Bearing Inspection, Inc., 3311 E. Gage Ave.,  
Huntington Park, Calif.



**5. LEG BRACKETS** are used in making sawhorses, benches, scaffolds and tables. No mitering cuts are necessary when making any of these units. Brackets come in different widths to suit the purpose. As an example, for benches, stools and low scaffolds the brackets take a standard 2 x 12 for the top and use 2 x 4 legs. One sawhorse bracket accommodates 2 x 4 legs and a 2 x 8 horizontal member. Another bracket available takes 2 x 4 legs and a 2 x 4 top member. Legs are removed by loosening wing nut as in detail

Saturn Mfg. Corp., P.O. Box 592, Topeka, Kans.

**6. SPIRAL BURNISHER** follows the reamer to produce a perfect hole to extremely close tolerances without waves or a trace of chatter marks. It does not remove stock as does a reamer but produces a combined burnishing and compression action as it is rotated. This action stresses the material being worked beyond its elastic limit as the tool is fed into the reamed hole. Stock sizes range from 1/16 to 1 in.

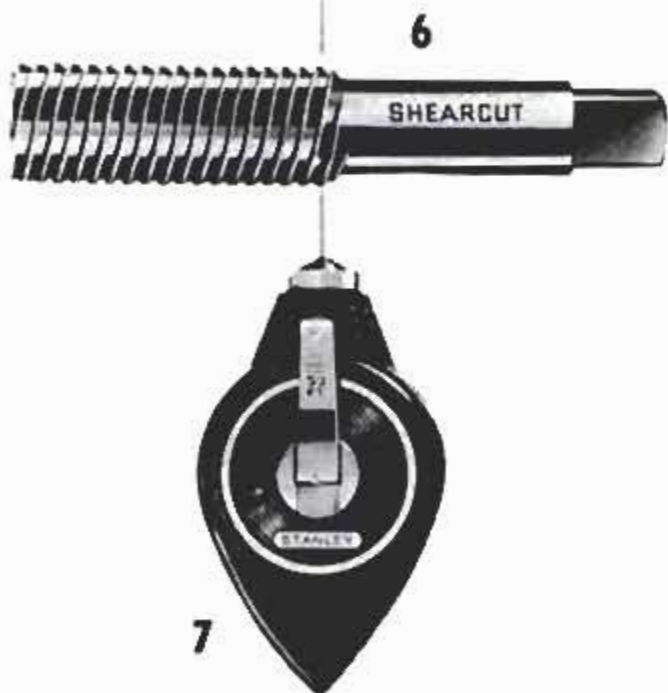
Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif.

**7. SELF-CHALKING LINE** comes in 50 and 100-ft. lengths, in a specially designed plastic case, or housing, which can serve as a plumb bob. Universal hook at free end of line can be attached to any projection or slot for one-man operation. Rewind handle folds into case for carrying in pocket or toolkit. Case is easily refilled with powdered chalk in colors

The Stanley Works, 111 Elm St., New Britain, Conn.

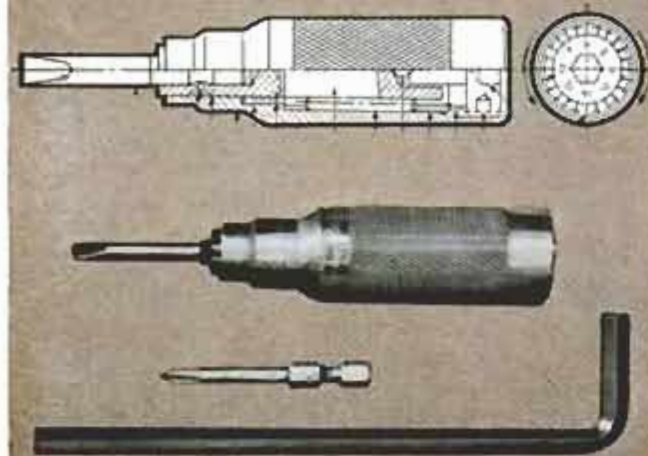
**8. TORQUE ADAPTER** converts any 1/4, 3/8 or 1/2-in. portable drill into an efficient torque wrench. Torque on the three sizes is adjustable, ranging to 120 lb. for the 1/2-in. drill, 540 lb. for the 3/8-in. drill and 960 lb. for the 1/4-in. drill. Slip clutch releases automatically when desired torque is reached. Square driver takes common sizes of wrench sockets for driving nuts and all types of machine screws

Stockholm Tool Co., 270 E. Mound St., Columbus 15, Ohio





9



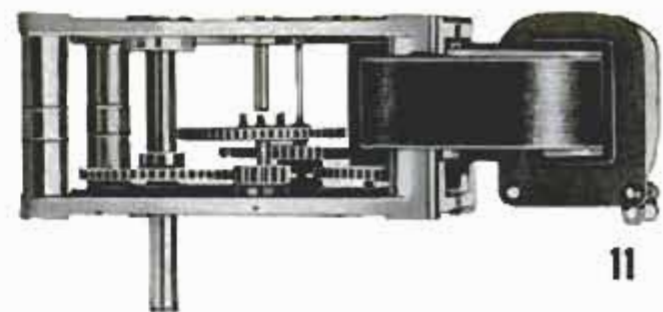
12



13



10



11

**9. WELDING GUN** handles studs through  $\frac{1}{2}$  in. in diameter, weighs less than 4 lb. and is only 9 in. long. Body of gun is of durable plastic. A comfortable pistol grip gives the operator close and positive control of placement and welding of the studs. Positive balance reduces operator fatigue, increases output and the accuracy and quality of the work

Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio

**10. FRAMING SQUARE** simplifies rafter layout, makes it easy to cut braces that fit, serves as a T-square, T-bevel, and as a level for plumbing wall framing. It can be set for marking any angle up to 45 deg. and can be set at 90 deg. to serve as a steel square. It's lightweight, easy to handle and stores readily in any toolkit. Graduations are clear and sharp

Squangle Corp., 6406-17th St. S.W., Lynnwood, Wash.

**11. SUB-FRACTIONAL HORSEPOWER GEARMOTOR** is directly connected to a gear train designed to convert low-power electrical input into slow-speed, high-torque output. It's built to give long and reliable service in the operation of animated advertising displays, various types of control devices, also vending and coin-operated amusement machines of various types

Multi-Products Co., 2052 Grove Ave., Racine, Wis.

**12. HAND SCREWDRIVER** works to a preset torque in a range of 0 to 25 inch-pounds. It is designed for precision assembly, production and maintenance jobs where air or electrically powered drivers cannot be used due to space requirements or safety regulations. Typical applications are assembly of industrial instruments, aircraft controls, appliance controls

Scully-Jones & Co., 1901 S. Rockwell St., Chicago 8

**13. PORTABLE ELECTRIC PAINT REMOVER** takes off old paint and varnish in one pass. Controlled depth of cut leaves a uniformly flat surface ready for repainting or refinishing. Disks are faced with tungsten-carbide abrasive, the grains being spaced to prevent clogging. Its use for paint removal eliminates fire hazards present when a blowtorch is used

Porter-Cable Machine Co., 128 Exchange St., Syracuse, N. Y.



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You read exposure easily—with ultra-sensitive photoelectric meter! Sets for all films.



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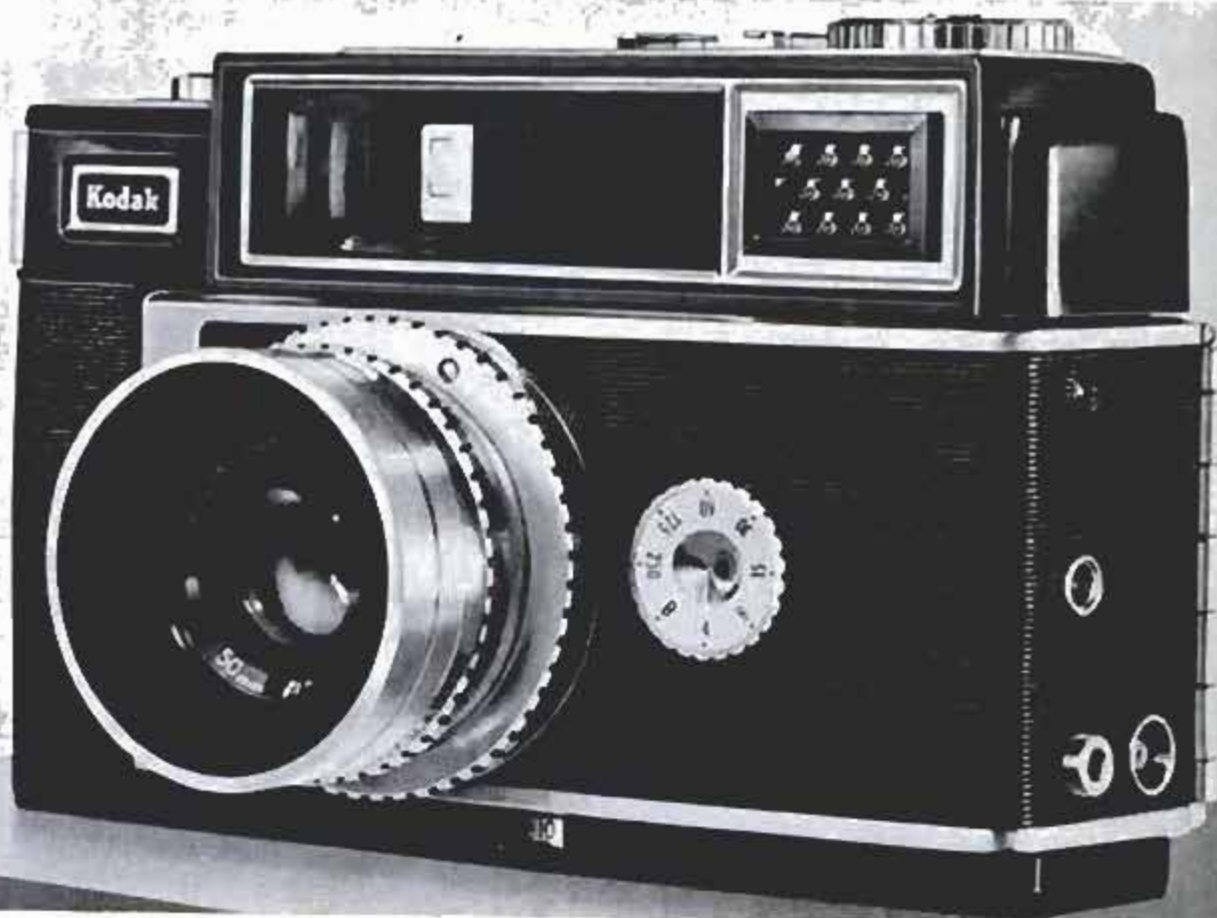
You pull in faraway scenes, take candid portraits with the telephoto lens. (90mm *f*/4, \$69.50)



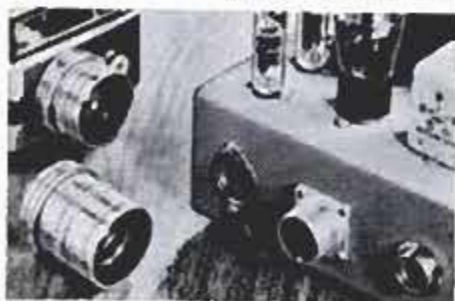
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### Restoring Oil Painting



**Q**—How does one go about restoring an oil painting which is quite old? I doubt if it is valuable but it is old and very much cherished, as it has been in the family for so many years. It is rather dingy in appearance and is covered with the dust and grime of years. Is there a safe solvent that can be used to clean and restore it to its original appearance? — D. G., Wash.

We'd suggest that you consider giving the job to a professional restorer who will have the opportunity to examine the painting and determine what procedures are safe and effective. However, if you wish to attempt the work yourself, we have one suggestion which may prove successful. Fold a clean, soft cloth to make two or three thicknesses that will cover the painting. Then dip the cloth in lukewarm, soft water and wring out until it no longer drips. Spread the damp cloth over the painting and press into contact. Allow the cloth to remain in place for five or ten minutes, then lift it off, rinse thoroughly and repeat the procedure. Several applications should remove most of the accumulated dust. Special care must be taken not to get the surface of the painting unduly wet. After it dries thoroughly it can be brightened with an application of copal varnish applied with a fine-bristle brush or better, sprayed on. Do not use any synthetic, clear finishes as these may contain solvents that will soften the oil paints used originally.

### Tool Selection For Home



**Q**—I would like to purchase hand tools for household use. I'm a new homeowner and I've thought it best to purchase tools only as I need them, gradually acquiring a complete set in this way. But I'd like to see a representative selection listing those tools likely to prove most useful over a period of time. — L. R., N. Y.

**A**—You are correct in the assumption that it is best to purchase tools only as the need develops. In any selection there are always a few tools that

(Continued to page 214)





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PLIERS**

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Look for the trademark on the handle**

(Continued from page 212)

will get more general use than others, but as a rule those not used so often will pay for themselves in time. Following is a list of hand tools selected on the basis of all-around home use but not necessarily calculated to cover all probable requirements:

Ripsaw, 26-in. blade (5 to 6 points per in.)	Jack plane, 14-16-in. frame
Crosscut saw, 24-in. blade (12 points per in.)	Level, aluminum frame, 18 to 24 in.
Compass saw	Cabinet scraper
Coping saw	Twist drills, 1/32 to 1/4 in. by 32nds
Hacksaw	Expansive bit, 7/8 to 1 1/2 in.
Combination square with scribe	4 flat files with handles (selected according to requirements)
Miter box, 26-in. back-saw (optional)	Combination pliers (slip-joint, side-cutting)
Ratchet screwdriver	Long-nose pliers
Hand drill, 1/4-in. chuck cap.	Tin snips
Combination ollstone	Ripping bar, 18 to 24 in.
Ratchet bit brace, 10-in. sweep	Marking gauge
Auger bits, 1/4 to 3/4 in. rising by 8ths or 16ths	Folding rule, 6-ft.
Rosehead countersink	Adjustable wrench (two or three sizes according to requirements)
Nail set	Pipe wrench, for pipe up to 2 in.
Nail (curved-claw) hammer 13-Oz. head	Spokeshave
Block plane	
Smooth plane, 8-in. frame	



**Refinishing Cherry**

**Q**—I have a chest of drawers which I've always thought was walnut wood. After removing the old finish preparatory to refinishing, I found that it is not walnut at all. A friend who knows wood says it is cherry. I want to refinish it to look like walnut. Can this be done successfully?  
C. S., Ala.

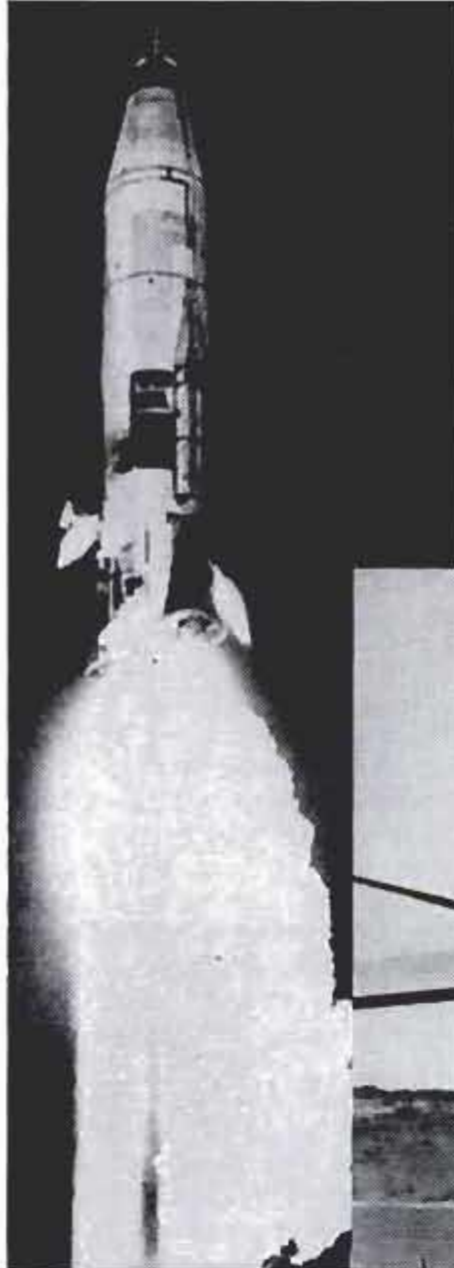
**A**—Selected pieces of cherry can be finished in a very close imitation of genuine walnut. You do not describe the chest in detail but if we can assume that all exposed parts are of cherry, then it should be possible to refinish the chest to appear as walnut. First, do a thorough job of sanding, using several grades of sandpaper and finishing up with the finest 8/0 grade. Follow sanding with a pigmented-walnut stain, applying and reapplying and wiping until you get the color that will match a finished sample of genuine walnut. It is not necessary to use a filler on cherry. Allow the stain to dry at least 24 hr. or more. Then go over the stained surfaces very lightly with fine steel wool, dust off and apply a sealer. When the sealer is dry, sand it lightly with fine sandpaper and dust off the surfaces. Follow with a water-white lacquer, applying with a spray gun rather than a brush. You can usually rent a sprayer from your local paint dealer. Spray on two thin coats of lacquer, allow to dry 24 hrs., then go over the surfaces with fine steel wool, 3/0 or 4/0 grade.

**Paint Peels From Window Casings**

**Q**—I have an older home and my problem is paint peeling from the window casings. What causes this and what can be done to prevent it?  
A. E., Minn.

**A**—You do not describe the windows or say whether the walls are insulated, but we think it likely that peeling of the paint is caused by moisture entering the window-weight wells from the room side and passing through the casings to the paint film. This could cause peeling of the paint as you describe. Basically, the trouble is due to the high humidity of the air in the rooms during the colder months. Anything you can do to lower this will, of course, help to mitigate the trouble. Although we hesitate to suggest it due to the labor involved, removing the casings and priming the back faces with an oilbase paint will tend to prevent peeling of paint on the exterior surfaces.

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## The "Squash Bug" Searches for Pay Dirt

(Continued from page 138)

served. "Did you notice the mercury retorts at the cinnabar mines in this range? We're mapping it geochemically, using a new technique. Already we've found we can detect mercury ore bodies hundreds of feet down by sampling on the surface."

Voices came from behind us. Three figures were coming down the trail. In the lead was Dr. E. H. Bailey, the party's geologist. Two young men carrying racks of small cardboard cylinders were introduced as M. Kyi Soe and Khin Maung Nyo, here from Burma to study geochemical techniques with U.S.G.S.

### Silk Cloth Is Sieve

Nyo sieved the fine soil of one sample through a silk cloth, then dumped a measured amount into a test tube with acid to "digest" it for the color tests to follow. Soe emptied plant leaves into platinum dishes and ashed them over a butane flame. We watched Ward transfer one sample to a colorimetric tube containing a measure of yellowish acid, add a few drops of one reagent, then a dash of another. Soon the yellow color was topped by a rapidly forming layer of red.

"This is a general test for heavy metals such as copper, lead or zinc," Ward explained. "If there's no reaction, we go no further. But we're getting a positive reaction, so let's see what we have."

To more of the sample he added other reagents. The solution turned gray, then blue, finally pinkish.

"Copper!" pronounced Ward. "Now, how much?"

### Color Indicates Amount of Metal

He passed the sample along a rack of fluid-filled tubes, each representing the color produced by a known amount of metal.

"Gray would mean four micrograms of copper per million parts; blue means five. Our sample has changed from blue to purple, but it hasn't quite turned red, it's pink—so we know we have a little more than five but not quite six micrograms. This color-matching is certainly faster than juggling laboratory balances!"

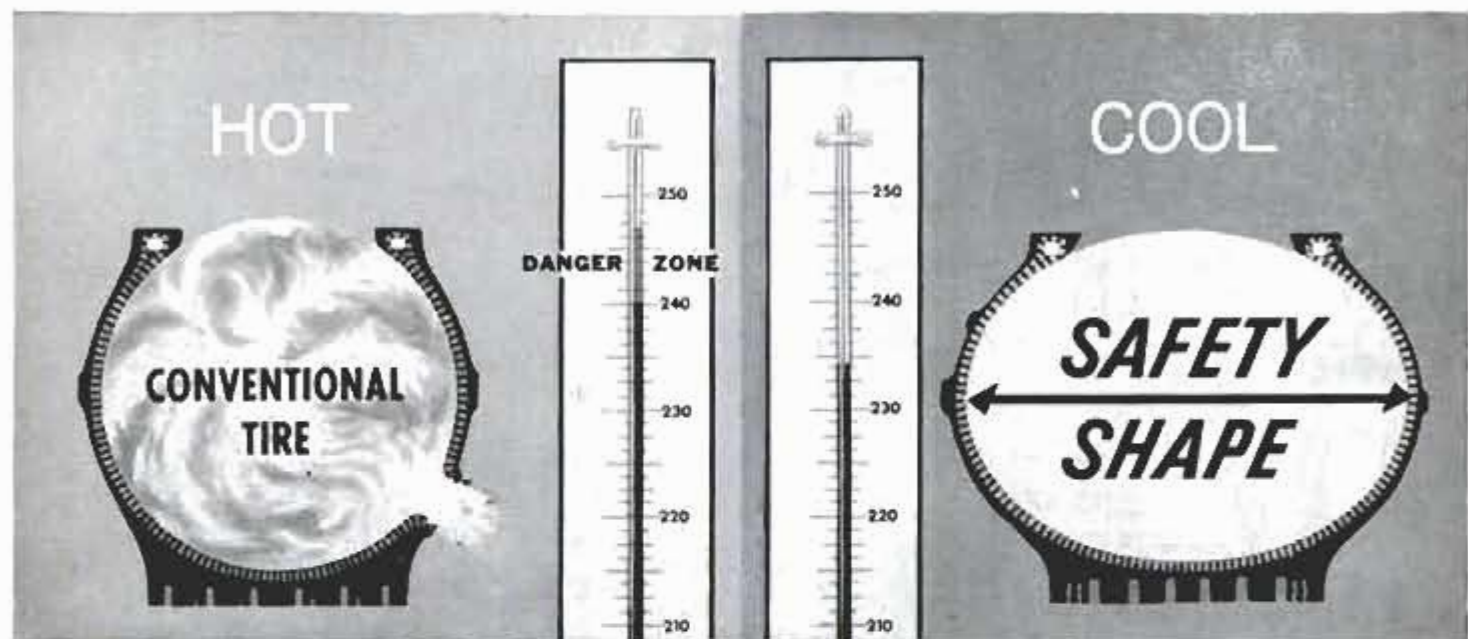
He quickly ran another test whose blue-green reaction at the finish indicated a small quantity of zinc. A test for lead was negative.

Ward explained that the first of these "miracle reagents" was reported in 1878 by

(Continued to page 218)

# RADICALLY NEW U. S. ROYAL LOW PROFILE SAFETY SHAPE TIRES

BEAT DEADLY HEAT, GIVE UP TO 35% MORE MILEAGE, SAVE GAS — YET COST NO MORE!



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In world's largest tire "torture chamber", U. S. Royal tests tires 24 hours a day, 279 million miles a year. Above, a conventional tire fails on a high-speed test wheel after only 72 minutes. *Murdered by heat!*



## SAFETY-SHAPE TIRE

New U. S. Royal Low Profile *Safety-Shape* tire passes "torture test" in a breeze. Keeps running hour after hour at high speeds. Lower, wider construction means less flexing, less heat, triple the high-speed endurance!



As your tires revolve, they constantly *flex*. This creates heat that can *murder* your tires. (*It's like bending a paper clip to and fro... the metal gets hot and finally snaps!*) U. S. Royal beats the heat with a new type of tire—the Low Profile *Safety-Shape* tire. This lower, wider tire doesn't flex as much as conventional tires. Runs cooler. Stays below the crucial heat danger zone. Gives up to 35% more miles. This easier-rolling tire *even cuts your gas bills!* Yet it costs no more than conventional tires. Ask your U. S. Royal Dealer.

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a chemist named Fischer. Apparently useless, it was forgotten until another chemist—also named Fischer—found the old report and noted that the reagent showed two highly important properties: It was both metal-hungry and color-sensitive.

This Cinderella compound, dithizone, became a sensation, for with proper coaxing it could be made to react with any of 17 metals, tinting a solution with color or producing a bright-hued precipitate. And the color was automatically linked with the metal that caused it!

### Colors Detect 30 Metals

Other researchers plied the entire list of metals with other organic reagents, thereby raising to 30 the number of metals that can be detected by the color tests.

U.S.G.S., familiar with the problems of prospecting parties that must carry their gear into roadless deserts and mountains, knew that the complex laboratory apparatus should be reduced to something closely resembling Junior's chemistry set. Its "idea men" replaced glass bottles with unbreakable polyethylene, found safe, inexpensive substitutes for temperamental reagents and dangerous acids; replaced delicate weighing operations with routines as simple as shaking a cocktail. Samples were identified on the spot by matching colors against reference standards.

These methods were taken into the field for tests against known ore bodies, then into totally unmapped areas. One team sampled waters of a bog in New York, found it zinc-rich and tracked the source down to springs bubbling up from deep ore bodies. In Alaska another team improvised a rapid way to sample soil beneath the all-concealing tundra, punching through masses of tangled roots and arctic moss with a sharpened pipe.

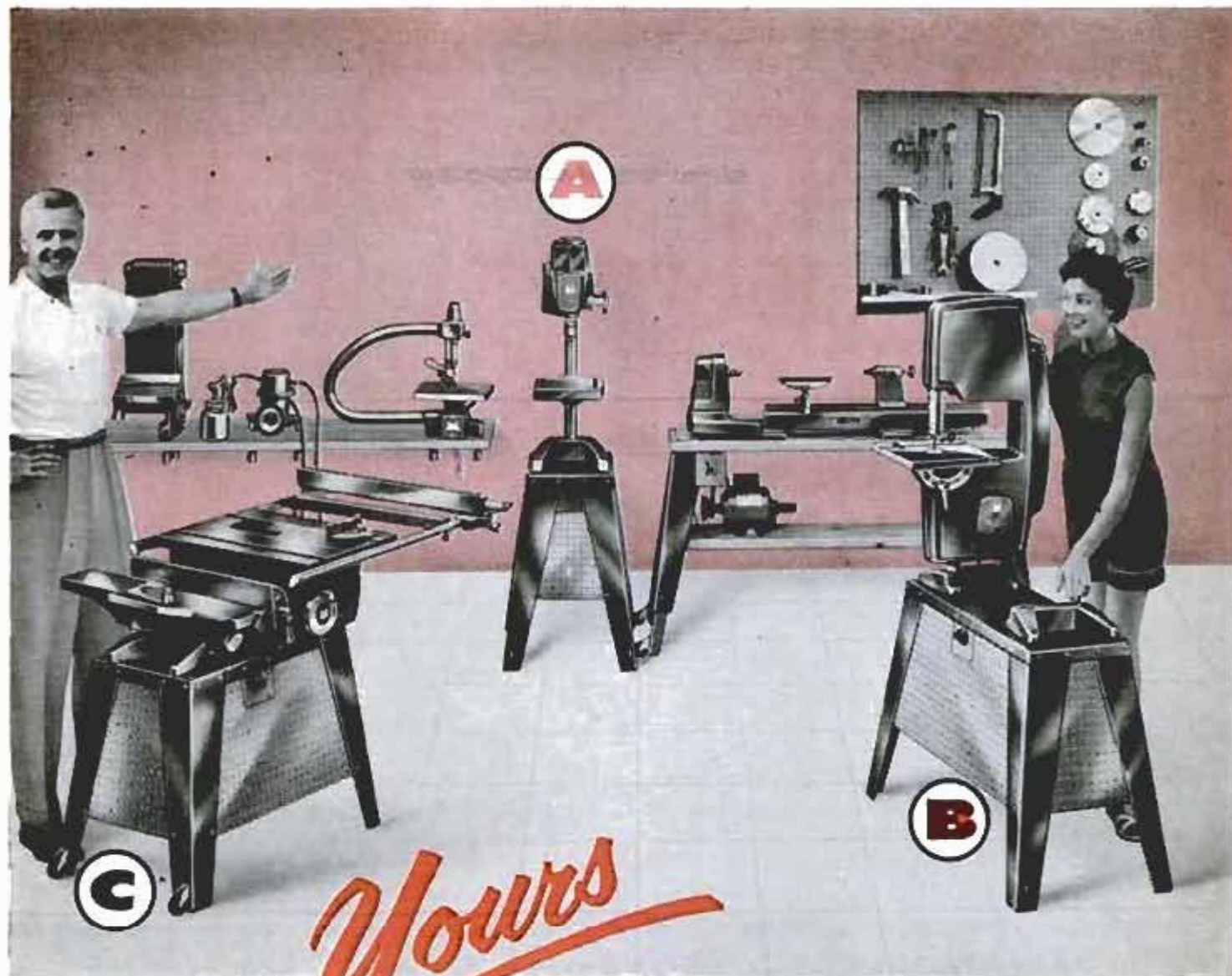
### Standardize Techniques

Waving his hand at the equipment ranged along the Squash Bug's let-down workbenches, Ward explained: "We're using this luxury-type mobile lab to standardize our techniques and get the kinks out of them. Then everything will be stripped down to the real back-pack equipment that can go out to the far places. A two-man team will be able to go anywhere and run their own tests instead of waiting weeks for assays to tell them whether they're on the right track."

Nearby, Dr. Bailey spread out a field-reconnaissance map.

"What we look for," he said, "is an 'anomaly'—a spot showing above-average

(Continued to page 220)



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readings. So, to get a quick picture of the general average, the metallic 'background,' we first cover the territory fast, sampling at long intervals.

"Only samples that show more than twice the background value are significant. If we find a cluster of high readings in our mapping we know we've found a metal-rich anomaly.

"For instance, the cobalt background in the Blackbird district of central Idaho is about 10 parts per million, but detailed sampling outlined an area three miles long and nearly a mile wide where the content climbed to 100. This cobalt-rich area will provide a good hunting ground for prospectors.

### Scientists Work in Pairs

"We generally work in pairs. The chemist runs the tests and the geologist interprets results and relates them to geological features such as faults, favorable structures and so on. Together they quickly reject ground that proves unfavorable, and space the samples closer over favorable areas."

Next problem, Dr. Bailey explained, is to get an idea of the shape of the anomaly. Is it a straight line, hinting at leakage of metals up through a fault or fissure? Is it a fan spreading out from the base of a cliff,

perhaps from a lode exposed by erosion? Or perhaps a fan-shaped train of ore fragments strewn by an ancient glacier? A water-borne trail of metal can be traced upstream just as the old-time prospector followed traces of gold to the lode.

In flat country, a circular ring or "halo" suggests an ore deposit at the bull's eye—often a spot where molten rock pushed up from the depths, its metal-rich vapors forcing their way out around the fringe of the deposit.

### Not Really Looking for Ore

The Geological Survey does not hunt ore, although its field men have turned up many a new deposit. Its job is to find out more about the earth, its structure, the forces that are changing it, and the way its mineral treasures are distributed. The Survey pioneers in developing basic scientific knowledge.

Already some of the new tools forged by this research are being put to work. In Africa, geochemists are handling more than 100,000 samples per year in a combing of the Rhodesian copper-belt soils, searching for chromium, cobalt, nickel and even the blue Kimberlite clay, source of Africa's diamonds. An oil company sampled waters of 467 lakes in Maine, locating three promis-

(Continued to page 222)

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ing grounds for lead, silver, zinc and copper. A two-man team in Finland is sifting clues from the fine sands left by melting glaciers, and is prospecting for bog-covered ores by analyzing peat.

The great bonanzas seem to be concentrated in certain metal-rich "provinces" that may extend over hundreds of square miles. For instance, the tin in most soils and rocks averages about 60 parts in a million, but there's an extensive area in Malaya and Indochina where this background rises to 100 or even 2500 parts.

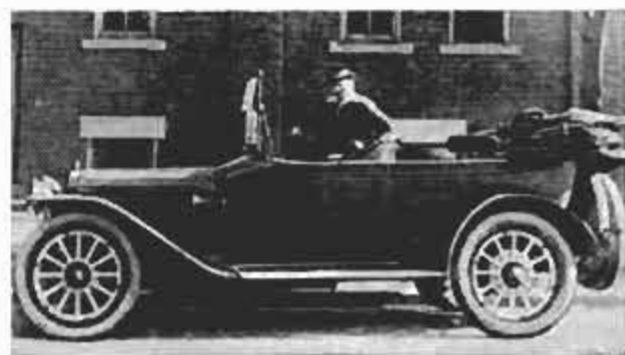
One of the big jobs of geochemistry is to block out promising areas for tomorrow's treasure-hunting. U.S.G.S. believes, for example, that the whole great Appalachian region of eastern United States can now be explored economically to reveal possible treasures buried under hundreds of feet of barren rock and soil. After all, radioactive "hot spots" marked from the air by U.S.G.S. geologists in the West's great canyons led prospectors to some of the world's greatest uranium deposits—and geochemistry doesn't require the use of an airplane! ★★★

## Worldwide TV Programs May Bounce Off Moon

TV programs from overseas may someday be bounced off the moon before they reach your receiver. British communications experts recently used the moon to reflect a radio signal to this country. They believe that a regular ultra-high-frequency radio link may be established within three years, using this method. A similar TV connection is expected by 1964, but not until a new "narrow band" transmission system can be developed. In the meantime, 100-foot metal-plastic balloons could be used to reflect the present "wide band" frequencies.

## Do You Know This Old-Timer?

(answer to quiz, page 14)



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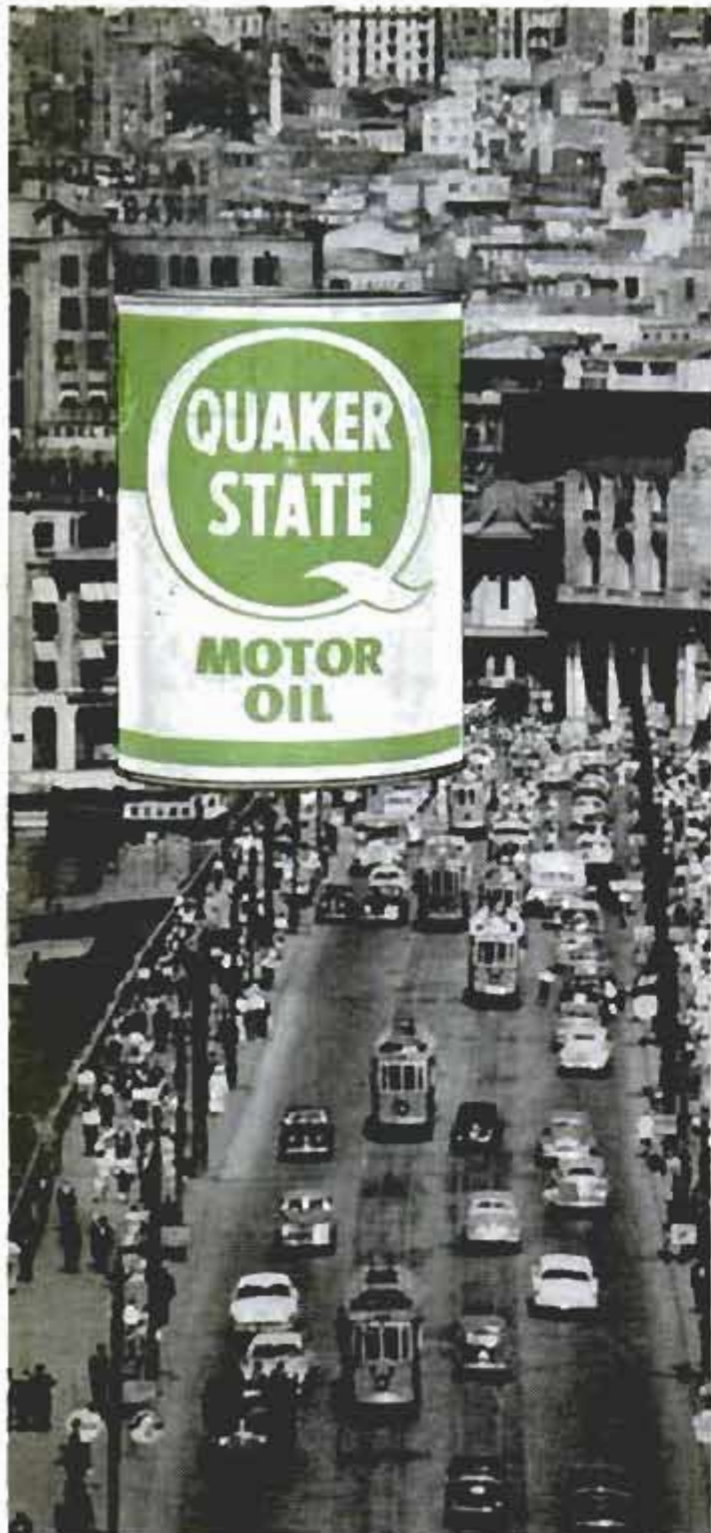
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## PM Salutes Igor Sikorsky

(Continued from page 80)

Turner bought it, and the little Sikorsky group was in business. A clutter of aircraft, emblazoned with Sikorsky's "Winged S" began to fill the skies—training planes, seaplanes, twin-engined craft. Finally, under the banner of United Aircraft, which absorbed his little company, came the great fleet of four-engined flying boats that carried the Winged S, via Pan-American Airways, to the corners of the earth.

Unhappily, according to Eugene Wilson, then vice-president of United, Sikorsky's flying boats proved that four-engined aircraft could safely hop the oceans in one leap—"and so paved the way for their replacement by land planes." Worse, a depression was in progress. In 1938, Wilson was ordered to tell Sikorsky to close up shop. Appearing at Wilson's office for this doleful meeting, Igor bowed from the waist, as is his custom, and blandly suggested that, far from ceasing research, it was United's responsibility to aviation to push on. "I seriously recommend as the subject of our research," he said, "the return to my first love, the helicopter . . . While admittedly radical, and perhaps impossible," he continued, waving aside protests about finances, "the helicopter is entirely rational." He quietly pointed out that a helicopter required no prepared landing field, would never compete with the airplane, and would be "used" not to destroy lives, but to save them.

Sikorsky got his financing and plunged into work on his now famous VS-300. The problems were staggering. One incidental trouble with a single-rotor helicopter is that as the rotor spins, the craft tends to

(Continued to page 228)

Sikorsky shows his friend Henry Ford the VS-300, first commercially built model of the helicopter





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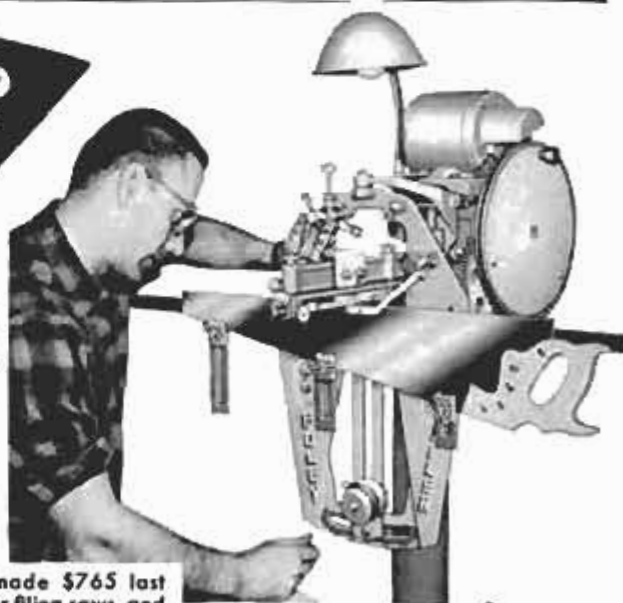
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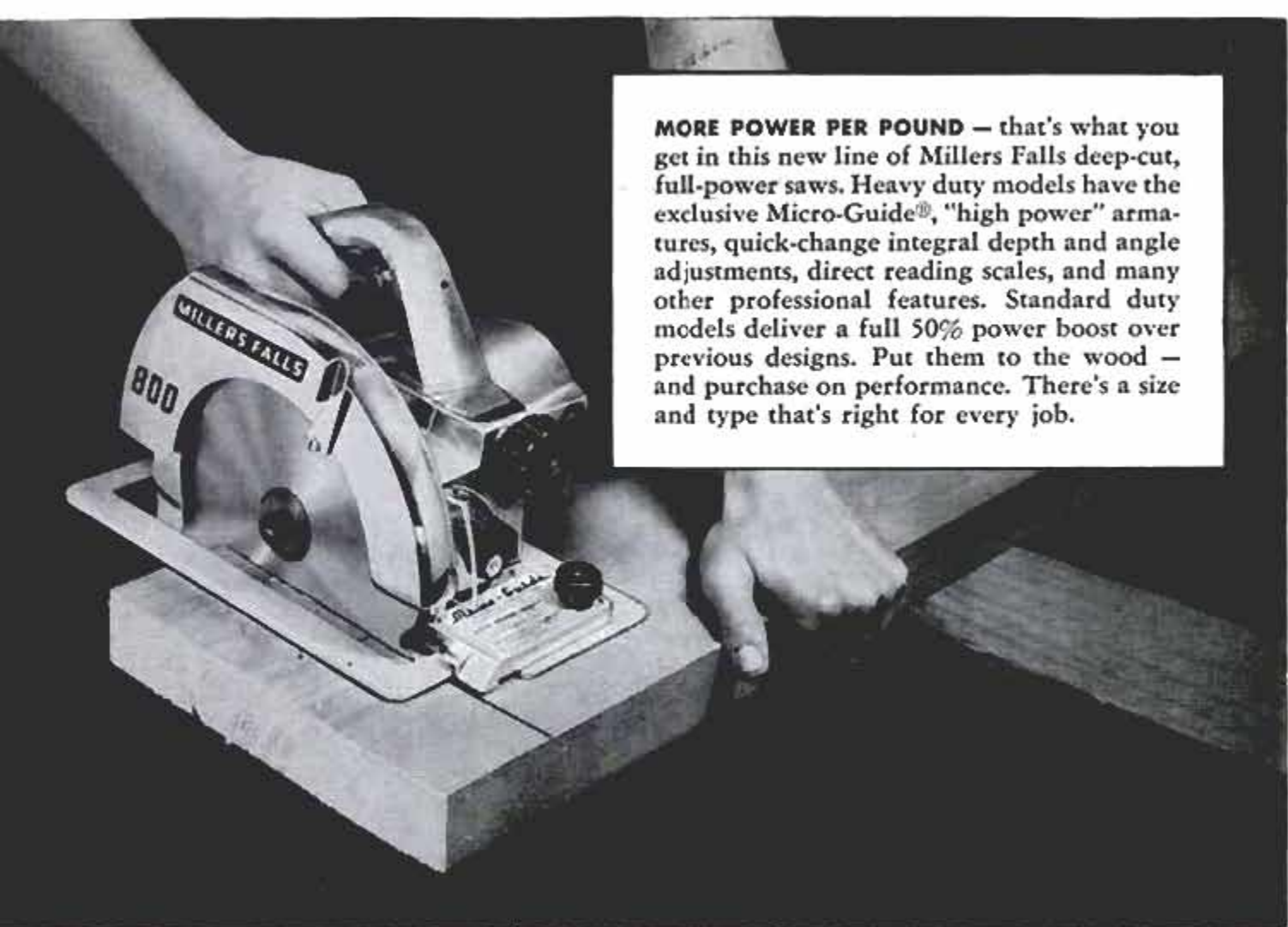
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spin in the opposite direction. Sikorsky solved this with a vertical tail rotor at the end of a long, skeletal fuselage. Another built-in headache of a rotor is that as the copter moves forward, the blade moving forward gets increased lift from the additional wind it encounters, while the blade sweeping backward gets even less than it would in still air. Result, the helicopter promptly turns turtle. To offset this disastrous effect, Sikorsky's odd-looking crate employed a hinge-like device that allowed each blade to increase lift on the back-sweep, and decrease its angle of attack on the forward sweep.

To steer his odd-looking birdcage, and make it move in any direction, he employed cyclical pitch—a mechanical blade-pitch control, activated by the control stick in the cabin. When the stick was pushed to the right, for instance, each blade of the rotor, as it swept through an arc on the right side of its circle, would automatically decrease its pitch (and lifting power) and the helicopter would fall away in that direction.

On top of all this, he introduced a system similar to that on a variable-pitch airplane propeller. When he wanted to rise vertically, his rotor blades tilted sharply, to take big bites of air; for hovering and moving straight and level, they flattened out.

When he was finished, the hub for the rotor of the VS-300 looked like a transmission case for a truck. But within a few months the rickety-looking framework of pipes was aloft, with Sikorsky sitting stiffly on the forward platform, in overcoat and fedora, patiently learning how to fly it.

About this time, the inventor prepared a movie for his colleagues at United as a sort of "progress report." Everyone was properly impressed, and it wasn't until later that it suddenly struck Wilson the movies showed Igor hovering, backing down, and weaving sideways—but not in one frame had the crazy machine moved forward. He called the inventor about it. "Oh yes, I know," Sikorsky told him seriously. "That is a problem we have not solved yet."

"The trouble," he explains today, "was a matter of turbulence. We were experimenting with two horizontal tail rotors at that time, and whenever we moved forward, the poor tail rotors would run right into the wash from the main rotor, and we would get bumped around very badly. But we solved that by putting the rear rotors on a high tower, above the wash."

By 1942, the VS-300 had proved itself. It also proved that the helicopter could, indeed, gentle itself into a patch of lawn no

bigger than the sweep of its rotors, and take off straight up from it. It could move into a tight spot and back out, or sneak sideways. It could hang in the air inches from the ground to take on or disgorge passengers or cargo—and light out again without having set a wheel on the floor.

Since then, "Igor's nightmare," as it was surreptitiously dubbed at first, has grown into an aerial workhorse with, he firmly believes, its greatest future still ahead. Short-haul whirlybird airlines from city rooftops to outlying airports already thrive in New York, Chicago and West Coast cities. Sabena operates a copter line between nearby cities in Belgium and Holland. Big choppers are airlifting giant steel towers into remote spots on craggy mountains for power lines. They haul tons of wet cement into inaccessible wildernesses, hover while they pour it into foundation forms, then make off, bucket dangling, for another load for all the world like a swarm of giant wasps building a nest.

Thousands of Sikorsky S-55s saw duty in the Korean war, chopping over the battlefields to save an estimated 15,000 lives. The whirlybirds have lifted disaster victims from the sea, plucked broken humans from mountain crags and flood-ravaged canyons. New uses for the strange craft crop up daily. Farmers use it for safe and sane crop dusting. Nut grove planters can harvest pecan crops by flying over the trees with a helicopter and beating the fruit to the ground with the breeze from the big blades.

Today, half a dozen big companies turn out helicopters of all descriptions. Twin-bladed "flying bananas," auto-rotating gyrodynes, big ones and little ones fill the skies—largely because Igor Sikorsky insisted on "the wrong way."

Where do we go from here? Unique helicopter configurations for the world of tomorrow are hidden away in the Sikorsky "dreams and schemes" department. "One day," predicts the inventor, "you will see helicopters, with automatic detachable hooks dangling under them. They will be 'elevators' for small airplanes—hoisting them from small parking places in forests or jungles and releasing them at high altitudes. They could also hook such planes in mid-air, and lower them into areas where they could otherwise never land."

Sikorsky believes the future lies with single-bladed helicopters. "One woman in the kitchen is enough," he says. "If you want to lift a bigger payload—use a bigger bladed rotor." He does admit, however, that multirotored copters may find specialized uses.

(Continued to page 230)





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"Jets may be applied to rotor tips for better performance," he says. "And you will see great advancement made in flying cranes—for hoisting movable-pod buildings to battlefields and construction sites, as well as lifting great steel assemblies to places no crane can reach."

What about those ducted fans, and flying platforms? Sikorsky shrugs. "Any decent propeller will provide a lift," he says noncommittally. "Even an indecent one. But there are great difficulties with control. If the fan stops," he points out with a humorous twinkle in his eye, "you then have a choice. I call it the 'two Ps'—for 'parachute or pray.' And you pray not for your safety but for your ultimate destination."

As for the convertiplanes, they will have a limited place, he thinks. But for people who want to go straight up—properly—Sikorsky is strictly a helicopter addict. ★★

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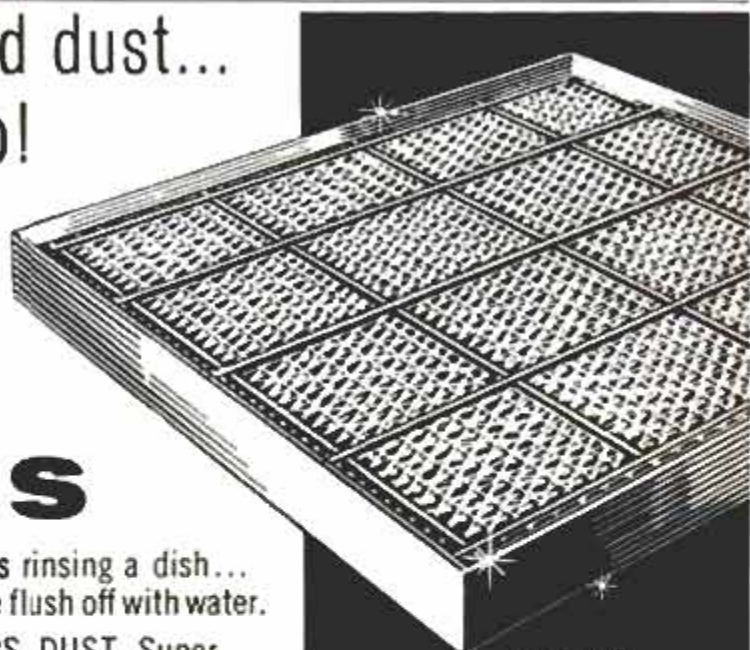


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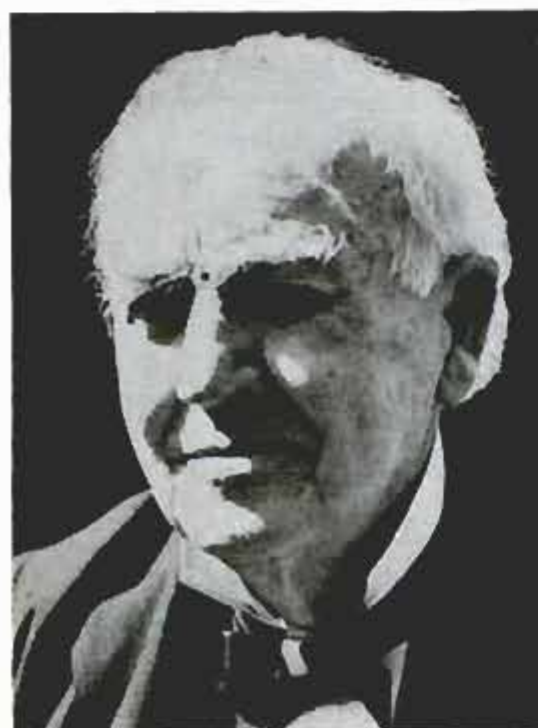
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## This Month's "Great Pioneer in Science"

(Page 20)



Thomas Edison (1847-1931)

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## Get Ready for the Next Flood

(Continued from page 145)

give way, farmers appear with their own supply of sacks and they also manage to bring along plenty of tarps, duck canvas and plastic haystack covers that can be used in an emergency. Farmers are good flood fighters. They know that high water can ruin a year's work in a matter of minutes."

Flood-conscious trainees are taught to use bales of hay, stacks of tree limbs and small trunks, or any other available material when caught in a flood crisis where there is too little time to get a supply of sacks.

### Wave Wash Erodes Levee

Frequently, flood conditions arise from an erosion of a levee due to action of a swift current of water against an earthen levee. This is called wave wash and usually gets started when a high wind forms pounding waves on the water.

The school for flood fighters advises students that they must patrol levee banks and test for slope erosion by actually wading along a submerged slope and feeling for the beginning of a washout with their feet. Trainees are cautioned to wear life jackets during this operation and seek the extra protection of a lifeline anchored to the shore.

Detection of washouts calls for the placing of wooden panels against the eroded area to halt further wave-wash erosion. Another method is heavy cotton bagging when available, or the placement of sandbags directly in the washout.

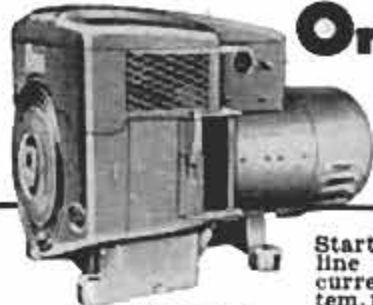
### They Go Right to the Trouble Spot

Engineers can usually go right to a trouble spot on a levee even when most of the water side of the levee is flooded. They know that erosion occurs the fastest at the ends of the levee dikes; on road-crossing ramps, and in areas where pipes and other structures penetrate the levee.

There are times when flooding of land occurs simply because the builders of the levee failed to estimate properly the high-water elevation of the adjacent body of water. Low levee sections cause many millions of dollars of damage annually throughout the country.

Trainees are taught to use emergency methods to provide additional topping on a low levee. Using the sack method, they are instructed to lay one layer of sacks one third to one half full of sand in stretcher-wise fashion on the crown of the levee; the second layer goes crosswise, and so on.

(Continued to page 234)



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Each layer provides three to four inches of topping. Trainees are told that this method can successfully raise a levee surface by as much as three feet and is likely to avert a flood!

Flood fighters are told to use lumber combined with sack topping to hold back water in low-levee areas. Stakes are driven into the river side of the levee crown, and panels are then nailed to them from the land side of the stakes. This wall is then backed with sandbags or tamped with earth.

### Mud Boxes Help

Mud boxes are yet another method used by flood-fighting experts in taming a cresting river. Two parallel wooden walls are placed near the waterward side of the levee crown and filled with available material. The walls are boxlike, being up to 24 inches in height and 30 inches wide. They are valuable in flood control when the fill material turns soupy. They can also take a liquid fill when sand or soil is scarce, but only if the boxes are lined with canvas or burlap material.

Construction methods are but one of the very important means of flood control. The other vital phase of work emphasized by the school for flood fighters is the organized levee patrol.

Trainees supervising flood-control crews on their own home ground must send out patrols to seek trouble spots along the levees. The trainee has to be able to judge the number of men he can spare for a patrol during emergency periods, how much equipment the patrols should carry and where to stockpile tools and supplies so they can be reached with the least delay.

In addition, trainees are instructed to learn what facilities in the community can be used during a flood. They must know the extent of their personal authority, for sometimes, in order to prevent widespread flooding, engineers have to divert a stream across private property, thus damaging a limited area to save a larger region.

The trainees are told how far they can legally proceed to control a flood and what help they may expect from other agencies and private citizens when aid must be commandeered.

### Effectiveness of Training Proves Self

The effectiveness of the training provided by the school for flood fighters became well known to Western hydraulic engineers as a result of the recent Cache Creek incident, occurring just a few weeks after the California Department of Water Resources

gave its employees the initial course in flood fighting.

Cache Creek, a small stream emptying into the Sacramento River below the town of Knight's Landing, had been deluged by eight inches of rain within two days. On February 24, 1958, a radio-operated measuring gauge on the banks of the creek tele-metered a warning to the operations center at Sacramento that the stream was about to overflow.

The water rise had been so sudden, engineers suspected that the warning equipment had gone haywire, and made telephone contact with a flood lookout in the area.

The lookout, a woman rancher, waded through three feet of water covering her fields in order to reach a manually operated gauge on the Cache Creek levee. The gauge confirmed the previous report, and the brave woman also advised that the creek might leave its banks in a sudden rush.

### Residents in Danger

Immediately in danger were 300 residents in the nearby town of Yolo, plus countless ranches, farms, two major highways and a main railway line.

Classroom technique turned to practice as flood-control experts rushed 200 men to the creek and used most of the flood-combat methods described in this article. Even though added rainfall caused further rise in the creek, it was declared safe within 24 hours.

The incident proved that, given ample time to reach a danger area, flood fighters with know-how can avert disaster, often under seemingly hopeless odds.

The state has since installed a radio-warning system along many of its treacherous streams, relaying river levels on a timed basis to the Flood Operations Control Center in Sacramento.

California hopes it will never again have to face a catastrophic flood such as the one that occurred during the Christmas season of 1955. Should threat of a major water invasion again occur, residents now have the assurance that they will be protected by men who received their training at the school for flood fighters.

In this respect, Californians are receiving the best flood security available anywhere within the nation. ★ ★ ★

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the meter scale with red ink. This portion of the scale indicates an excessive overload condition, and its emphasis in this manner will show at a glance when too much current is being drawn from the supply.

With all wiring completed, the power supply should operate the instant that the line cord is plugged into the wall socket and the switch, S1, is turned on. When this is done, the pilot lamp should light and the meter pointer should rise to a value between 5.5 and 6.5 volts, depending on the particular characteristics of the Zener diode it shunts. Because such diodes are selected to break down within  $\pm 10\%$  of their



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rated voltage, output-voltage variations within this range may be considered normal.

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☞ Persons born deaf are likely to have frequent, vivid dreams in three-dimensional color, say scientists who have interviewed totally deaf students at Gallaudet college for the deaf at Washington, D. C.

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Home Work Shop Model



DC Welder and AC Power Combination

duce equal and in-phase plate currents which cancel each other in the primary of T1 and produce no voltage in the secondary.

In Fig. 5F, a special matrix transformer, T2, has been added to the previous circuit. Although the L-R signals produce no voltage in T1, they do cause a voltage drop across the primary of T2 which is induced in the secondary winding of this transformer. With the secondary windings of the two transformers interconnected as shown, the (L-R) signal is effectively in series with both the (L+R) and  $-(L+R)$  signals of T1. Being in phase with one of these, and out of phase with the other, it restores the stereo difference to the two push-pull-amplified sum signals applied to the individual speakers.

The complete schematic of the Heath amplifier, less power supply, is shown in Fig. 6. The output stage, which follows the theory outlined above, is preceded by three stages of voltage amplification. These provide sufficient gain to permit a .1-volt input signal to drive the amplifier to its rated power output of 10 watts.

The power supply, a transformer-powered, full-wave doubler, employs two silicon rectifiers in a cool-running, well-regulated circuit.

### Advantages and Limitations

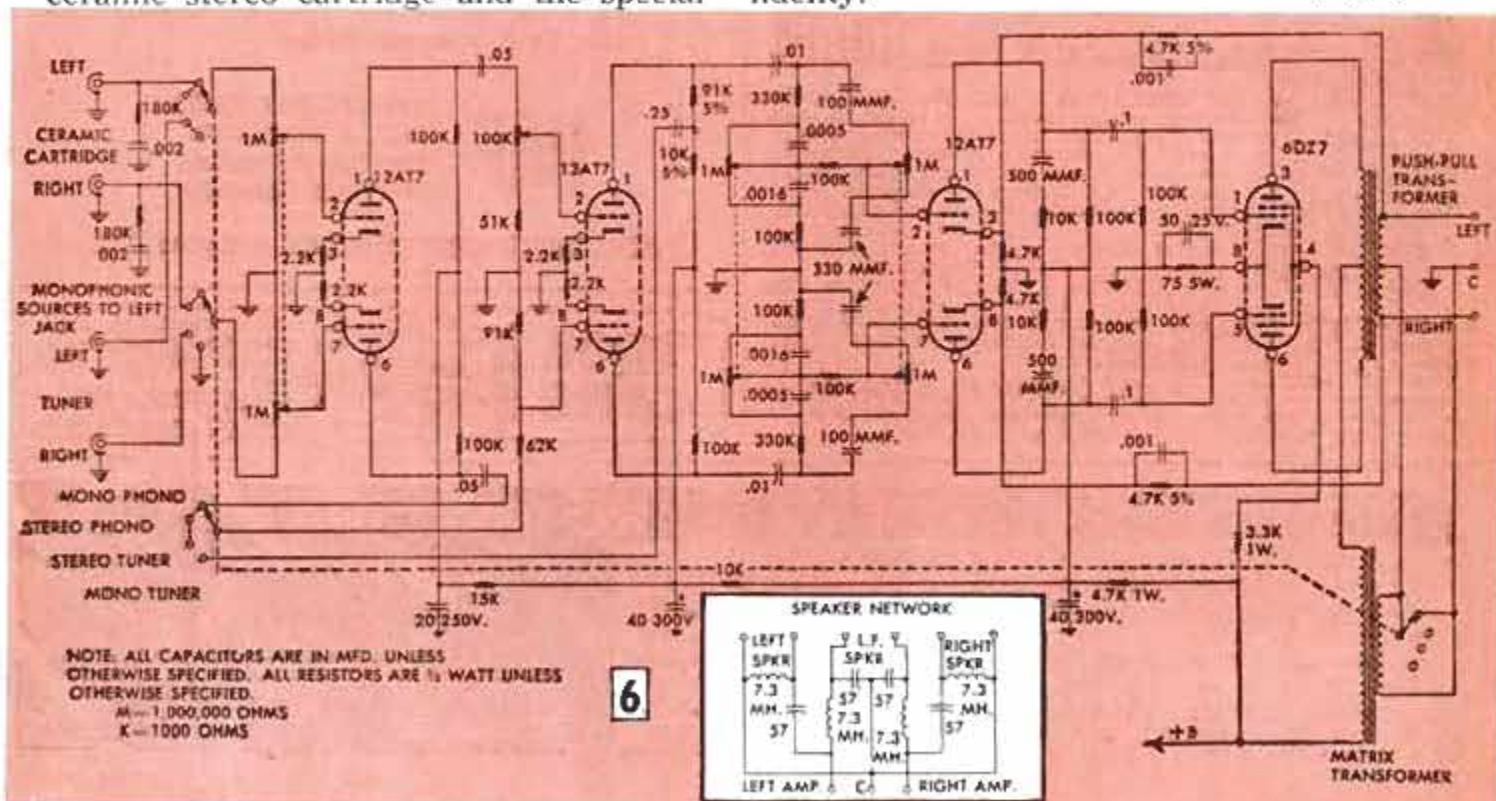
As an integrated stereo-phono system, The Heath Stereo Package leaves little to be desired. The amplifier has a flat ( $\pm 1\frac{1}{2}$  db.) frequency response from 30 to 16,000 cycles, with less than 2% harmonic distortion over the entire range at a 9-watt power output level. The quality of the other electronic components—the CBS ceramic stereo cartridge and the special

Jensen speakers—complements that of the amplifier.

But the system has its disadvantages. Despite the fact that the amplifier has two "tuner" input jacks and a "stereo tuner" selector-switch position, it is doubtful that present AM-FM stereo broadcasts will provide satisfactory stereo reproduction. Since the separate radio signals are not likely to have the exact phase relationships required for proper operation of the amplifier, stereo reproduction of this type would appear to be strictly accidental. On the other hand, radio reception from a monophonic radio tuner, either FM or AM, is excellent, and stereo by proposed FM multiplex methods is entirely possible. If stereo multiplexing replaces FM-AM stereo broadcasts, as it may well do in the near future, this amplifier system will be fully compatible.

A second limitation is the lack of a preamplifier which prohibits the use of the amplifier in conjunction with microphones or tape decks unless a suitable preamplifier is added separately. A limited number of input jacks and selector-switch positions restricts the use of the amplifier to one stereo-phono pickup plus one additional monophonic signal source, such as radio tuner, TV tuner, etc. In short, the stereo package lacks the versatility associated with "components" high fidelity.

But these shortcomings are important only where future expansion of the basic system is contemplated. For anyone interested principally in stereo-phono reproduction, with the possible later addition of an FM-AM (nonstereo) tuner, the new kit provides a worthwhile construction project—a low-cost means towards true stereo fidelity. ★ ★ ★





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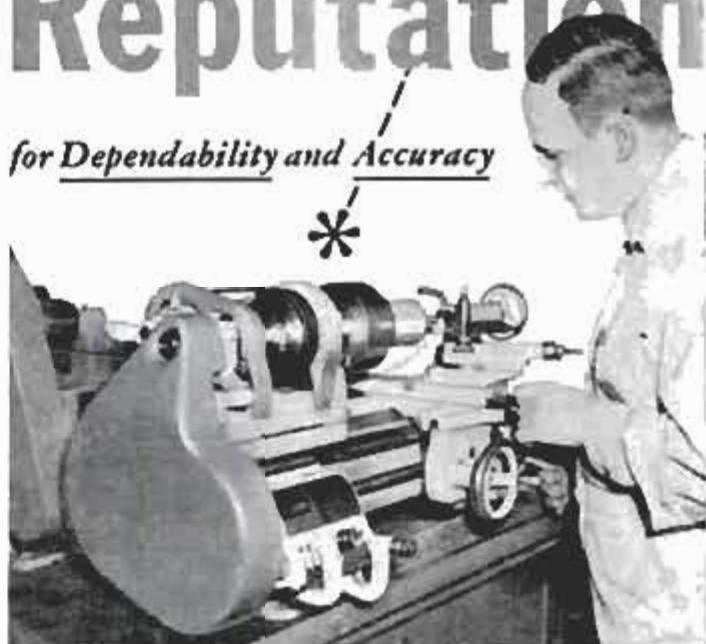
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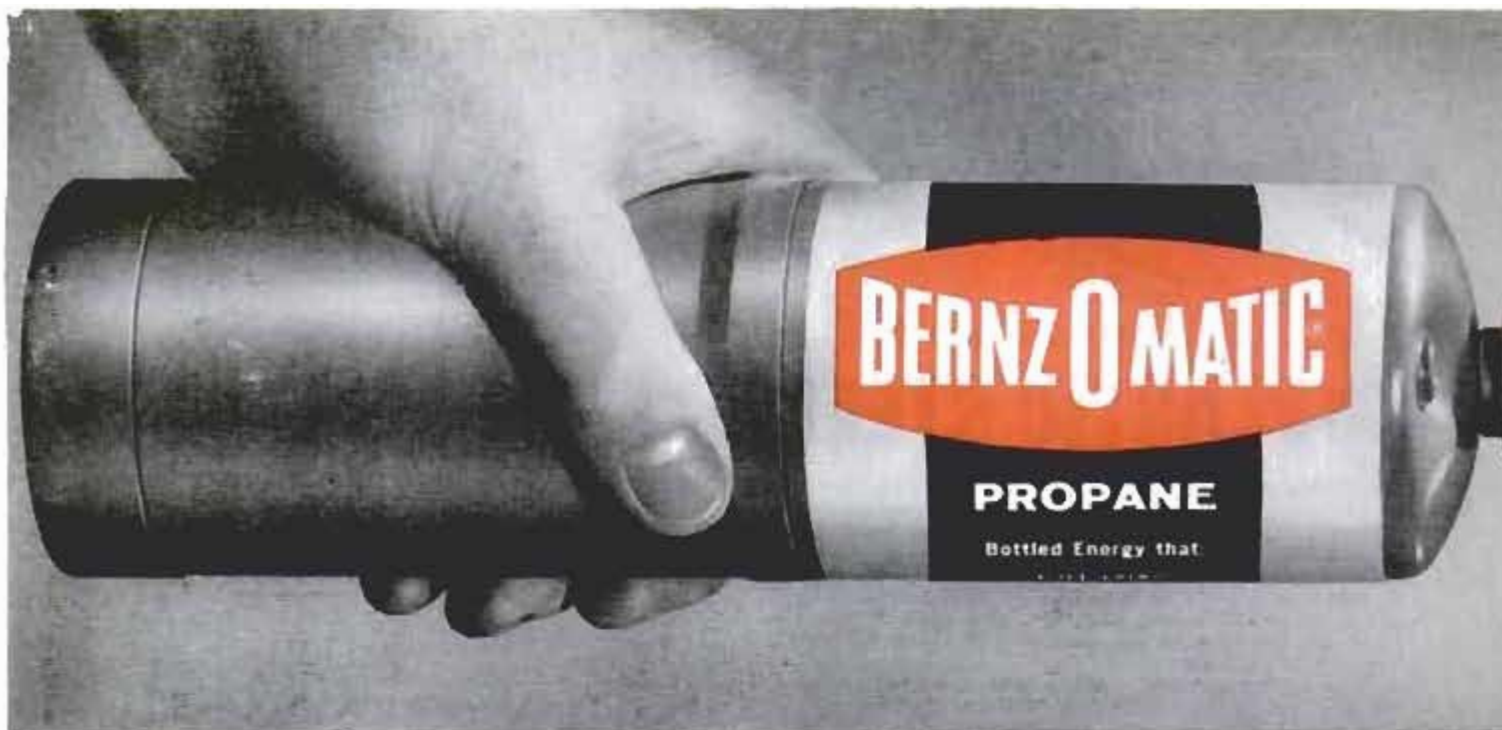
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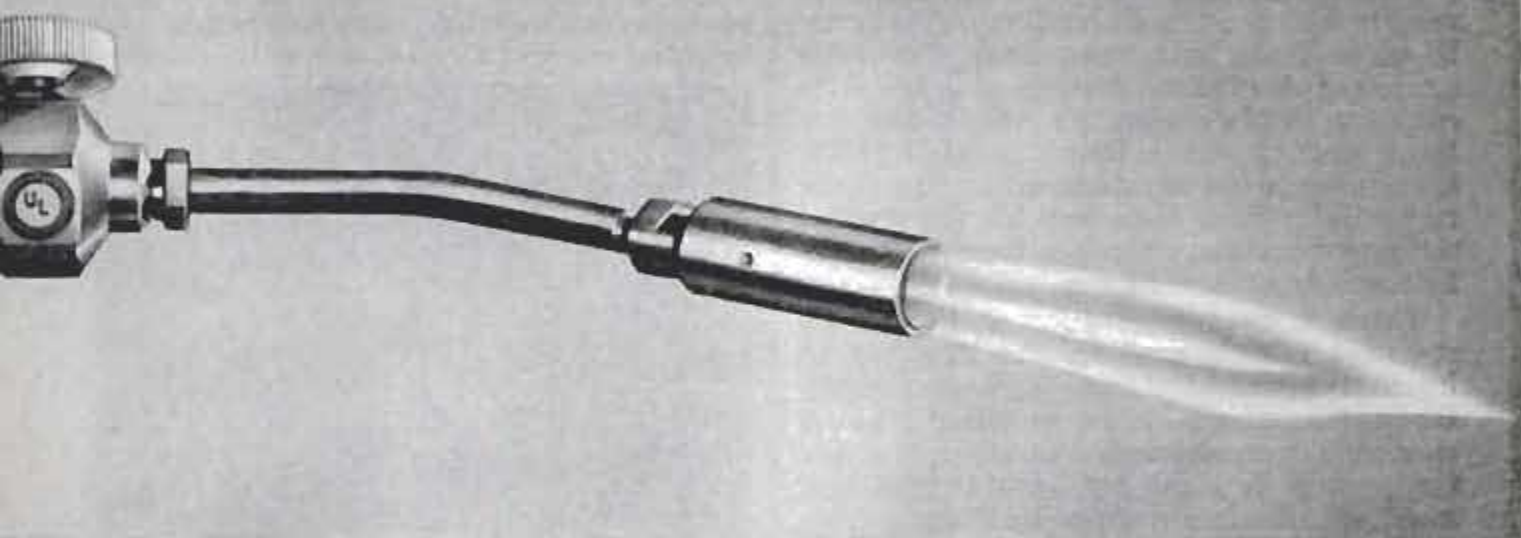
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REMOVES  
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LIGHTS  
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## Jungle Road Knives Through The Last Frontier

(Continued from page 110)

large town for extended treatment. One of the first chores in building the road was to clear small landing strips every 50 miles or so. Temporary only, the strips are rough and often muddy. All are suitable for single-engine aircraft, a few are large enough for a lightly loaded DC-3. Staple foods are air-dropped at the strips in partially filled bags that hit the ground without bursting, then are trucked to the intermediate road camps.

There is no refrigeration at the camps so meat is delivered on the hoof, to be butchered when the camp cooks are ready for it. Sometimes when no other meat is available, a camp sends a few men out into the jungle to hunt for land turtles and monkeys. Each is a welcome dish.

The road doesn't run through dense jungle from one end to the other, of course. Only the northern several hundred miles are in the equatorial rain forest. Farther south the road climbs to higher ground and the jungle diminishes to heavy brush, sometimes to open plains.

The jungle portion of the highway runs through gently rolling country that was hardly a challenge to the engineers until

they sized up the whole job. Then they realized the magnitude of the task. The close-growing trees had to be cut down one by one. Some are softwood, others are so hard they dull the saw. Each has its

Worker holds a land turtle, which furnishes the meat for supper at one of the workers' roadside campsites



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**6 TIMES  
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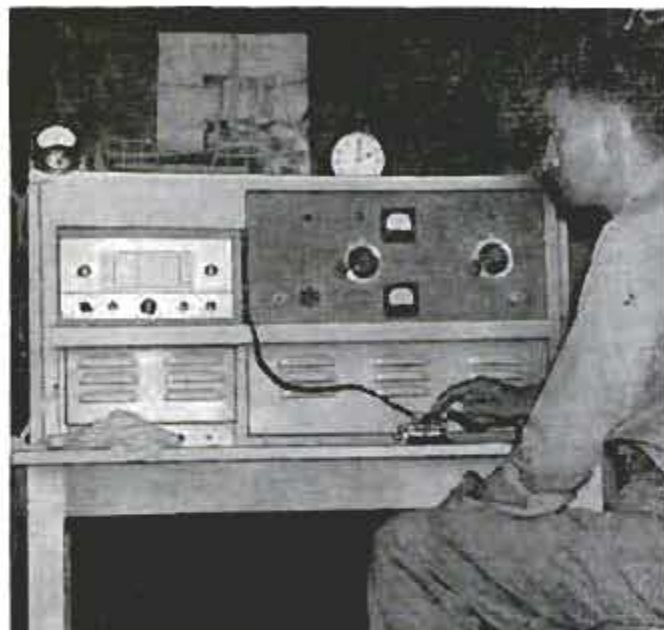
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Isolated road camps report to headquarters by radio. Radio above is located in a covered truck at a camp

own tangle of lianas, woody vinelike growths that may be 100 feet long and 3 inches in diameter. After being cut, trunks and debris had to be bulldozed into piles and burned, or shoved off the road, and the stumps had to be dynamited or pulled out by tractors. The ground itself was a mass of roots, which had to be bladed out.

Small jungle streams every mile or so

were crossed by small bridges or by fills and culverts. Two major rivers are being spanned by steel-and-concrete bridges.

The cleared roadway is 81 feet wide and is to be improved with a 22-foot-wide asphalt pavement in the center that will be suitable for truck traffic. The road is costing some two and a half billion cruzeiros, about \$35,000,000 in U. S. currency. This sounds fantastically cheap, but labor is inexpensive and no right-of-way had to be purchased.

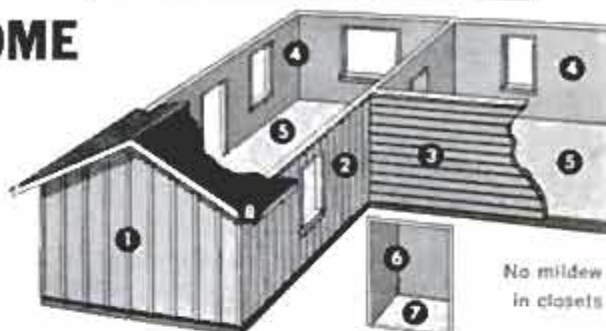
Keeping the road open for traffic is going to be a never-ending battle in the jungle area. New growth will spring up rapidly along the sides, old roots will force their way up through the pavement. For a time, falling trees occasionally will block the road. Torrential rains will erode the fills and wash out some of the stream crossings. The road commission knows what it is up against. It is establishing 30 sub posts along the road simply for maintenance.

No other roads that would tap other parts of the Amazon basin are planned for a long time. Some parts of the region are too swampy, other parts are flooded annually. For the single route the road to Belem, known as the "gateway to the Amazon," was the best choice, since the river itself is a cheap and dependable highway

(Continued to page 244)

## 8 WAYS TO REDUCE COSTS AND INCREASE QUALITY IN BUILDING YOUR NEW HOME

For certain applications, the *lowest-cost materials* you can use are the *highest quality* products in their field. This is true of Homasote products—by their very nature and by their wide variety of sizes, forms and thicknesses. Here are some of the savings possible—compared with other standard building materials—on a 3-bedroom house with 1200 square feet of exterior wall surface...



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## P & C **TOOL COMPANY**

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to the rest of the region. Cargoes that come down the river by boat will be transferred to trucks at Belem, while manufactured goods that the trucks bring up from the south will be transhipped to the river boats at the same point.

In the past the only way to move goods between the Amazon and the populated southern portion of Brazil was by small, slow ocean vessels that operated on infrequent schedules. Trucks will make the one-way trip in seven or eight days.

Brazil nuts, rubber and other vegetable products and hardwoods will be among the commodities that will be carried south. The rubber, incidentally, is being gathered once more from the wild trees in the jungle instead of from the plantations that were started a number of decades ago. The reason is that the native trees are spaced so far apart in the jungle that a tree disease can't jump from one rubber tree to the next. In the open plantations, with the trees growing close together, disease literally spreads like wildfire. Today, disease-resistant strains of rubber trees are being sought so that the plantations can be re-established.

### Resources Not Yet Realized

Brazil doesn't yet know the measure of the natural resources that exist in the Amazon area. Gold and diamonds have been mined in quantities. What is said to be the largest high-grade deposit of manganese ore in the world was discovered relatively recently near Macapa, north of the river's mouth, and now is being worked. Most Brazilians are sure that large deposits of petroleum exist in the region, although the few exploratory holes that have been drilled in the watershed so far were dry.

Not even the amount of commercial timber in the basin is known. A forest inventory is being taken now, and some 37 million acres have been surveyed by means of aerial photographs. From the pictures, the amount of softwoods and hardwoods can be estimated. Some 350 different species of trees have been identified and the list is not complete. At Santarem, 700 miles up the river, a training center to demonstrate modern sawmill techniques has been established.

SPVEA expects that pulp and paper mills will be built to use the softwoods, and various agencies are studying the best uses that can be made of the hardwoods. In some of the upper plateau forest areas as much as 80 percent of the species are "sinkers," so heavy that they sink to the bottom when dropped in a river. Some of the wood is so dense that it resists all or-

(Continued to page 246)



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dinary tools. An example is the abiorana tree. A saw that cuts through 100 inches of cedar in a given length of time can cut no more than six and a half inches of abiorana in the same length of time.

Many of the hardwoods are excellent as decorative flooring, and for industrial flooring that receives hard use. Practical ways of slicing or veneering the wood are being sought, so that hardwood surfaces may be applied to soft woods.

Under SPVEA the capacities of the electric power plants in several of the major Amazon cities have been increased, preparatory to greater industrialization. Soil studies are being made so that the commercial production of jute, black pepper, cocoa, rubber and other commodities can be increased. Cattle raising is contemplated for some areas. A large fishery industry is being promoted, and better air and river transportation is planned. The number of rural schools is being increased. There are more health centers.

One of the SPVEA officials at Belem summed up the whole program for me in a few words.

"Exploited in the past," he said, "the Amazon region now is being developed for the future." ★ ★ ★



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serving the Midwest and Southwest  
RADIATOR SPECIALTY CO., Charlotte, No. Carolina  
serving the East, Southeast and far West

## Which Import Is Best for You?

(Continued from page 103)

"Dealers don't seem to be equipped with necessary metric tools. High cost of replacement parts: \$32 for front bumper assembly."—Louisiana retired Navy officer.

"Frequency of having to shift gears due to small engine."

Washington, D. C. clerk

### Swedish Saab

Saab carries off top honors in two departments. In over-all rating, the Swedish car is rated excellent by an overwhelming 96.9 percent of the owners. No owner rates it average and 3.1 percent rate it poor.

Dealers rate high with Saab owners also, as 73.0 percent describe them as excellent to put Saab at the head of the list. Only 7.9 percent of the dealers are rated poor.

Saab owners are the only ones who rate handling ease above economy of operation in the best-like list. Roadability is also ranked high by the owners and so is riding comfort.

Complaints include insufficient power with 15.6 percent mentioning it and poor rear vision through its high, narrow rear window, 10.9 percent mentioning this.

Many of the Saab owners have had foreign-car experience before. Only 61.0 percent list it as their first imported car, the smallest percentage among the 10 cars.

Kelly's test put Saab in third place in acceleration, fractionally behind the Simca. Over-all gas mileage in the Kelly test shows 26.0 miles per gallon, tying for fifth place with the DKW (which uses a similar engine) and the Morris. The Saab engine is a three-cylinder, two-stroke design and it has front-wheel drive. This provides excellent roadability and traction in bad weather and as a result the Saab is a frequent rally winner both in this country and Europe.

Some owners (7.8 percent) do complain about the fact that oil and gas must be mixed due to the two-stroke design. This is a minor inconvenience that you may want to consider when buying a car.

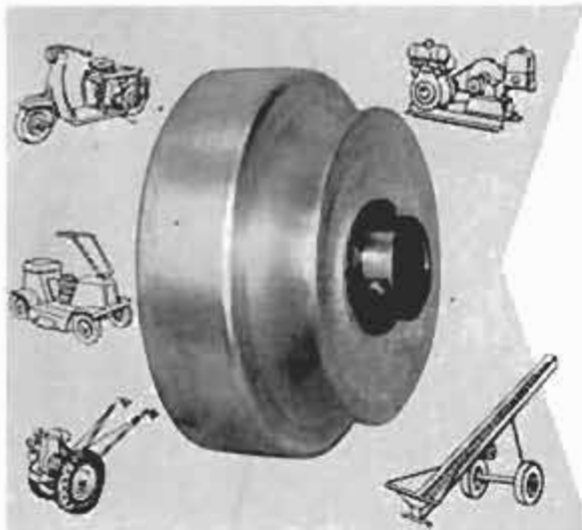
Trunk space on the Saab is limited sharply by the "fast back" styling. However, the rear seat is designed to be removed easily to open into the trunk so long loads can be carried.

Turn-circle diameter is also larger than most other cars due to the front drive.

Here are comments from Saab owners: "Handling ease. Front-wheel drive is terrific. Gives a sense of security while turning."—Wisconsin druggist.

"Economical to run, license and repair.

(Continued to page 250)



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"Quality and workmanship. More custom-made feeling."—New Hampshire city planner.

"Small size allows plenty of space on narrow city streets or winding country roads."—Rhode Island bank officer.

"More comfortable to sit in than an American car."—Massachusetts student.

"Could use about 15 more horsepower."—New York test pilot.

"Poor visibility to the rear. Also fuel goes into gas tank too slowly due to oil-mixing chamber."—Iowa photographer.

"Have to depend on only one dealer. There aren't enough in the area I might wish to drive in."—Virginia analyst.

"Little crowded in rear seat on long trips."—New York engineer.

### French Simca

Simca, which is sold by franchised Chrysler dealers, is a good test case on what normally happens when dealers are unfamiliar with a car. At the time of the survey, Chrysler dealers were comparatively new at the imported-car business.

The result shows up sharply in the survey of owners. Simca dealers are rated poorest of all with only 31.9 percent of the owners describing their dealers as excellent and 23.4 percent describing them as poor.

As Chrysler mechanics become more familiar with the Simca this will, no doubt, improve. Training programs are underway.

Simca is now offering some new models which are more up-to-date in styling although the mechanical parts are changed very slightly. There is one important change in the station wagon. At present the wagon is built on a heavy-duty truck-type chassis and is not as comfortable as most Americans prefer. The new wagon, out this month, will be softer riding and more like a sedan in passenger comfort.

Simca is second only to Volvo in acceleration and rates fourth in maneuverability. It is attracting many new owners to the foreign-car field, ranking third among first-time owners.

Economy of operation is easily the best-liked feature with 72.7 percent listing it first. Kelly's economy test shows the Simca averaging 25.0 miles per gallon over-all, eighth in the lineup. The most-frequent complaint of owners is poor or inadequate service and, as mentioned above, this could very well be a temporary

condition due to the transfer of franchises to Chrysler Corporation dealers just prior to our survey.

Here are some comments from owners:

"Economy of operation and initial cost. Also the way it takes curves on mountain roads."—Tennessee auto jobber salesman.

"Pleased with maneuverability around city. Find myself getting to and from calls more quickly now."—Iowa minister.

"Ability to park in congested places."—Ohio welder.

"Solid structure of the body with very few rattles."—Kentucky supervisor.

"Smooth riding."—Nebraska inspector.

"Low depreciation. Lack of unnecessary gadgets to get out of order. Simple to lubricate and wash."—Texas serviceman.

"Scarce parts. Poor instruction to dealers on proper maintenance. I know as much as the service man does about the car."—Indiana accountant.

"Too little legroom in front and rear. Only fair visibility."—Delaware salesman.

"Gas mileage not as good as expected. I get 26.4 miles per gallon."—Texas clerk.

"Somewhat underpowered."—Montana civil engineer.

"Noisier than U.S. cars. More vibrations. Synchronous roar at certain speeds (28 and 45 miles per hour)."—Delaware chemist.

"Rear doors don't open wide enough. Pedals too close together."—Ohio teacher.

### German Volkswagen

Still leading the sales race among imports (a position it has held for several years), Volkswagen is evidence of the fact that cars don't necessarily have to be stylish to be in demand.

With a body style only slightly different from what it was 20 years ago, the VW is still the imported car most wanted by the public. As a result, its resale value is artificially high—sometimes higher than its new price.

For example, a tabulation of the wholesale auction prices of used 1959 Volkswagens all over the country showed the average price was 10 percent greater than the average retail price. One-year-old Volkswagens wholesaled at auction for 94 percent of the new retail price, two-year-old models for 81 percent of the new retail price.

(By way of comparison, the Renault Dauphine wholesale prices were 77 percent of retail in the current-model year, 63 percent for one-year-old models and 52 percent for two-year-old models).

Dealers rank high among Volkswagen owners with 66.7 percent described as excellent. Owners report fewer poor Volkswagen dealers than for any other make—

(Continued to page 252)



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Torque, which disengages the blade if it jams or binds, makes it the safest saw to use. Then add these other top features—easy to adjust depth and bevel controls for accurate 45° to 90° cuts, plus a powerful motor rated at over 1 horsepower—and you have your best buy in power saws.

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only 4.3 percent rate dealers poor.

Over-all, the Volkswagen ranks second only to Saab, as 94.0 percent of the owners call the car excellent. In reliability, the German air-cooled rear-engined car rates highest with only 3.6 percent experiencing a road breakdown.

Best-liked feature of the VW is gasoline economy. Kelly's test rates the Volkswagen fourth in over-all gasoline mileage with 28.0 miles per gallon.

Luggage space is small in the Volkswagen; only the Saab and Morris have less.

Chief complaint among the owners is the inadequacy of the heater, followed by a lack of power at higher speeds. Kelly's test shows the VW rates fifth among the 10 cars in acceleration for speeds up to 50 miles per hour. Above that speed, it is seventh on the list.

Here are some quotations from VW owners:

"Economy. Took 1535-mile trip, spent \$15.10 for gas and oil."—Ohio engineer.

"Have owned two other VWs. Drove them over 58,000 miles, total cost under three cents a mile."—Vermont lawyer.

"Handling. Terrific traction in snow and mud. Fun to drive."—North Dakota owner.

"Skilled workmanship." — Mississippi school teacher.

"Convenient to park. A real timesaver in traffic."—South Carolina engineer.

"Low initial cost. High trade in."—Texas personnel counselor.

Rides as good or better than any American car I have been in." — Oklahoma oil-field worker.

"Heater not very good with weather around zero."—Wyoming electronics man.

"About eight more horsepower would give that extra push on hills and passing." Alabama design engineer.

"Sways when driving in gusty winds." Tennessee house builder.

"Front seats are fine but back seat not roomy enough for long hauls."—Kentucky college professor.

"Speed range between stop and five miles per hour awkward because first gear is not synchromesh."—Virginia sailor.

"Air-cooled engine noisy." — Indiana professional musician.

### Swedish Volvo

Biggest of the 10 cars under study, the Swedish Volvo is also the most powerful. It accelerates better than twice as fast as most of the other nine cars. Its top speed is well over 70 miles per hour.

As you would expect, gasoline economy suffers somewhat as a result. Nevertheless, economy of operation is still the best-liked feature with 70.9 percent of the own-

ers mentioning it. Kelly's economy run shows the Volvo averaging 20.0 miles per gallon over-all, ranking tenth on the list.

Most frequently mentioned complaint among Volvo owners is inadequate dealer service, with 16.5 percent of the owners mentioning it. Only 42.9 percent of the owners rate their dealers excellent, 47.9 percent rate them average and 9.2 percent describe them as poor.

Over-all, the owners rate Volvo high: 93.3 percent describe it as excellent, 6.7 percent as average; none call it poor.

Its index of reliability is also high with only 5.8 percent of the owners having had a breakdown on the road. Only two cars rate higher, Volkswagen and Fiat.

Nearly half of the owners will buy another Volvo (47.5 percent). Volvo has apparently been the most convincing of all imported cars as only 4.7 percent of its owners intend to buy an American car next time, the lowest percentage in the survey.

This car is relatively heavy with a sturdy, well-built feeling (only the Hillman Minx is heavier.)

Here are comments from Volvo owners: "Economy. I get 20 miles per gallon in town, 30 on trips. Have driven it up to 95 miles per hour and it was not wide open." North Carolina collector.

"Superior workmanship. Everything fits, everything works properly. No rattles. A solid feeling."—Illinois professor.

"Ease of handling. Also the fact that it is not as tiny as some foreign cars."—Rhode Island bookkeeper.

"Corners well. Have driven nothing like it. Goes when needed."—Indiana engineer.

"Low depreciation."—Illinois technician.

"Everything seems to be where you can see and get at it for making any repairs." Maine retired owner.

"Spare parts sometimes are difficult to obtain. But has improved greatly since 1955 when I brought my first imported car. Most gas stations now know how to lubricate them."—Washington, D. C. owner.

"Ride isn't as smooth and comfortable as in a big car and there isn't as much room inside."—Missouri lithographer.

"Gas tank too small. Holds only 9½ gallons. A 12-gallon tank would be much better."—Missouri highway engineer.

"Takes too long to warm up in winter. Heater isn't quite large enough for below-zero weather."—Indiana steelworker.

There it is, the story of 10 well-known and representative imported cars — the cars that forced Detroit to look into the "compact car" market.

It is fair to say that generally these imported-car owners seem happier than a

(Continued to page 254)



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similar sample of American-car owners. However, not all are happy and there is no guarantee that you will be.

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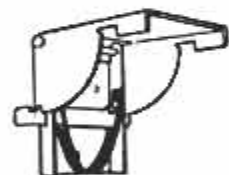
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## Where Should a Small Car's Engine Be?

(Continued from page 83)

four wheels, with swing axles in the rear.

Front tires (carrying only 40 percent of the weight) are lightly loaded, making steering light without power assist. Because the front tires carry low air pressure, there is less road shock transmitted to the steering wheel. The tires envelop road bumps more gently, flowing over them, rather than bouncing.

When you apply the brakes, a sharp shift of weight to the front wheels takes place in any car, front or rear-engined. With the engine in front, the heavy front end becomes even heavier. The front brakes have to do most of the work. The rear wheels are so unloaded that they would lock if set up to do their share.

As the rear-engine car shifts its weight forward in braking, it creates a balanced load with about equal work being done by all four wheels. Braking is faster, safer. Brake linings and tires will wear longer.

You can't spin the rear wheels either. Acceleration is better for any given amount of torque. On ice and snow there is no need for chains. The wheels won't spin out easily.

What about safety? Much has been said about the forward location of the gas tank and its vulnerability in collisions. The tank, Olley explains, is mounted behind the front suspension elements and beneath the fire wall. It is protected from either front or rear-end collisions. There is no exhaust pipe near it, nothing to heat it (a fact that wastes gasoline by vaporization in conventional designs). Vapor lock and percolation will be unheard of, the entire fuel system remaining cool always.

The heater, Olley explains, is gas-fired and mounted under the hood. It provides heat within seconds. The air-cooled engine itself heats faster than a water-cooled engine and the automatic choke goes off faster, saving gas in winter.

Finally, Olley says, the rear flat engine has its parts out in the open so service can be quick and simple. Spark-plug removal, point adjustment, fuel-pump overhaul, carburetor adjustment, all are made without delays caused by inaccessibility.

Olley compared the accessibility of the Corvair engine to that of the Volkswagen. He didn't mention that there are a lot of design borrowings from Volkswagen and that, in effect, it could be called an Americanized, up-to-date version of the German engine.

One point where the rear engine is less desirable, even Olley might be willing to admit, is in luggage space. There just isn't the room for luggage under the hood that there is under the rear deck. Like the Volkswagen, the Corvair also has a spot behind the rear seat for luggage, but this is neither large nor convenient.

Don't let the arguments about the location of the engine obscure the fact that this upcoming rear-engine design is a major engineering achievement. It is no secret that the American public has come to feel that salesmen and stylists rule the roost. This radical, exciting new rear-engine design may well restore the public's faith in our engineers. It will stop the battle cry that all cars are alike. It could make those critics who think only Europeans can engineer cars swallow their words.

After all, the proof of the pudding is in the eating. And, having driven both the Corvair and the Falcon, I can say that in both cases, the eating is good—very good indeed.

So don't let the propaganda from either side obscure the facts. Don't prejudge the cook before you taste the pudding. Wait until you've driven the small cars yourself and decide—that makes sense, just as much sense as these small American cars will make to a waiting public. ★ ★ ★



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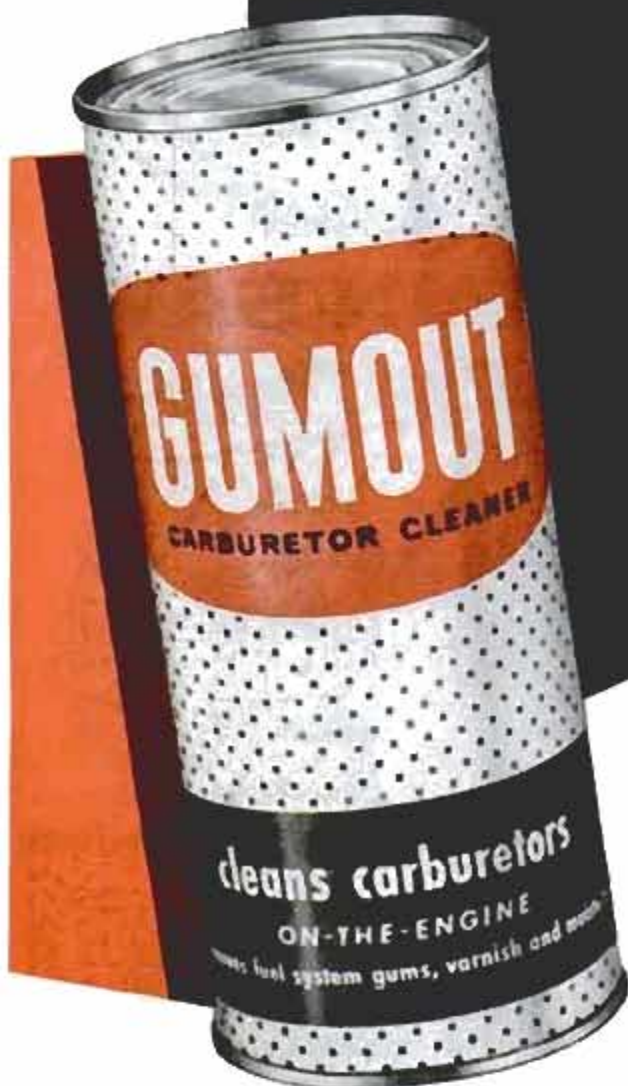
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## The Other Side of Paradise

(Continued from page 90)

and performed "magic." Lagoons appeared where once there was only mud; sandy beaches were built on coral reefs and fill; swimming areas popped up where once there were only rocks. Giant coco palms were magically planted overnight by huge cranes and then sometimes just as magically disappeared to make room for some new project. And in the middle of all this, Kaiser's Hawaiian Village grew and continues to grow upward and outward.

And further out in Waikiki you'll find that the cooperative apartment idea has just recently caught on. Along the shores of Waikiki all the way to the lee of Diamond Head, a good many apartment houses are under construction or in the planning stage.

Move a few miles away from Waikiki toward Honolulu itself, and you'll see one of the largest shopping centers in the world under construction. Costing over \$16,000,000, the Ala Moana Shopping Center will be virtually a self-contained city.

Industrially, Hawaii is not impressive when compared to many large mainland areas, but it is growing rapidly. Hawaii's new industrial area is mostly on Oahu, spreading from Honolulu harbor towards the newly developed Ewa area past Pearl Harbor. Here in the Ewa area, Standard Oil of California has already broken ground for Hawaii's first oil refinery. Standard plans to bring in oil from the Middle East and unload the oil at the \$40,000,000 plant by means of an unusual undersea submarine cable.

Nearby, construction has already begun on the first steel plant in the islands. Hawaiian Western Steel will for the most part turn out reinforcing bars. And in the same area Henry J. Kaiser has completed plans for a dust-free cement plant to take care of Hawaii's growing construction needs. In the same area, the 1200-acre Campbell Industrial Park is now partially completed; eventually it will grow to around 2400 acres. This area has been specially designed and planned to attract large and small industrial concerns to Hawaii. Plans call for a barge harbor, too, and later a deep-water harbor will be dredged. Another, and yet untouched, industry is the production of aluminum from Hawaii's vast bauxite deposits. This seems a long way in the future, but perhaps not so far as we might believe, for as one of Hawaii's leading economists sums it up: "Statehood will interest big mainland capital in investing in Hawaii. We look for vast industrial growth; the boom has just begun." ★ ★ ★

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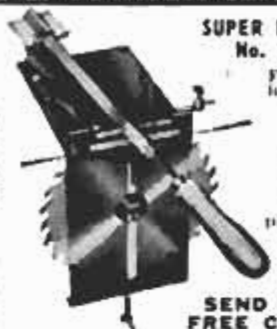
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(Continued from page 67)

ambitions for more responsibility, more salary, a more challenging job he had to learn more about accounting. When he noticed a correspondence school ad in a national magazine, he clipped the coupon and sent for information on correspondence courses in accounting.

Just to be sure of the school, he dropped by Lincoln High School to see if he could get background information. He found the high school placement advisor well-informed. The advisor gave the correspondence school the highest of recommendations and commended Jack for his initiative in taking home-study training.

In a short time he received complete information on courses available to him and, for a moderate cost, he enrolled in the basic accounting course. It didn't take Jack long to get back into the groove of studying, especially since he could apply the subject matter of his lessons to his job at the office. Two or three hours of studying and working on assignments three nights a week was an effort, but it was an effort Jack found well worth making. His assignments were graded and corrected by a qualified accountant employed by the school. Jack's assignments weren't perfect by any means, but penciled comments by his instructor in the margin of his corrected assignments and the correct solution returned in the mail let him know exactly where he stood.

Jack tried never to make the same mistake twice. The more he studied and the more assignments he turned in, the more interested he got in his profession. Taking instruction at home let him set his own "classroom" hours. Illness and vacation time didn't hold him back, and he found that by keeping up with his study assignments his grades stayed high.

After the completion of his fifth lesson, Jack received a letter from the school offering to send progress reports to the Chief Accountant who was his superior at work. Jack was only too happy to take advantage of this offer because he knew it would mean more rapid advancement for him if his boss was regularly informed of the courses he was taking and of his progress throughout his course of study.

Jack continued his part-time studies for about a year. He found that the Chief Accountant enthusiastically received progress reports from the school; so much so, in fact, that he often talked assignments



and lessons over with Jack. During a year Jack had taken a number of courses and the Chief Accountant knew he was ready for added responsibility, a chance to put his newly-acquired skills to work.

And so Jack was promoted to General Ledger Clerk with almost a 50% increase in salary. He was able to afford an apartment of his own and still save money toward the home he and his wife looked forward to so eagerly.

But for Jack this wasn't enough; he wanted more knowledge, and he continued to take courses of a more advanced nature. He talked things over with the Controller who headed the Accounting Department of his firm, and it was decided that the company would pay part of his tuition. The Controller knew by this time that Jack was an ambitious young man, a man looking for more responsibility—a man who, more than anything else, wanted to improve himself and, in so doing, was making himself more and more valuable to the company. For Jack now it was only a matter of time, study and hard work. He continued his instruction in accounting for two years and took a good share of the courses offered by the school. He broadened his knowledge and applied it directly to his job.

Also, he took advantage of an offer on the part of the school to provide consultation on some of the job problems that were now Jack's responsibility. This free advice, given by a qualified group of practical accountants and Certified Public Accountants employed by the school, was studied and considered by the whole Accounting Department. It was a valuable "extra" resulting from Jack's studies and it increased all the more Jack's importance to the department.

In about two years' time Jack, now 28 years old, received another promotion; this time to Chief Accountant with additional supervisory responsibility. In his spare evenings he is still taking advanced accounting courses and preparing for the future. His brand new, brick, ranch-style home in one of the most pleasant sections of Lincoln is a source of pride and satisfaction to him and his wife. Now, there is ample room for his children to grow and play.

Jack's wife, who had a yen for interior decoration, was able to furnish and decorate her house in just the way she'd always wanted. Jack's well-stocked workshop gives him a chance for relaxation

(Continued to page 262)



In these days of nuclear power, monkeys in orbit and dogs in space suits, some hands never use their skill. And honestly, it isn't always easier or faster to use power tools where hand power will do . . . and it's often not as satisfactory. Take screw driving for example.



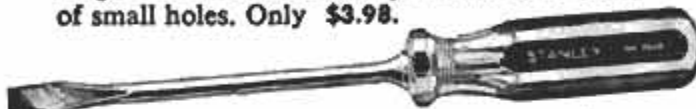
There's a Stanley screw driver that's exactly right for every screw and a "Yankee" push drill that's exactly right for preparing any pilot hole. Here are a few that are favorites with tool users.



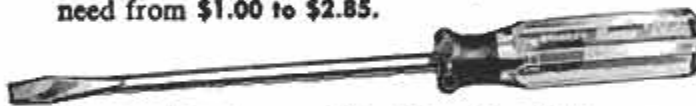
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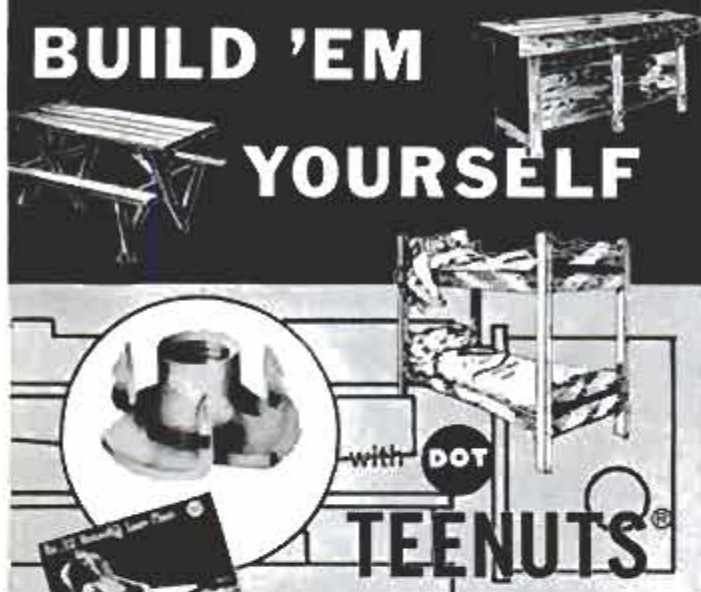
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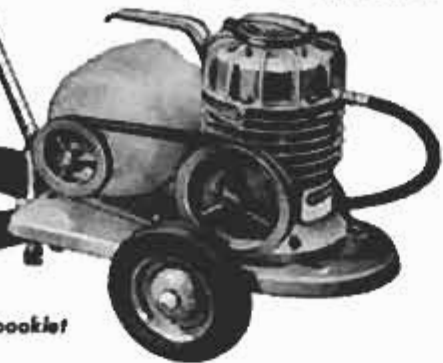
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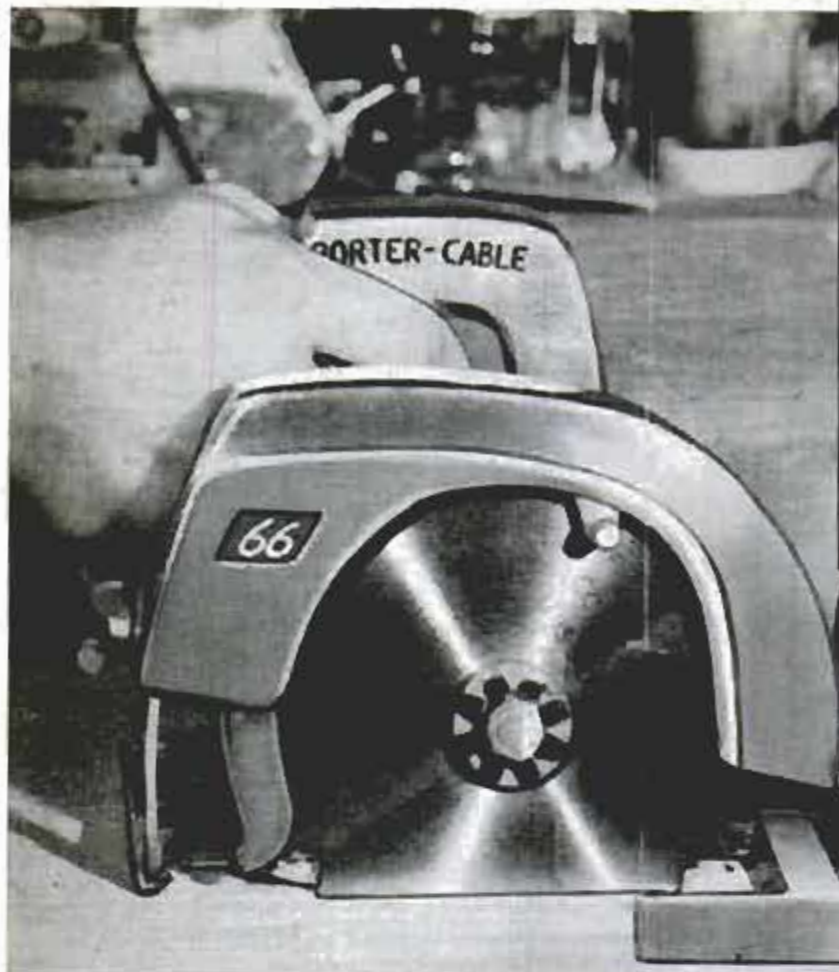
Has 24 volt universal motor. Will operate on 115 volts AC when used with transformer (see below). The motor turns 9000 RPM & is reversible. Gear ratio is 18-to-1. Power take-off shaft turns 500 RPM. A limit switch may be used to set length of travel or eliminated for continuous use. Also has a magnetic clutch. **NOW ONLY \$9.95**  
115/24 VOLT TRANSFORMER for above. Step-down 115 to 24 volt. \$3.45

**ATTENTION INDUSTRIAL BUYERS**

Genuine Vickers Electro-Hydraulic Hoist Drive Assembly. Complete with...  
1. 20HP, 220/440 V. AC, 3phase motor.  
2. Vickers 1000 PSI Hydraulic Pump — 11.5 to 20 GPM capacity.  
3. Remote operation control system.  
4. Two Vickers Hyd. Motor & Valve assem.  
5. 46 gallon reservoir.  
Sell ALL or parts. Write for info. **\$1500**  
Cost \$9000. Complete unit's now...

Send check or M.O. 1/2 deposit with C.O.D. All items shipped postage or freight collect.

**palley's** 2263 E. Vernon Ave., Dept. PM-99  
Los Angeles 58, California



Porter-Cable  
**CIRCULAR SAWS**  
 have  
*Power-Plus  
 Accuracy!*

This 6½" Saw is loaded with many of the exclusive features found on Porter-Cable professional models. You can make every possible cut, including 45° angles on 2 x 4's! Has instant depth and bevel adjustments . . . self-lubricating bearings . . . weighs only 8½ lbs.

**A 3-STAR TOOL**

Safety Kickproof Clutch  
 "No-Drag" Telescoping Guard  
 Cuts 2 x 4's at 45°

MODEL 66 Only **\$39<sup>95</sup>**

MODEL 146A

**\$74<sup>95</sup>**



6½" Heavy-Duty Porter-Cable Saw. Here is a professional saw at a low price. It's light in weight yet a powerhouse. Carpenters pick this model every time for speed and accuracy of cut!

**A  
 5-STAR  
 TOOL**

- ★ Ball bearings throughout
- ★ Exclusive gear lubricator
- ★ Safety Kickproof Clutch
- ★ Blower Clears Line as Cut
- ★ Calibrated Depth, Bevel Sets

**Limited offer! Order your saw now!  
 Send no money! Take 6 months to pay!**

Porter-Cable Machine Co., 9149 Marcellus Street  
 Syracuse 4, N. Y.

I wish to order the tools checked below. I agree to pay my Porter-Cable Dealer full price or down payment indicated upon receipt of tool, and the balance in monthly installments shown below.

	Price	Down Payment	Balance Monthly for 6 months
Model 66 Saw	\$39.95	\$9.00	\$5.50*
Model 146A Saw	\$74.95	\$18.75	\$9.95*

\*includes service charge

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City & State \_\_\_\_\_

**Porter-Cable**  
*Quality Power Tools*

**PORTER-CABLE MACHINE COMPANY**  
 9149 Marcellus Street, Syracuse 4, N. Y.

# THE MAILMAN

REMEMBER THE MORNING I FOUND ANDY SHOLL TRYING TO TAKE ON THE WHOLE NEIGHBORHOOD...



ALL RIGHT, BOYS, WHAT'S THE TROUBLE?

THEY CALLED MY POP A "MUSCLE HEAD" JUST 'CAUSE HE NEVER FINISHED SCHOOL



...DY! YOU'VE  
...N FIGHTING  
...AIN! OH, IF  
...Y WE COULD  
...AVE THIS  
...GHBORHOOD

MAYBE THIS  
WILL HELP...  
IT'S FROM  
INTERNATIONAL  
CORRESPONDENCE  
SCHOOLS



SURE ENOUGH, WITHIN A FEW WEEKS I BEGAN TO DELIVER MORE LETTERS AND PACKAGES FROM I.C.S.

WE'RE KEEPING YOU BUSY THESE DAYS. ANDY'S FATHER IS TAKING A CORRESPONDENCE COURSE, YOU KNOW



A SMART MOVE FOR ANY MAN!

IT WASN'T LONG BEFORE I BEGAN TO NOTICE CHANGES IN THE SHOLL'S HOME. LITTLE THINGS. NEW CURTAINS. FLOWER BOXES. FRESH PAINT. AND THEN, ONE MORNING...

LOOK, MR. MCCURDY. HOW DO YOU LIKE OUR NEW CAR?

WOW! THAT'S A BEAUTY!



GOSH, ANDY, WILL YOUR POP TAKE US FOR A RIDE IN IT?

NEW WEEKS LATER, MRS. SHOLL TOLD ME AS I CAME UP THE STEPS...

...S ANDY TOLD YOU THE NEWS? ...RE MOVING. MR. SHOLL IS ...NG TRANSFERRED. HE'S TO BE ...ECTION LEADER IN THE NEW ...LDALE PLANT. HERE'S OUR ...NEW ADDRESS



WELL, I'M REAL HAPPY FOR YOU. BUT I'M GOING TO MISS ANDY—AND THAT I.C.S. MAIL



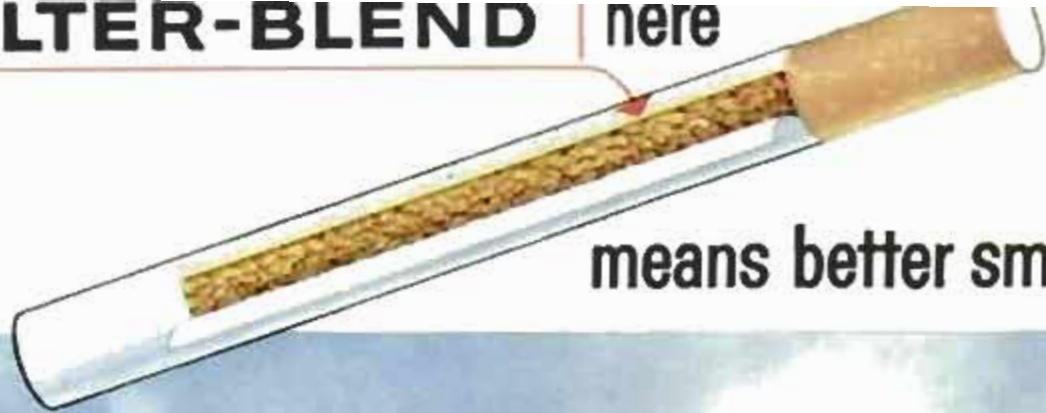
IT WAS YOU AND I.C.S. THAT MADE IT ALL POSSIBLE. WE

I'VE SEEN IT HAPPEN OFTEN. I.C.S. NOT ONLY CAN CHANGE PEOPLE'S ADDRESSES, IT CAN CHANGE THEIR WHOLE WAY OF LIVING.

IF YOUR LETTER CARRIER IS LIKE ME, HE'LL BE GLAD TO TAKE A LETTER THAT HAS THE I.C.S. COUPON INSIDE. IT REALLY STARTS THINGS!



**FILTER-BLEND** here



means better smoking here

*It's what's  
up front  
that counts!*



**FILTER-BLEND** ahead of the filter—  
that's the **WINSTON** secret

FILTER-BLEND is a mighty good reason for you to switch to Winston, because it means tobaccos *specially processed for filter smoking*. No other filter cigarette has it. Smoke Winston and you'll agree . . .



America's  
best-selling  
filter  
cigarette!

**WINSTON TASTES GOOD** like a cigarette should!

R. J. REYNOLDS TOBACCO CO., WINSTON-SALEM, N. C.