

WHAT OWNERS SAY ABOUT THE '57 BUICK

POPULAR MECHANICS

MAGAZINE

JUNE 1957
35 CENTS

HOW TO GUARD YOUR HOME
FROM WINDSTORMS

Read
"We Chase the Jets on Film"
—Page 91



Faster paste waxing!

Easier paste waxing!



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Johnson's new J-wax
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—nothing else to buy!

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More than 70 specially designed metal fixtures and Masonite® Peg-Board® panels (including heavy duty panels for garage and tool shed) are on sale at your lumber dealer's.

AS SEEN ON **HOME** WITH ARLENE FRANCIS



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In Canada: Masonite Corporation, Gatineau, Quebec
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City.....

Zone.....



HYN9-D69-7YT7

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**Another big reason why The Switch is On to the cars of The Forward Look*

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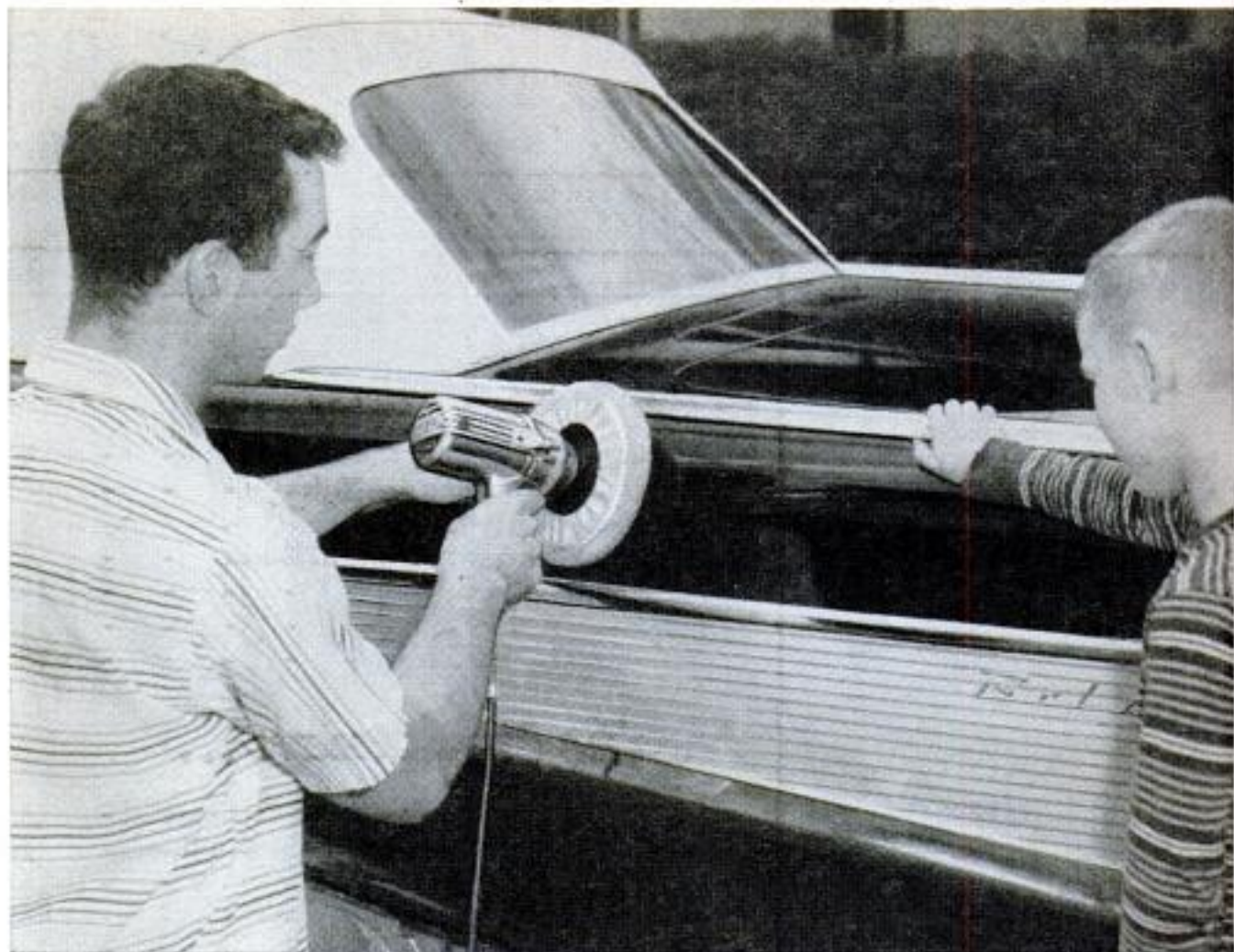
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Next Month...

Nowadays you can buy a prefabricated home complete with swimming pool, patio and outdoor-living area, in smart, modern design or colonial style, ranch type or two story. One of the most exciting developments in housing is revealed in a July article on "How the Prefabs Got That Custom Look"





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quality-built Thor SpeedPolisher. Just \$39.95. For complete versatility around the home workshop, be sure to see the complete kit at \$49.95. The kit includes accessories so that the basic power unit becomes a drill, a sander, a paint stirrer and a wire brushing machine.

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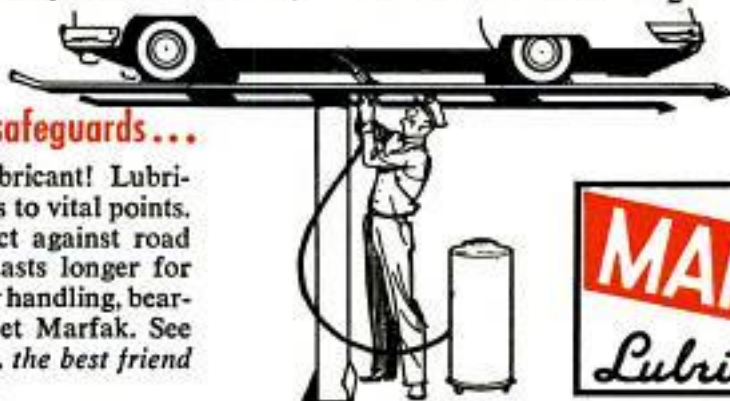
battery, filters, fan belt and other potential trouble spots. His Marfak chassis lubrication will give you smoother, quieter riding, easier handling.

Invitation: Stop where you see those green and white Texaco Registered Rest Room signs . . . *you're always welcome.*

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ACROSS THE DESK



To the Editor:

I have just read your article, "Build Your Own Swimming Pool," in the March issue.

I am enclosing photographs of the swimming pool we built in our back yard.



Pertinent facts:

- Size, 12 by 20 by 7 feet deep.
- Kiddy pool, 4 by 12 by 3 feet deep.
- Cinder-block construction (reinforcing rods and concrete in block cavities).

(Continued to page 8)

5 reasons why ACCOUNTING



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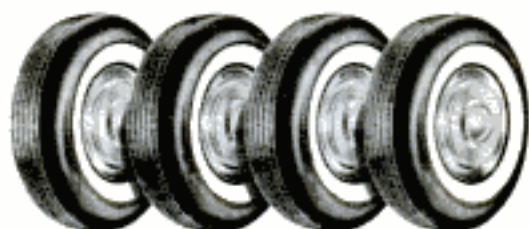
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JUNE 1957



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 They're AccuRated

DUNLOP TIRE AND RUBBER CORPORATION, BUFFALO 5, N. Y.

(Continued from page 6)

Floor of pool, 6-inch-thick reinforced concrete.

Wood-slat rustic fence 6 feet high obtained from sawmill nearby.

Blue morning glories cover fence.

Wire-mesh safety fence and gate around pool.

Flagstone border.

Water obtained from deep well.

The kids and I dug the pool with the shovel-and-wheelbarrow method. Tough work — two months digging — but a lot of fun. Help from mason contractor in laying blocks and cement work. Total cost approximately \$750 and worth every penny.

Joseph W. Scheld,
 Ansonia, Conn.

To the Editor (From "Down Under"):

Re Mr. Burggraf's article, "The World's Toughest Car Test," in February. Congratulations on a most interesting story, the like of which we Aussies would like to see more.

However, some of Mr. Burggraf's statements regarding our "roos," as we call them [kangaroos], would stand correction. For some eight years I worked as a ringer, the same as your cowboy, on New South Wales and Queensland sheep and cattle stations and I have seen thousands of these marsupials but never, as stated on page 188, 10 feet in height. One seven-foot red buck was quite a legend in his district.

Five hundred pounds in weight? Very doubtful.

But the statement "... frequent the center of the continent in packs numbering hundreds of thousands" is entirely incorrect. Under certain conditions mobs of 500 may be seen in the semiarid belt, but this would not happen once in 10 years.

J. Inall,
 Regentville, N. S. W.,
 Australia

Editor's Note:

Looks like we may have to go to Australia ourselves for the answer. Roland Burggraf, author of the article questioned, is with the Sydney, N. S. W., Sun.

To the Editor:

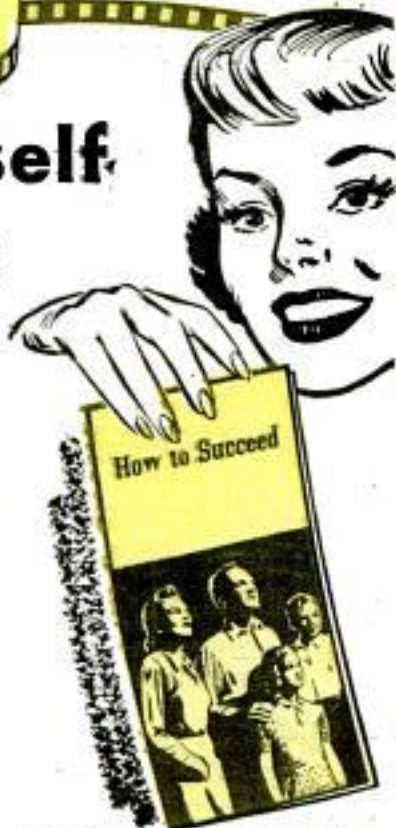
In the March issue of PM I read the letters from the people concerning the 1957 automobiles. It seems to me that most of these are aimed at Chrysler Corp., and as there is no answer to this in the book, I want to put in my two bits.

I think the Chrysler cars are distinctive and beautiful. They are different from those of the past and I predict the '58 Chevy

(Continued to page 10)



Picture yourself going places



You've done it often. Call it day-dreaming if you like, but you've seen yourself in a bigger job - giving orders and making decisions - driving off in a smart new car - buying your family a fine home.

There's nothing wrong with dreams. But how about making them come true? *You can do it*, if you're willing to try!

Look around you. The men who are going places are the *trained* men. They've learned

special skills that bring them better jobs and higher pay. It's the men *without* training whose dreams never come true.

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Look over the list of subjects in the coupon below. Pick out the one that interests you most - the one that holds the greatest future for you. Then mark the coupon, and mail it today. *Find out* what I. C. S. can do for you. It costs only a stamp or postcard, but it's the first step if you want to go places!



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L. P. S., Elkhart, Ind.

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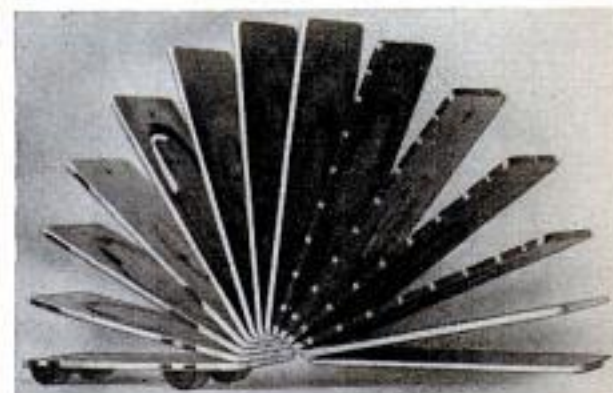
(Continued from page 8)

and Pontiac will fall in with the same type of design. I think the design of these cars is far advanced to the present Buick and Olds. These cars haven't changed in the last five years stylewise. I say let all companies go their own way in design, but let's get them to put them together better.

David Welch,
Sacramento, Calif.

Album of Chevies

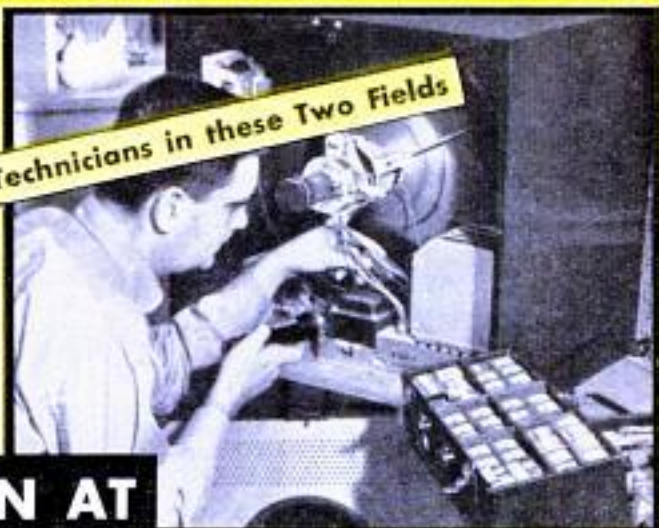
Ed Cole's office in Detroit is uncluttered and businesslike, as befits the office of the



sharp-thinking, young engineer who is General Manager of Chevrolet Division. Obviously out of place is the bright yellow-and-red toy bus that stands on a table looking, at first glance, like any other toy bus. But, Ed quickly points out, it is not at all like any other toy bus.

The bus is made up of 14 thin slices of
(Continued to page 20)

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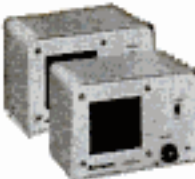
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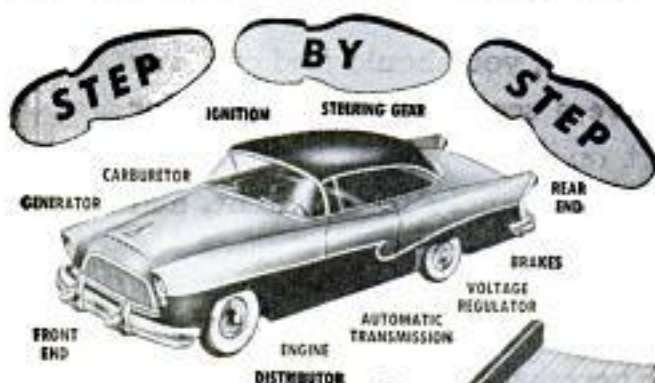
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(Continued from page 10)

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To the Editor:

Your article, "Beachcombers of the Woods," in the March issue has motivated numerous requests for additional information. We welcome this interest but to those of us who had to read and answer these letters it was obvious that the readers were overoptimistic of the possibilities. . . .

These many by-products of the forests should not be compared to drift material which comes to rest on the beach and is considered free for the taking by beachcombers. Minor forest products, such as decorative greens, cones, medicinal material and the like, are just as much a crop to the forest landowner as timber which is grown and harvested for saw logs, pulpwood, firewood and poles. Therefore, persons collecting or harvesting by-products of the forest must recognize ownership, abide by Federal, state and local requirements, and must obtain permission or negotiate for a price with the owner.

Another important item which is of direct concern to the novice collector is markets and harvesting know-how. Too often the beginner, lacking business ability and collection know-how, gets into trouble with the landowner or has no sale for the product. Believe it or not, this is generally a highly competitive business and unless the beginner is correctly advised, disappointment, heartaches and hard feelings may be the result. For example, the article mentions conk at \$2 per pound (presume this is quinine conk). This was probably one of the all-time highs during the war years. This past summer the price was about 25c per pound in the vicinity of Portland. We have been advised that there is no market for quinine conk at the present time. Demand and price vary.

Thomas H. Burgess,
Assistant Regional Forester,
U. S. Forest Service,
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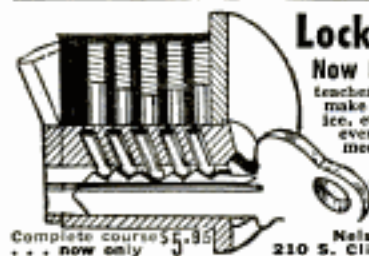
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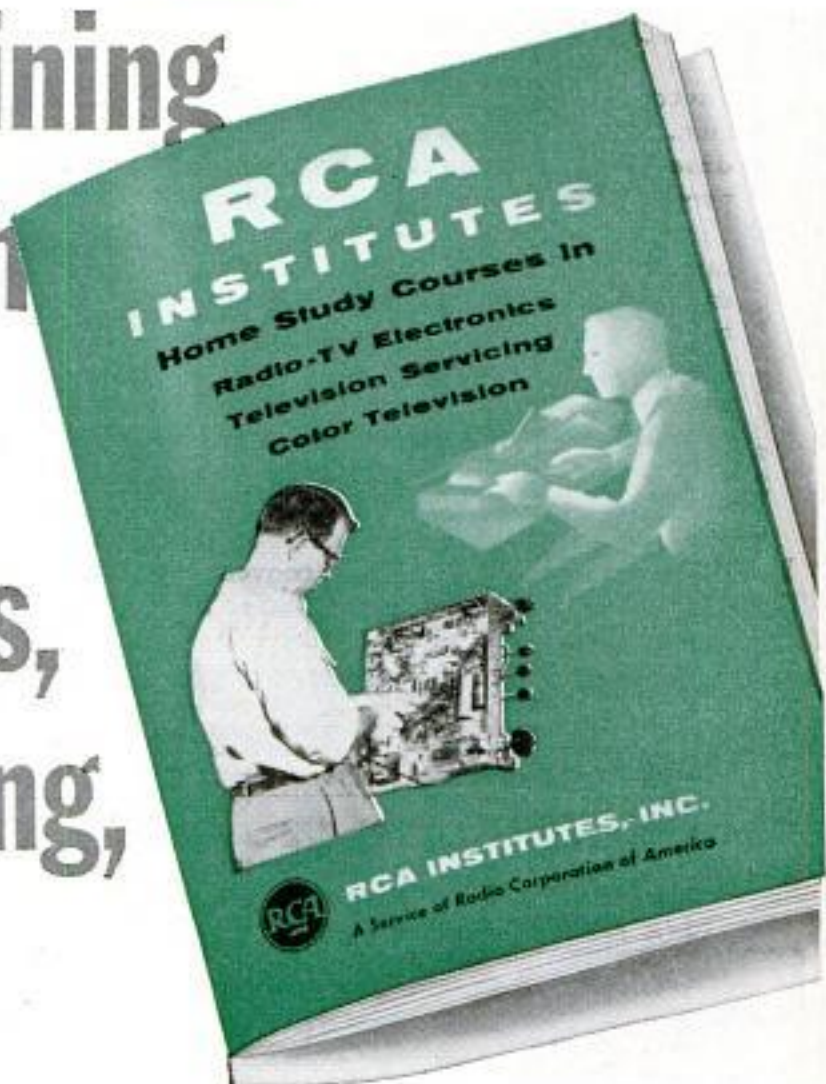
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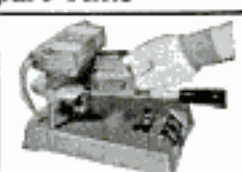
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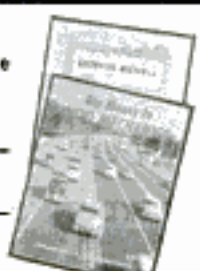
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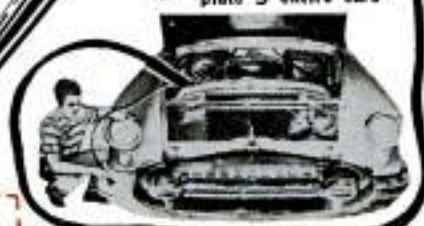
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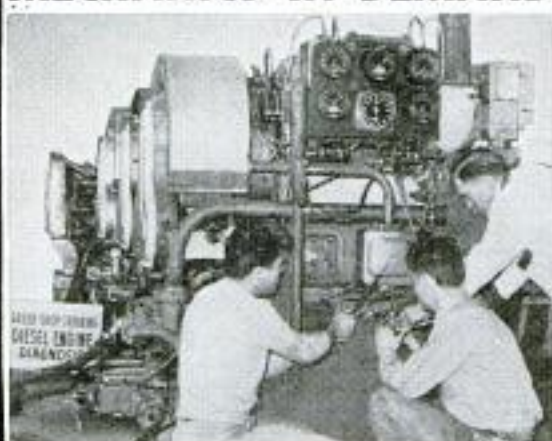
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BRUSH Plating outfits for plating articles in the home and shop. No tanks necessary. Good income spare or full time. Free particulars. Gunmetal Co., Ave. H, Decatur, Illinois.

\$1,000 MONTHLY Possible in collection agency business. Free details. Write Cole Associates, Syracuse 2, N. Y.

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

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

PLASTERCRAFT Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

BRED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropical Fish Breeders, Los Angeles 61, Calif.

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

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

LEARN Real estate by listening to records. Lee Institute, Brookline 46, Mass.

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.

FREE "Franchise Profit Letter" describes nationwide opportunities. Exclusive distributorships, dealerships, agency operations. Write today. National Franchise Reports, 333 North Michigan, Chicago 1.

LEARN Photo-negative portrait retouching. Men, women. \$5 hour possible spare or full time at home. Easy, glamorous. Work for photographers by mail order. Full details sent free. Duval, 100 So. Vermont, Los Angeles 4.

YOUR Own name brand business. No investment; no inventory. Part time or full time. Sell famous brands of appliances, housewares, silverware, radios, vacuum cleaners, lamps, tools, clocks, watches, jewelry, etc., etc., over 1000 items. Join thousands of successful independent dealers. Send for free catalog and dealer price list. H. B. Davis Corp., Dept. 11, 145 W. 15 St., New York City.

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

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.

FREE Cadillac \$10,000 yearly. Cars, appliances wholesale. Strateway, 6228E, Charlotte 7, N. C.

OPERATE Profitable mailorder business! Splendid opportunity. For details write: Thomas Bond, 1637H West Vernon, Phoenix, Arizona.

COLOR Concrete with chemicals. Marble-glaze cement benches, pottery. Home-shop. Hundred beautiful designs, made without molds. Birdbaths to waterfalls. Your chance for fame, fortune, 10¢ brings sample, pictures. Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, Calif.

CASH From sawdust, seventy methods. Tin-cans, thirty methods. Newspapers, eighteen methods. Instructions 50¢ each. All three \$1.00. Charles Company, 12-DXT, Norwood, Ohio.

BE Appointed state notary public now. Write, Stationers, Boerne, Texas.

GROW Mushrooms. Cellar, shed. Spare, full time, year round. We pay \$3.50 lb. We have over 25,000 customers. Free book. Mushrooms, Dept. 172, 2954 Admiral Way, Seattle, Wash.

WE Love our mailman—He leaves over \$1000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the Ranch Mailorder Method. Operates anywhere. Inquire: Eveningshade Ranch, Boerne, Texas.

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

BUY Wholesale! Discounts to 80%! Appliances, cameras, sporting goods, housewares, watches, tools, clothing, etc. Buy-Rite, Hawthorne 1, New Jersey.

FIX Typewriters. Inexpensive home course teaches factory secrets. Free booklet. Athey, Tarentum, Penna.

TOP Flight mailorder business opportunity. Modest capital. Request convincing details. Stav, 147 Victoria Street, Kamloops 18, B. C., Canada.

THEY Hand him \$100! Free plan "Secret Journal Hidden Dollars." Work home! Publicos, OceanSIDE, Calif.

MAKE \$48 From square foot plywood; jig saw necessary. Free information. Woodarts, X-7, Bridgewater, Mass.

\$5,000 YEARLY. Spare time at home. Nothing to buy. No local selling. Dignified. Guaranteed. Home Harvest, Rt. 3, Box 3491-A, Albuquerque, New Mexico.

"MAILORDER Laws and Regulations," \$1.00. Explains necessary licenses, different taxes, legal requirements, etc. "Mailorder Rules for Beginners," \$1.00 additional. Tasker, 1603 Peach Street, Alexandria, Virginia.

MIMEOGRAPHING Pays sensational local profits. Exclusive secret plans exposed! Start free. Mosele Mimeo Shoppe, Bonham, Texas.

PLASTIC Laminating. Pleasure and profit. Self-sealing. No machines. Complete home kit, \$1.00. Mountainside 1, Springwater, New York.

OPERATE Your own merchandise mail-order business. Everything furnished! B. Mann, Woodcliff Lake, N. J.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Free information. Empire School of Piano Tuning, Champaign, Ill.

MONEY For you! Big profits! Cast plaster figurines, bookends, plaques at home with XL rubber molds. No experience needed! Write for illustrated, 40-page catalog, only 25¢! Plastic Arts Studios, 3463 So. Madison Street, Department 5, Muncie, Indiana.

EXCLUSIVE Distributorship available in most areas for world-famous Cadmium battery guaranteed to outlast your car. Tremendous profit opportunity. Investment for merchandise only. Free franchise. Cadmium Battery Corporation, Dept. 102, El Segundo, California.

GROW Orchids at home. Profitable, fascinating. Year 'round. Maine to California. No greenhouse. Successful home grower shows you how to provide proper temperature and air conditions in any well lighted room. Full details and real orchid seeds free. Orchidland, 100 So. Vermont, Los Angeles 4.

PLATE Baby shoes, jewelry, gifts, bronze and colored pearl. Free booklet. Platex, 11029 South Vermont, Los Angeles 44.

LEARN Appliance service and repair. Motors, washers, refrigeration, cleaners, everything. Free booklet. Armstrong, 11027-A South Vermont, Los Angeles 44.

START Your own subscription service. Every family buys magazines. No capital needed. We tell you how, furnish all supplies free. Liberal commissions. Write McGregor Magazine Agency, Dept. 110, Mount Morris, Illinois.

NOW Grow mushrooms with standard commercial fertilizers. Marketing "how-to," free facts. Luxur, 641 South 19th, Newark 3, N. J.

BOOK On culture crickets and earthworms. Excellent information. \$1.00. Kean, Ladonia, Texas.

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

FREE! "\$3,000 Yearly Sparetime. Backyard. Raising Earthworms!" Oakhaven-38, Cedar Hill, Texas.

MILLIONS Of saws and lawnmowers need sharpening regularly. Get in on this profitable business now! Spare time or full time there's good money to be made; \$6.00 to \$10.00 per hour not unusual. For details write Max Mig. Co., 138 Stockton Ave., San Jose 26, Calif. No obligation.

MAKE Money growing miniature trees on your window sill. Free seed and plan. Miniature Nurseries, Dept. JE, Gardena, Calif.

LEARN Professional TV servicing in one week! Fabulous new simplified system. No big expense. No studying. No tools or equipment. Spare full time. Own your own big profit business! Save! Amazing but true! Free! Write, Electronic Engineering, Dept. AC-176, 1038 So. LaBrea, Los Angeles 19, California.

PRINT Without a printing press! Amazing new method! Print colorful signs, banners, cards, posters, glassware; anything at home. Big profits. Money-making opportunity! We supply everything. Beautiful sample, home-business plan free! Write Screen-Print Company, JE, Los Angeles 61, California.

MAKE Extra money. Cash commissions. Everybody buys easy-to-sell advertising book matches. Union label. All sizes. Cuts for all businesses. Powerhouse selling kit free. Steady repeat business. No experience necessary. Superior Match Co., Dept. MX-687, 7328 S. Greenwood, Chicago 19.

START Your own business on credit. Your own boss. 1527 dealers sold \$5,000 to \$32,000 in 1966. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. F-U-PPM, Freeport, Ill.

WANTED! Home workers to assemble luggage and cases for ready market. Instructions, materials, tools, everything supplied. Free details. Abarsi, 807-BG Sunset, Los Angeles 12.

NEWEST Spare, full-time home business \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautifully auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast JE, Los Angeles 61.

MAIL Order expert shows how to make money by mail, even with small starting capital. His informative course contains modern merchandising methods, not petty schemes. Write for convincing details. Seery, North Conway, New Hampshire.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 16-C1, New York.

FLEXIBLE Rubber molds for plaster and Marble figurines. Sample and large illustrated catalog 25¢, refunded on first order. K-C Novelties, Dept. 56, Southampton, Massachusetts.

GROW Expensive herbs for us! Big profits home-business of your own. Year around profitability! We supply everything necessary! Send for free rare seeds and revealing plan. National Herb Exchange, Dept. JE, Gardena, Calif.

MAILORDER. Free book, Shrager Advertising, 2 W. 46, New York City 36.

"HOW To Start a Business" booklet sent free! If you know any trade, go into business for yourself! Learn the 9 easy steps to follow. We've guided 5,000 others to success. Revealing free booklet yours for the asking! Write! National Business Consultants, Office JE, Los Angeles 61, Calif.

IMPORT-Export! Mailorder opportunities. Details. Warner, Box 6, Fort Scott, Kansas.

SELL By mail. Tested methods. Alfano, 19 Pine Street, Closter 2, New Jersey.

MAIL Order advertising agency executive reveals sensational no-risk advertising and merchandise methods. Start in office or home; minimum capital; positive profits. Free details: Impact! 3407 Prospect Avenue, Dept. 11-6, Cleveland 15, Ohio.

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

FREE Copy, Home Business Digest, full of home business information, send post card, Hofstede's, 928 Belmont Ave., Pater-son 2, N. J.

HIGHEST Profits all magazines. Sure success plan. Free catalogue, supplies, prizes. Subscription Service Co., Box 2070, Birmingham, Ala.

100% PROFIT. No investment. Stamp brings details, samples. Miller, Box 384, Brooklyn 1, New York.

60% PROFIT Cosmetics \$25 day up. Hire others. Samples, details. Studio Girl-Hollywood, Glendale, Calif., Dept. 1276H.

WANTED! Home producers, to be subcontractors. Cast plastic products for manufacturers in our clearing house service. Thousands of easily made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 6PM, East Boston 28, Massachusetts.

VENDING Machines—Every description. New or used. Lowest prices. Start a route or sell outright. Established 29 years. Mack Postal, 2932-C Milwaukee Ave., Chicago 18.

\$75 WEEKLY In spare time. Repairing watches and clocks. Full information 50¢. Stewart's, 5315 Wells, St. Louis 12, Mo.

LIQUID Marble—Brushed! Sprayed! Mold novelties, tile! Particulars free. Marbleizing Service, Edwardsville, Illinois.

OPPORTUNITY In mail order. Free literature. McFall Enterprises, 5075 Niagara, San Diego 7, Calif.

FREE! Profitable home mailorder plans. Townsend, 1018A Woodland, Sharon Hill, Penna.

WE Establish you in your own mail order discount business. Catalogs, sales letters, etc., printed your name can cost you nothing. No stock investment. We ship orders. Sell gifts, appliances, housewares, cookware, cutlery, dinnerware, silverware, jewelry, watches, etc., at big discounts. Catalog, details free. Topval Corp., Lindenhurst 818, N. Y.

MONEYMAKING OPPORTUNITIES

YOUR Own wholesale buying service. Buy for clients, the "best" at the "lowest" America's biggest money making deal. Free details. Associated Wholesalers, 1016-DX Starr, Burlington, Iowa.

HOME-Business pays big! Start spare time and grow with our help! We guide you every step of the way in any business you may choose. Free details, write National Business Consultants, Office P6C, Los Angeles 61, Calif.

MEN And women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars free by mail. Send postcard to Roberts, 1512 Jarvis, Room 7-H, Chicago 26, Ill.

MAKE Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-F, 7464 Clark, Chicago 28.

"50 NEW Home-Business Ideas" booklet free. Coast Industries, B6C, Los Angeles 61.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 16-D1, New York.

MAKE Top money collecting snakes, lizards, turtles, toads, frogs. We pay guaranteed prices. Details 25¢. Biological Exchange, Dept. 14b, Box 5302, El Paso, Tex.

MEN—Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room 7-H, 1512 Jarvis, Chicago 26, Ill.

SELL Books by mail. 400% profit. Royal, Box 368-X, Cleveland 27, Ohio.

PRINT Without printing press—At home! New miracle discovery lets you change cents materials into dollar profits. No selling. Customers come to you. Tremendous demand in every area. Possible \$250.00 week profit to you. Free revealing secrets plan, actual valuable samples, confidential facts. Hurry, supply limited! Screen-Print Company, 26C, Los Angeles 61.

60% PROFIT Cosmetics \$25 day up. Hire others. Samples, details. Studio Girl-Hollywood, Glendale, Calif., Dept. 1276H.

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 7-H, Chicago 26, Ill.

FREE Introduction copy to "New Horizons" for homeworkers. Shields Publication, Box 164A, Miami 38, Florida.

STEADY Income. Easy project. Tremendous demand. Yours for \$2.98. Betterworth, Vidor, Texas.

PRINTING Wholesale—Save 50%. Start brokerage. Elichs, 3035 Marvin(B), Toledo, Ohio.

"HOW To Win Prize Contests." Free information. National, 9128-P S.W. 26th, Portland 19, Oregon.

BIG Money making professional draperies. Complete instructions plus paper model, only \$2.50. V Z Sales, 123 E. Poplar, San Mateo, Calif.

MAIL Order ideas, suggestions, methods. \$1.00. Box 4066, Wichita Falls, Texas.

YOU Can double your income. No selling. Complete details \$1. Business Consultants, 615 East Smith, Medina, Ohio.

DO It yourself. What? Repair TV, build furniture, make barbecue, plumbing repairs, build boats, do house wiring, remodel home, lay tile, modernize kitchen, repair home, and scores of other things you can do yourself. Books covering each subject, only 25c. Send for descriptive list. It's free. Popular Mechanics Press, 200-LB East Ontario St., Chicago 11, Ill.

DIRECTORY! Where to obtain free merchandise, books, literature, other valuable! Directory, \$1.00. National, P.O. Box 606-L, Redwood City, Calif.

FREE: "Retirement \$68,700.00 Investor's Dream!" Zinke, 315 Lincoln, Mount Morris, Illinois.

BUY Wholesale! Save 66%! 100,000 name brand appliances, housewares, clothing, furniture, tools, sporting goods. Everything! Free catalog offer. National Buyers Service, Box 3338EB, San Francisco.

NYLONS 12½ Cents. Write: Allsheer, 636 E. State Fair, Detroit, Mich.

\$100.00 WEEKLY Spare time with a tape recorder! Proven facts free! Dixieland Publishers, Asheboro 2, N. C.

OPENINGS: Spare-time. Work home. Coleman's, 1350 Carol, Aurora, Illinois.

START Your worm project with the best. Free literature. Dewey's Worm Ranch, Henderson, Colorado.

NOW Grow mushrooms with standard commercial fertilizers. Marketing "how-to," free facts. Luxur, 641 South 19th, Newark 3, N. J.

FREE! "\$3,000 Yearly Sparetime. Backyard. Raising Earthworms!" Oakhaven-48, Cedar Hill, Texas.

REFLECTIVE Sign letters, ornaments. Free samples. E-Z-On Sign Letters, Pell Lake, Wis.

LEARN Technical metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver 8, B. C., Canada.

BUY Wholesale! 30-80% discounts! Appliances, gifts, typewriters, tools, watches, sporting goods, jewelry, cameras, housewares, etc. Consolidated Distributors, Clifton 28, New Jersey.

THEY Hand him \$100! Free plan "Secret Journal Hidden Dollars." Work home! Publica, Oceanside, Calif.

HOTTEST Mail order plan ever! Sell photos, films, art novelties. Huge proven profits! Free details! Ampro, 429 South Western Ave., Dept. 1, Los Angeles 5, California.

ADS Running under this heading sell printing. Ask me for proof. I'll gladly send you amazing facts. Ask for Folder "P." P. W. Johnson, 200 E. Ontario St., Chicago 11, Ill.

AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, 333 North Michigan, Chicago 1.

FREE Folio "\$5,000-\$45,000. Unlimited Vacations." No merchandise. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

OROW Mushrooms. Cellar, shed. Spare, full time, year round. We pay \$3.50 lb. We have over 25,000 customers. Free book. Mushrooms, Dept. 173, 2954 Admiral Way, Seattle, Wash.

"HOME Business Digest" has money-making opportunities galore. Sample 25c. Donovan, 79-PM Greenbelt, Levittown, New York.

EARN \$50.00 Daily making mats, shoes and mud guards from old tires. S and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

DOLLARS Every day! Amazing new magic mail plan. Set-up free. Miller, Box 588X, Oshkosh, Wis.

GENERAL Contest Bulletin. Lists contests monthly. Sample, 25c. 1609½ East 5th, Duluth, Minn.

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

RAISE Rabbits on \$500 month plan. Plenty markets. Free details. White's Rabbitry, Mount Pleasant, Michigan.

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

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

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

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 27, 715 Ensor Street, Baltimore 2, Maryland.

FREE Book "505 Odd, Successful Businesses." Work home. Pacific, Oceanside, Calif.

PRIZE Contests provide fabulous and confidential home income opportunities! Here's how and where to win your share! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

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BEAUTIFY Complexion and hair. Economical formulas 25c. Grace Collins, 804 14th Avenue, Paterson 4, New Jersey.

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PRACTICAL Formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

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.

FREE Formula catalog. Anything analyzed. Reasonable. Western Chemical, Salem, Oregon.

EXPORT — IMPORT

1957 BUYERS' Guide to imported German products. First complete directory of German products, marketed in U. S. by category, manufacturer, importer. Plus 110 pages market facts on Germany. 370 pages, 10,000 listings, \$3.40. Nordeman Publishing Co., Inc., 14 E. 62nd St., New York 21, N. Y.

FREE Catalog — Rare imported gifts. Empire Imports, 2514 Genesee Street, Utica 4, New York, Dept. M.

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AMAZING New book of science. Experiments, formulas, and catalogue of laboratory supplies. Only 25c National Scientific Co., Dept. PM-6, 500 West Road, Lombard, Illinois.

CHEMICAL Curiosities! Chemical puzzles! Chemical games! Chemical novelties! All, only \$1.00. National, P.O. Box 806-L, Redwood City, Calif.

STUDENTS — Amateur experimenters. Five unusual dazzling chemical experiments 25c. Chemtron Company, 114 East 28 Street, New York City.

ATOMOTRON. Model atom smasher. \$14.95. Raybaby cloud chamber. \$3.95. 3-in-1 electromagnet, \$14.95. Send 25c for literature. Atomic Laboratories, Inc., P. O. Box 343, Berkeley, Calif.

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

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

60 PAGE Booklets! "Beginners Chemistry," "Chemistry," "Physics," "Relativity," "Light," "Astronomy," "Electricity," "Radio," "Useful Tables," "Scientific Oddities." 10c each. Franks, 3121 South Racine, Chicago 8.

PLASTICS

NEW Liquid casting plastic, clear, colors. Embed real flowers, coins, photos. New manual shows fine things you can make at home and sell at big profit. Send 25c. Castolite, Dept. G-101, Woodstock, Illinois.

PLEXIGLAS, Fiberglass, polyester, epoxy, acetate, vinylite, styrofoam, acrylite. Instructive wholesale-retail catalog, free. Gem-O-Lite, 3529 Cahuenga, North Hollywood, Calif.

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

LAMINATING Supplies. Free price list. Solomson, 46 Cornhill, Boston 3, Mass.

REPAIR Kit welds broken plastic. Restores original finish. Standard kit \$2.00. Special trial kit \$1.00. Rayther Co., Box 271, Station B, Toledo, Ohio.

FIBERGLASS Patio sheets 58c sq. ft. Plexiglas 95c sq. ft. Liquid casting plastic \$1.95 qt. Send 10c for literature. United Plastics Products Co., Dept. 7, Roebling, N. J.

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 15c for postage. Aristocrat Plastics, 23-25 Sussex Avenue, Newark, N. J.

AGENTS WANTED

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. P. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

GOLDMINE Of 600 money makers. Copy free. Specialty Salesman Magazine, Desk 5-B, 307 N. Michigan, Chicago 1.

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

PRINTING, Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12½c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Nathan Portnow Associates, 605-AA West 12th Place, Chicago 7.

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

SELL Famous \$3 fire extinguishers. Fast sales, liberal profits. Write Fire-Killer, Box 182, Hazleton, Penna.

EARN An extra \$100 a week demonstrating the latest hit games Teeko, I.Q. Solitaire and Scar-Ne. Nationally advertised, millions seeking them. Terrific opportunity. John Scarne Games, Fairview, N. J.

BIG Profits! Fragrant cedar chips blended with certain tested ingredients freshens foul air, repels insects. Sell homes, stores, offices. Attractively packaged. Sample offered. Plinson, 706-PM, East 19th, Kansas City 8, Missouri.

SELL Hawaiian macadamia candy. Maier Products, 1120 Koko Hd, Honolulu.

AFRICAN Hand carved hard wood statuettes, wall plaques, book ends, warriors, big game animals, supplies limited, send for free list. Agents wanted. Apply J. A. Matthews, 3363 Queens Park West, Bulawayo, Southern Rhodesia, Central African Federation.

MAKE \$50-\$300 Extra money fast. Show big value \$1.00-\$1.25 Christmas, everyday greeting card assortments, gift wrappings, costume jewelry, gifts, stationery. Profits to 100%. Cash bonus. Write for newest assortments on approval, free gift offer, free album name imprinted Christmas cards, catalog, details. Hedenkamp, 361 Broadway, Dept. PM-49, New York City.

CALIFORNIA Sweet smelling beads. Sensational sellers. Particulars free. Mission, 2328-PM W. Pico, Los Angeles 6, California.

60% PROFIT Cosmetics \$25 day up. Hire others. Samples, details. Studio Girl-Hollywood, Glendale, Calif., Dept. 1276H.

EXCLUSIVE Line of personal initialed buckles, belts, cap badges, 3,000 emblems, uniforms, shirts, caps, etc. Hook-Fast, Dept. PM, Roanoke, Virginia.

BUY Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertz Station, Buffalo 16-A1, N. Y.

ROUTE Men—New terrific item sell bartenders. Send name. Ransom Sherman Enterprises, P.O. Box 3190, Hollywood 28, California.

MEN, Women, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags, and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1 1/2 years or replaced free. Write Wilknit, 1776 Wash., Greenfield, Ohio.

EARN \$10,000.00 Yearly—Only two sales daily. World's best seller, the Holy Bible (illustrated). Protestant or Catholic. Margaret's P.O. Box 92, Hazelton 6, Penna.

NAMEPLATES For homes, desks, etc. Free samples, Whitneys, West Springfield, Mass.

COULD You sell first quality nylon stockings at 39¢? That's all they cost if they run within 3 months because new slashed prices only 79¢ prepaid (including your commission and bonus). If free replacements needed, customer has two pairs for 79¢! Fantastic opportunity for fabulous earnings. Just write order, we deliver and collect. Free sample stocking and outfit. Dept. 33, Kendex, 108 Lawrence St., Brooklyn 1, N. Y.

HIGH Dealer and jobber profits on Magic-Mist. Attractive, all-purpose unit for vaporizing or bug killing. Many other practical uses. Proven consumer acceptance. Repeat sales of fuel crystals. Inquire Magic Mist, 1824 Spring St., Houston, Texas.

FABULOUS Patented sewing machine air-conditioner. Sells for \$1. Write for descriptive circular. Weidner, 131 West 45, New York City.

WANTED. Man sell fire stopper. Out-O-Matic, 1737A E. 31st, Denver, Colorado.

DAMASCENE Earrings! Gold plated. One pair, \$1.00, twelve pairs, \$6.00. Ohga, Pm88, Sigakenkusatu, Japan.

WHOLESALE Religious merchandise. Free catalog. Big profits! Gospel, 538 S. Dearborn, Chicago, Illinois.

\$1 PUTS You in business! Green Magic liquid hand cleaner in plastic squeeze bottle is easy, fast, repeat, big income, necessity item. Auto workers, painters, printers, mechanics, plumbers, say "It's the greatest!" Details free. Mr. Pope, The Lanyan Co., 401 Seneca Ave., Mt. Vernon, New York.

WHOLESALE Catalog! Clothing, linens, housewares. Write Bostonian, 14 Dock Sq., Boston 8, Mass.

CALIFORNIA Sweet smelling beads. Sensational sellers. Particulars free. Mission, 2328-PM W. Pico, Los Angeles 6, California.

SELL By mail or locally. African wall decorations. 57% profit! Clements, M-1345 Third, New York City 21.

TRADING Stamp salesman! Large discount catalog firm recently inaugurated unique stamp feature into already nationally known business. Protected territory! Top commissions! Leads! Kroboth's, W. 1118 Grace, Spokane 17, Washington.

JUMBO Profits selling slingshots to kids, stores. Buy wholesale. 50¢ for sample and information. Designed Products, P.O. Box 964-M, Concord, California.

BUY IT WHOLESALE

PLUMBING Goods—Faucets, valves, fittings. Buy brand names direct. Save to 60%. Send your requirements. Free list. Allied Mfg., Box 509, Morgantown, W. Va.

FREE. New wholesale catalog. Name brand products. Sell two items, get one free. Write: S. Smith, 1938 Pine Street, Beaumont, Texas.

MONEYMAKING Gifts, wholesale. J. J. Davis Co., Englewood Ave., Englewood, New Jersey.

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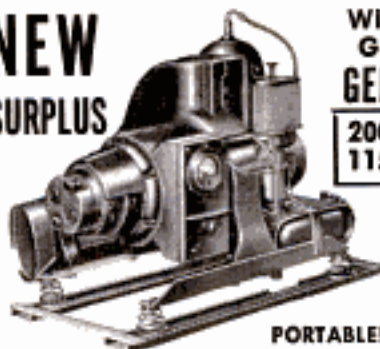
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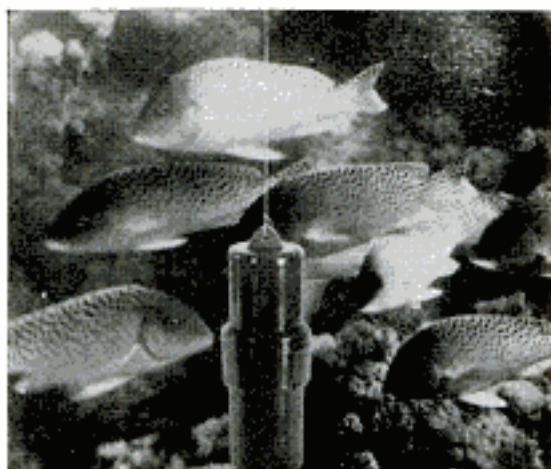
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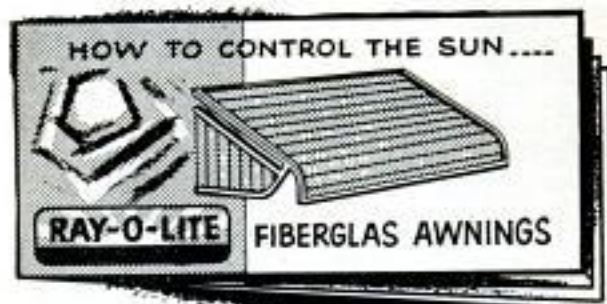
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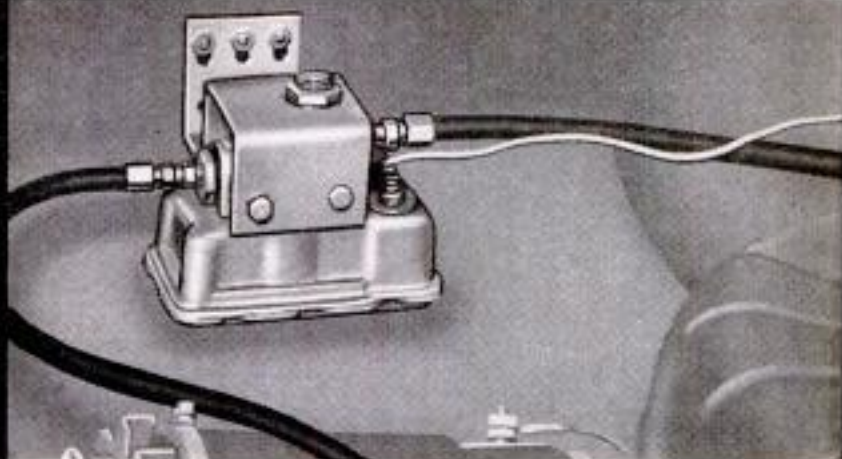
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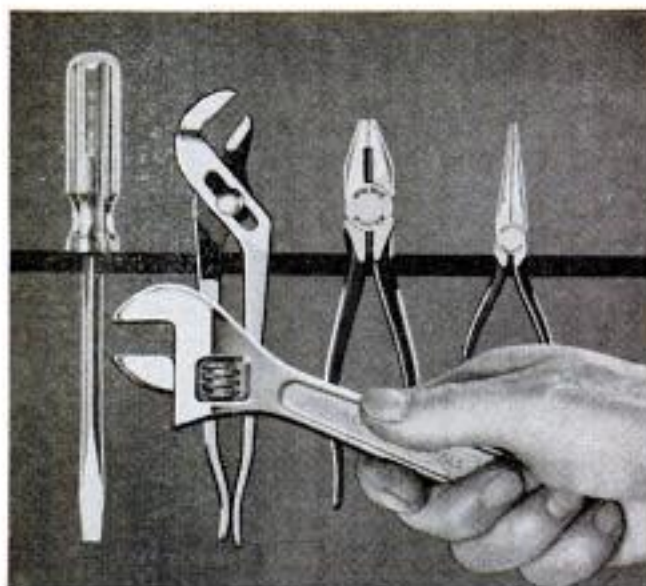
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.

How Is Your Science IQ?

Try the Quiz,

"ARE YOU SCIENCE MINDED?"

Starts on Page 242

mobile homeowners say:

KOOL-SEAL ALUMINUM ROOF COATING WEATHERPROOFS WITH ONE APPLICATION

Insulates... Beautifies... Lasts for years

For worry-free, all-climate roof protection, mobile homeowners tell us they are applying aluminum roof coatings like Kool-Seal, made with ALCOA® Aluminum Pigments.

DEFIES WEATHER

This roof coating is made with a tough asphalt base and has as its pigment brightly polished ALCOA Aluminum flakes. It remains firm on top, but soft and pliable beneath its protective shield of aluminum. It will not sag or run under tropic sun, or alter under frigid cold. It provides waterproof shelter, protects against surface deterioration.

TURNS BACK HEAT

Because aluminum turns back 70 percent of the sun's heat, your mobile home can be as much as 15 degrees cooler this summer . . . warmer in winter, too. Because of aluminum's low heat radiating power, it acts like insulation, reduces interior heat loss.

EASY TO APPLY

Aluminum coatings like Kool-Seal come ready mixed . . . require no thinning or heating . . . are easy to apply with either brush or spray gun . . . adhere to any metal or composition roof.

LASTS LONGER

Aluminum flakes "leaf" to produce a brilliant metallic surface—literally a metal shield that protects the underlying asphalt vehicle from deterioration. This means long life and years of service for your roof.

STAYS BEAUTIFUL FOR YEARS

The soft, silvery finish is highly reflective . . . sets off any mobile home . . . lends a clean, prosperous appearance that lasts for years.

ALCOA does not make aluminum roof coatings. But we will gladly refer you to reputable manufacturers who do. Write today for our two free booklets, *Painting With Aluminum* and *Aluminum Asphalt Roof Coatings Make Time Stand Still*. Use the coupon.



Look at the aluminum-coated roofs in this community, a typical sight in the more than 4,000 mobile parks in the United States. Inset

shows how easily Kool-Seal goes on. Kool-Seal is a product of Electric Paint & Varnish Company, Cleveland, Ohio.



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Aluminum Company of America, Paint Service Bureau
1718-F Alcoa Building, Pittsburgh 19, Pennsylvania

Please send me your FREE booklets:

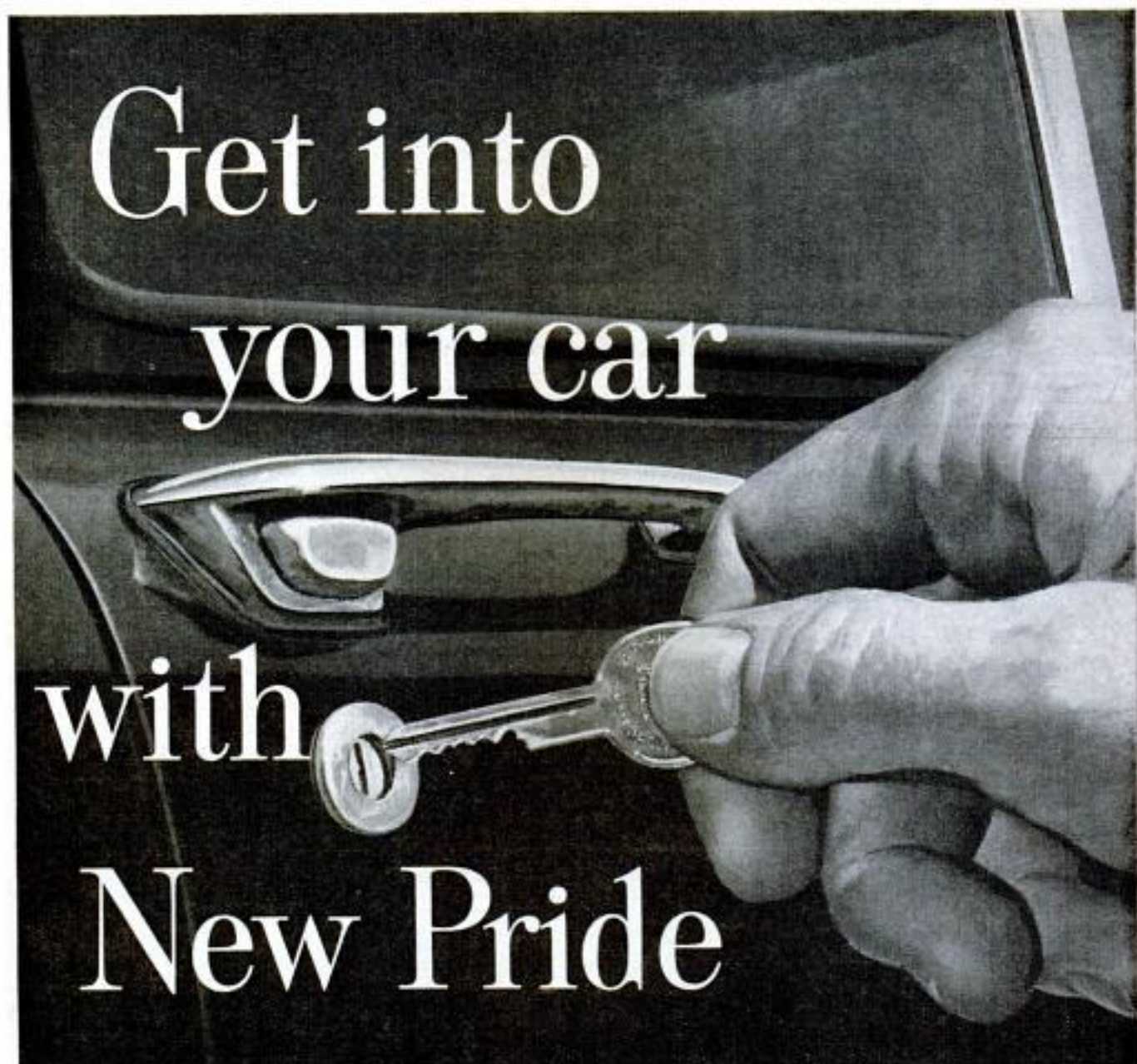
- Painting With Aluminum*
 Aluminum Asphalt Roof Coatings Make Time Stand Still

I am interested in protecting _____

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Address _____

City _____ Zone _____ State _____



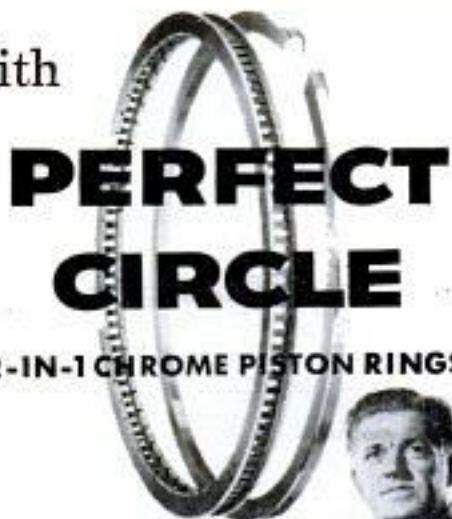
Restore that **NEW CAR FEEL** with

Why drive a car that just "gets you there"—when it's so easy to have a car that's a thrill to handle... full of pep, performance and GO! Your Doctor of Motors—your skilled mechanic—knows how to bring back that satisfying "new car feel."

Doctors of Motors everywhere install Perfect Circle 2-in-1 Chrome piston rings to assure top performance. Perfect Circles are plated

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POPULAR MECHANICS

POPULAR MECHANICS

JUNE
1957

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 107 NO. 6



For a time-lapse study of pollen, Ott focused 25 cameras on ragweed, some looking through microscopes

John Ott, who cast aside his career as a Chicago banker to pioneer time-lapse movies of flowers bursting into bloom, has crossed another frontier. Now cancer cells visibly multiply and ragweed pollen touches off hay fever under his microscope.

Reprinted "PM Highlights"

His Cameras Spy on Life's Secrets

By Clifford B. Hicks

MILLIONS OF TELEVIEWERS look on John Ott as an old friend, always on hand to help them tackle their gardening problems. Millions of movie fans look on John Ott as a magician with a camera.

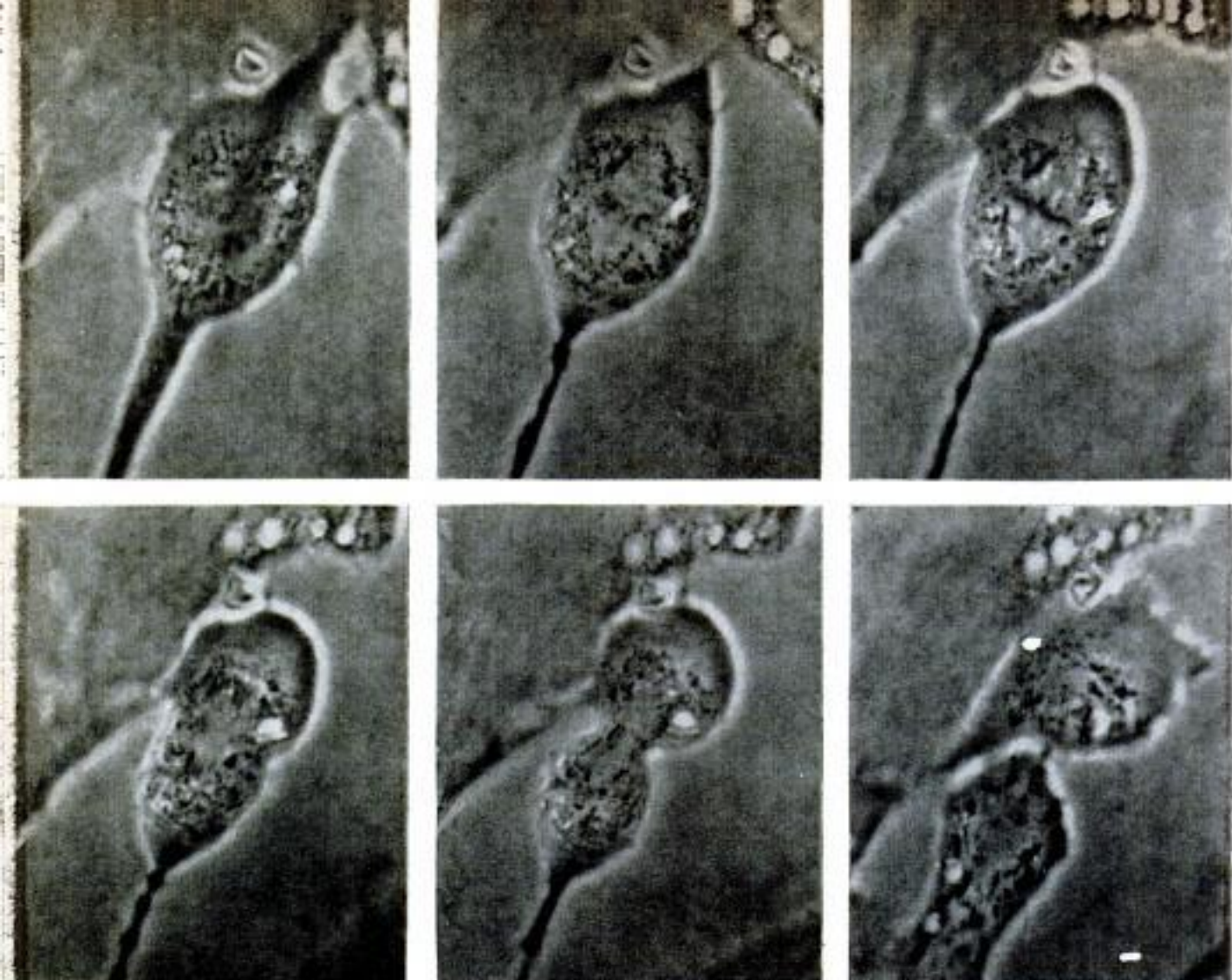
A few men—biologists, pathologists, chemists and other scientists—look on John Ott as a founder of a new scientific

technique. And only this handful has seen his most significant work.

These scientists, usually unemotional in their approach, have gasped at the sights he has shown them. Vital life processes which occur over a period of days, weeks or months unfold on a movie screen in seconds. They watch cancer cells divide and

Ragweed pollen, exposed to nasal secretion of hay-fever sufferer, starts emitting tiny drops of liquid





Scientists are excited about Ott's films which show (upper left to lower right) cancer cell reproducing

redive, ragweed pollen react in the nasal secretion of a hay-fever victim. They watch light of certain wavelengths determine the sex of various plants.

They watch these spectacular sights through the magic of time-lapse motion pictures, taken through a high-power microscope.

John Ott is a pioneer of time-lapse photography. Today his time-lapse cameras are spying on living cells. In his basement laboratory at Winnetka, Ill., he speeds the

Ott's wife felt he spent too much time in basement lab, suggested he edit film upstairs, as shown here. He tried it two days, then moved back downstairs



passage of time a hundred-thousandfold.

Back in 1927 a 17-year-old lad bought a movie camera. First off, he decided he'd photograph the unfolding of apple blossoms on the tree in the front yard. To do the job, he figured he'd have to expose one frame of film every few minutes. Then when he projected the film the blossom would unfold before his eyes. This was to be just the opposite of slow-motion photography. He was going to speed things up.

His first try showed blossoms appearing and disappearing so fast he scarcely could see them. After several false starts he produced his first successful time-lapse sequence. On the screen, buds appeared, swelled and burst into spectacular bloom.

That was 30 years ago. The boy grew to be John Ott, Chicago banker, who puttered around taking films of his garden as a hobby. Because the time-lapse technique was new, he had to devise his own equipment, and finally succeeded in making it automatic. After any desired interval, timers would close the shutters in his greenhouse, snap on floodlights, expose one frame of film, turn off the lights and open the shutters again.

Shortly after World War II, Ott found himself with a series of time-lapse garden

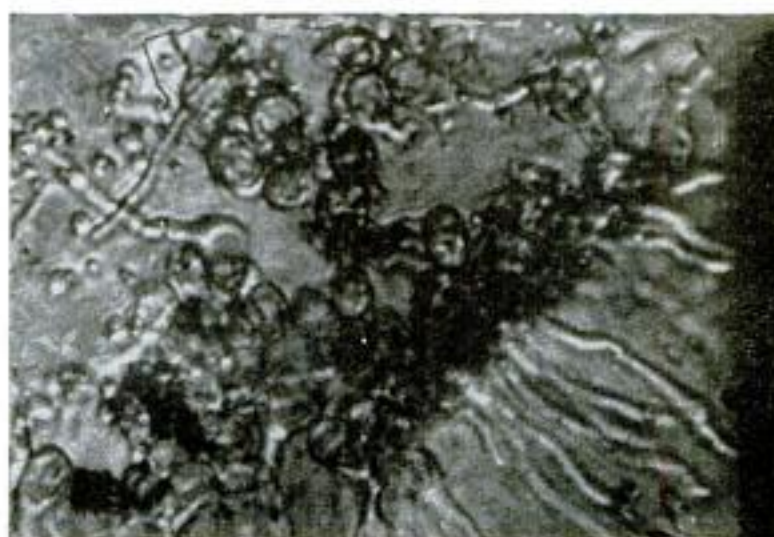
films so spectacular they'd make anyone gasp. Trouble was, few people had seen them. In 1949 one of the Chicago TV stations heard of the films and asked him to put them on the air. The reaction was immediate. So many viewers wrote letters that the station persuaded Ott to start the program, *How Does Your Garden Grow?*

The program has been televised over as many as 40 stations throughout the country.

Soon Walt Disney became interested in Ott's time-lapse films. As a result the films have appeared in the Disney movies *Secrets of Life* and *Nature's Half Acre*, and on the Disneyland television show. (Recently Ott rephotographed the blossoming of an apple tree in his yard, this time for Disney. A lad appeared in this film, too—Ott's nine-year-old boy.) Ott also has shown his films on such TV shows as *Zoo Parade*, *Today*, *The Home Show* and *Out on the Farm*.

He is a man of incredible patience. When he wanted to show the formation of a bunch of bananas on the screen, he trained 10 cameras on a banana tree for 18 months. In a recent study of ragweed he had 25 cameras focused on the ragweed plants, some of them watching the formation of pollen through microscopes.

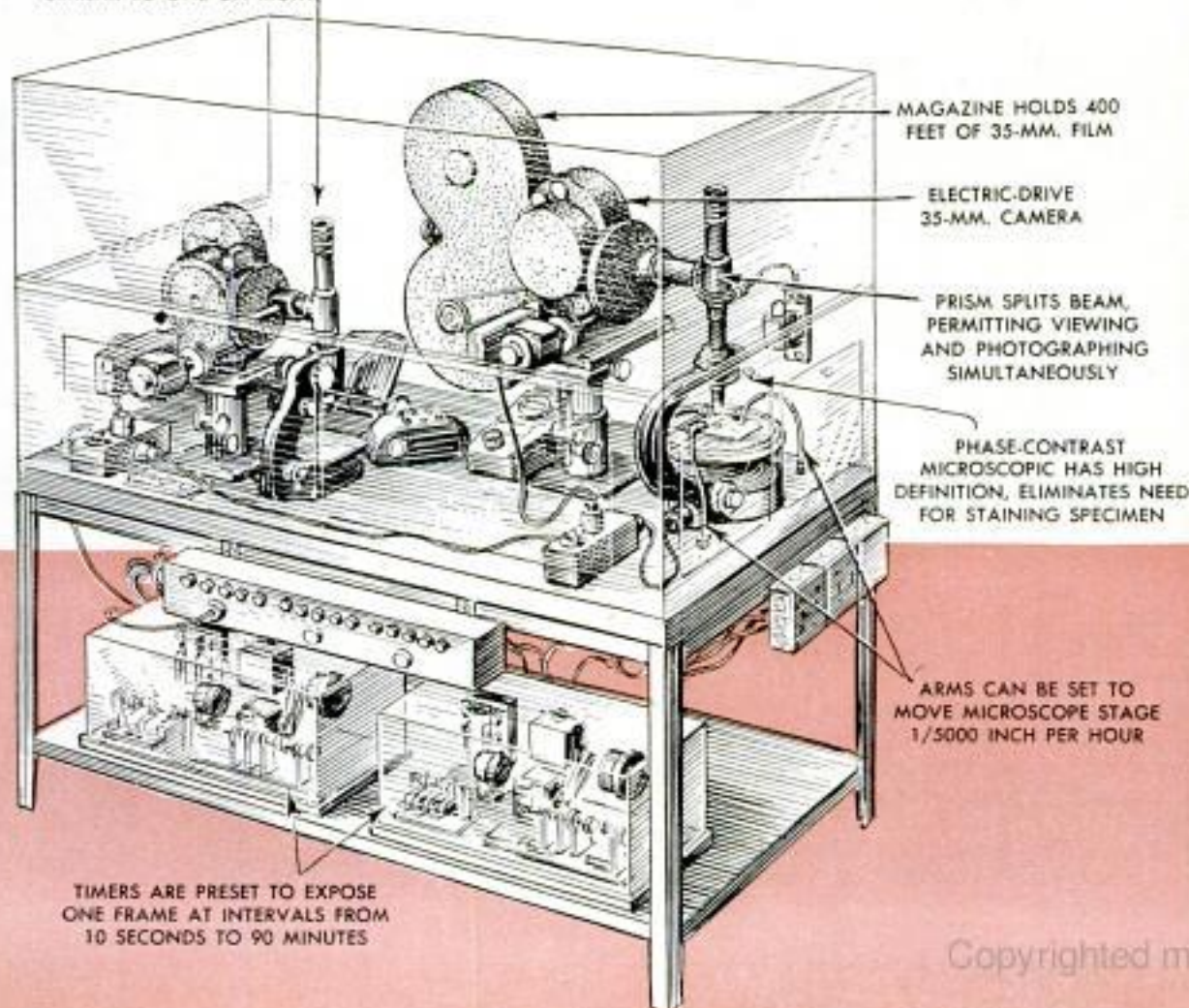
This quiet, scholarly man puttering

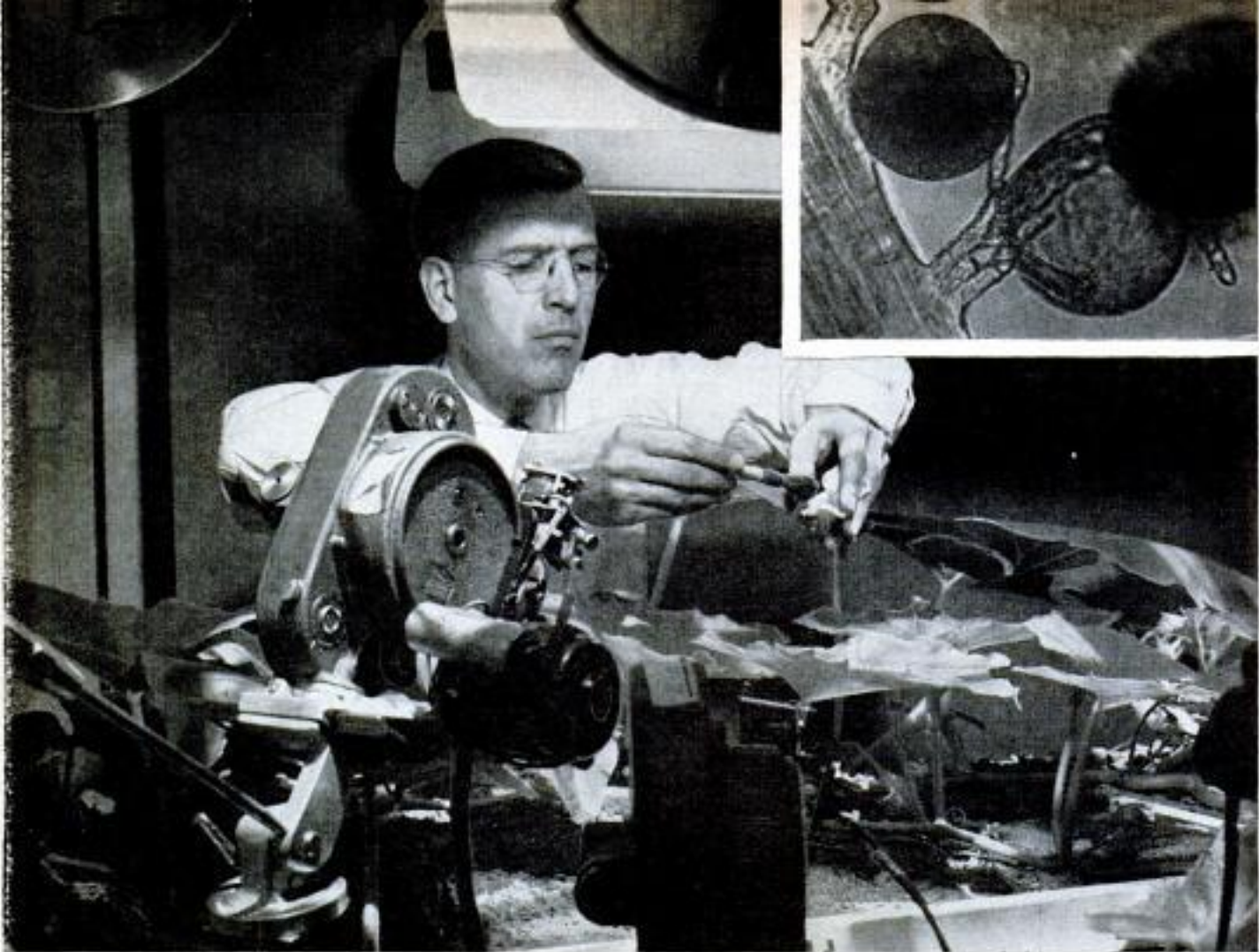


Miniature air-conditioned laboratory holds cameras and microscopes for taking films of life processes

Photos were taken from movie study of spore which causes black spot on roses. Note growth from spores

CAMERA-MICROSCOPE SETUP IS SIMILAR TO ONE ON RIGHT.





Ott dusts pollen on pumpkin flower. Inset, taken through microscope, shows tubes growing from pollen grain

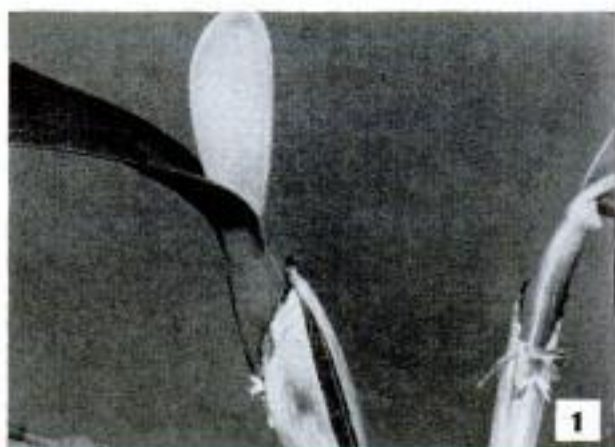
around his greenhouse appears the exact opposite of a television star or an eminently successful movie producer. Instead, he might be a soft-spoken scientist indulging in his hobby. This last impression strikes close to the mark, for Ott's latest field is science. He is a man driven by the idea that time-lapse motion pictures, taken through a high-power microscope, can reveal the secrets of vital life processes hitherto hidden from man's prying eyes.

Scientists peering through microscopes always have had difficulty in observing certain phenomena. Some activities, such as the splitting of cells, occur at unpredictable moments. Others gradually take place over a period of hours or days.

"It's like watching the hour hand of a clock," explains Ott. "You know it's moving but you can't see it move. Glance away for even five minutes, and you can observe that some movement has taken place. Yet if you watch constantly, your eye can't detect it.

"Similarly, a biologist trying to observe a vital life process often is frustrated because he can't actually watch it occur. The change is just too slow. In such a situation,

Typical time-lapse film of the type that made Ott famous shows the gradual unfolding of orchid blossom



a time-lapse movie is ideal. In minutes we can show a life process from beginning to end. We simply speed it up."

Ott has designed his own equipment to speed up life. In his miniature laboratory for science studies, a high-intensity light is focused through the microscope slide. The microscope itself is a new phase-contrast type that splits the light beam, retarding part of the light. The result is much finer definition (important to photographic work) and no need for staining the specimen. The staining process frequently kills living specimens.

A special eyepiece on the microscope permits Ott to watch the specimen at the same time a frame of the film is being exposed. The camera is a rebuilt 35-mm. Bell & Howell with electric drive. The magazine holds 400 feet of film. Whenever Ott refocuses the microscope, the camera automatically moves too. He also has installed miniature motors which will move the microscope slide at the infinitesimal speed of $\frac{1}{5000}$ inch per hour.

Heart of the time-lapse system, of course, is the timer, which can be preset to expose one frame of film automatically at any interval from 10 seconds to 90 minutes.

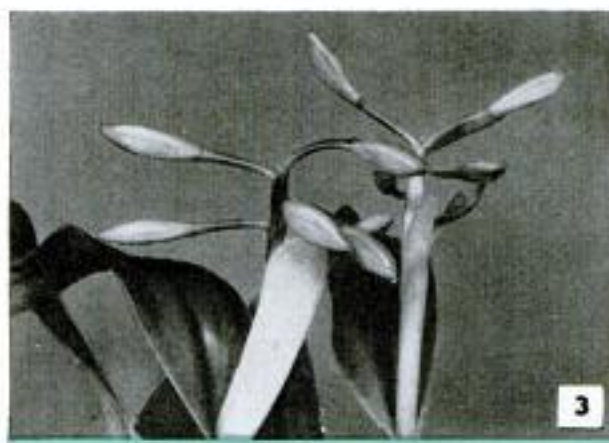
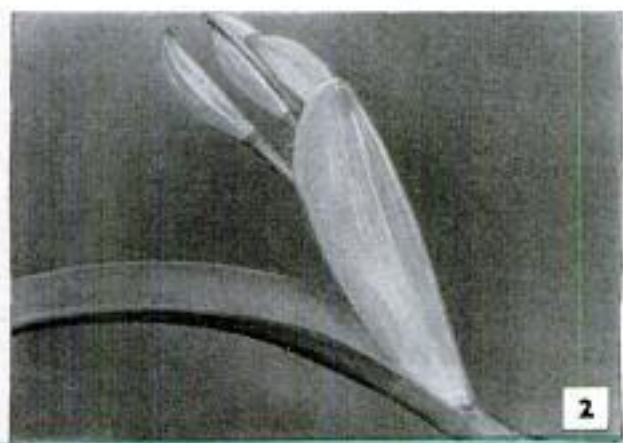
Perhaps the most spectacular of Ott's new scientific films shows individual grains of pollen fertilizing flowers. Before your eyes the grain of pollen produces a tube and

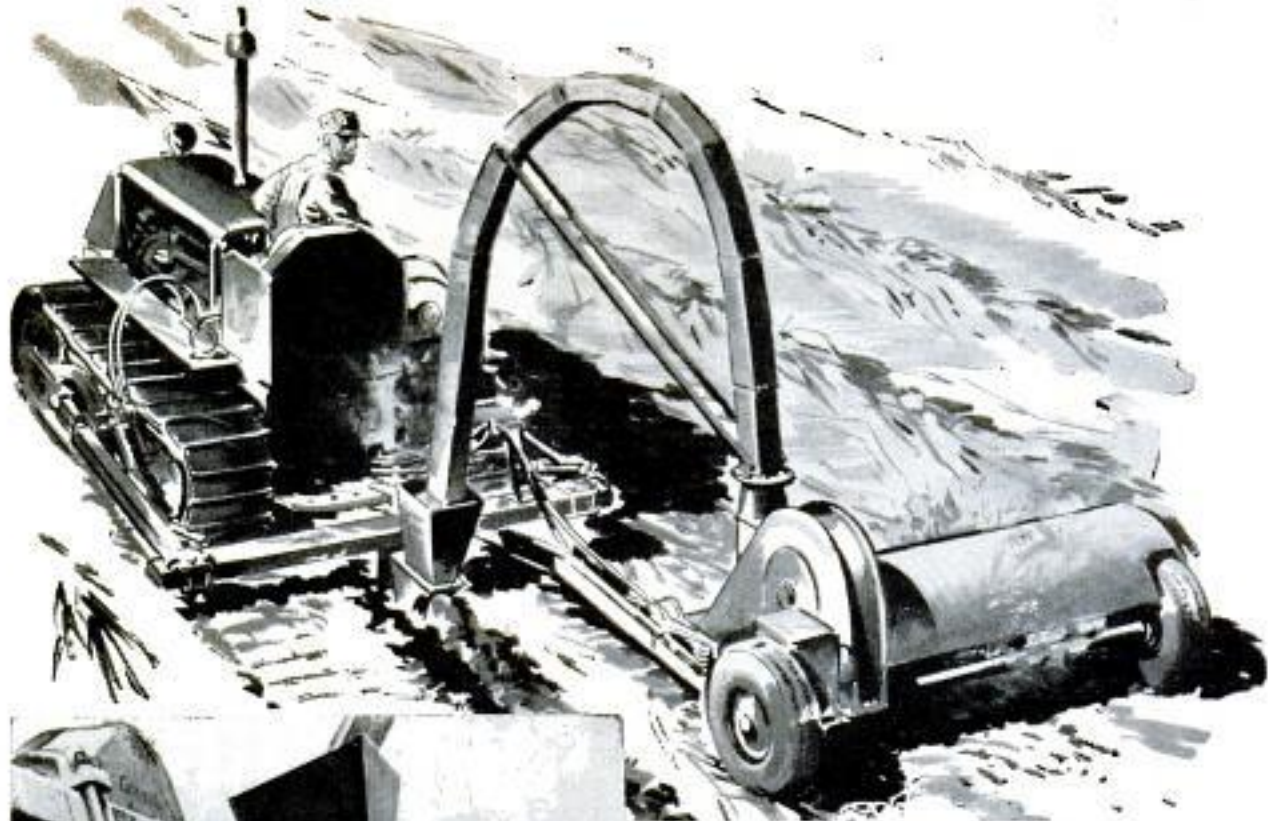
through it the contents of the pollen are discharged into the stigma. Ordinary time-lapse movies go on from there to show a pollinated pumpkin flower developing into a full-size pumpkin in 30 seconds, changing from green to bright orange.

Another time-lapse study shows the effects of ragweed pollen on humans. Across the screen move spheres of pollen. They are swimming through the nasal secretion of a person who is not allergic. Nothing happens. Then similar pollen grains appear, this time in a culture taken from a sniffing hay-fever victim. Almost immediately the pollen starts emitting tiny drops of liquid. Until this film was available there was some doubt as to whether the pollen itself changed, or whether the only change occurred in the nasal passage of the hay-fever victim. The time-lapse films prove that the ragweed pollen emits some substance. It's a film of profound significance in the study of such allergies.

Ott has become intrigued with the effect of certain wavelengths of light on plants. Light in a particular band will cause certain plants to produce flowers of only one sex. For example, a pumpkin exposed to a certain wavelength will produce all female flowers. The same plant, exposed to another wavelength, will produce all male flowers. Ott now is analyzing the effects of bands

(Continued to page 234)





"Vertical Mulching"

"Vertical mulching," a new technique in soil conservation, shows promise of increasing the water-storage capacity of the soil. In the technique, developed at Purdue University, a subsoiler opens up a channel in the soil 18 inches deep and 6½ inches wide at the surface. At the time the channel is opened, a forage harvester behind the tractor chops crop residue and blows it into the channel. Studies show that the crop residue holds the channel open to moisture penetration and prevents soil compaction for three to five years.



Power Saw Has Flexible Shaft

German woodcutters use a portable circular power saw that works at the end of a flexible shaft connected to an electric or gasoline engine on the cutter's back. Safety guides on the saw frame grip the timber, which can be five to seven inches in diameter for one cut. Two handles give the worker greater leverage.

Nylon Ship Propeller Has Longer Life

Air bubbles which develop when the screw propeller of a ship churns through the water can have a damaging effect on the mechanism. A Danish factory hopes to eliminate this problem by developing a nylon screw propeller. One of the nylon propellers is now being tested in the waters near Greenland. Besides resisting the wear of air bubbles, it is much lighter in weight.

Bowmen Collect Cones To 'Breed' Better Trees

IT'S APPROPRIATE that foresters on a large British estate use bows and arrows to help grow better trees. After all, Robin Hood's Nottingham Forest is nearby.

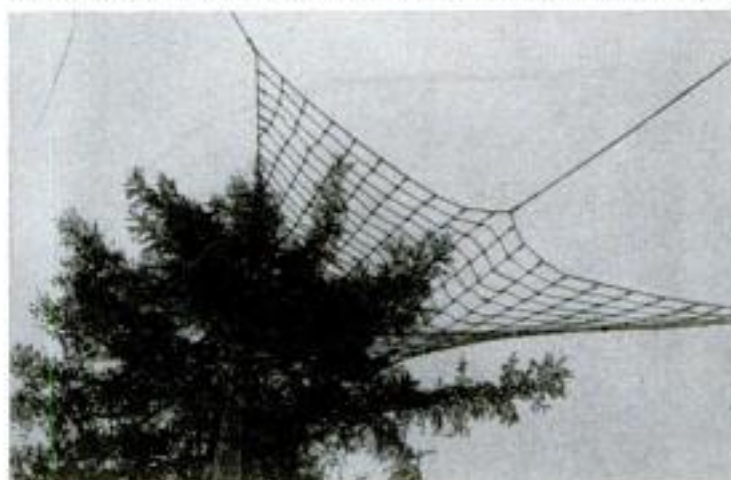
The longbows are a means of pulling ladders and rope nets high into the trees so cones can be picked for controlled plantings.

Sharpshooting foresters, anxious to improve timber quality, collect the cones from the known superior trees. If they wait until the cones fall it is difficult to tell from which tree each cone dropped.

With his bow, a forester shoots an arrow so it carries a trailing fishline over a branch high up the towering trunk. With the line as a starter, he pulls a rope over the limb and follows this with a ladder and netting. The crew then clambers around the netting, picking the cones which are cultivated to provide superior-quality seedlings.



Forester aims arrow while helper holds spinning reel to pay out the line that will pull the light rope over the branch. The rope then hauls up the ladder, shown in lower-left photo



Above, with the help of the ladder, a forester rigs the rope netting in position. Below, clambering over the net 100 feet in the air, the crew picks cones for future cultivation. The project is developing trees that produce top-quality timber





Push of Button Pulls Boat Onto Trailer

All the boater has to do to load his craft on a new trailer is push a button. The boat then glides out of the water and onto the trailer, pulled by an electric winch. The winch is powered by a low-amperage motor which connects to the electrical system of

the car. Available on one new make of trailer, the winch also can be installed on any other make or model and uses either a six or twelve-volt system. The winch is available in three capacities, to handle boats up to 1000, 1600 and 2000 pounds.

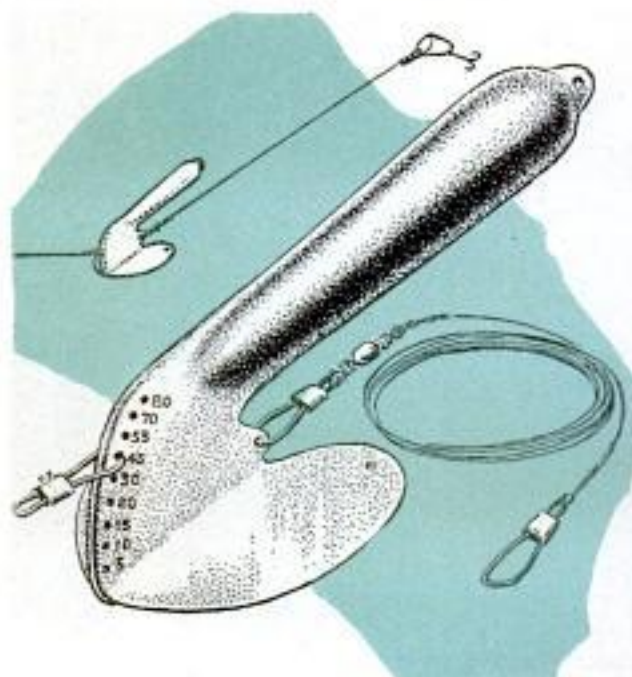
Shot Dispenser

Shot can quickly be installed on a fishline with the aid of a new plastic dispenser. The case holds a supply of 3/0 split shot. The fisherman simply dials a shot into position in a feeder slot, inserts the line and presses a plunger.



Depth Regulator for Trolling

Anglers can troll at any level with a new depth regulator on the line a few feet ahead of the lure. Fins on the regulator cause the lure to run deep or shallow, depending upon how the line is attached. The regulator floats when it is not in motion.



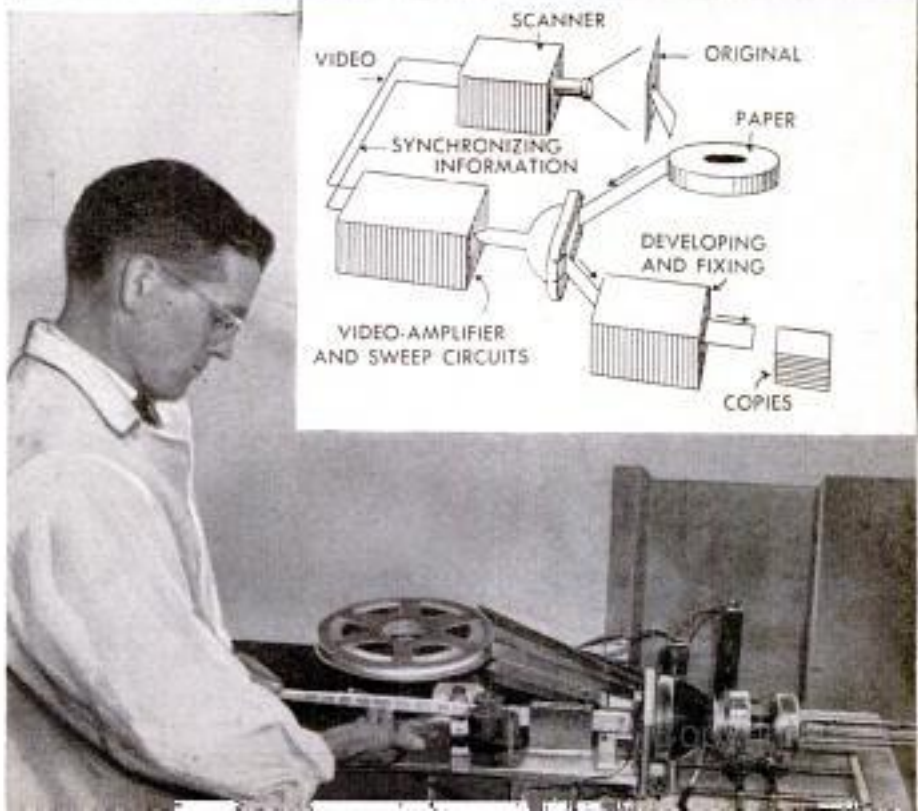
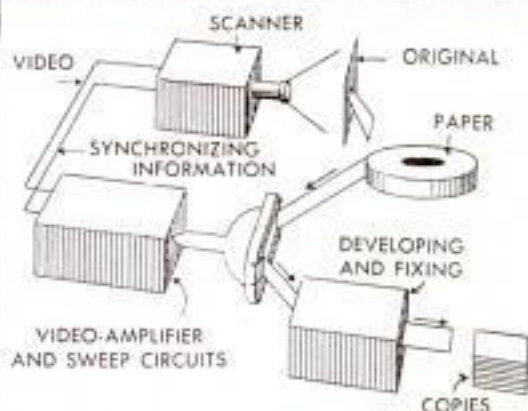
"Village Smithy" Travels Highways

Working out of a well-equipped, $\frac{3}{4}$ -ton truck, traveling blacksmith J. W. Burton and his helper, Jerry Kardas, have shod hundreds of horses in southern California in the past four years. These men use stock shoes for ordinary jobs and make special shoes for saddle, gaited and harness horses and polo ponies. Horse-shoes weigh from $2\frac{1}{2}$ ounces each for a thoroughbred to four pounds per shoe for a Tennessee walking horse. The "firm's" equipment includes a 25-pound trip-hammer for roughing out shoes; a forge that can be manually or electrically driven, burning blacksmithing coal, to heat a shoe red-hot in two minutes, drill press and anvil. A portable emery wheel folds out over one side of the truck to grind and polish shoes and to make nippers for trimming hooves. A portable acetylene-welding outfit is used to braze shoes and puts borium facing on parade shoes to prevent slipping.



High-Speed TV Office Duplicator

Closed-circuit TV may become standard in office equipment used for high-speed, multiple duplication of communications. Test models now can reproduce 17,000 characters of elite type per second—equal to three $8\frac{1}{2}$ by 11-inch sheets of paper. This electronic system consists of a transmitter-printer unit designed to occupy the same amount of office space as do current duplicating machines. Copies are printed directly from original documents (see photo right).



The Bus that Grew Into a Fire Truck

By Joe Van Wormer



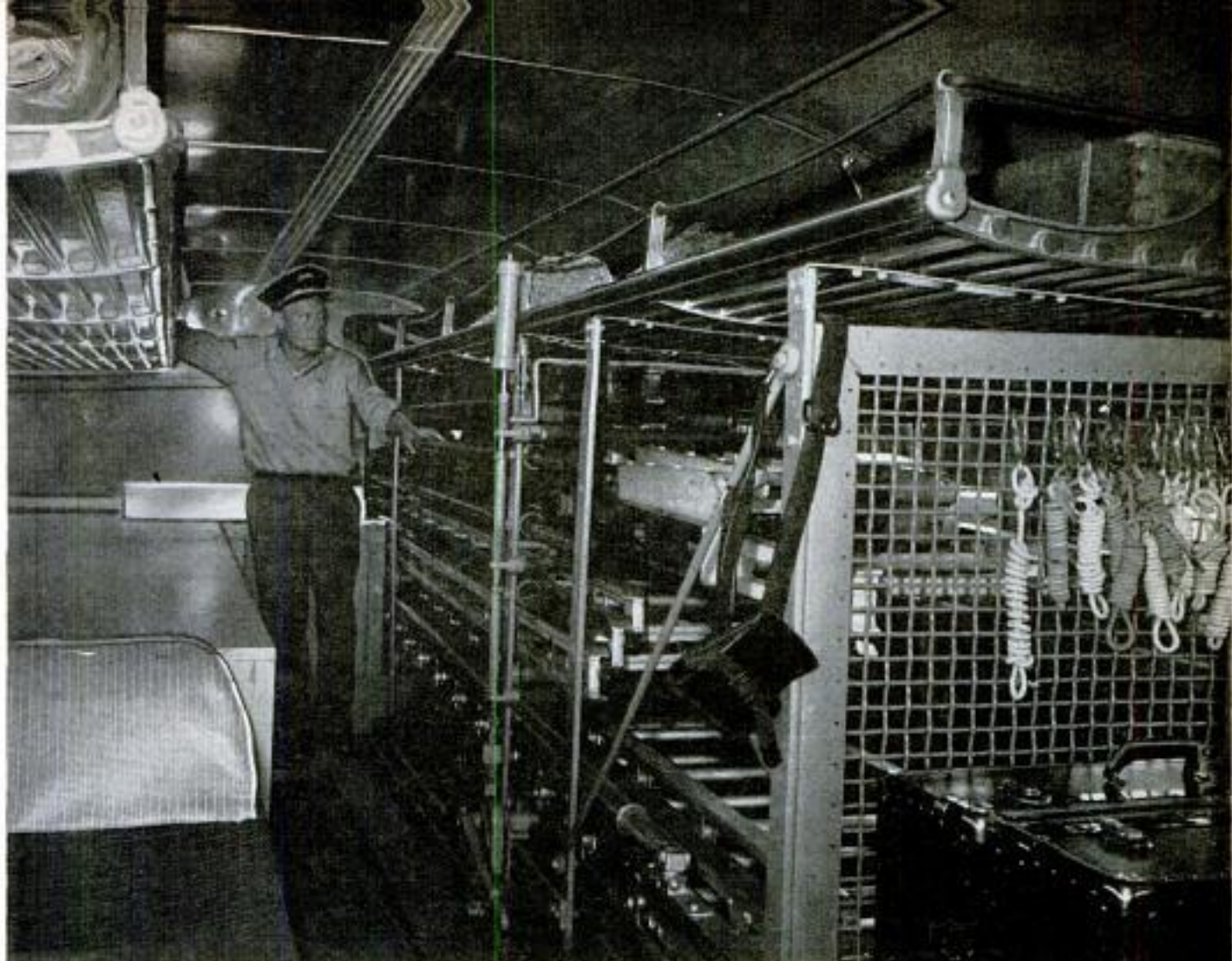
Members of Bend, Ore., fire department used their spare time to convert a bus into this fire truck

WHEN THE FIRE DEPARTMENT of Bend, Ore., needed a new emergency unit, city officials decided to shop around for the best bargain they could get for their tax dollars. They heard that Pacific Trailways, an intercity bus company, planned to sell a 25-passenger bus that had seen more than a million miles of travel but had been completely overhauled. The city made a deal at a nominal figure and acquired a bus which grew into a full-fledged fire-fighting unit.

The Bend fire department has 16 paid employees and 35 volunteer firemen. The paid firemen did the conversion work in their spare time and within two months had the unit, known as the "City Service Truck," in operation. The exterior of the

All this fits neatly inside the former bus: 1. 24-foot ladder; 2. 12-foot roof ladder; 3. 35-foot ladder; 4. Resuscitator and inhalator; 5. Smoke masks; 6. Light plants; 7. Salvage kit; 8. Sawdust; 9. Exhaust fans; 10. Salvage tubs; 11. 45-foot ladder; 12. Electric cords; 13. Picks and axes; 14. Mops; 15. Cellar nozzle; 16. Power saw; 17. Tarpaulins; 18. Hand tools; 19. Life belts; 20. Lights





Seven ladders, ranging from 45-foot extension set down to 12-foot roofer, can be rolled out back door

bus was given a coat of bright-red paint. Ladder racks were built along the left side of the interior so the ladders could be unloaded through a rear door. Toughest part of the project was making new doors where the thin metal skin of the bus had to be framed and braced. The conversion was planned so that nearly all the equipment would be accessible from the outside of the unit.

Visiting firemen are startled by the amazing amount of equipment regularly carried in the former bus. All of it is vital in modern fire-fighting techniques. Seven ladders on roller racks range from a small, 12-foot roofer to a 45-foot aluminum extension set. Two gasoline-powered electric plants with enough wire and floodlights to illuminate a sizable area are carried in the luggage compartment. Also included as standard equipment are smoke blowers, self-contained air masks, resuscitator and inhalator, first-aid kit, tarpaulin salvage covers, axes, shovels, saws, mops, brooms, buckets, tubs and other salvage equipment.

Except for a public-address speaker, siren and flashing red light on the front, the outside of the vehicle still looks like a bus. But inside, it's as well-equipped as a modern emergency unit can be. ★ ★ ★

Once a luggage compartment, now storage space for two portable electric generators, wires and lights



Detroit Listening Post



By Art Railton

IF YOU HAVE ONE, don't sell it. It will soon be a collector's item.

The proud, dignified, undeniably handsome Continental Mark II is gone to wherever fine cars go when they die. And those that remain will, no doubt, be much sought after by the car collectors of tomorrow.

It just didn't come off. Why? That is a question certain to be pondered for years.

Death was not due to any lack of publicity. No car was given more lavish press notices. It couldn't be the price, because many buyers spend \$4000 for medium-price cars these days. And when workers buy \$4000 cars, certainly top executives can afford \$10,000.

Perhaps the error was in too much emphasis on "dignity" and not enough on "sell." Or maybe it was in looking backward, not forward.

So now the 1958 Lincoln (which will be all-new and beautiful) is to have a Continental series as its top line. There will be enough of the Mark II in the new design so you can tell it is a legitimate descendant, but the custom-built Continental concept is gone. The 1958 Continental will be just another Lincoln, and fine as that is, it's no hand-rubbed Mark II.

The Continental will have a four-door hardtop among several body styles. It will be of unit construction as will all Lincolns. Rumor has it that the Continental series will be made to look different from other Lincolns by lengthening the hood. With unit construction, it is said to be possible to vary the relative proportion of the hood-to-greenhouse-to-rear-deck without great expense or complication. This may be the basis of a combined Lincoln-Continental design. Incidentally, it would seem that the "Mark" designation would have to go also. From 1958 on, it will probably be designated by the model year like more earthy machinery.

For Transportation Only

Studebaker-Packard (or is it Curtiss-Wright?) says it will soon have an "econ-

omy" car for under \$1800, including heater and turn signals. This car will be out much earlier than the regular 1958 line (in fact, it might even be out by the time you read this). But it will not be the all-new small car that early reports suggested. There isn't time or money enough for that.

It appears likely that this economy car will be a modified Studebaker Champion with certain cost-reducing differences. It may be that S-P hopes to build it for years without annual changes. It would become a car sold strictly for transportation—something a loud minority has been demanding. It will be interesting to see if the loud minority will back up its demands with money.

It would seem that the car will have to use the current Studebaker frame and shell and much of the current sheet metal. There are to be three body styles: A two-door, a four-door and a station wagon (the wagon, presumably a two-door, will sell for just under \$2000).

The theory may be that if the car sells steadily in small volume, it will be possible to cut the price to attract even more buyers in the years ahead. This, then, would put it in direct competition with the small foreign cars like Volkswagen and Renault which sell for around \$1600. All this activity, of course, would be separate from the main line of Studebaker-Packard cars which will continue with annual style changes.

Stretch It, Please

This year's Caddy owners are a bit unhappy about the shorter look of the 1957 car (although they are still lining up to buy it). The division senses this, of course, and is expected to stretch out the 1958 trunk. After all, when you buy the most expensive car, you want it to look big!

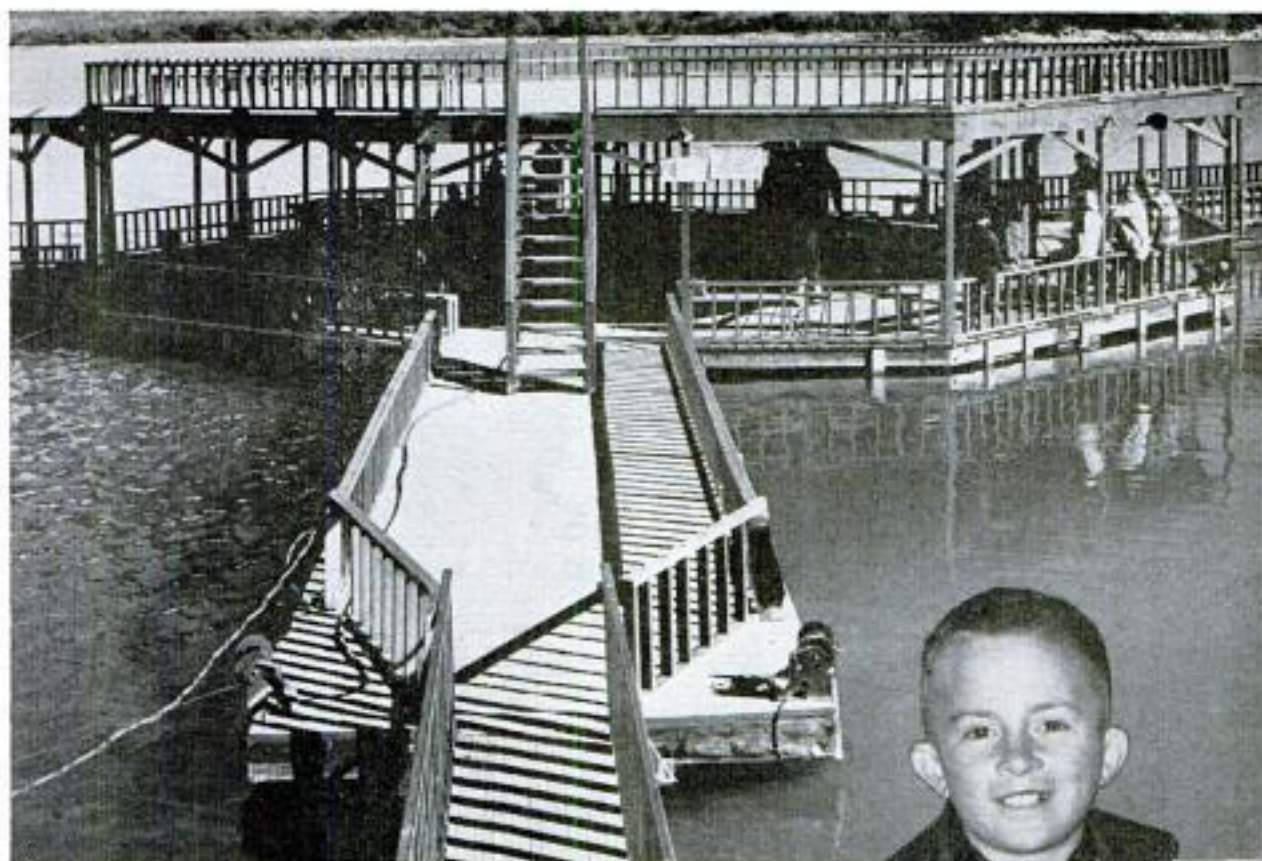
Cadillac and all GM cars are expected to offer air suspension in 1958. The corporation is going with it all the way, even down to the Chevy, rumors say. The experience with the air suspension on the Eldorado has been most encouraging.

Ford, too, is expected to have air suspension in all its divisions. American Motors may have it as an option. Chrysler seems certain to stick with torsion bars.

American Motors reportedly is in good shape for air suspension because its high-level pockets for the present four coil springs are ready-made to take air springs.

Nonslip rear axles will be common in the industry in 1958. They, plus fuel injection, will give companies like Chrysler something to shout about in a year of minor styling changes.

The British Ford is going after the U.S. market in a big way. It plans to sell 20,000 cars here this year. Look out, VW! ★ ★ ★

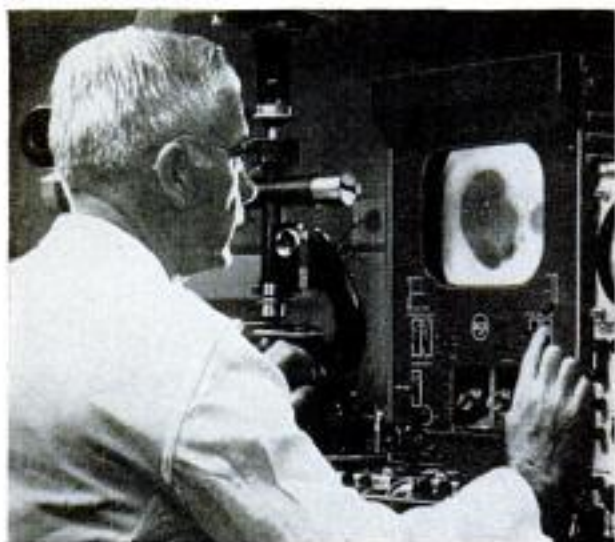


“Armchair” Fishing Dock

MANY FISHERMEN on Lake Buchanan, Tex., angle from an eight-sided, 100-foot-wide covered platform that floats in waters 10 to 25 feet deep. “Wells” are cut into the platform to accommodate several fishermen at a time. Anglers may fish from the sides or from one of two covered piers extending from the central “dock.” The owner baits the waters with alfalfa, corn and fish entrails from the cleaning block on the platform.

Entrails of cleaned fish are swept from cleaning block to water



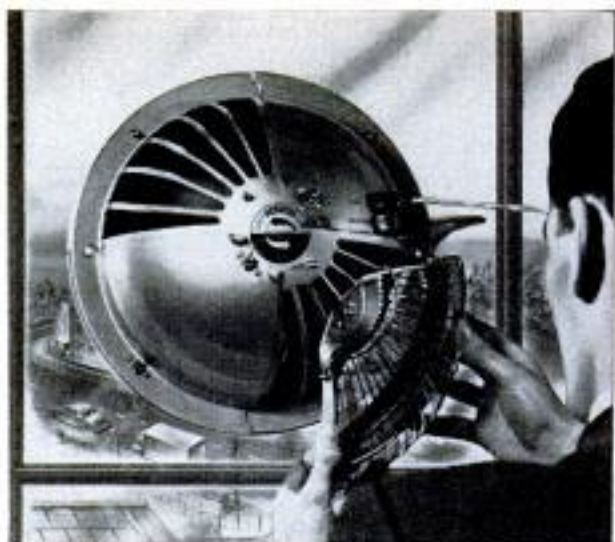


TV Aids Study of Cancer Cells

Closed-circuit TV enables cancer researchers to observe and take motion pictures simultaneously of chemical activity in living cells, making rapid diagnosis possible. Ultraviolet light is focused on a specimen under a microscope. A TV camera transmits the cell image to a TV monitor unit and an oscilloscope. Scientists then photograph internal cell activity.

Superstrong Magnet "Defies" Microscope

Iron particles small enough to be invisible under a conventional microscope are basic elements in a new superstrong magnet. By controlling size and shape of individual particles, this magnet can be made 10 times stronger than existing magnets. It can be molded in unusual shapes (see Christmas tree below) for various uses ranging from toys to aircraft instruments.

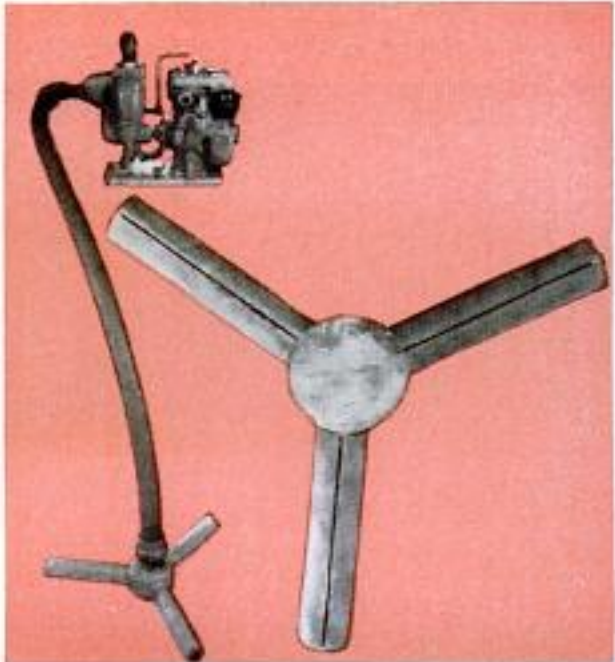


Two-Way Fan Eliminates Drafts

Drawing out stale air and blowing in fresh air in equal volumes, a new two-way ventilating fan eliminates drafts. Air change is 4140 cubic feet per hour. To warm fresh air, a one-kilowatt heater can be attached to the fan grille. A glass-fiber pad can be inserted to filter incoming air. An inner horizontal baffle separates pairs of inlet and outlet quadrants on the fan.

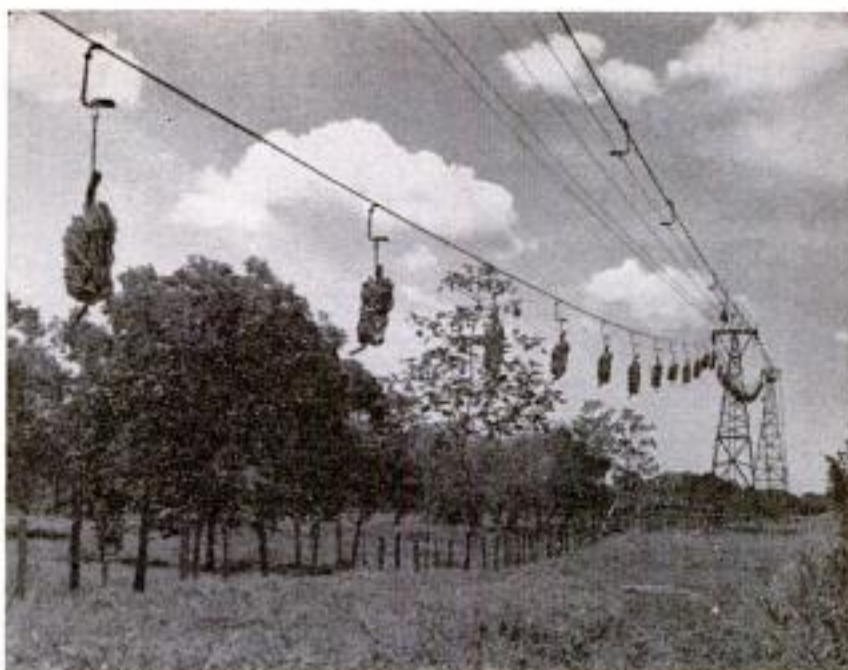
Floor Drainer Covers Wider Area

Through slits designed to draw water from a wide surface area, a new drainer is able to pick up liquid waste missed by conventional drainers. This drainer prevents an air cavity from forming. Pumping continues until all water is removed from flooded sections. Weighing five pounds, the drainer is heavy cast aluminum and can be attached to 1½ or 2-inch suction hose.



"Flying" Bananas Start to Market

"Airborne" cable systems enable Costa Rican plantation workers to move bananas to railroad shipping centers before shipment of the fruit to U.S. markets. Length of these conveyor assemblies varies from 5000 to 28,000 feet. Depending on terrain, the bunches move at 180 to 200 feet per minute along systems involving 51 to 191 towers which extend 16 to 80 feet in height. Cable carriers, in addition to moving fruit, are also used in the washing of bananas.



U.S. Bomber Air-to-Surface Missile Is "Rascal"



GAM-63 Rascal air-to-surface guided missile is supersonic rocket weapon used by long-range U.S. bombers. It could be used as a nuclear weapon

Jalopy Graveyard Grows in New York

Scrap-iron output for the U.S. will increase several thousand tons as a result of New York State's compulsory insurance laws. This legislation has driven many worn-out cars from the highways to the junk heap of Academy Auto Wreckers, a private firm. Stripped of radios, heaters and other usable gear, the car bodies wait for shipment to a smelter, where they are melted into scrap iron. Eventually, this iron may find its way into the chassis and other parts of new cars.





Closed-circuit television shows traveler Pullman space available when clerk dials train's code number

Buy Your Railroad Tickets by TV

By Creighton Peet

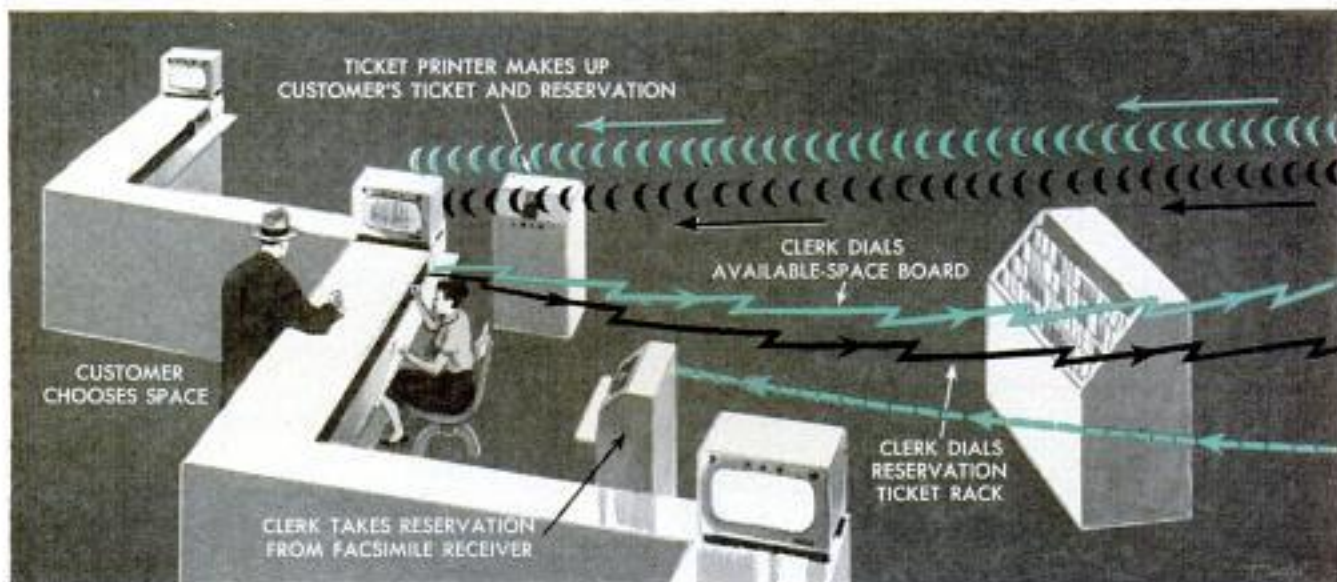
RAIL TRAVELERS are selecting Pullman space from television screens in New York's Pennsylvania Station. Batteries of electronic brains sort information about available space and transmit it with lightning speed to the customer via closed-circuit TV.

The Pennsylvania's \$900,000 system uses a dazzling array of humming instruments—105 television cameras and 101 receivers, 41 automatic ticket printers, 65 facsimile machines and 72 Telautograph units. Many of the TV receivers are on the ticket-selling

counters where the prospective passenger can see for himself what Pullman or coach space on a particular train has already been sold. With 5183 seats available on cross-country trains leaving the station each day, it's expected that this installation will save vast amounts of time.

Here's how it works. Suppose you want a lower berth on a train leaving tomorrow evening for Chicago. You tell a clerk at a zigzag counter that fills most of one side of the concourse. He dials a couple of numbers on a spin dial in front of him. Immediately,

Here's how electronic circuits in New York's Pennsylvania Station transmit information and speed sales



the TV screen on the counter flashes a view (from camera A in diagram) of the "availability board." It looks like a timetable. The clerk runs his fingers along one column and reports, "Sorry, no more lowers on that train . . . but there are still some on the train an hour earlier . . . and the train following." In some cases, availability boards may be consulted as much as 16 weeks in advance.

When you have selected a train with the space you want, the clerk dials another two-digit number. Now the TV screen shows the rack (camera B in diagram) where coupons for the reserved space on the train are stored in slots, like theater tickets. In this TV picture, you also see the clerk servicing the coupon rack. He can talk to the ticket seller by a two-way intercom system. The proper coupon is pulled from its slot in the rack and placed in a facsimile machine.

In about seven seconds, a reproduction of this coupon is transmitted to another machine, a few feet from where you are waiting. The slip of gray paper on which all the reservation data has been "burned" electronically is now your ticket for the space you ordered.

Meanwhile, the ticket seller has pulled a 10-inch-long matrix—something like an Addressograph plate fastened to a long strip of metal—out of a nearby rack. It is inserted in a ticket-printing machine which instantly prints the required transportation ticket and

(Continued to page 226)

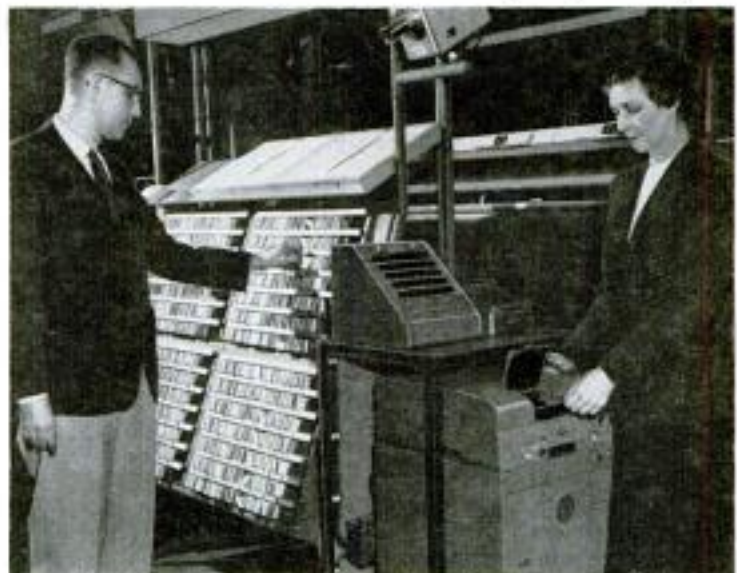
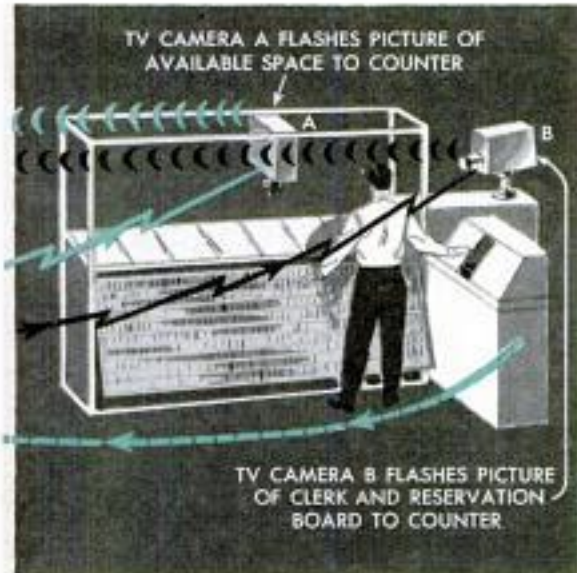


Battery of telephone sales clerks uses same TV facilities to handle orders of travelers calling from their home or office



Desk-on-wheels unit keeps clerk within reach of thousands of coupons representing space sold and reservations canceled

Facsimile machine, below, transmits reservation to ticket counter in seven seconds. Rack holds 500,000 space coupons





Harvesting unit moves through field until trailer is filled. Below, conveyor then unloads trailer into truck



Train of Equipment Harvests Forage on Cattle Ranches

Western ranchers are using a train of equipment as a unit to harvest green chopped forage and grass silage. First comes a self-powered, pusher-type mower, then a chopper and blower and finally a self-unloading grass trailer. The operator sits high beside the engine that furnishes

power for the entire rig. The trailer has slanting sides which tend to deposit grass in the center. When a truck draws up behind the trailer, a chain and bar conveyor moves the grass up and out of the trailer and transfers it to the truck. The trailer has a capacity of four tons.



"Iron Lung" on Wheelchair Goes With Patient

Thanks to a new portable "lung," some polio victims and other patients who require mechanical respirators now can attend the theater or go shopping. The patient sits in a wheelchair wearing the respirator, which fits snugly around the chest. The mechanism, which is battery-operated and about the size of a small suitcase, is installed beneath the seat of the wheelchair. The apparatus replaces an "iron lung" about the size of a large home freezer. With the aid of a nurse or attendant, the patient can leave the hospital or home and once more go on shopping trips or visit theaters and other places of entertainment.



Special Carriers Move Huge Girders

Prestressed concrete girders about 102 feet long, 11 feet high and each weighing 72 tons will be carried 30 miles to a building site. Master beam carriers have been designed to move them. Each girder is supported at either end above the carrier. Forty-two tires at each end help support the load.

He Fishes in Comfort

Ice fishing causes no hardships to Forest Throe of Burlington, Wis. Throe bought an old car and cut two holes under the back seat. When he arrives at the lake he chops holes in the ice, backs the car over them, removes the seat and fishes in comfort.

Tiny Bus Carries Five

Four children and a driver travel 20 miles per hour in a miniature bus, made by oil-company employees in the Persian Gulf. The vehicle has a 150-cubic-centimeter Piaggio engine and a four-speed gearbox with chain drive. The brake is hydraulic.





Huge "Docks" Shelter B-52 Bombers Undergoing Repairs

Portable "docks," costing \$170,000 each, now are being used at Castle Air Force Base, Calif., to cover B-52 intercontinental bombers on which repairs are made. Individual docks are 190 feet long and 60 feet

wide. The electrical power available at a dock is sufficient to light one full city block. Each dock weighs 350,000 pounds and can be broken into seven numbered sections for relocation.

Fight Atomic Fires With Special Gear

Firemen in Detroit, which has 55 plants and labs using atomic materials, now have special gear for fires involving radioactive materials: Geiger counter, self-contained oxygen mask, ionization tester, dosimeter and a transistorized Handie-Talkie set.

Homemade Flame Thrower Thaws Rail Switches

Frozen switches on a German railway are thawed with a flame thrower made from an insecticide sprayer, two-horse-power motor and ignited diesel oil. Fire spurts four feet at 950 degrees C. The unit uses $3\frac{1}{4}$ gallons of fuel hourly.





Sluice gates in proposed dam allow waters of rising tide to rush into river basin. Dam is 2100 feet long

France Is Harnessing the Tides

By R. N. Hadden

Drawings by G. H. Davis

WITHIN THE NEXT DECADE, the world's first tidal-power station will start to supply electrical power to the people of France, thus realizing one of man's oldest dreams—harnessing the sea.

Plans for this huge power station are well advanced. It will be built on the estuary of the river Rance, where twice every day the tide rises and falls between 7 and 41 feet. When this power station is completed it will produce about 800,000,000 kilowatt hours a year, according to the French engineers who have been working on the project.

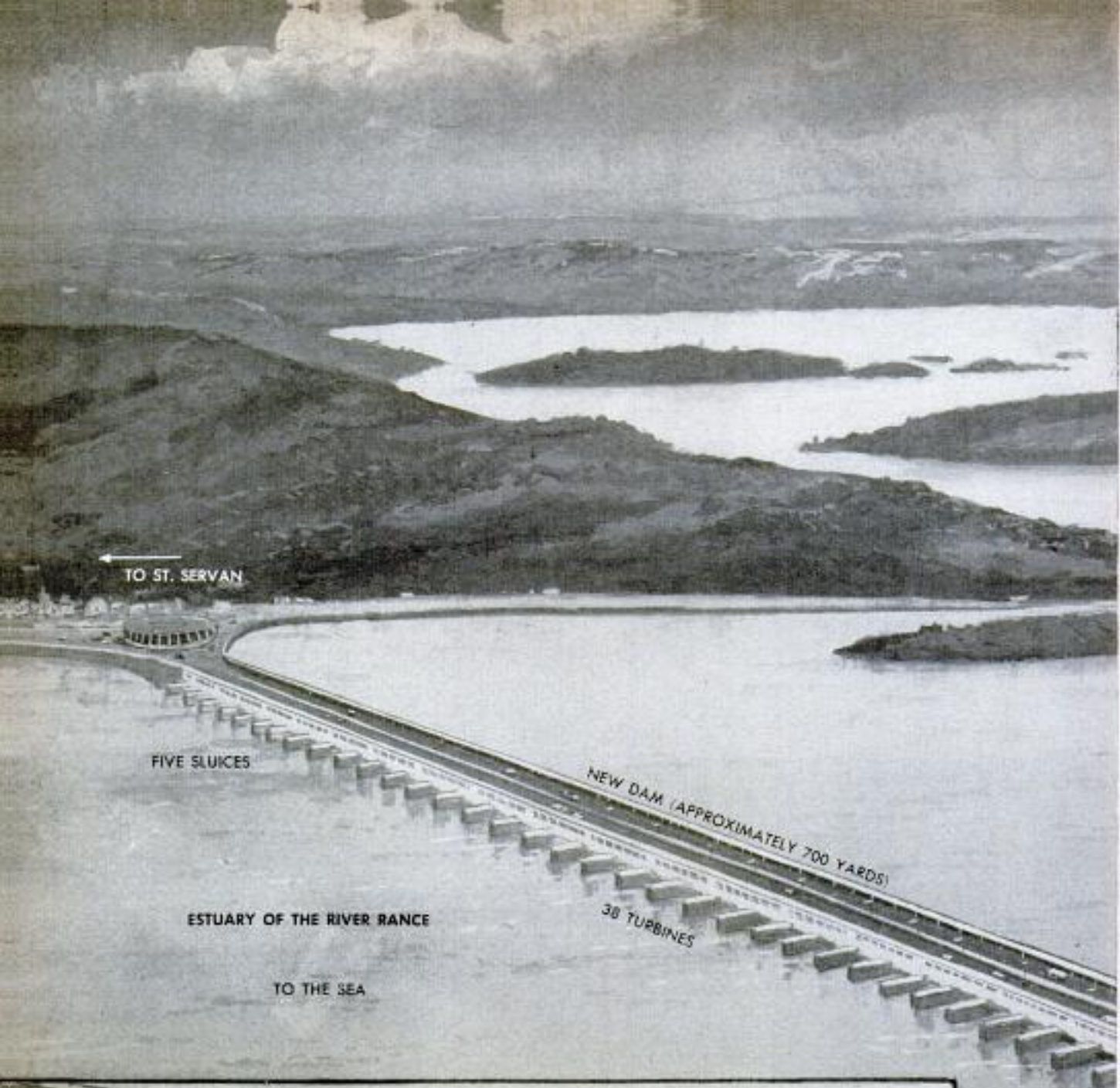
How will this power station derive its energy from the tides? Simply by capturing the water behind the dam at high tide and then releasing it to turn the turbines. However, this is not quite as simple as it sounds as is evidenced by the diagrams on page 88.

The dam will be constructed across the estuary at a point where the distance from shore to shore is 700 yards. Turbines and generators will be located within the dam which will be 150 feet wide at the base. Giant sluice gates will be about 27,000 square feet in area.

JUNE 1957

BUILT BY:
ELECTRICITE DE FRANCE
65 RUE DU FAUBOURG — ST. MARC
PARIS SE, FRANCE

85



TO ST. SERVAN

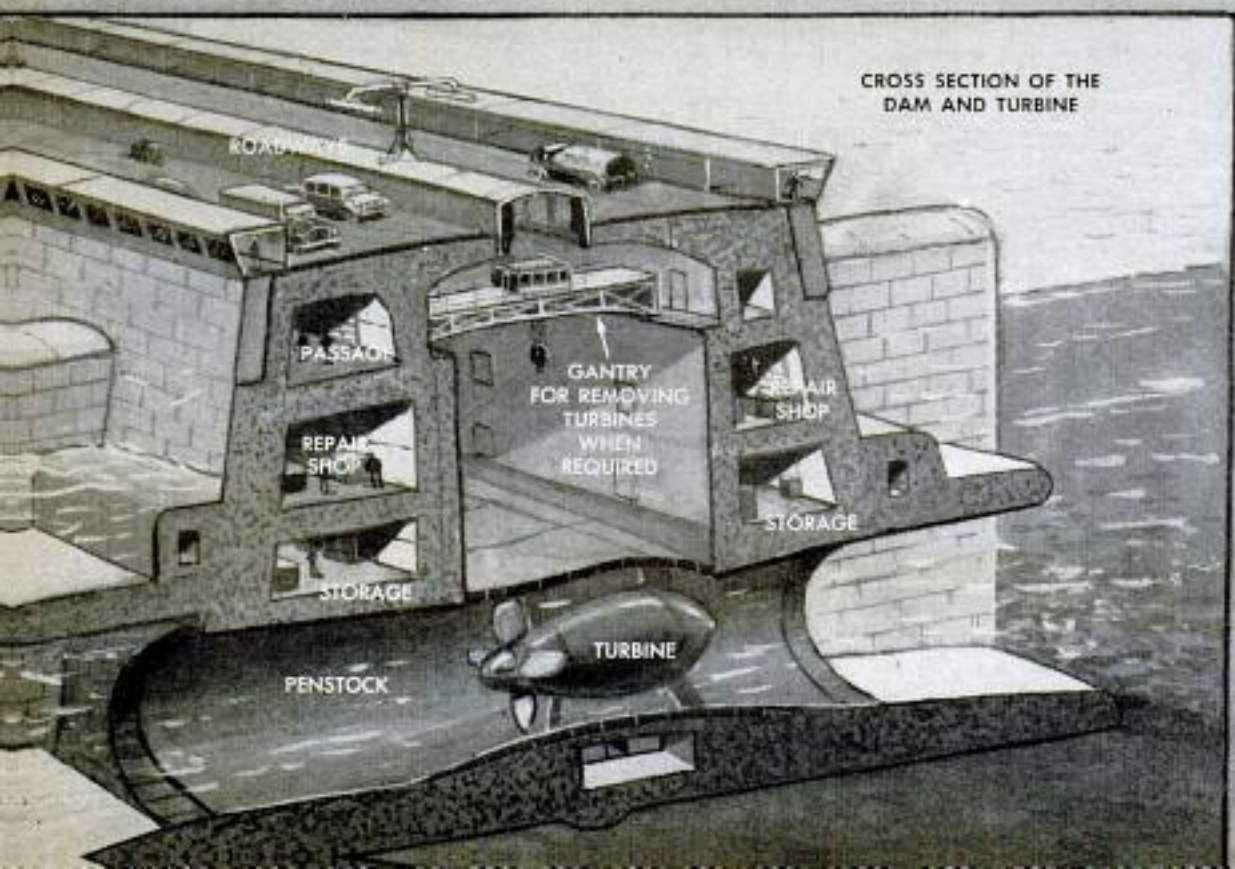
FIVE SLUICES

ESTUARY OF THE RIVER RANCE

TO THE SEA

NEW DAM (APPROXIMATELY 700 YARDS)

38 TURBINES



CROSS SECTION OF THE DAM AND TURBINE

ROADWAY

PASSAGE

REPAIR SHOP

STORAGE

PENSTOCK

GANTRY FOR REMOVING TURBINES WHEN REQUIRED

TURBINE

STORAGE

REPAIR SHOP



RIVER RANCE

RIVER RANCE
(SERVING AS BASIN)

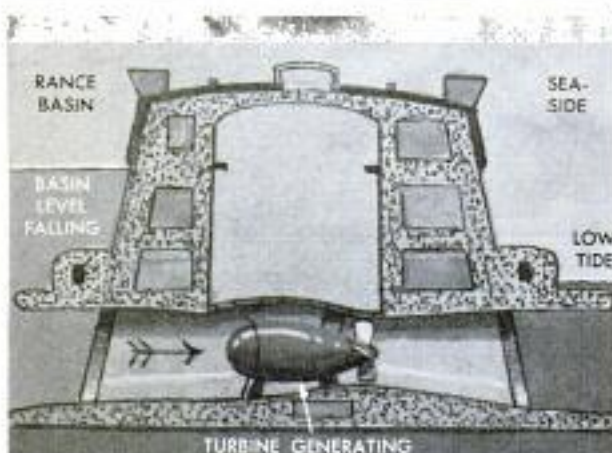
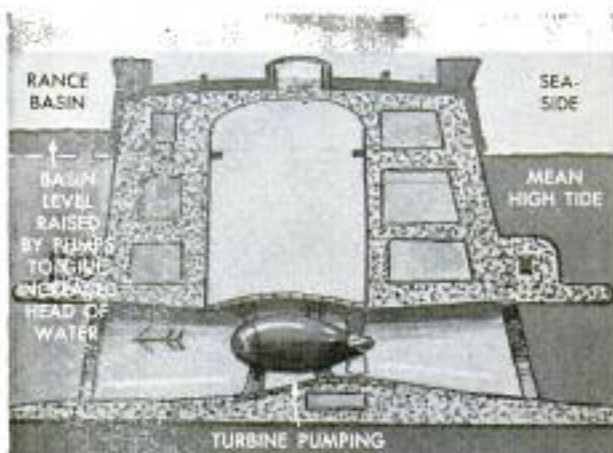
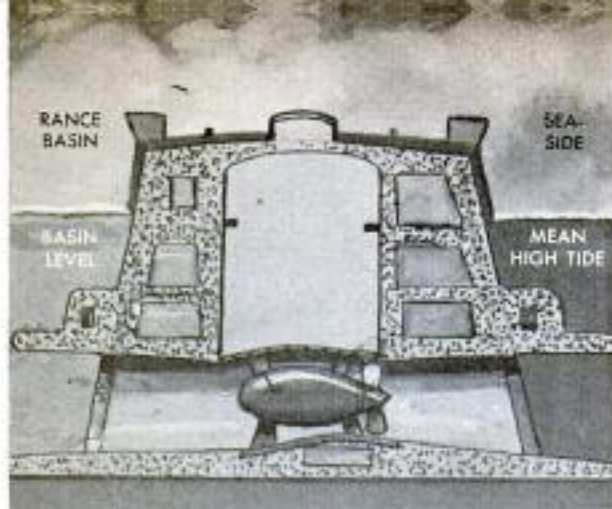
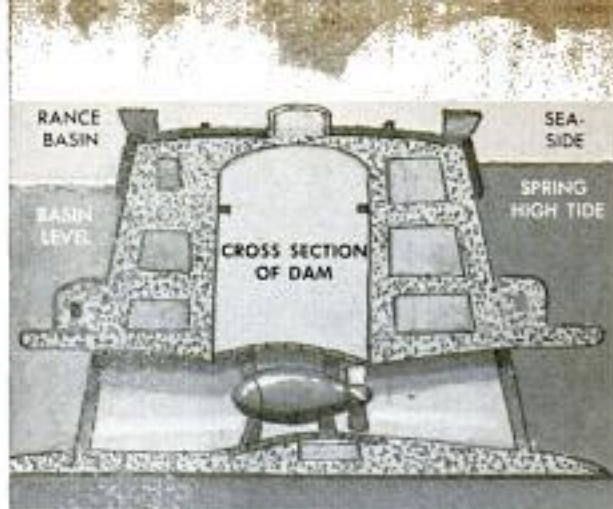
FIVE SLICES

RAISING
BRIDGE

LOCK ARRANGED
TO ALLOW SMALL
VESSELS AND FISHING
CRAFT TO PASS AT
CERTAIN PERIODS

NEW ROAD

G. JAMES
FRANCO
1837



Drawings show how the dam operates with respect to river and seaside water levels. Turbine also pumps

This is how the tidal "harness" will operate: Shortly after low water the sluice gates will be opened. When the tide rises, water will rush through the gates and fill the channel above the dam. When the channel has been filled the sluice gates will be shut. The turbines will then be started up in reverse to act as pumps, the generators serving as motors. The power taken for this operation will be obtained from France's existing electrical network. More water will be pumped from the sea into the channel above the dam.

When the difference in level between the water behind the dam and the falling tide has increased to four feet, the pumping will be stopped. Three hours after high tide the turbines will again be started up, but this time to run as turbines. Electricity will then be fed into the country's power network. The turbines will continue to run until just after low tide when the levels below and above the dam will again be equal. The cycle will then be repeated, electricity being produced for 10 hours in every day.

The reason for the pumping operation may not be quite obvious at first. It has, however, been found from model tests, that the small amount of power absorbed in pumping, when the difference in water level is small, produces a much greater quantity of power when the same water flows through the turbines under a higher head caused by the falling tide. In other

words, a small investment brings big dividends.

There is one apparent drawback to a tidal-power station if operated in this manner—its intermittent operation. This will not be a great difficulty in connection with the Rance plant because it will run in conjunction with a hydroelectric station. While the tidal station is shut down, the hydrostation will be running at a rate that would exhaust its water reservoir if its operation were to be continuous. When the tidal station is running, the hydrostation will be shut down—thus allowing water to accumulate in its reservoir.

The power station itself will be housed in a tunnel inside the dam. In order to preserve the beauty of the Breton vacation area, the top of the dam will be only a few feet above level of highest tides.

Several complex plans for the type and arrangement of turbines best suited to the situation have been considered and discarded by France's National Electricity Company. The present approved scheme calls for horizontal-axis turbines. This type permits using the units either as turbines or pumps. This offers many opportunities for choosing the best levels for greatest efficiency in operation.

The big advantage of a tidal-power station is that come what may, drought or fuel shortage, it will never lack water for its operation. Engineers say it will take about eight years to build the dam. ★ ★ ★

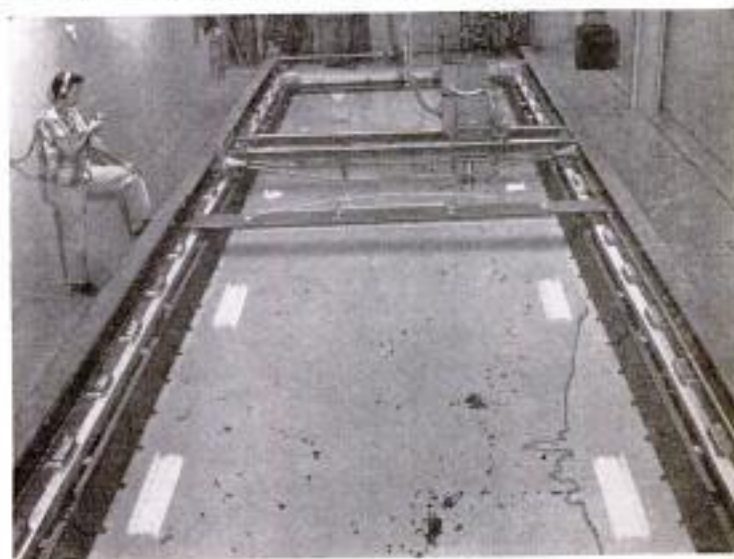


Mockup B-47 Nose "Flies" Around World

STUDENT NAVIGATORS in a mockup B-47 nose at Mather Air Force Base in California use a moving aerial photograph and an ultrasonic trainer to check their navigation on simulated flights around the world. They visually check the unrolling strip photograph of the ground until artificial weather obscures vision. Then they switch to a radar scanner. This ultrasonic trainer is electrically connected to a sound transceiver touching the surface of a nearby 38 by 11-foot tank of water. On the tank's floor is a relief model of the western coast of the United States. An ultrasonic sound head gives off high-frequency waves and echoes reflected to it from the underwater model are translated electrically into a typical radar picture, guaranteeing radar navigation for 1000 miles. The sound head moves across the tank with directional and speed settings made by the student to flight instruments.



Top left, student navigators use radar scanner, while "bug" on aerial photo at top right moves with speed and course of the simulated aircraft. Above, the instructor creates problems on radar navigational trainer operated by student. Below, in water tank with relief model of coastline, the ultrasonic transceiver picks up radar image for training navigation students





Portable Detector Speeds Up Prospecting

Powered by flashlight batteries, a portable electromagnetometer for prospecting metals is operated by two men simultaneously who can cover up to a five-mile line per day.

It was developed by Vaino Ronka of Toronto, Ontario, Can., patterned after the wartime mine detector.

Hunting for lead, zinc or copper, one man carries a receiver coil and equipment and the other a transmitter. They are connected by a 200-foot cable stretched taut between transmitter coil and receiver coil. In this way an electromagnetic field is set up between the coils and induces voltage to inform the prospectors when they pass over a metallic deposit.



"Flattop" Haircut Measured Mechanically

Thomas Siemons of Wenatchee, Wash., is a barber who guarantees a perfectly level "flattop" cut. He uses a horizontal, swinging iron bracket equipped with two swivel-arms that hold a slanted clipper blade in level position. An adjustable vertical sleeve places the blade in the exact plane for a "flattop" haircut. With clipper attached to the blade, Siemons moves the apparatus in sweeping arcs to produce a haircut in five minutes less time than for the usual trim.

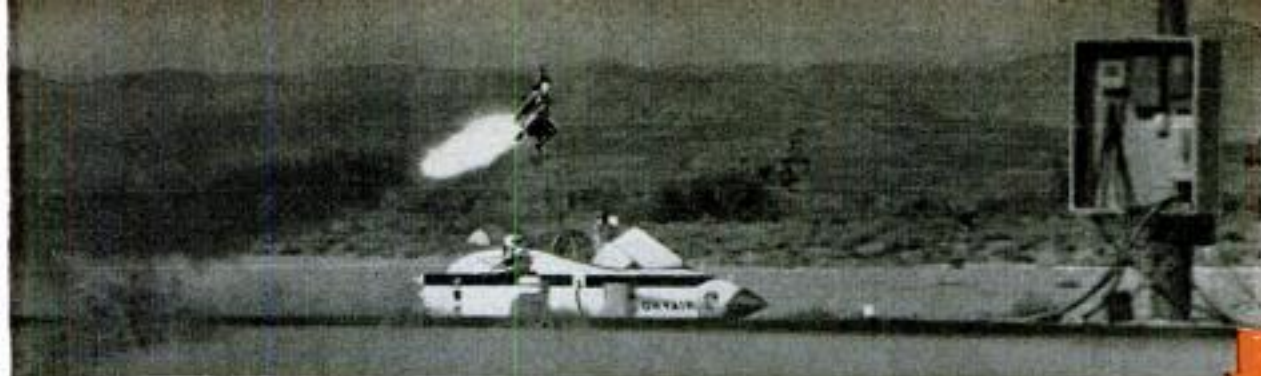


Chair Becomes Table

With a convertible backrest, a British tubular-steel chair has a dual function. Normally a lightweight straight chair, it becomes a chair-table combination when its plastic-covered backrest is flipped into a horizontal position.

Antibiotic Aids Crops

Duramycin is a new antibiotic compound to be used against diseases hampering bean, wheat and bluegrass crops. Named Duramycin because of its stability when subjected to heat, this antibiotic curbs growth of certain organisms and combats several yeasts and fungi, according to the U. S. Department of Agriculture.



Two dummies are rocket-ejected from a simulated-airplane sled traveling faster than the speed of sound

We Chase the Jets on Film

By Willis E. Harrison

Chief, Photographic Branch, Air Force Flight Test Center, Air Research and Development Command

As told to Thomas E. Stimson, Jr.

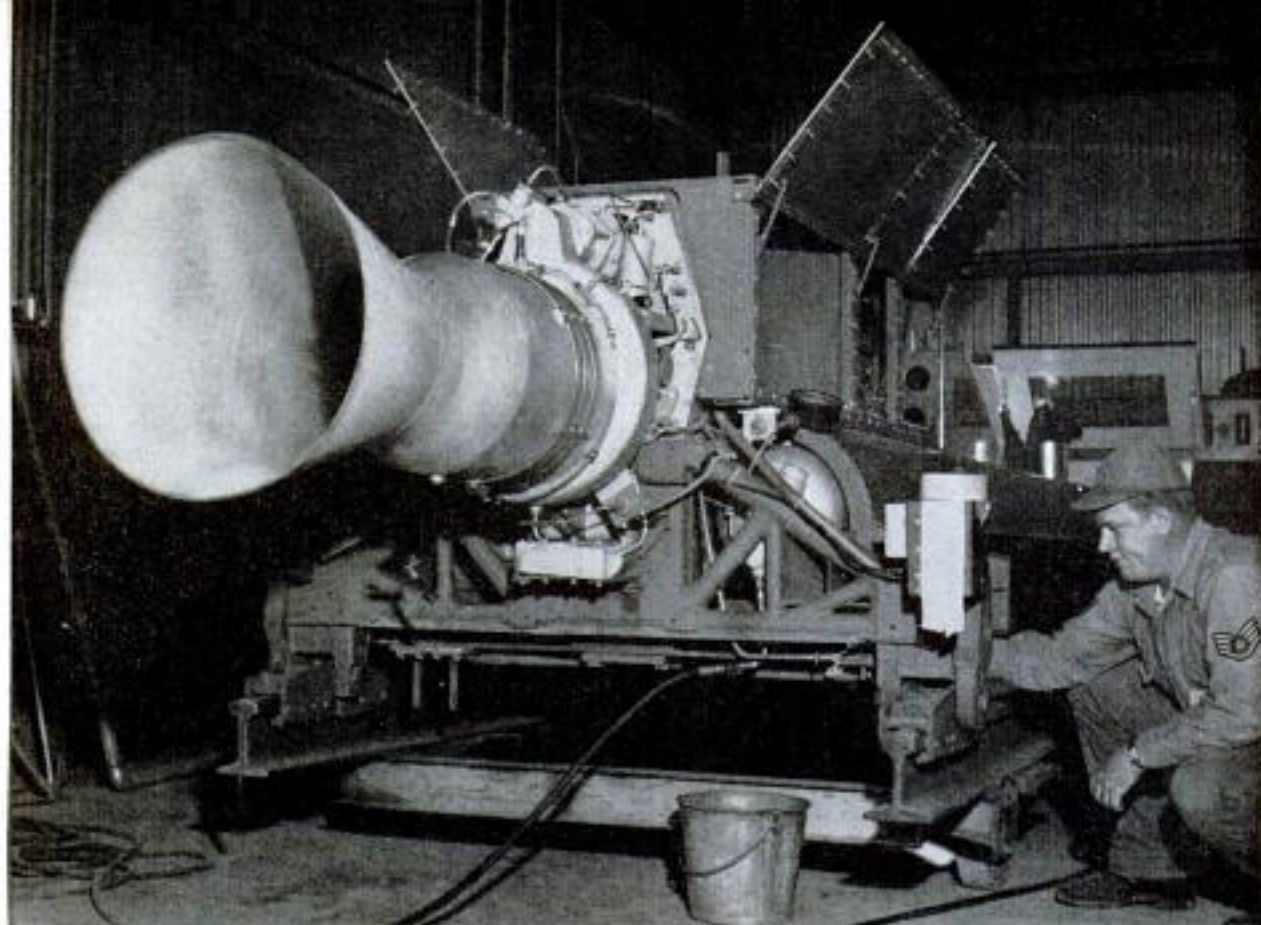
EMERGENCY LANDING! Emergency landing in 15 minutes! Get those cameras on the flight-line in a hurry!"

With this urgent command ringing in their ears, the four cameramen barely reached their stations at the edge of the runway when the crippled plane began its approach. It was an F-100 on a ferry flight and the pilot decided to land here at Edwards Air Force Base, Calif., upon dis-

covering the nose wheel of his plane had not fully retracted.

We thought he would land on his main gear and roll out most of his momentum, then slowly settle onto the nose wheel.

But this didn't happen. The pilot suddenly poured on full power, his nose pointed up, a wing hit the ground and the plane slammed over on its back, exploding in flames. He didn't have a chance.



Rocket engine powers the supersonic sled. "Slippers" on each side grip the track rails during the run



Aerial photographer's 30-lb. camera weighs the equivalent of 200 lb. in his lap during a 7-G pull-out

It happened so fast, to the human eye there was no telling what went wrong. But the movies would show us what happened. In addition to the four flight-line 16-mm. cameras shooting color at 700 frames per second, the accident was also covered by two space-position cameras on a hilltop four miles away. Projected at normal speed, these movies would stretch one second of time into half a minute on the screen. The accident could be analyzed foot by foot.

Films Tell Story

This is what they showed: The pilot made a normal approach and flare-out but at the last moment he decided to go around again. He snapped his throttle into afterburner for more power, then immediately cut it. He did this three times.

These enormous surges of thrust pushed

As these rockets burn out, ones on other end of sled fire up and reverse it suddenly to test fuel tank

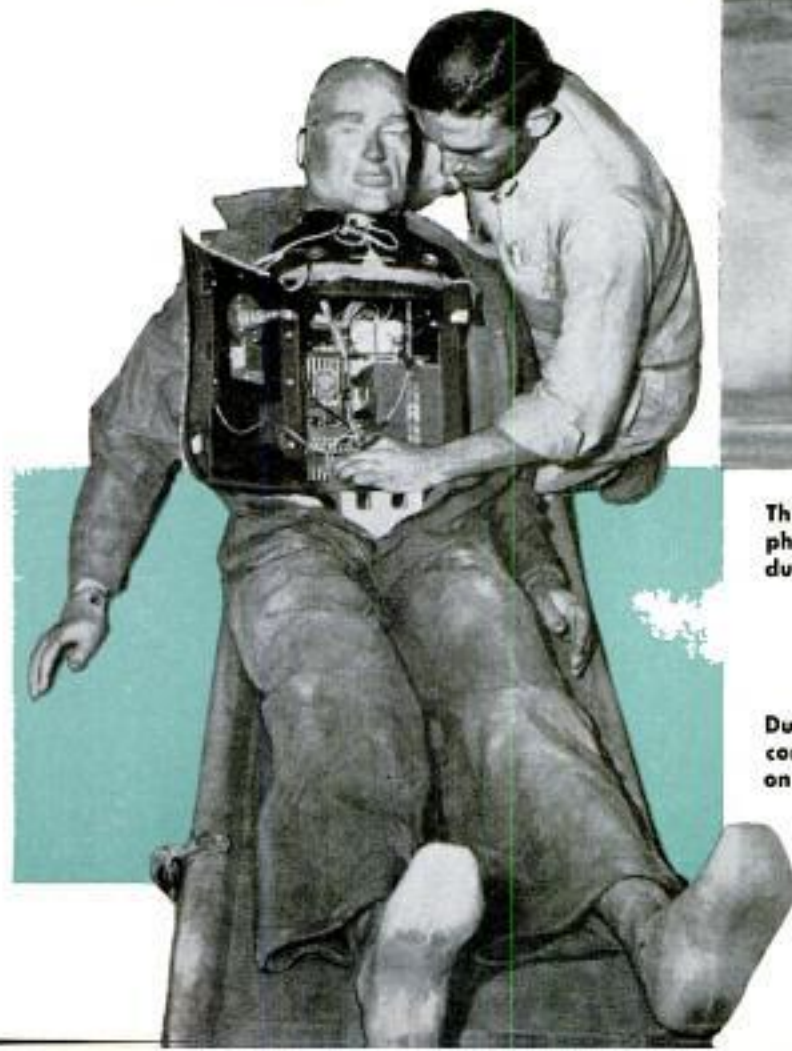


his nose so high that the normal flow of air into the engine intake was reduced. A compressor stall occurred, causing a reverse flow of the flame. That ended it. In the motion pictures we could actually see the afterburner go into action three times, could see flame shooting from the intake when the engine lost its air.

It was apparent the pilot delayed too long his decision to go around again. We made extra prints of the film and sent them to all tactical units using the airplane so pilots would learn the importance of completing a landing once they were committed.

One of the main jobs of our photographic branch at Edwards is to make high-speed movies of routine events merely on the chance that something might go wrong. If nothing happens, hardly anyone bothers to view the film. But if there is an accident the experts gather in the projection room and run the film over and over. Often there is no other way of taking an accident apart and learning how it developed. Because of this photography designers are learning how to build better airplanes.

That's the reason we record every run made on our rocket-sled track. As many as 42 cameras have been used on a single test. Some are high-speed 16-mm. movie cameras shooting up to 8000 frames per second, others are 70-mm. outfits that make 50 sequence stills per second. Most of them are located on "camera row," 360 feet away from the track. The rest are mounted beside the track. They are tripped electrically by a cutter bar mounted on the sled.



This might have been disaster! High-speed photo catches rocket breaking from ejected dummy, helps analyze cause of the accident

Dummy's "brains" are in its chest, where complicated instruments relay information on what would happen to a man in the tests



Billows of rocket smoke indicate the supersonic speed of this test sled in a sequence of front-view photos showing how a rocket attached to the ejection seat of lifelike dummy propels it from the sled's cockpit

Any piece of gear, any part of an aircraft that needs testing can be mounted on a rocket sled and fired down the 10,000-foot track at speeds up to Mach 2, about 1500 miles per hour. Fantastic things happen at this brutal speed.

Once, a complete rocket sled broke away from the rails and became airborne. Observers said it flew like an airplane, but the high-speed movies revealed that it made a complete flip. The action happened so fast that no one could see it with the naked eye.

We've seen big rocket bottles rip loose from their mountings on a sled and take off in erratic, tumbling flight. They behave like a toy balloon that you blow up and release. There's no telling where they will go. One bounced across the ground three times and then roared over the head of a photographer.

To give you an idea of the speed of a rocket sled, if we place a camera at trackside one mile from the start and operate it at normal speed, only three feet of film will be

exposed by the time the sled goes past.

Watching one of these supersonic runs is a unique experience. The rocket motor makes a tremendous roar. But it's absolutely silent approaching, for the sled is moving faster than Mach 1. There's a big crash when it goes by, a "close up" of the sonic boom you get from a supersonic airplane. The shock wave has a real punch and an inexperienced photographer is apt to duck.

The trackside cameras would be demolished if we left them unprotected. Each is encased in a box built of thick aluminum plates, with a glass port for the lens. Even this protection isn't always enough. The shock wave from a fast sled sometimes rips a camera box from its mounting and tosses it 30 feet away, popping all its rivets. We are now designing small armored block-houses for the cameras.

None of the photo staff has been hit by objects flying off a sled, although there have been a lot of near misses. Thick chunks of

Plexiglas from shattered canopies and portions of ejection seats have slammed into the ground close by. Usually the photographers crouch in a ditch when a sled roars past, but on some occasions they must be stationed in the open.

They are top men, with split-second reflexes. Recently I assigned six of them to cover every aspect of a multiple-seat ejection from a sled that simulated the nose of a bomber. Three canopies would be jettisoned from the sled and three dummy pilots in ejection seats would shoot up into the air. At a safe altitude the seats would drop away and the dummies would descend by parachutes. The sled would be traveling 650 miles per hour.

One photographer was assigned to the first canopy, the next to the first dummy, and so on. Each would pick his own object as it left the sled and pan his camera to follow it to the ground. What made the assignment difficult is that at the moment of ejection, the air is suddenly filled with all kinds of debris. Shoes and helmets may be ripped off the dummies, and anything loose in the cockpit is whipped up into the air. It's hard to single out the object to be tracked. Nevertheless, each photographer did a perfect job.

Testing an experimental ejection apparatus is always spectacular. Quite often the test is a failure as far as the dummy is concerned. That's why sleds and dummies are used for studying a new idea and that's why high-speed pictures are made.

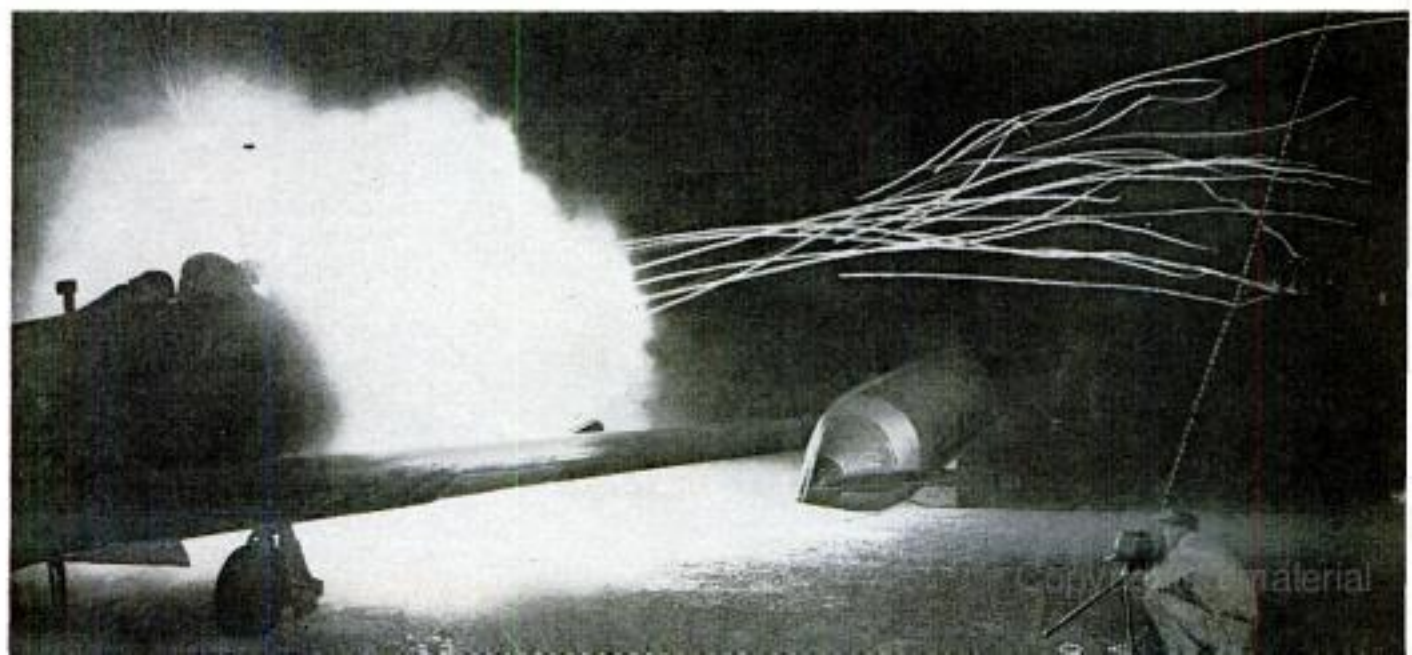
Most of the ejection studies today are concerned with escape from aircraft traveling 1000 miles per hour or faster. Eject a pilot traveling at these speeds and it's like

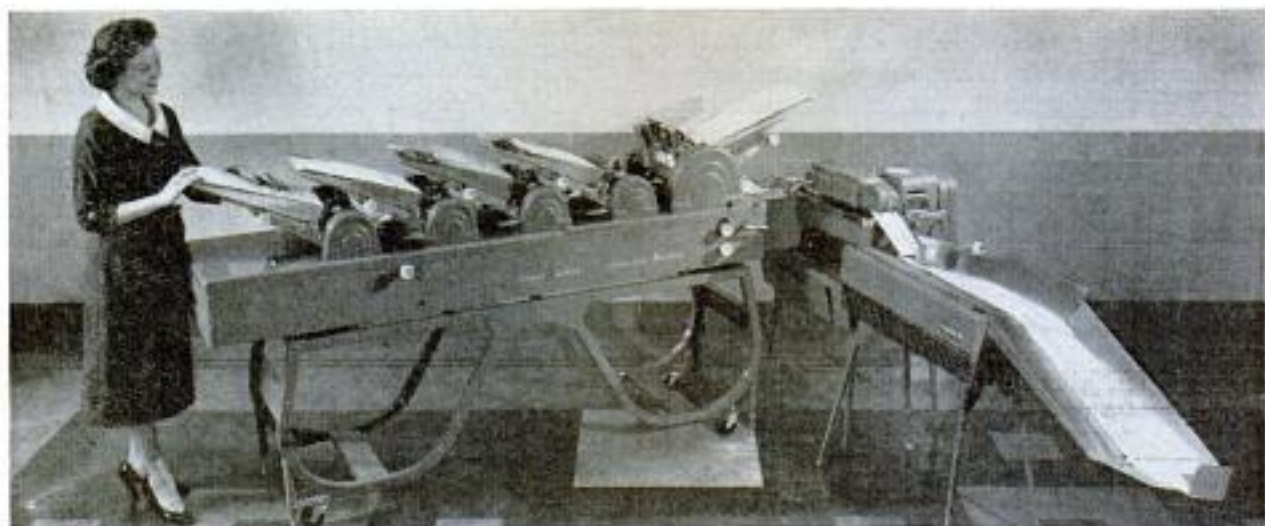
(Continued to page 228)

Right, high-speed-sequence still camera catches the launching of an airplane by rocket booster. Below, photographer is almost hit by flaming piece of solid propellant (see dotted lines under tripod) in filming of a rocket's effect on the pilot's vision



Sled's shock wave sometimes tosses trackside cameras 30 ft. although they're bolted down in metal boxes





Machine Opens, Stuffs, Counts, Seals, Imprints, Stacks Mail

Handling 6000 mailing pieces hourly, a new machine can open and stuff envelopes, count, seal, imprint postage and stack mailings in a continuous operation. One worker can set up a job in minutes without a mechanic or toolkit. Minor adjustments are made by turning knobs, and a straight-line, self-centering feed eliminates align-

ment problems. Automatic signals prevent misfeeding. A detector forestalls jams, faulty insertions and mutilation of enclosures. Variable speed control makes difficult jobs possible through dialing of slower cycles. This machine can accommodate most envelopes, end-folded telephone and utility bills and items of different shapes.



14-Ton Truck Can Expand to Five Times Road Size

Starting with an inside area of 150 square feet, a 14-ton truck made of aluminum can expand in five minutes to 780 square feet—five times its on-the-road size. When a button is pushed, the truck's sides move outward, while accordion-folded aluminum floors drop into place until an area large enough to seat 125 persons is available. With a trailer that can be drawn by any standard-truck power source, this vehicle's potential uses range from a service vehicle for the armed forces to a mobile home.



Battleship Guns Become Test Chambers

Two United States battleship guns have been converted into high-pressure test chambers at the Navy Electronics Laboratory, San Diego, Calif. Sonar equipment, diving apparatus, and devices destined for deep-sea use will be tested. The guns are of 12 and 16-inch caliber. One third of each gun barrel was sawed off and a solid-fitting, watertight, airtight plug was machined for the "muzzle" end. The breech mechanism is reported ideal for insuring the chamber against leaks. An object to be tested is inserted in the gun barrel; the breech is closed and water pumped into the barrel to simulate a desired depth, controlled by gauges on the gun's exterior.





Above, completely immobile patient rests on a three-in-one unit, which consists of a combination wheelchair, armchair and bed

Designed for the Handicapped



Right, young spastic patient finds her "walker" fun to use. This equipment provides support and allows leg movement



Above, legs weak, a girl works at a play table with an attachment on the reverse side to keep her erect

Below, "walking skis" promote normal gait in persons who have suffered the loss of leg functions



TO THOUSANDS OF DISABLED or partially disabled persons in Great Britain, the name of Emil A. Andre is synonymous with hope. Many of these people are polio patients, victims of accidents in the first stages of postoperative recovery or patients suffering from old-age ailments. Their common denominator is that each of these persons has limited use of the arms or legs. In his small plant at Tottenham near London, Andre makes devices to help these people eat, walk, exercise, play and meet everyday needs. Hospitals, such as St. Bartholomews in London and the Bristol Royal Infirmary, refer "problem cases" to Andre. For individual patients, he fashions working scale models, which he tests before completing the final product. A member of the British Red Cross Society, Andre has made a glassholder for the weak-in-arm, a "walker," "walking skis" and a play table for the weak-in-leg.

Below, her hands still too weak to grasp a glass, this young girl gets her water by using an Andre-designed "glassholder"



OWNERS REPORT:



HOW GOOD IS THE BUICK?

Owners say its best feature is its handling ease (47.0%), next comes its riding comfort (38.9%), third its styling (33.3%).

Owners complain most about poor gas mileage (20.1%), poor workmanship (14.5%), and body rattles (13.7%).

WHAT DO OWNERS THINK ABOUT INDUSTRY TRENDS?

Most of them approve. Only 12.3% register disapproval. Specifically, here's how they feel about Buick's design: 84.3% like its lowness; 79.7% like its length; 76.6% like its speed.

**FOR MORE OF WHAT OWNERS SAY
ABOUT BUICK READ THIS ARTICLE** 

Buick owners in 40 states (shaded on map at top of page) complain of poor gas mileage, praise handling



Owners Praise Handling, "Conservative" Styling

By Buick Owners

BUICK IS ALL NEW for 1957, but it's unmistakably Buick. You have no difficulty identifying it because it retains much of its character from previous years.

Whether this is desirable or not is a matter for argument. There are things to be said on both sides.

Among the Buick owners, there seems to be a strong feeling that certain makes have gone too far in styling. Of the Buick owners who rate exterior styling as the best-liked feature, 25 percent describe it as being "conservative" or "dignified" or use some similar term.

"I like the styling. Other cars look like rockets to me. I want a car that's down to earth."—Connecticut retired owner.

"It looks like an automobile and not like something that came from Mars."—New York sales manager.

"I like straight-line styling. No fantastic fins."—Ohio cafeteria worker.

"I like the nonradical style change. It keeps resale value up."—California pilot.

Owners also like the Buick's lowness, its front grille and open rear wheels.

"Car is built close to the road."—Ohio builder.

"I like the neat grille."—California telephone worker.

"Full-exposed rear wheels."—Colorado architect.

Among the least-liked exterior styling features are the three-piece rear window, the windshield shape, the front bumper and the rear-deck design.

"The three-piece rear window has good styling possibilities, but this is not the best that could be done with it. It leaks, too."—California pilot.

WHAT IS AN OWNERS REPORT?

Popular Mechanics sends questionnaires to 1000 owners of a different make of car each month. These owners are picked for us at random from coast to coast by an independent organization. The replies from owners are tabulated and compiled to provide readers with a summary of what the owners think of their new cars.

Next month's Owners Report will be on the 1957 Oldsmobile.



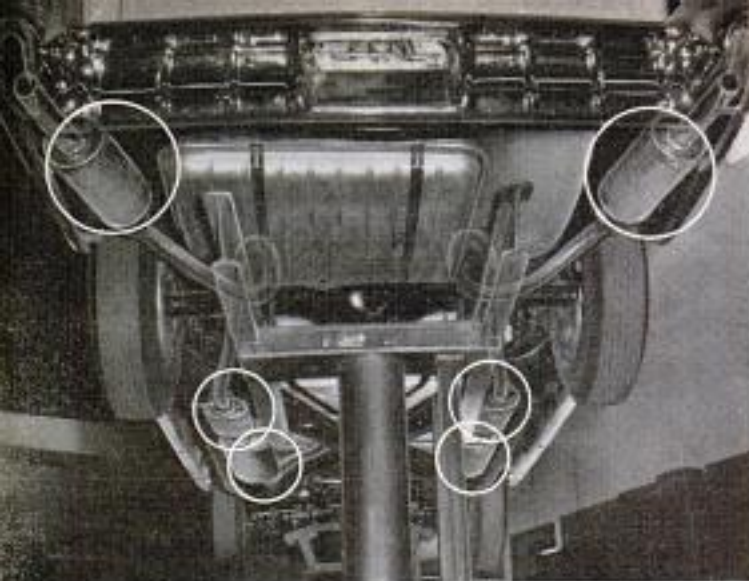
Irving Seligmann photos

Power and performance rate fourth with the owners, following the top-rated handling, ride and styling



Extending far into the door opening, the big wrap-around windshield makes entry and exit awkward, say 11.6 percent of owners. Below, the long glove box is handy and its lid is designed to use as a snack tray





Evidence of why cars cost so much is Buick's huge muffler system, shown in phantom. Cost of all parts of system: \$100. Labor for installation is extra

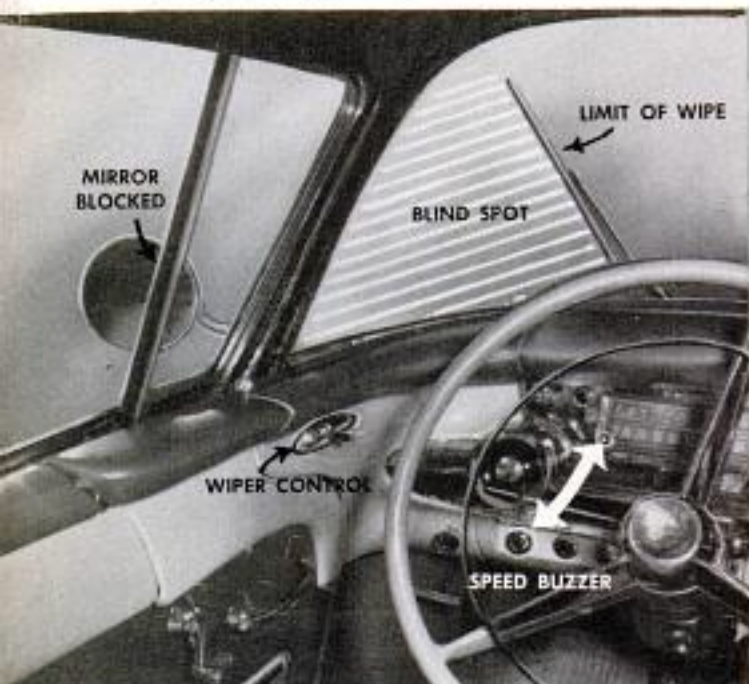


Photo shows some good and bad features as noted by owners. Buzzer adjusts to go off at any preset speed

Below, owners describe this styling as conservative and say they prefer it to more radical fin treatment



"Windshield curves too much, making it hard to get in and out the front seat."—Missouri sheet-metal worker.

"Front-bumper guards offer no protection."—California supervisor.

"Don't like the lopped-off trunk."—Illinois technician.

Best-Liked Features

Topping the list of best-liked features among Buick owners is its handling ease. Second is riding comfort, third is exterior styling.

"I drive four miles to work each morning, back home at noon for lunch, back to work and home at night again. All in heavy city traffic. My Buick is a dream to handle. No stalling at stop lights, no sluggish starts."—Indiana drill-press operator.

"In rainy weather I have about a half mile of mud roads to drive over. It handles good on mud."—Oklahoma aircraft worker.

"Easy to handle in traffic."—Michigan engineer.

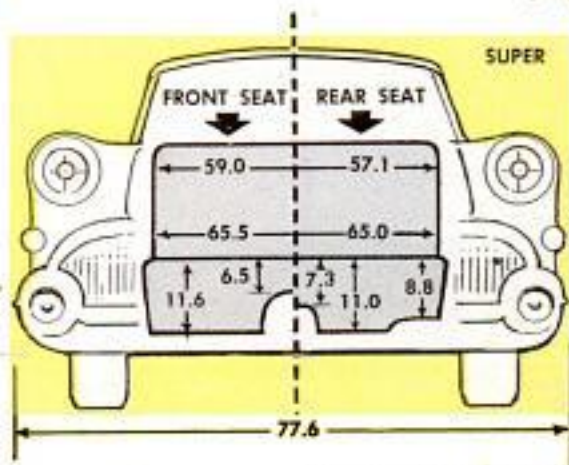
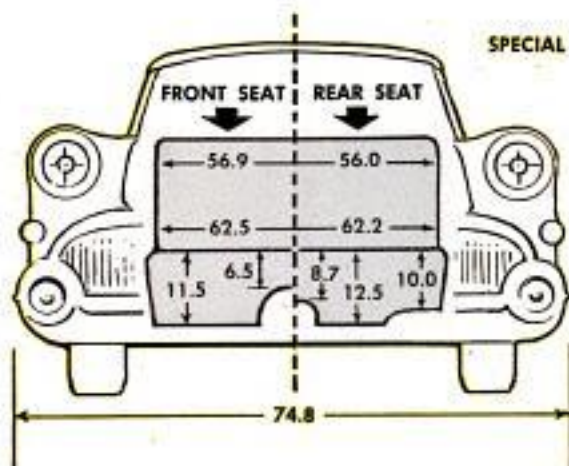
"The car is heavy enough for comfort on long trips."—Missouri superintendent.

"I am 71 years old and drive about 40,000 miles a year. I must have comfort and I find Buick affords it."—Maryland engineer.

"I like its dignified styling."—Connecticut salesman.

(Continued to page 218)

Special and Super dimensions are given on diagrams. The other models differ only by fractions of an inch



The OWNERS' OPINION of the '57 BUICK

Had trouble with engine?

No trouble	66.4%
Some trouble	25.7%
Considerable	7.9%

What was engine trouble?

Carburetor	9.8%
Valves, lifters	2.3%
Oil pump	2.3%
Water pump	2.3%
Timing	2.3%

Performance

Would like faster acceleration?

Yes, would	24.9%
No, would not	67.4%
Undecided, no answer	7.7%

Would like more top speed?

Yes, would	3.4%
No, would not	73.6%
Undecided, no answer	23.0%

What is the car's horsepower?

Knew correct hp	75.5%
Did not know hp	24.5%

Styling

Best-liked exterior feature?

Lowness of body	14.9%
Conservative styling	12.4%
Front grille	5.2%
Open wheel housings	4.0%

Least-liked exterior feature?

3-piece rear window	11.2%
Windshield shape	6.0%
Front bumper	3.2%
Short, stubby trunk	3.2%

Best-liked interior feature?

Dashboard design	30.5%
Glove box	7.6%
Upholstery	6.0%
Color treatment	5.2%

Least-liked interior feature?

Ash trays	8.0%
Floor covering	3.6%
Window-crank location	3.2%
Floor hump	3.2%

OVER-ALL RATING

Excellent	Average	Poor
60.9%	31.4%	7.7%

Miscellaneous

Have Safety Minder buzzer?

Yes, have it	91.4%
No, do not	8.6%

Is it used?

Yes, all the time	48.5%
Some of the time	45.4%
No, none of the time	6.1%

What car will buy next time?

Buick again	62.3%
Another GM make	6.8%
Chrysler Corp. make	7.9%
Ford Motor Co. make	4.1%
Some other make	0.4%
Don't know, no answer	18.5%

Why Buick this time?

Previous ownership	27.3%
Exterior styling	17.3%
Dynaflo	11.2%
Riding comfort	6.0%

What make car was traded?

Buick	58.9%
Another GM make	18.5%
Ford Motor Co. make	9.1%
Chrysler Corp. make	5.3%
Some other make	1.9%
No trade, no answer	6.4%

How is dealer service?

Excellent	50.4%
Average	31.9%
Poor	17.7%

Would buy from him again?

Yes, would	47.9%
No, would not	19.2%
Undecided, no answer	32.9%

What should be changed?

Nothing at all	33.7%
Improve gas economy	9.2%
Better workmanship	9.2%
Easier to get in, out	6.0%
Better brakes	4.4%
Less horsepower	4.4%
3-piece rear window	4.0%

Best-Liked Features

Handling ease	47.0%
Riding comfort	38.9%
Exterior styling	33.3%
Power, performance	27.3%
Dynaflo	16.9%
Roadability	6.8%
Roominess	6.0%

Most-Frequent Complaints

No complaints at all	22.9%
Poor gas mileage	20.1%
Poor body assembly	14.5%
Body noises, rattles	13.7%
Hard to get in, out	11.6%
Brake troubles	9.2%
Carburetor trouble	7.6%
Window fit, operation	7.2%

Buick is very low

Like this lowness	84.3%
Don't like it	10.7%
Undecided, no opinion	5.0%

Buick is very long

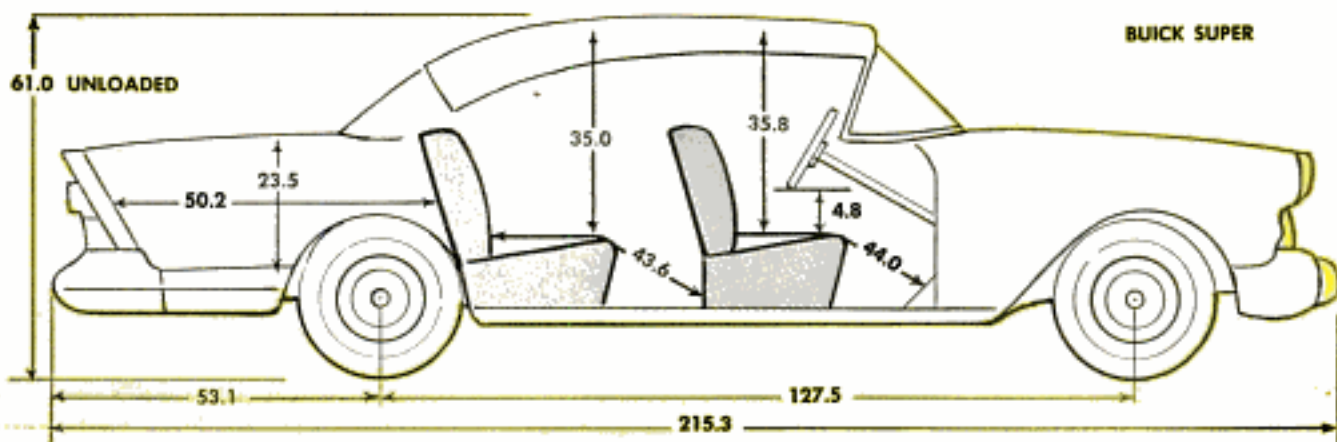
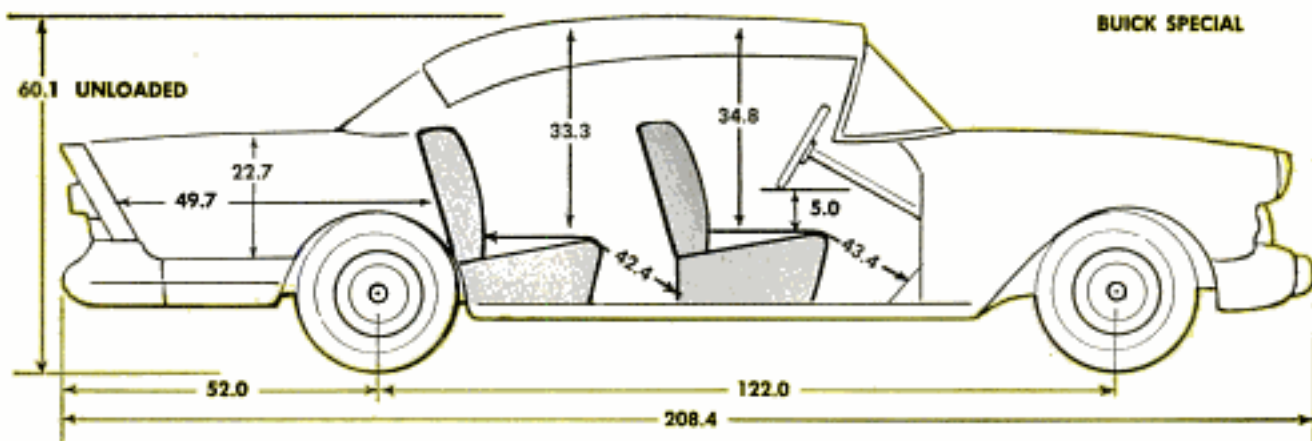
Like this length	79.7%
Don't like it	6.1%
Undecided, no opinion	14.2%

Buick is very fast

Like this speed	76.6%
Don't like it	7.3%
Undecided, no opinion	16.1%

What Do Owners Think of Industry Trend in Auto Design?

Like current trend.....83.1% Don't like trend.....12.3% No answer.....4.6%



An Engineer Analyzes the 1957 Buick

By Dale Kelly SAE, Registered Professional Engineer

MODEL TESTED: Special four-door hardtop with two-barrel carburetor, dual exhausts, Dynaflo transmission, power steering and power brakes.

Wheel base: 122 inches. Tires: 7.60 by 15. Weight: 4410 pounds with gas tank half full (55 percent

of this weight is on the front wheels, 45 percent on the rear).

Mileage on car at time of test: 1800 miles. Barometer: 29.25 inches. Temperature: 62 degrees F. Payload: 200 pounds.



ACCELERATION TIME FROM STANDING START IN SECONDS

	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Ignition timed for regular gas (90 octane Research)	3.1	6.9	11.8	24.5	19.2
Ignition timed for premium gas (97 octane Research)	3.0	6.7	11.6	24.5	19.0
Ignition timed for super fuel (105 octane Research)	No improvement noted				



FUEL ECONOMY IN MILES PER GALLON

	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Ignition timed for regular gasoline (90 octane Research)	18.1	17.4	14.9	9.4
Ignition timed for premium gasoline (97 octane Research)	18.2	17.0	14.8	9.4

On the traffic route the car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$189 for 10,000 miles.

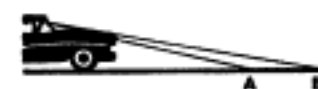


SPEEDOMETER ERROR (Miles per hour)

Speedometer speed	20.0	30.0	40.0	50.0	60.0	70.0	80.0
True speed	18.5	27.5	36.0	45.0	54.0	63.0	73.0

ODOMETER ERROR

Odometer showed correct mileage within ½ of 1 percent.



DRIVER'S VISION (for an average driver—5 feet 9 inches tall)

Distance at which part of road in front of car could be seen (A in sketch)	20 feet
Distance at which full width of road in front of car could be seen (B in sketch)	25 feet



GROUND CLEARANCE (unloaded car)

Radius of worst dip that could be crossed (solid line)	23.5 feet
Radius of worst hump that could be crossed (dotted line)	20.0 feet
Deepest rut car could be driven in	6.9 inches
Curb clearance for door opening	12.6 inches

MISCELLANEOUS

STEERING

Wheel turns from straight ahead to steer outside front wheel in a 100-foot-diameter circle: 0.65 turn
 Diameter of smallest circle within which wheels could complete a circle (curb-to-curb): 42 feet
 Diameter of smallest walled circle within which the entire car could complete a circle: 44.5 feet
 Steering-wheel turns, lock-to-lock: 4.0 turns
 Steering-wheel diameter: 17.5 inches

TRUNK CAPACITY

Number of standard cartons (1 cubic foot each) that could be packed into trunk: 11 cartons

CENTER OF GRAVITY (unloaded car)

Height of center of gravity: 21.5 inches

WATER RESISTANCE

Good. In splash-pan test, brakes and ignition were not affected and no water entered the body. In high-pressure car-wash test there was slight leakage at each of the doors, none in the trunk

OVER-ALL DIMENSIONS

Length: 208 in. Width: 75 in. Height: 60 in.

OBSERVATIONS

Buick has a full set of pointer-type gauges, preferred over warning lights by many motorists. However, only the speedometer has a proper numerical scale. Oil-pressure gauge, temperature indicator, and ammeter do not have any numbers at all. With engine running and battery low, the ammeter pointer, moving to extreme charge position, went completely out of sight. It indicated a slight charge when no current was flowing and read zero when radio alone was turned on

Straight-line speedometer is novel, but because red line ends at an angle there is a three-miles-per-hour ambiguity, depending on whether it is read at the bottom, where the graduations are, or at the top, where the numbers are

Buick is to be commended for providing an excellent jack and for building special jack points on the frame

Gas-tank fill rate satisfactory. Brakes good. Parking brake held on a 14-percent grade. Power-brake reserve vacuum sufficient for five applications with engine dead

Test Driving the '57 Buick Special

By Floyd Clymer

THE TEST ROUTE was from Los Angeles to Yuma, Ariz., via San Diego, then along the U. S.-Mexican border, the Salton Sea (346 feet below sea level) over El Cajon Pass (4301-foot altitude) and back to Los Angeles—a total of 815 miles.

The two-door Special hardtop has the 250-horsepower engine of 364 cubic inches, the displacement used in all '57 Buicks.

There is minimum engine vibration. It has fast acceleration and pulling power. The speedometer hit 116 miles per hour on long open stretches, but it was optimistic by about eight percent.

The car is several inches lower than previous models. There is a solid feel to the body and stability has been improved. The center of weight has been lowered, which has improved the handling qualities. Wind noise at high speeds and body rumble have been reduced to a minimum.

There is, however, the same steering-wheel vibration that was noticeable in previous Buicks at above-average speeds over rough roads or pavement. This is caused by the rear-end unsprung weight of the torque-tube drive. The torque-tube drive does combine the rear axle and drive shaft into a rigid unit, which assures better rear-end alignment than Hotchkiss drive.

The car has an extremely soft ride but front-end "floating" is noticeable, with some roll on sharp corners. Nevertheless, the car is a good roadholder. I found roadability to be better than in previous Buicks tested. Coil springs on the rear give a soft ride but, with a loaded car or over sharp dips, there is a tendency to "bottom." However, rebound control is good.

Dynaflow no longer has the slippage or mushiness so evident on early models. The

drive is positive enough to spin wheels on a dry pavement. The downshift is smooth and Low range provides excellent braking when descending steep hills. It has less "creep" than any transmission I have used.

I abused the brakes, both at high speeds and in the mountains. I have always felt that Buick brakes could be improved, and I haven't changed my mind, as there was some fading at high speeds.

The massive bumpers offer excellent protection. The rear bumper has openings at each end for the exhaust. This makes for dirty bumper ends—a no-good feature in my book. The gas-tank fill location is under a hinged lid in the center of the bumper, fine for fueling from either side.

Interior appointments are of high quality. Doors open and close easily. The instrument panel is new. Instruments are well arranged and located below a dull-finish cowl that has minimum reflection. The speedometer indicator is a horizontal ribbon in place of the customary needle. It has very little fluctuation. The new Safety Minder can, by means of a knob, be set to buzz when the car reaches any desired speed.

The heater is one of the best that I have ever used and heats quickly. The glove compartment is larger than average, with a lid that opens flat with indentations for four glasses—handy for drive-in eating.

Even though a full-circle horn ring is used, the speedometer view is unobstructed. I especially like the needle gauges for temperature, oil pressure and voltage. To me these are better than warning lights.

Another excellent feature is the location of the windshield-wiper control on the left side of the cowl ahead of the door. ★ ★ ★

Clymer praises Buick's soft ride, but says steering-wheel vibrations are noticeable on rough pavements

All Buicks have same displacement. Horsepower differences are due to carburetion, compression ratios





Lowly Cactus Starts Industry

Mescal cactus, once an unwanted plant, now is being processed into stuffing for car seats, cushions and carpet underpads by 85 workers in a modern factory at tiny Punto Colnett, Mexico. The workers at this \$100,000 factory place severed cactus leaves on an endless belt (see photo at left) which carries them to a sorter for sizing, pressing between rollers and shredding. Fibers extracted are dried on racks (top photo), packed and shipped.



← Zoo Vacuum Cleaner

Attendants use special vacuum cleaners to spruce up animals (left) at the zoo in Rome, Italy. Each cleaner has a suction brush that sucks dirt, dust and fleas from the fur of such beasts as the tapir at left.

Will Borazon Replace Diamonds?

Borazon crystals scratch diamonds and stay hard in temperatures at which diamonds burn. Officially named "cubic boron nitride," each colored grain is about as hard as a diamond and withstands 3500 degrees F., while a diamond burns at 1600 degrees F. Borazon's resistance to oxidation will make possible superior methods of mounting stones in industrial tools and may allow bits and wheels to be operated at higher speeds, according to General Electric Co., developer of borazon. Methods similar to those used in producing manmade diamonds were employed to make borazon.



Powered by four turbojet engines, the delta-wing Hustler carries pointed pod behind the nose wheel

Bomber Carries Detachable Pod to Provide for Various Missions

Detachable pods carried under the fuselage of the B-58 Hustler, America's first supersonic bomber, will enable this plane to perform a greater variety of missions,

U. S. Air Force officials report. The Hustler has been designed to carry such pods, which are kept off the runway by the aircraft's stilt-like landing gear.

Ultrasonics Rip Cells

Sound waves, made to vibrate at 400,000 cycles per second, break apart disease-causing microbes in making vaccines. Dr. Giulio Bosco, University of Chicago scientist, isolates internal-cell material by operating a 2000-volt generator. The exposed cell body is processed for vaccines.

Hearing Aid Helps Surgeons

Transistorized hearing aids now are saving the lives of surgical patients. A microphone from the hearing-aid amplifier is placed inside the anesthesia breathing circuit. The sound of the patient's breathing then goes to an earphone, and the surgeon has a check on the patient's respiration.

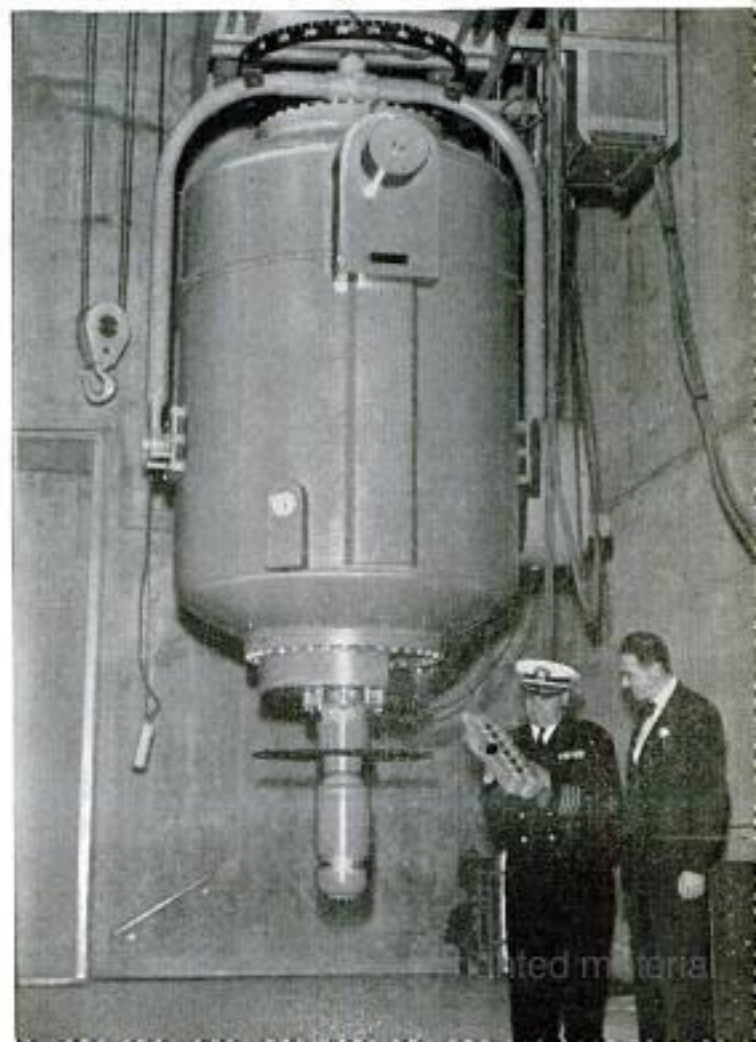
Two-Million-Volt X Ray

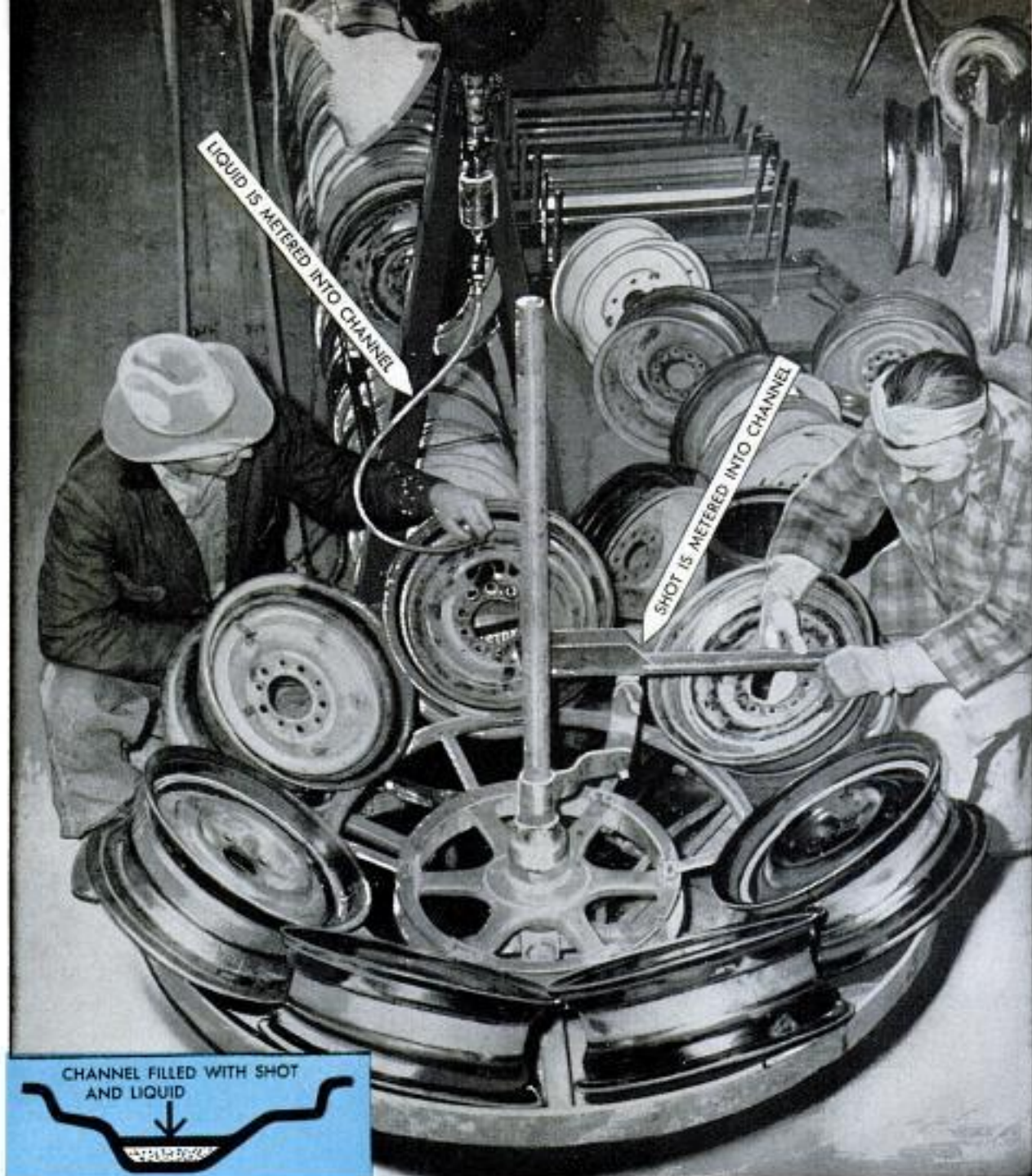
Navy Ordnance engineers use a two-million-volt X-ray machine at Port Chicago, Calif., to inspect defense materiel. The machine, the largest west of the Alleghenies, is housed in a huge concrete building with a 66-ton door to shield radiation "scatter."



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Shot and liquid are metered into channel (see drawing at left) in the wheel and the opening is then sealed

"Shot in the Arm" ***Balances Wheels***

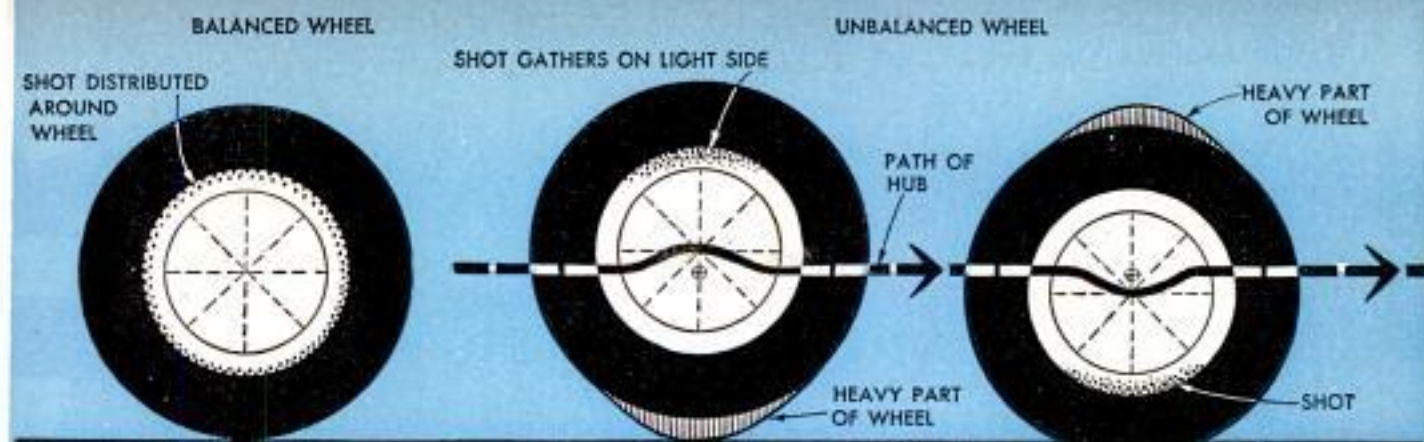
By Martin McAfee

HOW DO YOU make a wheel balance itself? It's a problem that has plagued the auto industry for years.

Now a Texas company claims to have solved the problem. It makes any wheel self-balancing simply by adding about 13 ounces of steel shot and some ethylene

glycol to form an automatic balancer.

The shot and the liquid in which it is suspended is retained in a welded channel around the drop center of the wheel. When a heavy spot develops in the tire or wheel putting the wheel out of balance, some of the shot is automatically thrown to the



As center of rotation (small circle near hub) moves, the shot is spun outward to counterbalance heaviness

lighter side, counterbalancing the heaviness. Centrifugal force does the work and the driver is unaware that the operation is taking place.

It's as simple as that, say the officials of the Self-Balancing Wheel Corporation, Perryton, Tex.

Only enough shot to counterbalance the heaviness moves to the lighter side. The remainder of this shot stays scattered around the channel awaiting a chance to correct subsequent imbalance.

The principle of the self-balancing wheel is not something new. But previous designs have usually involved circular tubes containing shot. These often became troublesome because they were easily damaged or knocked out of round. The channel must remain exactly centered around the wheel hub. Otherwise, the shot contributes to the imbalance.

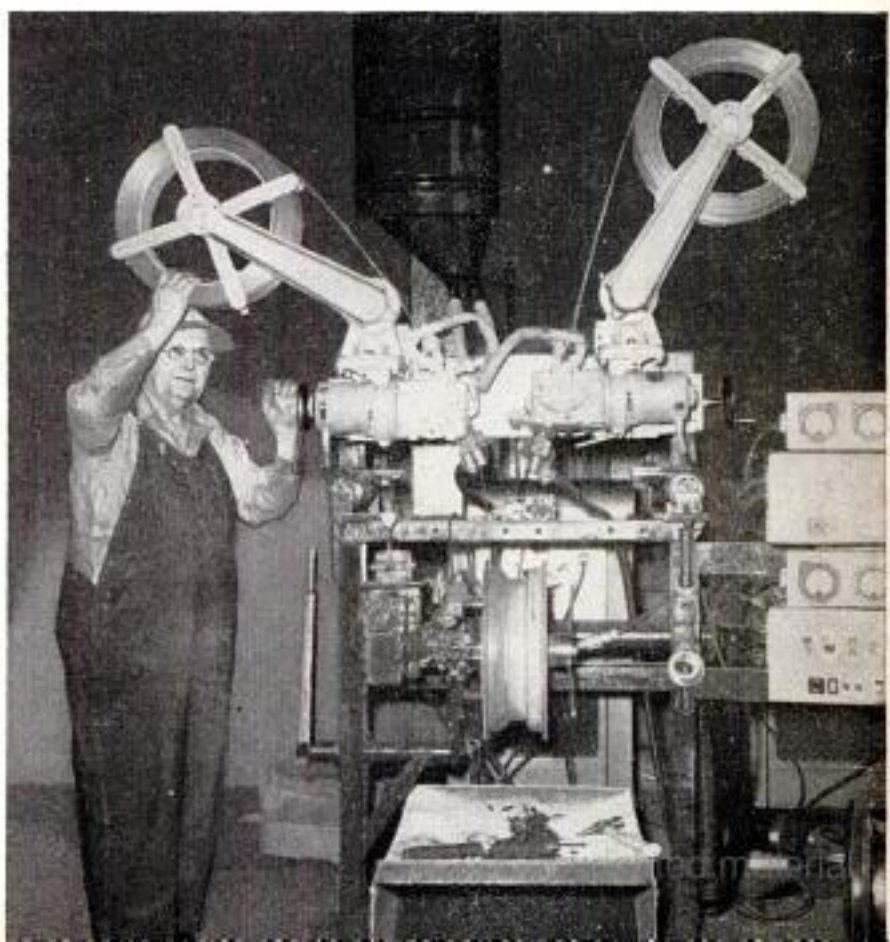
For this reason the first and most important step in the production is the cutting of a precise groove a quarter inch above the bottom of the drop center. The loss of this small amount of drop-center depth interferes only slightly with mounting tires.

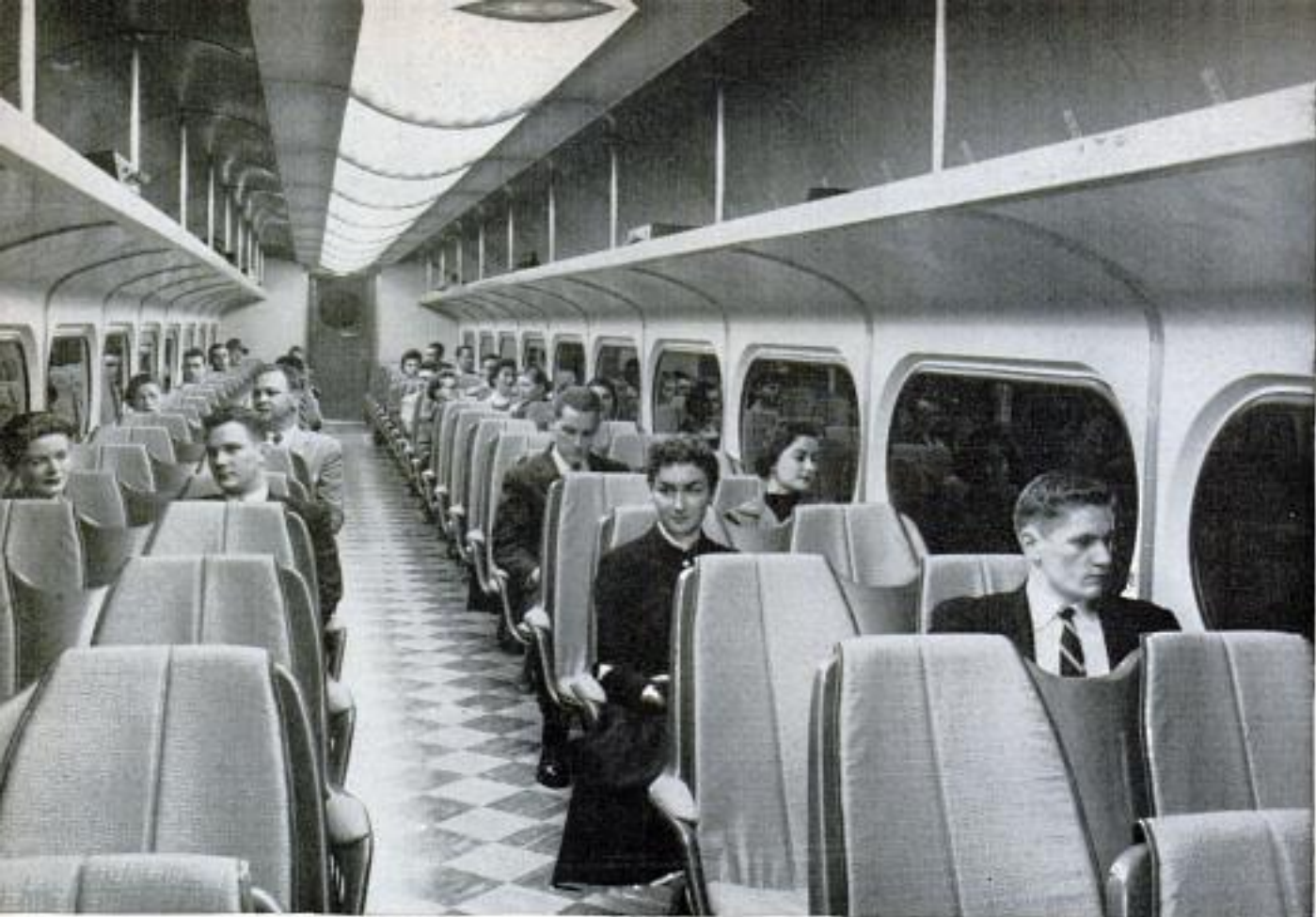
Major problem in mass-producing such a wheel is the accurate placement and welding of the steel band that forms the top side of the channel. This is done on a machine especially designed for the job. Then the liquid and shot are metered into the channel and the opening sealed.

The ethylene-glycol liquid is used to dampen noise and reduce wear on the shot. At speeds of under five miles per hour, there is a slight rustle as the shot moves around in the channel. Above that speed the shot is held to the outer surface of the channel.



Above, three steps in forming the shot channel in the wheel. Below, automatic machine welds band to wheel in three minutes





Lightweight Passenger Car Has Plastic Interior



With a gleaming skin of stainless steel, a new railway car has the lightest weight per passenger of any car ever built in this country. The car, built by Budd, meets all the strength and safety requirements of the Association of American Railroads. It weighs only 595 pounds for each of the 88 passengers it will accommodate, compared with 1678 pounds per passenger for a conventional car. Virtually the entire interior is plastic, including plastic seats, wall panels, ceiling and baggage racks.

Fuel Source in Pond Algae

Converting energy from the sun into methane gas has been achieved on a small scale by University of California scientists. The gas, a basic component of motor fuels, is formed when bacteria attack dead pond algae in the absence of oxygen. The plants store energy from the sun while growing.

Reel-and-Rotary Power Lawn Mower Introduced

Features of rotary and reel-type lawn mowers are now in one unit. Powered by a 2 $\frac{3}{4}$ -horsepower gasoline engine, the mower cuts down rough growth in a 20-inch rotary swath, after which the 18-inch reel smooths and shapes the lawn. Cutting-height controls are on the mower wheels to vary the degree of cutting. Clutching is automatic through throttle control on the handle. The rotary attachment is removed by pulling out two pins and slipping off the V-belt blade drive.

Homemade Automatic Sprinkler Stops When Rain Falls

When there's insufficient rainfall for Bert Scriver's lawn in Ft. Lauderdale, Fla., his homemade automatic sprinkling system takes over. He made a rainfall gauge out of a tin can. If rainfall is more than one quarter inch, the weight of the water in the tin tilts a control arm to disconnect the system. Otherwise, a time clock activates a solenoid valve inside a $\frac{1}{8}$ -inch water line, and triggers a hydraulic valve in the main water line from which the sprinkler system operates. Normal evaporation of water from the tin-can gauge resets the system.



Telephone Receiver Amplifier Can Be Carried in Pocket

Voice volume received by telephone can be amplified for the hard of hearing, for persons working in a noisy location and for those making rural or long-distance calls. A new portable amplifier clips over the receiver. With a plastic housing that has much the same contour as the telephone receiver it covers, this amplifier weighs only three ounces and can be carried in the pocket. This apparatus has been designed with printed circuits, transistor amplifier and tiny batteries which may be conserved by turning off a volume-control switch when the amplifier is not in use. Volume can be adjusted by finger-tip control. The amplifier also cuts out room noise.



British 1000-Mile-Per-Hour Jet Fighter Has Two Powerful Engines

Britain's Electric P1A prototype fighter plane has flown 1000 miles per hour in level flight and can fly 1500 miles per hour. Razor-thin, sweptback wings and tail have ailerons on trailing edges. The production

model will stack two Rolls-Royce Avon jet engines vertically in the fuselage with an air intake in the nose. They will replace the Hunter and Javelin as all-weather fighters for squadron duty with the RAF.



Like to try your hand at voodoo, jazz or chamber music on an assortment of antique instruments?

Drop in on this

Musical Museum

By John Franchey

Photos by George W. Walter



Arthur Sanders, son of museum's founder, inspects an orchestrion which duplicates a 12-piece band

Visitor tries out a tune on a dulcimer, built in 1860. Instrument is an ancestor of the present-day piano



EVER VISIT a museum and wish you could touch or get a better look at the rare objects on display?

There's one in New York State where visitors can do just that and more. They not only can see over 500 antique musical instruments and player devices of every description, all in working order, but they can play them as well.

The museum is a hobby turned full-time activity for a retired automobile mechanic, Hardie Sanders of Deansboro, N. Y., which is about 14 miles south of Utica. In a building near his home where he formerly operated his own business, Sanders has collected a fabulous assortment of priceless old instruments, from harmoniums to melodeons to all types of mechanical marvels.

Visitor Has Wide Choice

Depending on his whim of the moment, the visitor can try a tune on a 17th Century virginal, which is a small spinet, have a go with mallets at an 1860 dulcimer, an ancestor of the piano, or tap out a roundelay on a harpsichord built in 1547.

If he's percussion-minded, he can do a solo stint on such diverse instruments as African voodoo drums, Chinese gongs,

Javanese bells, Malayan cymbals or American tambourines dating back to the California gold-rush days of 1849.

Or if his tastes are on the loud and rugged side, the visitor can blast out a chorus on a pre-World War I pipe organ once used at spiritualist meetings, or make the neighborhood dogs howl by a brief turn on a calliophone that can be heard two miles away.

Automatic Musicmakers

There are scores of other manual instruments in Sanders' museum. And while they are popular, the center of interest is an array of automatic musicmakers that were ingenious in their day—and still are.

Typical of these is a 1915 Seeburg nickelodeon, the grandfather of today's jukebox. It plays tunes using bass and snare drums, cymbals and castanets, to name a few.

Another is the Mills Violano Virtuoso, probably the first mechanical musicmaker to be powered by electricity and once called "The Eighth Wonder of the World." Originally costing \$6000 around 1912, it plays piano and violin duets with steel fingers plucking out the melody on the violin. The museum has five of these rare collector's items, including two with a pair of violins.

Among the dozens of other mechanical marvels is a Deegan Una-Fon which is powered by a storage battery and plays tunes on 32 bells, and a Wurlitzer military-band organ complete with rows of cornets and drums. The museum also features several foreign street pianos from such countries as Italy, France and Turkey.



This is a DuKleist military-band organ used on a merry-go-round about 1898. It has to be hand-cranked. Note array of horns in the front opening

A pair of youthful instrumentalists try a duet with an old-fashioned slide trumpet, shown at left, and an unusual Italian serpentine horn





Hardie Sanders' Musical Museum features several foreign street pianos, including this one from France



Girl discovers how her grandmother listened to music with a 1904 phonograph and cylinder record

Remarkable Violano Virtuoso plays violin-piano duets with steel fingers plucking melody on violin



Sanders' curious hobby started 20 years ago when he bought a music box that wouldn't work. Being a master mechanic, he tinkered with it in his spare time until he fixed it. This interested him so much that, for a man who worked all day tuning motors, he turned to collecting and tuning old musical instruments and player devices as a relaxing hobby.

Since then Sanders has gradually added to his collection, all requiring repairs and some, particularly the self-playing type, needing extensive work.

Couldn't Get Parts

The manufacturers of these marvels of music automation have either gone out of business or changed to other lines of products, making it impossible to obtain vitally needed parts. So Sanders has to make his own parts and often special tools as well. Some of this work turned out better than the originals, Sanders claims with a true craftsman's pride.

At first Sanders kept his collection in his home. But then his son, Arthur, joined him in his hobby and it wasn't long before they had music boxes and melodeons under all the beds, harps and pipe organs stacked in the hallways, and assorted pianos, melo-harps and nickelodeons strewn all over the living room.

By 1951 the restored musical antiques were so numerous that they were crowding the family out of house and home. So, Mrs. Sanders made a suggestion.

Museum in Garage

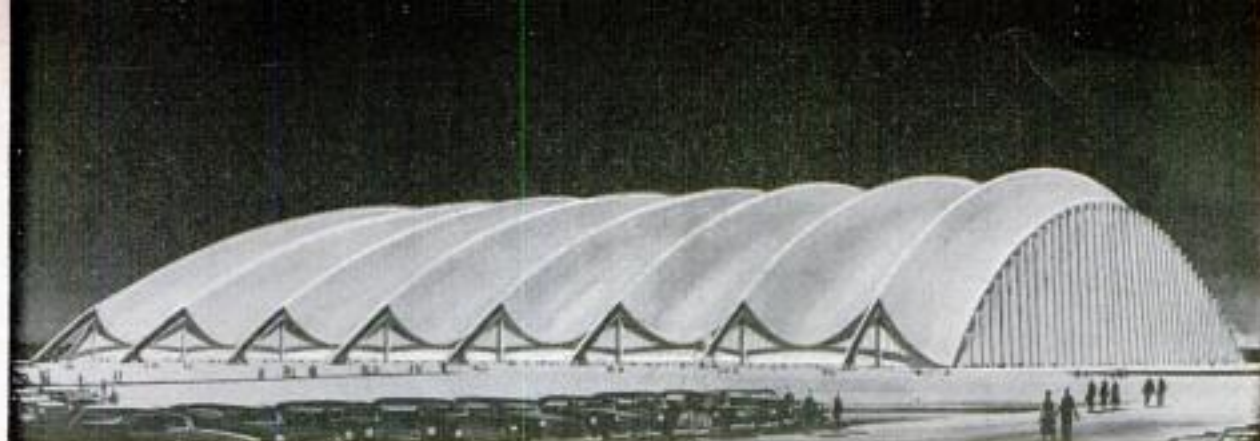
Since the doctor had ordered Sanders to retire anyway, why not convert the automobile-repair garage into a musical museum and open it to the public? This was done and it has been a tremendous success ever since.

Sanders travels throughout the country seeking additions to his collection, which has increased from its original 150 instruments to more than 500 today. And he has obtained them in the most unusual places and often in terrible condition.

For example, his orchestrion, an extremely versatile and complicated automatic that duplicates a 12-piece band, was located in a small Pennsylvania coal-mining town. The cabinet had been chopped up for firewood and the innards were a maze and filled with dust. Three months of intensive work were required to restore it.

And what are Sanders' plans for the future of his museum?

Nothing more, he says than to keep it the kind of a place where both children and grandparents can have fun exploring musical instruments of a bygone era that are a part of our cultural heritage. ★ ★ ★



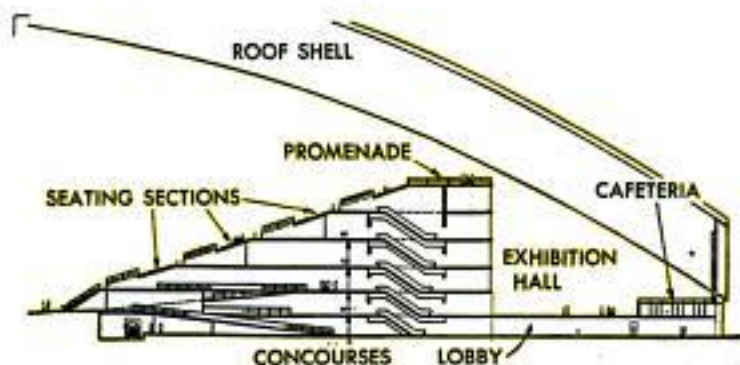
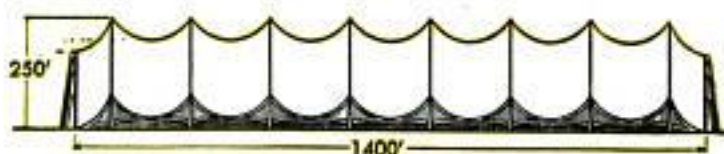
Olympic City will be world's largest enclosed arena. Eight ridges will support aluminum roof over 35 acres

Seats for 150,000— None Behind a Post

FOUR FOOTBALL GAMES could be played at the same time in the arena of Olympic City, \$57,000,000 aluminum-canopied sports and convention palace planned for the New York City area.

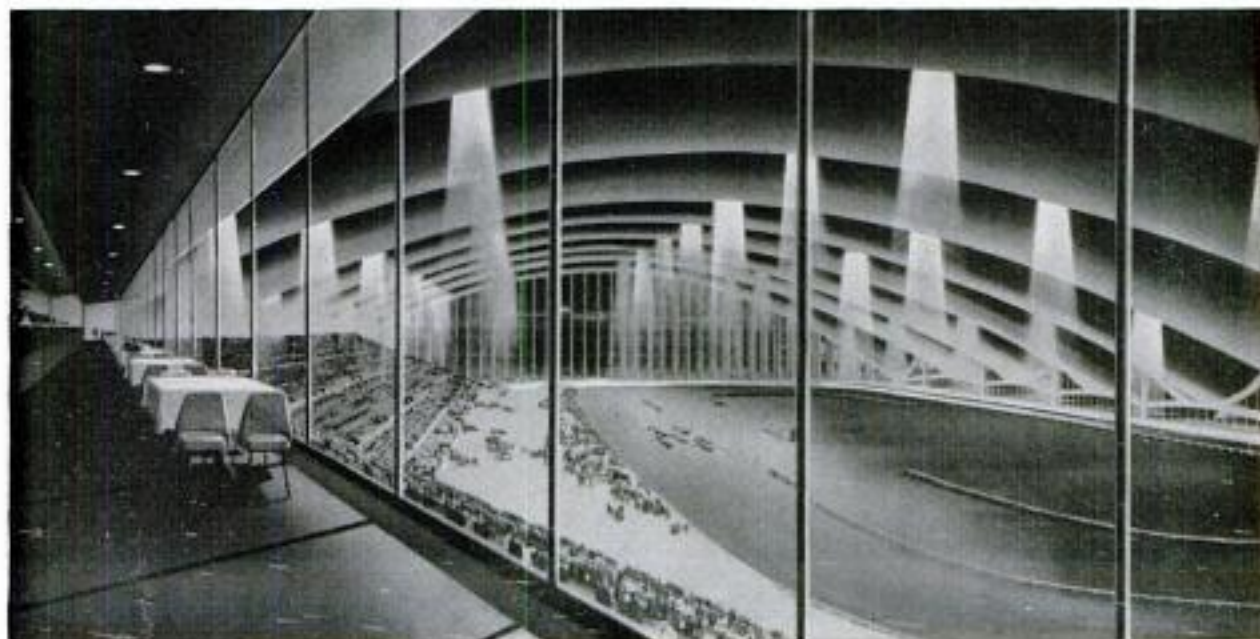
Dubbed the "world's largest room," its 250-foot-high ceiling will span 34.7 acres without a single supporting post to block a spectator's view. The building will contain an estimated 228,312,000 cubic feet of space. Seating capacity will be 150,000.

Architects designed the roof as a "series of hyperbolic paraboids," using plates of aluminum welded together and stiffened at the connecting ridges with extrusions. This design is expected to give the strength needed to span a width of 1080 feet and to withstand the usual snow and wind loads.



Roof of structure will reach height of a 25-story building. Weight load will be directed to foundation via walls at edge

At uppermost level of Olympic City clubhouse will be a promenade-restaurant with accommodations for 1000



New Tools for Grooming Your Lawn



ROTARY POWER MOWER with a 32-inch cut and a motor of only $2\frac{1}{2}$ horsepower is made possible by using three individual overlapping blades (see bottom-view diagram). The two smaller blades are belt-driven by the direct-drive center blade.

Goodall Mfg. Corp., Warrensburg, Mo.

SPRINKLER CADDY attaches to a garden hose and provides mobility, controlled watering and may be changed without getting shoes or clothing wet. It can also be used as a sprinkler for children. The entire unit folds flat for storage.

Clark Metals Co., Denver 2, Colo.

RIDING POWER MOWER will grade and seed a lawn, cut the grass, pull loads up to 1000 pounds and do a variety of other chores. Pneumatic rear tires provide maximum traction, while an automotive-type differential reduces lawn gouging.

Porter-Cable Machine Co.,
Syracuse 8, N. Y.



CUTTING HEIGHT is changed on this power mower by a simple lever that adjusts all four wheels simultaneously. Squeezing the lever releases it for a new setting in a matter of seconds, and when released it locks into place again.

Huffman Mfg. Co.,
Dayton 1, Ohio



DISPOSABLE ROTO-FERTILIZER is an easy way to feed the lawn. Slip the outer cover off, attach the metal handle and roll the perforated cylinder which releases the right amount of fertilizer evenly over the grass. And, the fertilizer is mint scented.

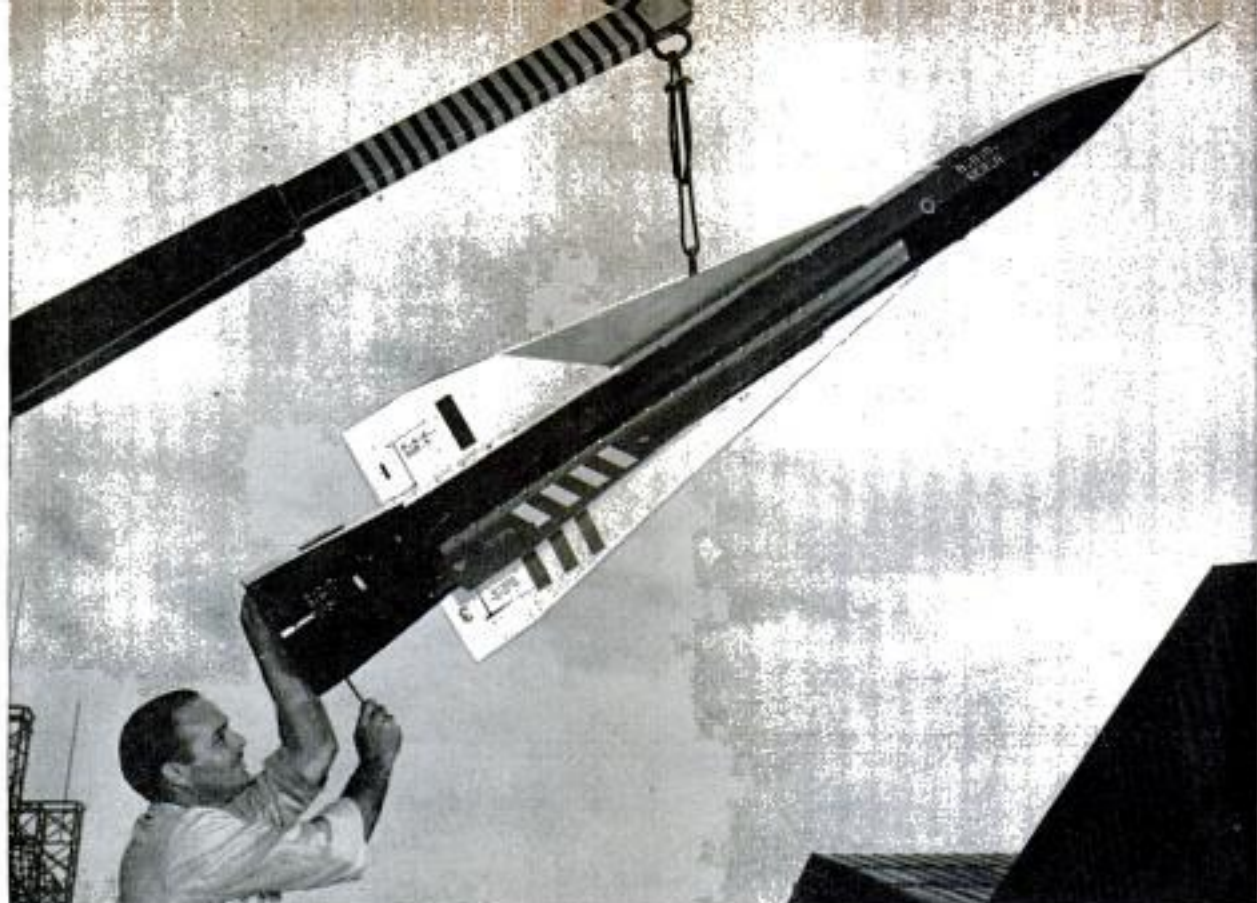
Forward House Div., Olin Mathieson Chemical Corp.,
745 Fifth Ave., New York City 22



LIQUID SPRAYER assures an even distribution of lawn chemicals. The hose pump operates on a one-wheel drive. As the wheel turns, rollers move along the hose and forces the solution out in a fine constant spray through a clogproof nozzle.

O. E. Linck Co.,
Clifton, N. J.



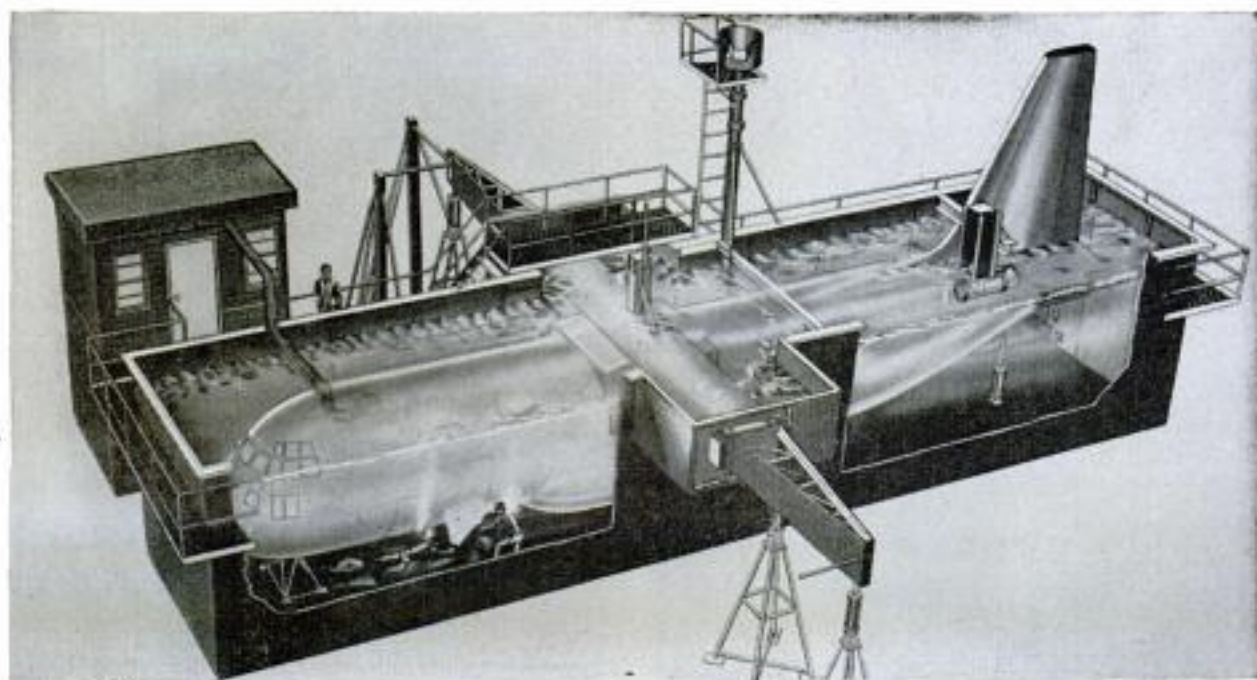


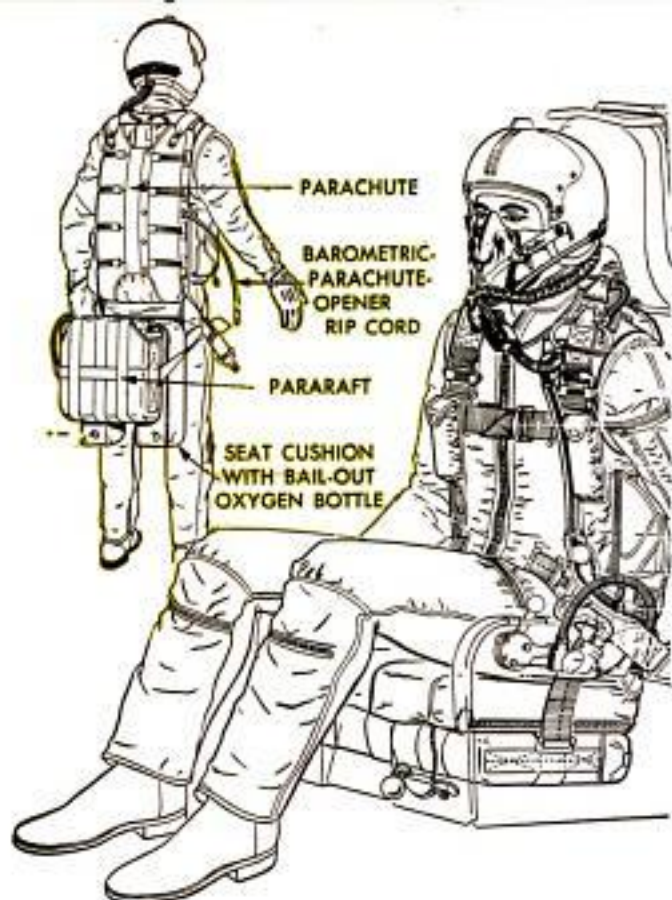
Experimental Missile Fired "Backward"

Rearward-launched guided missiles can be fired by high-speed U. S. bombers at attacking interceptor aircraft. This missile system, first developed for the U. S. Air Force by Cornell Aeronautical Laboratory, Buffalo, N. Y., has been tested successfully on rocket-propelled sleds at the Holloman Air Force Base, N. Mex.

Hercules Transport "Flies" Underwater

Skin divers are helping aeronautical engineers, equipped with TV cameras, fatigue-test an aircraft submerged in a 270,000-gallon tank of water at Marietta, Ga. The 62-ton C-130 military propjet plane will make 20,000 pressurized underwater "flights."





Flight Suit With Built-in Gear Developed for Skyhawk Pilots

Pilots for the Navy's A4D Skyhawk midget attack bomber wear a new lightweight flight suit. In one garment are: A

life jacket, parachute harness, seat belt, shoulder strap and oxygen gear. On ejection, a timing device opens the chute.

Ten-Story Mobile Tower Aids Missile Maintenance



Servicing of guided missiles prior to firing at Patrick Air Force Base, Orlando, Fla., is to be made easier by a 120-foot tower that moves under its own power along railroad tracks. The tower weighs 340,000 pounds, has a base span of 24 feet and can be lowered on a giant hinge in order to escape hurricane winds.

Basis of Life Created in Test Tube

Scientists have taken an important step toward the creation of life in a test tube. An international group of scientists has synthesized ribonucleic acid, the energy-packed cell material that manufactures protein. The laboratory-created molecules appear to be identical to natural ones, or at least very similar, and to behave in much the same way in laboratory tests.

F-51 Becomes Museum Piece

Retirement recently of the last North American F-51 Mustang to the Air Force Central Museum at Wright-Patterson Air Force Base, Ohio, marked the end of propeller-driven fighter aircraft in the U.S. Air Force.





Ross McKenney, center, shows students split sapling which he bent over knee and will form into snowshoe

Graduate of the Maine woods, Ross McKenney learned enough from the Indians and from his battles with Nature to become Dartmouth's

Professor of the

By William Gilman

Photos by Eleanor Gilman

Rabbit snare is wire loop on the end of a heavy pole balanced over forked stick and under peg in tree



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TO THE ORDINARY PERSON lost and hungry in the woods, perhaps facing starvation, a rabbit bounding safely away among the trees can be sadly frustrating. That's where Ross McKenney, expert in getting out of trouble in the forest, is different. He'd get that rabbit for his supper.

Where fancier sports gear fails, the do-it-yourself survival technique of this master woodsman takes over. He'd have the rabbit come back. And he'd snare it with whatever he had handy—shoelace or threads unraveled from his sweater or a piece of tree bark.

Such are the tricks which McKenney teaches at Dartmouth, where he is America's only college coach in bait and bullet, cabin and trail. One of our few remaining woodsmen of the genuine old school, his university was the deep Maine woods.

Tenderfeet Get into Trouble

Forests have much to teach in these outdoor-living days of camping and hunting, when the tenderfoot can stray into serious trouble. But where the tenderfoot feels only lonely wilderness around him, McKenney's alert eyes see a supply house filled with the simplest materials imaginable for easing an ordeal or saving a life.

For example, tree bark can meet one emergency after another. It will kindle a warming fire and tie poles for a night's shelter. Lapped sheets will give a "shingled" roof against rain. Bark will wrap

leaves or moss around a wound, bind sapling splints about a broken leg, tie improvised snowshoes or make an emergency stretcher for transporting an injured companion. Bark binds sticks into a cage-like fish trap or can be made into a cup for heating water.

This kind of education may seem remote from Latin, literature and logarithms, but along with being in the Ivy League, Dartmouth has a strong North Country flavor. That is why 16 years ago it created a new job called "outdoor technician" and asked McKenney to take it.

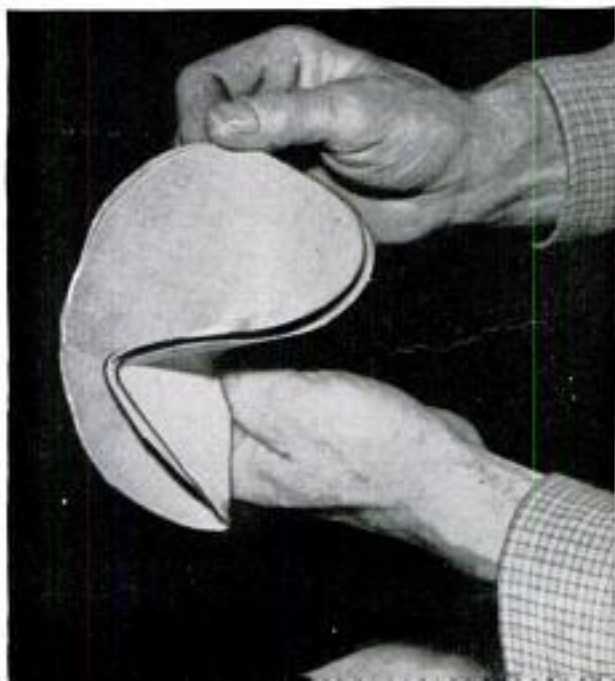
His main duty is coaching woods-and-stream activities of the famed Dartmouth Outing Club at this New Hampshire school whose students attend our only college with an arctic research center. Dartmouth owns summits such as Mount Washington and a 26,000-acre wilderness for use as a proving ground by budding geologists and explorers. DOC rescue teams, frequently called on to hunt crashed airplanes and lost persons, are made up of two first-aid men, two rock-climbers and two woodsmen.

"Workshop" Is the Outdoors

On campus McKenney has a basement workshop, where the only power tool is a motorized grindstone for sharpening such favorite instruments as his trail ax or his unusual "whittling tool" made from an old hayrake tooth. In this basement,

Outdoors

For emergency cup to get drinking water, McKenney cuts out circle of birch bark, folds it (below) and inserts it in split-stick handle



he builds skis, snowshoes, canoe paddles and the like. His main workshop is the outdoors where he teaches the "little things" that make a crafty woodsman. His young trailmates look on him as somewhat of a cross between Deerslayer and Hiawatha.

Incidentally, it was from serious Johnny Neptune, a Penobscot Indian chieftain, that McKenney learned many of his stock of survival tricks like getting that rabbit if you've missed him with your gun, or if you don't have a gun. In a few minutes you can rig up a snare. It's easiest if you have in your pocket a coil of copper wire. With wire a slip-knot loop can be made quickly. Otherwise, a bootlace or strand of tree bark or sweater threads will do the trick just as effectively.

Keep off the Rabbit's Tracks

Choose a tree alongside the route which the rabbit took, but keep off the hare's tracks. A heavy pole is poised across a forked stick. The lightweight end of the pole is held down by a peg driven in several feet up the tree trunk. The snare's

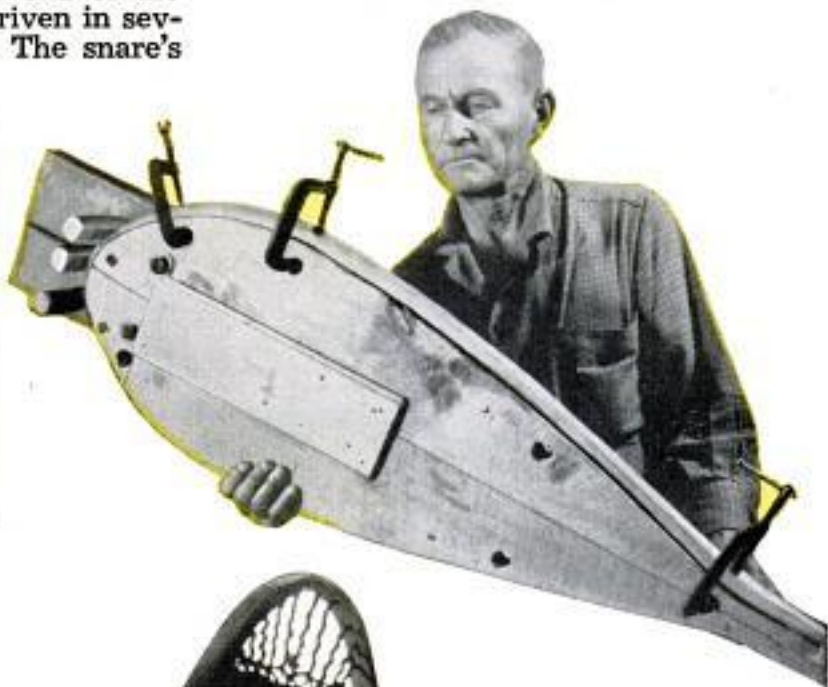
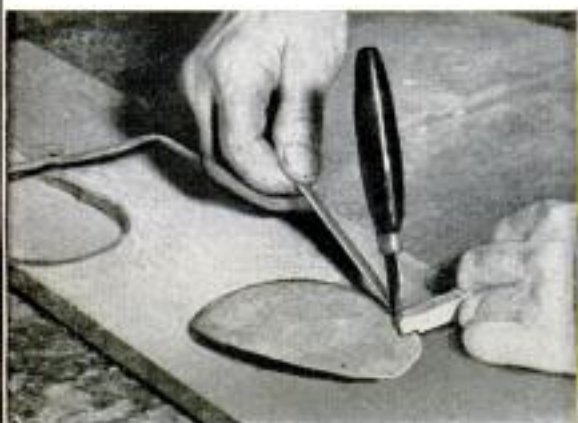
loop dangles from the pole tip. When the rabbit runs into the loop, dislodging the pole tip from the peg, the heavyweight pole end drops and the snared animal is raised.

McKenney "Outfoxes" Rabbit

Without bait the snare might stay empty a long time, but McKenney knows a rabbit habit. In flight, it halts at the nearest thicket. By circling around, then hollering, you can start the rabbit running again. But this time it bolts straight down its previous tracks and runs its head into the loop suspended there, even if someone stands only several feet off to one side of the rabbit trail.

Besides this tip-up snare, there are various deadfall traps using bait. Here, a pole's heavy end or a rock drops on the animal after it has dislodged a trigger pin whittled out of wood. This trap can be set up in a tree to catch climbers or in water to get animals such as the muskrat.

Drinking water also can be an emergency



Top left, McKenney makes leather thongs by pulling circle of leather, cut from boot, against knife beside whittled wood block. Left and top right, he builds snowshoes in campus shop



The "professor" shows how to make a two-section lean-to out of boughs and bark with fire in the center

item, especially if it happens to be tantalizingly out of reach in a stream or pool; or perhaps you're too exhausted or have had an accident and can't get down to the water.

Bark on the common white birch tree peels easily. Cut a round sheet of it six inches in diameter. Fold this in half; then fold the bark again. Open the bark like a chemist's filter paper and you have a conical drinking cup. Split the tip of a stick and insert the cup's folded side in the slit, and you have a handy dipper the handle of which can be several feet long. Additional layers of bark make the cup sturdier. Two handles prevent its getting limp; when warmed carefully over a fire, you can boil water in this container. Yet, McKenney will show you there's no better emergency kindling for a fire; a match flame applied strongly to "green" birch bark causes a quick flare-up.

Shelter and Warmth

A big survival item is providing yourself with night shelter and warmth to restore your energy and avoid dangerous wandering in the dark. "A nice overhanging ledge is fine," says McKenney, "but they don't often come when you want one. I've seen too many victims of walking too late. When a fellow knows he's lost, an hour before sundown is none too soon to start putting up that shelter and dragging in windfall stuff for an all-night fire."

McKenney's experienced eyes can spot a

suitable shelter site almost anywhere. The lean-to structure can be a pair of forked uprights with crossbar over the forks to support the leaning roof poles which are then covered with tree boughs or birch bark to keep out rain.

You can pull down the top of a young tree, lash it to a ground post and have a fine arch against which to set poles. A lodged tree fallen against another is also ideal "backbone" for a lean-to. A log lying on the ground or an ordinary standing tree will do when poles are poised at an angle on them. For the tree you whittle wooden pegs which you pound into its trunk; driven slightly downward with the grain, the pegs penetrate. Poles leaned against these pegs form a wigwam-shaped shelter.

Heating Tips

Heatingwise, if your fire is built at the base of a tree, a natural draft will pull smoke up. If there are several persons, rather than making a wide sleeping shelter, erect two narrower ones face to face; fire between them makes for easier heating. In winter dig down to ground level for your fire and shelter; walls of the snow trench will make you more snug.

One *must* item is waterproof matches, either the purchased kind or the type made by wrapping ordinary matches in paper and dipping the package in melted paraffin. The other *must* is your cutting tool—a belt ax preferably, but at least a jackknife.

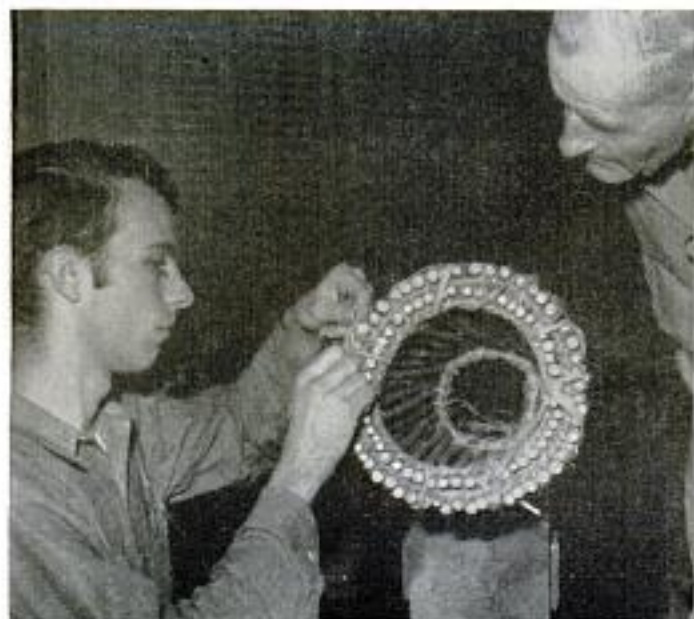


Fish trap made of sticks and tree bark is placed in stream below pool. Dammed stream steers fish to trap

Survival also means finding your way back to civilization. In case of a deep snowstorm McKenney builds his own snowshoes to carry him lightly over icy surfaces. For material his first choice is the ash tree—a lightweight wood, easy to work. He cuts a four-inch sapling and splits it lengthways into four quarters. To prevent warping he removes most of the heartwood. He now has lumber for the snowshoe frame.

Remaining work consists of slowly bending such a strip over your knee to give it

McKenney shows Tony Ryan fish trap made of sticks and tree bark. Fish enter inner edge of snare through the small end



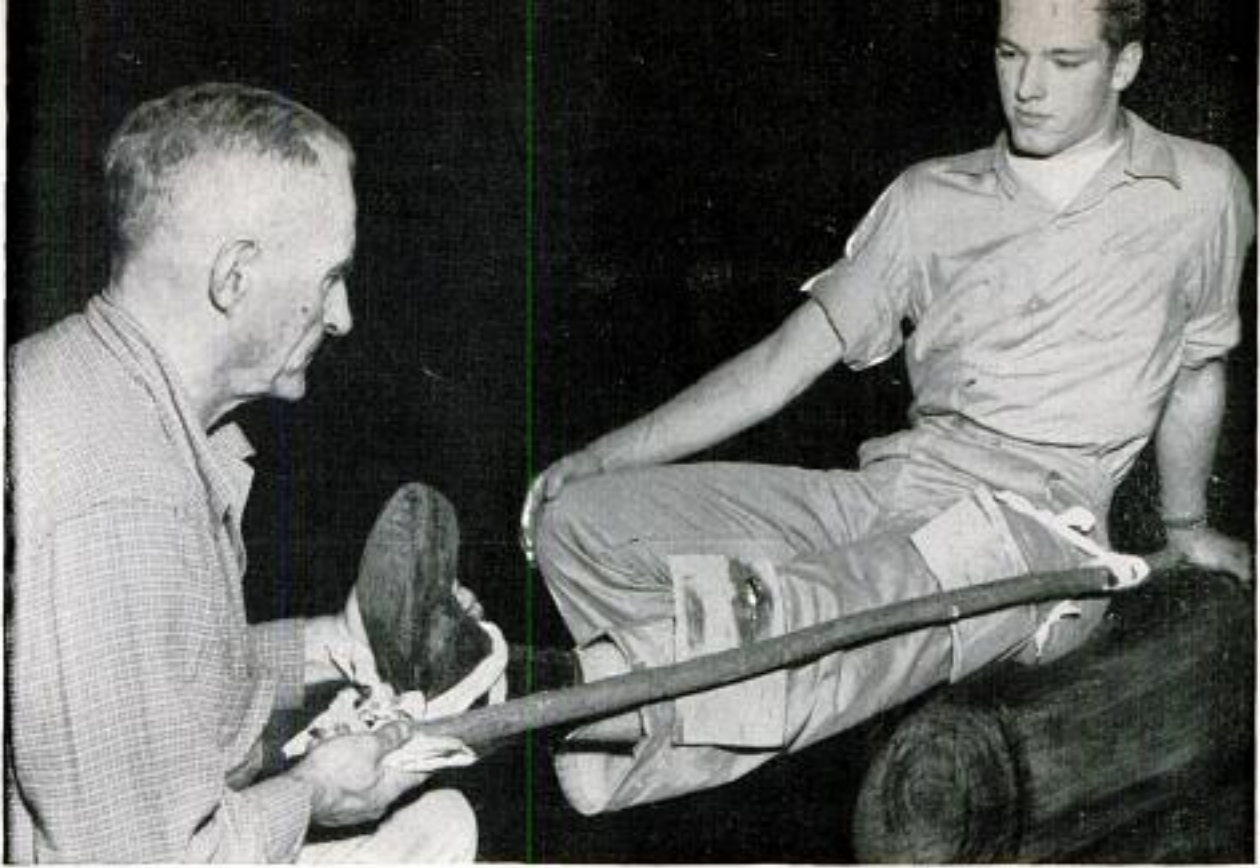
snowshoe shape; if soaked in water first, the wood will bend more readily. It is slotted toward front and back; in the slots a wooden toe and heel bar are inserted; then the tail end is tied together permanently. Netting is now strung across with a basket weave, as in darning. For this filling, thongs would be fine, but tree bark will do. Use tough, inner bark that has been cut into strips and braided for extra strength.

Trees such as elm, basswood and ash are best for bark removal. In spring's sap-run time the bark peels off easily in big sheets. Later, when the bark is tighter, you peel more carefully, as you pry with your knife. When bark is very tight in winter, first pound the tree with a club or simply whittle strips of bark from the trunk.

Thongs From Animal Skin

An expert woodsman isn't limited to tree bark, when he needs material for rope. From the skin of an animal, McKenney easily makes rawhide thongs. After scraping the hide, he slices it into thong strips. Drawing them through a $\frac{1}{8}$ -inch hole shapes them nicely.

McKenney's neatest trick for making emergency thong involves his leather boot. First, he cuts off a circular strip. Then, he whittles a notch at the end of a small piece of wood. The notch is as deep as the leather's

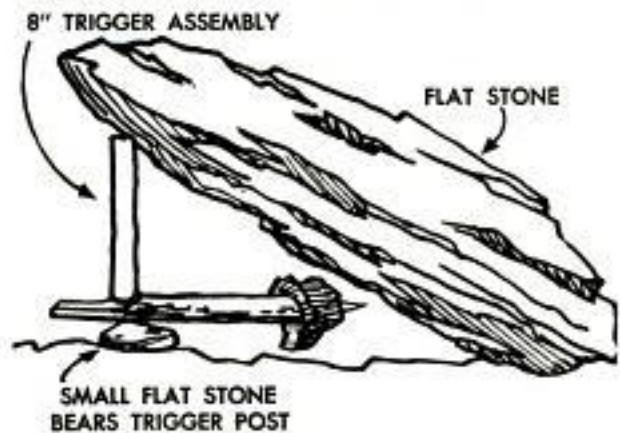


Above, chopped sapling serves as splint with padding of birch-bark sheets for "injured" Dartmouth student

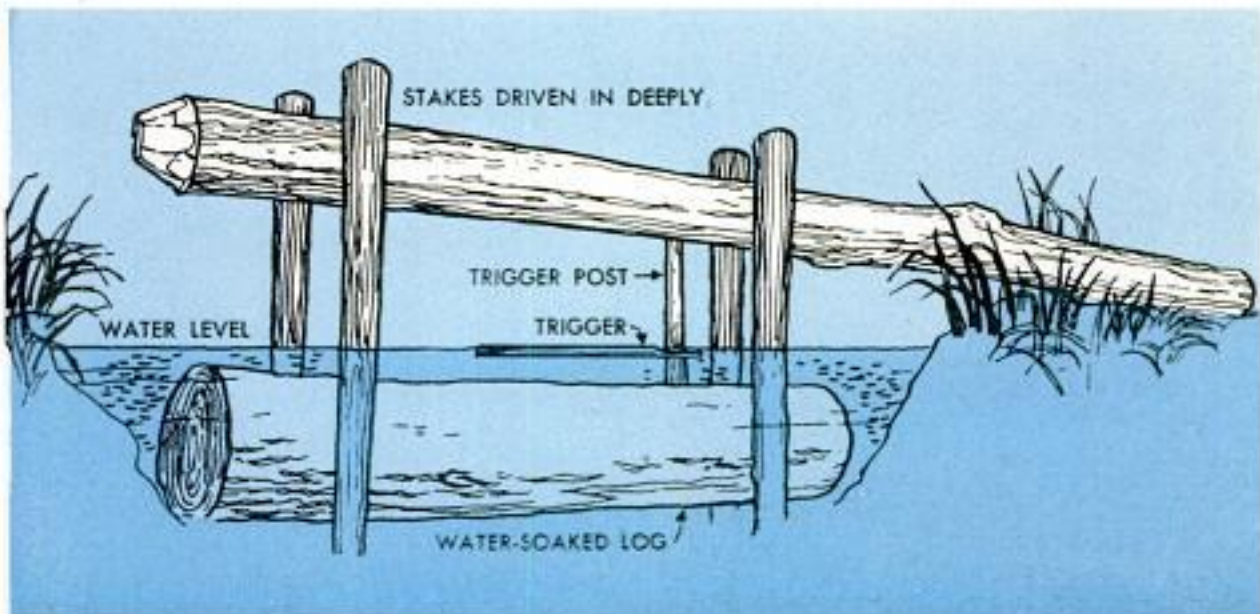
thickness and as long as the thong is to be wide. The leather is laid on a flat piece of wood with the notch held firmly over its edge and the point of a jackknife jabbed into the wood at a slight slant. Simply by pulling on the leather's end—as in ripping a ribbon of cloth—the leather unwinds into a long thong.

With such a selection of emergency binding materials, McKenney points out that it's easy to create equipment in the woods in case your companion is injured.

"Of course, if he's big and you're a little
(Continued to page 216)



Rock deadfall trap, above, and tree deadfall, below, both operate on principle of animal dislodging trigger





WIRE-ART KIT contains 40 feet of wire of various colors. The hobbyist, using simple jigs and other tools, bends the easily worked wire into a variety of shapes to make miniatures, ornaments and gifts. A complete chess set made of wire figures is shown below. Other hobbycraft materials such as pipe cleaners and raffia are fastened to wire with special glue

X-Acto, Inc., 48-41 Van Dam St., Long Island City 1, N.Y.



FOR THE HOBBYIST...

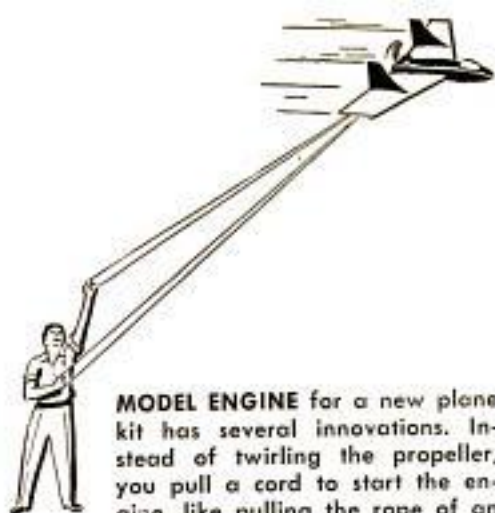
BUILD A CITY in your spare time. Prefabricated parts of skyscrapers and bridges interlock to form strong, realistic models. The set consists of plastic sections of various shapes which can be combined to form models of real buildings such as New York's Empire State Building and Chicago's Tribune Tower

Halsam Products Co., 3610 Touhy Ave., Chicago 45

TILE KIT duplicates appearance of ceramic tile but actually consists of small squares of vinyl tile. Odd-shaped tiles are easily made by trimming with scissors. Tile cement is spread over object such as a wooden bowl, and tiles pressed into place. Tile mortar then is used to fill and seal cracks

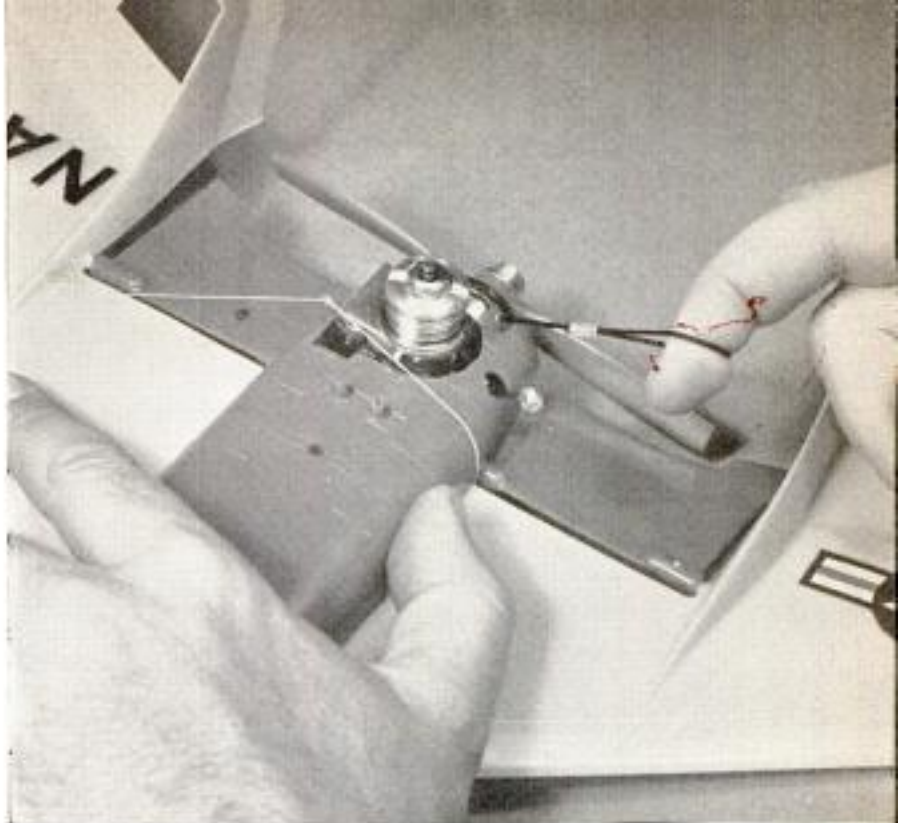
Hobby-Time Mfg. Co., 14401 Meyers Rd., Detroit 27, Mich.





MODEL ENGINE for a new plane kit has several innovations. Instead of twirling the propeller, you pull a cord to start the engine, like pulling the rope of an outboard motor. The plane has two sets of controls (above). One set makes model climb or dive, the other is connected to a new control on engine which enables the young aviator to slow it down or speed it up. Previously, such model planes flew at constant speed

Wen-Mac Corp., 11511 Tennessee Ave.,
Los Angeles 63, Calif.



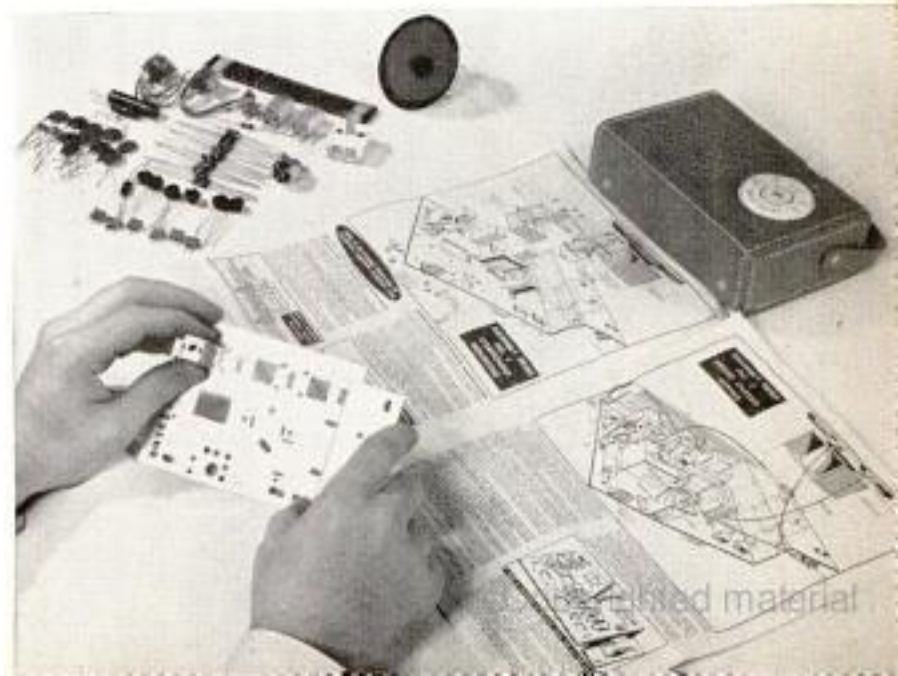
FURRY SQUIRREL, approximately full size, comes to life in another kit. The kit has 12 preshaped plastic parts which are cemented together to form the animal. Flocking then is applied to give the squirrel a furry appearance. Whiskers and green-tinted eyes complete the project

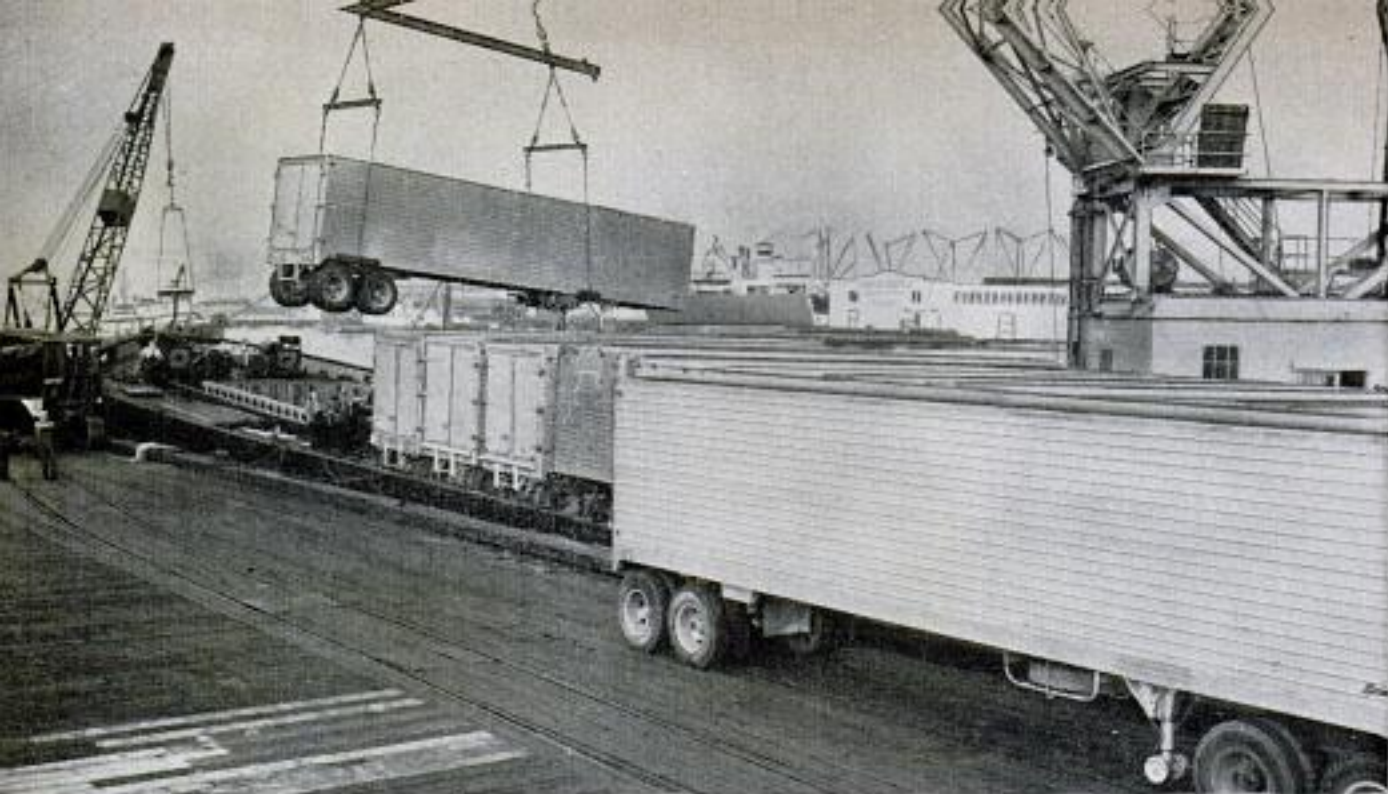
Revell, Inc., 4223 Glencoe Ave., Venice, Calif.



PORTABLE RADIO complete with six transistors can be built from another kit. Small battery no larger than a flashlight battery powers the transistorized circuit. Instructions include easily understood diagrams so even a novice can assemble the radio. Kits are also available for building smaller transistorized radios. Hearing-aid plug takes place of speaker

Lafayette Radio, 165-08 Liberty Ave.,
Jamaica 33, N.Y.





Loaded van is stowed aboard a barge and fastened securely for the five-day voyage to an Alaskan port

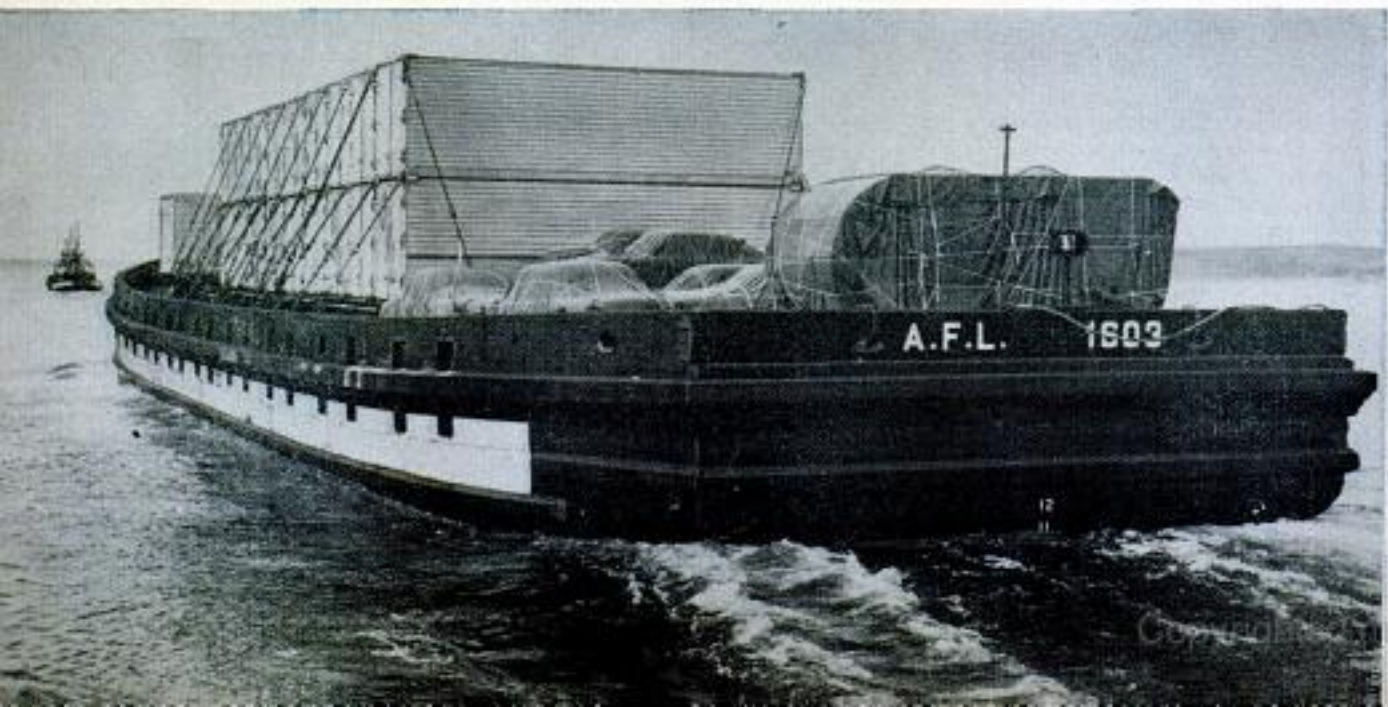
Seagoing Trucks for Alaska

By Edward A. Herron

CONVEYING SUPPLIES to Alaska quickly and safely has been a problem since gold-rush days almost 60 years ago. Seagoing "truck convoys" may be the answer. These consist of a fleet of ocean-going tugs that move in a perpetual circle between Seattle and Anchorage; behind each tug is a 204-foot barge crowded with

refrigerated trailer units. At Alaska Freight Lines' pier in Seattle, cranes lift loaded vans aboard barges for the 10.7-mile-per-hour, 5-day voyage. Self-contained generator units on each barge continuously refrigerate perishables. Arriving at Anchorage or Seward, vans are hauled by diesel trucks to destinations. ★ ★ ★

Bargeload of trailer units is towed through Puget Sound toward Port of Anchorage 2000 miles away



Most of the tugs and barges are able to make the trip between Seattle and Anchorage (at 10.7 m.p.h.) in less than a week



Below, dock facilities are maintained at Anchorage in the summer and at Seward to the south for wintertime barge deliveries



Right, 60 heavy-duty, diesel-powered trucks haul cargoes in vans to docks at Seattle and from docks at Seward and Anchorage

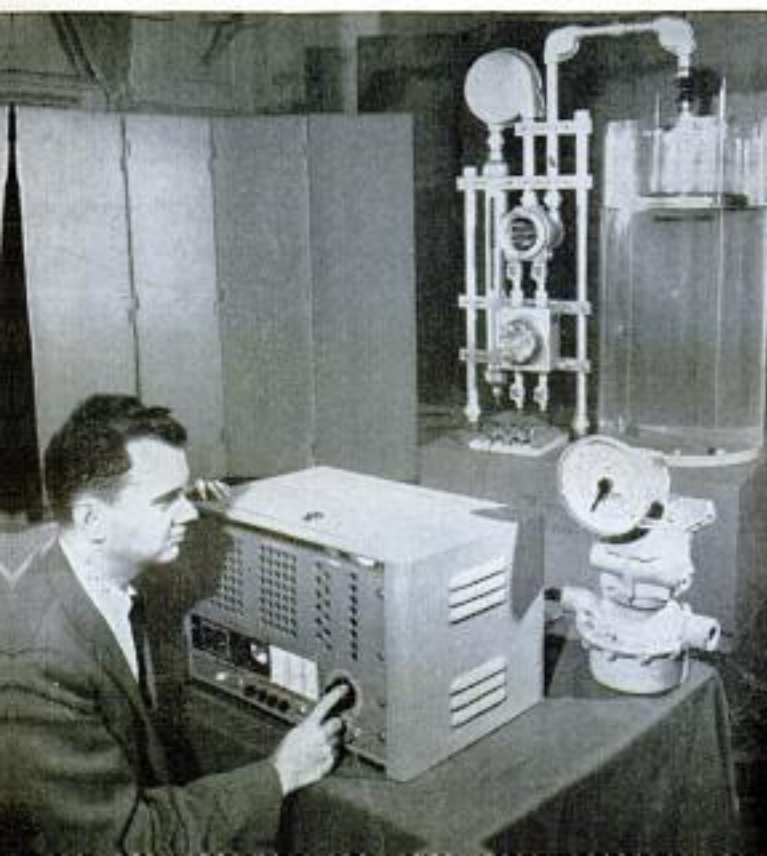




Globemaster Hauls Two 36-Foot Trailer Homes to Greenland

Two special 36-foot-long cold-weather trailers are loaded into a C-124 Globemaster for delivery in Greenland. The trailers will be office and home for the men who operate one of the Air Force's distant early-

warning line of radar sites which stretch across the frozen regions of North America. They are specially insulated against cold weather and equipped with vaporproof lights.



Push-Button Control Operates Distant Factory

Industrial processes can be measured and monitored by remote-control apparatus hundreds of miles from the actual production site. When requested by a supervisor at the control point, the temperatures, pressures or other data necessary in storage tanks and manufacturing techniques are adjusted and reported. A receiver indicator, remotely operated by a supervisor, "calls" the tank or work site with signals over ordinary telegraph circuits, telephone lines, VHF and microwave radio bands. Apparatus at the production area converts data requested into a return signal for the receiver indicator.

Left, supervisor operates remote-control receiver indicator in "calling" for position of tank float. Device by tank's side converts data into return signal

Slotted Surfboard Gives "Feel" of Water Skis

There's a new thrill in water sports—a board that combines the features of a surfboard and water skis. The board, shaped much like a surfboard, has a U-shaped slot in the rear, leaving two sections about the width of water skis. The flexibility of these sections gives the "feel" of water skis, yet the board is easier for a beginner to master than a pair of skis.

Tailor-Made Antibiotics

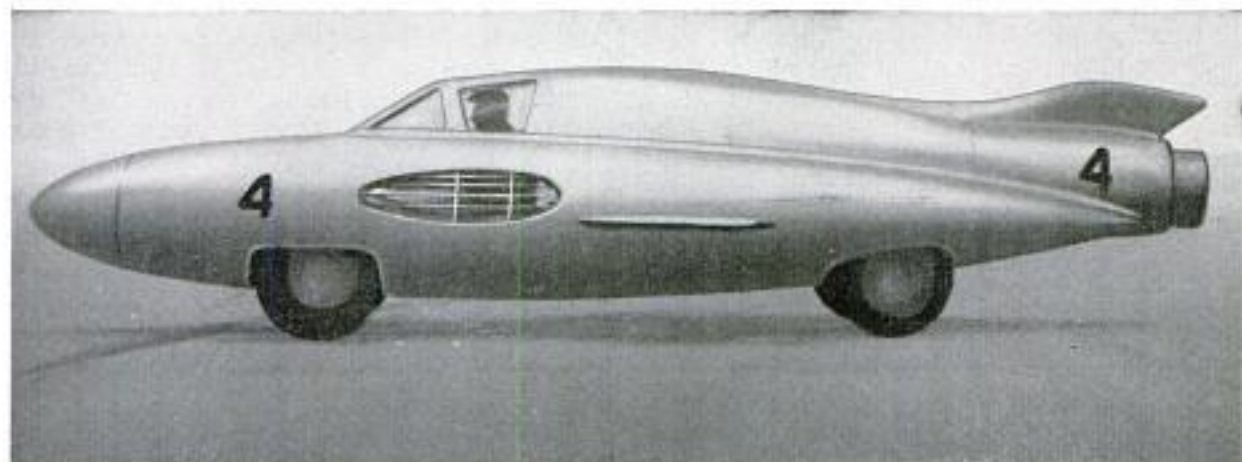
Can microorganisms be crossbred? That is the hope of scientists at Rutgers Institute of Microbiology. They are studying microorganisms' reproduction methods in the hope that tailor-made antibiotics can be developed.

Weight "Heard" On Scales for Blind

Electronic scales enable blind workers to "hear" the weight of small-lot items to be packaged. Wired to a three-tone speaker, a two-arm scale produces one sound for underweight, another tone for overweight, and a third sound for correct weight. A blind worker places a container with the exact number of items to be packaged on one scale arm; into an empty container on the other scale arm, he drops items until the scale tone tells him the arms are balanced and the container has enough units.

Russian Jet Race Car Hits 185 Miles Per Hour

Strictly experimental, a jet racing car built by the Gorky Motor Works in Russia has been successfully tested, according to press stories. The jet car is driven by jet thrust alone, there being no linkage between the wheels and the kerosene-burning jet engine. Thus no gearbox is needed.



SUBMARINE LUMBERMAN

By Ken Metzler

DEE McVAY, ex-Navy diver, heard that Oregon's State Game Commission was seeking an economical way to clear the mountainous stacks of logs and stumps that cluttered the shores of a tiny lake on the coast.

If so much wood clogged the shores, McVay reasoned, there must be wood on the bottom, too.

As a result of this curiosity, today he's in business diving for logs to help fill the high demand for lumber.

Back in 1954 McVay slipped beneath the waves of Eel Lake in the first of a series of underwater explorations. There, in jumbled abandon, he found hundreds of logs representing 10 million board feet of lumber.

This began one of the most unusual logging operations in the annals of American forestry. So far, McVay and his five-man crew have raised a million board feet of submerged logs from the depths of the lake.

The logs are an accumulation of timber cast off from reckless logging operations of 20 to 45 years ago. These loggers literally stripped the coastal foothills of old-growth timber. The logs were shoved into the lake, where they eventually sank to the bottom.

Storms Also Contributed

To a lesser extent, gales whipping landward from the Pacific contributed to this massive collection. Through many centuries, giant Douglas firs, cedars and spruces succumbed to the ravages of coastal weather and toppled into the lake.

From the murky, muddy lake bottom, McVay brings up logs he estimates blew into the water about the time the *Mayflower* was being rigged to sail westward with the Pilgrims. The water has preserved them remarkably well, according to McVay, and the lumber is as sound as if the trees had been chopped down only yesterday. He said the lumber goes to market with that of recent vintage, and no one can tell any difference between the two.

The techniques used by these deep-water lumberjacks would probably astound some of their traditional ax-and-power-saw



Canvas-bag buoys, when inflated with air, bring logs to surface

contemporaries. Working from a raft, McVay or one of his divers descends into the inky blackness of water 40 to 50 feet deep. He "fells" a log by attaching a large deflated canvas bag or buoy at each end.

Air is then pumped into the bags and, as the diver cries "Timber!" over the two-way telephone, the log begins rising to the surface. Inflated, these canvas bags can bring up logs weighing as much as two tons.

Logs thus "harvested" are towed to shore, sawed into convenient lengths for handling and fed into an adjacent sawmill. The rough-cut lumber from this mill is trucked to another mill for finishing.

In this highly specialized type of logging, no one worries about falling trees or forest fires. Logs rising out of control, however, are a serious threat to both the diver and the men on the raft above. And there are probably no other woodsmen who have to worry about getting their air lines fouled.

Project Aids Conservation

Despite these differences, both accomplish the same basic purpose of providing lumber for a construction-hungry nation. But equally important in McVay's project are the conservation aspects.

Eel Lake rests placidly beneath the foothills of the Western coastal mountains in



Diver emerges from the bottom of Eel Lake, Ore., the scene of unusual underwater-logging operation

a setting of young trees. Oregon's Game Commission, anxious to revive it as a fishing and recreation lake, gave McVay underwater-salvage rights in return for clearing the shores.

Not Getting Rich

McVay admits he isn't exactly getting rich from his underwater logging operation, but he finds the task very interesting and he is familiar with the work since he's been diving for years.

His previous salvage-diving work sent him to the bottoms of sawmill storage ponds to recover sunken logs. He also has helped remove automobiles from torrential streams.

Once he spent many nerve-racking hours beneath the surface of a raging flood in Iowa, patching up dikes that threatened to wash out at a moment's notice.

Spider Shares Helmet

But his most hectic time in a diving suit occurred the day a spider somehow got inside his helmet.

"The darned thing started building his web," McVay recalled, "from my nose to my eyebrows and there wasn't a thing I could do about it. He was still at it when I came up two hours later. It was the worst time I've ever had." ★ ★ ★

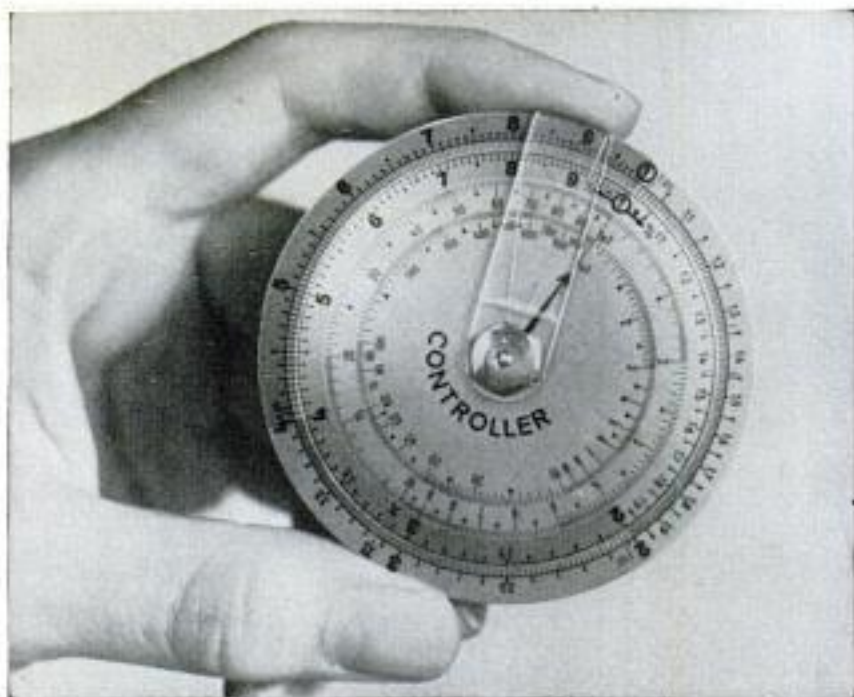
Below, McVay saws a log into sections. Water has eroded log's surface, but wood inside is usable





Russian Volga Is Clutchless

Ruggedly built for the rough roads of Russia, the new Volga has that country's first automatic transmission. It is a conventional torque converter with a three-speed gearbox. The 150-cubic-inch engine is a four-cylinder model of 70 horsepower. Top speed of the Volga is said to be about 80 miles per hour.



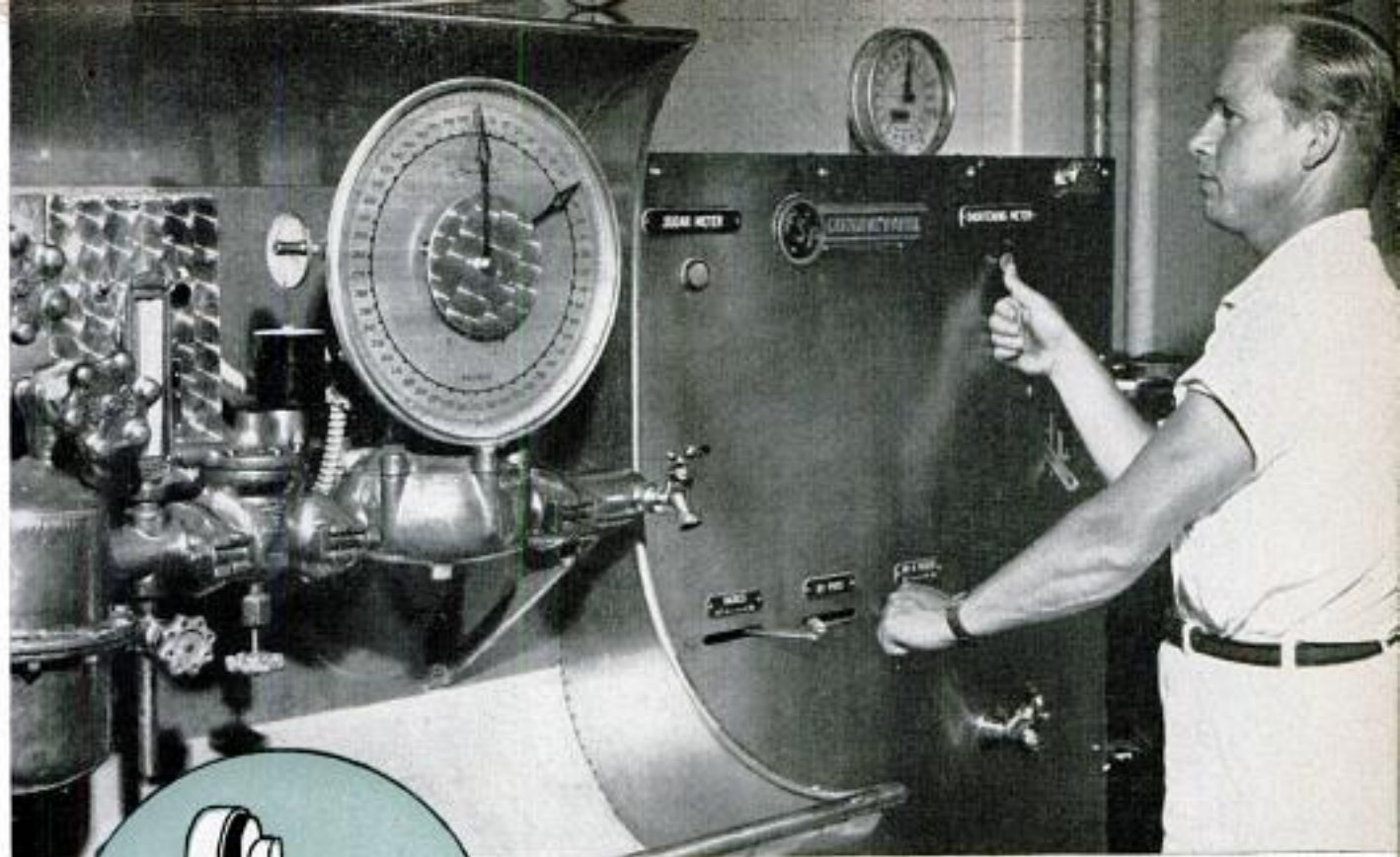
Pocket Calculator Easy to Operate

You can write with one hand, while the other is operating an automatic calculating device. Made of aluminum, this instrument is three inches in diameter and weighs one ounce with case. The circular calculator does multiplication, division, exchange rates, currency calculations, percentages, squares, cubes and other problems. The device is said to have the performance of a 10-inch slide rule. Instructions accompanying the device furnish all knowledge necessary to operate the unit.



Streamlined Cycle Looks Like Scooter

It looks like a motor scooter, but it's really a streamlined body shell that can be clipped to any motorcycle. Made of plastic, the shell was designed as a prototype by staff members of the British magazine *The Motor Cycle*. Tests show that a motorcycle equipped with the body gets up to 35 percent more mileage per gallon and 10 percent more speed. The 45-pound body shell, including 20 pounds of accessories, is attached by thumbscrews at only three points on the motorcycle frame.



Activated by button, the control panel meters proper amounts of sugar, shortening and other additives to the mixing machine

By Thomas E. Stimson, Jr.

Bakery

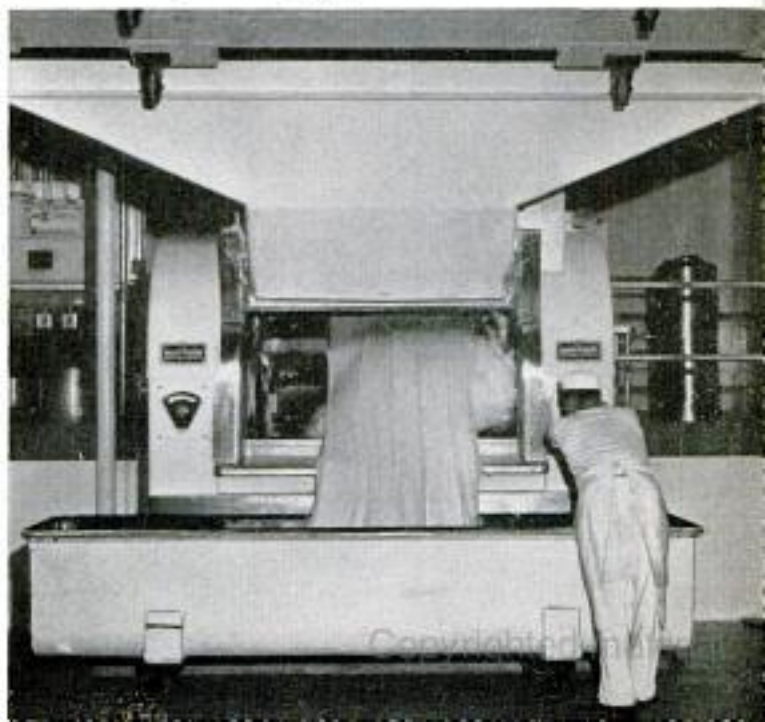
URNS OUT 10,000 LOAVES PER HOUR

ANYONE WHO HAS WATCHED a housewife struggle through the chore of baking half a dozen loaves of bread will marvel at a mammoth bakery near Los Angeles. It has a capacity of 10,000 loaves per hour. The new Langendorf bread plant, costing \$2,500,000, turns out loaves of bread in much the same manner that Detroit manufactures automobiles.

Automatic equipment sifts flour, meters ingredients and mixes dough. Other machinery cuts dough to size, shapes loaves and places them in pans that travel on conveyor lines through a giant baking oven and finally to slicing and wrapping machines.

Not only does the robot bakery perform all the work that once was done by hand, its machines have been taught to think for themselves. The molder-panner refuses to drop a lump of dough onto its conveyor line until an empty pan arrives and then

Final mixer discharges 1600 pounds of dough after all ingredients have been mixed for about 10 minutes. From here, the dough goes to the loaf divider



ABOVE, BASIC INGREDIENTS ARE MIXED INTO SPONGE AND DISCHARGED INTO A WHEELED TROUGH

ABOVE, SPONGE FERMENTS 4½ HOURS AT 80 DEGREES F.

ABOVE, IN FINAL MIXER INGREDIENTS ARE ADDED TO SPONGE TO MAKE UP 1600 POUNDS OF DOUGH

LEFT, DOUGH IS CUT IN DESIRED SIZE AND SHAPE IN LOAF DIVIDER BEFORE GOING TO LOAF ROUNDER

BELOW, LOAVES MATURE FOR 12 MINUTES WHILE PASSING THROUGH PROOFER

LEFT, TRAVELING BELT CARRIES LOAVES TO ROUNDER FOR KNEADING AND ROUNDING

BELOW LEFT, IN FINAL PROOFER LOAVES RISE 65 MINUTES AT 110 DEGREES F. HEAT

BELOW, LOAVES ARE FLATTENED TO ELIMINATE GASES

RIGHT, LOAVES ARE RE-ROLLED AND DROPPED IN SINGLE PANS

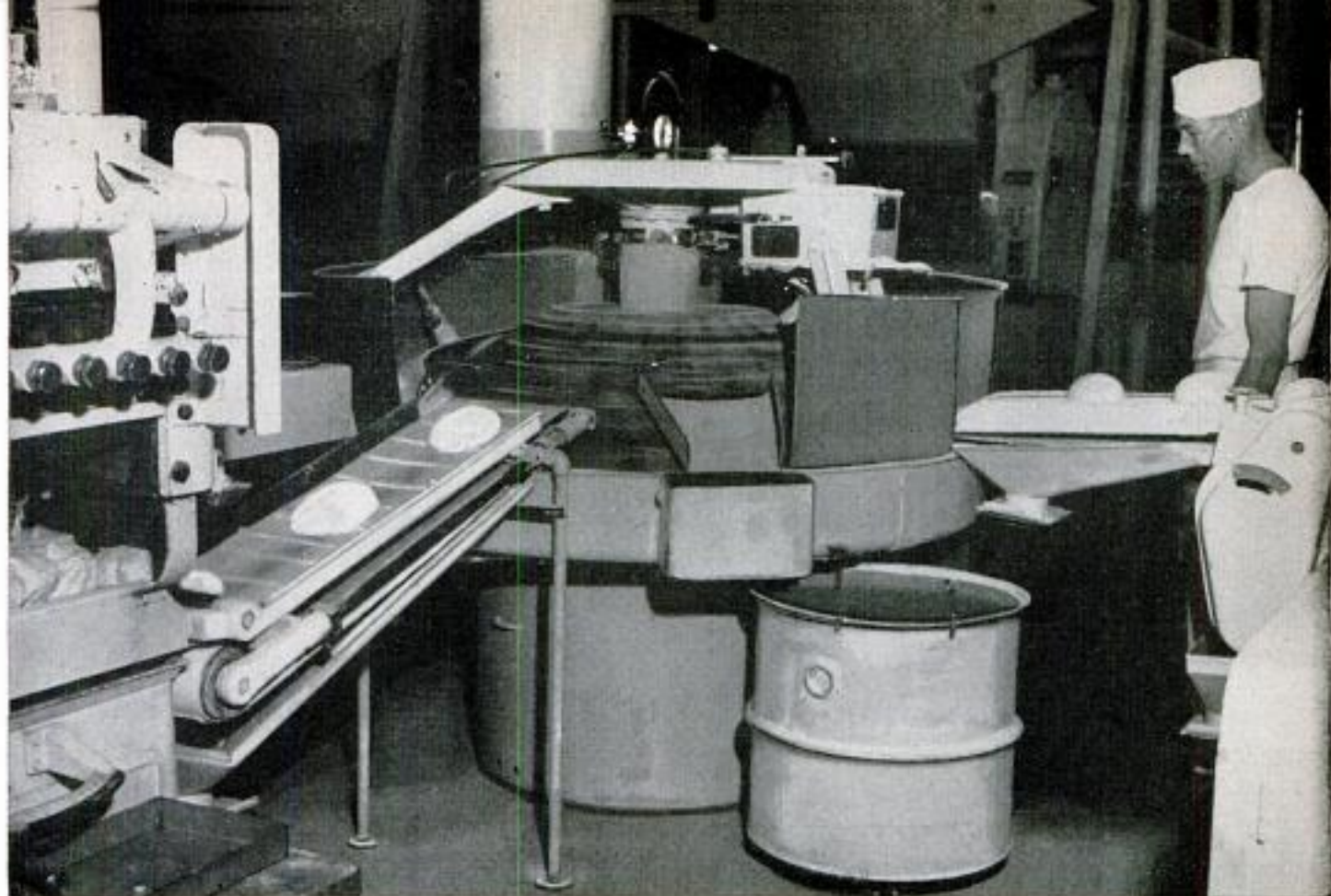
LEFT, IN 120-FOOT OVEN AT 400 DEGREES F., LOAVES BAKE 22 MINUTES

ABOVE, AIR JETS LOOSEN LOAVES, WHICH ARE DROPPED ON TRAVELING BELT

ABOVE, BREAD SPENDS 1½ HOURS IN COOLER AND COMES OUT AT 95 DEGREES F. FOR SLICING, WRAPPING, SHIPPING

R. P. GILLES

ed material



Loaf divider, at left, cuts dough to correct weight and shape. Dough then moves to loaf rounder, at center

drops the dough in the center of the pan. Again, when pans from several machines are arriving simultaneously at the main conveyor line, pans from one machine are held up until other pans have moved along and the way is clear. Otherwise, there would be a traffic jam. There are still white-shirted bakers present, but they are there only to oversee the machines. The entire process operates on an electronically controlled timetable.

In this bakery, quantities are measured by the ton instead of in ounces or pounds. There is enough flour in four big tanks for 136,000 large loaves; even more flour remains in an adjacent seasoning room. Blended and sifted, flour in the tanks is blown by air pressure through stainless-steel tubes to the mixing department when needed.

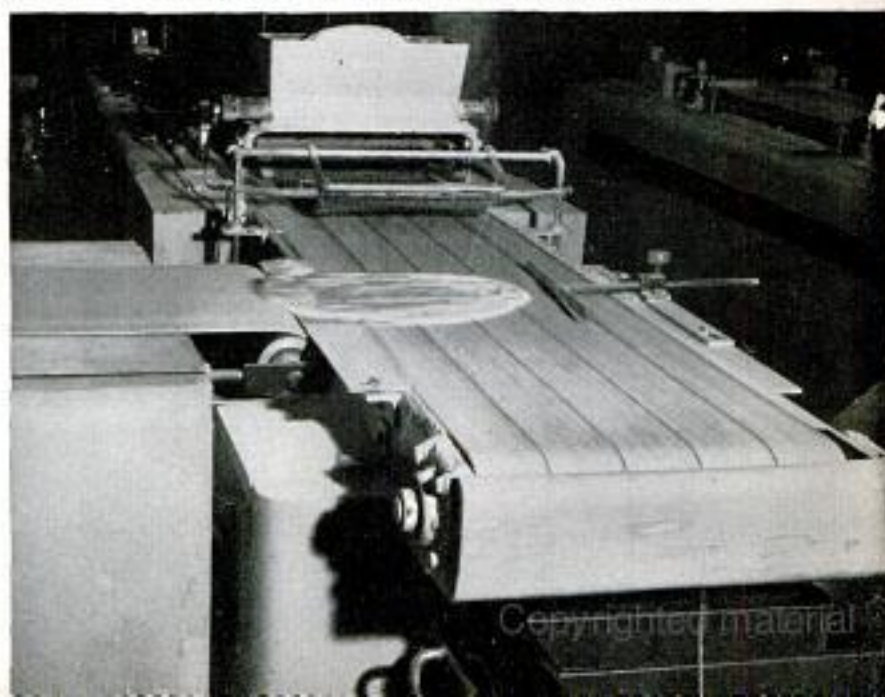
8000-Gallon Sugar Tank

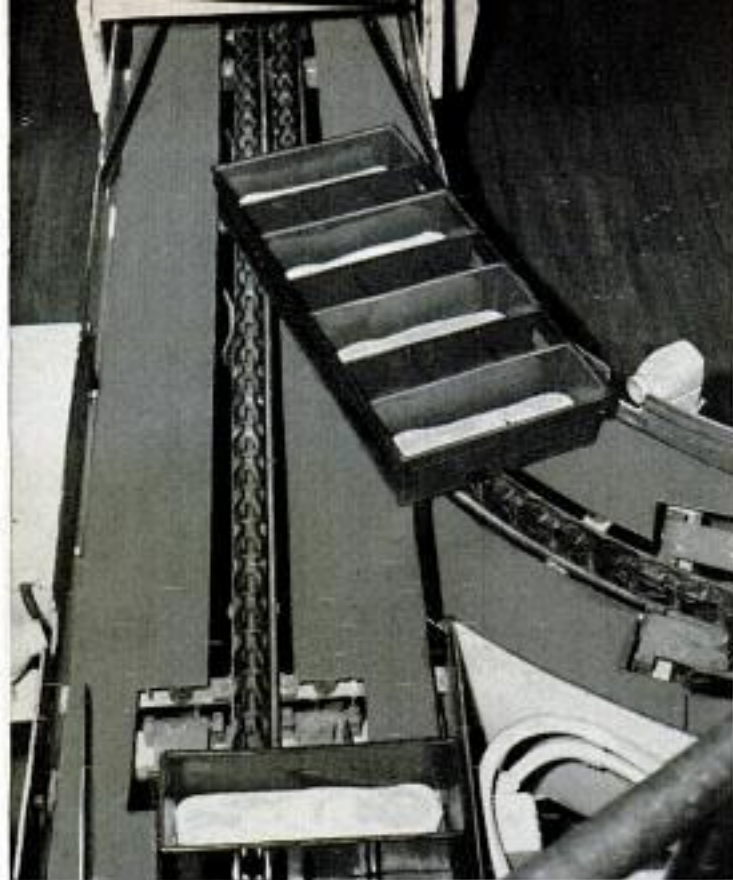
A housewife keeps a few pounds of sugar in a bin; at the Langendorf plant as much as 8000 gallons of liquid sugar are stored in a huge plastic-lined tank, kept sterile by ultraviolet lamps. A pair of 4000-gallon tanks contain shortening that is heated to 115 degrees F. so it can be pumped as a liquid through insulated pipes to the mixing department. Milk, salt and

other ingredients are kept in stainless-steel receptacles.

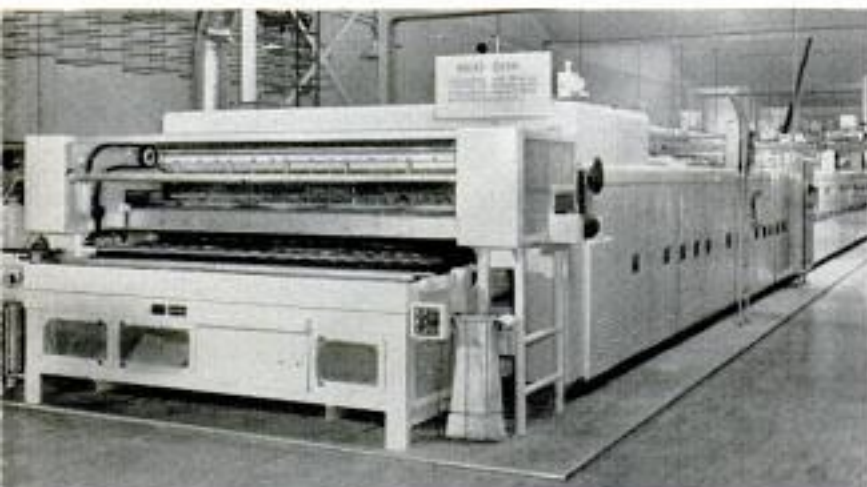
It isn't even necessary here for the master baker to look at the ingredients he is mixing. Almost everything he does is by remote control. His recipe for a certain kind of bread might read like this: "Set the flour dial and press the discharge button. Next, press the shortening and sugar buttons. Set the water meter to deliver the desired number of pounds and press that button. . . ." Each substance is electronically

After leaving the proofer, each loaf is squeezed flat by rollers to eliminate gases. Here a flattened loaf, shaped like a tortilla, is moving along from one endless belt to another



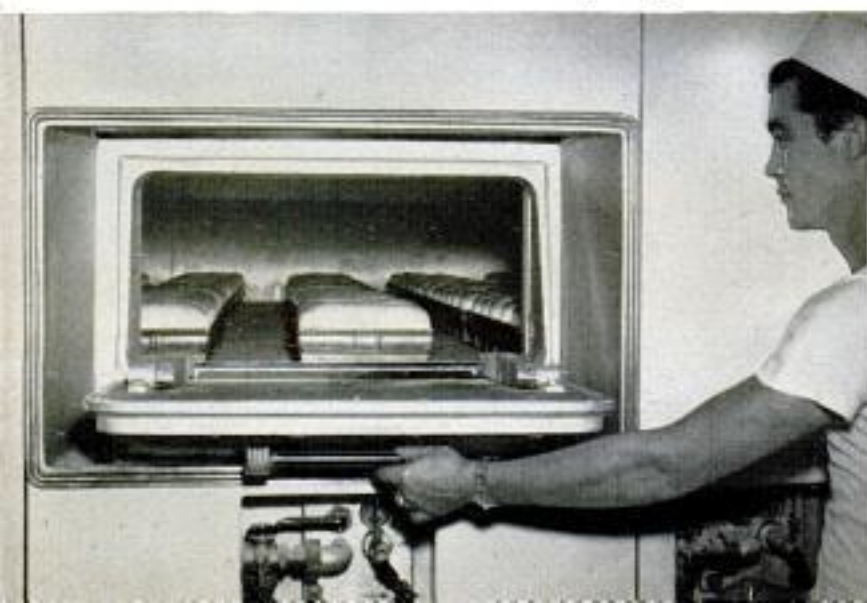


Above, four pans with loaves are connected to form a moving "train." Electric eye spaces trains and prevents pile ups



Above, this is a general view of the 120-foot traveling oven. Next, loaves are depanned, cooled, wrapped and shipped

Below, inspection doors spaced along the oven allow attendant to check the bread as it cooks its way along to the other end



measured to the correct amount when its button is pushed, then is automatically delivered through pipes or tubes to the proper mixing machine.

Step-by-step, the process of baking bread scientifically follows this pattern: Metered amounts of flour, yeast, yeast foods and water are stirred together in a giant mixer, then poured into a trough which is wheeled into a fermentation room for a 4½-hour period. During this time, under controlled heat and humidity, the yeast converts the basic ingredients into a "sponge." From the fermentation room the sponge goes to another mixer where the final ingredients are added. These consist of more water and flour, milk, malt, sugar, shortening, salt and enrichment substances (such as minerals and vitamins).

Dough Goes to Loaf Divider

Next the thoroughly mixed batch of dough, now weighing 1600 pounds, is delivered to the loaf divider, a machine that automatically weighs and cuts the dough into the pieces that eventually will become loaves of bread. Each piece of dough falls onto an endless belt that carries it to the next machine, a loaf rounder, that kneads and rolls the lump of dough into a ball. A belt carries the loaves slowly through a "proofer room" where fermentation continues.

Gases produced by the yeast must now be removed, so the loaves are squeezed flat like pancakes in a series of rollers, then carried by endless belts to the molder-panner where the flat pieces of dough are rerolled into shape and are dropped one at a time into the baking pans traveling on a conveyor line below the machine.

The conveyor line transports the pans to the final proofer room where the dough rises and assumes its final loaflike shape. The slowly moving pans spend 65 minutes here in a temperature of 110 degrees F., then are switched to a conveyor that carries them into one end of the 120-foot-long baking oven. This oven is a continuous traveling hearth, with its heat automatically controlled so that loaves enter one end as dough,

emerge from the other end at the precise moment when they have been beautifully baked.

Air Jets Loosen Loaves

Now each loaf must be loosened from its pan; this is done by a jet of air directed down one side of the loaf. Next, loaves must be removed from their pans. This was a hot chore that no one wanted in the days of baking by hand. In the new bakery, it's done via machine by a depanner that clamps onto 20 pans at a time and tips them over, dropping the loaves onto a traveling belt. On this the loaves move to a cooler where they are transferred to slowly moving trays for an hour of cooling off.

By the time their temperature has dropped to 95 degrees F. they leave the cooler and ride one after another along a belt to the slicing machine, where a row of bandsaws slices an entire loaf at once.

The final operation is the wrapping of each loaf, a task that a machine can do more quickly and neatly than human hands. In the wrapping machine a length of plastic is cut from a thick roll, wrapped and folded around the loaf, then sealed with heat. There are several slicing and wrapping machines side by side; each handles 60 loaves per minute.

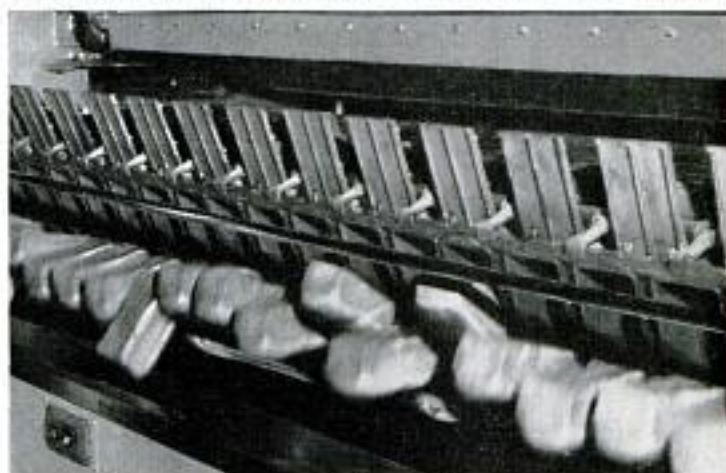
Process Takes 10 Hours

There's only one thing that mechanization cannot do without lowering the quality of the product, and that is the speeding up of the fermentation, rising and cooling processes. Each of these steps takes time. The only thing science can do about it is to provide the temperatures and humidities at each step that produce the best results. It still takes 10 hours from the time the first ingredients are mixed together until the freshly baked loaf is sliced and wrapped.

On merits of home-baked bread as compared to bread made in a commercial bakery, master bakers flatly say that from the standpoint of quality control, the bread made by machines wins hands down. The reason: Each loaf contains precisely the same amounts of the same scientifically selected ingredients, baked exactly the correct length of time at exactly the same temperature. ★ ★ ★



Above, baked loaves emerge from oven to conveyor system that takes them past air jet which loosens loaves for depanner



Above, in the depanner, hot loaves tumble from their pans to traveling belt that carries them quickly to the cooler room

Below, after a trip through wrapping machine, which automatically slices, wraps and seals them in cellophane, the finished loaves are taken by conveyor system to the shipping room





UNESCO Headquarters in Paris to Have Two Acres of Glass

Ideas of some of the world's greatest architects went into the planning of the massive, Y-shaped UNESCO headquarters building in Paris. The seven-story concrete-and-glass structure was designed by Pier Nervi of Italy, Bernhard Zehrffuss of France and Marcel Breuer of the United States. They were assisted by Lucio Costa, Walter Gropius, Charles Le Corbusier, Ernesto Rogers, Sven Markelius and Eero Saarinen, whose buildings dominate the capitals of the world.

As indicated by the models above, the Secretariat will be faced with nearly 100,000 square feet of glass. The futuristic structure in the foreground will be used for conferences and committee meetings. Approximately 1000 scientists, educators and technical experts will have offices in the Secretariat Building. The basement will have facilities for five radio and television studios, a theater, printing plants for UNESCO publications and an emergency electric plant.

Dome Design for Oklahoma City's "Church of Tomorrow"

Wide sweeping curves are emphasized in the design of the First Christian Church of Oklahoma City, Okla. The steep hemispherical roof of the modern sanctuary

rises to a height of four stories and has a glistening cover of white-chip marble. The front of the egg-shaped structure features a towering arch of glass.





KEEPING UP WITH THE ATOM



QUESTION: How do you photograph the interior of a vast underground tank made "hot" by the storage of millions of gallons of radioactive waste?

ANSWER: By rigging a camera on a "fish pole." That, in effect, is what General Electric photographers did at the Hanford plant. The tank had to be checked by photograph after the wastes were removed. An additional problem was that the tank's top entrance was only nine inches in diameter.

The photographers rigged an old copy camera on one end of a 12-foot metal pole. A flash unit was fitted in place with a spring hinge so it would fold back behind the camera as it entered the tank. Once inside, it flopped into firing position.

The fish pole was a success and engineers now have a composite picture of the inside of the entire tank.

☆☆☆

RESEMBLING a guided missile, a gleaming new electrostatic generator (lower right) has been put into operation at Aldermaston, England. Capable of building up to six million volts of electricity, the instrument hurls atomic "bullets" at various materials in a target area. The instrument will serve as a tool for basic nuclear research.

☆☆☆

TOMORROW'S leading nuclear scientists may be trained in a new nuclear-engineering center under construction at the Massachusetts Institute of Technology.

Physics students of a few years ago would be amazed at some of the facilities that will be available at the new center: A \$2,225,000 research reactor, a nuclear instrumentation laboratory, a subcritical reactor and a graphite-moderated pile.

☆☆☆

THE ATOM powers a new airport-marker lamp that has no bulbs, batteries or electric supply and will operate for as long as 10 years without maintenance.

The lamp operates by exposing phosphorus to a radioactive gas. It is available in a variety of shapes and sizes.

☆☆☆

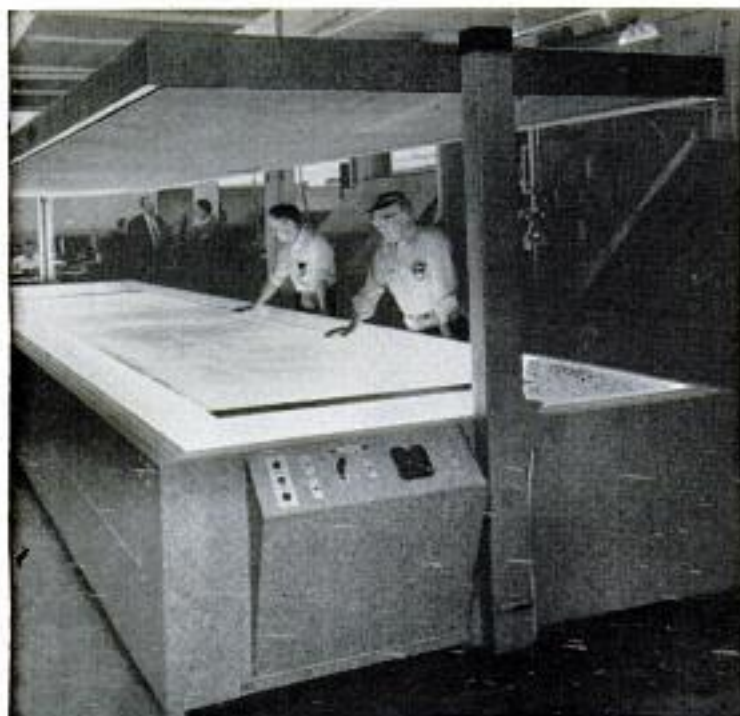
URANIUM mining in the United States now has moved east of the Colorado plateau for the first time.

Just 50 miles northwest of New York City, at Warwick, N. Y., a uranium mine now is producing ore and high-grade uranium concentrates.



Camera on a "fish pole" is lowered into a "hot" tank at Hanford. Strange rig had to be devised because the tank was intensely radioactive and there was only a small opening at the top. Below, a new electrostatic generator strikingly resembles a guided missile





Templates 30 Feet Long From Giant Printer

A contact printer which reproduces templates 30 feet long has been developed for the aircraft industry.

The first machine, installed at the Columbus, Ohio, plant of North American Aviation, Inc., is actually two units mounted end to end. They can be operated separately or simultaneously from either of two control panels.

A unique feature is the raising and lowering of the lid with a powered ball-bearing unit. This replaces the "clam shell" or "removable blanket" type of lid found on the usual contact printer.

Average cycling time of the machine is three minutes.



Getting Cold Feet?

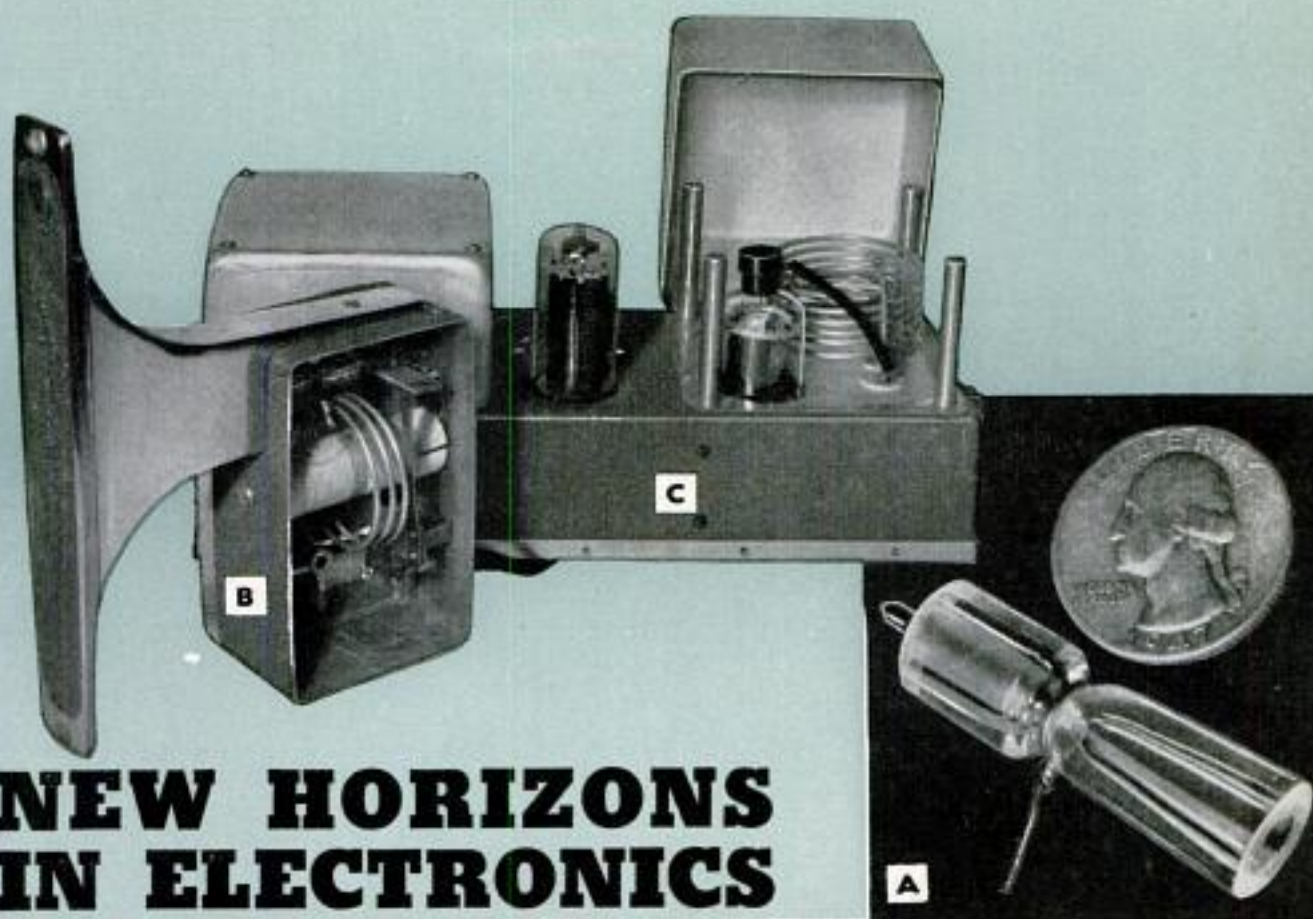
No more cold sheets! A new bed warmer, developed in Germany, takes the chill off the bed quickly. The warmer is plugged into an electrical outlet and slipped between the sheets. A wire frame around the heating element holds up the top sheet and permits the warm air to spread throughout the bed.



"Pony Express" By Motor Scooter

Mailmen in residential areas are sitting down in comfortable, weatherproof motor scooters as they deliver mail. A large cargo space behind the cab enables the mailman to carry his entire day's mail instead of having to be supplied from storage boxes. The Post Office Department has ordered 1500 of the "Mailsters" from the Cushman Motor Works, makers of the well-known motor scooter.

□ A British firm has developed a glass-fiber diesel-powered lifeboat that holds 144 persons.



NEW HORIZONS IN ELECTRONICS

By Lothar Stern

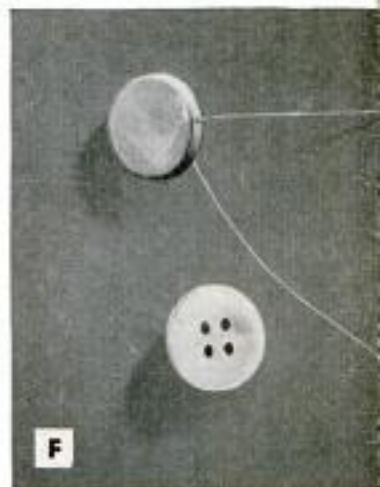
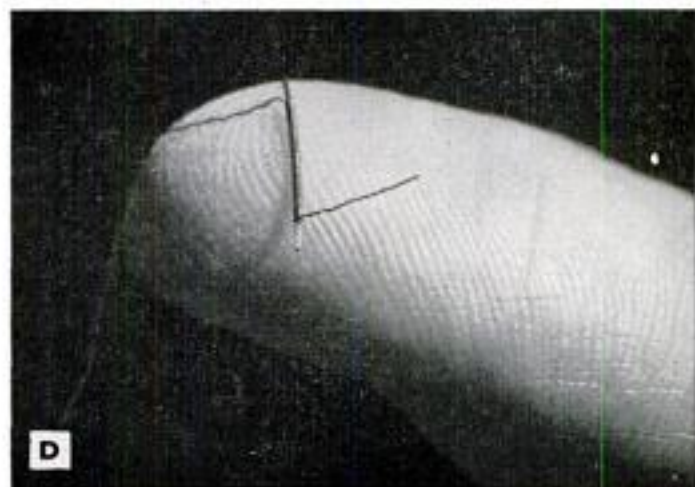
THE YEAR 1957 is likely to go down in history as another milestone in the field of electronics. Some developments already announced promise to open entire new vistas for experimentation and may provide the solutions to some very vexing problems.

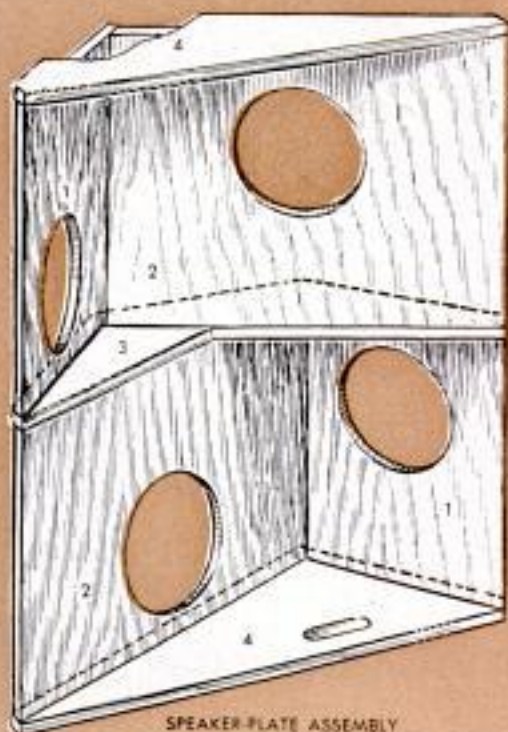
Sound Waves Unlimited

One of the most startling achievements is the development of the Ionovac, a loud-

speaker capable of changing high-frequency audio waves into equivalent sound waves with amazing fidelity. The operating principle of this unit, though not new, differs radically from that of any speaker in common use. Rather than employing a moving voice coil and diaphragm, it utilizes the motion of ionized air to change electrical energy into sound. The complete

(Continued to page 212)



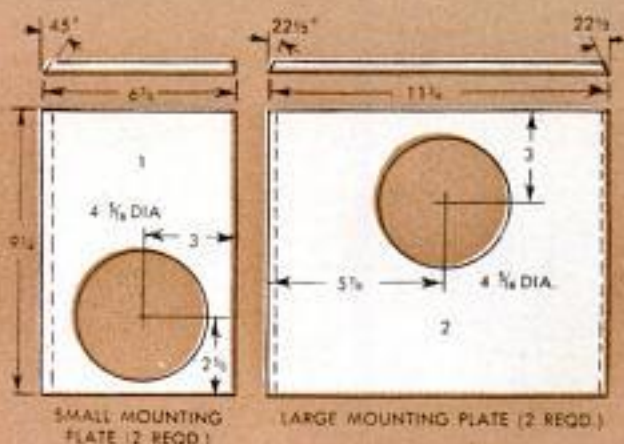


SPEAKER-PLATE ASSEMBLY

Fig. 1, above. Initial assembly consists of numbered parts shown at right. Tip of V-shaped cutout in board No. 3 is located midway between outer edges and $1\frac{1}{2}$ in. from back edge

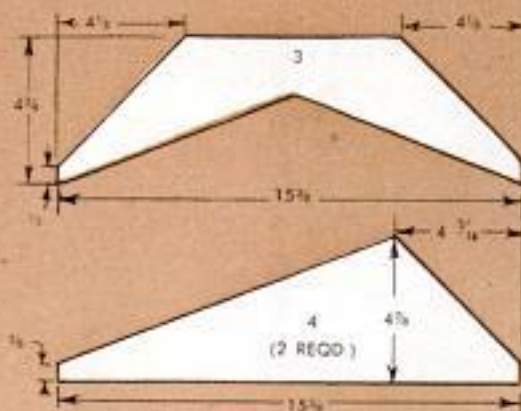
Fig. 2, lower right. Cabinet details. Cutout in front of bottom plate permits entry of leads

Fig. 3, below. Install glass-fiber insulation, and mount and phase speakers before fastening speaker-plate assembly to cabinet cleats

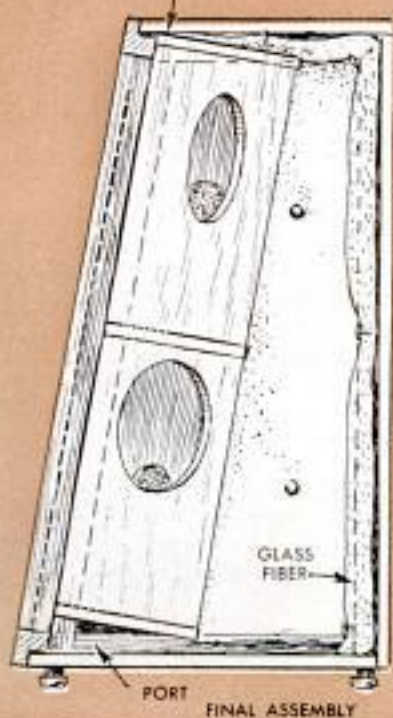


SMALL MOUNTING PLATE (2 REQD)

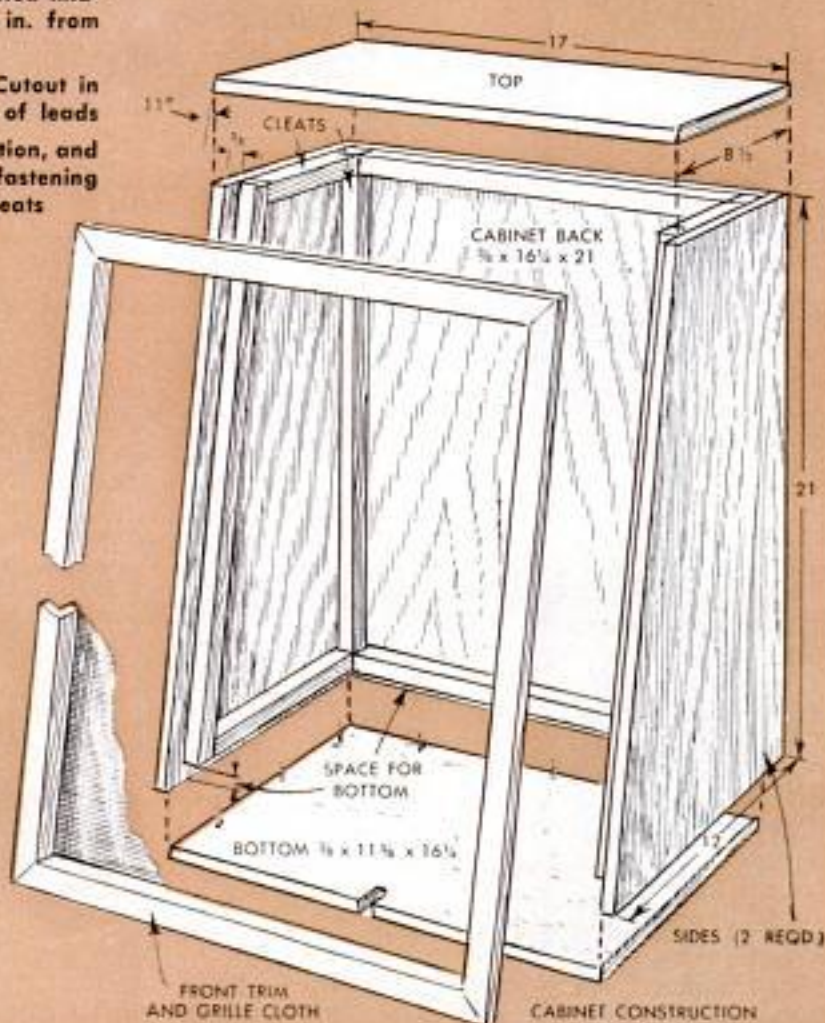
LARGE MOUNTING PLATE (2 REQD)



SPEAKER-MOUNTING PLATES TIGHT AGAINST UNDERSIDE OF TOP



FINAL ASSEMBLY



FRONT TRIM AND GRILLE CLOTH

CABINET CONSTRUCTION



A Four-Speaker Bass-Reflex Enclosure

By Dr. Richard C. Hitchcock

HERE'S A LOUDSPEAKER system that's fun to build and a pleasure to listen to. It is specially designed for improving the sound quality of console radios and television receivers, but will also do full justice to low-cost hi-fi systems.

The system consists of four identical 5-in. speakers mounted in a bass-reflex cabinet of unusual design. Each speaker is mounted at an angle so that the high-frequency sound beams cover an angle of 120 deg. as compared to the 30-deg. dispersion angle of single speakers. Vertical spacing between the four units prevents interference between individual beams.

At low frequencies, the four small cones, acting in unison, can push around plenty of air, and the bass-reflex cabinet design provides efficient speaker-to-air coupling which makes even a low-power amplifier sound mighty impressive. Rigid construction provides a vibrationless enclosure with a remarkably smooth response. Don't use cheap surplus speakers and expect to get a wide frequency range. But good extended-range units, such as the Jensen P5TX models used in the original enclosure, will give you an upper limit in excess of 15,000 c.p.s. and good efficiency down to about 80 c.p.s. (measurable response down to 60 c.p.s.).

Cut out the required pieces in accordance with the dimensions given in Figs. 1 and 2. If you don't have a power saw, better

hunt up someone who has, because the dimensions are rather critical if a tight-fitting final assembly is to be obtained.

Inexpensive $\frac{3}{8}$ -in. fir or white-pine plywood can be used for the speaker-plate assembly and for the back and bottom of the cabinet. Birch plywood, $\frac{3}{8}$ in. thick, is recommended for the top and sides, since this will take a good finish. The cleats fastened to the inside of the cabinet pieces should be $\frac{7}{16}$ in. square and can be made from scrap lumber (not plywood).

Begin the construction with the speaker-plate assembly shown in Fig. 1. If all dimensions and angles have been cut correctly, the outside edges of the speaker plates should line up evenly with those of the top and bottom plates and of the center spacer. This is important because these surfaces will be fastened to the cleats in the cabinet during the final assembly. The cutout in the bottom piece is for the terminal strip to which the speaker and amplifier leads will be connected.

All panels must be securely joined with glue and nails. Any good wood glue and $\frac{3}{4}$ -in. brads are satisfactory.

Assembly of the cabinet is illustrated in Fig. 2. The cleats are so placed that all nailing can be done from the inside of the cabinet. If the cleats are $\frac{7}{16}$ in. square, $\frac{3}{4}$ -in. brads will get a firm grip without emerging from the $\frac{3}{8}$ -in. facing plywood used for the top and sides.

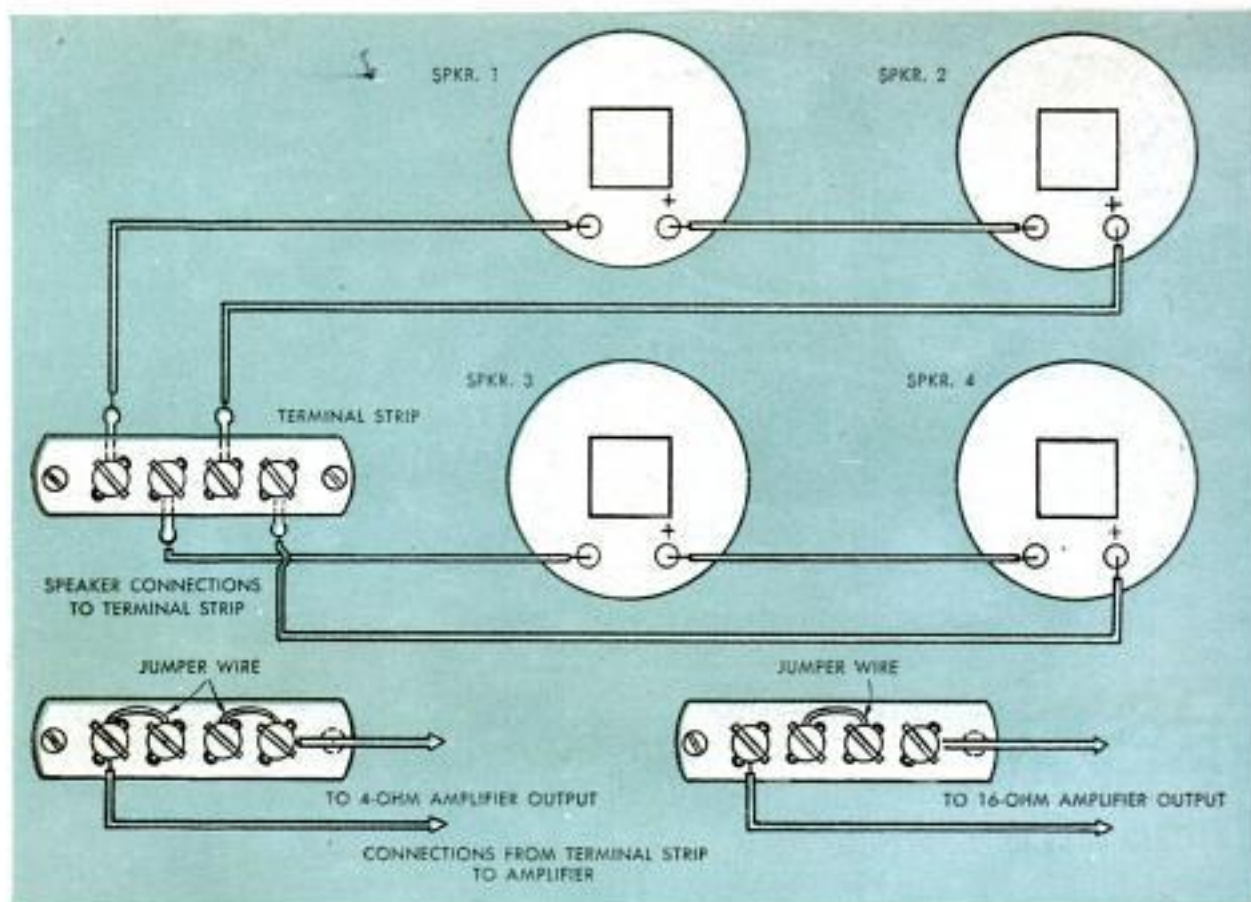


Fig. 4. Proper connections between speakers and terminal strip for matching 4-ohm or 16-ohm amplifier output

All panels are glued and nailed except the bottom which is screwed on with No. 4 flatheaded screws, $\frac{3}{4}$ in. long.

The inside of the cabinet must be thoroughly padded with glass-fiber or similar acoustical insulating material. Use a double thickness (1 in.) and cut it as shown in Fig. 5. Cover the back and both sides, and use several thicknesses for the top. The bottom remains uninsulated. Use large-headed tacks to hold insulation in place.

Install the speakers by front-mounting them to the panels with wood screws. It is essential that the speakers be properly phased so that their respective cones move in and out in unison. To do this, solder a

wire lead to each pole of a 1.5-volt battery and momentarily touch the voice-coil lugs of a speaker with the opposite ends of these wires (one wire to each lug). As contact is made, the speaker cone will move either out or in. If it moves out, label the lug going to the positive side of the battery with a + sign. If the cone moves backward, label the lug connected to the negative side of the battery with a + sign. Repeat this with all speakers and then interconnect the speakers and terminal strip as shown in Fig. 4.

Now glue and nail the speaker-plate assembly to the diagonally mounted cleats on the cabinet sides. (See Fig. 3.)

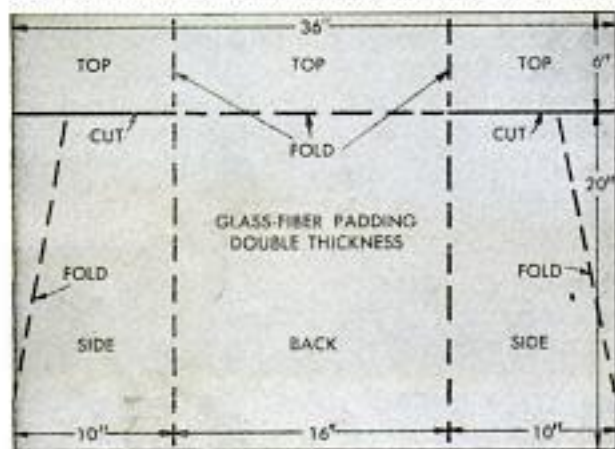
Some front angle trim, cut and assembled to fit the front of the cabinet and backed up with grille cloth, completes the enclosure.

Operation

Fig. 4 shows two methods of connecting the speaker system to the output of an amplifier. Television sets, radios, tape recorders and the like usually have 4-ohm output impedances, and the corresponding 4-ohm connection should be used. For hi-fi amplifiers having only an 8-ohm and a 16-ohm output, use the 16-ohm connection.

Caution: Do not play this speaker system at full volume (preferably not at all) until the glued joints have had a chance to dry completely. ★ ★ ★

Fig. 5. Pattern of insulating material to fit cabinet



X131 also → 365

THE

POPULAR
MECHANICS

WTM 59

CRAFTSMAN



"FIELD KITCHEN" FOR WEEK-END CAMPERS

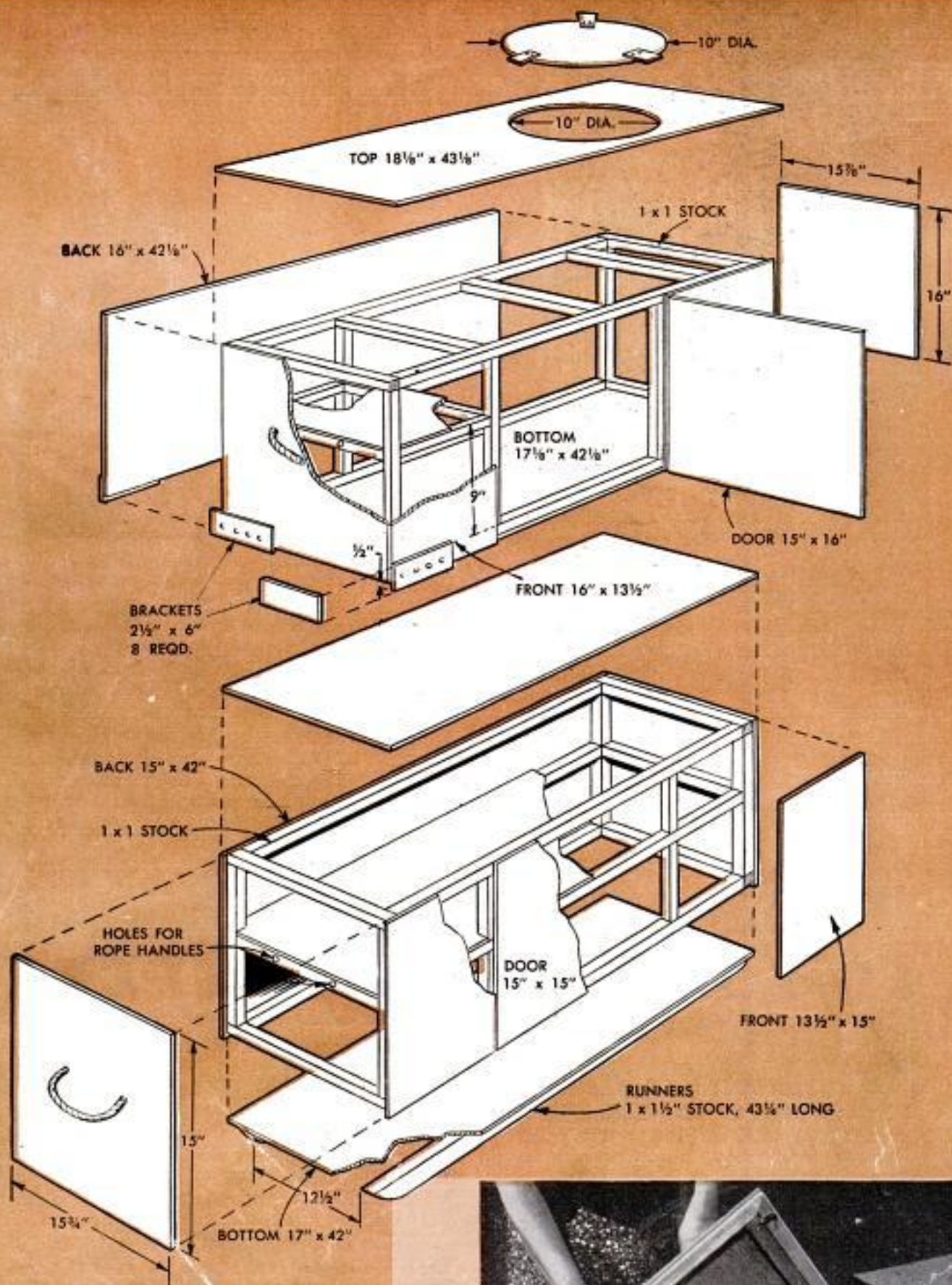
By Clinton R. Hull

ON YOUR NEXT family picnic you can "take along the kitchen sink." All you have to do is build these two plywood cabinets, which have storage space for all the necessary pots and pans, dishes, cutlery, packaged foods, a two-burner stove and even a self-draining sink built into the top unit.

A removable end table and a second table attached to the back of the upper unit provide seating space for four adults. Additional tables can be attached to the front and opposite end if desired, doubling the seating capacity. The tables are joined to the upper unit by hooks and screw eyes,

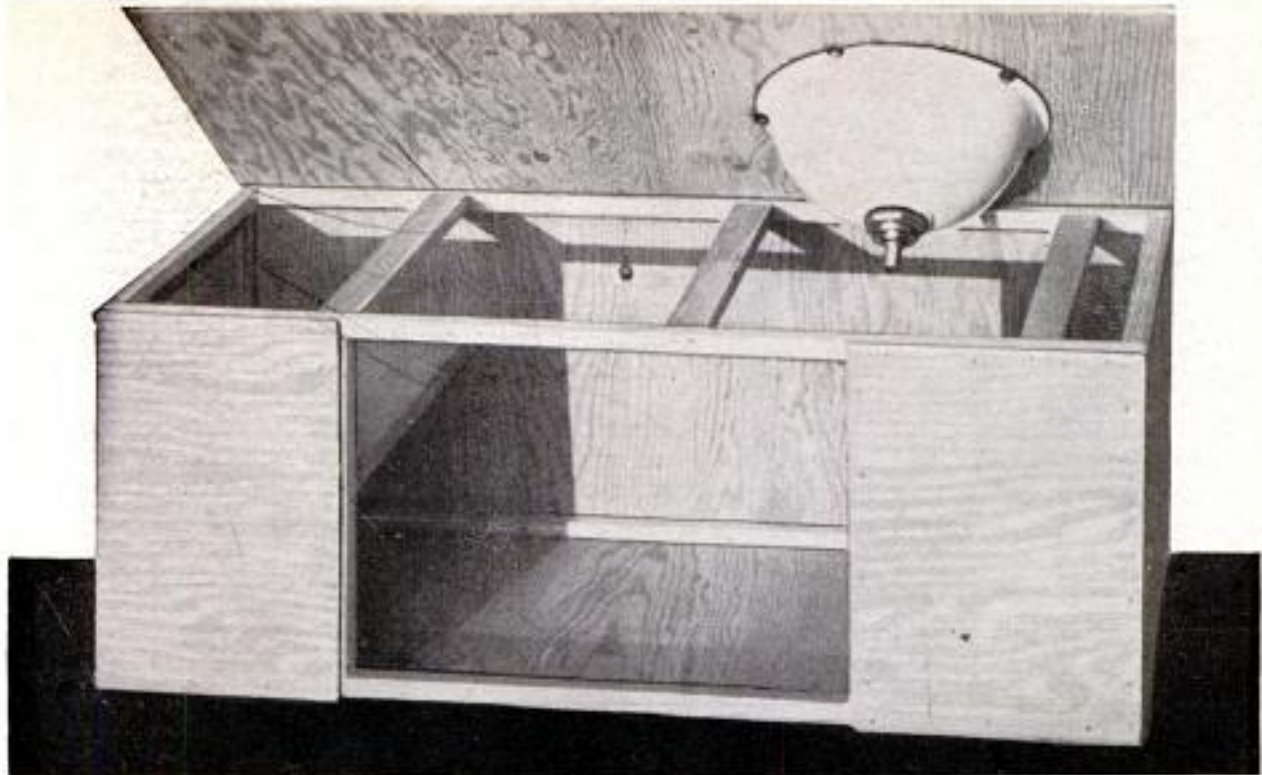
and can be supported at the outer end by a brace or by a leg inserted in a floor flange screwed to the underside. The end table shown in the illustration above is supported by a wooden bar hidden from view, similar to the type used on a drop-leaf table.

The sides, ends, bottoms and tops of both units are cut from $\frac{1}{4}$ -in. exterior-grade fir plywood and glued and nailed to a frame of 1 x 1-in.-pine stock as shown in the drawing. Runners cut from 1 x $1\frac{1}{2}$ -in. stock and nailed to the bottom of the lower unit permit easy moving of the stacked units at a camp site. Rope handles at both



Right, hooks made from flat steel and screwed to underside of end tube, engage screw eyes on cabinet





Marine-type seam compound, applied between sink lip and underside of cabinet top, assures watertight seal around sink. Garden hose is clamped over sink outlet to carry waste water to trench near camp site

ends of each unit provide a comfortable and safe grip when carrying them.

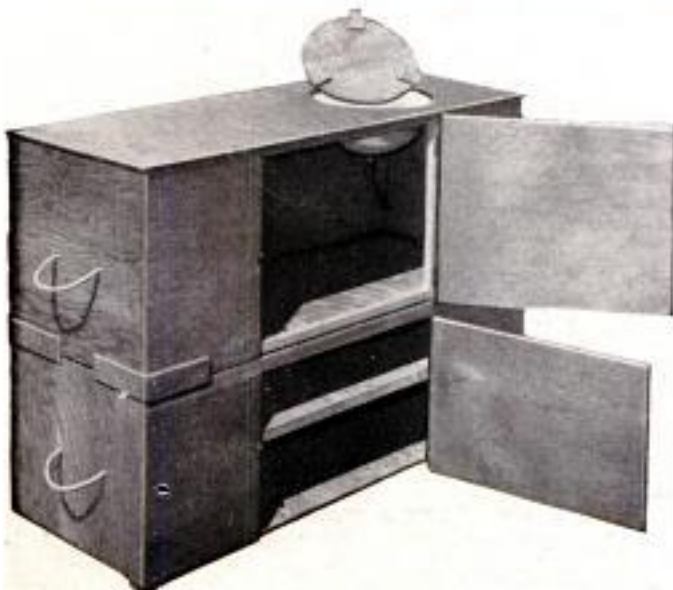
The top on the lower unit should be flush with the sides and ends with the edges sanded round, so that the corner brackets on the upper unit slide over the top without splintering the edges when stacking the units for use. A thick coating of marine-type seam compound applied between the rim of the sink and the underside of the cabinet top before mounting the sink, assures a watertight seal. The completed cabinets can be painted or varnished and

Cleats on plywood sink cover hold it flush with surface of top when unit is used as bunk or seat

plain or fancy hardware installed on the doors and tables as desired. A plastic-laminate top installed on the top of the upper unit provides a good work surface and improves the appearance.

A length of plastic garden hose attached to the sink outlet and passed through a hole drilled in the end of the cabinet provides for convenient disposal of dishwater and other liquids. Liquid refuse should be allowed to empty directly into a shallow trench and covered with fresh earth daily for sanitary purposes. ★ ★ ★

Leg on table attached to cabinet is inserted in floor flange screwed to underside of table top

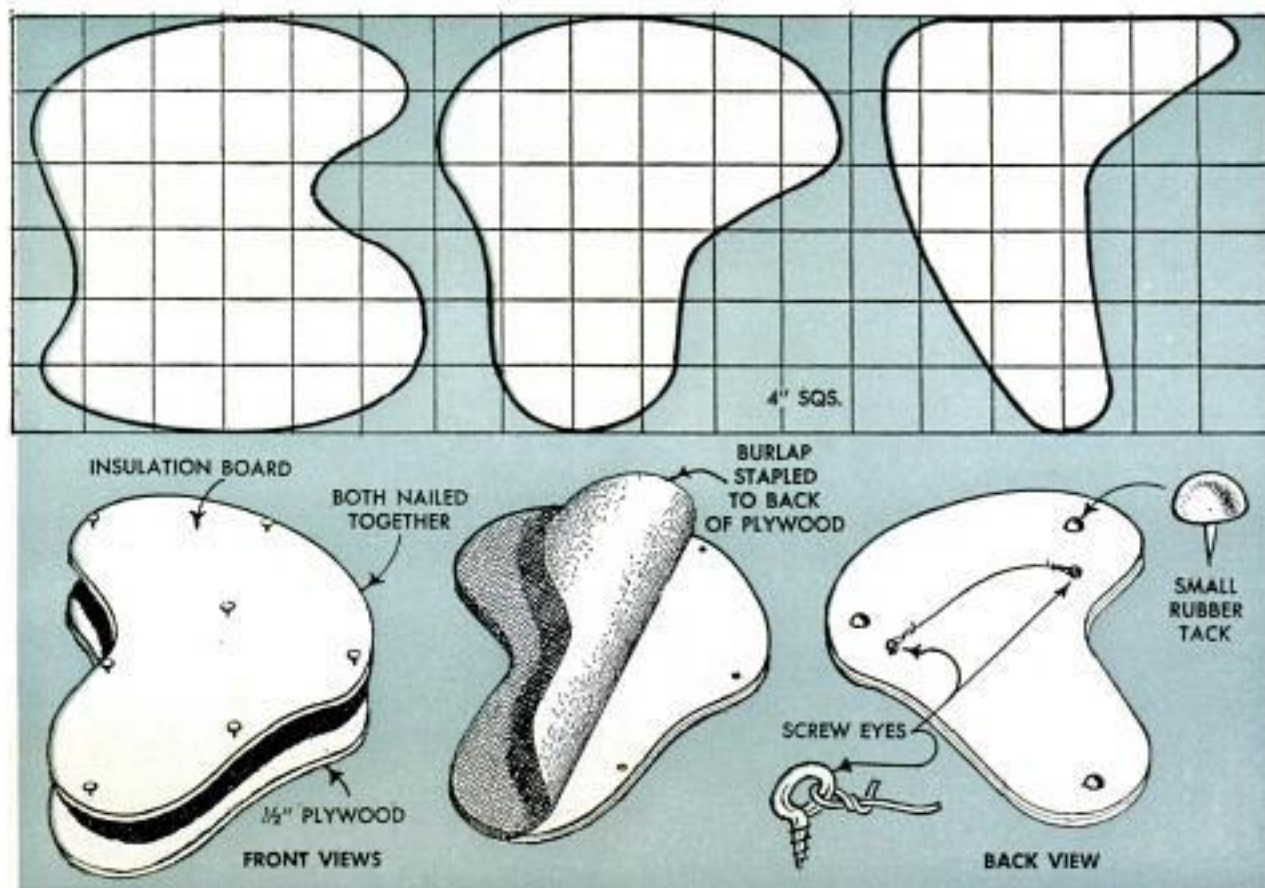


WIM 59

DECOR BOARDS IN FREE FORM

In addition to being conversation pieces in themselves, decor boards are the answer to the problem of displaying small pictures, curios and other knickknacks in a room of modern furnishings. Besides adding a sharp contrasting background, these "bulletin boards" save the wall from numerous nail holes as they hang like pictures. Insulation board tacked to a plywood base provides a soft, thumbtack surface which is covered with a fabric of your choice. The decor board in the photo was covered with black burlap to contrast against a salmon-pink wall.

Jeanne and Emil Frey, Trumbull, Conn.



Bug Catcher on Car Radiator Gathers Fish Bait En Route

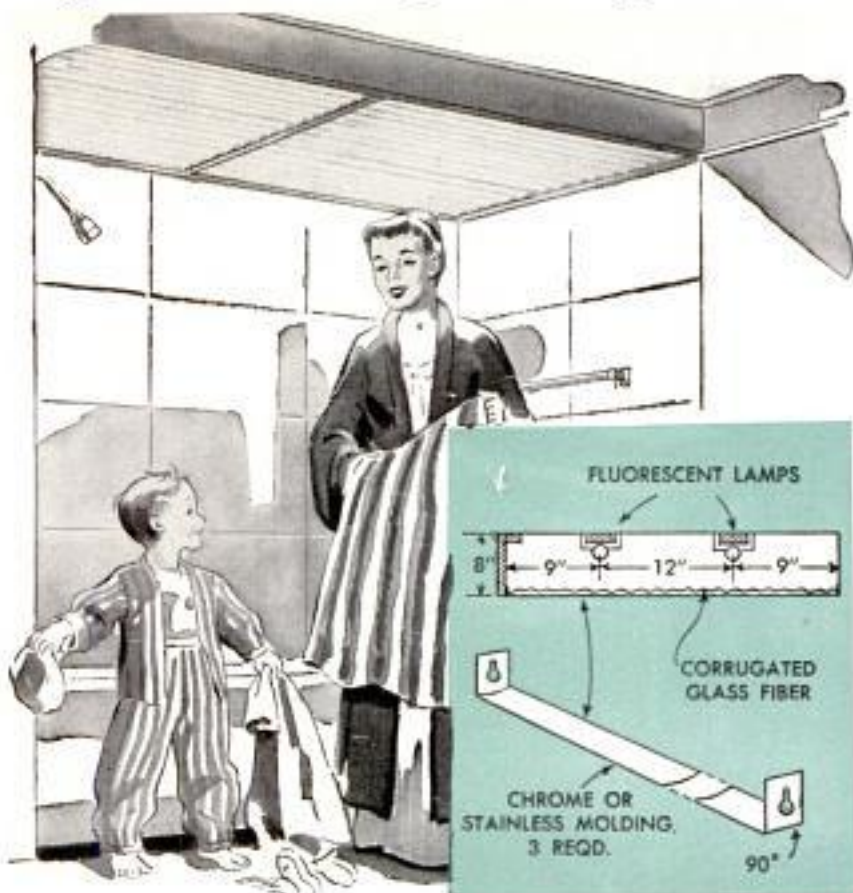
Using your car to trap fish bait may sound a bit ridiculous but it proved a worthwhile stunt to one fisherman in traveling from one lake to another on a vacation trip. Like every motorist, he was plagued with bugs clogging the radiator of his car. The thought occurred to him that the bugs would make excellent bait if there were some way of collecting them as he drove along. This was accomplished by attaching a piece of screen wire to the radiator and curling up the lower edge to form

a trough to catch the bugs that fell to the bottom. Each day a handful of bugs was collected in this manner which made it particularly convenient when bait was not always readily available.

Lyle Sovay, Toledo, Ohio.

When preparing vegetables for cooking, peel and cut the onions before you peel and cut the potatoes. Handling the potatoes after the onions will kill the onion odor on your hands.

Light-Radiating Ceiling Illuminates Bathroom



Soft, shadowless illumination that approaches the effect of daylight is produced in this bathroom by fluorescent lamps mounted above a false ceiling of corrugated glass fiber as shown in the illustration. Line-type fluorescent lamps are installed 12 in. apart and wired to a wall switch that is located out of reach from the tub as a safety precaution. A single strip of plywood 8 in. wide, nailed to a cleat fastened to the ceiling, forms one side of the light enclosure. Three pieces of stainless-steel molding bent at the ends and provided with T-slots so they can be hung between opposite sides of the enclosure, support a panel of corrugated glass fiber as shown. The latter is mounted 8 in. below the fluorescent lamps.

Subduing Appearance of Screws On Cabinet Hardware

Often the appearance of a cabinet may be improved by making the screws or bolts that attach the hardware as inconspicuous as possible. This can be done by filling the screwhead slots with crack filler, sanding them smooth and painting them to match the hardware. In the case of a bolt head, just paint the exposed part or replace the bolt with a screw, if it is possible.

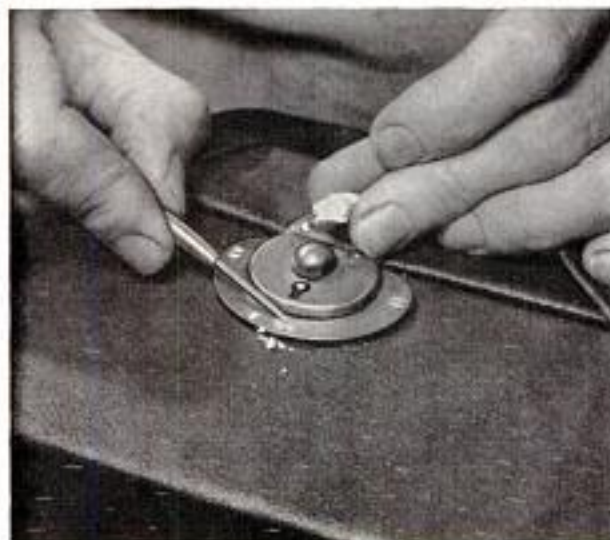
Walter E. Burton, Akron, Ohio.

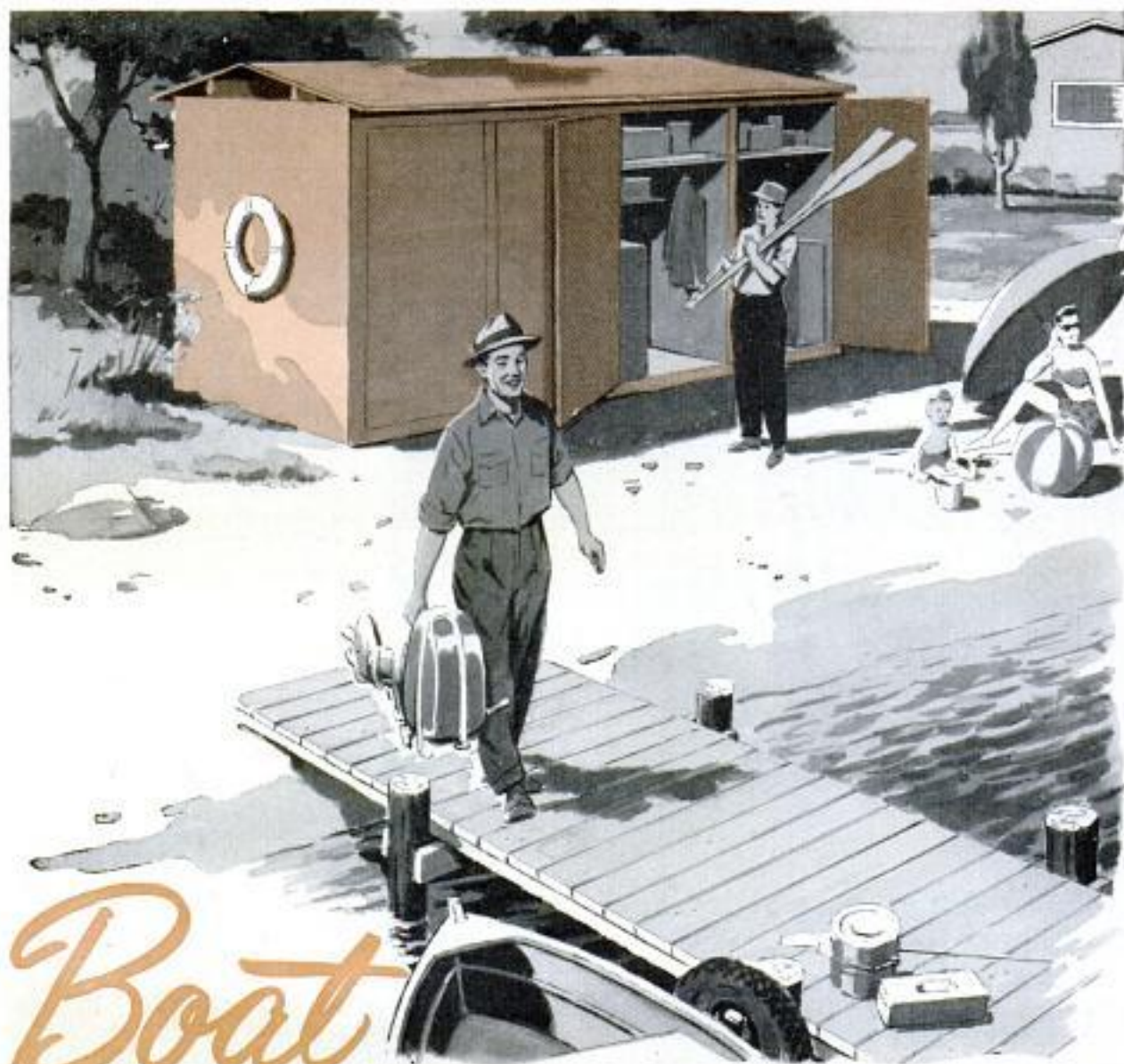


Plane Itself Is Fixture For Honing Blade

When the plane iron of your block plane needs honing you can put a perfect edge on it without removing it from the plane. First extend the length of the oilstone with a piece of wood of the same thickness as the stone to serve as a rest for the rear end of the plane. Then advance the plane iron through the adjustable throat a distance sufficient to hone a 25 to 30-deg. bevel and simply move it back and forth over the stone, keeping the end of the plane on the wooden block. If the plane iron cannot be clamped in the plane, hold it in place with the fingers, using a slight pressure on each forward stroke over the oilstone.

Ken Murray, Colon, Mich.





Boat EQUIPMENT LOCKER

THERE'S ROOM for shipshape stowage of all your valuable boat gear in this locker. The structure, which can be built in single or multiple units, is framed in 2 x 4-in. stock and sheathed and roofed with exterior-type plywood bonded with a waterproof adhesive. Doors and storage shelves also are of plywood. Details on the opposite page suggest shelf arrangements, but of course both the arrangement and number of shelves are optional with the builder. There will be material left over from cutting the plywood panels to make shelves of average size for each unit. In this way waste is reduced to the minimum.

A single unit of the locker measures 7 ft. from the bottom of the sole plate to the top plate. It is 6 ft., 1½ in. wide and 3 ft., 7 in. long. The multiple unit as pictured on the opposite page provides four lockers

and is approximately 13 ft., 4 in. long. The multiple unit also can consist of only two single units, making the structure very nearly square. This can be an advantage in some locations.

As originally planned, the structure can be placed on the dock or along the water front as pictured above. Note that the plan view on the opposite page provides for framing the structure on the dock, the sole plates, which in this case are 2 x 4s, being nailed directly to the dock boards. In this construction the dock forms the floor. When the structure is located elsewhere, as along the water front, a foundation and floor must be built. The upper right-hand details on the opposite page suggest two methods. If you decide to build a single-unit locker it may be advantageous to frame the floor on skids so that the locker can be moved.

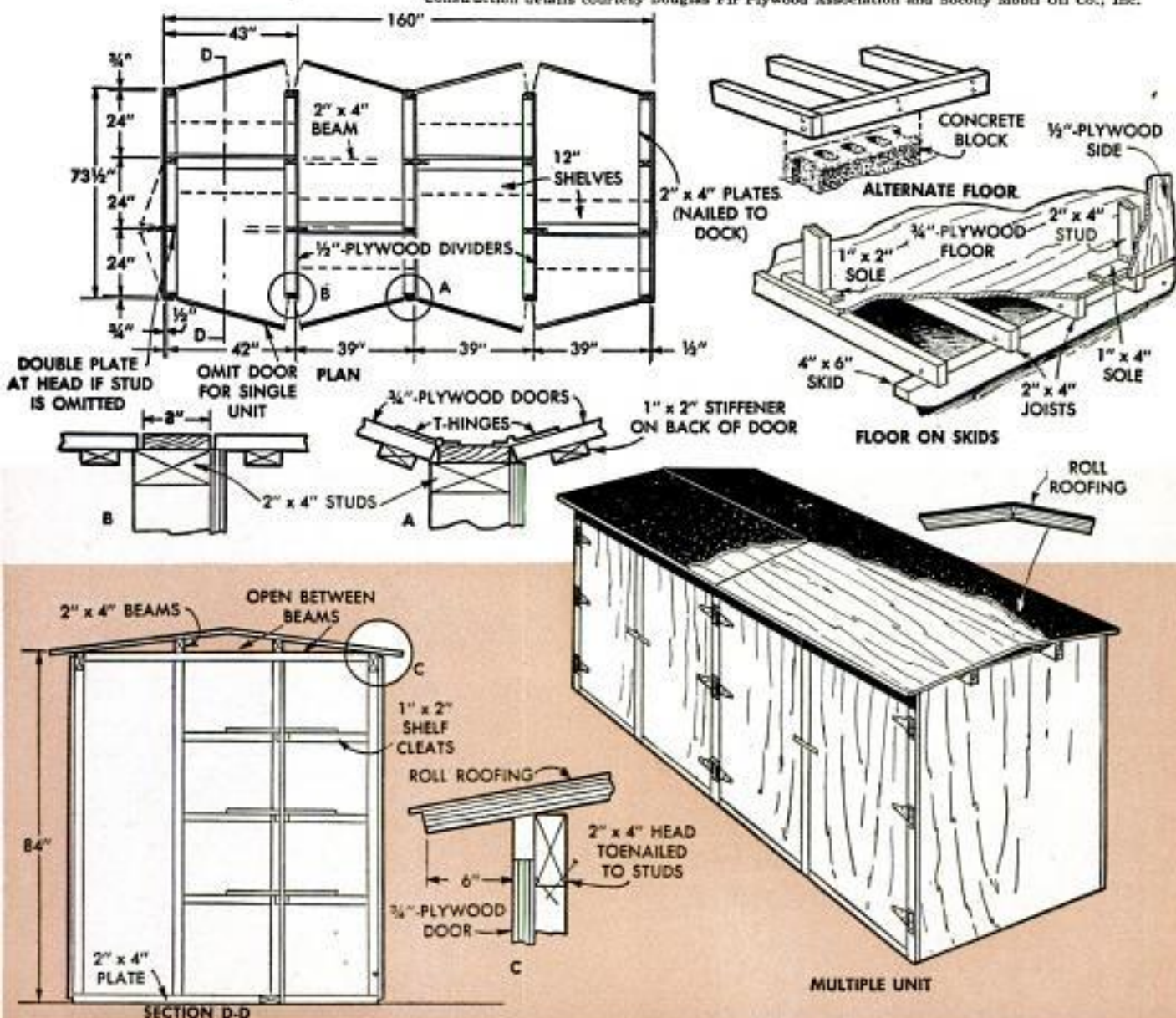
In this case, 2 x 4-in. joists are nailed to two 4 x 6-in. skids. Then a plywood floor goes down over the joists and the studs are toenailed to sole plates nailed in turn to the floor. Use nails of sufficient length to reach through the plywood floor into the joists. Where a multiple-unit structure is to be located permanently on the beach, the floor can be framed as in the upper

right-hand detail below, the framing bearing on concrete blocks as suggested in the illustration. Flat stones also can be used as a foundation. When blocks or stones are used in this manner they should be bedded level on reasonably stable soil. Stones or blocks should be placed at the corners and also at a minimum of three points along the length in order to support a four-unit structure adequately. As a foundation for a two-unit structure, stones or blocks should be placed at the corners and at the mid-point. In any case, the structure must be above grade level a sufficient distance to assure ample air circulation under the floor.

Note from the details that the roof is supported on two 2 x 4-in. beams running lengthwise. Note also the construction at section D-D and in details A, B and C. Materials required for construction of one unit only are given in the material list. ★★★

BILL OF MATERIALS FOR SINGLE UNIT	
PLYWOOD	
1—4'x8' 3/4" ext. fir plywood (roof)	
2—4'x8' 3/4" ext. fir plywood (doors; waste for shelves)	
4—4'x8' 1/2" ext. fir plywood (sides, doors and dividers)	
LUMBER	
8—2"x4"x8' No. 2 and better, S4S (studs)	
8—2"x4"x6' No. 2 and better, S4S (plates, beams and headers)	
3—1"x2"x10' white pine, S4S (door stiffeners)	
6—1"x2"x8' white pine, S4S (shelf cleats)	
4—1"x3"x8' No. 2 white pine (door trim)	
HARDWARE	
4 1/2 pr. 4" lightweight T-hinges (doors)	
3—3/4" safety hasp (doors)	
4d galv. casing nails (door stiffeners)	
6d galv. box nails (plywood to frame)	
8d and 16d common nails (framing)	
MISCELLANEOUS	
Roll roofing and finishing materials (Follow recommendations of manufacturers)	

Construction details courtesy Douglas Fir Plywood Association and Socony Mobil Oil Co., Inc.

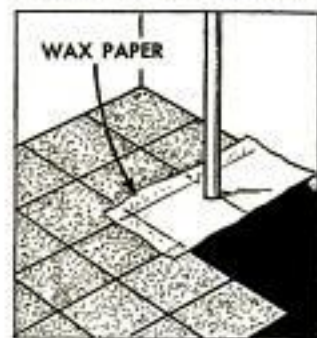




Hinged Tool Tightens Flooring Before Nailing in Place

To avoid damaging the tongue of a flooring board while tightening it for nailing, one carpenter uses the tool shown. It is made of two wooden blocks hinged together, one end being grooved to fit over the flooring tongue, the other having three or four large screws driven at an angle to project about $\frac{1}{2}$ in. Placing the notched end over the tongue of the flooring and pressing the tool down with the foot drives the projecting screw points into the sub-floor and forces the finish floor into place.

Wax Paper Keeps Tile From Sticking to Mastic



Fitting floor tile individually around pipes, door casings and other obstructions can be a messy job when the floor has been coated with mastic. A stunt worth remembering is to first lay a piece of wax paper over the sticky mastic. This will permit you to cut and try the tile for fit without getting it smeared with cement. Since the mastic will not cling to the wax paper, it can be removed easily.

John Krill, N. Lima, Ohio.

Cool Grip for Hot Cup

Slipped over a paper or aluminum cup, a sleeve of corrugated cardboard will provide a cool grip when serving hot coffee. Several sleeves can be made in a few minutes by cutting the sleeves from



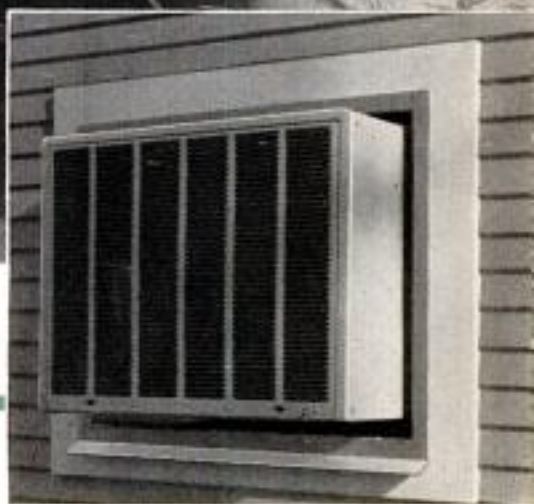
single-faced corrugated cardboard. Be sure to make the sleeves small enough that they will not slip over the tops of the cups.

Truck-Size Insecticide Sprayer Utilizes Exhaust Manifold

Eliminating insects from an outdoor picnic grounds is done by one grounds keeper with a minimum of time and labor by using the exhaust system of a pickup truck as a portable sprayer. A pump-equipped gallon tank from a kerosene heater is clamped under the instrument panel of the truck and connected to the exhaust manifold by a length of tubing. After the tank is filled with insecticide it is pumped to 10-lb. pressure, which assures that the insecticide will be forced into the manifold against exhaust pressure. A valve on the tubing line controls flow of the insecticide into the manifold where the heat and pressure cause an insect-killing fog to be discharged from the exhaust pipe.

DENNER HORNE
3500 S. OSPREY AVE
SARASOTA, Fla.





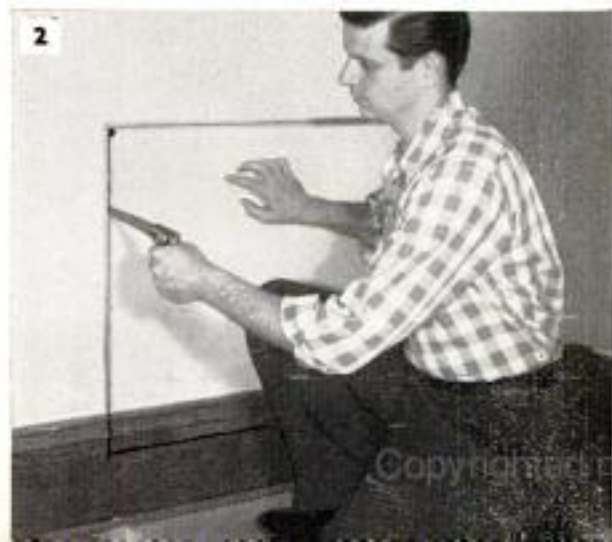
HOW TO INSTALL A THROUGH-THE-WALL AIR CONDITIONER

IF YOU DISLIKE the idea of having to mount a room air conditioner in a window, you'll be interested to know that through-the-wall models now permit the do-it-yourselfer to mount them right in the wall where they won't rob the room of daylight or hinder the cleaning of the window.

Through-the-wall opening is located on inner side of wall first. Here cutting line is drawn on masking tape

Being thinner in cross section than the conventional window types, they take up less room both inside and out. As an example, General Electric's Thinline model, which was used in this installation, projects into the room less than 3 in. and permits a novel camouflage treatment when the unit is not

Sawing through tape helps prevent chipping of plaster. Note starting hole at corner for keyhole saw





After marking through-the-wall opening on outside, plus the cutting line for the surround casing, a portable saw makes quick work of cutting the opening



When siding and sheathing have been ripped off rough-cut opening, a handsaw is used to saw off the studs flush. Notice how siding has been cut back



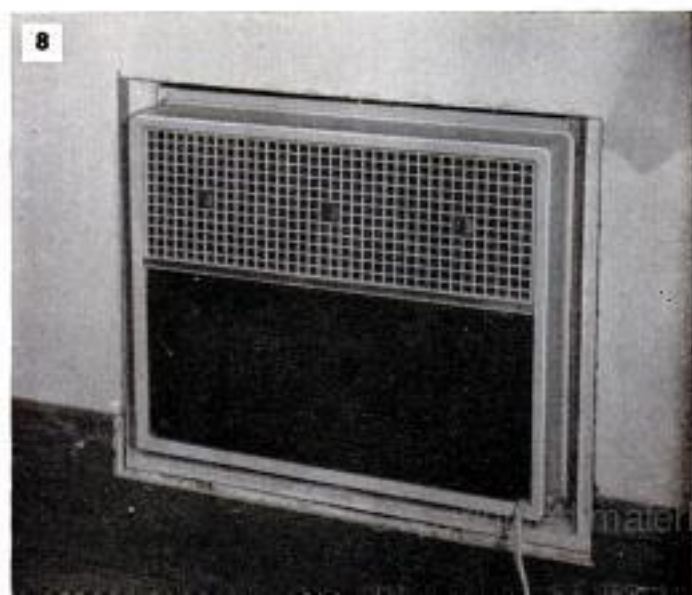
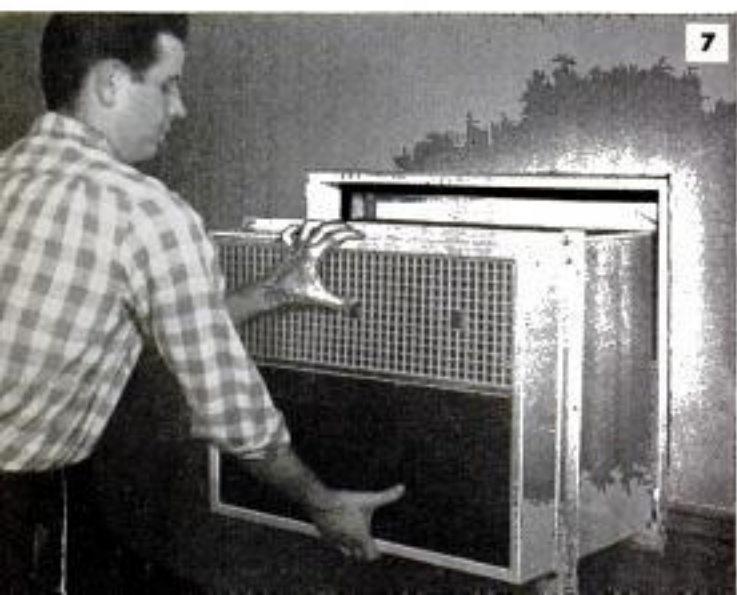
Above, this part you make yourself. It is called a surround and is nailed securely in the opening

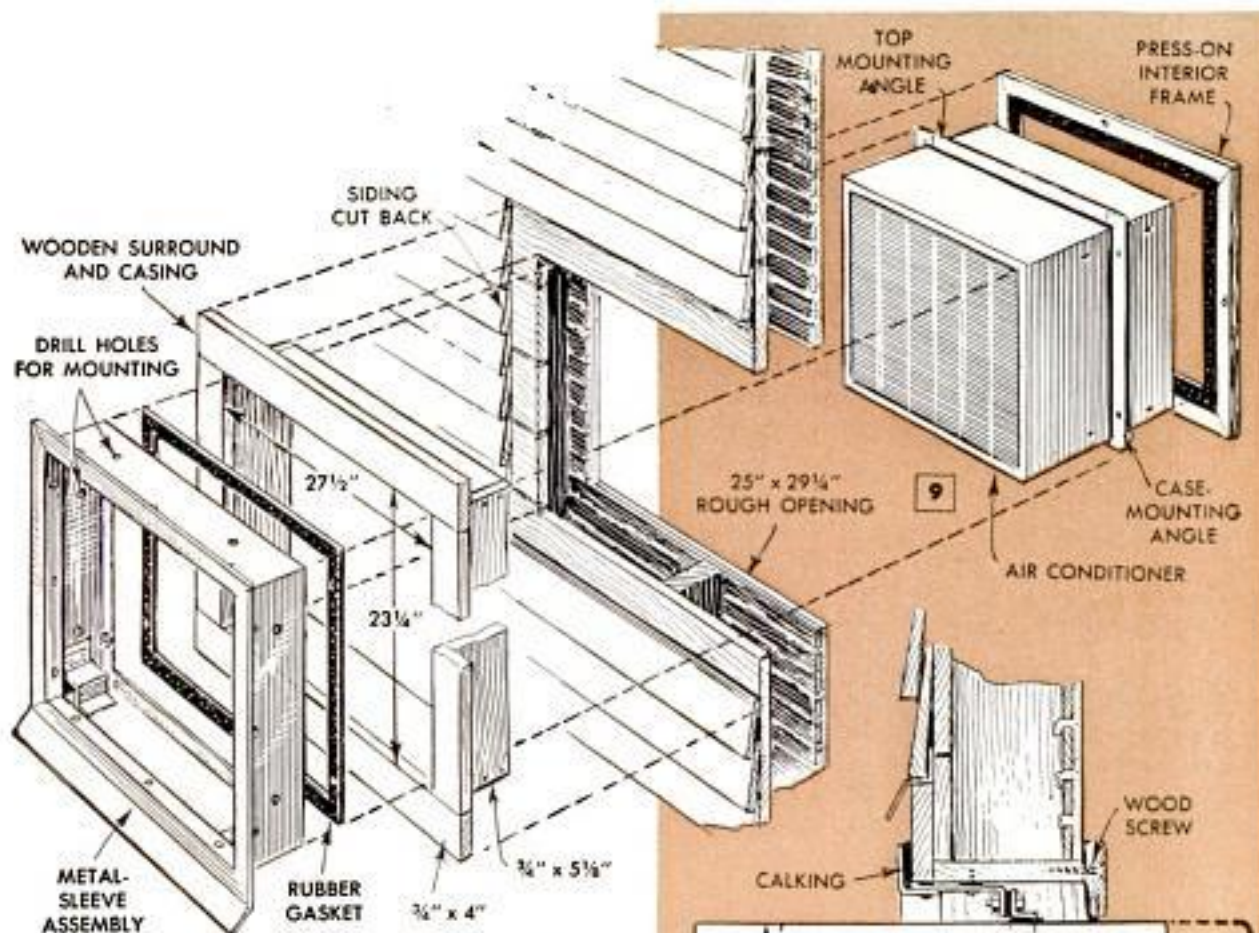


Above, metal sleeve assembly is installed next and is screwed solidly to the surround at top and sides

Below, with mounting flanges in place, unit is set in opening and bolted securely to the metal sleeve

Below, unit installed. Preassembled "picture frame" fits snugly around case to cover rough plaster





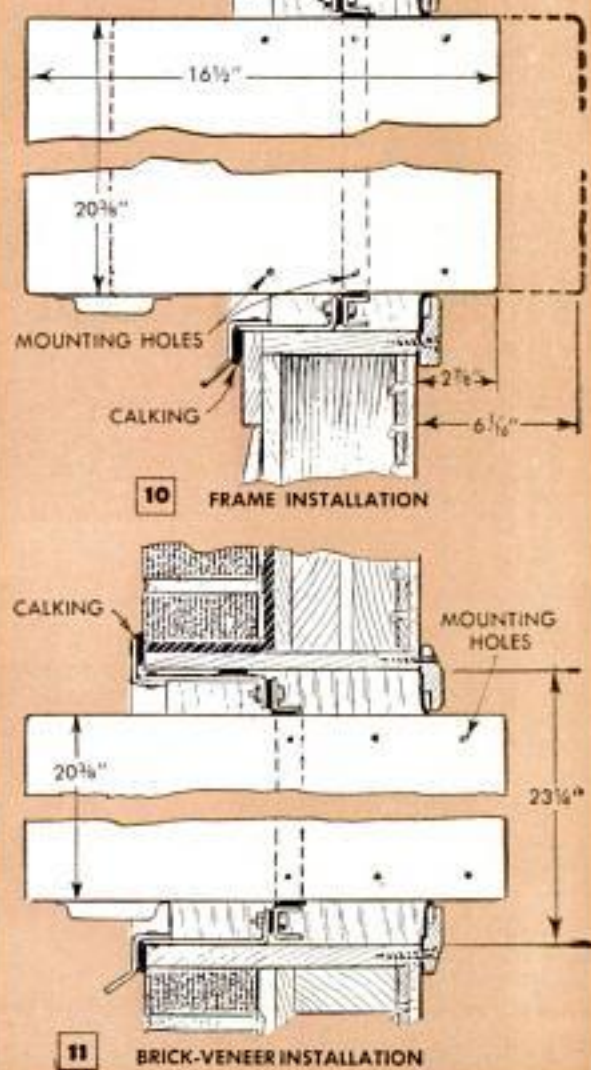
being used. A large wall picture can be hung over the grille in cases where it presents a decorator problem appearancewise.

The unit pictured comes as a kit and all you need do to install it is to cut a rough opening in an exterior wall and make a wooden surround and casing to fit the opening. The air conditioner can be installed in both brick-veneer and frame construction. The manner in which it is supported in each case is shown in Figs. 10 and 11. In frame construction it can be easily installed by any handy homeowner.

Roughing-in the Opening

It is best to make the surround and casing beforehand so as to have it ready to slip in place when the rough opening is cut. This is made similar to a regular window frame, using $\frac{3}{4}$ -in. material for the surround part and $1\frac{1}{8}$ -in. stock for the casing. Fig. 9 shows how it is nailed together. The important thing is to see that the inside opening measures $23\frac{1}{4}$ x $27\frac{1}{2}$ in. You should give it a priming coat of paint at this time.

Actual location of the air conditioner is governed by individual requirements and preferences. You may wish to mount it low, such as under a picture window, or up higher on the wall. From the standpoint of maximum efficiency and the fact that cool air falls, a head-high installation is perhaps best. The design of the room itself will





Caulking space between the metal sleeve and surround is filled all around to make it water and air-tight

dictate where it will work out the best.

Make the opening in the inside wall first, marking it as in Fig. 1, and sawing through the plaster and lath with a keyhole saw as in Fig. 2. The rough opening must measure 25 x 29 $\frac{1}{4}$ in. to allow for the thickness of the wooden surround that lines the opening. Your next step is to align the position of the opening in the outside surface with the one just cut. Perhaps the best way to do this is to spot the four corners of the opening by marks on the sheathing, doing this as accurately as you can, and then drawing lines diagonally from these points. A small hole is drilled through to the outside at the point where the lines intersect and this hole is used as a central point in marking the outline of the siding. You have a little leeway here if you do not get this just perfect. With a level and square you'll be able to come close.

Electric Saw Speeds Job

A portable electric saw makes quick work of cutting through both the siding and sheathing as shown in Fig. 3. It is partic-

ularly useful in cutting back the siding all around to let in the casing of the surround. From here on it is a case of sawing off with a handsaw studs that fall in the opening, as in Fig. 4, and then inserting the surround as in Fig. 5. You'll notice in Fig. 10 that the surround, when in place, must not protrude beyond the plaster. A width of 5 $\frac{1}{4}$ in. for the surround only is about right for all typical frame-wall construction. The surround is nailed securely in the opening.

The hardest part of the job is done and from here it is a case of inserting a metal sleeve assembly in the surround as in Fig. 6. This comes preassembled with a sponge-rubber seal around the rear face. The sleeve is fastened to the surround with two screws on each side, inserting them in holes that you must drill yourself. Additional screws may be used in the top to anchor the sleeve, but do not use any in the bottom. Water could leak through if you did.

Placing the Air Conditioner

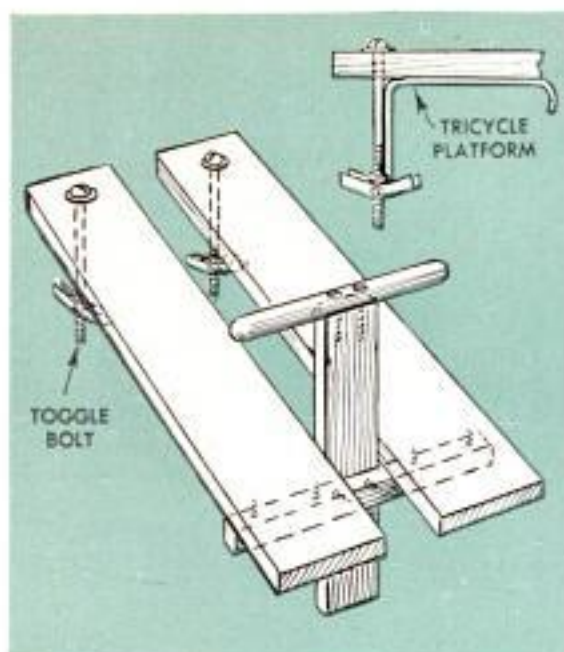
Mounting angles must be screwed to the case of the air conditioner before it is shoved in the opening. You have a choice of two mounting positions which depend upon the thickness of the wall. In frame construction, the No. 2 mounting position is generally used. Complete instructions show just how these angles are attached. The air conditioner is placed in the opening from the inside and is anchored securely to tapped holes in the sleeve with six hexhead bolts that permit you to draw the case tightly against the sponge-rubber gasket provided. Where it is mounted high on the wall, you'll need help as it is fairly heavy. After this, the opening remaining around the case on the inside is covered by a preassembled picture-frame trim piece held with four screws. The final step before plugging it in is caulking all around the metal sleeve on the outside, as in Fig. 12, to make it weathertight. A caulking gun does the job in a jiffy. ★ ★ ★

Cork Strips Prevent Buckling of Hardwood Block Floor



To prevent a hardwood block-type floor from buckling at doorways and other places where a small gap for expansion is not practical, one homeowner cemented a cork strip in a gap provided between the outer edge of the flooring and adjoining construction. At interior doorways, a cork strip the width of the threshold is used, and next to the threshold piece of exterior doors and other places where an expansion gap is needed, a strip $\frac{1}{2}$ in. wide is sufficient. The strips can be cut from $\frac{3}{16}$ -in.-thick squares of cork tile, or from a sheet of cork gasket material obtainable in most auto-supply stores.

Removable "Rumble Seat" Makes Two-Passenger Tricycle



Just a few scraps of lumber and a couple of toggle or J-bolts are all the materials required to build this tricycle "rumble seat," which is bolted to the step plate. Dimensions are determined by the size of the tricycle, but the seat should not extend too far or the rider's weight may raise the

front wheel off the ground. Mounting a heavy-duty caster on the lower end of the handle-bar support of the rumble seat may be necessary, if the step plate at the rear of the tricycle is too narrow to provide sufficient support for the seat.

John D'Avella, Lindenhurst, N. Y.

Index Card in Negative File Identifies Cut-Film Type

A method employed by one photographer enables him to quickly identify cut-film type by referring to an index card filed with the specific negatives. Printed notching codes cut from the film boxes are pasted on the cards, as shown, identifying the film type used, so that the same type can be used in making a similar shot.



☞ To prevent marring freshly painted drawer pulls, leave the screws in the pulls and "hang" them from a magnet. Screws must be steel to be attracted by a magnet.

Rowlock Horns Tied to Gunwale Can't Be Dropped Overboard

Rowlock horns can be prevented from being accidentally dropped overboard from a rowboat if a short length of fishing line, tied to the shaft of each, is secured to a screw eye fastened to the underside of the gunwale as shown. As a safety precaution, the horns should be removed from their sockets when passengers are boarding.

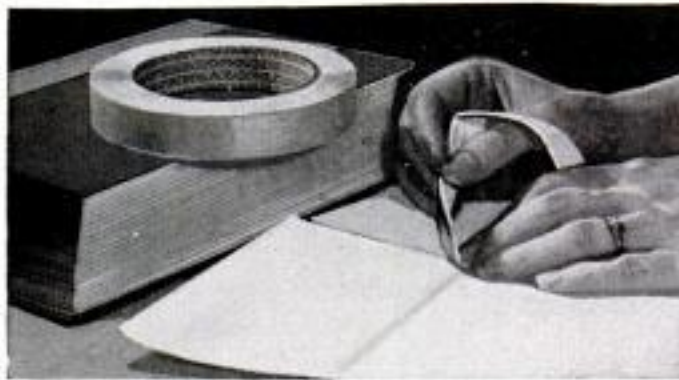


☞ It is easier to finish wood paneling before installing it. Be careful when nailing or gluing so that no marks will be left on the finished panels.

SOLVING Home Problems



YOUR PAINT-ROLLER TRAY provides an ideal container for storing brushes overnight. Lying flat in the tray, there is no chance of the bristles losing their shape



MASKING TAPE applied to the reverse side of book jackets at the top and bottom edges prevents wear and tear

THREAD ON YOUR BOBBINS won't come unwound and tangled in your sewing box if held with bit of sticky tape



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PAPER DRINKING CUPS serve as perfect molds for making frozen fruit-juice suckers. Punched paper strip placed across cup will hold stick upright in cup while the liquid freezes



PLANTS ARE REMOVED from their pots without disturbing the roots with a slotted paddle. Slip slot around plant stem, turn over and dislodge by tapping paddle on table edge

WHEN THE LIFTING TAB on a milk-bottle cap tears off, a handle can be formed by wrapping the cap in plastic wrap and then twisting the ends as shown. Cap will still fit the bottle



POPULAR MECHANICS

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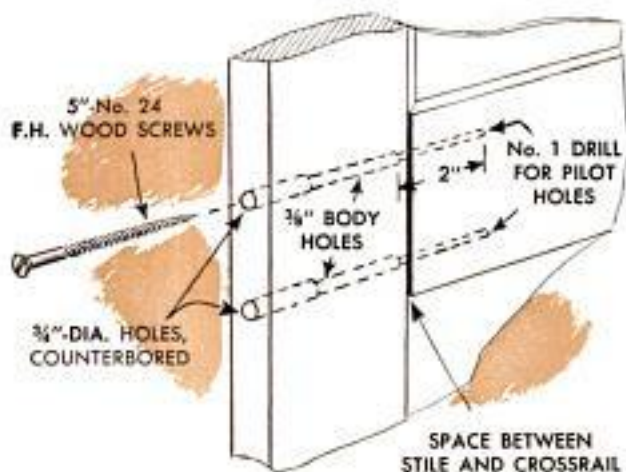


FOLDED TURKISH TOWEL makes a good padded surface for ironing any material that has snap fasteners. Fold the towel in several layers and place fasteners face down on it. Then press from backside

COAT HOOKS are less of an eyesore when mounted over plastic coasters. Here you can see what eye appeal a leaf-design coaster adds to a plain hook on hall door. Holes are punched in coaster for screws



WHEN A JOINT OPENS between the crossrail and the stile of a paneled door, two long screws driven in counterbored holes as shown below will draw it up tight again. Hold it first with a clamp if you can



JUNE 1957



TO AVOID THE SHINE on ribbon after washing, don't iron it. Instead, wind it tightly around a clean bottle and let dry. A couple of rubber bands may be used to hold the ribbon in place on the bottle

BOWL WON'T ROCK AND ROLL when chopping vegetables for salads if you rest it on the open end of a pan. This will cradle the bowl so it won't rock. Any kitchen pan that is smaller than the bowl will do



RECIPE HOLDER becomes a new use for a spring-type paper clamp when attached to the file box. Use a small clamp for this and attach it to the front of the lid with a tiny bolt placed in hole provided

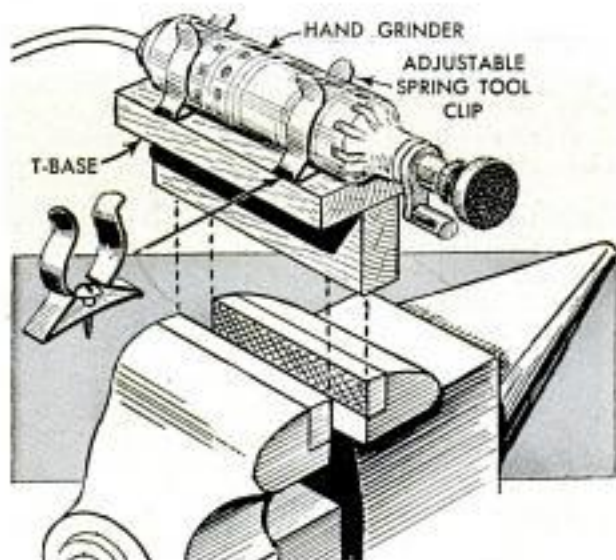


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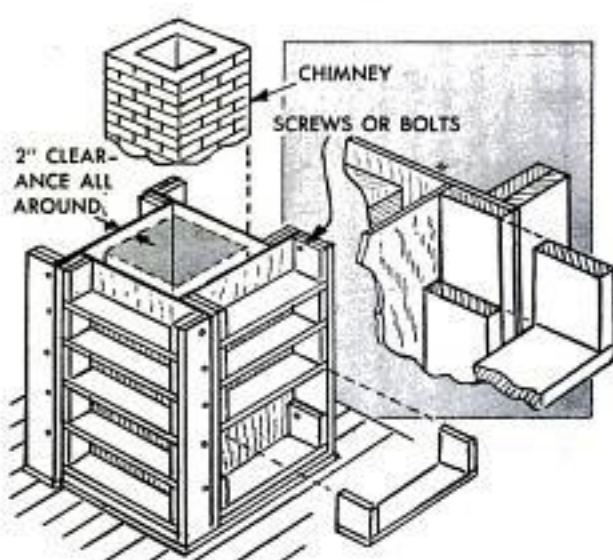
T-Base Fitted With Clips Holds Hand Grinder in Vise

Next time you want to hold your hand grinder horizontally in a stationary position so both hands are free, don't risk damaging the tool by squeezing it between the jaws of a bench vise. Instead, take a few moments' time to make this simple holder which is nothing more than two blocks nailed together T-fashion and fitted with two spring-type tool clips. Adjust the clips so they grip the grinder firmly yet allow it to be removed easily.



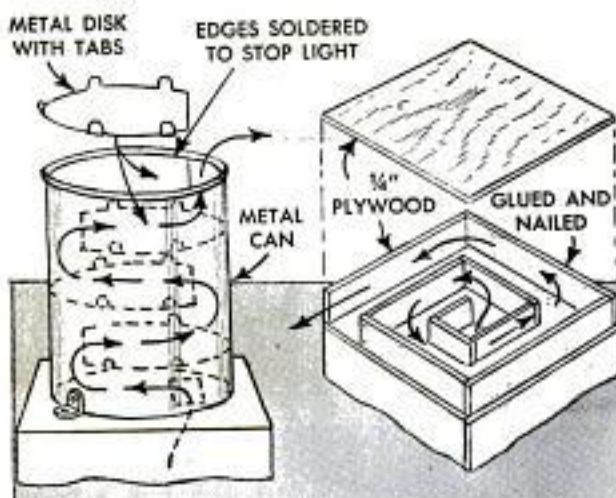
Shelving Conceals Chimney For Attic Conversion

In attic conversions, where chimneys cannot be included in corners or concealed between walls, they can be made less conspicuous behind removable shelving. When installing the shelving, allow a 2-in. clearance between the chimney and combustible material such as wall framing. Four sections of shelving, extending from floor to ceiling, can be arranged around a chimney, forming a rigid assembly when bolted or screwed together as indicated.



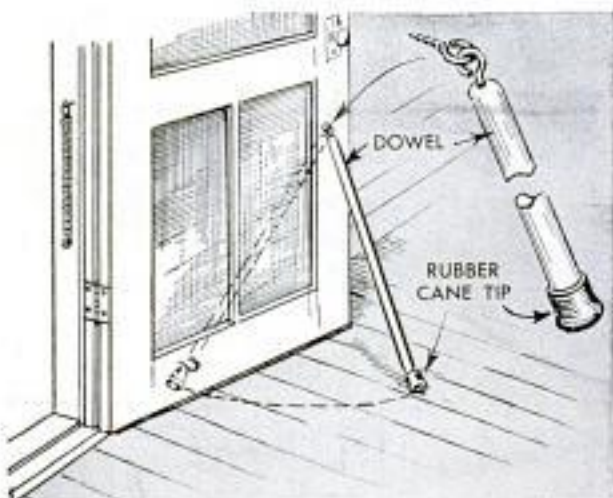
Two Light-Tight Ventilators For Cooling Photo Enlargers

One of these two light-tight ventilators can be used to prevent a homemade photo enlarger from overheating. The vertical ventilator consists of a 1-gal. metal can in which disk baffles are fastened. Trimming one edge of each disk provides a zigzag path for the escaping air. The horizontal ventilator is made of wood and contains a spiral passage from inlet to outlet for the heated air.



Screen Door Held at Any Angle By Rubber-Tipped Prop

Holding open a screen door at any angle is no problem when this door prop is used. It consists of a 2½-ft. length of ½-in. dowel that is attached to the doorframe by means of a screw eye in both dowel and frame. A rubber crutch tip on the lower end of the dowel prevents it from slipping. When not in use, the prop is swung out of the way and fitted into a screw hook driven into the lower part of the door.





Oil-Barrel Oven

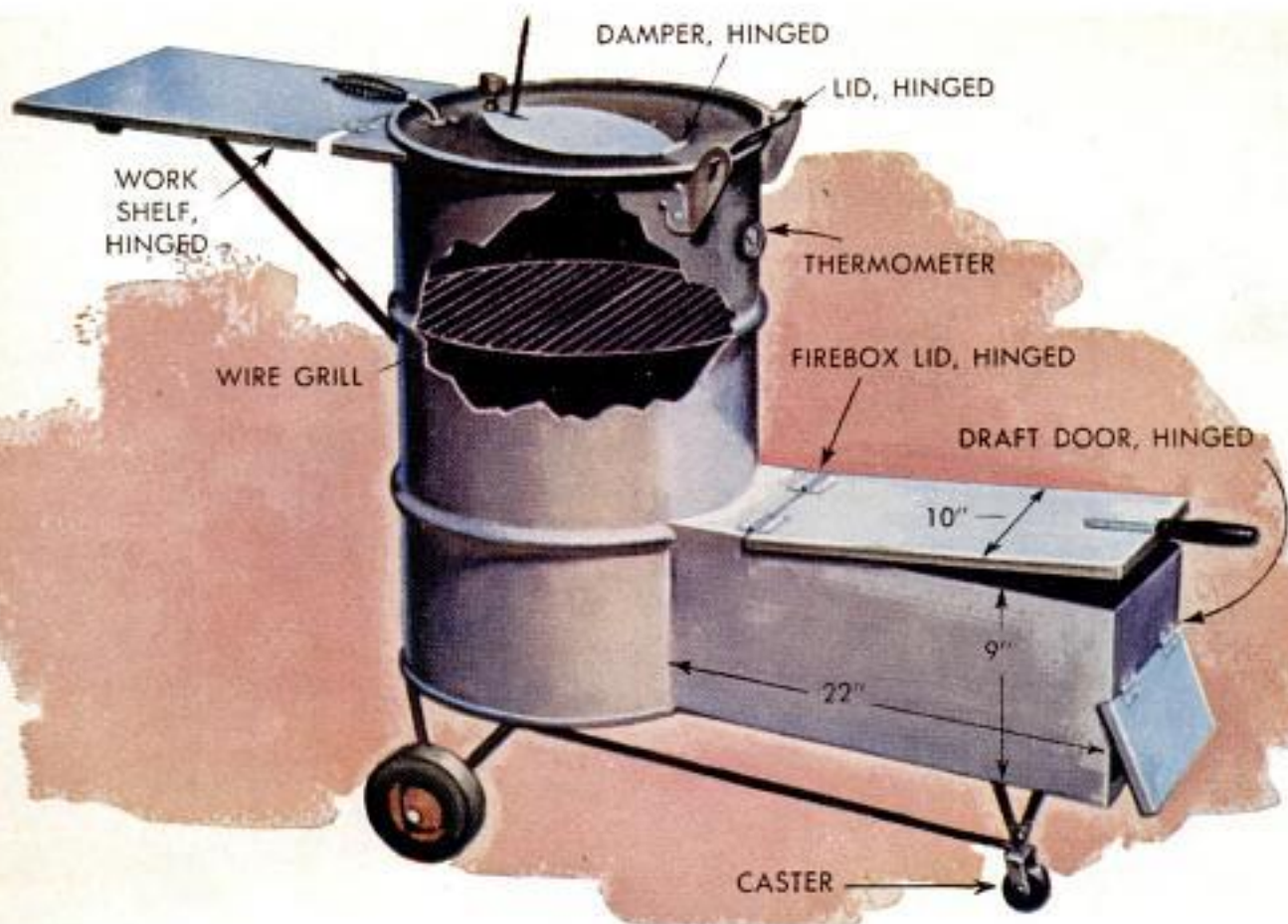
By Gene Segerblom

SMOKE ROASTING, now so popular, can be done by anyone without expensive oven equipment. All that is needed to make this close cousin to a Chinese oven is a 35 or 55-gal. oil drum, some small wheels or large casters to provide mobility, and an asbestos-lined box of heavy sheet metal to serve as a firebox. Necessary adjuncts are a thermometer and a heavy-gauge wire grill.

If making the firebox is beyond your tools and skill, have your local sheet-

metal man do it. Have him provide a hinged lid and a draft door as indicated. Then, while the box is being made, remove one end of the drum, which will be hinged in place later to serve as a lid, and clean the barrel thoroughly inside and out.

Now, rivet the firebox over an opening cut in the side of the drum near the bottom and line the box with asbestos. The lining may be held in place with sheet-metal screws, driving them through the asbestos and into the metal. The projecting ends of



the screws should be cut off almost flush with the sides of the firebox.

Mounting the wheels or casters is next. This may be done in any way desired. The method shown is only a suggestion. Next comes the wire grill. Mount it inside the barrel in the position shown. Three small angle brackets, spaced equally and riveted or bolted to the side of the barrel, will support it.

You are now ready for the lid. Cut a damper opening in the lid, hinge a cover over it and provide some means of supporting the cover at different heights. Some kind of a cool lifting handle will be required for the lid. This may be an old cooking-utensil handle, stove-lid handle or something similar. The handle should be installed before hinging the lid to the barrel.

Installing the thermometer is next. This should be the type that can be inserted in the barrel with the dial on the outside and have a reading up to at least 350 deg. F. If this type is not available, an oven thermometer may be installed inside the barrel, but will be difficult to read.

The work shelf is a handy accessory, but not absolutely necessary if you prefer to get along without it. It is made of heavy sheet metal flanged along both sides and one end to provide rigidity. The other end is hinged to another piece of sheet metal, which also is flanged at the sides, and has

one end cut to the contour of the drum. This piece is attached to the drum with small metal brackets. A folding bracket supports the shelf in the raised position.

Painting is a matter of choice, but be sure to use a heat-resistant paint. Before cooking in the oven, preheat it to a high temperature to burn off any residue that might cause an unsavory odor in the food. In use, charcoal is burned in the firebox, the draft door and damper being adjusted to maintain the desired temperature inside the oven.

Since every outdoor chef considers accessories as necessary to his hobby as an oven or grill, every neophyte chef should have a supply. Basic are a chef's hat, cotton gloves to handle charcoal, a pair of tongs to handle meat without puncturing it and a folding wire grill to handle crumbly hamburgers. There are others not necessary, but convenient if you wish them. But more important is a knowledge of fuels. In most stores you will find two types of charcoal, lump and briquettes. Which one to buy is mostly a matter of choice. There is a third type of briquette that contains partially burned hickory that imparts a hickory flavor to the foods. And, of course, small pieces of hardwood can be applied to the fire to produce smoke and impart their flavor to the foods. Hickory and cherry are the woods most used. ★ ★ ★



Larry Argiro, Associate Professor of Art, State Teachers College, New Paltz, N. Y., saw his first mosaics as a boy in southern Italy while playing in the ruins of Pythagoras' temple. Struck by the intricate designs on ancient floors and walls, he decided then to revive the nearly forgotten art. Although Professor Argiro worked in many art forms in this country, it wasn't until five years ago that he discovered a successful way to inlay mosaics on metal, wood and other substances used in modern buildings and furnishings. Now, mosaic can be applied to almost any surface in or on your house



DECORATE WITH

MOSAICS

By Larry Argiro

THE ANCIENT ART of mosaicking (inlaying surfaces with ceramic or glass-like tiles now available in many colors) is well within the ability of almost anyone. Applied with special adhesives, mosaic tile may be used to modernize and beautify old surfaces, or to inlay new pieces, such as free-form tables designed and built to your liking. Lamps, book ends, jewelry and cigarette boxes, glittering bowls and ash trays can be made with base materials that depend entirely on your own ingenuity. Or, you can tile counter tops, walls around sinks, lavatories and bathtubs and, if desired, even work out beautiful designs on other walls.

Most mosaic tiles are approximately $\frac{3}{4}$ in. square and are available in a rainbow of colors. There are three basic types, the cost of the tile depending on the type. The tiles may be "cut" to various sizes and shapes with carpenter's pincers. In doing

Tray and table above are two good examples of using mosaic tile to produce modern-appearing objects. Below, large cardboard tube is mosaicked to produce an unusual, but beautiful, base for a modern lamp





The beginning of an attractive, easy-to-clean splashboard above the work counter in a kitchen

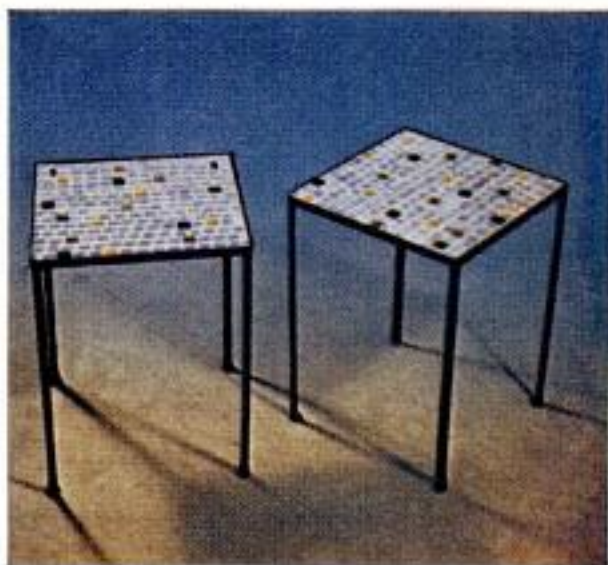
this, there will be some waste as a tile does not always break as desired. But in most cases, the waste material can be used in working out other designs.

To apply mosaics, first work out the design full size on paper, Fig. 1, coloring it to match the tiles being used. Then transfer the design to the base or object to be covered, Fig. 2, first thoroughly cleaning the surface. Next, apply adhesive to the



A plywood top mosaicked and edged with brass and fitted with screw-on legs produced this table

Right, an old metal tray takes on a crisp, new look when mosaicked in a pleasing design of suitable colors



Modern metal tables lend themselves nicely to mosaic tops. Final appearance depends on the design used

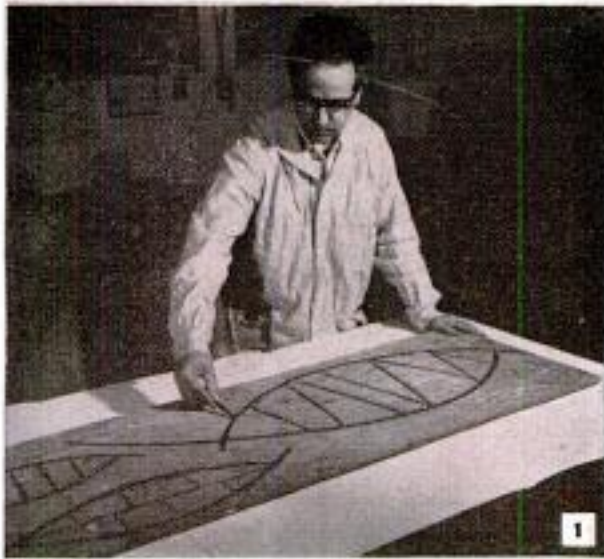
surface and place the tiles, following the design and color previously worked out. It is best to coat only a few square inches of surface at a time as the adhesive may set before the tiles can be placed.

It is easier to work out any central designs or themes first, Fig. 4, and fill in the background afterward. Leave spaces of $\frac{1}{16}$ in. or more between the tiles for grouting.

After all tiles have been applied, mix a grout as in Fig. 3. It consists of white tile cement and water, mixed to a consistency slightly thinner than patching plaster. This is spread over the mosaic by hand to fill in the joints between the tiles. While the grout is still wet, wipe the face of the mosaic with a damp sponge to remove excess grout.

In case of a table or other flat surface, metal or wood edging may be used to cover the edges and produce a finished appearance. The basic forms on which you can cement the tile to make different objects are endless. For example, a section of cardboard carpet roll provides an excellent cylindrical lamp base. Each end is plugged with a wooden disk, glued in place. Rec-





First step in mosaic work is to lay out the design on paper full size and color it to suit your desire

tangular lamps can be produced by assembling suitable forms from plywood. A hole bored in the top before the tiles are applied will accommodate the lamp fittings, which are available in any hardware store.

Blocks of wood provide excellent bases for mosaic book ends. They may be used in rectangular shapes, or sawed diagonally to make interesting pyramidal forms.

Old cigar boxes provide good foundations for jewelry and cigarette boxes. Interesting effects can be achieved by setting the tiles close together with no grouting. Almost any battered old tray or bowl can be made to look like a collector's item with simple application of mosaic. Steel mixing dishes used by chefs in restaurant kitchens are good, as are wooden salad bowls. Cheap metal or paper trays and bowls from the dime store do equally well. Much depends on the mosaic design.

A mosaic-surfaced table is a piece you

After tile has been placed and adhesive set, grout is mixed in bowl and applied to the tile joints



JUNE 1957



The design then is transferred to the surface to be mosaicked and the tiles laid according to pattern

will be proud of forever. If you make your own in free form or in rectangular shape, nothing lighter than $\frac{3}{4}$ -in. plywood should be used. Shellac both sides to prevent warping. Sets of flange-base, screw-on legs in walnut, mahogany, birch or metal may be purchased inexpensively. These legs come with mounting plates for setting them either vertically or at an angle, depending on the period design of the table.

Mosaic may be applied directly to walls to make interesting splashboards above sinks, bathtubs and lavatories, much in the same manner as applying plastic tile. To assure neat, straight rows of tile, draw pencil lines on the wall for each row, leaving joint spaces for grouting. Apply the grout as for other types of work and wipe off the surplus. Here, as for other jobs, work out the design on paper first and then transfer it to the wall. Be sure to use appropriate designs for kitchen and bathroom. ★ ★ ★

Remember, it's easier to work in central design first and then fill in the various backgrounds afterward



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Pivoted hood swings down to provide convenient access to outboard motor. Evinrude 35 sent *Sea Knight* skimming along at 26 m.p.h. during the trial runs

SEA KNIGHT

PART II

By *Glen L. Witt*

Naval Architect

HAVING REACHED THE POINT described in Part I, you are ready to plank the hull. The importance of careful fairing cannot be stressed too much and you should double check with a straight-edge to make sure that the planking will lie flat against all contacting members. This not only includes the sheer and chine log and the edges of the frames but the keel and bottom battens as well. You'll notice in Fig. 21 that the keel is faired from a centerline. As there is a slight arc to the bottom members of the frames, you may find it necessary to fair the outer edges of the bottom battens a little. A strip of plywood placed across the members as in Fig. 22 will determine the amount that must be removed.

Side planking: Sectional views in Figs.

To Save Both Time and Work

If you wish, you can buy the patterns for the stem, frames, transom, breasthook and chine blocking already drawn full size. And, to further simplify construction, you can buy these parts in kit form accurately cut in mahogany from Glen-L Marine Designs, P.O. Box 566, Compton, Calif.

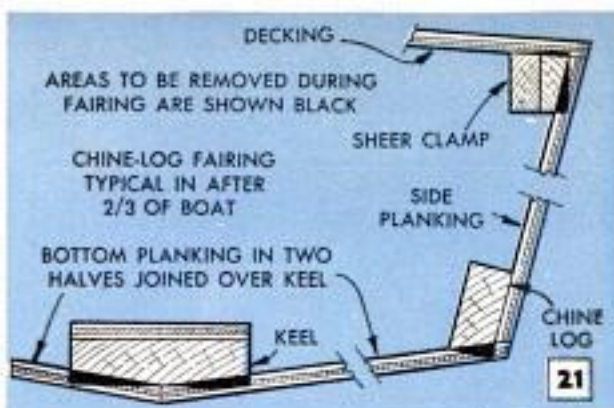
24, 25, 26, 31, 34 and 35 detail the planking. It is preferred that the hull be side-planked with single panels of $\frac{3}{8}$ -in. marine-grade (AA) plywood. However, if you cannot obtain plywood long enough, two panels can be joined in the manner shown in Fig. 27.

If working alone, perhaps the best way to determine the shape of the plywood planking is to make a template by stretching wrapping or building paper around one side of the hull and marking it accordingly. This is then cut out and traced on the plywood as in Fig. 32. If extra help is available, you can forget the paper pattern and mark the shape directly on the plywood by holding it against the hull and running a pencil along the sheer and chine log. After the plywood is cut slightly oversize, it is clamped and temporarily screwed in place at several points for the final fitting, Fig. 23. The fitting at the transition joint, Fig. 28, from frame 5 forward, must be made at the very edge of the chine log and is the most important joint in the planking. The planking at the sheer, transom, stem and chine aft of frame 5, may be left $\frac{1}{4}$ in. or so long for final fitting after the planking is permanently fastened in place. When the

trial fitting meets your satisfaction, the planking is removed and used as a master pattern to mark the plywood planking for the opposite side. If the hull is to be coated with glass fiber, you can use a hard-setting glue in applying the planking. Where it is not to be treated with glass fiber, a soft-setting or mastic-type glue should be used.

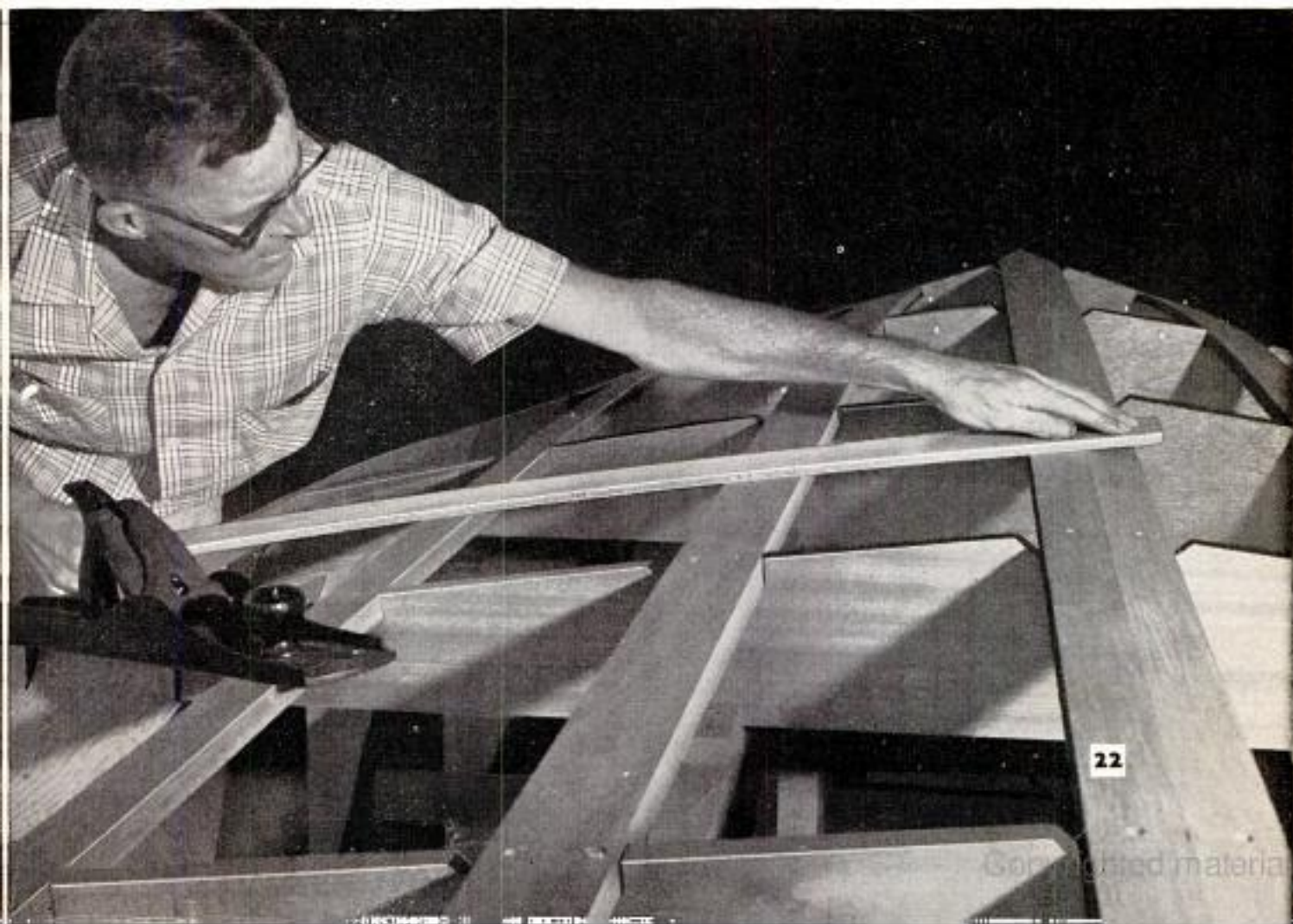
All contacting surfaces are coated with glue and the plywood planking is relocated by the trial screw holes and fastened permanently. Screw the planking to the sheer clamp with 1-in. No. 8 screws spaced 4 in. apart. Space them 3 in. apart at the chine and stagger them as much as possible. Space 1¼-in. screws 2 in. apart at the stem and transom. It is not necessary to screw the plywood to the frames unless you wish. The plywood planking is applied to the opposite side of the hull in the same manner. You will notice in Fig. 30 that it is first necessary to fair off the planking at the stem to allow the planking to lap at this point. The planking on both sides is now trimmed even with the chine-log member. Go about this carefully and check as you proceed with a straightedge as you did in fairing. Here, the fairing is done only aft of a point at frame 5. Fig. 28 shows that from this point forward, the bottom planking and the side planking butt together.

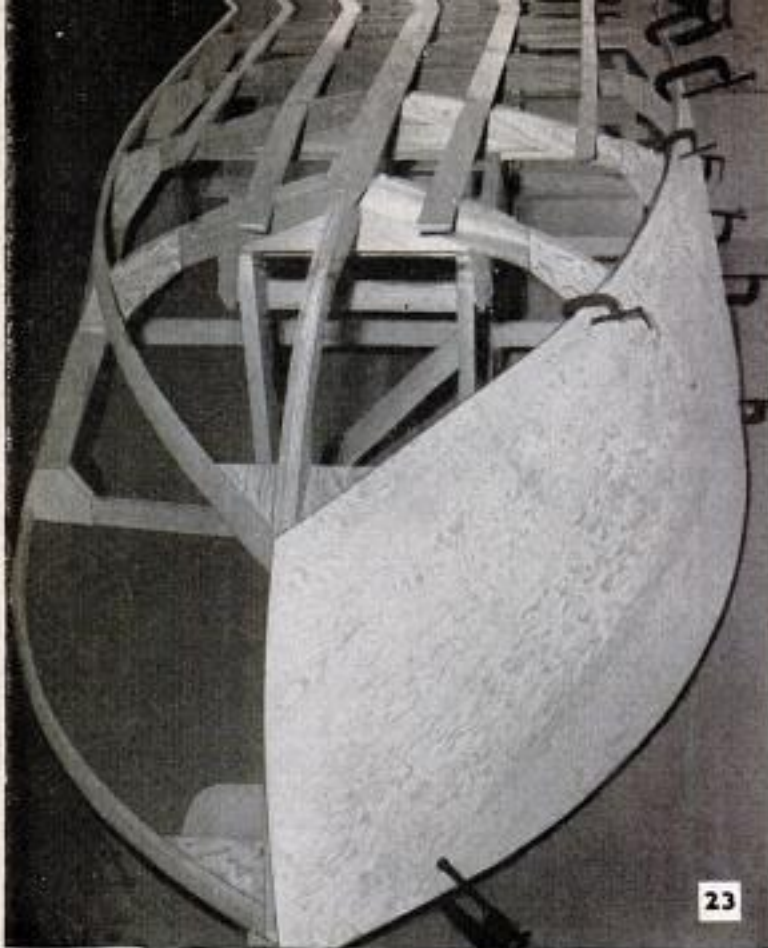
Bottom planking: The bottom planking



is ¾-in. marine plywood also and, like the side planking, it is preferred that it be full-length panels. It is applied in two sections with the joint falling on the centerline of the keel. Fitting the butt joint with the side planking from frame 5 forward will require a little doing. Your best bet is to rough-mark, cut and keep trimming until you get a good fit. The rough scribing along the stem is, of course, a simple matter. In springing-in the bottom planking up forward, you will find the panel fairly stiff. To help make it conform, cover the area with a few burlap bags and saturate them with boiling water. This is necessary also when actually fastening the panel in place. After one panel of the bottom is fitted, it may be used to mark the other half. Coat all contacting surfaces with glue as before

Fairing of keel, battens and chines is checked for unevenness with plywood strip placed across members



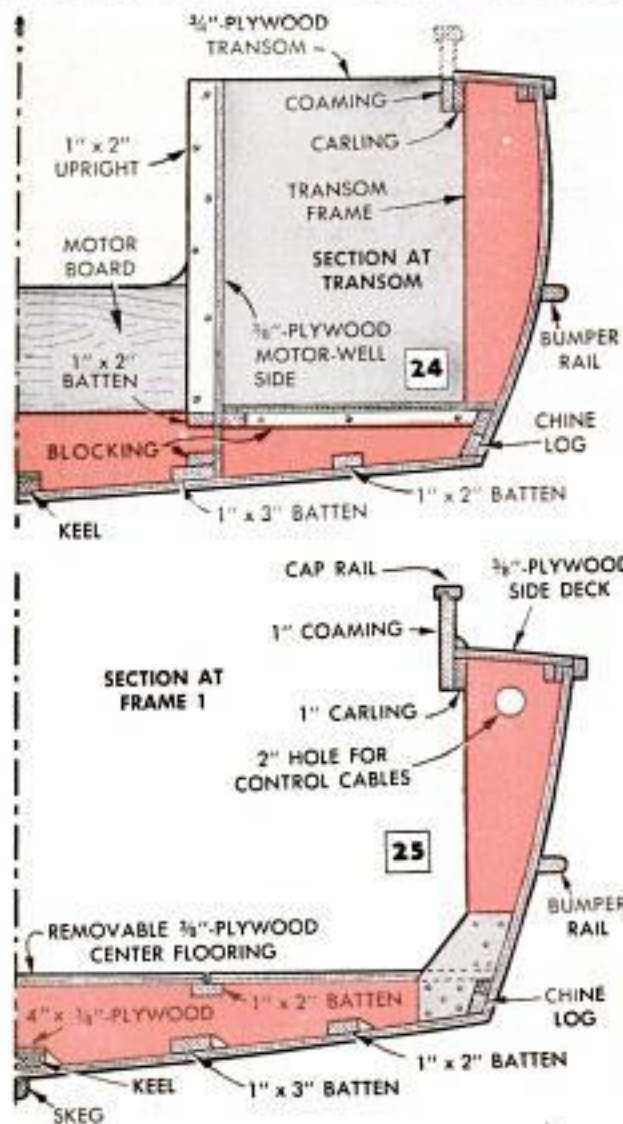


Left, plywood side planking is temporarily clamped in position and then roughly marked for over-all size

and begin driving the screws, working forward from the transom. Use 1-in. No. 8 screws 3 in. apart along the chine and keel and 4 in. apart at the battens and stagger them as much as possible. After the first half is trimmed at the stem, the other half is applied. After both halves are in place, final trimming is done.

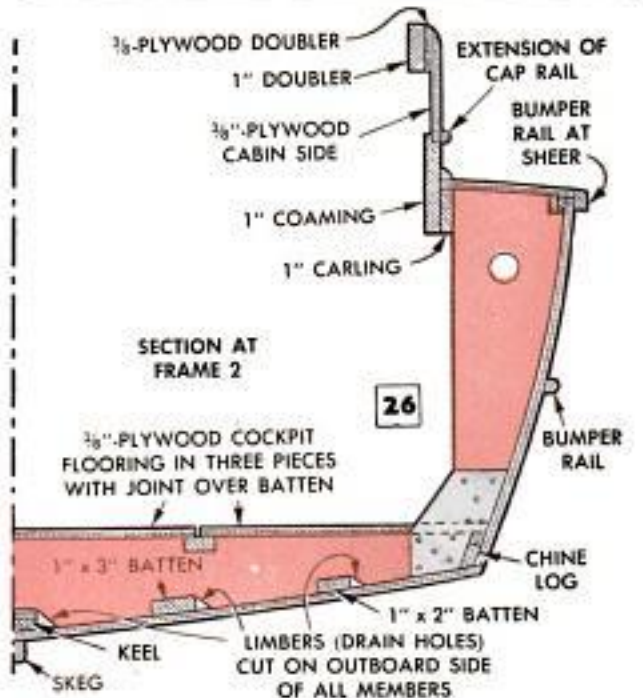
Skeg: The skeg covers the joint in the bottom planking at the keel, Fig. 38. It is cut from 1¼-in. oak or fir, following Fig. 38 and is set in a bed of mastic before being fastened to the keel with 2-in. No. 10 screws spaced about 6 in. apart. If the hull is to be glass-fibered, the skeg, of course, is added afterward.

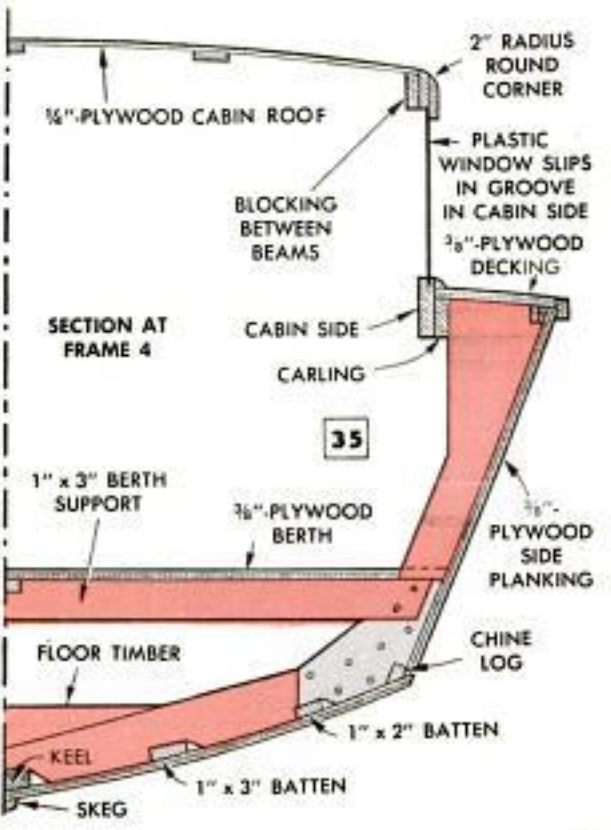
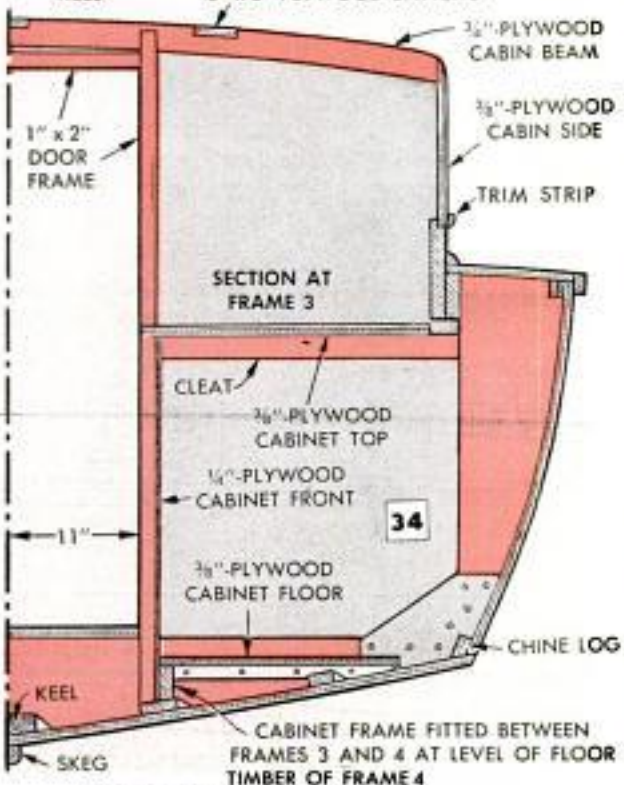
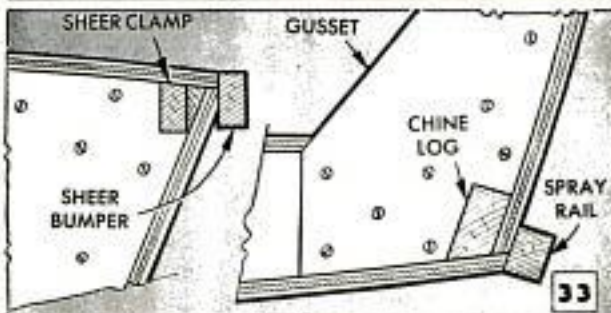
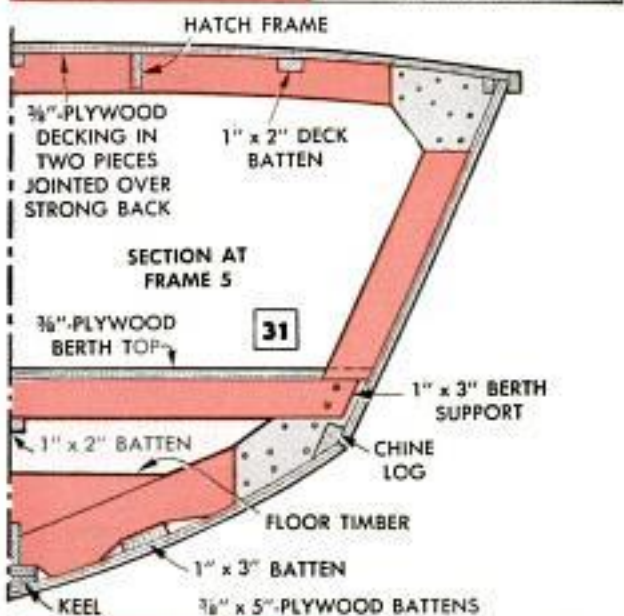
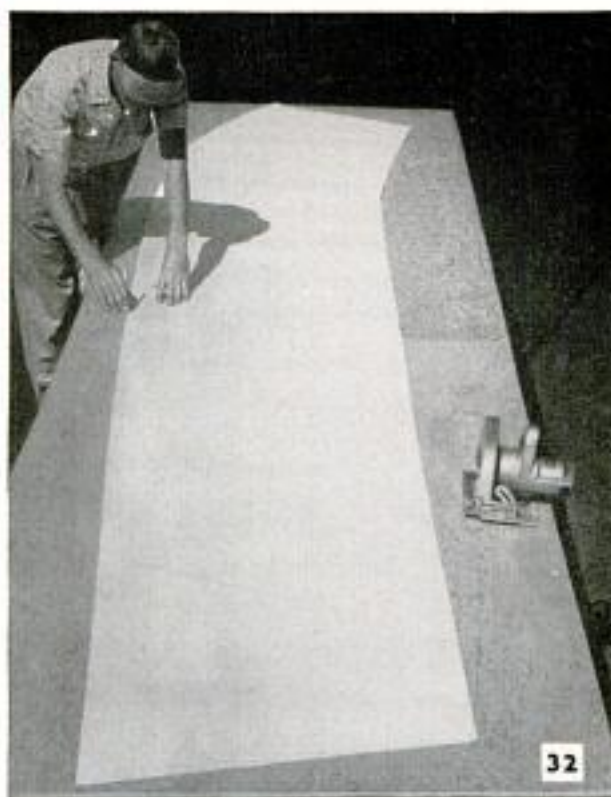
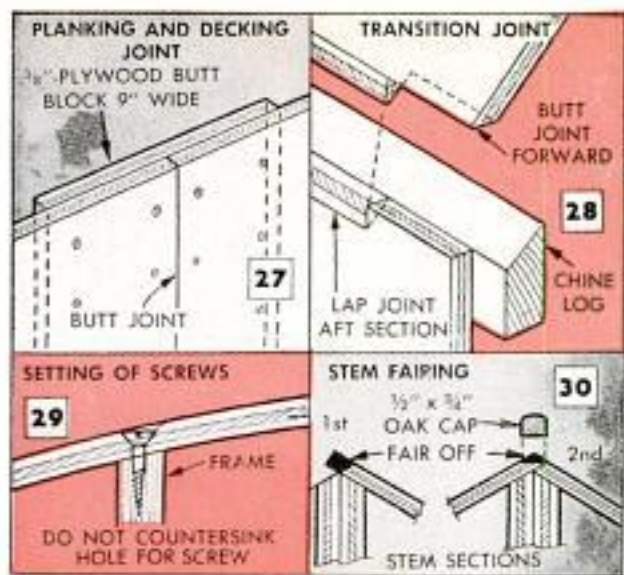
If the hull is not to be covered with glass fiber, a stem band is used to cap the exposed edges of the plywood planking. This oak strip, which measures ½ x 1 in., extends from the deck line to the end of the skeg. Screw this to the stem and keel with 1½-in. No. 8 screws spaced 12 in. apart. In addition to the stem band, a spray rail should be added to cover the joint of the side and bottom planking at the chine, Fig. 33. A single piece of oak or mahogany is used for this and is ripped to measure 1 x 1¼ in. in section. It too is embedded in mastic before being attached with 2-in. No. 10 screws, 12 in. apart.

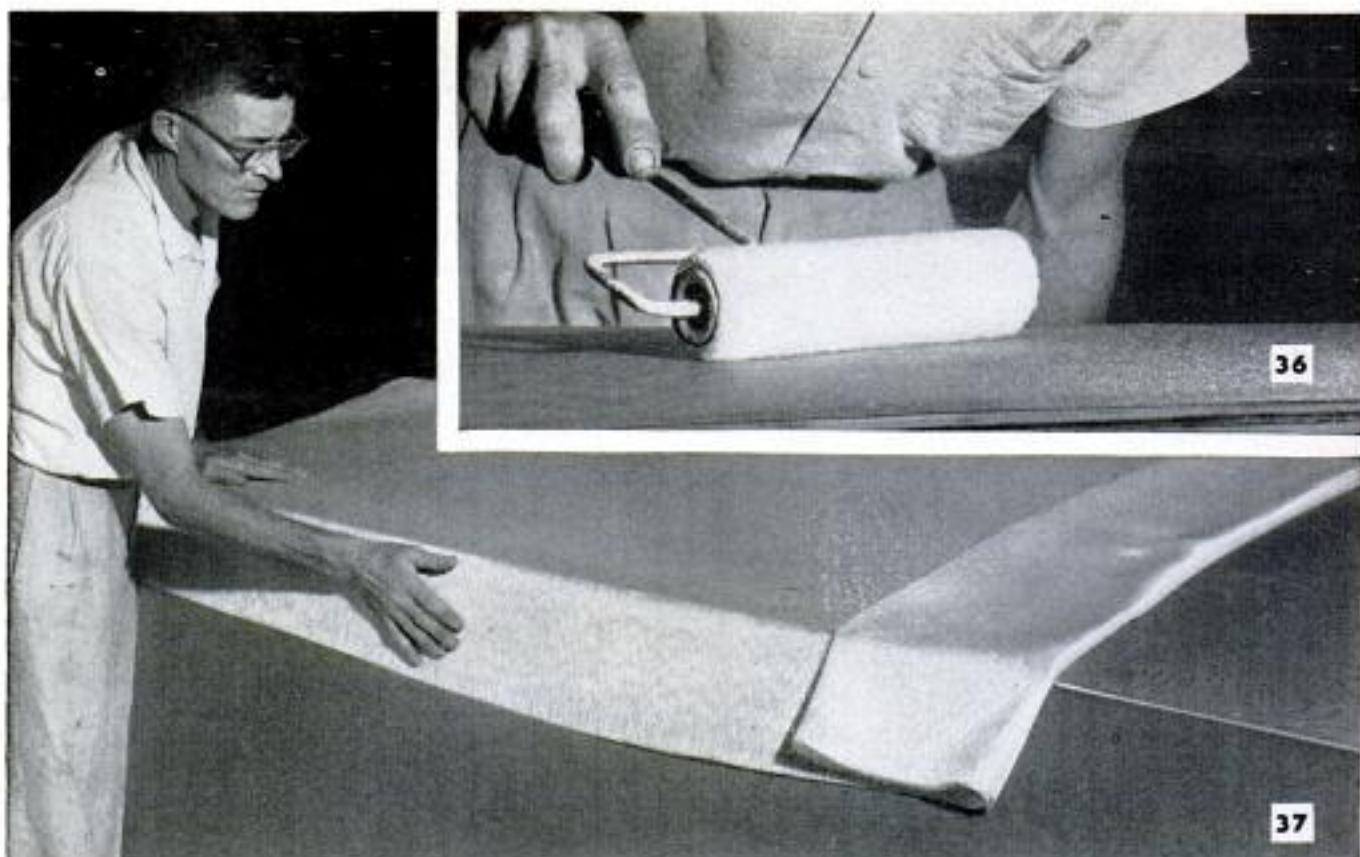


Blueprints Available

Those who prefer to build *Sea Knight* from plans larger than the ones presented in the magazine may purchase a set of blueprints, 17 x 34 in., by writing Blueprint Department, *Popular Mechanics Magazine*, 200 E. Ontario St., Chicago 11.





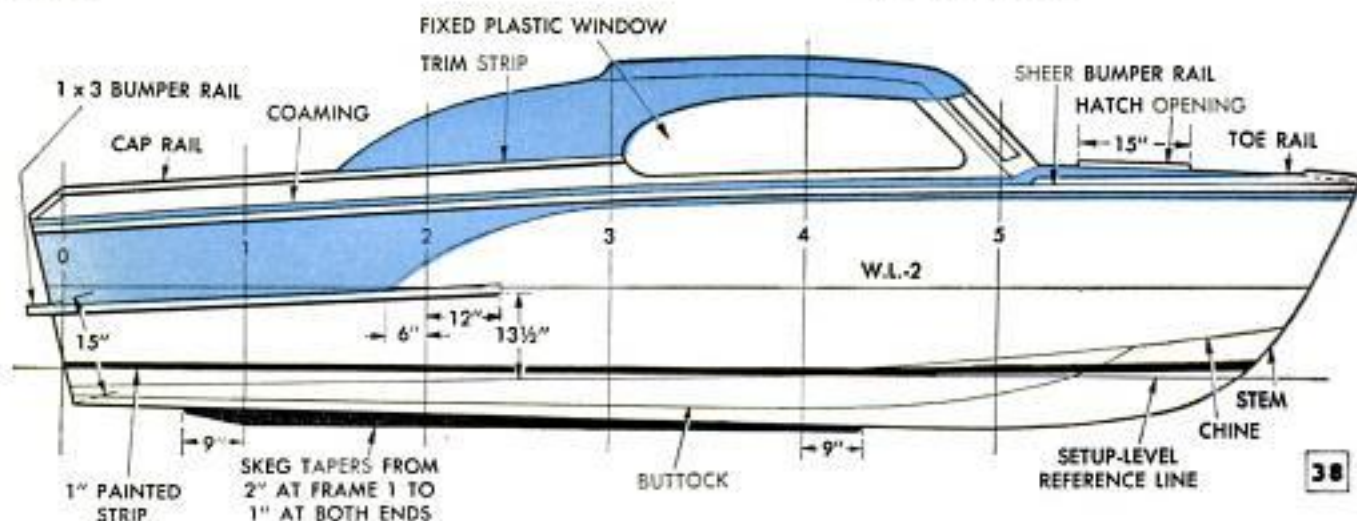


Glass-fiber cloth is applied to bottom of hull and brought about 4 in. up side planking and trimmed

Glass fiber: Covering the hull with glass fiber is a sure way of preventing checking of fir plywood, a common fault. There is nothing particularly difficult about applying glass fiber but it is important that the manufacturer's instructions be followed carefully. Proper proportions in mixing the resin catalyst are most important as is the correct temperature for applying. Essentially, it is a case of applying the bonding agent to the wood with a roller as in Fig. 36 and then laying glass-fiber cloth in it while wet, Fig. 37, and finally applying a second application of the resin-catalyst mixture. Before actual painting, the hull should be sanded lightly and any screw holes or imperfections filled with wood putty.

Painting: While the hull is upside down, the primer may be applied to the bottom. If the hull has been covered with glass fiber, be sure that the primer is recommended for use on glass fiber. If the hull is fir, use a resin-type plywood primer as a base. Flat primer should be applied, sanded when dry and then given a second application and so on until the surface is smooth. Follow the primer with two coats of marine enamel applied to the bottom only. If the hull is to remain in water, the bottom should be painted with an antifouling paint applied according to manufacturer's instructions. This is generally applied to an unprimed surface shortly before the hull is launched.

(To be continued)



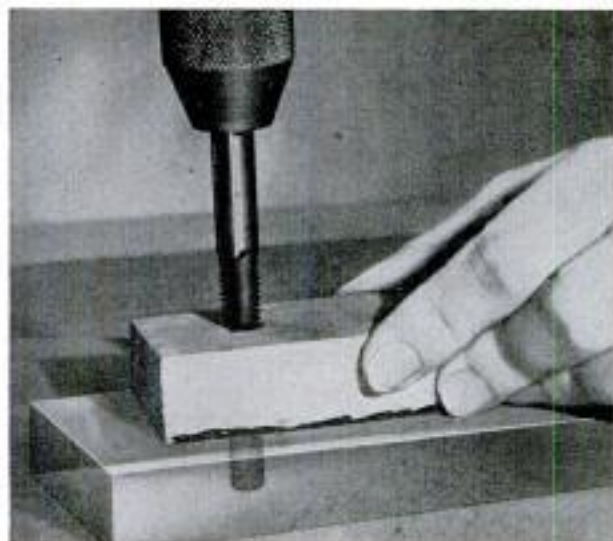
Magnet Serves as Cutoff Stop

When using the saw fence as a cutoff stop for repetitive work, a strong horseshoe magnet stuck to the fence provides a "self clamping" clearance "block." A block like this, or one of wood, is always required in cutoff work and never should the work be butted directly against the fence. If done, the work will catch between the blade and fence and be thrown with force.



Wood Jig Starts Tap Square in Plastic

The difficulty of starting a tap square in plastic, without damaging the surface of the material, is avoided when a block of wood is drilled and tapped and then held in position over the work. In addition to eliminating damage to the plastic, this jig will enable you to make the holes tap true and with greater precision.



Rubber-Stamp Impressions Tinted With Metal Powder

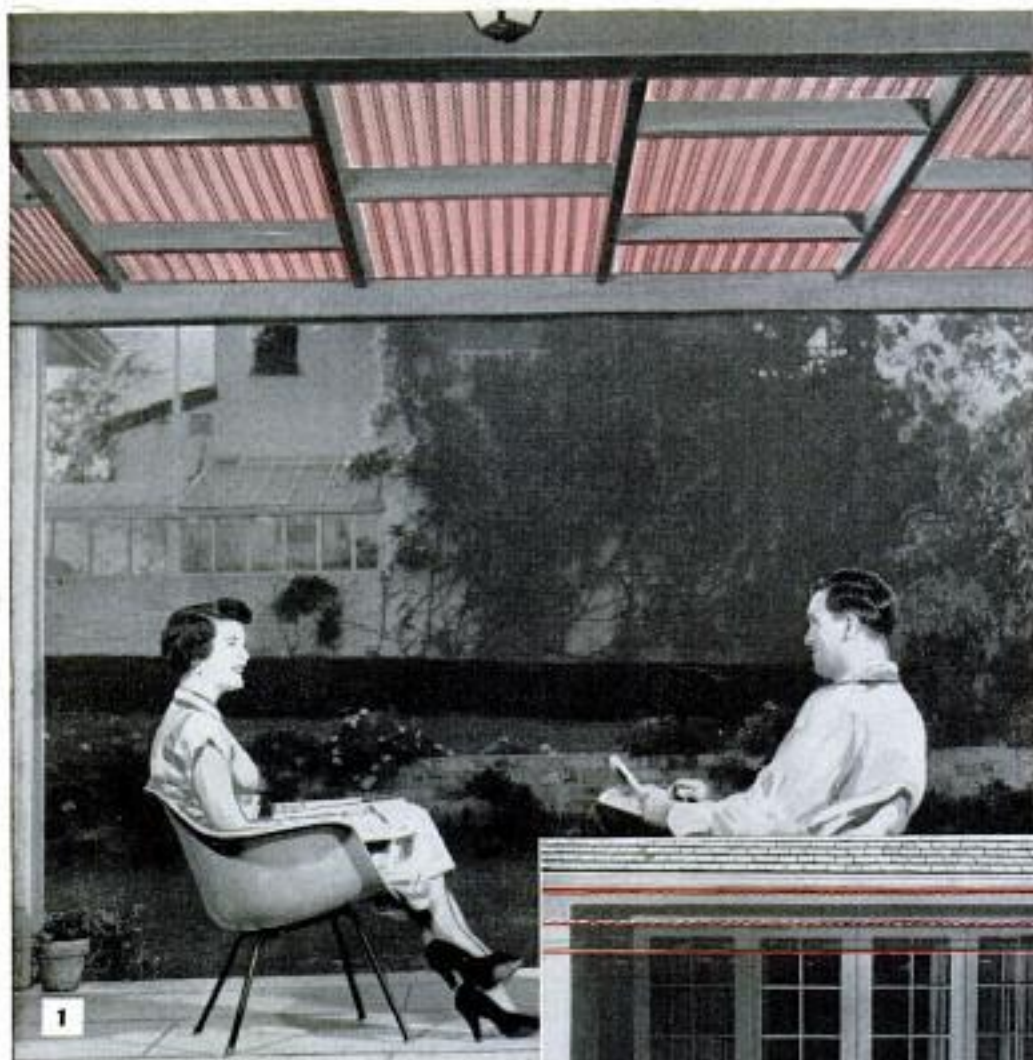
Metallic powders are easily applied to fresh rubber-stamp impressions, giving them the appearance of having been imprinted with metal. Regular stamp ink can be used in any color on absorbent materials. After covering the impression with the powder, allow it to dry a minute or two. Then gently shake off the excess.



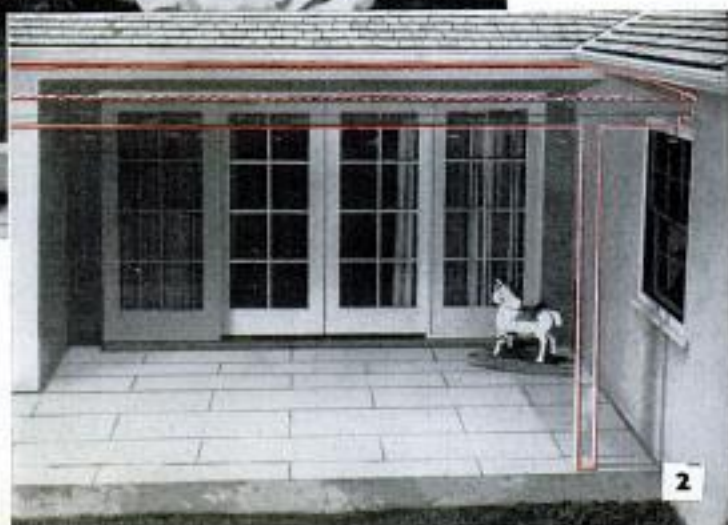
New Fence-Post-Treating Method Stops Decay and Termite Damage

A simple soaking process, developed by the Forest Service of the U. S. Department of Agriculture, has been devised whereby homeowners and farmers can treat their own fence posts against decay and termite damage. It entails soaking the ends of the posts in two successive solutions, the first being copper sulphate, available in crystal form, which is diluted at a ratio of 18 lb. to 24 gal. of water. Allow a day for the crystals to dissolve, otherwise extensive stirring will be necessary. The large ends of the posts, preferably freshly cut, are immersed in the liquid which should be of a sufficient depth to cover the entire section of the post that is later to be buried in the ground. After two days the posts are transferred to a second solution of sodium chromate, purchased in powdered form, which is dissolved in water at a ratio of 18 lb. to 26

gal. Posts are soaked with the wide end down for one day and are then inverted to permit saturation of the narrow end for another day. Upon removal, they should be piled and allowed to dry for several weeks to allow the chemicals to become more evenly distributed. If necessity demands that they be used immediately, rinse the posts in clear water to remove surface deposits. Rubber gloves are required for handling the solutions and care must be taken as these chemicals cause irritation if brought in contact with the skin and are harmful if taken internally. Residue should be disposed of in a hole dug in the ground at a sufficient distance from wells and livestock ponds to prevent contamination. The liquids should be allowed to seep away before refilling the hole. If retained, the solutions must be fortified before reusing.



Above, patio roof of corrugated glass fiber nailed on framework of 2 x 4s attached to house and supported by posts as outlined in Fig. 2, affords protection from rain and direct rays of the sun. A second post, not shown in the outline, supports the other end of the roof



KEEP YOUR PATIO COOL WITH A GLASS-FIBER ROOF

By Raymond Schuessler

HERE IS A COLORFUL glass-fiber patio roof that you can start building in the morning and have completed before sundown. After measuring the area to be covered, the members for the framework are cut from 2 x 4s and the supporting posts positioned as indicated in the red outline in Fig. 2. Each post is anchored to the floor by a ½-in. steel rod, which is inserted in the bottom of the post and in a ½-in.

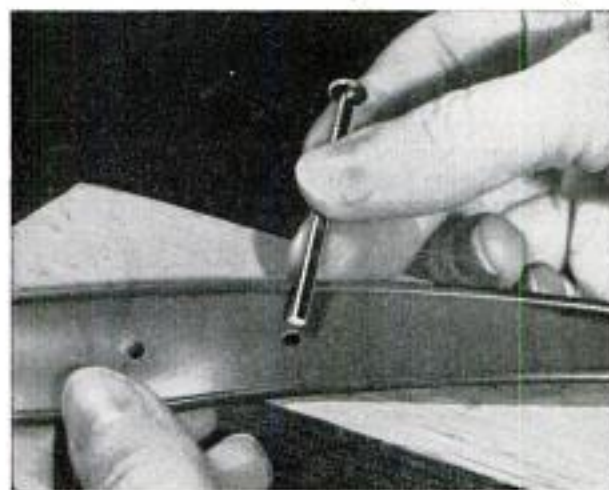
hole drilled in the concrete floor. Then the framework is nailed to the house and to a 4 x 6-in. beam nailed on top of the posts, Figs. 3 and 4, after which the glass-fiber panels, Fig. 1, are cut and fastened to the 2 x 4s with aluminum nails. The panels should overlap one corrugation for sealing with clear mastic. Predrilling of nail holes is recommended prior to fastening the panels to the rafters. ★★★



Above, cross pieces are staggered to break dominant lines of corrugated roof. Fig. 4, pre-painted 2 x 4 nailed directly to house supports upper end of roof. Fig. 5, glass fiber is easy to cut with fine-tooth saw



Leather Punch Improvised by Grinding Nail End Flat



When it is necessary to provide an extra hole in a leather belt and no punch is available, try grinding the end of a nail flat as shown. Then, hold the nail in position on the belt, using a wooden block as backing, and strike it a sharp blow with a hammer. A neat, clean-cut hole will result.

☐ When you reupholster or slipcover furniture, pin some of the fabric scraps to the underside of the chair or sofa. There they will be handy in case you need them for small patches. They will have faded about the same degree and be just about as soiled, making a better match than a piece of fabric stored where it kept perfectly clean.



Board of Fire Underwriters photo

Protect Yourself Against

Simple, practical suggestions that any homeowner can take to family as well as reduce possible damage by wind to his home

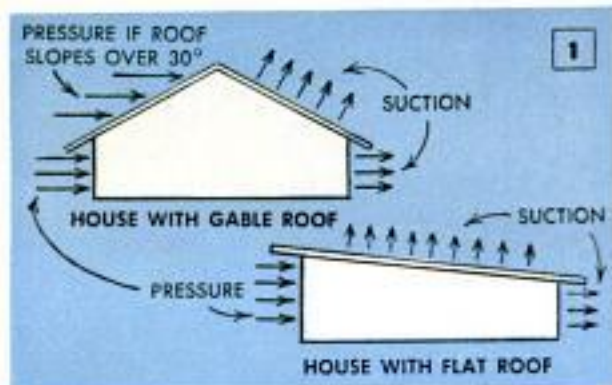
YOUR CHANCES of becoming part of the statistics compiled each year on the loss of life by windstorm can be reduced greatly by taking precautions to safeguard yourself and family. This is especially important if you live in a region where severe windstorms may be expected.

Although it is not practical at present to build houses that will withstand the full impact of tornadoes, they can be reinforced to resist the strong winds along the fringe of tornadoes, or most winds of hurricane force. Personal safety in such storms is best assured by substantial shelters below grade level. Much property damage can be

prevented by taking some simple precautions before a storm strikes.

Effects of Severe Winds

A wind blowing from one prevailing direction exerts a positive pressure on the windward side of a building, and a negative pressure or suction on its leeward side. The amount of pressure on the windward side of a roof depends mostly upon its angle. There is practically no pressure from a horizontal wind if the roof slope is less than 30 deg., but the roof covering still may be susceptible to damage. Fig. 1 shows the distribution of pressure and suction on



WIND-VELOCITY PRESSURES			
M.P.H.	Lb. Per Sq. Ft.	M.P.H.	Lb. Per Sq. Ft.
Wind Speed		Wind Speed	
2 30	2.30	120	36.8
40	4.09	130	43.3
50	6.39	140	50.2
60	9.21	150	57.8
70	12.5	160	65.8
80	16.4	170	74.2
90	20.7	180	83.0
100	25.6	190	92.6
110	30.9	200	102.4



Board of Fire Underwriters photo

Windstorm Damage

By E. R. Haan

*help assure safety to himself and
and other personal property*

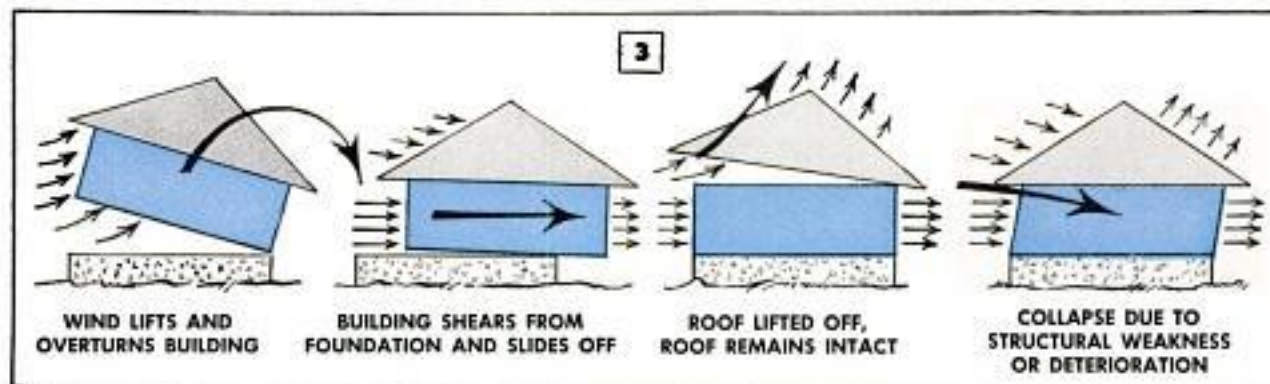
various parts of two types of buildings, one having a gable roof and the other a flat or shed-type roof. While a 50-m.p.h. wind produces a pressure of about $6\frac{1}{2}$ lb. per sq. ft., a 70-m.p.h. wind almost doubles, a 100-m.p.h. wind quadruples this pressure as shown in Fig. 2. Sometimes the suction force exceeds the pressure force. Openings like broken windows on the windward side of a building permit pressure to be built up inside of it.

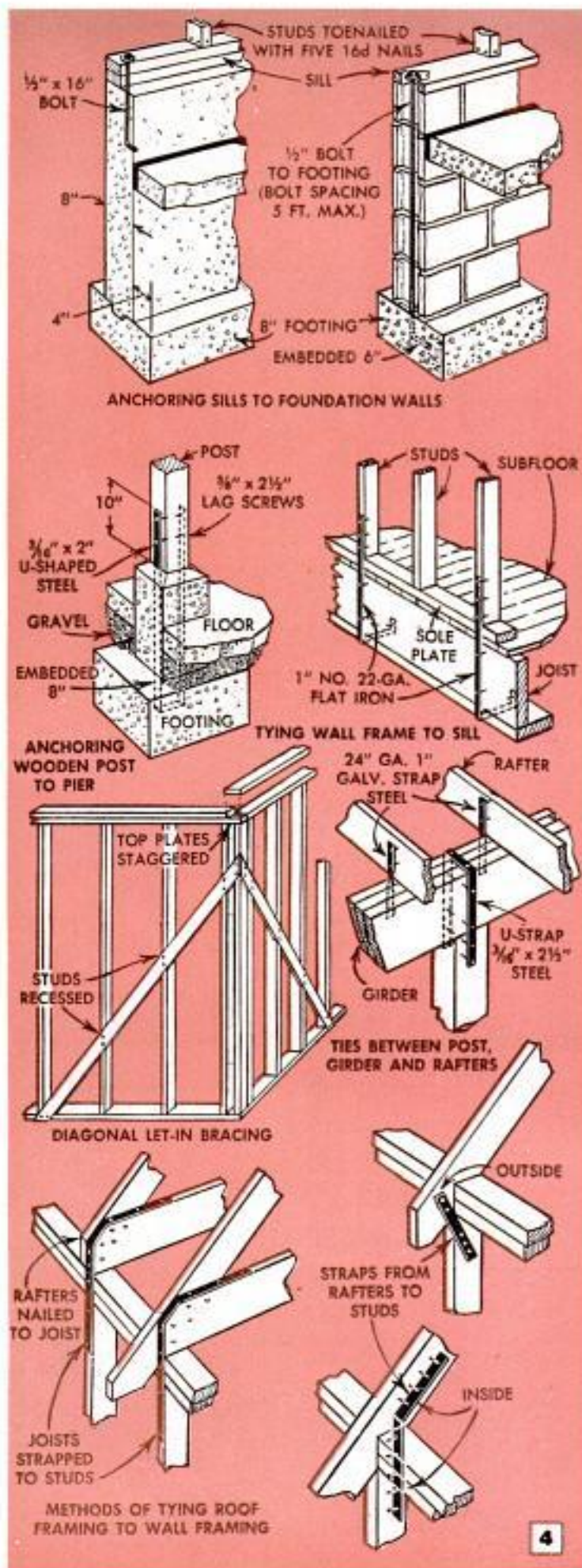
Fig. 3 shows how buildings are affected by strong winds. Pressure against the windward side tends to lift and overturn a building not firmly anchored to a founda-

tion or one not having a substantial foundation. As the suction force increases, a building tends to shear and slide off a foundation. Suction on the roof, aided by pressure under it, tends to raise it unless firmly anchored to the walls. A building tends to collapse under wind pressure if it does not have properly braced walls and roof, or if the structural members are weakened by decay or deterioration. Momentary gusts of wind from varying directions, generally of greater force than that of the prevailing wind, weaken a building.

Windstorm-Resistant Construction

New buildings erected in a region where severe windstorms can be expected should have windstorm-resistant construction. Details of such construction are contained in





the National Building Code. Information on how to build wind-resistant farm buildings is also contained in Bulletin No. 144 of the U. S. Dept. of Agriculture. Fig. 4 shows a number of important features. Sills are fastened to a poured-concrete foundation wall with $\frac{1}{2}$ x 16-in. anchor bolts of which the ends to be embedded are bent at right angles. For concrete-block foundations, the anchor bolts extend through the blocks and are embedded in the footing. In both cases, the spacing of anchor bolts should not exceed 5 ft. Studs are each toenailed to sills with five 10d nails. Wooden posts on piers are fastened to them with U-shaped straps of $\frac{3}{16}$ x 2-in. steel. These are embedded in both the pier and the footing, and fastened to the post with $\frac{1}{2}$ x $3\frac{1}{2}$ -in. lag screws. Diagonal bracing let into the frame members of walls at corners will add considerable rigidity. Girders resting on posts are bolted or strapped together with $\frac{3}{16}$ x $2\frac{1}{2}$ -in. steel straps. Rafters and joists resting on top plates of wall framing are attached to them and to the studs with 24-ga. steel straps about 1 in. wide, as in the lower three details of Fig. 4.

As roof damage is the most frequent result of windstorms, particular attention should be given to strong roof construction and wind-resistant covering. Roof coverings should be applied strictly in accordance with manufacturers' instructions. Inadequate nailing is usually the cause of failure of some composition shingles in breaking off when subjected to strong wind. Fastening each tab with a spot of quick-setting asphalt cement, not less than 1 in. in diameter, Fig. 5, will hold the tabs down securely.

Protective Measures

Existing buildings are less susceptible to windstorm damage if kept in good repair. Any loosened projections of portions of a house, such as trim, cornices, shutters, gutters and downspouts, should be kept properly secured, in good sound condition, or replaced as necessary. Tabs of composition shingles should be cemented down as already noted. Trees should be kept pruned to eliminate dead branches and minimize breakage



DABS OF QUICK-SETTING ASPHALT CEMENT (1" MIN. DIA.) TO HOLD COMPOSITION SHINGLES

5

of live ones. Loose objects like trash cans, lawn furniture, lumber and children's play equipment, should be located in spots sheltered from prevailing winds, or gathered and put in the basement before a severe storm strikes. This will prevent them from being blown about and causing damage. Some of the loose objects may have to be anchored securely.

Window Protection

In areas subject to hurricanes, strong panels of 1-in. wood or $\frac{5}{8}$ -in. exterior-type plywood should be kept at hand to board up windows as in Fig. 6. Provisions for securely fastening such panels should be made in advance, instead of nailing them down at the time of an emergency. In some cases the panels may be held in place like storm sash or screens, using hangers at the top and hooks or turn buttons at the bottom. The inset in Fig. 6 shows the use of hanger bolts, which are left in place permanently. The panels should not touch the glass of a window, especially when under wind pressure. For windows that are larger than a single panel, you can join several panels together, reinforcing the abutting edges with lengths of $\frac{3}{16}$ -in. T-iron as shown in Fig. 7.

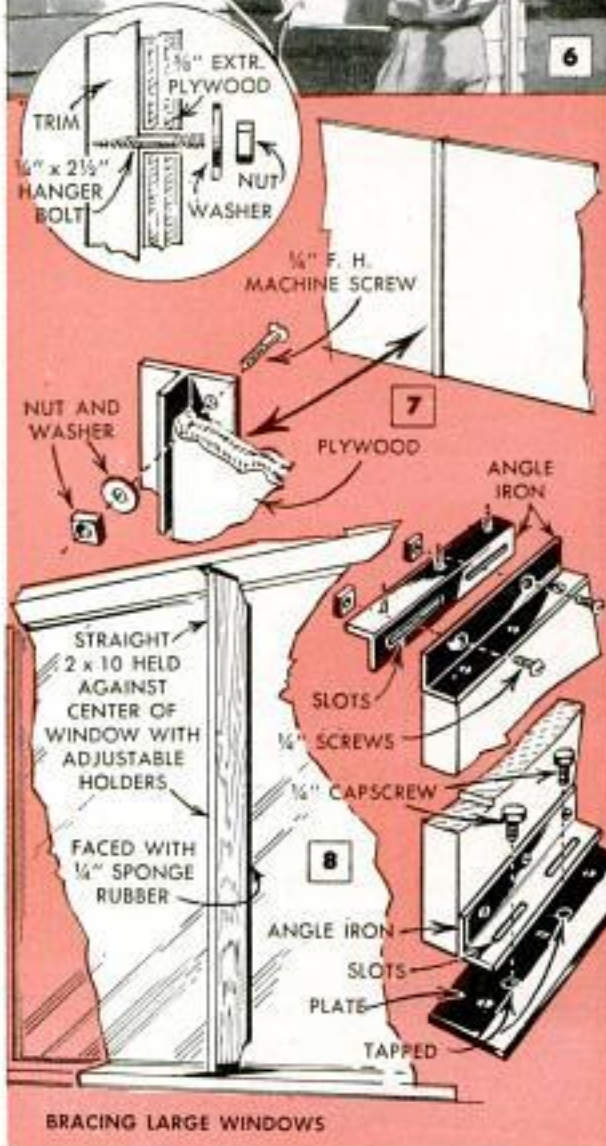
Picture windows in houses, and display windows in stores can withstand considerable wind pressure if braced as shown in Fig. 8. A straight piece of 2 x 10-in. stock is set vertically against the center of the windowpane by means of adjustable holders at the top and bottom. A slight cushioning effect is provided between the glass and the brace by applying a length of self-adhering sponge-rubber weather stripping to the edge of the brace as indicated. Large garage doors also should be braced.

If, during a severe windstorm, the wind blows into the house through broken windows, doors or other openings, dangerous pressure may be built-up inside. This can be relieved by providing openings of equivalent size on the leeward side. This precaution may be enough to save a building.

Warnings are radioed in areas that are likely to be subjected to severe storms like tornadoes and hurricanes. As tornadoes form suddenly, and therefore cannot be

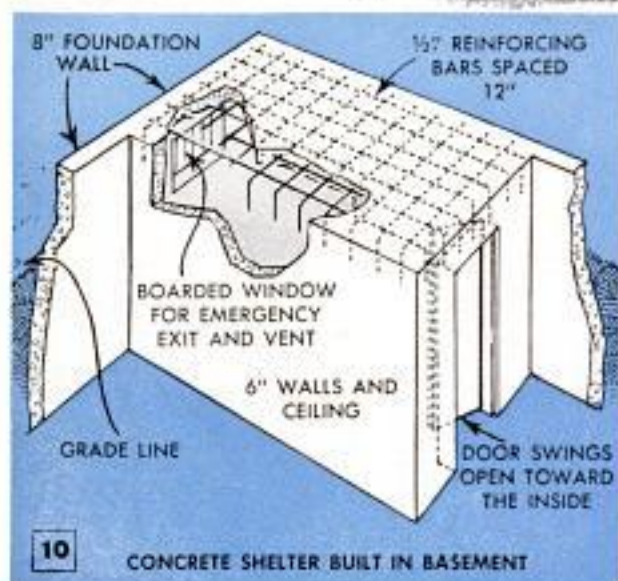


6



BRACING LARGE WINDOWS

forecast, tornado alerts are issued in areas where weather conditions are likely to cause them. After one has been observed, its general direction and progress can be broadcast. The general path of a hurricane can be predicted with reasonable accuracy and warnings issued many hours in advance. Knowing what kind of a windstorm to expect enables a person to take



specific precautions besides the general measures that apply to all windstorms.

Recognizing a Tornado

Persons who are frequently in open country and may be out of touch with communications temporarily, should be able to recognize the funnel-shaped cloud formation that is characteristic of a tornado. Extending downward from storm clouds, this columnar cloud may look like a thick rope that is only a dozen or so feet in diameter. Or, it may be a V or U-shaped cloud of much greater diameter, occasionally as much as a mile or two, although the average diameter is about $\frac{1}{4}$ mile. This cloud whirls around in counterclockwise direction at speeds estimated as high as 500 m.p.h., accompanied by a deafening roar. When the lower end of the cloud touches the earth, which it may do intermittently, continuously or not at all, structures in its path usually are instantly demolished.

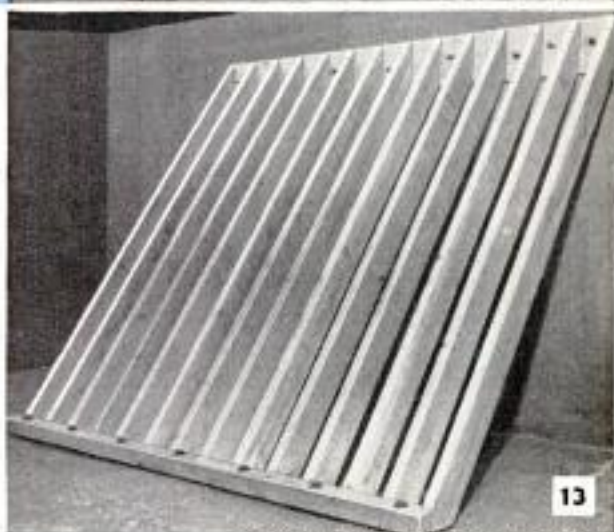
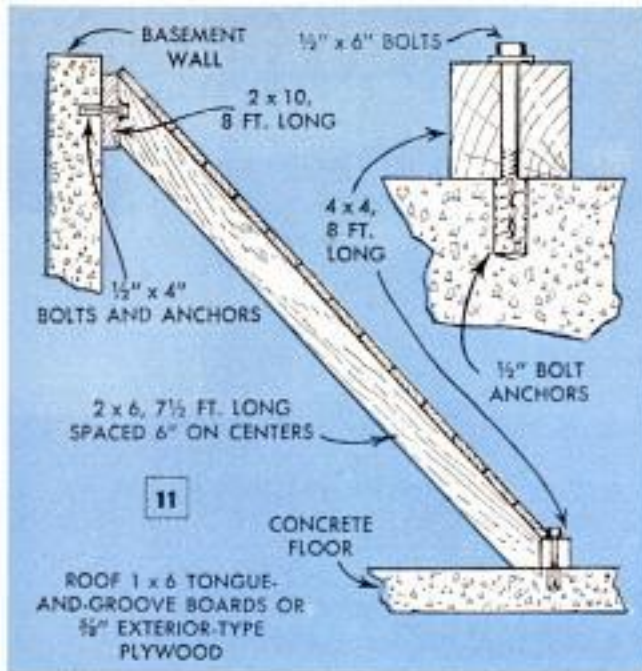
In central U. S., tornadoes generally

move toward the northeast and tend to swing northward at the end of their path. The forward speed is generally 25 to 40 m.p.h., although over 65 m.p.h. has been recorded. A tornado may remain stationary at one spot for several minutes, or it may follow erratic U-shaped or circular paths occasionally. While the average path is only 15 miles long in midwestern U. S., some have traveled over 200 miles. They may occur in any month of the year, but their greatest frequency is during the early months in the southern states, and during May and June in locations farther north. The center of a tornado is an area of greatly diminished pressure. When this passes over buildings that are not vented to equalize air pressure inside and out, the structures practically "explode." The difference in pressure may be equal to several hundred tons.

Surviving a Tornado

Quick decision and action are essential to survive an approaching tornado. Often people in autos can get out of the way. If such escape is impossible, the best place outdoors is a ditch or depression in which a person should lie flat. The greatest protection is afforded by a reinforced-concrete shelter built below grade level, Fig. 9. It should be about 5 x 8 ft. in size, preferably about 7 ft. deep. It should have a vent and a strong door that can be fastened securely.

A reinforced-concrete shelter located in one corner of a basement, as in Fig. 10, will be accessible quickly to persons in the house. This shelter should have a window opening, provided with a solid panel of plywood instead of glass, as an emergency exit should the doorway become blocked with debris. The door should swing inward so it cannot be held shut by debris.



U. S. Civil Defense Administration photos

A lean-to type of basement shelter that will accommodate two or three persons, and has an exit at either end, can be built of wood as shown in Figs. 11 to 13 inclusive. This shelter was especially designed by the U. S. Civil Defense Administration to provide protection against bomb blast. Being highly resistant to falling debris, largely because of its strongly reinforced roof that slopes at a 45-deg. angle, this shelter offers considerable safety in a tornado. The roof of 1-in. yellow pine or $\frac{5}{8}$ -in. exterior-type plywood is nailed to a framework of 2 x 6-in. "rafters" spaced about 6 in. on centers. These are nailed to top and bottom plates or cross pieces which in turn are securely bolted to the wall and floor of a basement.

In a frame house, the part of a basement that is closest to an approaching tornado is the safest spot to be if a separate storm shelter is not available. Very little rubble tends to fall into the basement of a frame house at this point. However, just the opposite is true in case of a brick, stone or concrete-block house. Such a house tends to disintegrate quickly when struck by a tornado, and debris may bury persons in a basement. Such a house should have a separate storm shelter. Reinforced-concrete buildings or those that have a steel-frame construction offer a high degree of safety when occupants keep away from windows and doorways.

Hurricanes

A hurricane is a rotating windstorm that may be several hundred miles in diameter. The center or "eye" is a calm area of low atmospheric pressure averaging about 14 miles in diameter. Around this center the wind travels in counterclockwise direction,

at speeds of 75 to 150 m.p.h. The greatest force is just outside the eye. The storm center advances at a relatively slow speed. A spot that lies in the path of the eye is first subjected to winds from one direction, after which there is a period of absolute calm, and then the wind blows with equal fury from the opposite direction.

Many hurricanes lose most of their violence after traveling inland, but cause torrential rainfall, often resulting in severe floods. In the U. S., hurricanes are seasonal from June to November, reaching a peak of frequency at the beginning of September but they can occur at other times also.

In view of the changing wind direction that may be experienced in a hurricane, the vent openings on the leeward side of buildings during the early part of the storm may have to be closed, and other vents provided on the opposite side. Occupants of waterfront homes should evacuate them and move to higher and safer locations farther inland before the storm strikes. ★ ★ ★

Water-Ski Jump



Section of Wooden Snow Fence Provides Slipproof Walk

Instead of slipping and sliding around when climbing a sloping beach, lay a section of wooden snow fence on the sand. The slats provide a slipproof surface on which to walk with little possibility of the fence settling too deeply into the sand.

Pulling Headless Nail

Pulling a headless nail is no problem if you grip the nail with a pair of pliers and slip the hammer claws under the pliers. If a nail is especially hard to remove, and a pair of regular pliers slips, grip the nail lightly with a pair of cutting pliers.



SKI-JUMPING THRILLS are not restricted to winter snow when you have this floating ski-jump ramp to lift you into the air on water skis. The 20-ft. ramp lifts the skier 5 ft. into the air, and only speed and natural caution determine how high and how long will be the jump.

Designed for simplicity of construction and quick disassembly for winter storage, the ramp has a 2 x 4 frame that is assembled with galvanized bolts, nuts and washers. For the surface of the floating ramp, a new, high-density-resin overlaid fir plywood is recommended. The surface of this type of plywood is glass-smooth and flint-hard, ideal for water skiing, as it requires no waxing or finishing and withstands the abuse of water skis sliding over it. However, regular exterior-grade plywood can be used for the ramp surface. Its upper surface should be prepared by flowing on two coats of heated carnauba wax. The underside of the plywood, as well as all framing of the ramp, should be given a heavy prime coat, then finished with a good grade of exterior or marine-grade paint. As indicated in the details, the framework under the plywood ramp consists of cross members between the outer frame members, and staggered shorter members between the cross members. This construction assures a rigid surface for the skier. The lower frame, in which oil-barrel floats are strapped, also is made as one unit.

When the ramp is to be assembled, float the lower frame with all diagonal braces loosely connected to it. Then, float the plywood ramp over it and slip bolts through the upper ends of the diagonals while lifting the ramp into position. Next, install the two side gussets and tighten all bolts. Now, strap the oil drums in place, with the bungs facing upward, and fill them with water, as required, to balance the ramp and adjust its height. Heavy screw eyes on the four corners of the lower frame of the ramp are used to attach anchor cables that lead to anchors made by filling pails with concrete and inserting large screw eyes in the wet mix. These anchors are necessary to keep the ramp from shifting with the wind and from the wake of a passing boat.

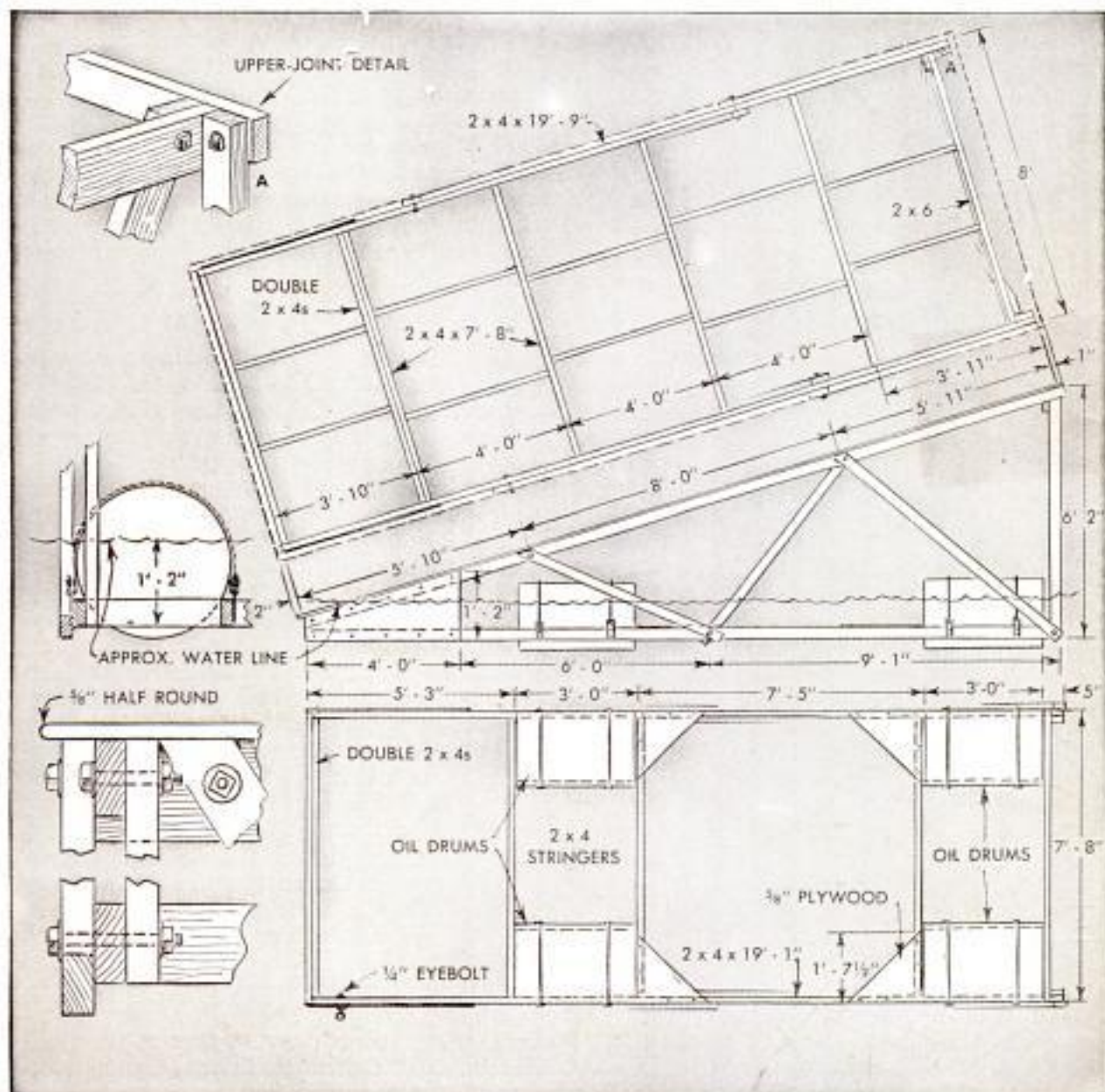
As indicated on the detail, the forward member of the ramp frame is a length of 2 x 6 to provide added strength at this point. To finish the edge of the plywood ramp, $\frac{5}{8}$ -in. half round is glued and nailed to it as indicated in the detail.

Douglas Fir Plywood Association



Add a new dimension of thrills to the sport of water skiing by taking to the air via this floating ramp. Details below show that upper frame, to which plywood ramp is screwed, consists of staggered short

members fitted between cross pieces of outside frame. Lower frame supports four standard 55-gal. oil drums that act as floats. All openings in the drums should be sealed except those on the sides of the drums



How to make

Fishing Jigs

By Vlad Evanoff



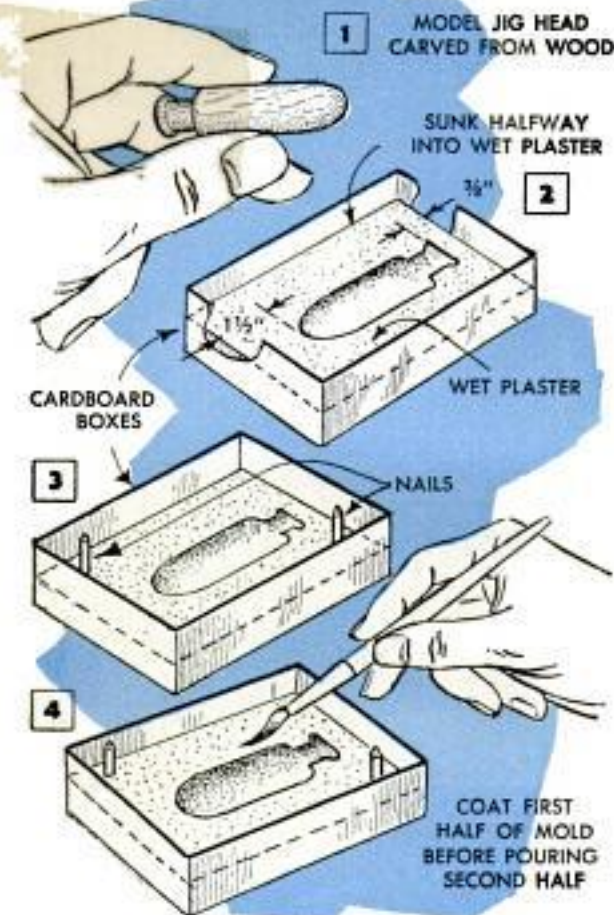
ONE OF THE MOST effective lures used in salt-water fishing, and which now is finding increasing favor with fresh-water anglers, is the "jig." This lure consists of a metal "head" in which a single hook is embedded, and a "body" of bucktail hair, feathers or nylon. The most attractive feature of jigs is that any fishing enthusiast who ties his own flies or makes his own lures can cast the jigs with a minimum of tools and equipment.

Making the Molds

First step in making jigs is to have a model, or pattern. The pattern can be a jig on hand from which the feathers have been stripped and the hook and eyelet removed, or it can be carved from softwood, Fig. 1. Next, a mold is made by pouring plaster of paris or water putty into a cardboard box. As indicated in Fig. 2, the box should be a size that permits a space of $\frac{3}{8}$ in. between the body end of the jig and the box side, and $1\frac{1}{2}$ in. from the opposite end of the jig and the box side. First, pour the box half full of plaster, coat the jig pattern with petroleum jelly and press it halfway into the wet plaster. Two nails then are sunk into the plaster near diagonally opposite corners and allowed to project about $\frac{1}{4}$ in., Fig. 3. They will act as locating pins when reassembling jig halves for casting.

After the first half of the mold has hardened, brush its entire surface with heavy oil, then fill the box with plaster. When the plaster sets, which usually requires about $\frac{1}{2}$ hr., break the box away from the mold. Use a knife blade to separate the mold halves, Figs. 5 and 6. Pry out the pattern, which will remain in one of the mold halves, and set the mold aside to season at room temperature for about two weeks.

POPULAR MECHANICS



When the plaster mold has thoroughly seasoned, use the point of a knife to cut eyelet grooves and hook slots, Fig. 8, which are determined by placing hooks and eyelets on the mold and tracing around them with a pencil. Eyelets, Fig. 7, are formed from brass or copper wire. Also carve a funnel-shaped pouring hole in each mold half.

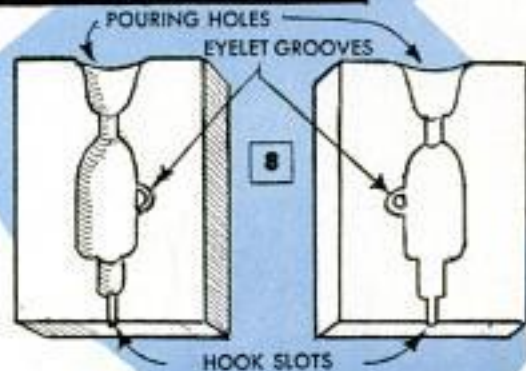
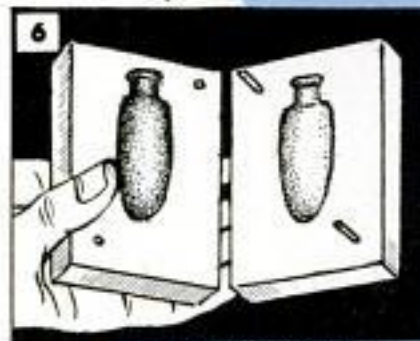
Casting the Jigs

Metal for casting the jigs should be lead or tin, which often can be purchased as scrap metal. A combination of the two metals, such as bar solder, also is good. The greater the proportion of tin, the lighter the jig will be. Melt the metal in a ladle and pour some into each half of the mold, both to warm it and to remove any moisture. Next, place the hook and eyelet in position, Fig. 9, hold the mold halves together and quickly pour the mold full of metal, Fig. 10. When the surface of the metal indicates that it is hardening, lay the mold on its side until the metal has cooled completely. Wear heavy gloves for this operation, as the mold quickly becomes too hot to hold, and there is the risk of splashing molten metal on the hands.

In a minute or two the mold halves can be separated and the jig removed. Cut off the excess metal, Fig. 11, and drop it back into the ladle. A mold made as described will permit casting up to two dozen jigs. Chips or holes in the mold can be patched, but when the mold gets rough it should be remade. For a permanent mold, take a freshly cast plaster mold to a foundry and have it cast in bronze or aluminum. The cost should not be more than a few dollars, and the mold can be used for a lifetime.

Finishing the Jigs

After a number of jigs have been cast, file them smooth, then polish with sandpaper or emery cloth. Feathers or hair now are applied in several steps. First, wrap a few turns of heavy thread around the jig where the feathers will be attached, and cover this wrapping with quick-drying cement. Place a pinch of feathers against the cement, then wrap a few more turns of thread over them. Again apply the cement and a few more feathers. Repeat this operation until the hook is well concealed. Finally, wrap a few extra turns of thread around the assembly and coat them with cement. If the metal used for casting the jig had a high tin content, it probably will stay shiny. Metal containing more lead will quickly oxidize and turn dark, so it should be painted in colors that are compatible with the colors of the feathers used. Eyes may be painted on the jig to give it a more professional look. ★ ★ ★





Rubber Band Cut From Inner Tube Chipproofs Sharpening Stone

The edges of your sharpening stones will not become chipped when stored in a tool drawer if a wide band cut from an inner tube is stretched around each of them as shown. Also, dirt is prevented from working into the surface of the stones in contact with the bottom of the drawer.

Lavatory "Step" for Small Children

This plywood step or platform built into a lavatory cabinet permits a small child to reach the lavatory. Made of $\frac{3}{4}$ -in. plywood, the step is fitted in a slot cut in the front of the cabinet as shown, and slides between cleats nailed to the inside of the cabinet. A wooden strip nailed to the front and extending slightly from the sides of the platform prevents it from being pushed in too far.

Robert Taylor, Cuyahoga Falls, Ohio.



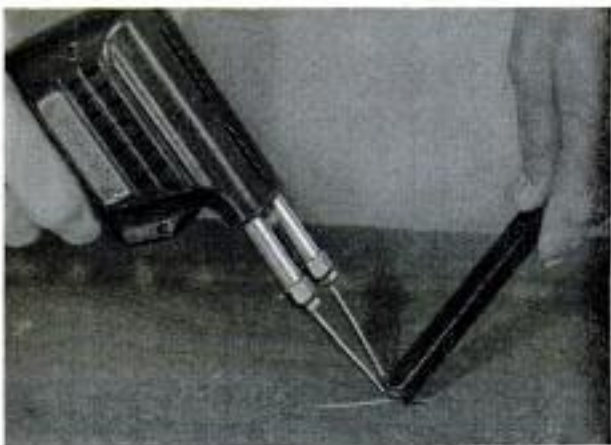
Warm Water for Washing Car

Warm running water was made available outdoors for car washing by this homeowner who installed a hot-water tap next to the cold-water outlet on the side of his house and then connected both to a garden hose with a laundry-tub mixer, which is available at most hardware stores. Temperature of the water is controlled by adjusting the tap faucets.



Solder Gun and Stick Shellac Speed Furniture Refinishing

One fast and efficient way to fill deep scratches when refinishing furniture is to use a soldering gun and stick shellac. Use just enough heat to melt the shellac and flow it into the cracks. Overheating will char the wood. Smooth the shellac as well as possible with the heated gun, then sand when cool.—H. Y. Moon, Orient, N. Y.





Boat Camping for the Sportsman

By Clinton R. Hull

IF YOU USE A BOAT to reach your favorite hunting or fishing grounds, and would like to spend more time at these spots, boat camping may be the answer to your problem. When fishing a lake or stream, instead of heading back to a lodge or seeking a camp site in late afternoon to avoid traveling in strange waters after dark, just drop anchor and stay aboard.

Boat camping does not require a large craft outfitted with bunks and deluxe equipment. Ordinary outboard-powered runabouts from 12 to 16 ft., if fairly broad-beamed and seaworthy, can be fitted for boat camping. Two persons can sleep aboard most 12 to 14-ft. boats, and there will be room for food, fuel and equipment for a two or three-day trip. If the boat is 15 or 16 ft. long, three adults can be accommodated under the same circumstances.

Fuel and oil consumption will limit the distance that it is possible to run a boat, if there are no fuel or supply stations along the route you plan to take. For an ordinary runabout the maximum round-trip distance usually is from 150 to 200 miles. After a test run of a fully loaded boat to determine

fuel consumption, the practical range of operations can be estimated fairly closely. Keep in mind that some extra fuel should be carried to permit operating the boat while on the hunting or fishing grounds. Because 20 gal. of gasoline and 4 qt. of oil equal the weight of an average adult, and require as much or more space, rate of fuel consumption may dictate that one less person can be carried in a boat when longer trips are made.

Boat camping permits you to drop the fishing pole and pick up the mess kit without walking a step



Framework of lightweight tubing fitted on boat supports canvas cover that provides excellent weather protection for boat camper



Each boat will have to be considered a separate problem, but fundamentally, boat camping requires that a boat have weather protection and sleeping space. In some instances, removable hinged plywood seat backs can be lowered to a horizontal position so the backs and seats form a sleeping platform. Where this is not possible, two or more pieces of plywood placed lengthwise of the boat across the seats will provide a sleeping platform. When the platform is not in use, the plywood pieces are placed in the bottom of the boat for floorboards. For maximum sleeping comfort, sleeping bags are recommended over a blanket-mattress combination. Sleeping bags are weatherproof, and can be rolled up and stowed away in a small space.

For protection against the weather, a folding canvas cover can be either pur-

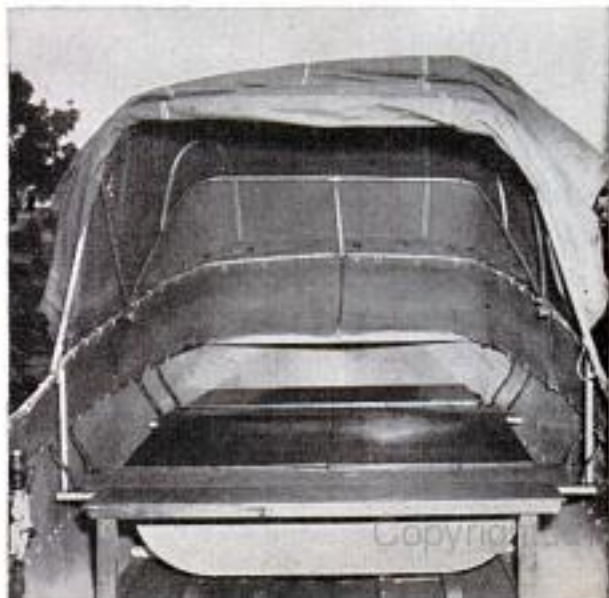
chased or made. For the do-it-yourself top, $\frac{1}{2}$ -in. thin-wall conduit is bent to form the ribs and the cover itself is cut and sewn from 8-oz. canvas. As shown in the photographs, the lower portion of the cover is designed to stay in place when the upper portion is removed, forming a windscreen.

Cooking can be done aboard on a small camp stove. Because gasoline and oil for the engine, as well as fuel for the stove, are carried aboard, a dependable portable fire extinguisher should be considered standard equipment when a stove is used. In addition, keep the stove as far as possible from engine and fuel supplies. Flashlights or battery-powered electric lanterns should be used rather than lamps requiring fuel.

Because you must be self-sufficient when boat camping, a spare propeller and nut should be clamped under one of the seats

Lower portion of cover stays on boat permanently, provides a windscreen and protection against spray

Plywood and boat seats form spacious platform for sleeping bags and canvas cover completes "bedroom"



Weather seal between removable upper portion of canvas top and permanent lower portion is provided by flap extension on upper portion as shown



or under the foredeck out of the way. A lightweight folding anchor and about 100 ft. of anchor line also are necessary. A small kit of tools, spare ignition points and spark plugs should be included in the equipment. If your boat is subject to puncture or snag damage, buy a repair kit, available at most boat dealers, which consists of glass-fiber cloth patches and resin. Materials in these kits can be used on either wood or metal hulls. Shear pins for the propeller are another necessity, as is a pair of lightweight oars, just in case a pin is sheared in midstream and the boat must be rowed to shore.

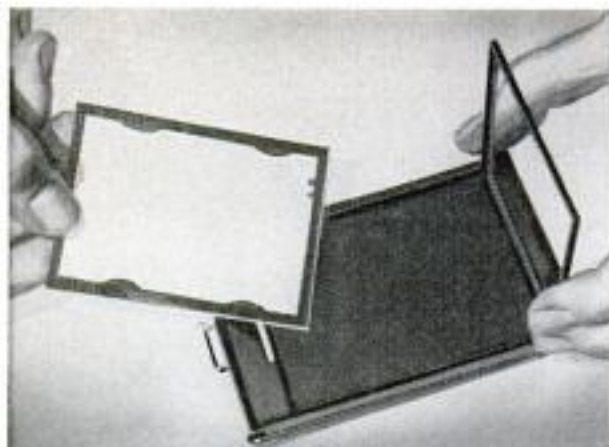
Foodstuffs carried aboard should be as light as practicable, and can include pancake flour, dried fruits and the like. Carry a minimum of canned goods, since their weight may be considerable. A first-aid kit is an indispensable piece of equipment for boat camping or any outdoor trips. If you anchor your boat in a stream where there is a possibility of flash floods, put out plenty of anchor line and face the bow upstream. In country where there are snakes anchor at least several feet off shore, with the bow toward open water so the boat will ride well in case of a sudden storm. Where the banks are rocky, wedge several smooth dead branches vertically against the bank to keep the boat off the rocks. Tie bow and stern lines well above water, in case the stream should rise while you are sleeping.

When you have had enough of hunting or fishing, no time need be spent in breaking camp. Just take in the anchor, start the motor and head for home. ★ ★ ★



Above, with sleeping bags unrolled on platform, comfortable sleeping accommodations are ready. Below, dead limbs keep boat way from rocky bank





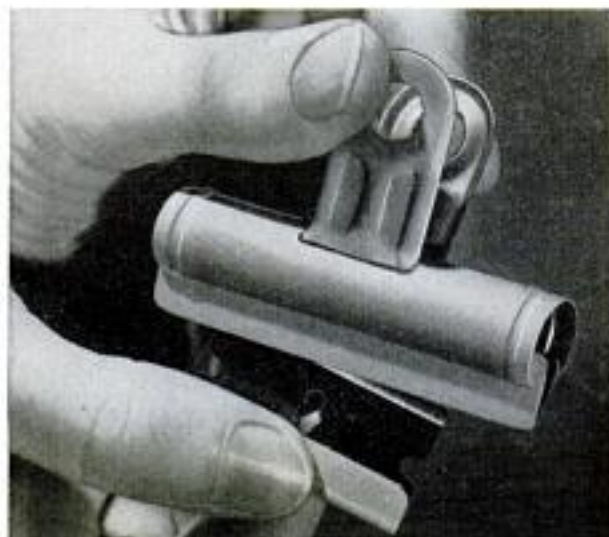
Adapter for Cut-Film Holder Handles Off-Size Film

Sheet film that is smaller than the holder at hand can be used in an emergency by making a simple adapter to hold it. Select a discarded negative that will fit the holder and cut four tabs in it under which the edges of the unexposed film can be inserted as shown in the photo. Then load the adapter and insert it in the holder in the regular manner. A fifth tab cut at the upper end of the adapter will allow you to center the film when loading in the dark.

Richard Hanscom, Elmhurst, Ill.

Razor Blade Used for Cutting Stored Safely in Clip

A single-edge razor blade is a useful cutting tool for many odd jobs around the home, but when not in use it is a real hazard unless the sharp edge is covered. After slipping the blade in the clip, hang it in a convenient place out of reach of children, or keep it in a drawer.



Protect Art-Brush Bristles With Drinking Straw

The bristles on a small art brush can be protected from damage when not in use if a short length of drinking straw is slipped over the ferrule as shown. For a long period of storage, the bristles can be completely sealed in the straw by closing the open end with cellulose tape.



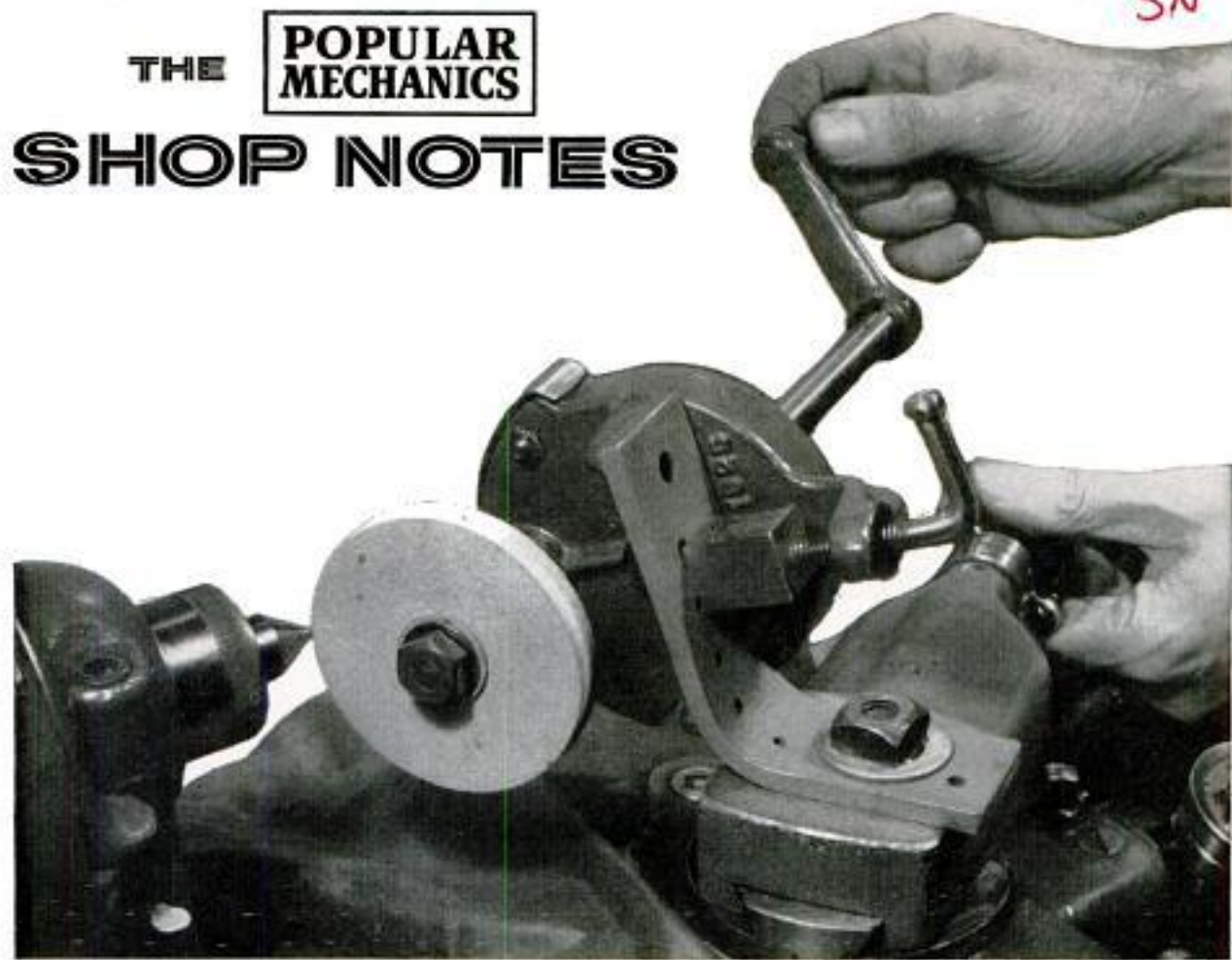
Year-Round Uses for Shellac in the Home

From garden markers to winter bouquets is the range of uses for shellac around the home. For the garden, shellac empty seed packets to row markers and then shellac the outside surfaces of the packets. The packets will stay in place and be legible all summer. In your home, holes worn in linoleum can be repaired by filling them with a paste made of shellac and finely ground cork. When the mixture has dried, sand smooth and paint to match the linoleum pattern. Repair cracked wooden salad bowls by cleaning the cracks as well as possible and then filling them with shellac. Use only enough to come flush with the surface and wipe off any excess. You can restore the appearance of a mirror

when breaks appear in the silver backing by applying smooth aluminum foil and shellacking it in place. Polished-brass fixtures and utensils will not darken if two thin coats of shellac are applied. Denatured alcohol will remove shellac should that become necessary. Old lamp shades can be given new life by stripping off the covering and replacing it with a colored map or decorative paper. For durability, apply two thin coats of shellac to the paper. Shellac can be used to preserve the beauty of autumn foliage for winter bouquets. Lay the leaves as flat as possible on a newspaper and apply shellac to one side, covering stems as well as leaves. When the shellac is dry, turn the leaves over and repeat.

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THE POPULAR MECHANICS SHOP NOTES



Hand Grinder Fitted to Lathe

By Walter E. Burton

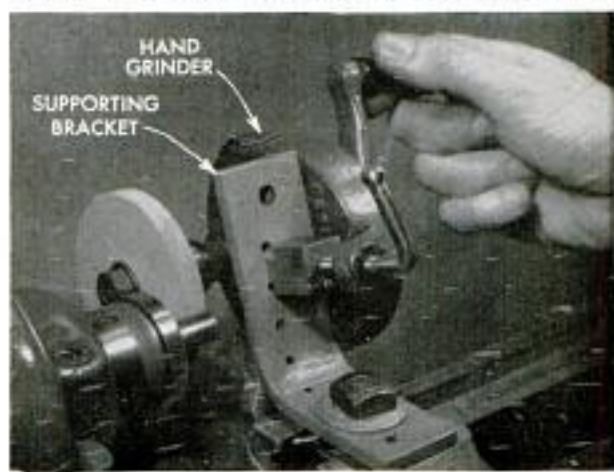
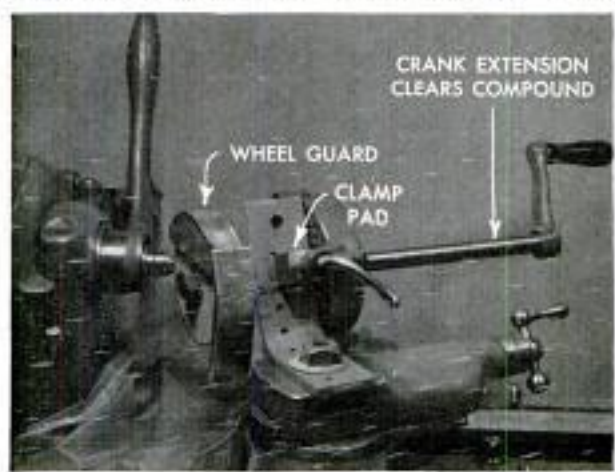
S SMALL SHOPS will find practical use for this simple adaptation of a hand grinder of the type that clamps to a workbench. Common light grinding jobs ordinarily done on the lathe with a motor-driven tool-post grinder can be carried out with an accuracy very nearly equalling that of

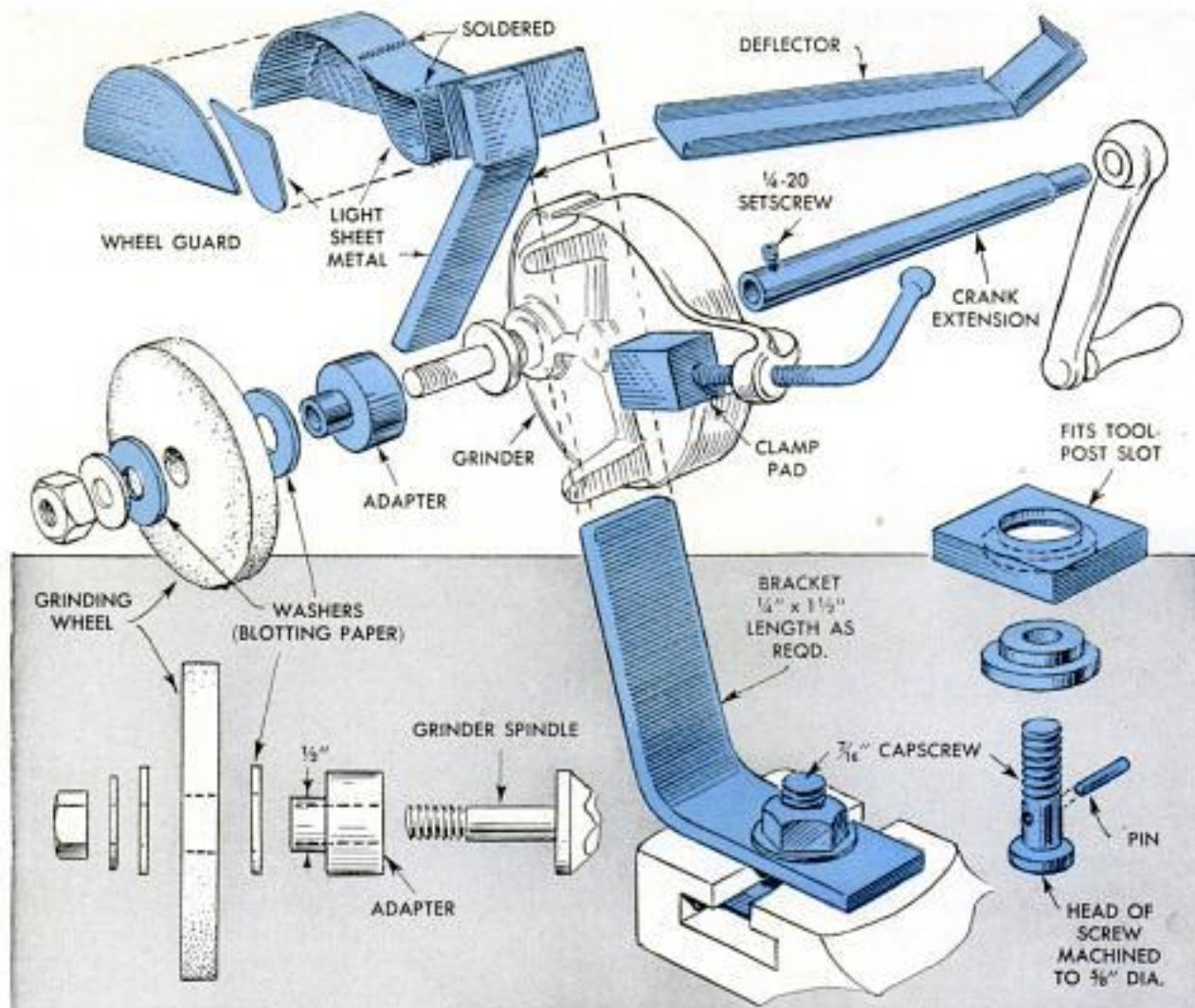
standard tool-post-grinder setups. The hand grinder used must be in good condition with tight bearings and without excessive backlash in the gear.

As pictured above and below, the grinder is clamped to a bracket bolted to the tool-post mounting pad. On some small lathes,

Here the hand grinder is set up with wheel guard and crank extension for refinishing lathe center

Axis of grinding wheel must be in same horizontal plane as lathe centers. Note position of bracket





a standard $\frac{1}{2}$ -in. machine bolt will serve to hold the bracket. On other lathes you may find it necessary to make a special clamping plate and alter a cap screw to suit as in the lower-right-hand detail above. The pin detailed is usually necessary to prevent the screw from turning in the T-slot when tightening or loosening. In some cases the standard tool-post clamping plate will serve as a clamp for the grinder bracket. If this assembly can be utilized, then all that will be needed is a cap screw altered to suit. The bracket must be bent at the correct angle to bring the axis of the grinding wheel in the same horizontal plane as that of the lathe centers when the grinder is clamped in place.

In addition to the bracket and clamping-plate assembly, the parts shown above in color were added to the original grinder. These are the crank extension which is necessary when the grinder is aligned with the compound, the deflector and wheel guard which are optional, the special clamping screw and pad, and the adapter. The adapter is needed only when wheels having center holes larger than the grinder spindle are used. Ready-made adapters

also are available. If the original clamp screw and pad are long enough to clamp tightly onto the bracket, then the special clamp screw and pad pictured will not be required. None of the parts shown is fully dimensioned as each must be made to fit the grinder and lathe used.

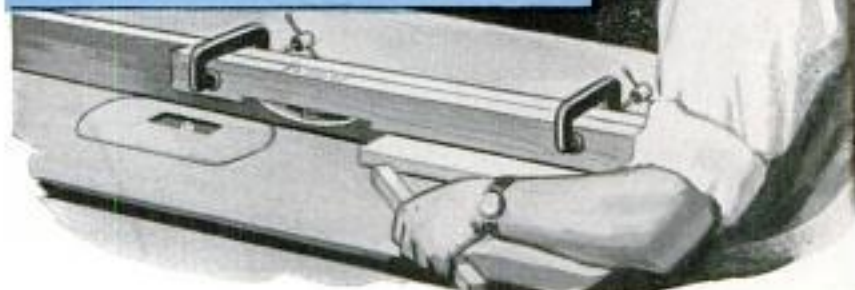
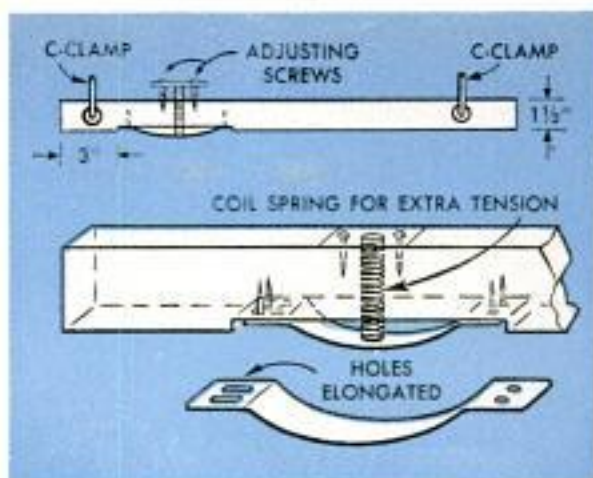
Before grinding work mounted in a chuck or between centers, dress the grinding-wheel face square-across. When grinding work mounted between centers, set the compound at an angle of 1 to 2 deg. so that only the corner of the wheel contacts the work. Set the lathe carriage for a slow longitudinal advance and turn the grinder crank uniformly at a moderate speed. If you do not wear eyeglasses regularly, protect the eyes either with goggles or a suitable eyeshield. ★ ★ ★

Damper Quiets Circular Saw

To reduce the "sing" of a circular-saw blade one craftsman improvised a damper. The damper consists of a piece of sole leather positioned to contact the blade below the arbor. It is supported by a length of spring wire bolted to the dust chute.

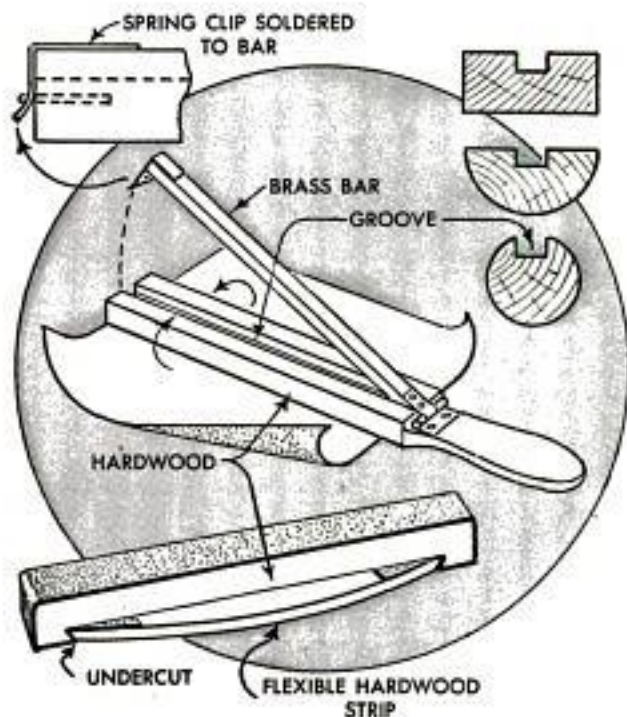
Hold-Down for Running Moldings

To run uniform moldings on a saw, one craftsman uses this adjustable hold-down, which clamps to the rip fence. A piece of thin spring steel bent as shown and mounted in a recess in the lower edge exerts a downward pressure on the stock. Elongated screw holes at one end permit limited flexing. Additional tension is applied by a compression spring inserted in a hole drilled edgewise through the hold-down at the center of the recess. The screws in the plate which retains the spring are adjusted in or out for the desired tension.



Sanding-Block Lock

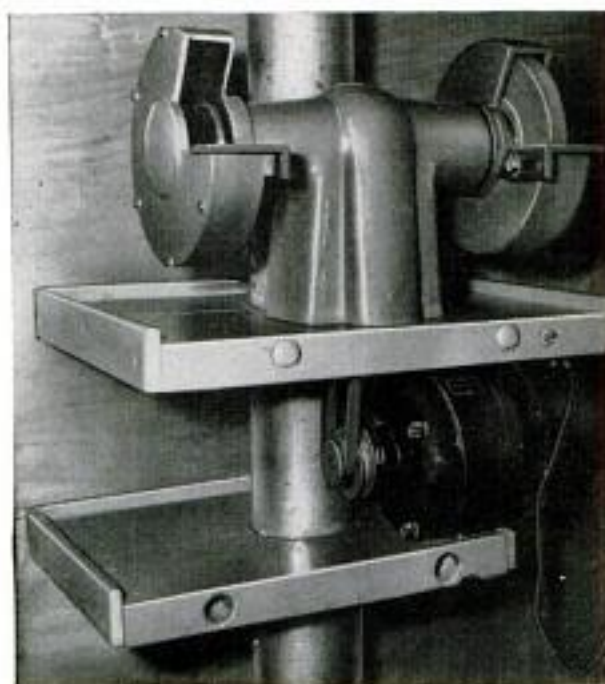
Cloth or paper abrasives may be locked to a flat, curved or round sanding block by means of a bar which snaps into a slot cut lengthwise in the block. The bar is hinged at one end and equipped with a spring clip on the opposite end. When depressed in the slot the bar does not interfere with the sanding operation. Another means of fastening strips of abrasive to a flat holder is with a flexible piece of wood wedged against undercut shoulders at each end to clamp the ends of the abrasive.

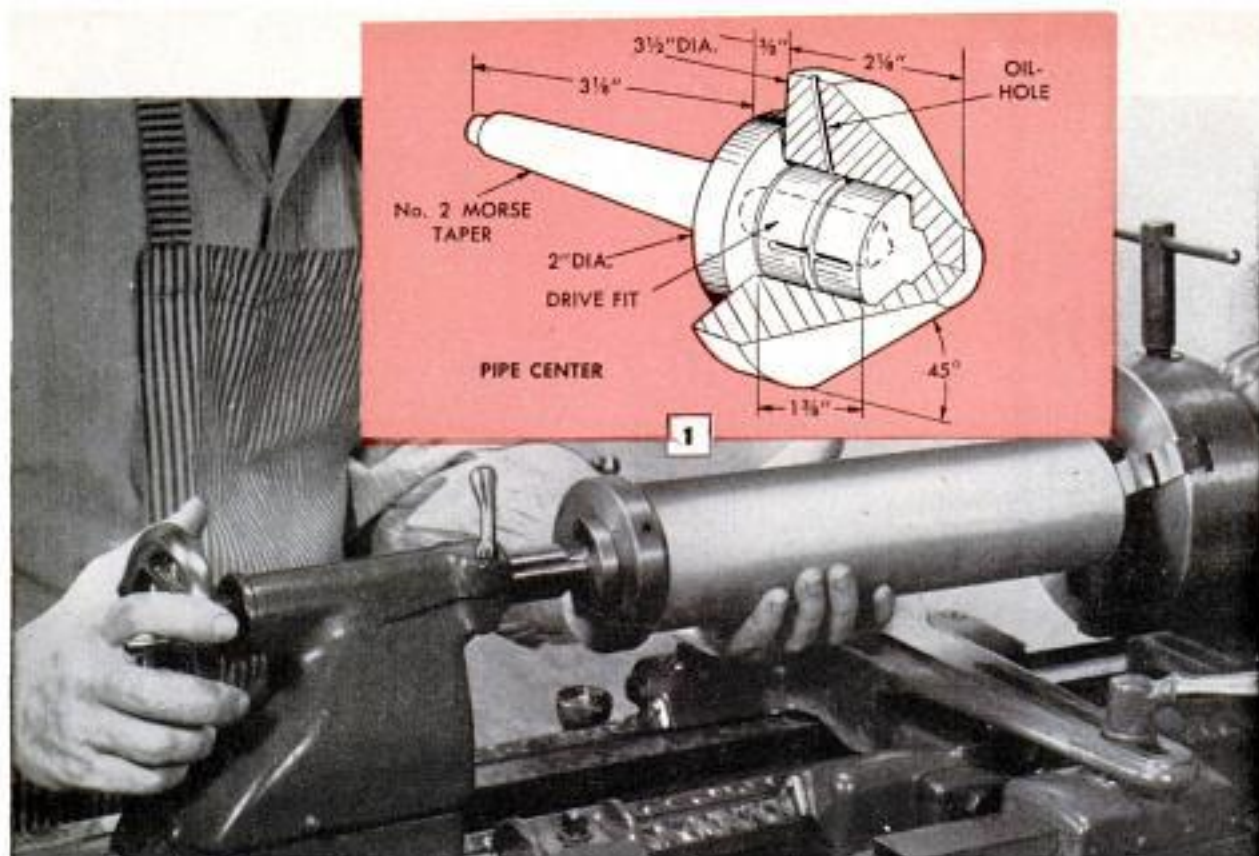


Post Shelves Add Shop Space

A metal support column located in your basement workshop can be used to good advantage when equipped with shelves as shown. Each shelf is made from two pieces of 2 x 8 clamped together edgewise around the post, the hole for the post being cut half in each piece. Long bolts running through both pieces clamp them to the post. Thin wood strips nailed to the shelf edges, to project above them slightly, keep small parts and tools from rolling off and being damaged on a concrete floor.

Mrs. Doris F. Wiley, Maywood, Ill.





MACHINING METAL TUBING

By Sam Brown

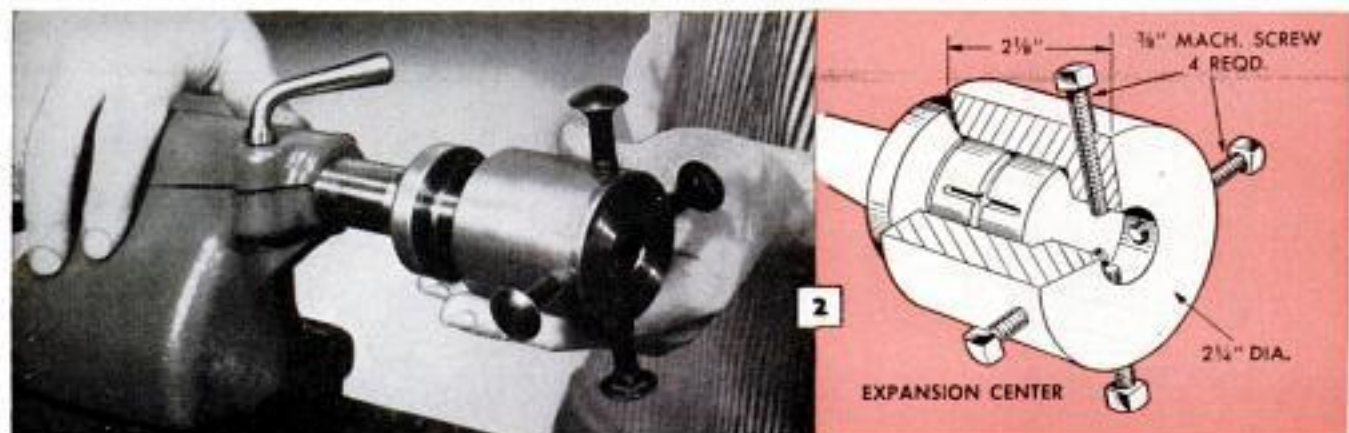
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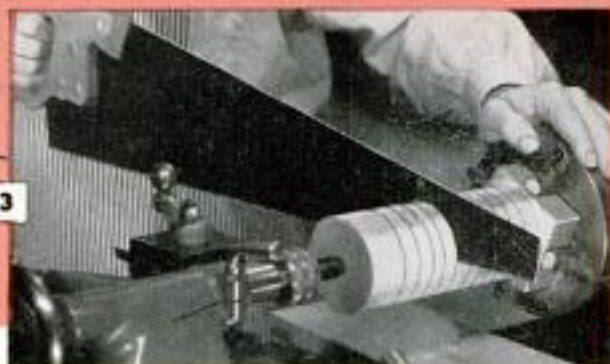
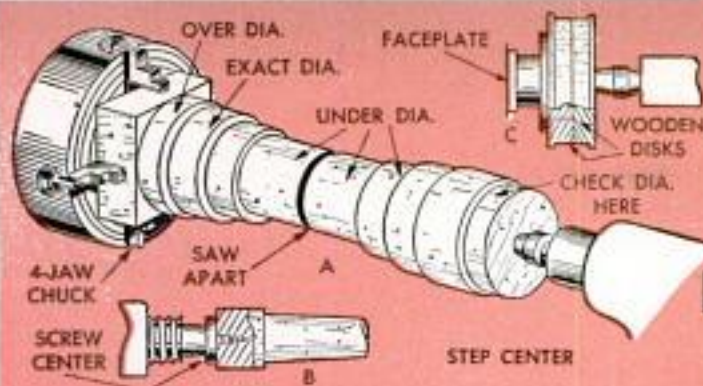
MACHINING METAL TUBING in the lathe often poses a problem in mounting between centers and also in chucking. Some operations may require that internal cuts be made to precise dimensions, or that both ends of the tube be faced-off true. When chucking tubing having a wall thickness of $\frac{1}{8}$ in. or under, special care must be taken to prevent crushing the tubing out of round or, if chucked internally, of distorting it and affecting the accuracy of the machining cuts. Although it requires more time and care to center the work accurately in the 4-jaw chuck, some operators prefer

the latter rather than the 3-jaw scroll, or self-centering, chuck. Each individual jaw of the 4-jaw chuck will require less pressure to hold the work securely, whether it is gripping the tubing internally or externally. The four jaws also more nearly equalize distribution of the pressure.

As a rule, when machining externally or internally, it is advisable to remove stock from tubing in a series of light cuts rather than attempt to bring the work to dimension in one heavy cut. Aluminum, brass and plastic tubing are easiest to work, as the average cuts can be made without a

Many lathe operators prefer expansion center for supporting tubing. Center does not score outside surface





Above, hardwood turning is sawed apart to make two step centers. Below, tube mounted on step centers

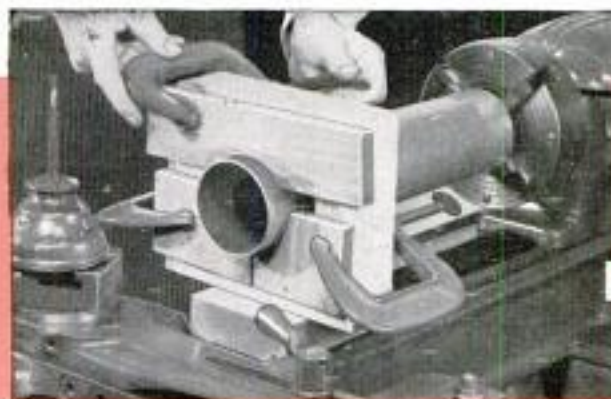


lubricant. Smooth work on steel tubing will require a lubricant.

Turning: Perhaps the easiest of all methods of chucking a large tube for turning is to grip it internally with a 4-jaw chuck and then support the tailstock end with a pipe center, as shown in Fig. 1. The pipe center can be purchased ready-made or can be turned in the lathe. Pipe centers with plain bearings are suitable for average work. The center detailed has a plain bearing with oil grooves. It has a capacity of up to 3½-in. inside diameter of tubing. Another method of handling tubes over 3 in. in diameter is by means of an expansion center, Fig. 2, which works on the same shank as the pipe center. The expansion center is fitted over the shank, which is placed in the tailstock, and is then adjusted to the inside diameter of the work by turn-

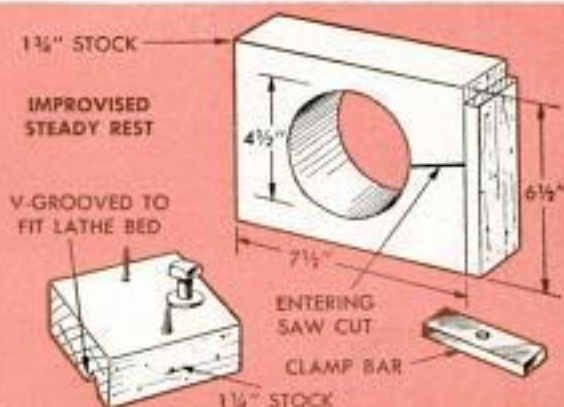


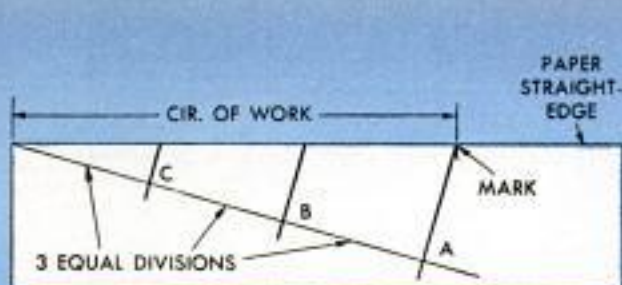
Above, end of long tube is supported in steady rest. Below, improvised rest supports large-diameter tubing



ing the four bolts or screws in or out as needed. Either carriage bolts or machine screws can be used.

The one disadvantage in using a pipe center is that the end of the work must be faced-off square to assure accurate centering. However, if the work is mounted on a cone center having a slow taper, reasonably accurate centering will be more or less automatic. A metal pipe center is sometimes made up with a slow taper to accommodate a limited range of work diameters. Often the required slow taper is worked on a length of hardwood to the requirements of the job at hand. For making wooden-plug chucks, or centers, B in Fig. 3, use maple or birch, either one of which will hold its shape and turn well at slow speed. Instead of cutting the plug chuck to a slow taper, it can be step cut, A in Fig. 3, to the exact work size on one step. By turning





9

three steps on each piece the center can be used for three work diameters. After turning the chuck and before removing it from the 4-jaw chuck, it is sawed apart, Fig. 3, to provide a mounting for both ends of the tube. Fig. 4 shows a tube mounted on plug chucks made in this manner.

A standard piece of equipment for supporting the outboard end of a chucked piece of tubing is the lathe steady rest. On small lathes this will have a capacity of about 3 in. Both the steady-rest jaws and the work at the point of contact should be coated with lubricant to minimize scoring. If it is desired to completely eliminate scoring on a piece of smooth tubing, the simple trick of wrapping the work with gummed paper tape will give the needed protection. The tape should wrap around and slightly overlap, with the lap so made that the edge of the paper will not catch and tear as it passes under the steady-rest jaws. Coat the paper with polishing wax or paraffin and then apply light grease.

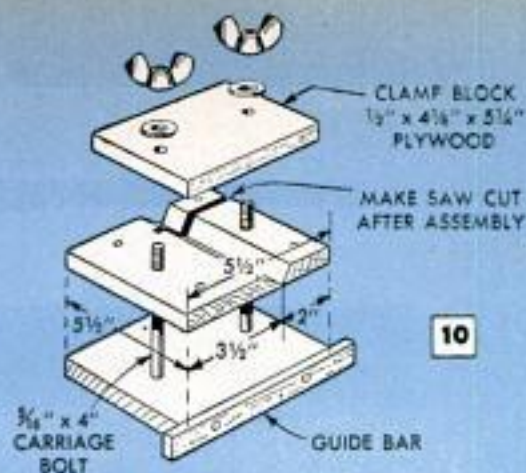
When centering work with the lathe steady rest, run the work at slow speed with the jaws set to clear. Then, with the work rotating, advance any one jaw of the rest until the tube appears to run true. Center with a stop, or a dial indicator if a high degree of accuracy is specified. Note in Fig. 5 that work longer than the lathe

can be handled by using the steady rest. Fig. 5 shows the headstock end being threaded, the mounting being a plug chuck on a screw center, B in Fig. 3. This type of chuck is often used for tubes under 2 in. in diameter. For very large work, two disks of wood, C in Fig. 3, are most practical. One disk is first turned to the required diameter and flanged slightly as detailed. The second disk is then placed against the first and supported by the cup center. This setup will give enough friction to hold the second disk in place and permit turning it to duplicate form.

A large steady rest is often useful. A simple improvised type is shown in Fig. 6. It is suitable for work up to 4¼ in. in diameter. Jaws for this rest are made up as required for each job. An example is pictured in the photo, Fig. 6, the special jaws being held in place with C-clamps.

Drilling: When holes are to be drilled in tubing it must be mounted in a vise or held securely by other means. A milling vise of the type pictured in Fig. 7 is useful as it allows the work to be moved directly under the drill bit. Holes should be accurately located and the locations center-punched before drilling. A simple method of locating a straight line around a tube is to use a single wrapping of paper, Figs. 8 and 9. The paper can be taped in place or used as a straight-edge for pencil marking, Fig. 8. The paper may also be used to determine hole spacing. Do this by first marking the circumference of the work. Then, for example, if the work is to have three holes, set off three equal spaces on any line drawn on the paper, Fig. 9. Connect point A with the circumference mark and then draw lines from B and C parallel with the line from A. This will divide the circumference into three equal spaces, and the marks can be transferred by wrapping the paper around the work.

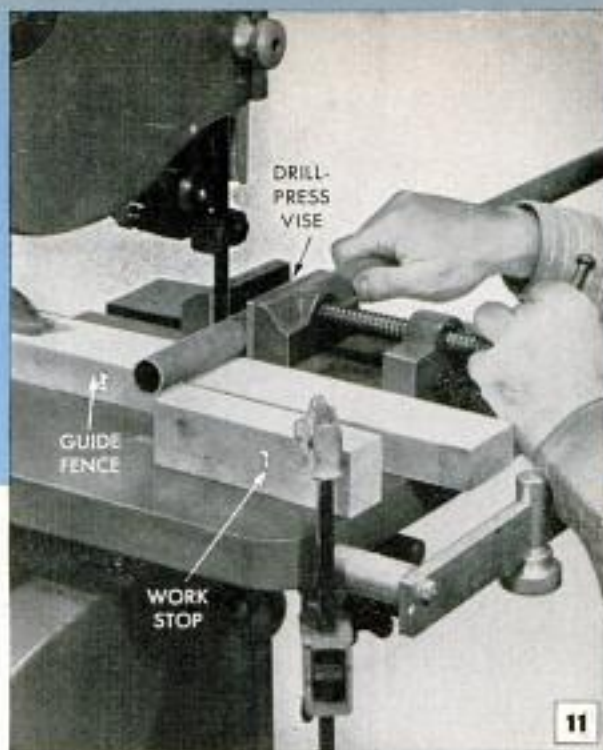
In most cases it is not worthwhile to fit a backing behind a drilled hole to prevent burring. On most jobs, slight burring on the inside of the tube is not objectionable. Burring can be minimized by using a drill



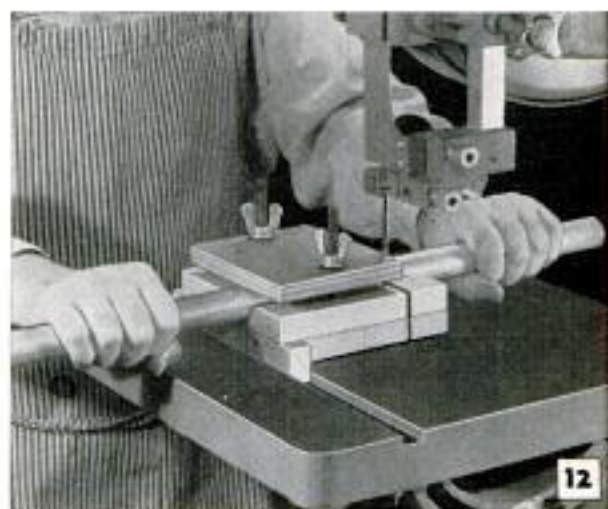
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with a point angle of about 135 deg. instead of the usual 118 deg.

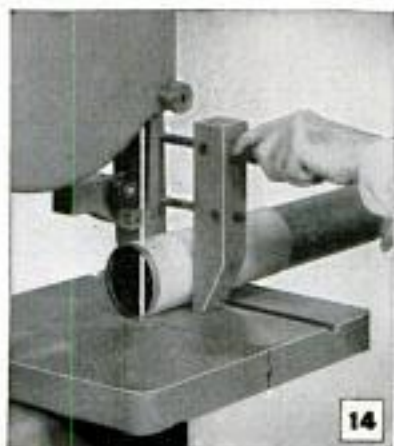
Sawing: Aluminum is easily cut on the bandsaw, using an ordinary woodcutting blade running at the speed normally used for wood. Of course, tubing also can be cut with a hacksaw if a bandsaw is not available. The tubing is very likely to slip and turn if you try to cut it freehand by either method. It is always best to use some kind of clamping device in order to get an accurate cut. One simple mounting is the drill-press vise, Fig. 11. A shop-made V-block, Figs. 10 and 12, will take tubing up to 2 in. in diameter. The use of a drill vise in an inverted position, Fig. 15, is often useful. Two other practical methods of holding tubing for bandsawing are pictured in Figs. 13 and 14, the hand screw providing both clamp and handle for moving the work to the blade. Note that the clamp detailed in Fig. 10 and shown in use in Fig. 12 has a guide bar which slides in the groove in the machine table. This device gives a very accurate cut. Brass and steel tubing also can be bandsawed, but the machine must be fitted with a reduction drive and special metal-cutting blades. Some small bandsaws are available with a built-in reduction gear which reduces the speed of the band wheels for metal cutting. Machines without this special drive can be driven at reduced speeds through an improvised countershaft. Always use a blade with the correct number of teeth. ★ ★ ★

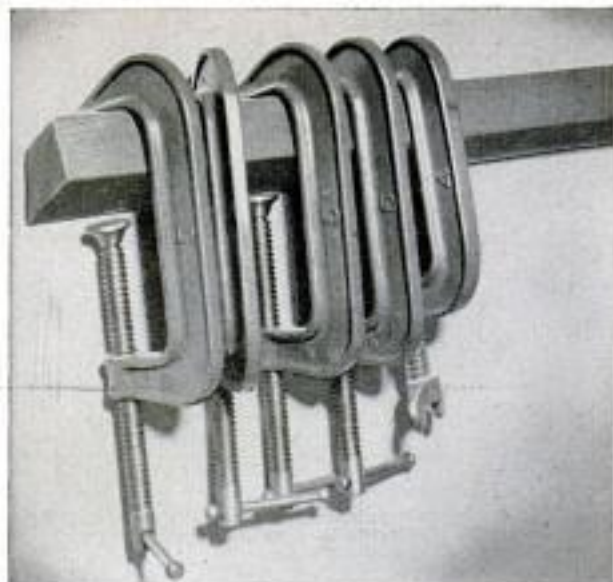


Drill-press vise holds tubing securely for cutting with bandsaw. Setup produces accurate, smooth cut



Above, work up to 2 in. in dia. can be held in this V-block with improvised clamp and a guide bar which rides in table groove. Below, three views picturing use of hand screw and drill-press vise as holders for tubing of large and small diameters. Fig. 13 shows handscrew used as clamp with sliding guide. Figs. 14 and 15 show hand screw and drill vise used freehand





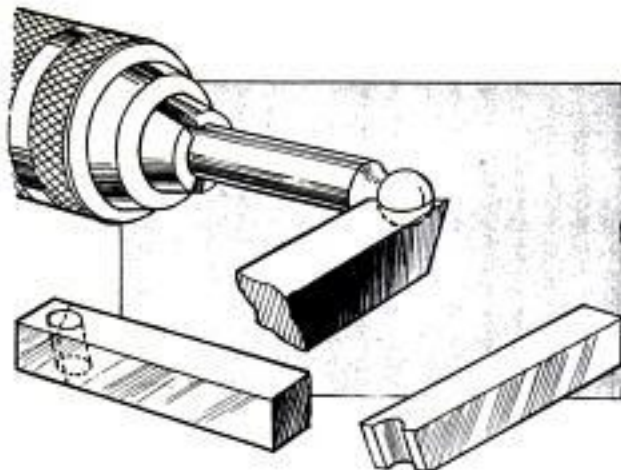
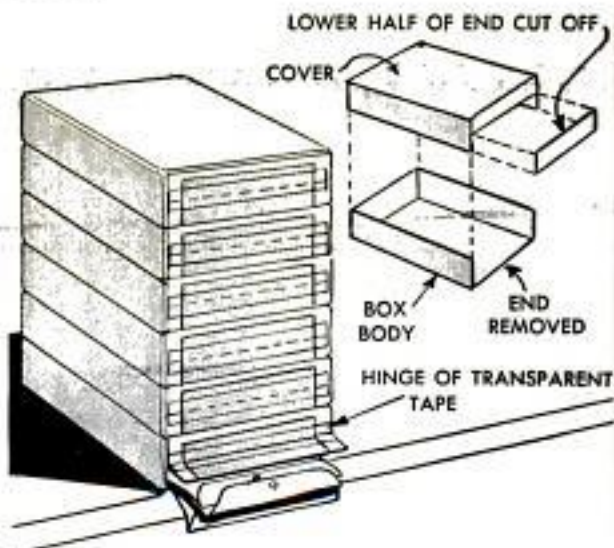
Simple Rack for C-Clamps

If you are tired of dragging several C-clamps hooked together out of a drawer, or unscrewing them from the edge of the bench top each time one is needed, try the simple rack shown. It consists of a length of 2 x 4, beveled on one edge so it tilts up slightly when screwed to a wall. The clamps are hooked over the 2 x 4 with the clamp screws down.

M. C. Anderson, San Lorenzo, Calif.

Altered Boxes Save Work, Time

Many of the stacked paper boxes on store shelves need not be lifted off to get at items in the lower ones if the box fronts are altered as shown. This applies particularly to boxes containing such items as envelopes and other thin, flat stock in boxes that have slipover covers of equal length. First, the end of the box is removed, then the lower half of the end of the cover is "hinged" with transparent tape to provide easy access.



Simple Ball-Turning Tool Bit

The tool bit shown in the detail permits fast, accurate turning of small metal balls on a lathe without a special ball-turning attachment. To make the bit, use a blank turning bit or a piece of tool steel. Anneal it and at a slight angle drill a hole of the same diameter as the desired diameter of the ball through the bit near one end. Mark a diagonal line around the tool, bisecting the center of the hole at the top and bottom. Then grind away the end to this mark. The bit is then hardened and the ends honed to provide keen cutting edges.

C. W. Woodson, Chicago.

Wire Solder on Tape Spool Protected Against Dirt

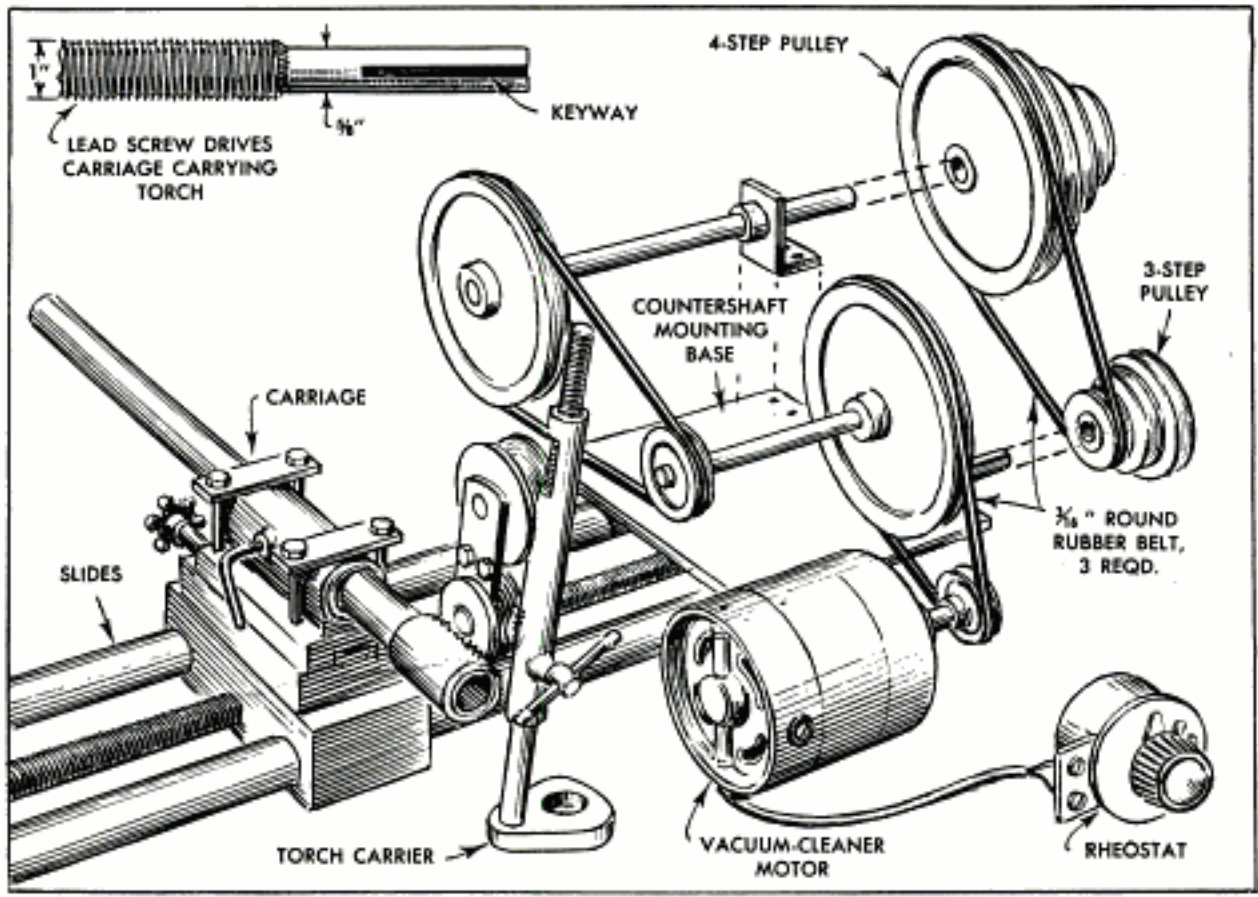
Wire solder will stay dirt-free and grease-free whether carried in a toolbox or stored on a shelf in the workshop when it is rolled onto an empty adhesive-tape spool. Snapping the cover onto the spool as indicated will effectively seal the solder against dirt. The tape spool also is ideal for carrying small amounts of solder in a toolbox when the solder is removed from a large roll.



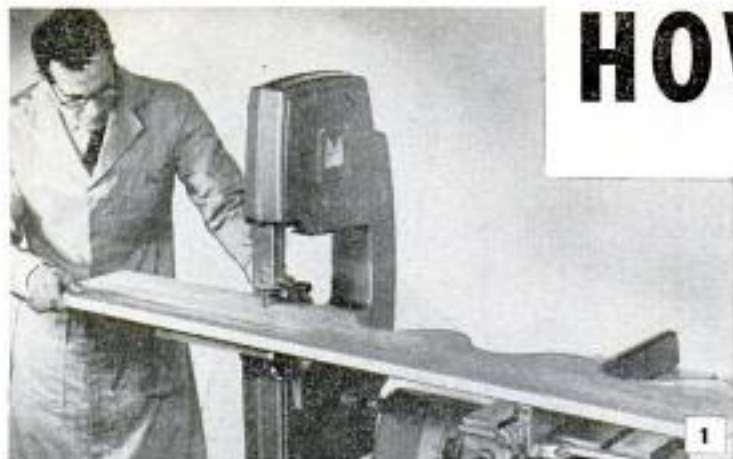
SN 59

TORCH CARRIER for flame cutting

THIS TORCH CARRIER, or burning machine, was developed to handle a special flame-cutting job, the specifications of which called for cutting heavy steel plate to a tolerance of plus $\frac{1}{16}$ in. The unit consists of a carriage sliding on $1\frac{3}{16}$ -in. rods in a manner similar to that of a lathe carriage. The carriage is advanced at a uniform speed by means of a lead screw, which is power-driven through a double-reduction, V-belt drive as detailed below. A vacuum-cleaner motor controlled by a rheostat supplies power. On the original machine a three-step sliding pulley was used on the lead screw. Matching four-step pulleys also can be used. Only a few general dimensions are given as the drive unit must be built to suit the job. Ordinarily, the machine is mounted on a large welding table so that the torch can be positioned for straight cuts. For cutting off heavy tubing as pictured at the right, the torch is held stationary and the work rotated.—Phillipo Vallini, Kenosha, Wis.

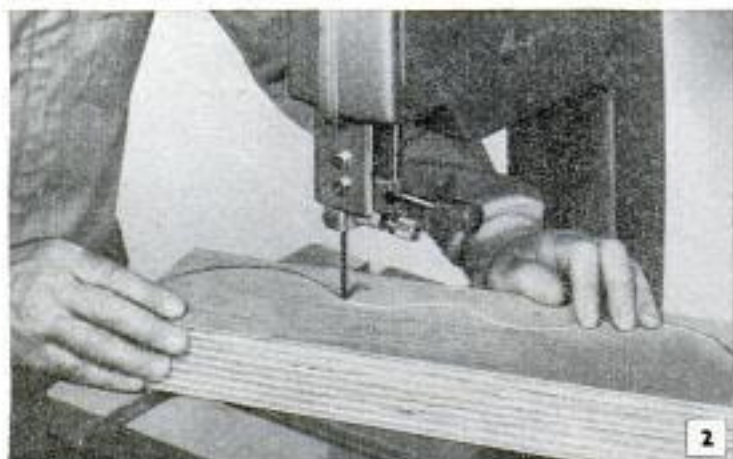


HOW WOULD



Q—When cutting long stock, what should be done to minimize blade breakage and assure accurate cutting on a bandsaw?

A—Provide an extra support for extremely long work. The support can be an extension of the saw table, a special, separate supporting table, a stand or sawhorse of the correct height. On some combination tools, such as shown, the saw table and rip fence can be combined to provide a low-friction supporting surface in a matter of moments



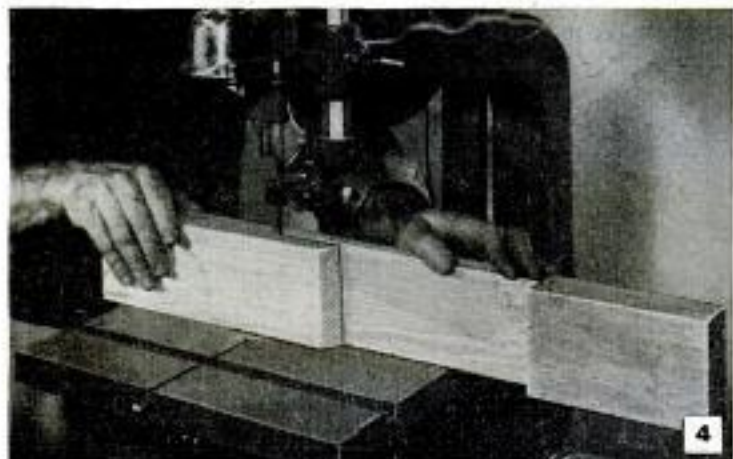
Q—What is "pad sawing" and how can it be a big timesaver when many duplicate pieces of stock are cut on a bandsaw?

A—"Pad sawing" simply means that a number of pieces of stock are made into a "pad" or stack that is held together by driving nails through the waste portions of the work. The pattern to be cut out on the saw is drawn on the top piece of stock and the cut is made as though the stack of wood were a single piece of material



Q—Cutting a small number of pieces of the same width in which there are reverse curves will require what bandsaw setup?

A—A pointed guide block is clamped to the table as shown in the photograph. After drawing the curve on the stock and making the first cut freehand, the guide block is clamped to the table directly opposite the center of saw blade so the space between the blade and the end of block is equal to the width of the workpiece to be cut



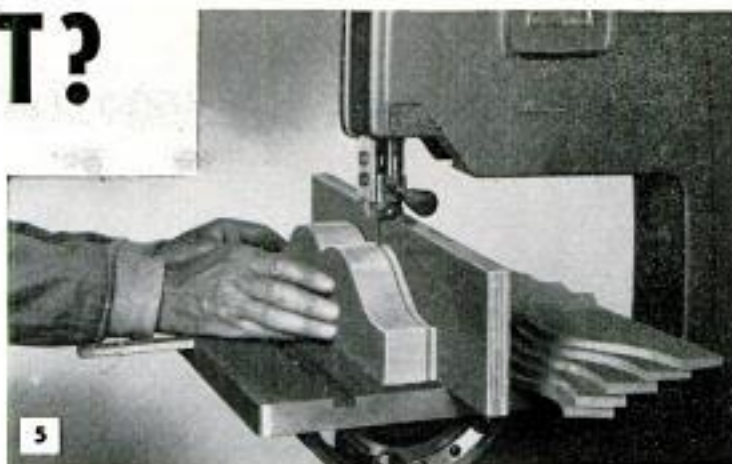
Q—Stock to be bent in a curve must be reduced in thickness on the area of the curve. How is this done on a bandsaw?

A—On one edge of the stock, mark section to be reduced in thickness, making its length about 1 in. more than the required length of the curve. Make one end cut first, then saw into the line and to the end cut. Reverse the workpiece and saw along the line to the opposite end of the scribed line as shown in the photo

YOU DO IT?

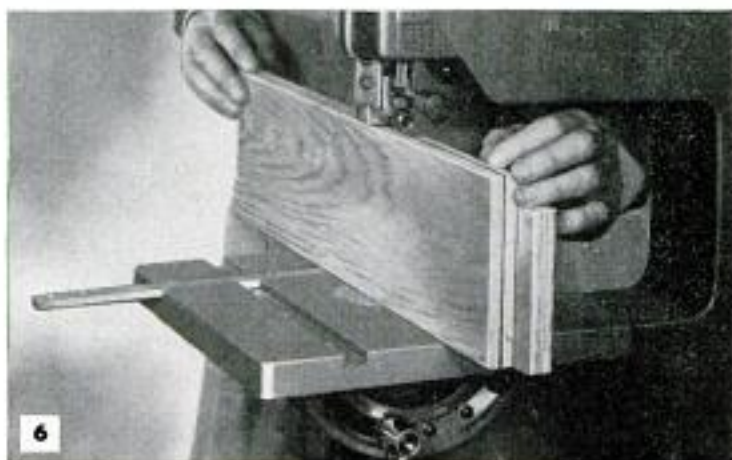
Q—You need a number of thin pieces of wood cut in a curved pattern for trim. How can they be cut from thicker stock?

A—Lay out the pattern on a piece of fairly thick stock and cut it out on the bandsaw. Next, turn the shaped stock on edge and rip it into thin sections as shown in the photograph, to produce pieces of trim of the desired thickness. Stock to be cut in this manner must be clear, straight-grained and free of large knots



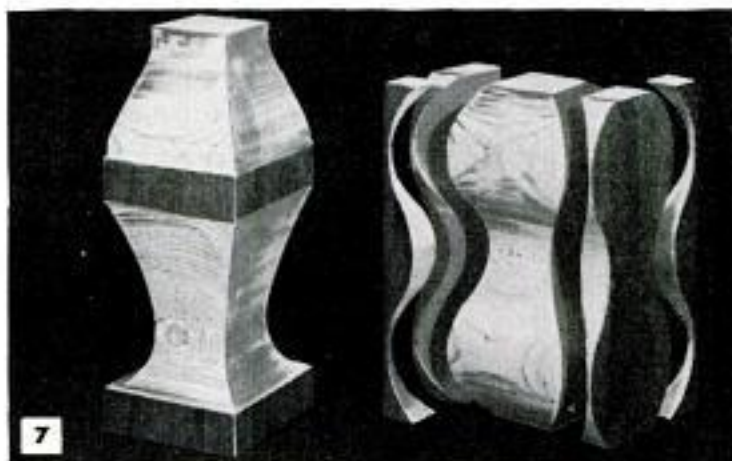
Q—What two rules should be followed when ripping thick stock on a bandsaw to produce accurately dimensioned thinner stock?

A—Because even the widest bandsaw blade is comparatively narrow, it is important that the work be held rigidly and at right angles to the saw table. Even if your saw has a rip fence, attach a wide auxiliary fence to it as shown in the photo. This will assure that the stock being ripped has support its full height and length



Q—In compound cutting, as when making a shaped part, why should the waste pieces be kept until bandsawing is completed?

A—Because the waste pieces can be replaced temporarily on the workpiece to permit easier handling while other cuts are made. To make pieces like the ones shown in the photo, make cuts on opposite sides first. Then tack or tape the waste pieces back onto the surfaces from which they have just been bandsawed



Q—When cutting pieces of stock to a simple curve and uniform width, what setup can be used on a bandsaw?

A—Place the rip fence on the table so the distance between it and the blade is the width of the stock to be cut. Then, cut the curve on one edge of the stock freehand. Place this edge against the rip fence and make the opposite cut by keeping the curve at a constant tangent to the rip fence to make a parallel cut



SHOPPING FOR TOOLS



1. BUILDER'S LEVEL works on the principle that water always seeks its own level. Consists of two transparent tubes with valves and clamps. One of the gauges is screwed to each end of a garden hose filled with water. Gauges are clamped to that part of structure to be level-checked as pictured. Lengths of hose can be coupled to give accurate level checks of 100 ft. or more

Level-Rite, Granby, Conn.

2. SETTING TOOL is made especially for expanding masonry anchors in bottomless holes, and also in walls where hammer blows may break or shatter masonry such as tile and cinder-block construction. In use, the anchor is attached to expandable holder and pressed into hole in masonry. Turning the handle sets the anchor tightly in the hole. Comes in a wide range of sizes

Arro Expansion Bolt Co., Marion, Ohio



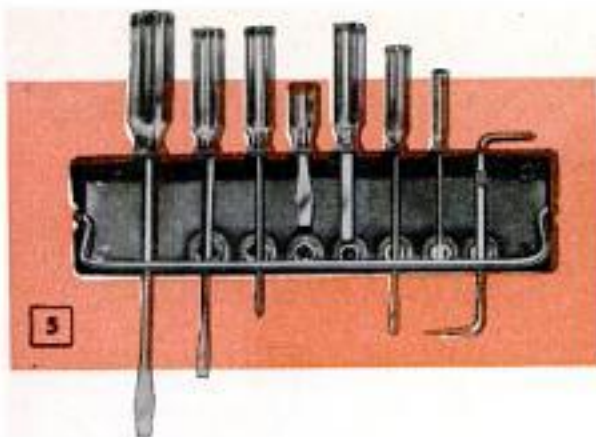
3. BANDSAW AND BELT SANDER mounted on a single stand provide the small shop with an efficient combination tool that conserves space. Comes complete ready to set up and operate. Includes 10-in. bandsaw, 6-in. belt sander, 1/2-hp. motor, motor mount and floor stand. Tools located to permit full-capacity use without interference. Mount designed for easy belt change

Power Tools, Inc., Beloit, Wis.

4. BUILDER'S SQUARE has body 48 in. long and tongue 16 in. in length. Made especially for work on wallboards of all kinds, also plywood panels 48 in. in width. Tongue is graduated through 8 in. of its length and outer end is provided with a lip which prevents the tongue from dropping below the edge of stack when laying off dimensions across width or along length

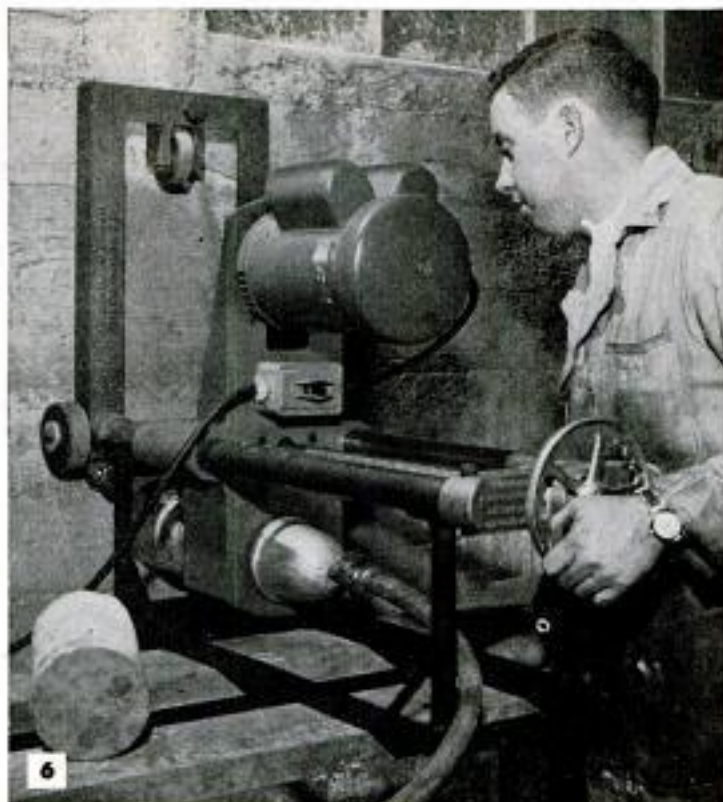
Fairgate Rule Co., Cold Spring, N. Y.





5. SERVICE KIT is a 16-piece screwdriver and socket set packed in a metal tote tray which also serves as a wall rack. Set contains seven screwdrivers in assorted sizes, seven sockets, one socket-drive handle and metal tray. Drivers have plastic handles

Falber Sales Co., 1842 Merilbrook Rd., Philadelphia 31, Pa.



6. MASONRY DRILL is power-driven, cores a hole through reinforced concrete at an average rate of 1 in. per min. Can be positioned for vertical operation as pictured, or for operation on floors. Maintains a constant cutting speed in either position

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

7. SPECIAL CHUCK holds drills and reamers with broken shanks. Chuck features a driving plate designed to fit over the flutes of the drill and hold it in correct axial alignment when chuck is tightened. Three-jaw collet grips the drill body uniformly

Paul H. Moynihan & Co., 4206 N. Wilson Dr., Milwaukee 11, Wis.

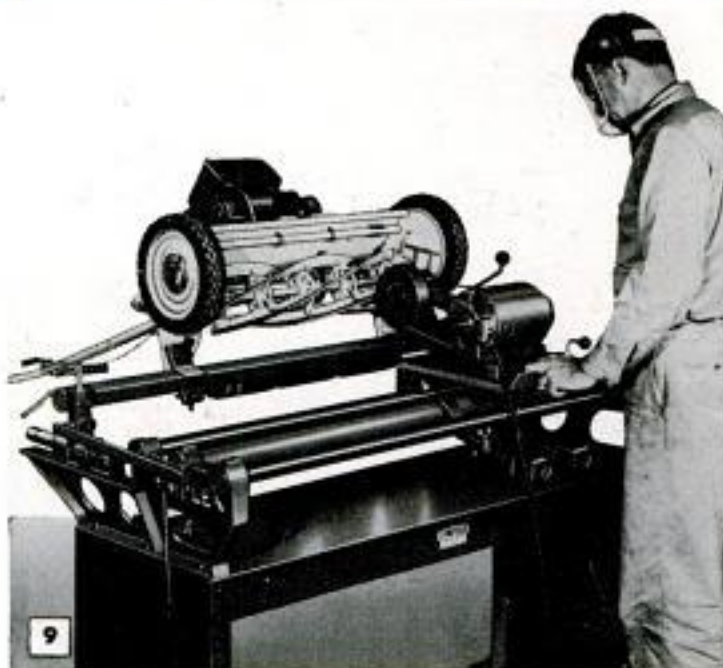
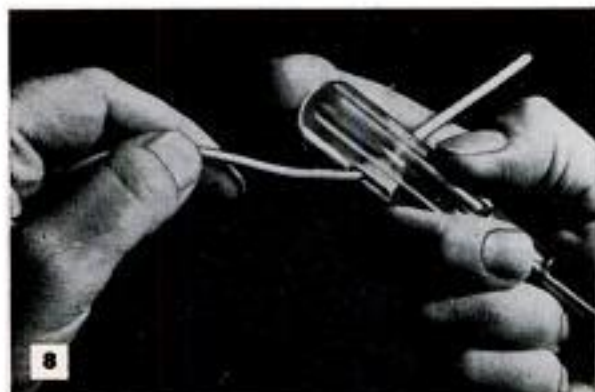


8. SCREWDRIVER has wire stripper in plastic handle. Strips insulation from solid or stranded wires, 14 to 20 ga. inclusive, without tearing insulation at point of cut or scoring the wire. Driver blade is nickel-plated. Comes in 4, 5 and 6-in. lengths

Wire Stripper Tools, Inc., Glen Head, N. Y.

9. LAWN-MOWER SHARPENER handles both reel and rotary-type mowers. Fast, accurate adjustments for positioning mower, hollow or flat grinding of bed knife and for horizontal and vertical feed of grinding carriage. For hand and power mowers

The Fate-Root-Heath Co., Plymouth, Ohio



On the MARKET

for Do-It-Yourselfers



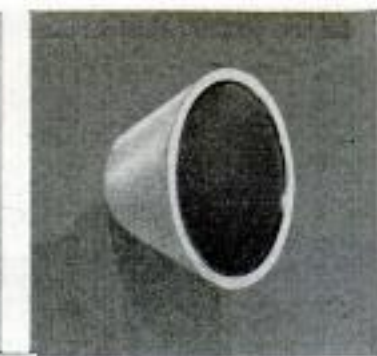
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1. ALUMINUM SLIDES modernize and beautify old windows. To install, remove the wooden stops, cords and weights. When removing the stops, care must be taken not to splinter the sides of the grooves in which they are installed. Then insert metal strips according to instructions furnished with the kit. Due to tension which holds strips in place, they also act as weather stripping. Wimsal Mfg. Co., 727 Allegheny Ave., Oakmont, Pa.

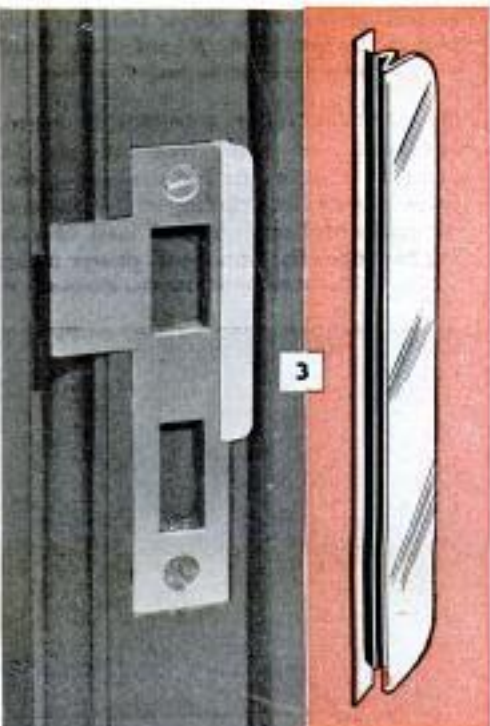
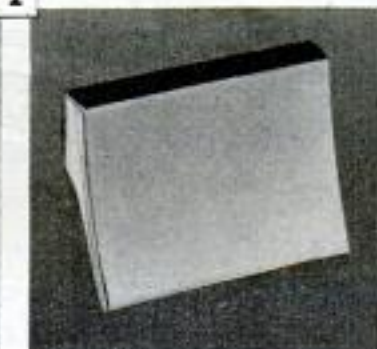
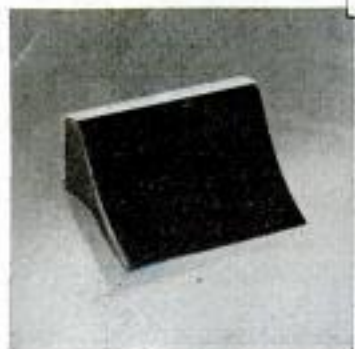


2. TWO-COLOR DRAWER PULLS combine velvety black and colors with polished brass, bronze or copper. Come in choice of two sizes of conical knobs and two sizes of rectangular pulls as pictured. The parts are interchangeable, making a range of color combinations possible. Round pulls can be used either as doorknobs or drawer pulls in colors to match counter surfaces. Washington Steel Products, Inc., Tacoma 2, Wash.

3. LOCK GUARD attached to the strike plate of a door lock prevents forcing of the striker with a strip of metal or a hacksaw blade. Is installed simply by loosening the striker plate with a screwdriver and then sliding the guard into place. Requires no alteration of the lock or striker plate. Will not cause the door to bind. Available in 3/32, 1/8 and 5/32-in. sizes. Cellulock Corp., 299 Madison Ave., New York City 17



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3

4. ALUMINUM INSULATION is said to reflect up to 95 percent of radiant heat that reaches its surface. Keeps homes warmer in winter and cooler in summer. Comes in easily handled rolls 36 in. wide, each roll covering an area of 250 sq. ft. Installed with a staple gun or with a hammer and ordinary tacks or screen staples. Foil is bonded to two sides of heavy paper

Reynolds Metals Co., 2500 N. Third St.,
Louisville, Ky.

5. SPECIAL PAINT-CAN LID is fitted with a tubular holder designed to support the brush upright in the can when the lid is pressed down into the closed position. Eliminates the time and bother of cleaning the brush at the end of the day, a feature that will be fully appreciated by do-it-yourself painters and decorators. Also prevents film forming over paint in can

R. S. Hansbury, 300 Marshall Ave.,
Collingdale, Pa.

6. WEATHERPROOF COATING can be used inside or out for added protection for exposed surfaces such as window sills, porch columns and exterior doors. Applied over a glass fabric it seals cracks in plaster, woodwork and masonry, gutters and flashings. Can be colored and used as a primer for paint or as a finish coat on walls. Can be applied with gun or applicator

Tuff-Kote Co., Woodstock, Ill.

7. FOLDING UTILITY TABLE also can serve as a sturdy workbench. Top is 1½ in. thick, 24 in. wide and 60 in. long. It is supported on folding brackets of steel finished in baked enamel. Brackets lock automatically when table is raised to horizontal position. Folding feature aids in solving space problems in laundry and utility rooms, kitchens and garage workshops

Sturdy-Bilt Steel Products, Inc.,
2501 W. Peterson, Chicago 45



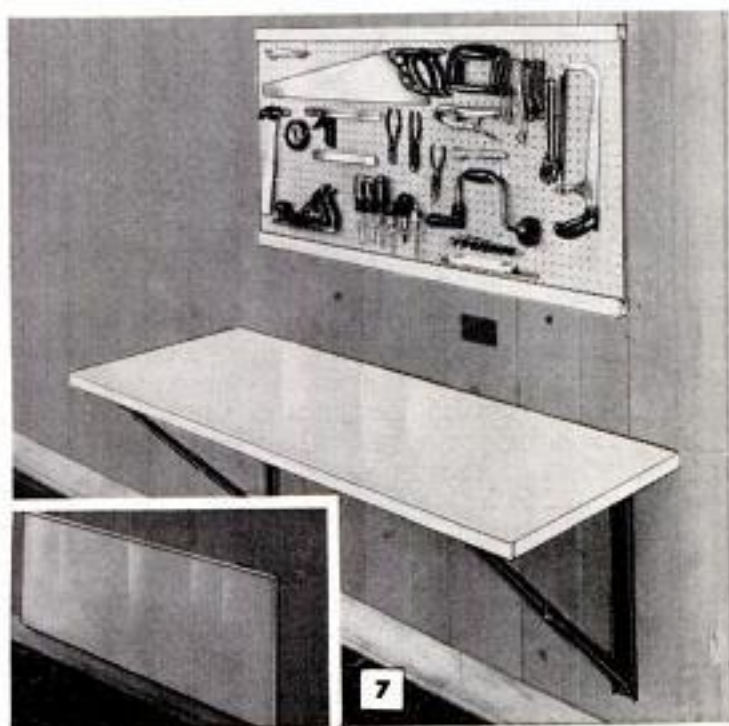
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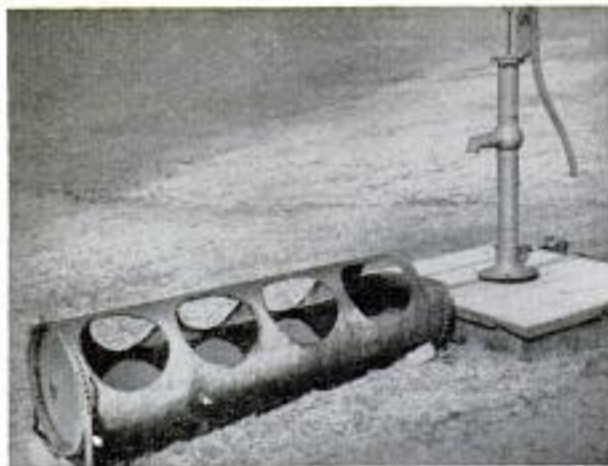
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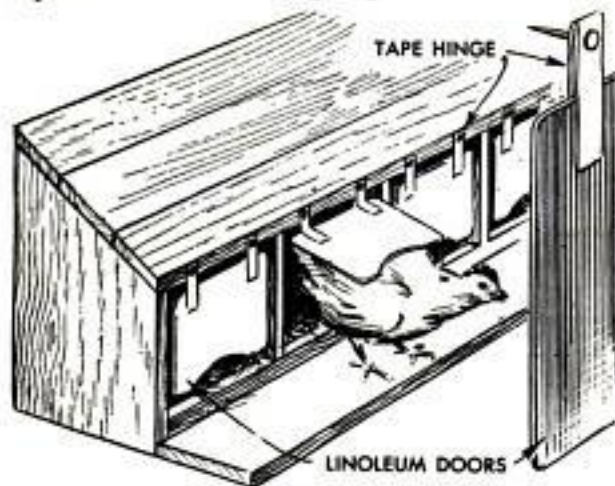
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Hot-Water Tank Converted To Stock-Watering Trough

A discarded hot-water-heater tank with four holes cut on one side and three staggered on the opposite side allows hogs or sheep to drink without crowding or getting into the water. A cutting and welding torch is the only tool required to cut the holes and weld the tank to its base.

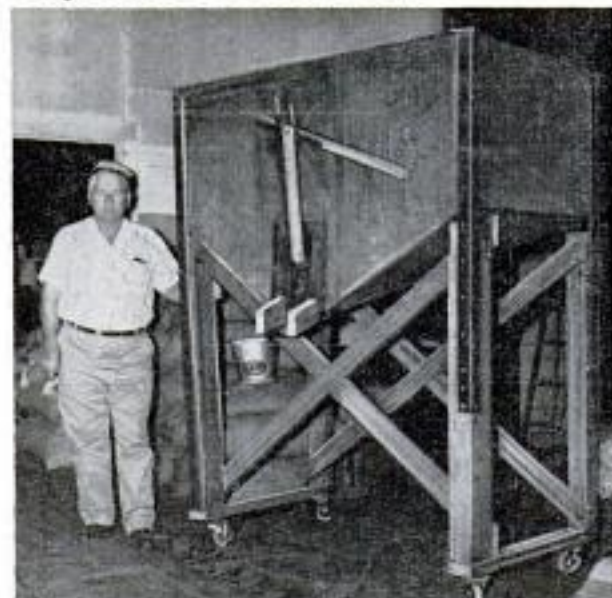
Egg-Eating Hens Discouraged By Linoleum Swinging Doors



When the problem of hens eating their eggs must be eliminated by attaching swinging doors to darken the nests, linoleum doors hinged with friction tape will do the job. Cut the doors to the shape shown and fold the tape so it adheres to both sides. Tack the free ends of the tape hinges to the upper edge of the nest opening. Leather or canvas also could be used as hinges. The latter materials would require riveting to the linoleum doors.

When selecting a paint color remember that the sample should be a little lighter than the finish desired since paint dries darker, and the larger the wall surface to be covered, the darker it will appear.

Grain Hopper Set on Legs Dispenses Ground Feeds



The grain hopper from an old combine was salvaged by a feed dealer and mounted on legs with casters for use in dispensing ground feeds in small quantities. The legs, made from 4 x 4-in. stock, are fastened to the hopper with angle iron at the corners and steadied with diagonal braces of 2 x 4-in. lumber. Bed rails for the casters are also made from lengths of 2 x 4s. A vertical sliding door on the side of the hopper, operated by a lever, controls the flow of feed.

C. F. Marley, Nokomis, Ill.

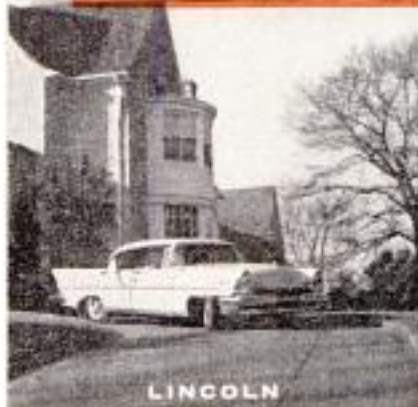
Old Iron Wagon-Wheel Rims Support Farmyard Feed Rack

Iron-wheel rims from old wagons and farm implements were used by one farmer to support feed troughs at the proper height. Two wheels cut in half with the spokes removed furnish the four supports necessary for one trough. Flat-steel cleats are welded to the cut ends of each rim and drilled to accommodate bolts which fasten them to the bottom of the trough. Serving as runners, the rims permit skidding the trough to a new location when necessary.





FORD



LINCOLN



CONTINENTAL



MERCURY



THUNDERBIRD

Some spark plugs are designed for high speeds, some spark plugs are designed for low speeds, but . . .

AUTO-LITE **POWER TIP** "fires up" Ford Motor Company cars at all speeds!

The first spark plug ignition-engineered
for today's engines* and today's driving

Today's higher-horsepower, higher-compression engines and today's driving demand *more* from spark plugs, and Power Tip *gives* more! Performance tests prove Power Tip "fires up" engines of Ford Motor Company cars for top performance and economy at *all speeds!* Here's why...

At *low* speeds, the projecting Power Tip gets hot *fast*, operates hotter to burn away fouling deposits which impair engine performance in city driving. At *high* speeds, the Power Tip is actually cooled by the richer air-fuel mixture to check dangerous pre-ignition caused by over-heated spark plugs.

Ask your dealer to install a set of Auto-Lite Resistor Spark Plugs with Power Tip in your car *today!*

*Power Tip is ignition-engineered for overhead-valve V-8's and for most overhead-valve 6's in all these cars: Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Ford, Hudson, Imperial, Lincoln, Mercury, Nash, Oldsmobile, Packard, Plymouth, Pontiac, Rambler, Studebaker.

THE PROTRUDING TIP
MAKES THE
BIG DIFFERENCE!



Ordinary Tip Power Tip

AUTO-LITE® RESISTOR SPARK PLUG WITH **POWER TIP**

Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Small-Engine, Transport, Aircraft, and Diesel-Starting.

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TYPES TO FIT MOST
FLASH-SYNCHRONIZED
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(AS LITTLE AS \$1 DOWN)

F-A-S-T MAGAZINE LOADING WITH
CARRIER DISCS THAT HOLD
6 FLASHBULBS EACH

Rotary Flashholder

permits 6 flash shots without reloading!

Ever miss a prize flash shot because you were changing bulbs when the action took place? Not much chance of that happening when you own a new Kodak Rotary Flashholder! It holds six M2 bulbs per loading, changes bulbs instantly by revolving the magazine turret, ejects all spent bulbs simultaneously . . . and can be completely reloaded in split seconds!

Ask your photo dealer to demonstrate the

Kodak Rotary Flashholder. You'll like the simplified exposure calculator which tells at a glance which lens opening to use. And with its B-C (battery condenser) power, you'll get top flash dependability. Available in two models to fit most synchronized-shutter cameras. Complete with a Midget B-C Flashpack, flashbulb carrier discs. (Batteries extra.) List prices only \$9.95 and \$11.95 . . . or as little as \$1 down.

HERE'S HOW THE KODAK ROTARY FLASHHOLDER WORKS...



FAST, EASY LOADING. Six M2 flashbulbs are slipped into each of the two carrier discs that come with the Kodak Rotary Flashholder.



LOADED DISC OF BULBS is placed in magazine on the back of the flashholder. Bulbs are changed by simply rotating the magazine turret.



DIAL WINDOW on flash exposure calculator frames name of film in use — provides direct reading of correct exposures to be used.



BATTERY COMPARTMENT easily accessible. Rotary Flashholder operates on either B-C or penlight battery power. Midget B-C Flashpack provided.



TYPE I KODAK ROTARY FLASHHOLDERS attach directly to the bodies of cameras provided with the Kodalite-type of built-in contacts. Type II Kodak Rotary Flashholders fit cameras with an accessory shoe, or those that require a bracket mount. Bracket, cord, and connectors supplied.

(Prices are list and are subject to change without notice)

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KromeX Piston Ring Sets

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Sealed Power manufactures piston rings specifically designed for every American make of car.

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A KromeX ring job saves you oil money *immediately*, also pays off in longer piston and cylinder life. Install a Sealed Power KromeX Ring Set and you will prove to yourself that no finer piston rings can be had.



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Clinic for Homemakers



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Water in Basement

Q—During exceptionally heavy rains water comes into my basement through the floor drains. Several times it has reached a depth of 2 in. or more, even at the highest points of the floor. My neighbor says he thinks this water comes from the downspouts which empty into tiles at the corners of the house. Is this possible? If so, how do I correct it?
R. A., Mo.

A—It's possible your neighbor is right. We're guessing, of course, without knowing the layout and direction of the drain, or drains, from the downspouts. Assuming that these lead to a common drain, which in turn leads to the storm sewer, it is possible that the common drain has become partially clogged, either with debris or by tree roots. If this assumption is correct and the common drain is clogged to the point where it will not take the full flow from the gutters, then the excess water will back into the basement through the floor drains. Assuming that this deduction is correct, then the thing to do is have the drain rodded to clear the obstruction. However, another and more common cause of basement flooding should not be overlooked. That is the possibility that water may be backing from an overloaded or partially clogged storm sewer directly into the basement through the floor drains. In this case it may be necessary to install a sump pump or "standpipes" of the type which screw into special threaded fittings installed in the floor drains. Also it's a good idea to notify your street department. Cleaning the sewer may remedy the trouble.

Buckling Roof Shingles

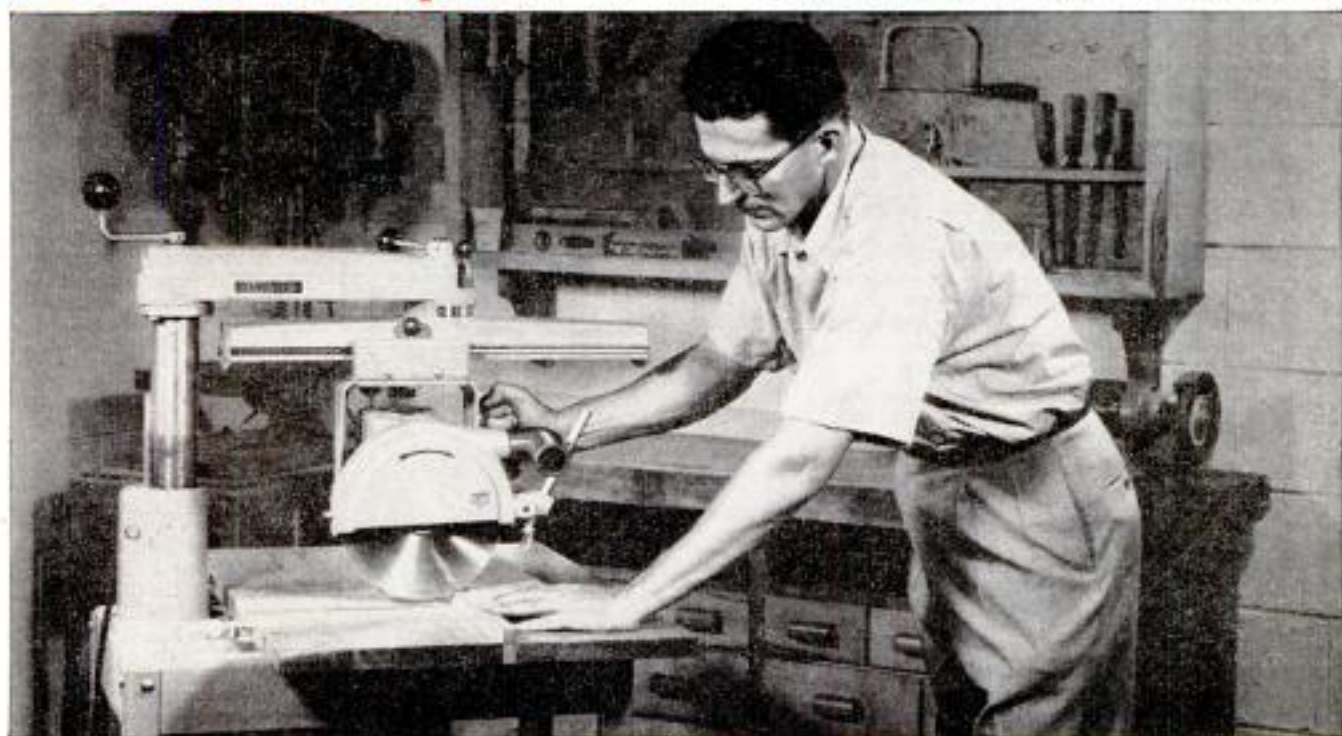
Q—My home is less than a year old and already the roof shingles are buckled in places on both sides of the ridge. What has caused this and what should I do to correct it?—B. S., Chicago.

A—Usually, shrinkage of the roof boards is the reason shingles buckle as you describe. Either the roof boards were wet by rain before the shingles were applied, or the lumber already contained too much moisture. In either case, as the boards dry they shrink in sectional size and any course of shingles nailed to one board will buckle as shrinkage of the board lessens the distance between the nails. It also should be noted that buckling can

(Continued to page 210)

ROCKWELL-BUILT

DELTA "900" radial saw



.. "industrial saw" power, home workshop price

The Delta "900" is the most powerful 9" home workshop radial saw ever built. And it's the most useful all-purpose radial saw ever made for use outside of industry. Here's why:

TRUE 3/4 H.P. MOTOR—Actually exceeds NEMA power specifications. Guaranteed for one full year! You make heavy cuts faster, easier—and the motor runs cooler.

EXCLUSIVE "TURRET ARM" ACTION—Swing, spin and tilt the head with Delta's double overarm construction. You get full blade travel and full table capacity at any angle, including left hand miters.

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TAKE UP TO 24 MONTHS TO PAY on terms to suit you! The Delta Budget Plan offers easy terms—as little as 10% down—and you can start enjoying Delta tools right away.

GET ALL THE FACTS ABOUT THE DELTA "900" RADIAL SAW—Compare—then make up your own mind. Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your phone book.

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 Please send me names of Delta Dealers near me.

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Aluminum Living

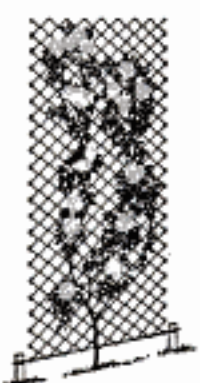
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ALUMINUM grass stop

for the neatest lawn in your neighborhood



- RUSTPROOF—lasts for years and years
- NEW "safety edge" makes installation easy — no sharp edges. No joints or clips.
- Ideal for use around trees, shrubs, sidewalks and driveways
- Substantially reduces tedious lawn work
- Won't interfere with mowing
- Available in 40 ft. coils in 4" and 8" girth



ALUMINUM clothesline



- RUSTPROOF — lasts indefinitely
- Once up — always up, summer and winter
- Will not rot, rust, chip or crack
- Solid or stranded in 50 ft. and 100 ft. coils

nichols WIRE & ALUMINUM COMPANY
DAVENPORT, IOWA

RECOMMENDED BY A LEADER OF OPINION
Guaranteed by Good Housekeeping
AS SHOWN AT ADVERTISED PRICES

(Continued from page 208)

be caused by the swelling of the roof boards due to absorption of excess moisture in the attic. If this is the case, buckling will occur where the shingle course happens to be nailed to adjacent boards, one of which may be of high resin content and, therefore, less absorptive than the other. One board swells (expands) and this has the effect of shortening the distance between the nails. Usually buckling caused by shrinkage of roof boards will correct itself if excessive moisture is eliminated from the attic by adequate ventilation. However, when buckling is caused by shrinkage of the roof boards, it can be corrected only by carefully removing the nails holding the buckled shingles, flattening the shingles and then re-nailing. After re-nailing in this manner, the old nail holes in the shingles should be filled with asphalt roofing cement to prevent leakage.



Relocating Trim

Q—The walls in my home are in bad condition, the plaster having deteriorated to the point where it will be necessary to cover walls and ceilings with plasterboard. The trim is old style and I'm wondering what to do about it, that is, how does one relocate it to compensate for the added thickness of the plasterboard?—O.R., Nebr.

A—Perhaps you have thought of removing the old plaster. We hesitate to recommend this procedure as a first step. It's a tedious, disagreeable task, but in some cases it may be advisable to assure a permanent job. Removing the plaster saves a lot of extra work in relocating the wiring, outlets and the trim. If you decide not to remove the plaster you have two or three choices of procedure. You can remove the trim and nail 1/2-in. filler strips to the door and window casings. These strips should be about three fourths the width of the trim piece so that when the latter is reinstalled it will cover the edge of the plasterboard. Another method is to remove the trim entirely and install a metal molding, or edging, especially made to finish off edges of the plasterboard at openings. In some cases old types of trim have square edges and the pieces are thick enough to permit rabbeting the edges to take the plasterboard. Of course, this job requires power equipment.



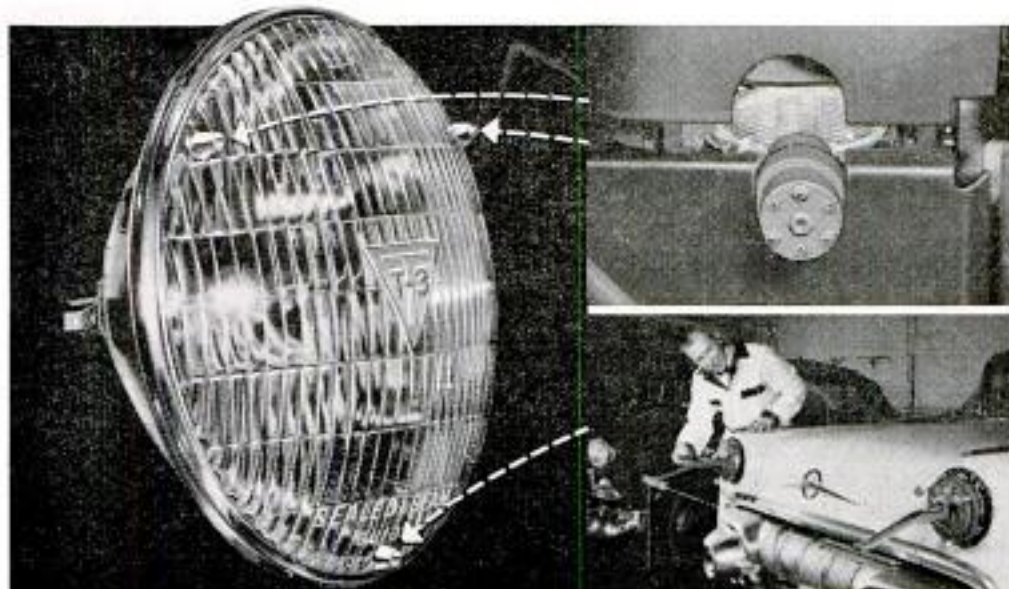
Restyling Exterior

Q—I have a postwar brick home, square, two-story with hip roof. "Modified Georgian" I suppose it's called. The door opens onto a concrete stoop and there's a picture window. It's livable but unattractive. Can you suggest improvements? E. D., N. Y.

A—If, as you say, the house affords a livable interior plan, then we would not make any major changes in the structure. Your local architect or builder is in a much better position to advise than are we at such long range. All that we can offer are suggestions for your consideration. We would think about adding a porch, extending perhaps across the front but lacking a foot or so of being the full width of the structure. This could be built with concrete floor over a suitable fill, the roof being supported on corner columns of ornamental iron. We also would consider adding a screened porch at the back, or an open porch if desired, with access from the service door or the kitchen.

GM GENERAL MOTORS GUIDE

goes one step further to give you
the big difference in headlamps



In this Guide-developed machine each Guide T-3 Headlamp completes its assembly as follows. The light is turned on and when the exact beam center is automatically located, the machine electronically computes, memorizes and performs the necessary degree of "Guide Point" grinding to establish a perfect plane for Safety-Aiming.

Here, with only an ordinary screw driver, Guide T-3 Headlamps are being accurately aimed with T-3 Safety-Aimers that fit over the accurately placed and ground "Guide Points". This can be done in a few minutes in broad daylight —insures your really getting all the benefits built into these new Guide T-3 Headlamps.

*Exclusive electronically controlled process
is secret of Guide's extra aiming accuracy!*

Now, your car can have 20/20 vision for nighttime driving. With new Guide T-3 Safety-Aim Headlamps you get more light aimed right . . . on the right side of the highway, where you need it most!

A Guide-developed process permits Guide to gem-grind three precisely located aiming points on the lens of every headlamp. These "Guide Points" are accurate within one ten-thousandth of an inch—providing the most accurate aiming plane in the industry.

You get safer, more relaxed, pleasanter motoring every night you drive with Guide! It's a proven fact that nighttime driving is the most tiring and dangerous. So, give yourself and fellow motorists all the benefits of more light aimed right from a new pair of Guide T-3 Safety-Aim Headlamps. Your nearby AC dealers can install and aim them in a matter of minutes, day or night.

Relax . . . go Guide . . . tonight!

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

GUIDE

T-3

Safety-Aim

HEADLAMPS

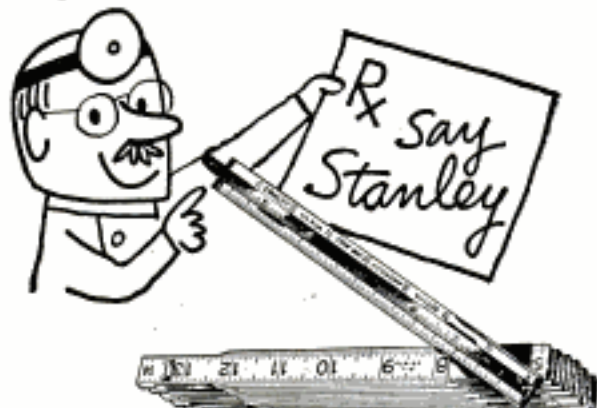
BUY IN PAIRS
WHERE YOU SEE



Don't call
a doctor...

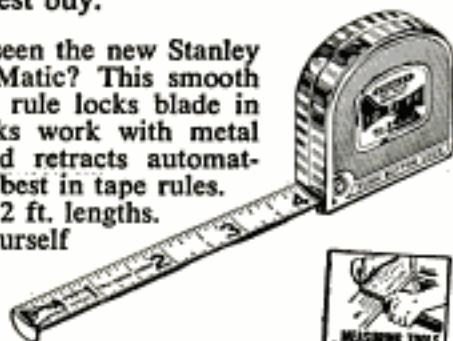


This rule has loose joints . . . they're weak and worn. It's ready to fold up forever. Don't call a doctor. Get a new one. This time, be precise . . . say Stanley, it's a good rule.



Take this new Stanley "100 PLUS" No. X226 6 ft. Extension Rule for example. No comparable rule lasts longer. It never gets "rule arthritis." Its joints have been permanently lubricated. They're young and springy. They can take it. The black, deep-cut markings with their protective plastic finish wear four times longer than those on thin-skinned rules that may suffer from "tired ink." Buy No. X226, and make a note of how long it measures up for you. You'll agree that Stanley Rules are your best buy.

Have you seen the new Stanley Glide-O-Matic? This smooth acting tape rule locks blade in place, marks work with metal scribes and retracts automatically. The best in tape rules. 8, 10 and 12 ft. lengths. Try one yourself and see.



For free booklet "Measuring Tools and How To Use Them" write Stanley Tools, Division of The Stanley Works, 626 Elm Street, New Britain, Conn.



STANLEY

The Tool Box of the World

New Horizons in Electronics

(Continued from page 141)

absence of any moving mass other than air contributes to its phenomenal high-frequency response, said to be well over 50,000 c.p.s.

The heart of the Ionovac is a small quartz cell, Fig. A, which is divided in two sections by a narrow aperture. Air cupped within this aperture is ionized by the application of a high r.f. voltage which literally tears billions of electrons out of their atomic orbit and forms an electron cloud. Under the influence of an audio signal, this cloud expands and contracts, thus creating sound waves which faithfully follow any modulating electrical signal.

As a hi-fi "tweeter" the Ionovac is mounted in a horn, Fig. B, which also houses a transformer required for coupling the signal from the modulator-oscillator chassis, Fig. C, to the quartz cell.

Although the Ionovac's first application is in the field of high fidelity, its more significant potential lies in its ability to create supersonic (silent sound) waves of almost any power and frequency. These frequencies above the range of human hearing are already being used for numerous industrial and medical purposes, but research is still in its infancy. It is here that the Ionovac's unique characteristics may prove to be of vital importance.

Introducing the Cryotron

Three years of research have resulted in the development of the Cryotron, Fig. D, a tiny electronic switch destined to trim giant computers down to size. The Cryotron represents the first practical application of superconductivity, a phenomenon discovered nearly 50 years ago.

(All materials, even the best conductors, have some electrical resistance at normal temperatures. At extremely low temperatures, however, below -240 deg. F., the resistance of certain metals is reduced almost to zero and such metals become superconductive.)

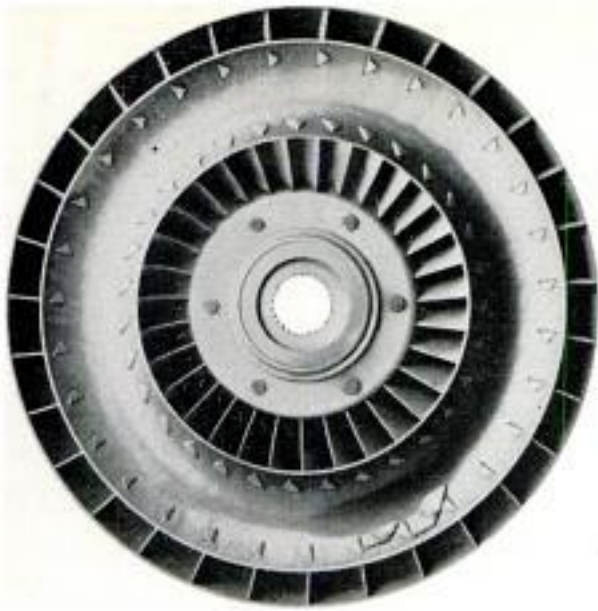
The Cryotron, in its simplest form, consists of a straight piece of wire with another wire, fine as a human hair, wound around it as a control winding. Below the critical temperature, the resistance of the straight wire drops almost to zero, permitting the flow of a large amount of current through this wire. Any current flow through the control winding sets up a magnetic field which destroys superconductivity in the straight wire, causing its resistance to return. Thus current in the control winding can cut off the current in the straight wire.

(Continued to page 214)

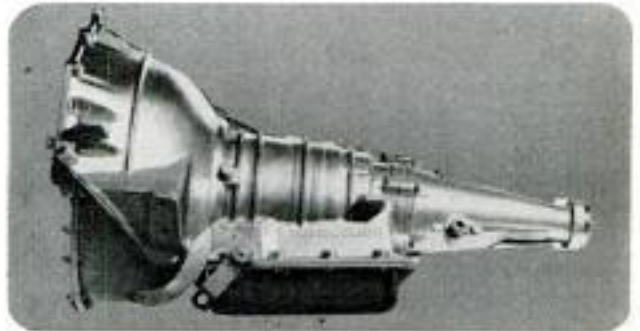
POPULAR MECHANICS



X-RAY ON CHEVROLET



TURBOGLIDE: forecast of the future



You don't have to look on the drawing boards—the answer is plain in any Turboglide-equipped 1957 Chevrolet. Here is tomorrow's drive, with an absolutely shift-free sweep of power, smooth as a plume of steam. Here is a quadrant that doesn't say "LO"—because there is *no* auxiliary planetary gear system needed. Here are *three* turbines for full-torque take-off, brilliant passing power and ultra-thrifty cruising. Here is the finger-flick Hill Retarder for safer slowing on grades . . . all this in a transmission that weighs 30 percent less than any other automatic drive (thanks to the largest production aluminum die casting in the world), with fewer parts, far fewer external openings and absolutely no delicate automatic shift valves. It's an engineering triumph—because it moves without a hint of mechanism. Try it and see! . . . *Chevrolet Division of General Motors, Detroit 2, Michigan.*



Switches such as these form the basis of electronic computers, and many thousands of them are used in a single instrument. To date, fragile vacuum tubes and expensive transistors have been used, but the Cryotron's basic simplicity which permits rapid, low-cost manufacture, coupled with its small size, may bring about a revolution in computers.

New Batteries Show Promise

With the invention of transistors less than 10 years ago came the demand for smaller, lighter batteries with longer life. Two recently announced units give promise of some real progress. The small battery in Fig. E packs a potential of 95 volts into a cylinder only about $\frac{3}{8}$ inch in diameter and less than 1 inch long. But its real asset is its phenomenal shelf-life expectancy—predicted to be more than 20 years. Though currently produced only for special applications requiring high voltage at little or no current, such as monitoring instruments, one-shot triggering devices and the like, continued research may soon produce a similar unit for more popular and universal applications.

Departing from the conventional method of generating electricity by chemical action, the button-sized battery in Fig. F actually converts atomic energy into elec-

tric power. Operation of the battery depends on a two-step conversion of energy: from atomic action to light and from light to electricity. The light source consists of a mixture of phosphorus and an oxide of promethium-147, once considered a waste product of nuclear fission. Beta particles emitted by the promethium are absorbed by the phosphorus and converted into red and infrared light. This light is picked up by two or more photocells and converted to electric current.

The atomic battery has a nominal power output of 20 microwatts and will provide usable current for about five years. It is the first such device to be completely safe for personal use and requires no special precautions.

Although not yet commercially available, the battery will eventually be used for hearing aids and radios, and even an atomic-powered wrist watch is currently under consideration.

The principles involved in these new products represent drastic departures from accepted procedures. While designated, at present, for specific and special applications, engineers are already engaged in research and experiments intended to broaden their scope. Results of those experiments may have a far-reaching influence on electronic developments. ★ ★ ★

**WHAT A DREAMBOAT!
MY IDEAL HERO!**

**WHAT A DATE!
I'M BATTING ZERO!**

**SMELLS GRAND!
PACKS RIGHT!
SMOKES SWEET!
CAN'T BITE!**

**WHY YOU
SMOKE A PIPE
TOO! MM-MM!
YOU'RE FOR
ME!**

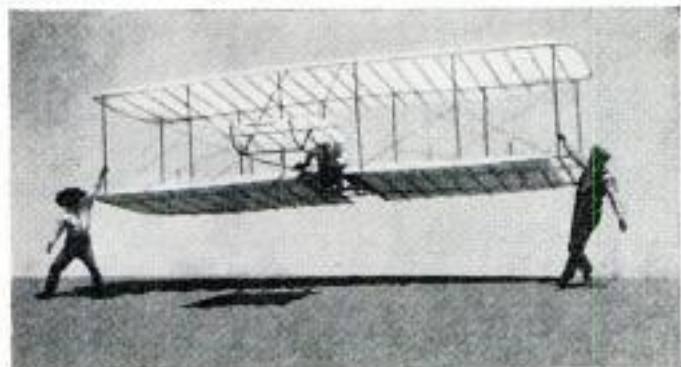
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SIR WALTER
RALEIGH—
NATURALLY!

SIR WALTER RALEIGH'S BLEND OF CHOICE
KENTUCKY BURLEYS IS EXTRA-AGED
TO GUARD AGAINST TONGUE BITE.

FREE!

24-PAGE BOOKLET ON
PIPE CARE. JUST WRITE
TO: SIR WALTER RALEIGH
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LOUISVILLE, KY.



A great heritage

A great future



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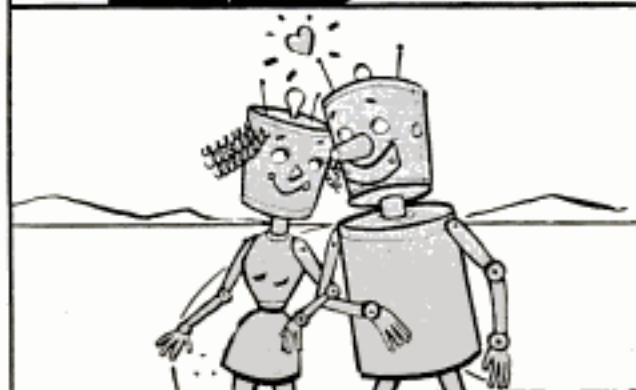
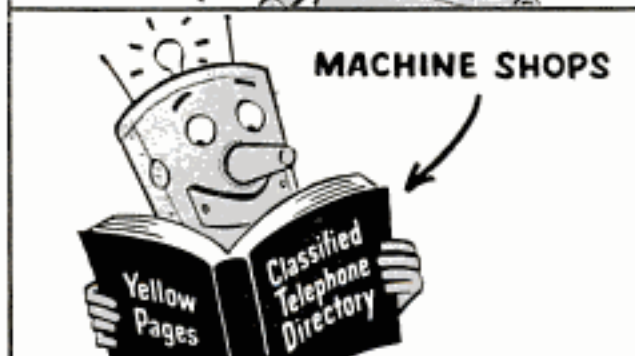
YEARS OF
AIR POWER

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whatever you need-

Find It Fast
In The
Yellow Pages



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Professor of the Outdoors

(Continued from page 123)

guy, it might be best to leave him comfortable in a shelter with fire and fuel, and hike out for help," says McKenney. "But even so, if he's badly hurt, you can carry him out on a travois."

First, if the injury is a fracture like a broken leg, saplings bound with thong or bark will keep the leg straight. "Don't try to set the bone. The main thing is to keep it straight so the tendons won't contract," McKenney says. Then, assemble a travois, which is a pair of poles for dragging your burden. Upper ends of the poles are tied around your chest. Below, the poles are cross-framed with notched saplings tied to the poles. Bark is woven across this frame to support the victim and is used to lash him to the travois for the journey. If there are two or more persons available for the carrying job, an ordinary stretcher can be put together in similar fashion.

Campus Workshop

Back in his campus workshop with a choice of drawknives, clamps and other gear, this woodsman turns out homemade products. In five minutes he blocks out an ax handle from a flat plank or tree limb; in 15 minutes more he has it whittled to exactly what he wants.

His favorite carving tool—his "crooked knife"—is a hayrake tooth of quality steel. This, McKenney heated and pounded to shape to give it an upturned and slight backward curve. The resulting tool doesn't tear wood but slices in a quartering motion; swiveling the wrists adjusts the depth of cut.

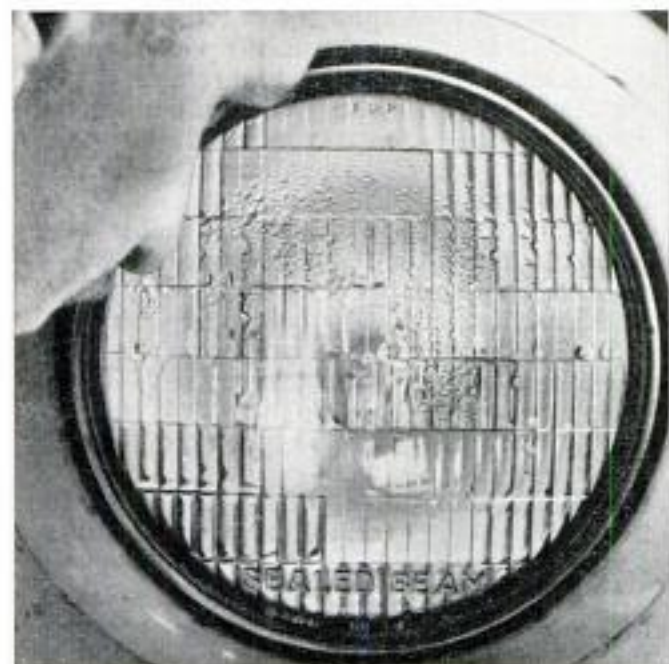
Of his profession McKenney concludes: "I wouldn't sell my forest knowledge for all the paper money in Wall Street, but I'm happiest when I'm giving it away to real sportsmen who are able to laugh when the going gets rough." ★ ★ ★

Insects Due for Fatal Surprise

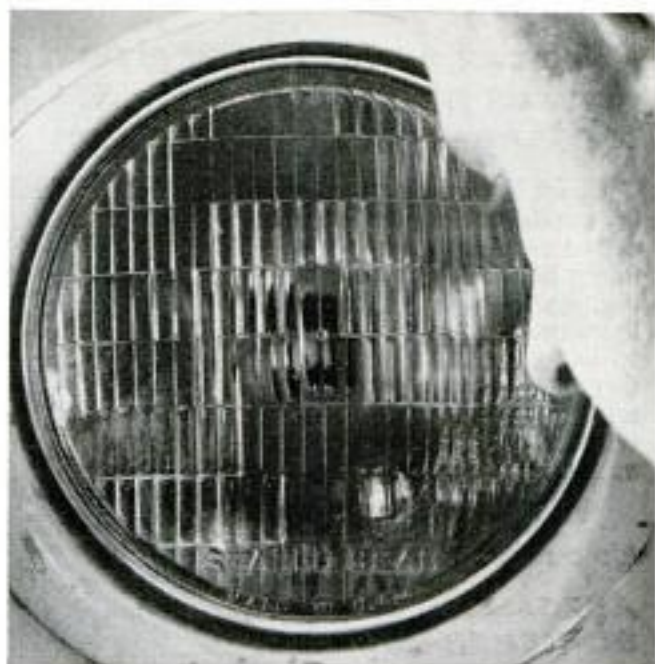
New contender for the championship among insect repellents is diethyltoluamide for use on skin or clothing against mosquitoes, chiggers, ticks, fleas and biting flies. Resisting rubbing and wearing, this substance is a pleasant lotion that reportedly is superior to other repellents against the yellow fever, salt marsh, irrigation water, snow water, subarctic and malaria mosquitoes, in addition to the stable, deer and sand flies. Diethyltoluamide is said to be the best available repellent against ticks and chigger mites.

If your headlamps look like these—

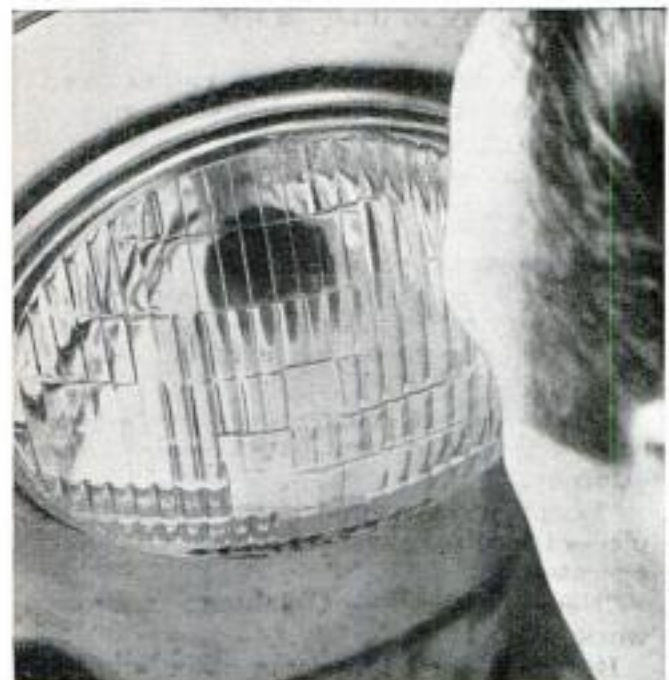
**YOU NEED A PAIR OF NEW G-E *All-Weather* HEADLAMPS
YOU'LL GET LOTS MORE LIGHT!**



WATER DROPLETS inside the lens not only scatter the light, but they also help discolor metal reflectors. This can't happen with G-E *All-Weather* Headlamps—moisture can't possibly get inside.



DISCOLORED REFLECTORS absorb light rather than reflect it, causing a loss of up to 50% of the original light output. Dirt and moisture can never enter G-E *All-Weather* Headlamps so the reflectors always stay shiny.



BLACKENED BULBS in old-style headlamps block out the light from the filament and cause a dangerous drop in light output. This can't happen with G-E *All-Weather* Headlamps because *there are no inner bulbs!*

G-E *All-Weather* HEADLAMPS NOT ONLY GIVE YOU LOTS MORE LIGHT... BUT YOU ALSO GET:

Better seeing in fog, rain, snow—The lower beam filament has a special shield that cuts down reflected glare and lets you see better in any weather.

Lower beam puts twice the light 300 feet ahead at the curb—You can see much better against the glare of oncoming traffic.

Upper beam that reaches far and wide—For open road driving, the upper beam filament is left unshielded to let you see curves, dips—even side roads.

So, for safer night driving, get a pair of new G-E *All-Weather* Headlamps today — and have your dealer aim them when he puts them in. You'll see the difference tonight. General Electric Co., Miniature Lamp Dept., Nela Park, Cleveland 12, Ohio.



GENERAL  ELECTRIC

Soft water can save every home owner \$100 a year

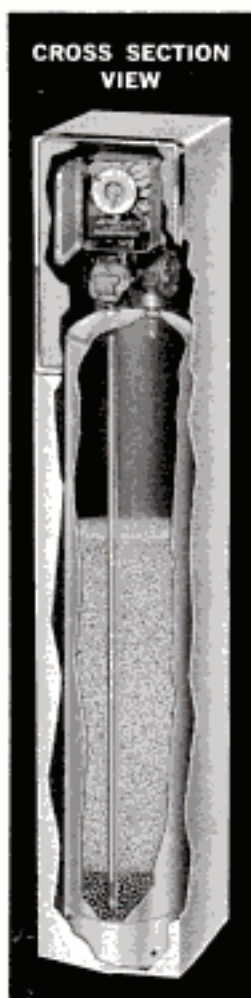
Reduces water heating costs, saves plumbing, adds 33% longer wear to clothes

Clear, filtered soft water is more efficient, more economical for every water-using need: photo developing, car washing, bathing, laundry, dishes. Saves up to 60% on soaps and detergents, keeps drains open and trouble-free. No hard water scale in plumbing, appliances, utensils.

New Culligan®
AUTOMATIC WATER SOFTENER—provides an unlimited supply of hot and cold soft water regardless of family size or water usage.

Completely automatic! Electronic Regen-a-rator quickly, quietly, automatically regenerates at night, while you sleep. Compact! Softener is 57 in. high x 10½ in. square. Low operating cost; salt supply lasts 6 to 12 months. 10-year Warranty.

About **\$330** plus installation
Slightly higher west of Rockies and in Canada



3,000 page, 12-volume \$20 Popular Mechanics DO-IT-YOURSELF ENCYCLOPEDIA SET. Send coupon for certificate which your Culligan dealer will redeem for \$20 Popular Mechanics Encyclopedia Set with your purchase of Culligan Automatic.

CULLIGAN, INC., NORTHBROOK, ILLINOIS
Gentlemen: Please send free Popular Mechanics Do-it-yourself Encyclopedia Certificate.

Name _____

Address _____

City _____ State _____

(This offer void wherever taxed or otherwise restricted. Offer may be withdrawn or modified at any time.)

Owners Praise Handling, "Conservative" Styling

(Continued from page 100)

Most-Frequent Complaints

While 22.9 percent of the Buick owners make no complaints at all, others have some unkind things to say.

First on the complaint list is the excessive use of gasoline. Second is poor assembly and third, body noises and rattles.

"The car is fine, but it takes a banker to drive it at the mileage it gets. My two-ton truck gets better gas mileage."—Texas lumberman.

"Very poor gas mileage: 7.5 miles per gallon in city and 10 on highway."—Missouri telephone worker.

"I must use the very best premium gas. It won't run properly on some brands that are advertised as premium grade."—Ohio telephone assigner.

"My complaints are in the assembly. I think there is good material used in Buick, but it is put together poorly. Doors don't fit, windows don't roll all the way up, bulbs are missing or don't light."—Iowa inspector.

"Most of my trouble has been minor, but annoying: Faulty ignition switch, oil pumps, speedometers, leak in power steering, window alignment, door locks, horn ring not operating, and others. When we get all the parts working properly, it will most likely turn out to be a good car."—California accountant.

"I have had it at the dealer's for service approximately 40 times in five months."—California surgeon.

"Dealer unable to stop rattles and squeaks in body."—Texas branch manager.

"Rattles like a cheap car, not like a \$4000 automobile."—Tennessee advertising man.

What About Interior?

Buick owners place the neat instrument panel high on their list of interior likes. Other interior features they commend include the large glove compartment and the upholstery.

"I like the arrangement and workmanship of the instrument panel."—Maryland attorney.

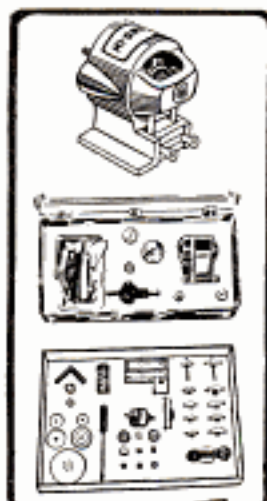
"Large glove-compartment door with places for coffee cups."—Indiana telephone operator.

"New fabrics."—Oklahoma railroad worker.

But they don't like some other interior features. And, as seems to be common in the industry, the chief complaint is the location and design of the ash trays. Other complaints involve floor mats, location of

(Continued to page 220)

BIG VALUES in TINY MOTORS and POWER APPLICATION KITS



Order your choice of four miniature battery-operated motors—one for every use—from 1½ to 12 volts—and today's BIGGEST VALUES IN THE HOBBY FIELD. These motors, with the accessories in kits listed below, provide all types of drives for hobby items, toys, research and industrial devices. Make wonderful gifts.

- *No. 8-100 Hi-Drive Motor, 3-6V. \$2.50
- No. 9-100 Same for 12V. \$3.00
- No. 3-100 Tiny Atom Motor, 1½-3V. \$2.00
- For higher voltage. \$2.50
- *No. 3113N Tiny Atom motor assembly kit with many acc. . . \$3.50
- No. 1300N Small accessories kit. \$1.00
- No. 3700 Large accessories kit \$3.00
- No. 4000 Deluxe accessories kit with motor. \$5.00
- *No. 700 Super-Power kit with motor, speed reducer, all accessories. \$10.00
- No. 88 Kit of 8 pulleys—2 leads \$2.00
- No. 3000 Vari-speed gear unit. \$4.00
- No. 1049 Gear train with Hi-Drive motor No. 8-100. . . \$5.95
- Same with No. 9-100 Motor. . . \$6.45
- * Item illustrated. Ask for FREE Cat.

All Wilson's motors have Permanent Alnico Magnets.

Remit with order and we pay postage in U.S.A. No C.O.D. Add 3% Sales Tax for delivery in Ohio. Write Dept. PM.

For quick delivery see your local dealer — or order direct

WILSON'S OF CLEVELAND

425 Lakeside Ave., N.W. • Cleveland 13, Ohio



GENUINE ALNICO MAGNETS

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL. Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as guns, tackle from fresh or salt water; tools from tanks & drains. **GUARANTEED.** Try any magnet one week. Money back if you are not well-pleased.

- No. M-710 (Wt. 5½ oz.) Has pull of 225 lbs. on steel block. . . \$16.50
- No. M-625 (Wt. 7½ oz.) Has pull of 125 lbs. on steel block. . . \$9.50
- No. M-775 (Wt. 1½ oz.) Has pull of 75 lbs. on steel block. . . \$6.50
- No. M-500 (Wt. 13 oz.) Has pull of 50 lbs. on steel block. . . \$4.50
- No. M-300 Kit of Flat Bars 5 Pairs (10 Magnets). \$3.00
- No. M-250 Kit of Round Rods 5 Pairs (10 Magnets). \$2.50
- No. M-47 Hot Pad Magnets. 10 for \$1.00. \$0 for \$4.87
- No. M-35 Hobbyist assortment of 8 small magnets. \$1.50

Send N.O. or check. We pay postage. Sorry no C.O.D.'s.

MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.

MONEY FOR MEN ALL FREE

DATA

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastic and Marble imitation. Experience unnecessary. The material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings good returns. We are now placing big Chain Store orders with manufacturers. Ambitious men have chance for real prosperity. Our Free booklet will interest and benefit you.

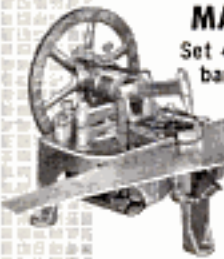
PLASTEX INDUSTRIES, Dept. A
3400 Third Ave. New York 56, N. Y.

Automatic Saw Set...

MAKE EXTRA PROFITS!

Set 400 teeth per minute on hand or band saws, 4 to 16 point, with the BeMaCo Automatic Saw Set. Fast, accurate, true hammer-anvil action sets teeth uniformly, eliminates tooth breakage. Used profitably by saw shops and manufacturers everywhere. Every machine positively guaranteed!

Write for details—today!



Saw Machine Division 28-C

BEAVER MFG. CO.

800 ISIS AVENUE • INGLEWOOD, CALIF.

MAKE MINE KLEINS



Your skill—the quality of work you do—is controlled in no small measure by the quality of the tools you use.

That's why electricians and good workmen everywhere insist on Klein Pliers—standard of quality by which others are judged "since 1857."

In the complete Klein line you will find pliers exactly suited for every job you do. See your hardware store or Klein distributor for the Klein Pliers you need.



Your hardware store has Kleins in stock or can get them for you quickly. Look for this new display board. It shows the most popular items in the Klein line.

Mathias KLEIN & Sons
Established 1857 Chicago, Ill., U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS



solves woodworking problems in seconds!

Speed your jobs, get answers to countless building and woodworking questions immediately! Improved GREENLEE Woodworking Calculator converts linear to board feet, gives nail specifications, tool sharpening tips. Compares woods, gives bit sizes for screws, concrete mixes, painting information, etc. Convenient . . . simple to read. 6" diameter . . . heavily varnished cardboard. Special offer by the makers of famous GREENLEE tools . . . **Only 25c** (no stamps please)

TOOLS FOR CRAFTSMEN

GREENLEE

The GREENLEE line of fine tools includes auger bits, electric drill bits, chisels, gouges, spiral screw drivers, drawknives, and many more. At leading hardware and building supply dealers.

GREENLEE TOOL CO.,
2106 Columbia Ave., Rockford, Ill.

the window cranks and the floor humps. "Must close ash trays to get out of the car. I have two skinned knees to prove it. The trays are too low and too small."—Anonymous owner.

"Ash tray is too small and dangerous. Have to look every time it's used. That takes my eyes off the road too much."—Kansas salesman.

"Don't like long-nap floor mat."—New York retired Army officer.

"Carpeting shows all footprints."—Ohio housewife.

"Front-window crank not in right place. Too hard to work."—Mississippi farmer.

"Don't like hump in front where transmission is located."—Maryland dentist.

More Best-Liked Features

The following quotations from owners describe additional best-liked features. For a listing of the features and the percentage of owners mentioning them, turn to the percentage table on page 101.

"When you tromp down on the accelerator, the variable pitch comes in and you are gone."—Texas lineman.

"Performance is superb. It has speed if I need it and very often I need it."—Ohio salesman.

"I like Dynaflo, especially in the mountains in snow and ice. You keep moving. We have passed dozens of stalled cars, but the Buick just keeps on going."—Ohio businessman.

"Dynaflo is smooth. You feel no change in going from stop to high speeds."—Kansas secretary.

"Holds the road good at top speed."—California serviceman.

"Has the weight to keep it from whipping every time the winds are strong."—Oklahoma retired policeman.

"Holds the road. You feel solid and secure."—Nebraska cattle feeder.

"This four-door hardtop has legroom, front and rear."—Virginia salesman.

"Visibility good. Lower hood means all four fenders are visible."—California scrap dealer.

"Interior trim is in good condition. Nothing is misfit. No rough edges."—Michigan carpenter.

"Low without sacrifice of seat height and headroom in my Super."—Nebraska retired farmer.

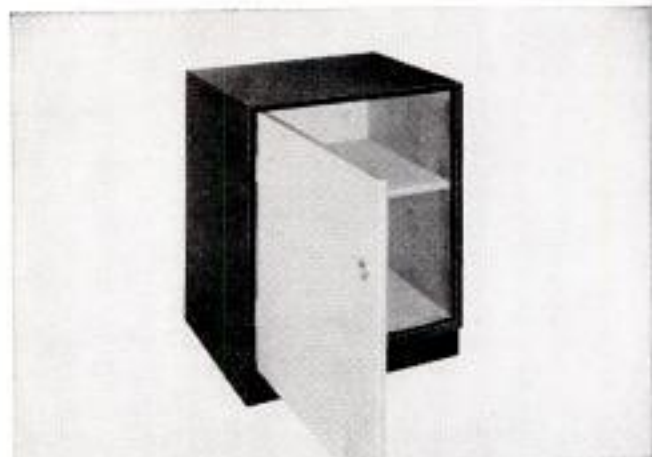
"Like the windshield washer and find the new location of the control button an excellent safety feature."—California owner.

"I find the Safety Minder buzzer useful. It would have saved me \$10 if I had used it all the time."—California aircraft worker.

"I like the elimination of portholes on

(Continued to page 222)

New Pine Plywood helps you add storage space to your home



STORAGE CABINET only 29" high—but with over 5 cubic feet of storage space! Has an adjustable shelf. Ideal for records, linens or as a base for desk or dressing table. See coupon for easy-to-follow plans.



SLIDING-DOOR CABINET is 4' long, 2' deep, has adjustable shelves. Ideal for linen, china, clothing, etc. Complete plans and step-by-step photos in new booklet. See coupon for your copy.

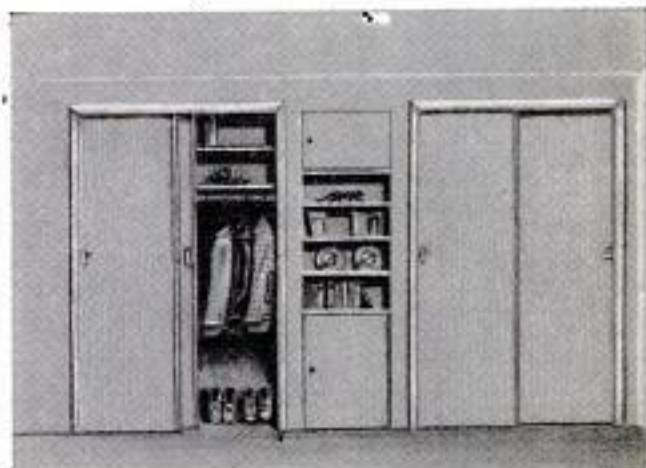


EARLY AMERICAN HUTCH gives you plentiful storage space in a handsome, conversation-provoking cabinet. Has drawer, handsome planter box, over 6 cubic feet of storage space. See coupon.

Weldwood Old Craftsman makes the job easy because it's the easiest working, easiest painting plywood ever!

Cramped for storage space? Here are four ways you can get it—easily. And although these projects are really "pro"-looking, they're not hard to build. The reason: they're made with Weldwood Old Craftsman Pine Plywood according to easy plans (see coupon). Old Craftsman Pine combines all the advantages of top grade pine lumber with all the advantages of rugged plywood construction.

Old Craftsman Pine Plywood paints better, saws cleaner, machines more quickly and sands smoother. Comes already factory-sanded! Available in panel sizes from 3' x 6' to 4' x 10'. Thicknesses from 1/4" to 1-13/16". See Old Craftsman at your lumber dealer's soon.



BUILT-IN CLOSET converts the wall at one end of your room into two 6' x 30" closets plus four open shelves and two swinging-door cabinets. See coupon for plans.



PINE PROJECT BOOK

UNITED STATES PLYWOOD CORPORATION
Box 61, New York 46, N. Y.

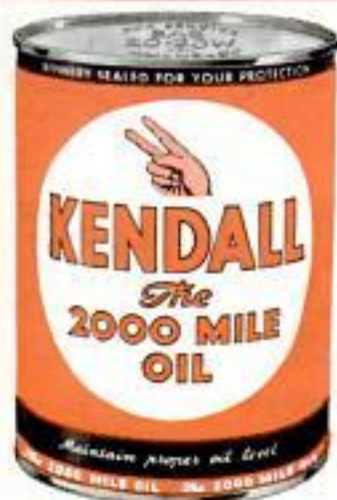
Please send me your book "Projects You Can Build With Weldwood Old Craftsman Pine Plywood." I understand it contains the 4 projects shown on this page plus 14 others. I enclose 25¢. PM6-57

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ADDRESS.....

CITY.....STATE.....

STILL FULL AND SAFE



Refined from 100% Bradford Pennsylvania Crude Oil — world's richest — by special Kendall processes and an exclusive additive formula.

STOPS VALVE LIFTER STICKING, TOO

Kendall quality means economy for you. Specially formulated to provide full protection and superior lubrication for the engine in your car. Kendall, the 2000 Mile Oil has been performance-proven by millions of motorists. Ask for it at your favorite dealer's now.

BY THE REFINER OF
KENDALL SUPERB MOTOR OIL
KENDALL REFINING COMPANY
BRADFORD, PENNA.

the front fenders."—Massachusetts field representative.

"Have had very good service from my dealer."—Texas medical doctor.

And Other Complaints

Here, in order of frequency of mention, are quotations that describe the other complaints of Buick owners:

"Not enough entrance headroom. I don't like hitting my head every time I get in."—Iowa assistant manager.

"Difficult to enter and leave from curb side, although plenty roomy when inside."—Illinois businessman.

"Brakes wear out too fast."—California physician.

"I have had five sets of brake linings put on this Roadmaster in 5000 miles."—North Carolina radio serviceman.

"Brakes always grabbing on windy days due, so experts say, to sand blowing into the brake drums."—Wisconsin owner.

"Bad carburetion, but a special carburetor kit is coming in to correct it."—Kansas engineer.

"Am having trouble with stalling. Dealer blames it on carburetor. GM is sending a kit to correct it."—New York pharmacist.

"Windows are hard to move up or down."—New Jersey merchant.

"Glass in windows does not fit properly."—Kentucky salesman.

"Windshield wipers are jerky if windshield isn't real wet."—Indiana farmer.

"Wipers do not give enough coverage in heavy rain and snow at high speed."—Iowa salesman.

"Car is only two months old and chrome is pitted and rusted."—Michigan plumber.

"Paint poor. It's flaking."—Georgia Army officer.

"Dealer service particularly poor."—California secretary.

"Does not have good rear springs. They bottom easily when loaded."—Ohio railroad engineer.

"With any grade of gasoline there is a sufficiently vicious engine knock on fast acceleration to cause one to let up."—Illinois electrical engineer.

"They should put better tires on the car. In 5000 miles I have had three of them replaced."—Texas welder.

"Should put some kind of a handle on trunk of Special."—New York attorney.

"When new, oil consumption was very heavy—five quarts first 1000 miles. Now it burns none. I don't like fact that I must buy premium gas for normal driving."—Connecticut park superintendent.

"Rear window fogs up. It is a definite safety hazard. Someone forgot to compute

(Continued to page 224)

SAVE MONEY THREE WAYS WITH A SILENTONE MUFFLER!

The moment you install a Silentone on your car, you start saving money in three ways. Look at this!—

1. LONGER MUFFLER LIFE—Silentone is a heavier muffler, with double-wrapped, up to $\frac{1}{2}$ heavier shell, heavier outer heads and tubes; this gives you thousands of extra driving miles.

2. BETTER MILEAGE—Silentone's scientific design lets your car run quieter—more efficiently, too, reducing exhaust back pressure to give more pickup and smooth acceleration. And with improved performance you get real savings on gas.

3. LOWER FIRST COST—Despite their extra performance and longer life, Silentones actually cost you less. Many stores will install a Silentone for you at big savings. Ask about one today. They're individually engineered for your car.



1 Double shell—26 gauge inner shell, 22 gauge outer shell—lasts longer

2 Nonlogging extruded holes—no whistling, no restriction

3 16 gauge spun locked, blowout-proof steel heads

4 Crimped seams eliminate weak points

5 High and low frequency tuning chambers

SOLD ONLY BY AMERICA'S LEADING AUTOMOTIVE CHAIN STORES

SILENTONE MUFFLERS · DYNATONE · GLASS-PACKED
Dept. 2F, Toledo 1, Ohio

FOR BETTER REFINISHING JOBS USE



Klean-Strip
PAINT REMOVER

- Non-inflammable
- Removes any finish
- Fast • Non-messy
- Needs no neutralizing

"Peels Off Paint"

**FREE! 44 PAGE BOOKLET
ON PORTABLE POWER TOOLS**

Hundreds of time and money-saving ideas for hobbyists, builders, professional wood-workers. New booklet #204 includes 150 pictures of latest tools with complete specifications on how they work and what they do. Write for your free copy now!
PORTER-CABLE MACHINE COMPANY
7146 N. Salina St., Syracuse 8, N. Y.

**SAVE MONEY ON YOUR
COMPRESSED AIR**



buy this complete
SMITH 45-P air compressor

Right for spray painters, plumbers, contractors, monument shops, tire changing trucks, maintenance shops, quarries, utilities, many other uses. Delivers 45 plus cu. ft. per minute; pressure up to 150 P.S.I. Powered by Wisconsin 4-cyl. air-cooled engine; uses less than 1 gal. gasoline an hour! Most compact, biggest-value compressor for its capacity anywhere! Other models to 230 cfm.

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FREE
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GORDON SMITH & COMPANY, Inc.
411 College Street, Bowling Green, Ky.

JUNE 1957

**'Budget' HOIST
LIFTS 2 TONS**



**HANDLES ALL KINDS
OF LOADS EASILY:**
Farm Implements
Autos, Trucks
Wheels, Tires
Boats, Motors
Crates, Bags, Bundles
Structural Units
Baled Hay
Oil Drums, Ash Cans
Machinery, Dies
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Concrete Pipe



Save your back and money. To lift a tractor or deep freeze, a propeller or side of beef, a 2-ton machine or 250 lb. tank—use a 'Budget' Electric Hoist. It's fast— $\frac{1}{4}$ ton can be lifted 1 ft. in less than 2 seconds. It's safe—the two brakes act "quick as a wink". Each brake can hold the full load. It is easy to "inch" loads into place. All parts of the hoist are extra tough for years of work. Garages, farmers, institutions, machine shops, big and little plants—all prefer portable 'Budget' Electric Hoists. $\frac{1}{8}$ to 2-ton sizes. AC and DC models. For truck service or where there is no electricity, choose a 12-volt battery-operated model. Ask your "Shaw-Box" Distributor for details or write us for Bulletins 402 and 404.



57A-6

MANNING, MAXWELL & MOORE, INC.
SHAW-BOX CRANE & HOIST DIVISION
354 W. BROADWAY
MUSKEGON, MICHIGAN

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At Last!

**A "TOOTHLESS" PLIER
THAT GRIPS
WITHOUT GOUGING**



CHANNELLOCK

No. 415 Smoothjaw PLIER

Just
The Thing
For Chrome
Fixtures and
Fittings



One of the handiest tools you'll ever use . . . the new "toothless", smooth-jaw plier that grips without gouging. Just the ticket for gripping chrome-plated fittings, plastic, wood and other smooth surfaces. Especially handy on chrome sink-fixtures and other hard-to-handle jobs. Jaws quickly adjustable to full 2" opening. Get yourself a Channellock No. 415 Smoothjaw Plier. You'll find it's "the right tool" on scores of jobs in home and shop.

**Ask Your Hardware Man For A
CHANNELLOCK Smoothjaw PLIER**

MADE ONLY BY

**CHAMPION DEPARTMENT TOOL CO.
MEADVILLE, PENNSYLVANIA**

the air circulation."—New Jersey marketing analyst.

"Don't like plastic lining in glove compartment. Everything in it rattles."—New Mexico farmer.

Other Comments

PM asked the owners for their opinions on the trends in the industry. The great majority state that they agree with the trend (83 percent). Many made interesting criticisms of the trends. Some of the most interesting are quoted below.

"I am disappointed in the trend toward lower, faster cars. The lowness makes it awkward to get in and out. You have to push harder on the seat and this ruins the seat eventually. No other durable item appears to get into the consumer's hands needing so many adjustments as a new automobile. At the price we have to pay we should receive quality merchandise."—Massachusetts comptroller.

"I would like to be able to see a little farther by having my eyes a little higher. They put prison guards up in towers so they can see farther and at the same time they drop us lower in these cars and claim better visibility. Just who are they trying to kid?"—Colorado trader.

"I wish the car builders would listen more to these PM questionnaires and build the cars the people want."—Ohio salesman.

"It is my opinion, having had eight new cars in the past 10 years, that you are now trading in a better car fundamentally than you get."—New York clergyman.

"If I had it to do over, I would have kept my 1955 Buick. It had only 12,000 miles on it. I got 18 miles per gallon, it rode better and I believe it was faster."—Indiana service attendant.

"This Buick is as low as it should ever get. Fourteen-inch wheels would be foolish as would the addition of fins."—Massachusetts product specialist.

"If I had wanted exceptional gas mileage I would have bought a smaller, lighter one."—California mechanic.

These are the opinions of a cross section of 1957 Buick owners from coast to coast. They live with the car and know it best. Turn to pages 102 and 103 for additional opinions and performance data on the Buick Special. ★ ★ ★

Closed-Circuit TV for Trains

British Railways have put into service the first train to be equipped with closed-circuit television for passenger entertainment, with a coach fitted as a studio and a receiver in each passenger coach.

Handi-calk saves on
HOME REPAIRS



**SO EASY
YOU CAN
Do-It-Yourself**

Handi-calk

Ugly cracks and gaps in your home due to settling, admit dirt, dust, soot, moisture and cold and lead to costly repairs, inside and out. Seal them the easy way with Handi-calk. Will not sag or stain. Can be painted over. So easy to do yourself with the Handi-calk gun.

FREE!

Home Calk Check List "Where and How to Calk". Get your copy now!

Glazing? Try **EASY HANDI-GLAZE!**
HANDI-CALK DIVISION DEPT. HC2
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**Beauty... Power
... Adventure!**



**YOURS
with the fabulous new
HARLEY-DAVIDSON
SPORTSTER**

★ BEAUTY...

Magnificently sleek styling, flashing chrome and striking two-tone color combinations command immediate attention wherever you go.

★ POWER...

Get "raring to go," instantly responsive speed and acceleration with the 1957 Sportster's pace-setting new 55 cubic inch overhead valve engine.

★ ADVENTURE...

Whether you're off on a lark or off to work, each mile is an adventure on a Sportster. You're on your own, happy and carefree as the wind.

Easy Monthly Terms

Your Harley-Davidson dealer will be pleased to show you how easy it is to own a fabulous new Sportster... arrange for a convincing test ride. Call him now or write for free literature.

HARLEY-DAVIDSON MOTOR CO.

Dept. P, Milwaukee 1, Wis.

NEW 1957 CATALOG 200 MODELS—SAVE 2/3

BOAT KITS

EASY TO BUILD—Designed for the amateur. Over 200

Models. Plans to Cruisers, 8 to 21 ft. Formed hulls. Semi and Custom finished. Save 50%... Now **NEW** Sea Ray Molded FIBERGLAS BOAT KITS. Truly professional results. NO upkeep. **SAVE 2/3** assembly time. 12 to 16 ft. Utilities and Runabouts. **SEND 35c** for 64 page Boat Kit & 24 page Sea Ray Catalogs. **SEND \$1.00** for both plus "Boating Handbook". Dealers inquire for franchise.

**BOAT PLANS
& PATTERNS
Frame-Pac Kits**

World's largest selection: over 200 plans, full-size patterns, frame-pac kits! Designed strictly for amateurs! All types: prams, kayaks, racers, runabouts, catamarans, houseboats, cruisers - inboard-outboard 6-40' wood-plywood-steel! **Send 35c for PLAN CATALOG** Catalog PLUS "Boatbuilding Handbook" \$1.00

WRITE NOW! CUSTOM CRAFT, BUFFALO 7A, N. Y.

the finest
FLOOR POLISHERS
are
Red Devil Tools.

Protect your home against
power interruptions
with an...

**ONAN Emergency
ELECTRIC PLANT**

Provides dependable stand-by electricity for heating system, pumps, freezer, lights, appliances. Keeps home safe, livable. Automatic start and stop. *Find out how little it costs!*

Write for Folder!

D. W. ONAN & SONS, INC.
3249 University Ave. S.E. Minneapolis 14, Minnesota

A SIZE FOR EVERY NEED
500 to 75,000 watts.
Compact, quiet-running.
Gasoline-powered
Priced from \$269.00

Make \$20 to
\$30 a Week

**EXTRA
MONEY**



MACHINE SAW FILING PAYS UP to \$3 or \$5 an HOUR

• Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$3 or \$5 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

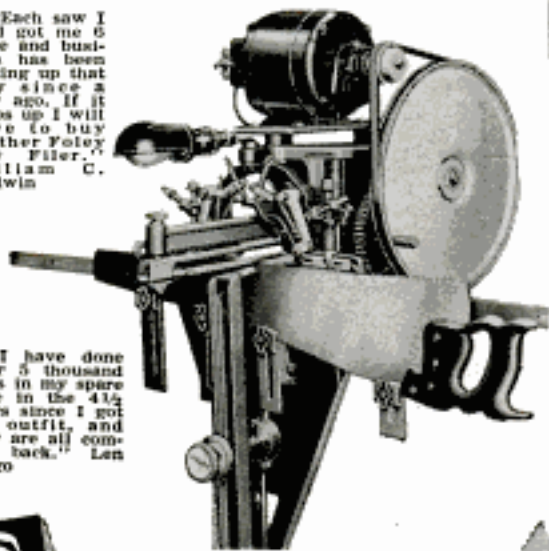
You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

SEND FOR FREE BOOK "MONEY MAKING FACTS"

Shows how you can get business from home owners, farmers, carpenters, schools, factories, etc. With a small investment, no overhead, no stock of goods to carry, you can get right into a cash business,—and possibly later on develop into a full-time repair shop. Send coupon today for Free Book. No salesman will call.

"Each saw I filed got me 5 more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer."
William C. Baldwin

"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back." Len Crego



Send Coupon for **FREE BOOK**

FOLEY MFG. CO., 616-7 Foley Bldg.
Minneapolis 18, Minnesota
Send **FREE BOOK** —
"Money Making Facts"



Name _____

Address _____

Buy Your Railroad Tickets by TV

(Continued from page 81)

staples it to the space coupon. The transaction is ended and you pay your money.

The original coupon listing the space sold is forwarded by pneumatic tube to the filing area where it will be quickly available until the moment the train departs. If there is a cancellation, it will be returned to its original slot in the rack.

The ticket machine not only prints the price, the tax and the total cost of the ticket, but makes a detailed record of every transaction on a four-inch-wide strip of tape. At the end of the day, this tape will show the total cash intake, eliminating many hours of tedious bookkeeping.

Telephone orders for reserved space are taken by one of the Pennsylvania Station's 72 information clerks. Each has a television receiver, dial system and Telautograph machine. The customer's name and the location at which he wishes to pick up the ticket are flashed to the coupon clerk via Telautograph so the ticket and reservation coupon can be forwarded instantly by facsimile to the ticket designated.

Still another innovation of the electronic ticket-selling system is the use of Intrafax machines in hotels and offices of large industrial firms. A clerk in the hotel or office merely puts an order on the Intrafax cylinder. A few minutes later, on the same machine, out comes a facsimile railroad ticket and space-reservation ticket on a single sheet of paper. This service was purchased by 25 firms before it went into operation, but facilities for 100 more firms, including banks and other railroad ticket offices, are being added. The service eliminates the need for messengers and bypasses the problem of congested city traffic. Intrafax customers are billed later by mail.

Although some availability boards list space on trains for several months in advance of their departure, most display only the available space on trains departing for a two-week period. When all the space of a certain type or for a given date is sold, the area on the availability board appears blacked out on the television screen.

Parlor-car reserved seats are handled at a different set of counters in another part of Pennsylvania Station. For parlor-car customers, the actual space coupon is sold when the ticket is purchased. Since these are sold without regard to location, and all are identical in price, they are simply handed out from a pack as they are needed. Only in the case of telephone orders are facsimile slips prepared for parlor-car seats. These are usually forwarded to a distant location. ★ ★ ★

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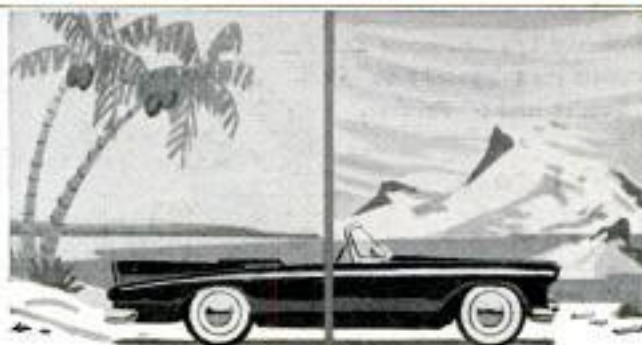
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MILLERS FALLS COMPANY
Dept. PM-18
Greenfield, Mass.

This offer expires June 30, 1957

We Chase the Jets on Film

(Continued from page 95)

slamming him against a brick wall. Earlier methods of escape aren't good enough.

One current idea is to power the pilot with his own personal rocket. If his aircraft gets into trouble, the rocket can shoot him up from the cockpit and ahead at the same time. He doesn't get hit by the tail of his own plane, and deceleration is less violent. On one early test the dummy was shot out of the plane as planned, but then the rocket tore away and ran wild. On the basis of our high-speed pictures, the engineers designed a stronger bracket for the rocket.

Our photographic branch handles every kind of assignment. Seven of the staff are qualified as aerial cameramen and they have done extensive photographic work while flying supersonic. Two-place versions of such aircraft as the F-100 are used as camera ships.

There's not much routine in their work. One man may be assigned to track a bomb after it's been released at high altitude. His camera ship may follow the bomb drop for thousands of feet and then level off in what amounts to a 7-G pull-out. At that time the 30-pound hand-held movie camera weighs the equivalent of 200 pounds pressing down in the photographer's lap.

Meanwhile, another cameraman may be filming spin tests of a new plane and a third

(Continued to page 230)

Photo officer adjusts the camera which shoots through a hole in the tail of the drag parachute sled





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\$795 Complete Unit

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CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

may be making air identification pictures of a new bomber.

Planning the camera layout for some jobs is complicated and we have a photo engineering unit for that purpose. The engineers lay out the locations of the cameras and how they will be triggered. One typical assignment was to make high-speed motion pictures of an aircraft taking off by the system known as "Zelmal" (zero launch, mat landing). For take-off, the plane is held in a launching position and becomes airborne with the help of a huge rocket booster under the fuselage.

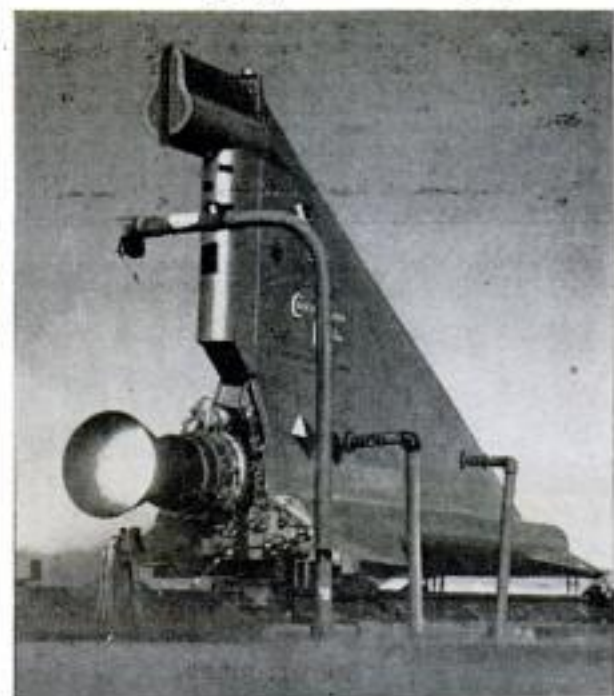
One camera was to be focused on the launching frame, one on the rocket bottle, and others were to track the bottle to the point where it dropped from the aircraft. In addition, a number of theodolite cameras were positioned to supply the following information: Altitude versus time, down-range distance versus time, flight-path deviation versus time and pitch angle versus time. Accuracy had to be within one foot of actual position at all times. Such an assignment had to be planned with care.

Another tough problem was how to make close-up pictures of raindrops smashing against a radome at Mach 2. A radome is an exposed nonmetallic housing where the radar antenna is located. Purpose of the pictures was to learn more about rain erosion of a radome surface at high speed.

It would have been simple to mount the camera on the rocket sled carrying the radome, but this would disturb the normal flow of air around it. The camera had to be

(Continued to page 232)

Big liquid-fueled rocket engine fires up before take-off on a high-speed test of drag parachutes



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ITEM #415—Designed for remote operation of controls on engines, boats, special machinery, etc. Eliminates complicated mechanical linkages, cables, pulleys, etc. The master unit connects to the slave unit with a single 1/4" tube.

When master control lever is moved, slave lever follows exactly. Light, compact, aluminum alloy construction. Dim. of both units: 5 1/4" W, 9" H, 1 3/4" D. (exclusive of handle) Ship. Wt. 8 lbs. P.O.B. Chicago. . . . **27.50** pair (Note — Tubing not supplied)

GROBAN FOUR-WAY OPEN CENTER HYDRAULIC CONTROL VALVE

ITEM #126 — Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs.

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MODEL 700 — 750 WATTS A.C. 59.50
Model 2000 — 2000 WATT A.C. Generator. 133.00

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These all bronze Centrifugal Pumps are ideal for use as marine bilge pumps, circulating pumps, fire protection or irrigation, car-washing, dewatering, basement sump pumping, lawn sprinkling. Will pump water, oil, brine, gasoline, DDT and sulphur compounds. Equipped with 6" adjustable 'V' pulley, 2" dia. inlet and outlet, 180 GPM capacity. Inlet and outlet take hose with 2 1/4" inside diameter. Dimensions: 11" x 8" x 11".

Total head-feet	Speed	H.P.	GPM
25	3600 RPM	3	180
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Back plate may be rotated for most convenient inlet position. Gov't acquisition cost \$96.00. Shipping weight 31 lbs. P.O.B. Chicago. . . . **29.50**

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ITEM #16-C — 1 1/2" bore, 26" stroke. Will lift 1760 lbs. with 1000 lbs. pump pressure. Great for hay loaders, etc. 1" stainless steel piston rod. Postpaid. . . . **16.95**

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BRAND NEW
ITEM #505 • For house movers, railroads • Construction Equipment • Machinery, rigging. 16-Ton Simplex screw jacks, 1 3/4" x 16", 4-way head type, with malleable iron base, and heat-treated steel handle. Shipping Wt. 35 lbs. P.O.B. Chicago, EA. . . **9.50**

Set of 4 — 35.00
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BRAND NEW 1 H.P. 12 Volt Electric Motor

For electric wheel chairs (Pop. Mech. Digest—Mar., 1957)
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For self-propelled scooters, children's mid-let cars.

ITEM #308
Rated 1 H.P., —100 amps., 5000 R.P.M., 12 volts, D.C.—This double shaft motor of ball-bearing construction may be run on 6 volts for lower horsepower requirements.—Standard 3/8" shafts, flange mountings.—Dimensions: 3" x 4 1/2" x 4 1/2" Ship. wt. 19 lbs. A real **12.50** P.O.B. Chicago

2 H.P. ELECTRIC MOTOR

24 Volts, 90 Amps., 4000 RPM, Split shaft both ends. Style similar to above. Mfgd. by Hobart or Diehl. **ITEM #315** P.O.B. Chicago. . . . **13.00**

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Please send me information on the Moog Ball-Bearing Idler Arm Kit and name of my nearest dealer.

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installed beside the track, together with the sprinkler heads supplying the "rain."

Here again careful planning was necessary. At 3000 frames per second, the 100 feet of film in the camera would last just 1 1/3 second. But one third of the film would be run off while the camera was accelerating up to speed, so we actually had less than one second of shooting time. And the long lens we were using had only an 18-inch field of view at the selected distance. This meant we had to catch the radome as it raced past a particular 18 inches of track at 1500 miles per hour.

All we got on the first run was a cloud of fog. The camera was late. On the third run we hit it on the nose and got sharp, clear pictures of what happens to an object when hit by raindrops at 1500 m.p.h.

We were asked recently if a camera, aimed to film bombs as they leave the bomb bay, could be attached to the wing tip of a B-47. It isn't as easy as it sounds. The flexible wing of a B-47 droops when on the ground, but straightens out in flight. You can calculate the angle at which the camera should be aimed, but there's another factor. The instant a B-47 is relieved of its bombs, the plane rises. The wings deflect momentarily and your camera misses its aim.

A problem like that is exasperating. We have others that are worse. For example: How would you mount a wing camera on a supersonic aircraft? You can't hang it outboard, as on a B-47. Turbulence would smash the camera and possibly the wing. Our solution was to have a small hole cut in the leading edge of the wing, with a mirror attached at an angle just inside the hole. The camera was placed inside the wing and aimed at the mirror.

That wing was ready for the scrap heap after its first flight. We hadn't anticipated the tremendous forces existing at Mach 1 and above. The small hole had disturbed the normal flow of air so violently that the wing was pounded out of shape in some places, ripped open in others. It looked as if it had been hit by flak. We had to try a different scheme for our pictures.

Sometime soon our rocket-sled track at Edwards will be lengthened to about four miles. Faster sled speeds will be possible, and a start will be made in full-scale studies of aerodynamic heating right on the ground. Surface temperatures may rise to 650 degrees. A whole structure won't have time to heat up, of course, but the skin will be too hot to touch. We're wondering what'll happen to our cameras mounted on these "hot" sleds.

We'll find out in time, and there'll be a whole new set of problems to solve in putting supersonic experiments on film. ★★

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(Continued from page 69)

of light on the sex of fish, and there is some evidence that certain wavelengths have a strong effect. Biologists are so interested they already are asking him to make similar studies on poultry and cattle. The implications are obvious.

Another time-lapse study shows cancer cells dividing. One of the principal characteristics of malignant cells is that they reproduce wildly. Ott's films, of great interest to scientists studying the cause or causes of cancer, actually show the division of cancer cells in such detail you can even see the chromosomes ("threads" which carry the hereditary genes) lining up in orderly fashion prior to the division.

Cancer in a Glass Cage

For Northwestern University, Ott set his cameras to spying on the life secrets of cancer cells for a full year. He imprisoned malignant-tumor cells inside a glass cage, and rigged pipes to the prison which fed nourishment in the form of plasma and saline solution to the vigorously growing cells. His cameras took one exposure every 30 seconds, day and night, for a year. In that year he obtained 1,041,200 separate pictures on 65,075 feet of film, certainly the most intensive study ever made of cancer.

Occasionally Ott is so wound up in his scientific studies that he can't sleep at night. "Then something compels me to get up and head for the laboratory to see if anything has happened," he says.

Sometimes things happen that aren't anticipated. When Ott screened a microscopic study of pollen, he saw what he hoped to catch, but something else stole the show. In one corner of the screen, a cell-like body appeared to be going crazy, trembling violently and changing shape so fast he scarcely could trace its movements. This strange "thing" which crept onto the stage is still a mystery to biologists.

Ott makes no pretense of being a specialist in this microscopic world, and makes it clear that he leaves the interpretation of his films to qualified scientists. There is a universal desire on their part to lay their hands on more of his work. In the short time he has been showing his microscopic studies, he has been besieged by universities and medical laboratories to tackle specific assignments. Right now he's at the crossroads, and can turn down any number of paths he wants to investigate.

Chill and Warm Cycles

He has turned up one interesting theory

(Continued to page 236)

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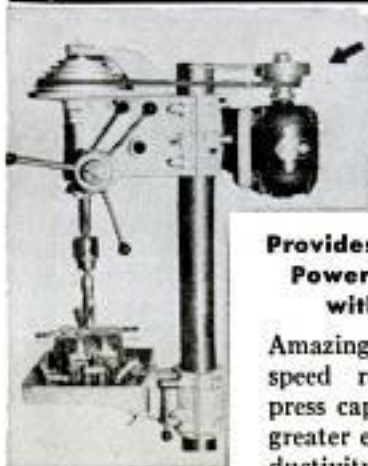
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that he wants to pursue. A gardener by inclination, he has long been aware that certain plants (tulips are a common example) require a chilling period—winter—then a warming period before they will germinate. Ott suddenly observed that this phenomenon carried over to his medical studies. For some time, cancer specimens had been brought to him in heated containers from a university, and he had observed them in their heated stage. For long weeks he could see no activity. One day the lid fell off the heated container during the trip to the laboratory. Ott was tempted to throw the specimen away, but decided to put it under a microscope anyway. To his surprise, the sample showed intense activity. Subsequently, he found that many living specimens which were chilled and warmed again behaved spectacularly.

In a study of black spot on roses (caused by a microscopic spore) he couldn't force any black spot to appear, although he knew the spore was present. One day he discovered that the laboratory's night thermostat was failing to function. As a result, the heat wasn't turned down at night and the laboratory was maintained at the same temperature continually. When the thermostat was repaired, black spot immediately began to develop on the rose leaves. Subsequent experiments proved that the spore had to go through a chill-warm cycle before it would do its damage.

Similarly, he has observed insects going through the pupa stage in winter. He is convinced this is not merely a protective stage, but that the chill-warm cycle is vital to their existence. He further is convinced this chill-warm phenomenon is more important to many life processes than is generally believed. Most medical authorities agree that chilling plays an important part in the common cold, infantile paralysis and other illnesses. Ott feels that the complete cycle, chilling and warming, is essential. In one study he made of the secretions of common-cold victims, long tentaclelike growths attacked the body cells. Chilling and warming speeded up this activity.

Ott also is excited about the prospect of industrial uses of time-lapse movies taken through a microscope. In metallurgy, such films would be of great value in the study of corrosion and molecular change.

John Ott is a modest man. He speaks in soft terms of his accomplishments, but he speaks enthusiastically of the time-lapse technique that makes them possible. Scientists are even more enthusiastic about this new research tool. It's quite possible that this technique may play an important part in the solution of some of our greatest medical mysteries. ★ ★ ★

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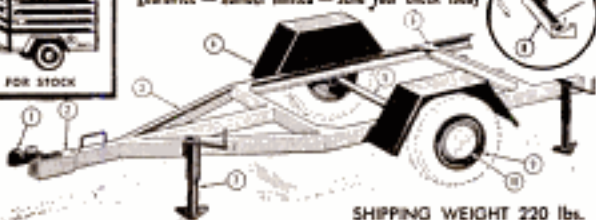


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Hiller Helicopters to Develop X-18 Tilt-Wing Plane

Propeller-driven, tilt-wing transport aircraft, capable of vertical take-off and landing, are now under development. They have

less hovering ability but greater forward speed than copters. Illustration shows phases of vertical to forward flight.



British Machine Is Versatile

Back-yard gardeners will find plenty of use for a small British power tool that can weed, dig, hoe, cut grass, trim hedges or, if you wish, polish your car. A universal coupler fits to the end of the drive shaft and powers a variety of tools. The air-cooled engine develops one horsepower. The entire machine weighs only 58 pounds and can cultivate between rows.

CAA Controls More Airspace

All airspace above 24,000 feet has been taken under the control of the Civil Aeronautics Administration. This more than triples the amount of airspace controlled by the CAA. Under the old system the CAA controlled traffic only when it was moving along the 90,000 miles of designated airways, or in the control zones of airports. The new system controls all airspace above 24,000 feet regardless of whether it has been designated an airway. Eventually the CAA plans to provide positive separation of all aircraft at the upper levels.



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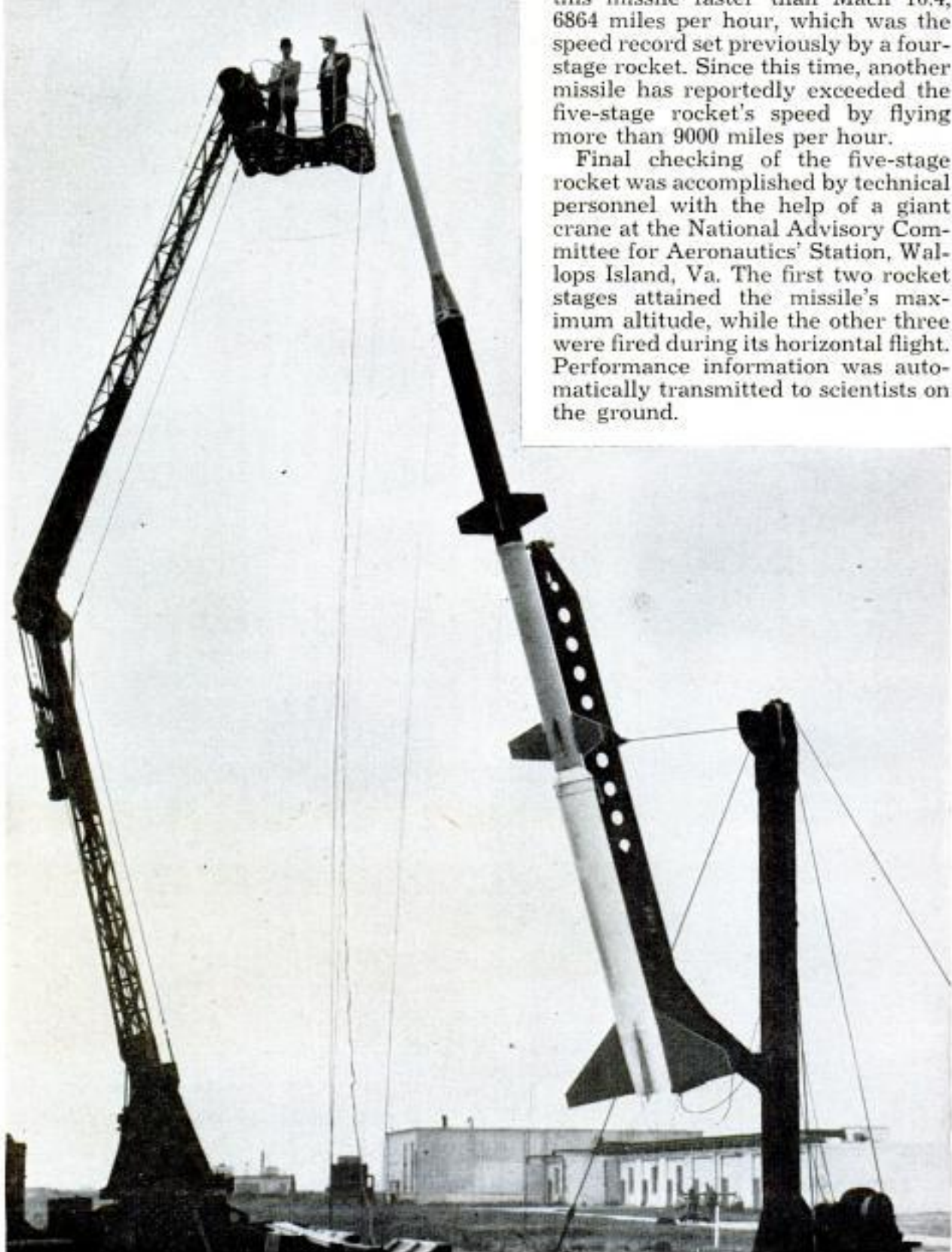
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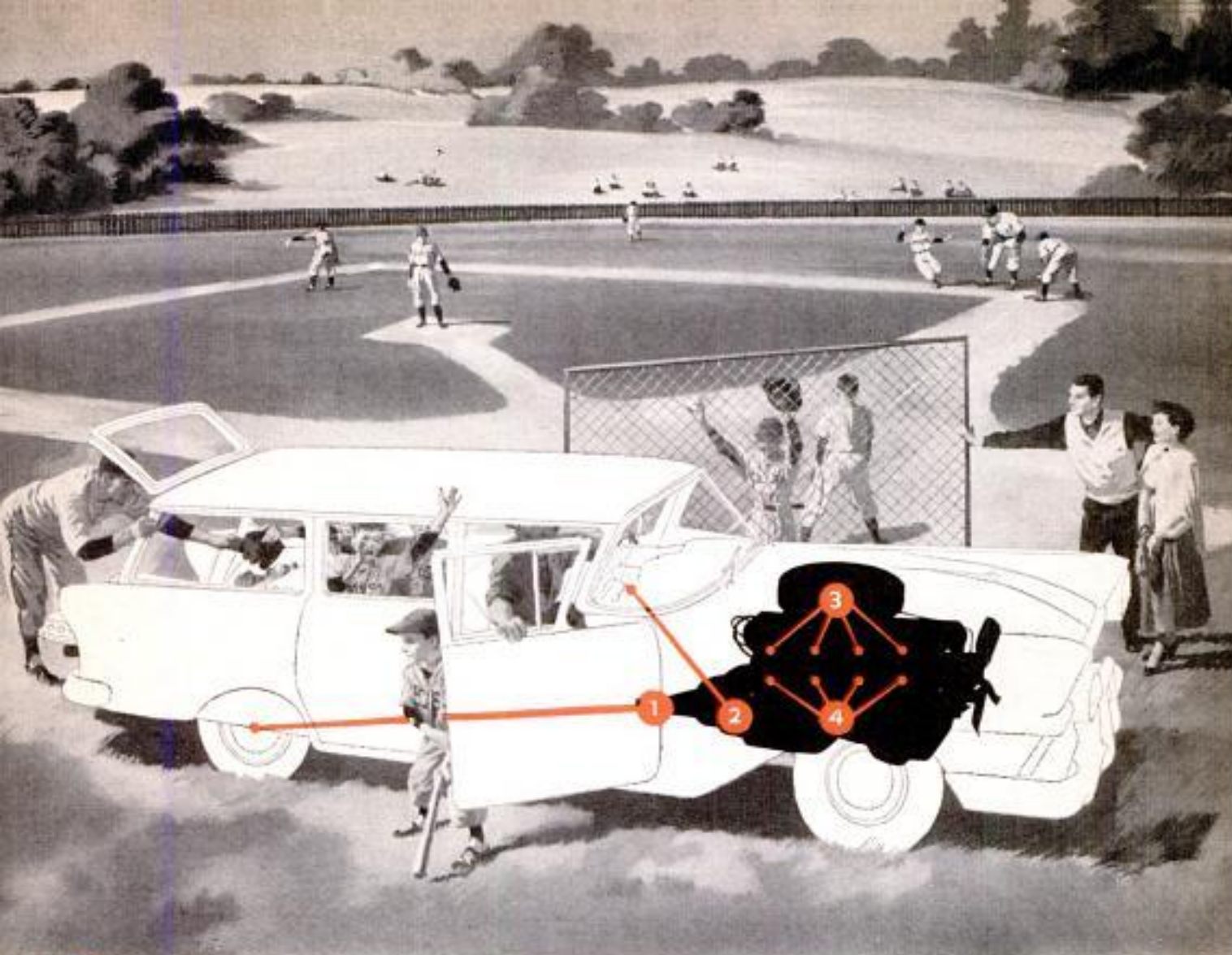
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Five-Stage Rocket Exceeds Mach 10

FIVE STAGES of rockets propelled this missile faster than Mach 10.4, 6864 miles per hour, which was the speed record set previously by a four-stage rocket. Since this time, another missile has reportedly exceeded the five-stage rocket's speed by flying more than 9000 miles per hour.

Final checking of the five-stage rocket was accomplished by technical personnel with the help of a giant crane at the National Advisory Committee for Aeronautics' Station, Wallops Island, Va. The first two rocket stages attained the missile's maximum altitude, while the other three were fired during its horizontal flight. Performance information was automatically transmitted to scientists on the ground.





1 More road horsepower— Your car will act young again when you put in 5-rib Champion spark plugs! Independent engi-

neers proved new Champions give cars of all makes an *immediate* boost in the real power actually delivered at the rear wheels. Most

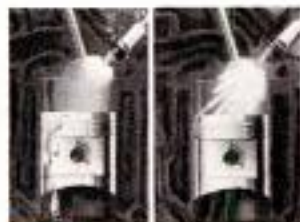
cars gained 6% to 31%—for better hill climb and safer passing. No wonder 9 out of 10 racing drivers insist on Champion spark plugs.

If you haven't changed your plugs in about 10,000 miles—

You can make your car 4 ways newer with Champion spark plugs



2 Quicker starts—Your engine will start quicker, too...save time and battery wear. Tests with cars whose plugs had gone about 10,000 miles show that new Champions cut starting time as much as 71%—with an average of 39%!



3 Less engine wear—You'll save costly repairs! Old misfiring plugs (left) dilute oil with raw gas. New full-firing Champions (right) burn the gas...protect oil from dilution. *When changing oil—be sure to check your spark plugs!*



4 Lower cost-per-mile—You get top power and gas economy for life of the plug. Champion's great new Powerfire electrode stands up better than ordinary types—as photo above shows. Always insist on 5-rib Champion spark plugs!



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are you SCIENCE MINDED?

DO YOU HAVE a natural aptitude for science? The following quiz will give you a clue. It's a shortened version of a 2½-hour examination given by the Science Clubs of America in a search for tomorrow's research scientists.

Don't be discouraged if the questions look tough. They are tough. The test isn't designed to test your over-all knowledge or reasoning ability, but only your aptitude toward science.

There are 17 questions with 28 different answers to be provided. Give yourself one point for each correct answer (a perfect score would be 28). Based on a random sample of high-school seniors who have taken the test, a high score is 18 or better; average, 10 to 17; and low, 9 or less. You'll find the answers on page 252.

1. One kilowatt is equivalent to 2,654,200 foot-pounds per hour. One horsepower is equivalent to 33,000 foot-pounds per minute. How many kilowatts are equal to one horsepower?

1. $\frac{33,000}{2,654,200}$
2. $\frac{33,000 \times 60}{2,654,200}$
3. $\frac{33,000 \times 2,654,200}{60}$
4. $\frac{2,654,200}{60 \times 33,000}$

Should be #2 not #4 as shown on p 252

2. Which one of the following terms or concepts does not apply to lichens?

1. Fungus 2. Perennial
3. Seeds 4. Symbiosis

3. Leprosy is caused by a

1. Bacillus 2. Chemical irritant
3. Protozoan 4. Virus

4. The diagram shows the relative size of the earth and another celestial body. On the basis of relative size, which of the following is the most likely identity of the larger body?

- 1. Jupiter
- 2. Mars
- 3. Polaris
- 4. Sun



5. Androgens have been made from

- 1. Ascorbic acid
- 2. Cholesterol
- 3. Insulin
- 4. Trypsin

6. Hyperon refers to

- 1. Unit of measurement
- 2. Guided missiles
- 3. Hormones
- 4. Subatomic particles

7. If a sphere of 10-inch radius represented the earth (sea level), about how far would a projection representing a mountain range with a height of 15,000 feet project from the surface of the sphere if the scale were the same?

- 1. .0025 inches
- 2. .0075 inches
- 3. .0250 inches
- 4. .1000 inches

8. The first successful separation of rare-earth elements as free ions, reported in 1955, made use of what method?

- 1. Chromatography
- 2. Ion-exchange resins
- 3. Magnetic centrifuging
- 4. Successive precipitation

9. A special type of temperature-sensing element which can transmit a strong signal from a very tiny temperature change is a

- 1. Thermion
- 2. Thermistor
- 3. Thermocouple
- 4. Thermophile

10. According to Charles Darwin, "A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase. Every being, which during its natural lifetime produces several eggs or seeds, must suffer destruction during some period of its life, and during some season or occasional year, otherwise, on the principle of geometrical increase, its members would quickly become so inordinately great that no country could support the product. Hence, as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical con-

(Continued to page 244)

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(Continued from page 243)

ditions of life. It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraint from marriage. Although some species may be now increasing, more or less rapidly in numbers, all cannot do so, for the world would not hold them."

It can best be inferred from this paragraph that:

- 1. The natural laws of reproduction serve to keep all organic beings in check;
- 2. The principle of geometric increase serves to keep all organic beings in check;
- 3. There is always a struggle for survival, keeping organic beings in check;
- 4. When environment is limited, a struggle for survival must occur.

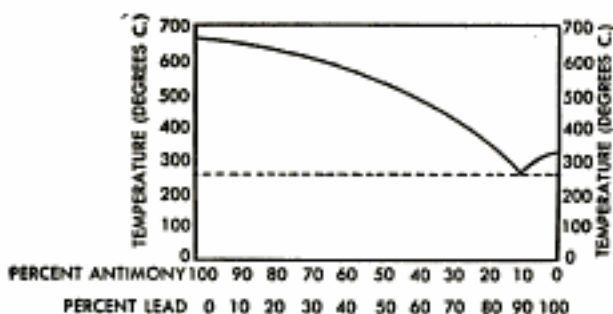
11. In Darwin's statement the doctrine of Malthus evidently refers to

- 1. Manifold force;
- 2. The fact that natural limits cannot be overcome, even by living organisms;
- 3. The fact that organic beings, if allowed, will overgrow the capacity of their surroundings;
- 4. The fact that the animal and vegetable kingdoms are in constant strife.

12. According to Darwin, the constant battle which each organic being wages against the other is due, first of all, to

- 1. Food problems
- 2. High reproductive rate
- 3. Natural enmity
- 4. The animal-vegetable cycle

(Graph below applies to questions 13, 14 and 15.)



13. This graph shows the relationship between melting temperature and composition of antimony-lead alloys.



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The graph clearly shows that

- 1. Antimony decomposes lead
- 2. Lead and antimony are insoluble
- 3. Lead has a lower melting point than antimony
- 4. Lead is softer than antimony

14. As the percentage of antimony increases from 0 to 100, the melting temperature of the alloy

- 1. Decreases
- 2. First decreases, then increases
- 3. Increases
- 4. Remains constant

15. A mixture of lead and antimony with the lowest melting point consists of

- 1. 10% lead and 90% antimony
- 2. 50% antimony and 50% lead
- 3. 90% lead and 10% antimony
- 4. None of the mixtures listed in the other three answers

16. Underscore the correct chemical name for each of the following substances

1. Hypo (sodium hypochlorite) (sodium thiosulfate)
2. Marsh gas (methane) (methanol) (trichlormethane)
3. Rare earths (actinide series) (lanthanide series)
4. Saltpeter (potassium nitrate) (sodium nitrate)
5. TNT (trinitrophenol) (trinitrotoluene)

17. Column I lists enzymes and hormones. Column II lists the glands that secrete them. Place the number of the gland from column II in the parentheses in front of the appropriate name in column I.

- | | |
|---------------------|-----------------------|
| () 1. ACTH | 1. Adrenal cortex |
| () 2. Erepsin | 2. Adrenal medulla |
| () 3. Insulin | 3. Gastric glands |
| () 4. Parathormone | 4. Intestinal glands |
| () 5. Pepsin | 5. Liver |
| () 6. Ptyalin | 6. Pancreas |
| () 7. Rennin | 7. Parathyroid glands |
| () 8. Thyroxine | 8. Pituitary gland |
| | 9. Salivary glands |
| | 10. Thyroid gland |

For answers to quiz see page 252



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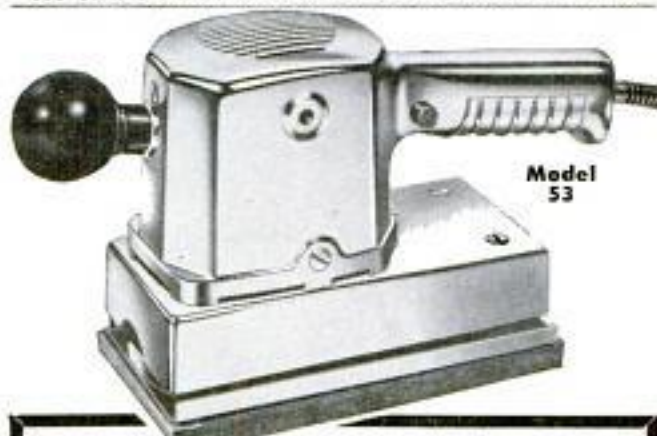
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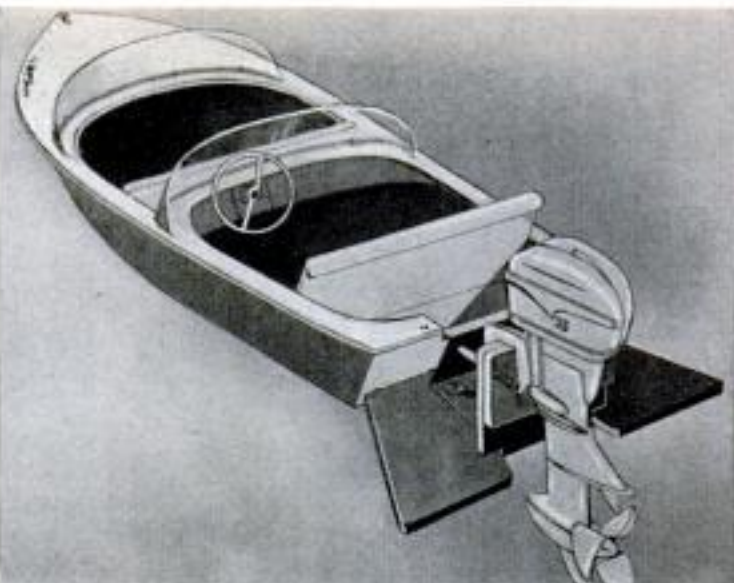
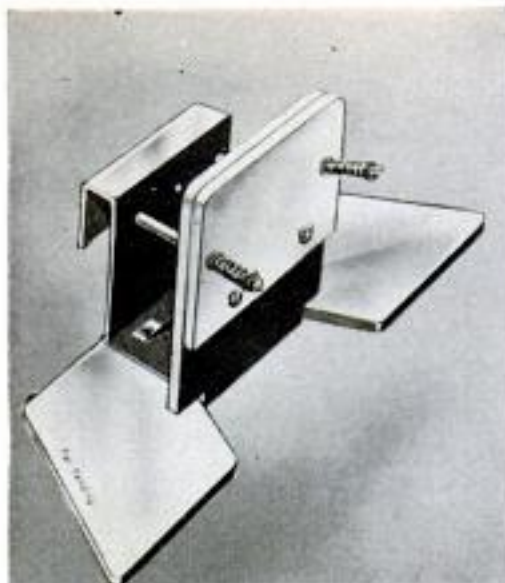
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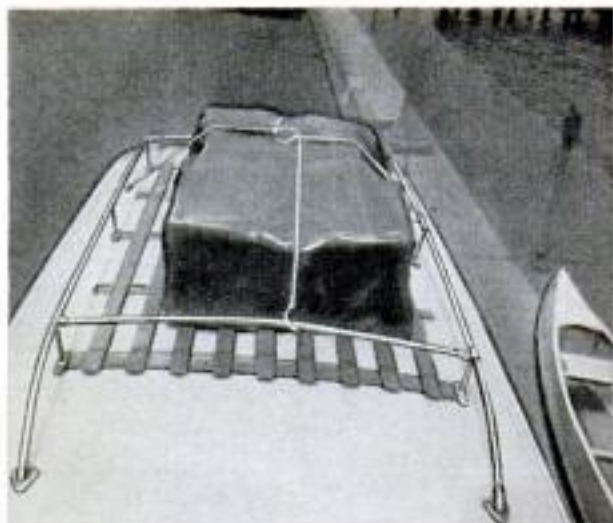


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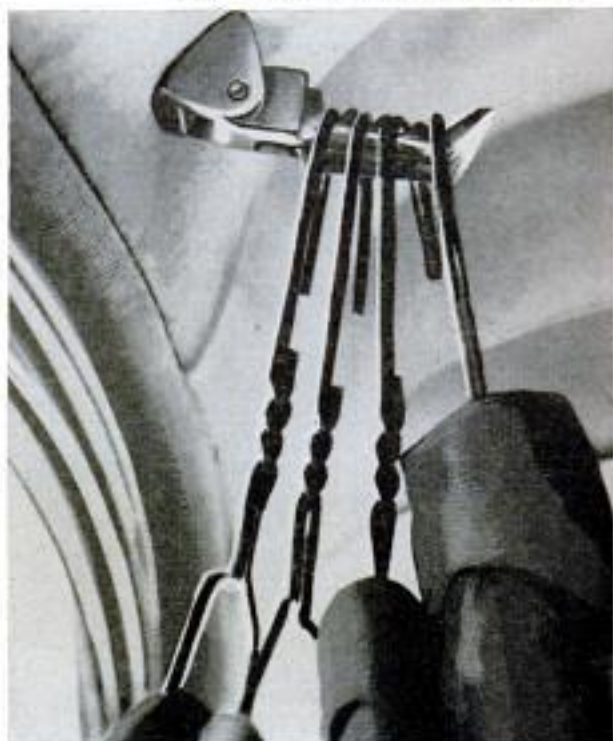
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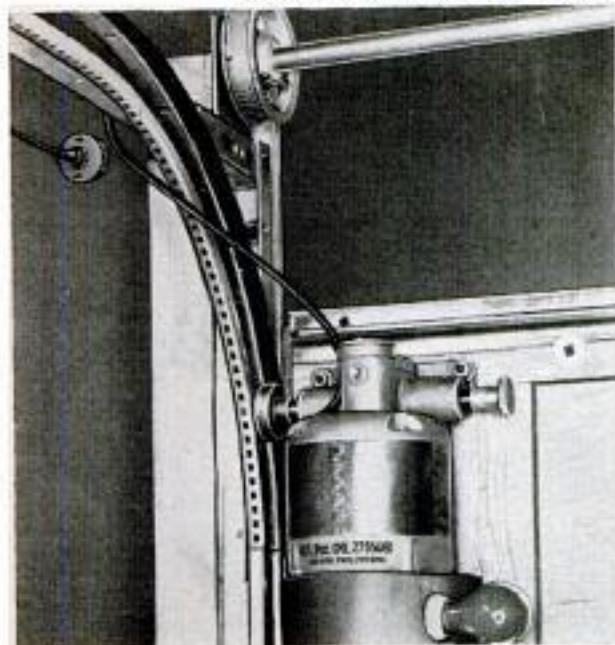
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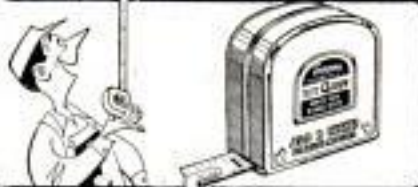
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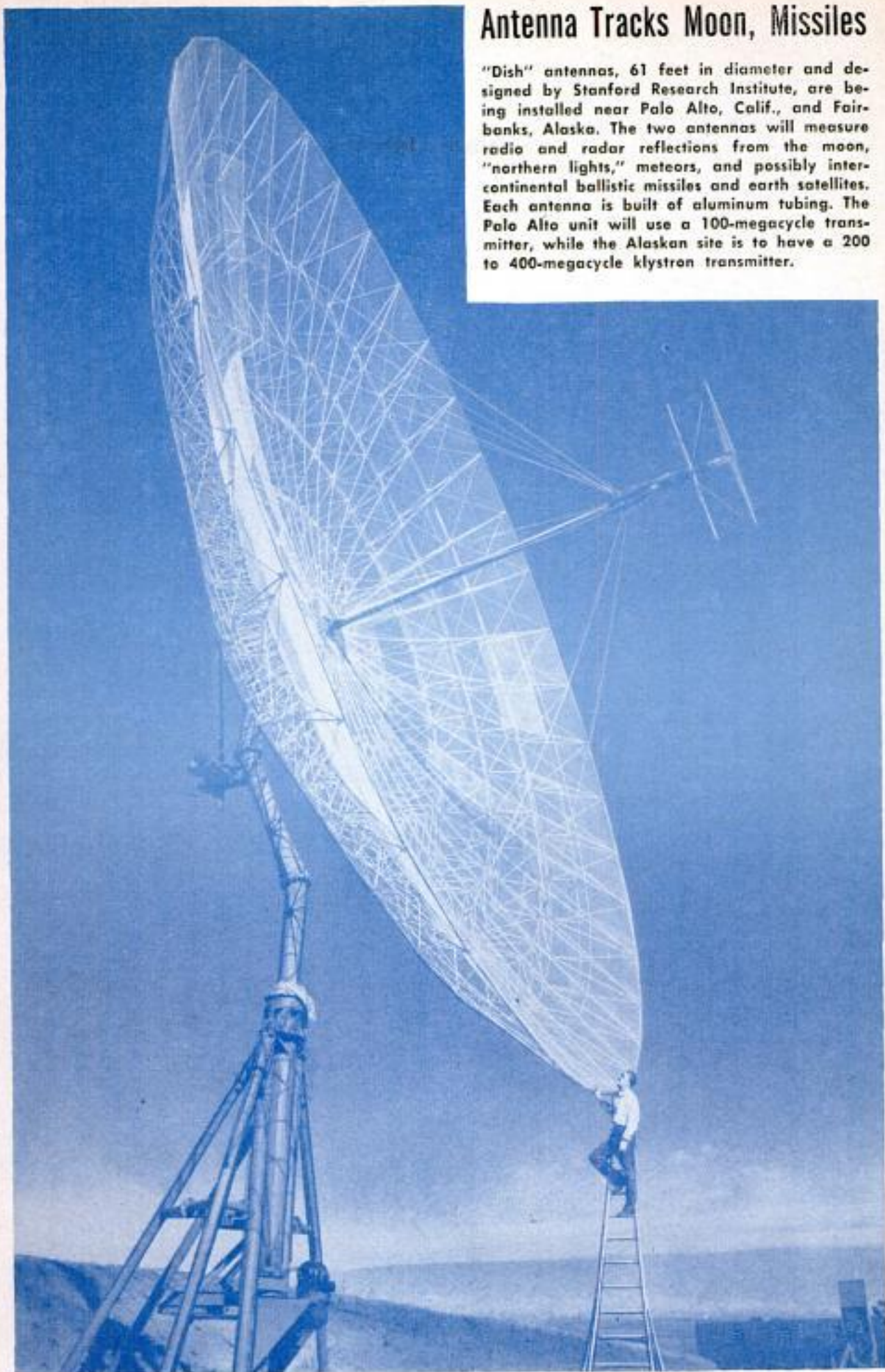
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"Dish" antennas, 61 feet in diameter and designed by Stanford Research Institute, are being installed near Palo Alto, Calif., and Fairbanks, Alaska. The two antennas will measure radio and radar reflections from the moon, "northern lights," meteors, and possibly intercontinental ballistic missiles and earth satellites. Each antenna is built of aluminum tubing. The Palo Alto unit will use a 100-megacycle transmitter, while the Alaskan site is to have a 200 to 400-megacycle klystron transmitter.





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Fluid samples from prospective oil-bearing rock formations can be obtained for analysis with a tool that is lowered on an electric cable into position opposite the suspected formation. Discharged electrically, a hollow bullet attached to an alumi-

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num tube is fired into the rock. Formation fluid flows through the bullet's open nose, along the tube and into a small reservoir.

A valve seals the reservoir when full and a slight pull frees the tool. Five tests can be made each time the tool is lowered.

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Mercury, wobbling around like a worm in a transparent, tubular fishing lure, provides continuous wiggle, dive and dart enticing to fish. With a red head and tail, this 1/4-ounce plastic lure pulls a treble hook and appears to be a real worm moving deep through the water, or just under the surface during trolling. When a retrieve is halted briefly, the lure goes into a wiggling "dive."

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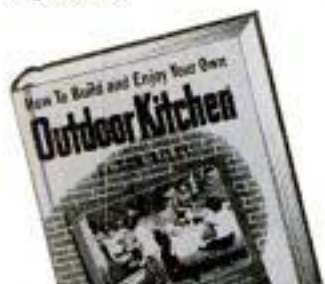
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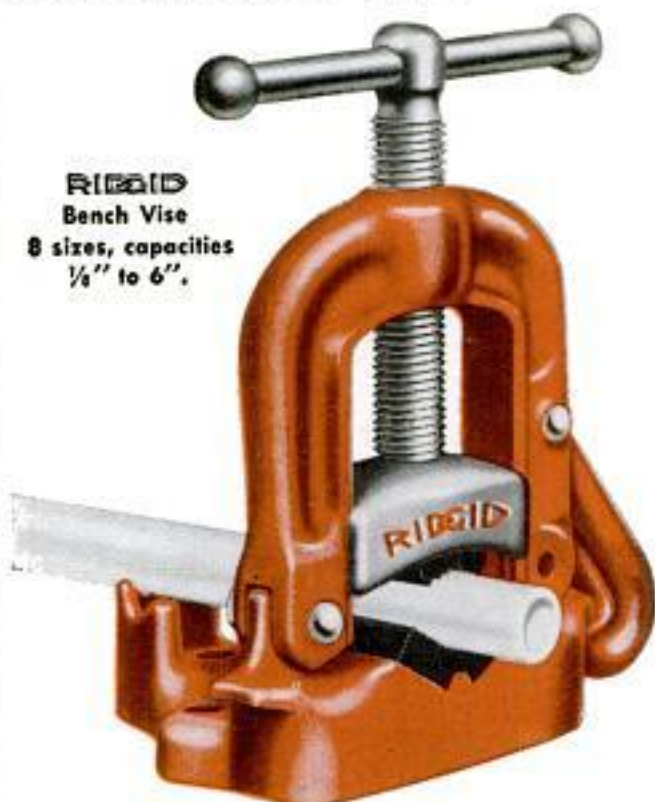
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Cardboard Cathedral Model

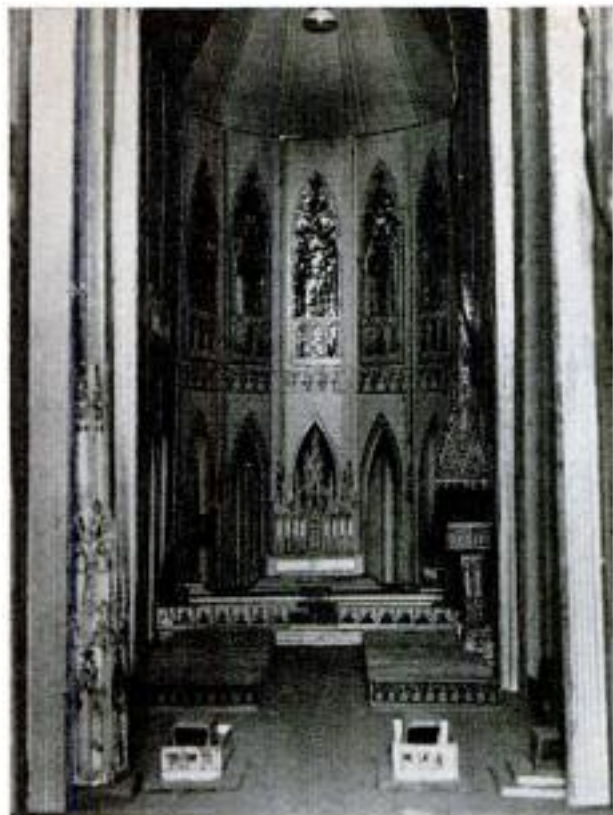
Cardboard church models are the hobby of Franz Boehm, formerly of Prague, Czechoslovakia, and now living in Wiesbaden, Germany. Working with scissors in his home, Boehm recently built a scale model of the cathedral at Cologne. The model's towers are four feet high.

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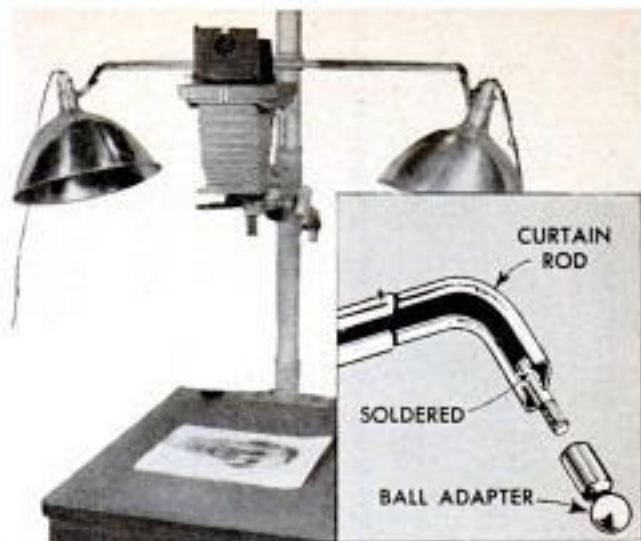
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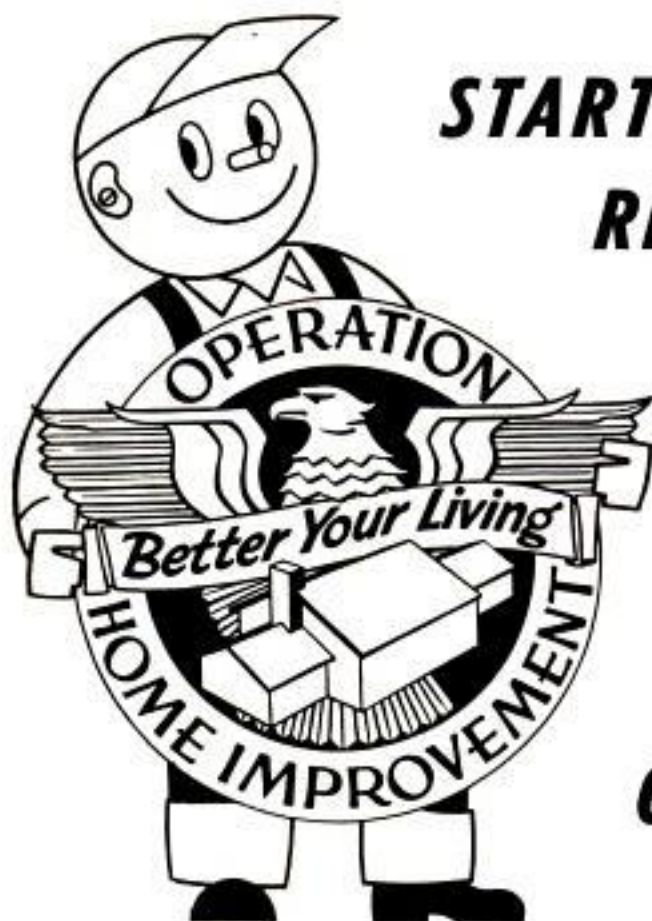
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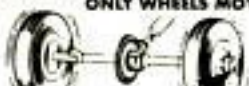
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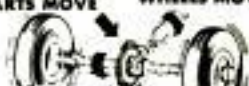
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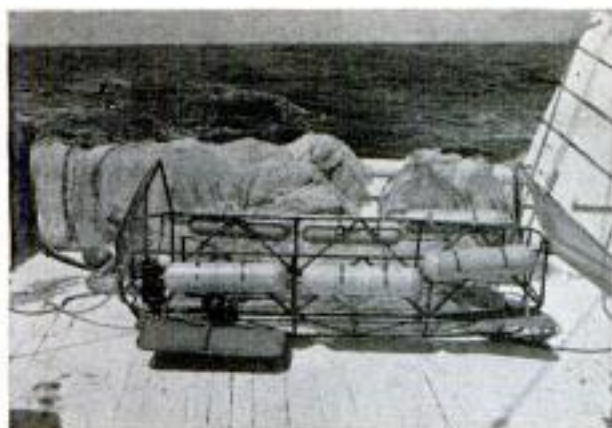
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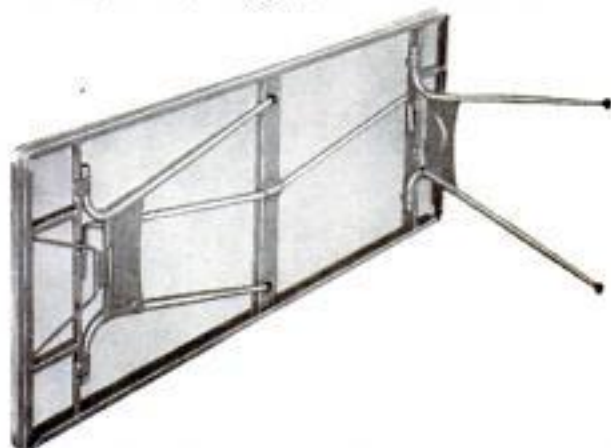


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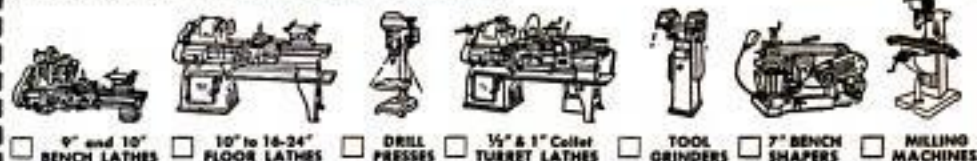


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