

AUGUST 1956

35 CENTS

# POPULAR MECHANICS

## MAGAZINE

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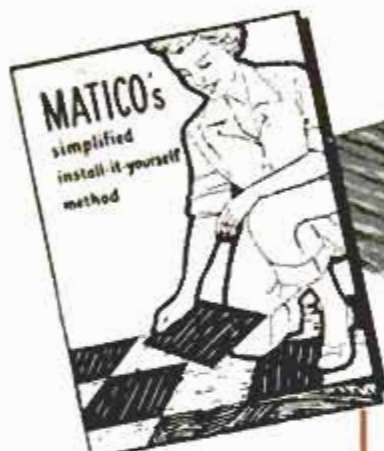
—See page 76



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Right now, it's a fun-packed game room for all the family to enjoy. But within minutes it can be transformed into a cozy guest room where overnight guests can sleep in comfort.

Day or night, it reveals a lot of really workable ideas—ideas for efficient use of space, for making the room look more attractive, for adding luxury to your living.

It's fun to build. The room you see is

planned for a 12-ft. by 15-ft. area, but our free plan shows how to use your available space to best advantage with Masonite Panel products. Right now these strong, grainless, easy-to-finish panels are offered in several new surface designs that add so much to the "atmosphere" of your room. See them all at your lumber dealer's. Or send the coupon—now!



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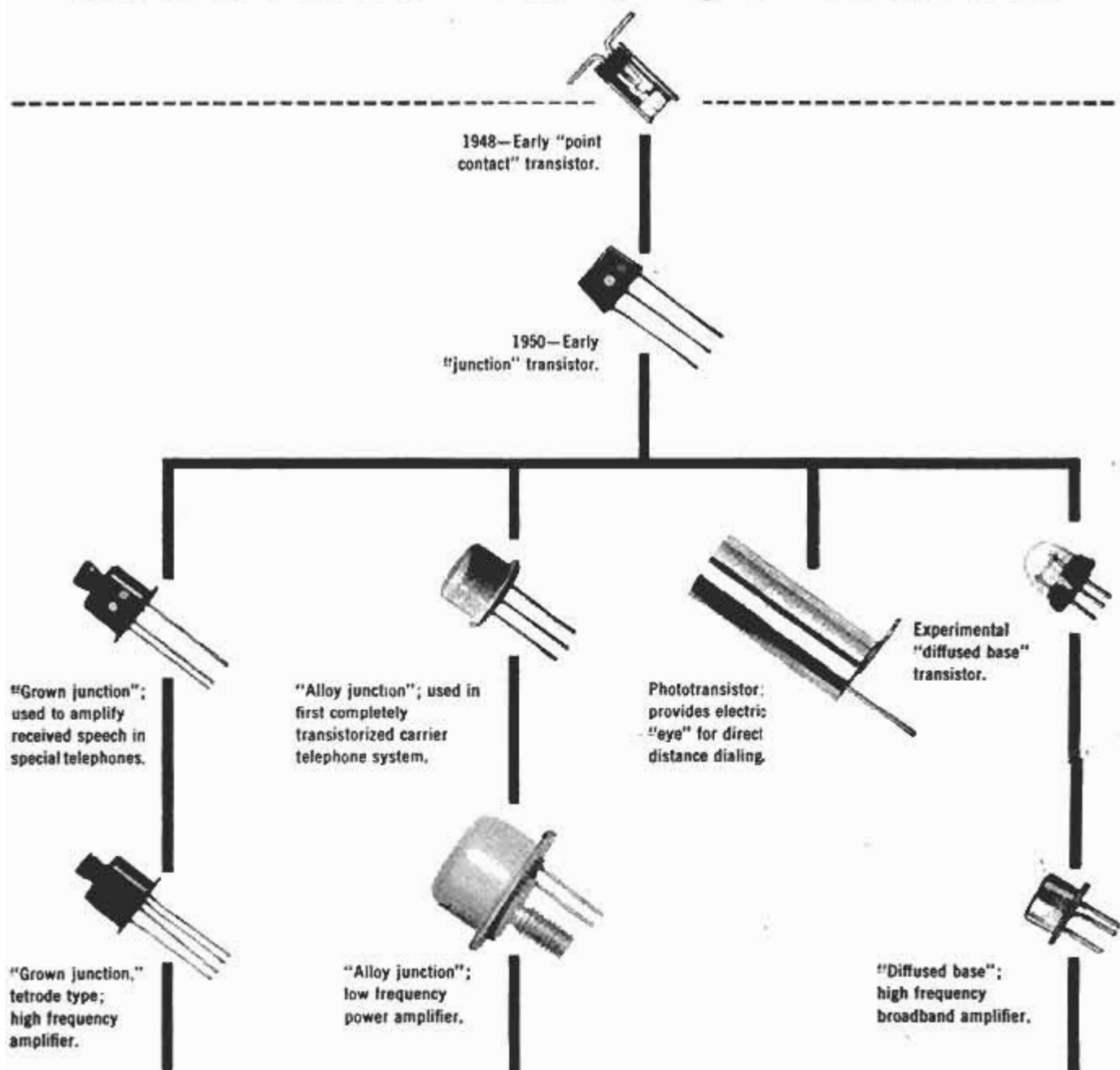
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1 This One



2 5Y5X-HY5-UA2Z

# TRANSISTORS—first family of electronics



In 1948 Bell scientists announced their invention of the transistor—a tiny device able to amplify signals a hundred thousand times using a small fraction of the power of an electron tube. From this original "point contact" transistor has grown a distinguished family of immense usefulness to electronics. Some of its leading members are shown here, in approximate actual size, with their type names.

For telephony the transistor has opened the way for notable advances in instruments, transmission and switching. Elsewhere it has opened the way to advances in hearing aids,

television, computers, portable radios and numerous military applications.

Bell's transistor family is typical of the Bell Laboratories research that helps keep your telephone service the world's best—and at the same time contributes importantly to other fields of technology.

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POPULAR MECHANICS



# Popular Mechanics Magazine

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H. H. WINDSOR, Founder

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



## Next Month

HOW MANY TIMES have you wanted to take good indoor snapshots of the family without an elaborate system of flash or flood lighting? Well, you now can get photos as appealing as the one above, and you can do it in ordinary room light or with the help of just one small bulb. Furthermore you can snap top-notch sports pictures and candid shots without professional equipment. Even the old-time box camera can yield sparkling prints on cloudy days. A feature next month, "Indoor Pictures Without Flash," will tell you how to use the remarkable new "superfast" films

Sources of further information not listed in the index, starting on page 58, about articles in this issue, frequently are shown in the Where-to-Find-It List prepared for each issue. A copy may be obtained by readers, without charge, from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11, Ill.

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for other items and manufacturers of available products





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**New Powerfire electrode** stands up better in today's high-power engines. Photo shows how ordinary electrode (left) burns away. Champion's Powerfire electrode (right), after identical use, is still good for many more miles of powerful performance!



## ACROSS THE DESK



When Charles F. Kettering talks, it pays to listen. Retired — but still busy — vice-president of General Motors Corporation, he played a large part in the development of the self-starter, tetraethyl lead for high-octane gasoline, the electric cash register, ignition and lighting systems for automobiles and a host of other inventions. We thought PM readers would be interested in these excerpts from Mr. Kettering's remarks at the opening of General Motors' new technical center at Warren, Mich.:



"To me a technical center is a place where people can think and develop ideas . . . if we took all the people out of it, we know that nothing would come of it. . . . Ideas are developed in the mind.

"We have roughly 60,000,000 cars,

trucks and so forth in the United States. If we allocated five seats to a vehicle; that gives us 300,000,000 seats. We have only 160,000,000 people, so we can take all of the people of England, France, Italy, Spain and Portugal along as guests, and I am sure some think we do that every Sunday.

"The great difference between an inventor and a scientist is the fact that the inventor, when he fails, counts it as a practice shot, and it doesn't make any difference how many times he makes it. . . . The inventor fails 9999 times and if he succeeds once, he is in. Here in this institution we have the place where scientists can make many practice shots, and the only time we don't want to fail is the last time we try it.

"The thing we need to do is to have in our minds the idea that the future is infinite. You can't avoid it. What are you going to do with it, then? It should be compulsory to use it in the best way that we can.

"Anything you can think of today can be done, but it takes time. How long from the concept of an idea is it before we have the product in the hands of the customer? It is 50 or 60 years sometimes before an idea develops, but if we recognize that there is a definite time in which an idea can become a product, provided the customers are available for it, the future is the greatest

(Continued to page 8)

## New greaseless way to keep your hair neat all day

Billy Pierce took a shower . . . then he used Vitalis



White Sox lefthander Billy Pierce rarely goes to the shower before the game ends.

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Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

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(Continued from page 6)

natural asset we have. You make its value, depending upon how you think."

Popular Mechanics editors present birthday greetings and good wishes to Mr. Kettering, an extraordinary man to whom America and the world owe much. He will be 80 years old on August 29.



Vacation ruined by rain? Next time get it insured. You can't stop the rain, but an insurance company now issues a policy which enables the vacation traveler to collect up to a maximum of \$300 a week for trips spoiled by excessive rain.



When Tom Stimson, our Western editor at Los Angeles, was prowling around the set of the new Todd-AO movie *Around the World in 80 Days*, he discovered a man with an interesting profession. Alex Sinel (at left in photo, facing Stimson) builds trees. The tree shown here is one of the synthetic



evergreens Mr. Sinel was fashioning for a forest background in one of the movie scenes (see Mr. Stimson's story beginning on page 65); it's a desert yucca stalk drilled to receive branches of juniper, then realistically painted. In chatting with Mr. Sinel amid his make-believe forest, Tom discovered he is a regular reader of *Popular Mechanics*, says his subscription is paid up to 1960!

(Continued to page 10)



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(Continued from page 8)

### Indian Craftsman

At Wisconsin Dells, famed beauty spot of the Midwest, the people call Roger (Chief Little Eagle) Tallmadge "the man of many jobs and many faces." He is a schoolteacher, boat pilot, expert craftsman (see page 72), museum operator, biologist, actor, civic worker and Indian chief of the Sioux tribe.



In the schoolroom, Chief Little Eagle has the face of a kindly young professor (which he is). When he dons his jaunty pilot's cap, he is the happy-go-lucky boatman of inland waters exchanging banter with gay tourists. But when he puts on his feathered head-dress and full regalia he is all Indian. Born on a reservation in Minnesota, Little Eagle has come a long way and has the college degree of bachelor of science. He likes to think that some of the things he has accomplished may be an inspiration to the youth of his race.

#### To the Editor:

I was glad to receive the cutting headed "Watery Coal Mine" describing our under-sea boring in the Firth of Forth (page 132, PM, April 1956). May I point out that it is a 500, not a 5000-ton tower?

Henry Donaldson,  
Press officer,  
National Coal Board,  
London, England

#### To the Editor:

I was interested in the letter from Newt Stairs in the April issue. I can go him one better. I have a March 1906 issue of PM and have nearly all issues since then.

Lowry Sexton,  
The Dalles, Ore.



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Nothing takes the place of PRACTICAL EXPERIENCE. That's why NRI training is based on LEARNING BY DOING. You use parts I send to build many circuits common to Radio and Television. With my Servicing Course you build the modern Radio shown at left. You build a Multitester and use it to help make \$10, \$15 a week fixing sets in spare time while training. All equipment is yours to keep. Coupon below will bring book of important facts. It shows other equipment you build.

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# I Will Train You at Home in Spare Time to be a **RADIO-TELEVISION** Technician

## TELEVISION

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"I have progressed very rapidly. My present position is Studio Supervisor with KEDD Television, Wichita."—Elmer Frewaldt, 3026 Stadium, Wichita, Kans.

"Fix sets part time in my shop. Made about \$500 first three months of the year. Could have more but this is about all I can handle."—Frank Borer, Lorain, Ohio.

"I've come a long way in Radio and Television since graduating. Have my own business on Main Street."—Joe Travers, Asbury Park, New Jersey.

"I didn't know a thing about Radio. Now have a good job as Studio Engineer at KMMJ."—Bill Deltzell, Central City, Nebraska.



**BROADCASTING:** Chief Technician, Chief Operator, Power Monitor, Recording Operator, Remote Control Operator. **SERVICING:** Home and Auto Radios, Television Receivers, FM Radios, P.A. Systems. **IN RADIO PLANTS:** Design Assistant, Technician, Tester, Serviceman, Service Manager. **SHIP AND HARBOR RADIO:** Chief Operator, Radio-Telephone Operator. **GOVERNMENT RADIO:** Operator in Army, Navy, Marine Corps, Forestry Service Dispatcher, Airways Radio Operator. **AVIATION RADIO:** Transmitter Technician, Receiver Technician, Airport Transmitter Operator. **TELEVISION:** Pick-up Operator, Television Technician, Remote Control Operator.



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A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent, registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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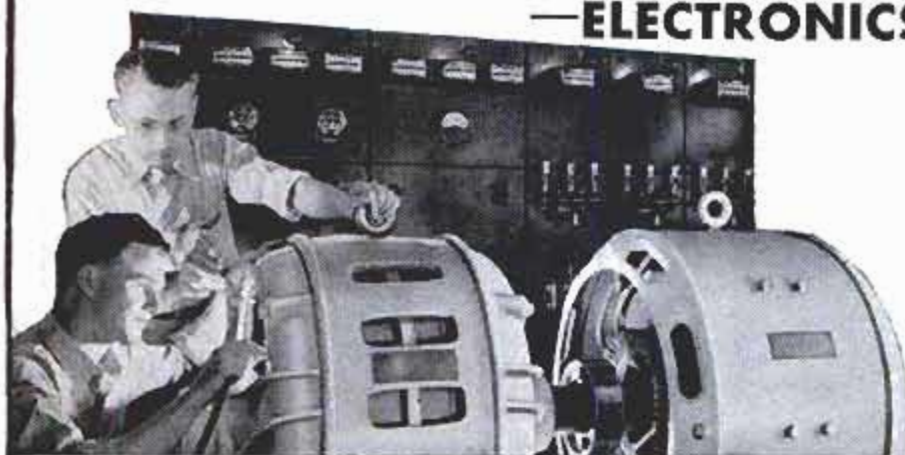




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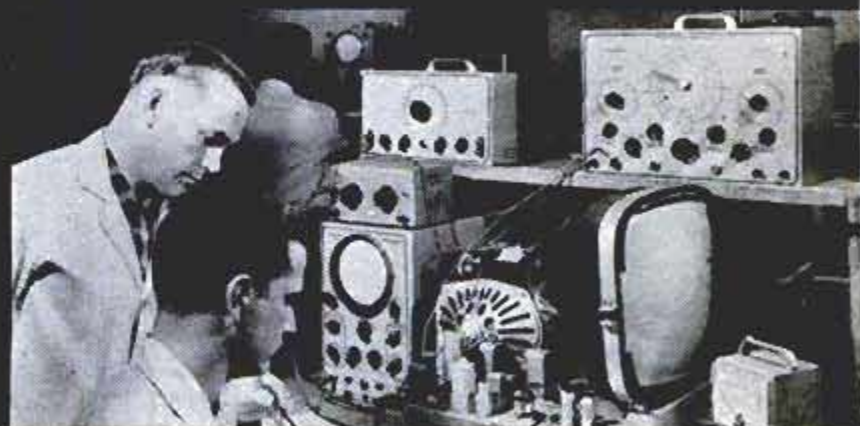
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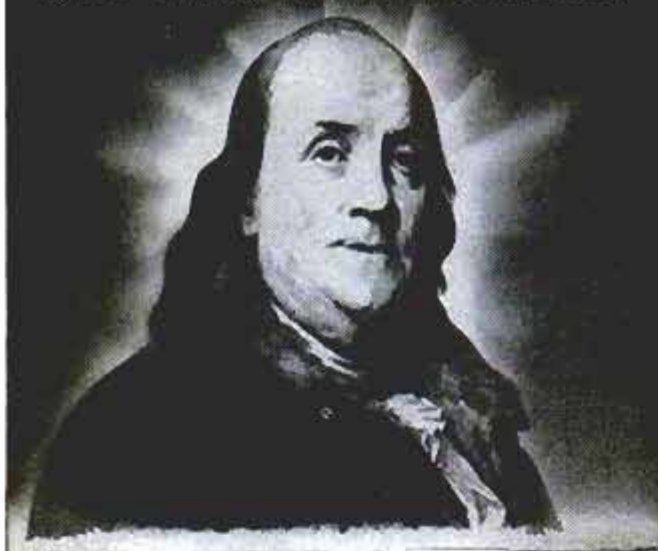
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The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

*Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.*

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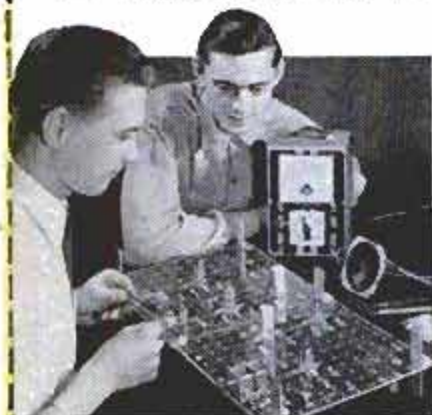
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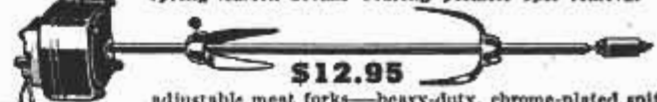
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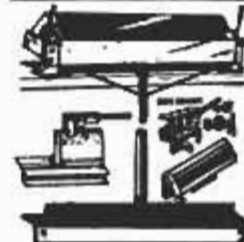
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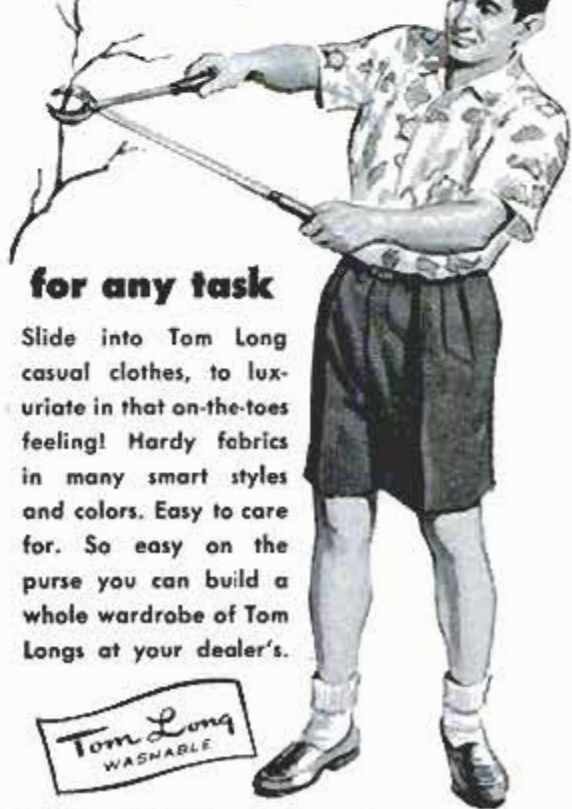
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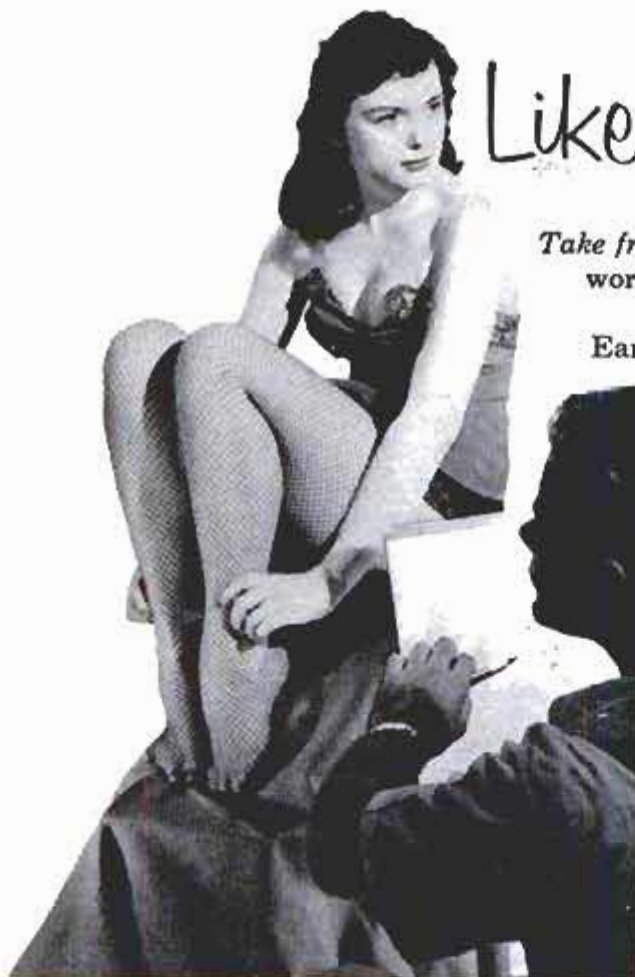
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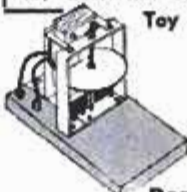
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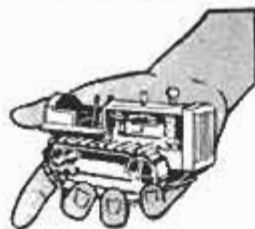


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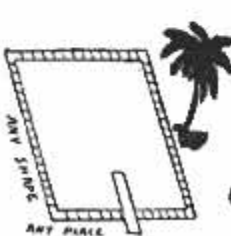


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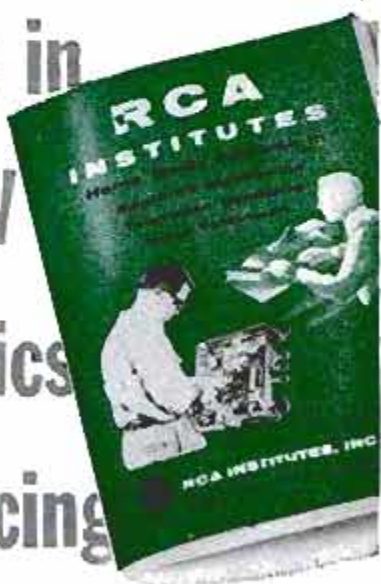
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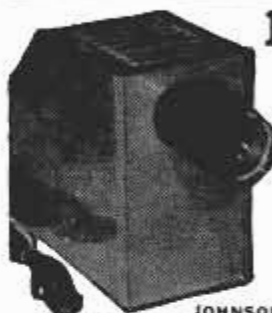


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**MONEY** In saw and lawnmower sharpening sparetime at home. Free book. Virgil Foley Company, Columbia Heights, Minnesota.

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

**\$350** WEEK Cleaning venetian blinds. Patented machinery. Free literature. Robinson, 7213B, Indianapolis 1, Indiana.

**NATURAL** Molding rubber, extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Illinois.

**MAKE** Sell polishes, cleaners, anything. Formula catalog free. Kemixer, Park Ridge, Ill.

**EARN** Money at home! Homeworke Magazine tells how. Sample 25c. Sizemore, 20-H East Delaware, Chicago 11.

**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.

**BE** Appointed state notary public now. Write, Stationers, Helotes, Texas.

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

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

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

**BRONZE** Baby shoes. Instructions, equipment and mountings for genuine electroplated process. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First Street, Los Angeles 33, Calif.

**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. W, 145 W. 15 St., New York City.

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

**GROW** Orchids at home—Profitable, fascinating. Year 'round, Maine to California. No greenhouse. Gorgeous cactleyas, cymbidiums, etc. Successful home grower shows you how. Full details free. Flowerland, 4622 Wilshire, Los Angeles 5.

**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, Helotes, Texas.

**FIX** Typewriters. Inexpensive home course teaches factory secrets. Free booklet. Write, Typewriter, Tarentum 1, Penna.

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

**\$70** WEEKLY—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757A, Los Angeles 34.

**\$150** WEEK—Easy! Start home Venetian blind laundry. Revealing book free. A. T. Co., 101 S. 44th, Philadelphia 4, Penna.

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



**VENDING Machines**—Every description. New or used. Lowest prices—Start a route or sell outright. Mack Postal, 2952 Milwaukee, Chicago 18.

**WANT To make big money at home?** \$5 profit in an hour possible with invisible reweaving. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 8334 Prairie, Chicago 19, Illinois.

**YOUR Own business.** No investment. No inventory. Sell name brand nationally advertised items. Free catalog. Confidential wholesale price list. Normandy Dist. Co., Dept. PM, 133 Fifth Ave., New York 1, N. Y.

**INTERESTED Mail order?** Copies leading mail order magazines. All different. 25¢. Palm, Box 1221, Baton Rouge, La.

**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.

**HIGHEST Commissions** all magazines. Free catalogue, supplies, prizes, exclusive extras. Subscription Service Co., Box 2070, Birmingham, Alabama.

**LEARN Sewing machine big money repair, sales, service.** Machines, "everything" wholesale. Taylor Service, Box 2126, San Bernardino, Calif.

**INTERNATIONAL Mailorder business.** Complete setup service—Not just instructions. Hermes, 152 West 42, New York City 36.

**YOU Can make money at home in spare time** taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write today! McGregor Magazine Agency, Dept. 500B, Mount Morris, Illinois.

**TOPFLIGHT Mail-order business opportunity.** Modest capital. Request convincing details. Stav, 147 Victoria Street, Kamloops 18, B.C., Canada.

**OPERATE Statement mailing service** from your home as our unit. Lifetime income! American, Mt. Airy, Maryland.

**50% PROFIT Baking** new greaseless doughnuts in kitchen. Grocers buy daily. Free recipes. M. Ray, 3605 South 15th, Minneapolis 7, Minnesota.

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

**IMPORT-Export opportunities,** mailorder, details free. Jeffries, Box 66, Rutherfordton, N. C.

**OPPORTUNITY!** Start collection agency. Very profitable. Valuable franchise ready. Write: Edmondson, Box 4865-P, Atlanta 2, Georgia.

**MAKE 80¢ Profit** on every dollar selling merchandise by mail. Everything furnished. Write: Eastern, Box 142-A, Boston 24, Massachusetts.

**\$30,000 PER Year** in the meat business. No investment or experience required. Free information. Write Meats for Profit, 5801 Cleveland Ave., Worthington, Ohio.

**\$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.

**HOW To make money** with carnival games. 144 page book. 35 illustrations. Enormous profits possible full or part time. \$2.00 postpaid. Free details. Theron Fox, 1296 1/2 Yosemite, San Jose 28, California.

**UNUSUAL Mail order ideas,** products, projects, sources. Authentic information, guidance. Free details. Write: Fax, Box 1024, Galveston, Texas.

**IMPORT-Export opportunities.** Terrific profits. Little capital needed. Lists of foreign and domestic manufacturers and exporters. Mail order laws and regulations, instructions, complete \$1. Details stamp. WillRiet Co., 107-D Ilford Ave., North Arlington, N. J.

**"I Earn \$400.00 a week."** I've learned an amazing new method of printing colorful signs, banners, cards, posters, glasswear—anything. No printing press or other expensive equipment is necessary! Big money-making opportunity for anyone. Write for my secret and revealing home-business plan, you'll be amazed! Mr. Anderson, Screen Print Company, Dept. PM-3, Los Angeles 61, California.

**"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 AT, Los Angeles 61, Calif.

**FREE Literature** describing money-making mailorder plans. National Service, Richland, Georgia.

**BUY 250,000 Articles** wholesale. Directory 104. Publishers, Drawer 1486-P8, Detroit 31.

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

**WHOLESALE Buyers!** New 1956 "blue book" gives names of over 3000 jobbers, manufacturers who supply anything. Free details. Associated Wholesalers, 1016-D Starr, Burlington, Iowa.

**A Business of your own.** Earn \$125.00 a week in your spare time with the Ovengio infra-red oven. Hot sandwiches in minutes. Write Ovengio Sales, 4729 North Lincoln, Chicago.

**MAKE Tough,** attractive building plastic, easily, 800% profit. Exclusive district. Bays Laboratory, Oklahoma City 9.

**READY-Made home business.** Inquire! Opportunity, Box 642-H, Tallahassee, Fla.

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

**START Identification tag business.** Clearview Co., 172 Stanton St., New York City.

**FREE Samples.** "Dancing" elephants-mules. Windshield mounted. Smith Agency-51, Excelsior Springs, Missouri.

**SHARPEN Saws** and lawnmowers spare time or full time; very profitable; complete power equipment; easy to operate; no experience necessary; thousands of satisfied users. Free literature. Max Mfg. Co., 138 Stockton Ave., San Jose 26, California.

**CHARGE Auto,** flashlight batteries 2¢. Also three, quick cash. Inside secrets. Eleven others. \$1.00. Teycer, Box 1287P, Chicago 90.

**BUY Wholesale 750,000 products.** Details free. Carter, Box 6011-B, Chicago 80.

**FLEXIBLE Rubber molds** for plaster and Marbleite figurines. Sample and large illustrated catalog 25¢, refunded on first order. K-C Novelties, Dept. 16, Southampton, Mass.

**ADVERTISING Book matches**—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX856, 7530 Greenwood, Chicago.

**MODERN Formulas** for easily making fastest selling big profit products. Valuable literature free! Miller, Chemist, 1517-K, Tampa, Florida.

**25,500 SALES** in two weeks! Amazing radio-mail order method. Free details. Broadcast Service, 1412-KM Great Northern Building, Chicago 4, Illinois.

**BOOKKEEPERS.** Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

**OPERATE Restaurant or diner.** Free booklet reveals plan. Write Restaurant Arts, BU-18, Fremont, Ohio.

**60% PROFIT Cosmetics** \$25 day up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, Calif., Dept. 1268H.

**AMAZING Successes** through franchises! Become exclusive distributor, agency operator. Nationwide opportunities. Request details. National Franchise Reports, 333 North Michigan, Chicago 1.

**YOUR Own mailorder business** started at home, spare time. Profitable, fascinating. We show you how, supply everything. Free details. Cuddihy, 8-M Fairview, Jersey City 4, N. J.

**AMAZING Profits** home business. Start \$25.00. Guaranteed. Dickie, Quitman, Arkansas.

**AMERICA'S Greatest** wholesale catalog! Buy everything direct! \$1,000,000 stock. Save 66%! Best name appliances, housewares, cameras, tools, toys, sporting goods, jewelry. Large catalog \$1.00. Refundable. General Wholesalers, Box 3058E1, San Francisco.

**PLEASANT Profits**—Let us show you how to start your own complete scissors and tool sharpening business. Free details. Serr-Edge Inc., 9735 Lorain, Cleveland 2, Ohio.

**WHOLESALE Buyers directory.** New 1956 edition. Lists thousands wholesalers, manufacturers. Save personally 66% on everything you need. Free details! National Buyers Service, Box 338EP, San Francisco.

**DRAFTSMEN,** Make structural steel shop drawings at home. You can earn \$3.50 or more per hour. Send \$2.00 for select list of companies. Pride Service, P.O. Box 3837, Cleveland 10, Ohio.

**"STERIBOILER"** Fastest and easiest selling novelty on the market. Patented beautiful special white plastic submerison water heater (110 volt-1000 watt) brings water to boiling point in ten seconds. Every man, woman, co-worker or fellow-employee after seeing it demonstrated a sure fire and immediate customer. Make as much money you want, full or part time. Postpaid International Parcel Post package containing ten Steriboilers dispatched immediately after receipt \$15.00 money order or certified check. In registered airmail letter to Frank InterAmerican Manufacturing Corporation, Edificio Santa Beatriz, Lima, Peru.

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**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-V, 7464 Clark, Chicago 26.

**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.

**GROW Mushrooms.** Cellar, shed. Spare, full time, year round. We pay \$3.50 lb. We paid John Betts \$7,977.76, he started as amateur. Free book. Mushrooms, Dept. 173, 2954 Admiral Way, Seattle, Wash.

**EARN Money** immediately repairing electric clocks without experience. \$3.00 investment. Details free. Puthuff, Box 1504, Santa Rosa, Calif.

**WANT To go in business** for yourself without capital? We show you how. Start part-time your own home. Postcard brings you details absolutely free. Topval Corp., Lindenhurst 720, N. Y.

**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.

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

**GENERAL Contest Bulletin.** Issued monthly. Sample, 25¢. 1609 1/2 East 5th, Duluth, Minn.

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

**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.

**SELL Titania gems;** far more brilliant than diamonds. Catalog free. Diamondite, 2420-M 77th, Oakland 5, California.

**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.

**\$150 WEEK—Easy!** Start home Venetian blind laundry. Revealing book free. A. T. Co., 101 S. 44th, Philadelphia 4, Penna.

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

**FORTUNE Possible** raising, fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

**CONVERT Cheap foods** into money making milk. Complete free information. Voight Farms, Lomira 2, Wisconsin; or Atlanta 2, Texas.

**ATTENTION: Typewriter owners.** Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

**IMMEDIATE Cash** for used plating equipment. Send description. Equipment Division, 1624 East First, Los Angeles 33, California.



\$50 TO \$100 Per week. No skill necessary. Send 25¢ for sample and details. Arrowhead Sales, 4588 So. Acoma, Englewood, Colo.

**START A** profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. Send this ad with your name and address to: Agency Bureau, Dept. PM, Hearst Magazines, 250 West 55th St., New York 19, N. Y.

**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 78, Chicago 26, Illinois.

**SELL** Aluminum awnings. Baked enamel colors. All sizes. Write Jack Groff, Box 12054, Tampa, Fla.

**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 78, 1512 Jarvis, Chicago 26, Ill.

**FORMICA** Textolite, micarta. \$50.00 a day making countertops. Sample cutaway counter and complete instructions including trade secrets only \$4.00. House & Home, 204 George Street, New Haven 10, Conn.

**WHOLESALE** Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, tools, watches, jewelry, cameras, housewares, etc. Consolidated Distributors, 7-27, Henry, Paterson 15, New Jersey.

**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 78, Chicago 26, Ill.

**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.

**PHOTO** Christmas greetings bring big profits in your spare time. Show Whitehall's fast selling Christmas greetings, everyday cards, personalized stationery, napkins, gifts. Samples on approval; 1/2 price feature offer. Make big money fast. Whitehall Studios, 386 Cleveland, Elmira, N. Y.

**60% PROFIT** Cosmetics. \$25 day up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, Calif., Dept. 1268H.

**BIG** Home earnings for you; selling information, \$10.00 an hour and more. No previous training; special talent needed. Literature free. Charles R. Coachman, 6805 North Independence, Oklahoma City 16, Oklahoma.

**BUY** Wholesale! Save 66 2/3%! Appliances, furniture, jewelry, toys, sporting goods, tools. Free details! National Buyers Service, Box 3338EB, San Francisco.

"WHERE To Find Products," \$2.50. Money-making guide. Sayer Associates, 1129-C Vermont, Washington 5, D. C.

**LOOKING** For something informative? Home work, mail order plans, and trade magazine 25¢. Warren Co., P.O. Box 11, Glenview, Ill.

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

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

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

**MODERN** Formulas for today's fastest selling big profit products. Valuable literature free! Miller, Chemist, 1517-J, Tampa, Florida.

**FREE** Formula catalog. Anything analyzed \$35.00. Western Chemical, Salem, Oregon.

#### PLASTICS

**NEW** Liquid casting plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25¢ for handbook, "How to Cast with Liquid Plastic," and proved success plan showing how to make money at home. Castolite, Dept. J-101, Woodstock, Ill.

**PLASTIC**, Sheet, rod, tubing. Catalog 10¢. Coleman Sales, 5928 Cornell, Dearborn, Michigan.

**LAMINATING** Supplies. Free price list. Solomson, 46 Cornhill, Boston 8, Mass.

**PLEXIGLAS**. Cut to size. Clear. Any thickness. Colors. Rods. Tubing. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

**LEARN** Plastics fabrication for spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 13, Ore.

**PLEXIGLAS** Square foot cost 1/8" \$1.20, 3/32" \$1.35, 3/16" \$1.58, add 15% for postage, write for list. Aircraft Plastics, P.O. Box 7924, Mt. Lebanon 16, Penna.

**PLASTIC** Repair kit welds breaks and cracks. Restores original finish. Complete kit \$3.00 cash, check, money-order. Rayther, Box 271, Station B, Toledo, Ohio.

**PLEXIGLAS**, Fiberglass, polyester, acetate. Unique wholesale-retail catalog—15¢. Gem-O-Lite, Box 886M, North Hollywood, California.

**PLEXIGLAS**, Lucite. Square foot cost, 1/16" \$1.18; 1/8" \$1.52; 3/16" \$1.86; 1/4" \$2.21; 3/8" \$3.23; 1/2" \$4.36. Colors add 10%. Send 15¢ for postage. Aristocrat Plastics, 23-25 Sussex Avenue, Newark.

#### CHEMISTRY

**SPECTROSCOPE** For quick chemical analysis \$3.00. Kutting Sons, Los Altos, Calif.

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

**HOME** Laboratory and apparatus kits, laboratory supplies. Catalog 25¢. John H. Winn, 124A West 23rd St., New York, N. Y. Established 1931.

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

**CHEMICALS**, Supplies. Catalog 25¢. refundable. Laboratory Sales, Box 161-E, Brighton, Mass.

**AMAZING** New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-8, 500 W. Road, Lombard, Ill.

#### AGENTS WANTED

**NEW** Bathroom deodorizer. Hangs on wall. Banishes odors bathroom, kitchen. Lighting seller. Samples sent on trial. Kristee Co., Dept. 50, Akron 8, Ohio.

**AMAZING** New "Touch-Glow" Christmas cards sell swiftly from free samples. \$62.50 profit on 50 boxes easy! Many tall cards, stationery, novelties, album of imprints. Profits to 100% plus gift bonuses. Samples on approval. Creative, 4401 Cermak, Dept. 509-D, Chicago 23.

**FREE!** Beautiful leather pictures 200% profit! Apartado 9036, Mexico 1, D. F.

**AGENTS** Opportunity. Grotesque, beautiful cypress knees, 50¢ up. Details. Gipple's Giftwares, DeLeon Springs 5, Fla.

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

**YOUR** Own business—Used suits \$1.50, overcoats 65¢, mackinaws 35¢, shoes 12 1/2¢, ladies coats 30¢, dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 805-AA West 12th Place, Chicago 7.

**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.

**\$1.00 PROFIT** Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

**AGENTS**—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

**USED** And new watches \$2 up. Free list. Southern Watches, Gray, Georgia.

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

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

**WANT** More business? Here's an amazing opportunity to increase your sales. Talk to thousands of interested readers of "Mechanica Popular." Our Spanish Edition covers the Latin American countries like a blanket. They're real mailorder buyers. Classified rate 75¢ per word. Try an ad in our next issue. Classified Advertising Department, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

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

**CHRISTMAS** Cards—144 exceptionally distinctive greetings, all with customer's name. To attract big-volume sales, line includes many cards specially designed for business firms and professional people. All popular subjects, wide price range. Unequaled in lavish treatment, unusual illustration, high-quality stock. Up to \$5 to \$100 commission on each sale. Full or part time. Experience unnecessary. Old, established firm. For complete sample kit, write Process Corp., 1950 S. Troy, Dept. MS-8, Chicago 23, Ill.

**MOORE** Made \$9.00 in an hour selling farmers. Hundreds of salesmen making good money full time or spare time with 3 leading poultry magazines welcomed everywhere. No investment or experience needed. Powerful sales kit free. Poultry Tribune, Box 468, Mount Morris, Illinois.

**EXTRA** Cash for you. Sensational tested fast selling items bring extra profits to you in spare time. No experience needed. Sell fabulous gifts, greeting cards, gadgets, personalized stationery, toys, from all over the world! Big money ahead for you if you write for brand new free colorful catalog at once! North Star, 735 Park Square, St. Paul, Minn.

**YOU** Can make money at home in spare time taking magazine renewal subscriptions. No capital or experience necessary. All supplies furnished. Write today! McGregor Magazine Agency, Dept. 500A, Mount Morris, Illinois.

**RUN** Spare-time greeting card and gift shop at home. Show friends samples of our new 1956 Christmas and all-occasion greeting cards and gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 89, Ferndale, Mich.

**WHOLESALE** Catalog! 30-80% discounts! Appliances, musical instruments, typewriters, tools, watches, jewelry, cameras, housewares, etc. Consolidated Distributors, 7-10 Henry, Paterson 15, New Jersey.

**EXTRA** Cash in your spare time. No experience needed. Just show superb Elmira Christmas cards, name imprinted. Samples on approval. Bonus: Free box of cards; also 50% profit on first order. Elmira Greeting Card Co., 289 Clinton, Elmira, N. Y.

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

**AT** Last! Something new and sensational in latest tall Christmas cards. Make extra money fast! Show satins, velours, metallics. Gets easy orders. Pays up to 100% profit. 30 free samples. With name 50 for \$1.50. Big line. Amazing convertible pen-pencil, napkins, gifts, stationery. Several \$1.00 boxes on approval. Puro Greetings, 2801 Locust, Dept. 640-K, St. Louis 12, Mo.

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



**MAKE 3 Days pay in day!** Amazing Name-in-Silver Christmas cards pay \$65 on 65 boxes! No experience needed. Sample book free, assortments on approval. "Southern Belle" doll free for promptness! Southern, 478 N. Hollywood, Dept. L-63, Memphis 12, Tenn.

**BIGGEST Christmas card profits.** Sensational "super-36" assortment pays \$1.25 profit on every box—\$50.00 on 40 boxes easy. 200 fast sellers double earnings! Tall cards, novelties, stationery, bargain specials. Assortments on approval. Color catalog, personalized album free. Midwest, 1113 Washington, Dept. 494-R, St. Louis 1, Mo.

**MAKE Extra money—with newest Christmas card assortments.** 21-card \$1.00, \$1.25, \$1.50 "tall-slim" Christmas, all occasion, religious assortments, gift wrappings, gifts, novelties, imprinted Christmas cards. Experience unnecessary. Profits to 100% plus cash bonus. Write for samples on approval, free \$1.00 gift offer, catalog, selling plan. Hedenkamp, 361 Broadway, Dept. PM-43, New York City.

**600 WAYS To make extra money!** Sell over 600 unique, profitable gifts, greeting cards, stationery, gift wraps, gadgets, in your spare time. World famous brands like Westinghouse included in line. Make up to 100% profit! No experience needed. Send for brand new big free colorful catalog and free money making plan today! Greetings Unlimited, 335 Park Square, St. Paul, Minn.

**IF You want to earn money fast.** I'll send you free sample stocking of newest stretch DuPont nylons to sell at only \$1 a pair. American Mills, Dept. 496, Indianapolis 7, Ind.

**SPARE Time greeting card business!** Show friends new type tall, parchment, photochrome Christmas, all occasion assortments. Make \$50, \$75, \$100 extra money. Bonus. Write for feature boxes on approval, 74 free samples personal Christmas cards, stationery, free catalog, selling guide. New England Art Publishers, North Abington 833-F, Mass.

**SELL Newest tall Christmas cards—Make 75¢ on sensational \$1.25 assortment.** 250 hottest gifts, cards, stationery, 50 exclusive personalized designs, super-roll gift wraps, 30 for \$1 box. Samples on approval, surprise offers, prompt action gift. Cardinal, 1400 State, Dept. J-79, Cincinnati 14.

**SHINE Shoes without polish.** New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee Co., Dept. 52, Akron 8, Ohio.

**FREE Box of 21 nationally famous Christmas cards** included with other fast selling assortments sent on approval. Earn \$50.00 by selling only 50 boxes of our 900 series Christmas card assortment. Can be done in a few hours of your spare time. Sunshine Art Studios, Inc., Dept. PM8, Springfield 1, Mass.; Pasadena 1, Calif.

**\$1,000.00 A Month for making dramatic 3-second demonstration of amazing light-weight Presto fire extinguisher.** New chemical used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free kit. Merlite, 114 E. 32nd., Dept. P-52K, New York City 16.

**PICTURESQUE Overseas imports.** Excellent sales appeal. Two samples 10¢. Goodall, 68-W Joost, San Francisco 12.

**BIG Money-making opportunity.** Exclusive line work uniforms. Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit free. Master Co., 420 Water, Ligonier, Ind.

**60% PROFIT Cosmetics.** \$25 day up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, Calif., Dept. 1268H.

**FAST Selling money makers!** Metallic ironing board cover; purse-shopping bag; many others including \$1 retailers. Quality Products, Dept. A, Box 748, Passaic, N. J.

**BUY Wholesale!** 100,000 name brand products! Save 66 2/3%! Big profits selling others spare time! Free details! National Buyers Service, Box 3338EE, San Francisco.

**REDUCING Machines.** Factory agents. 100% profit. Exclusive. Mary-Mac, 1012 Powhattan, Dallas 2, Texas.

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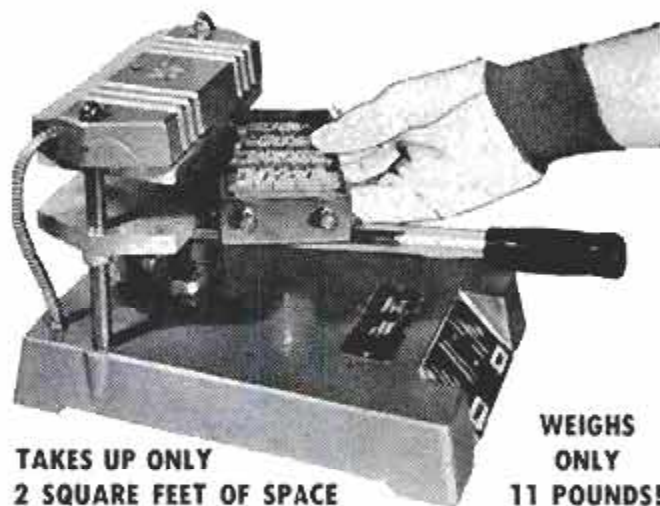
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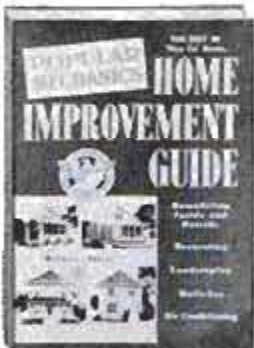
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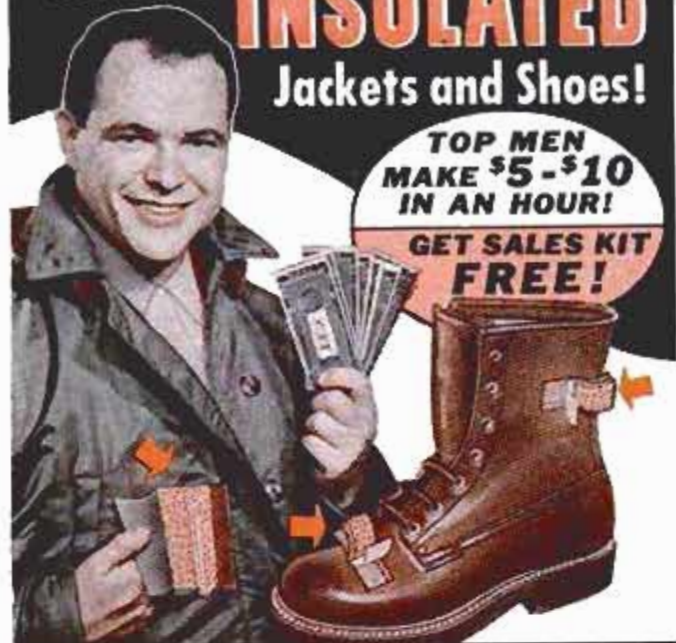
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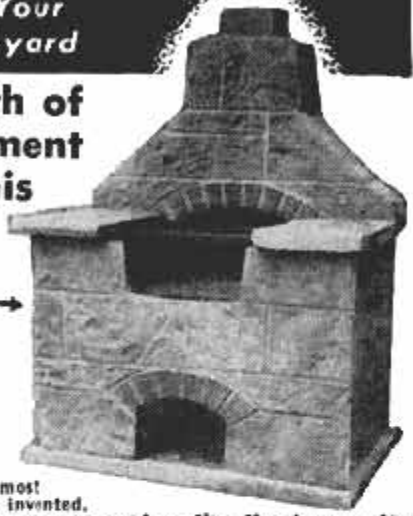
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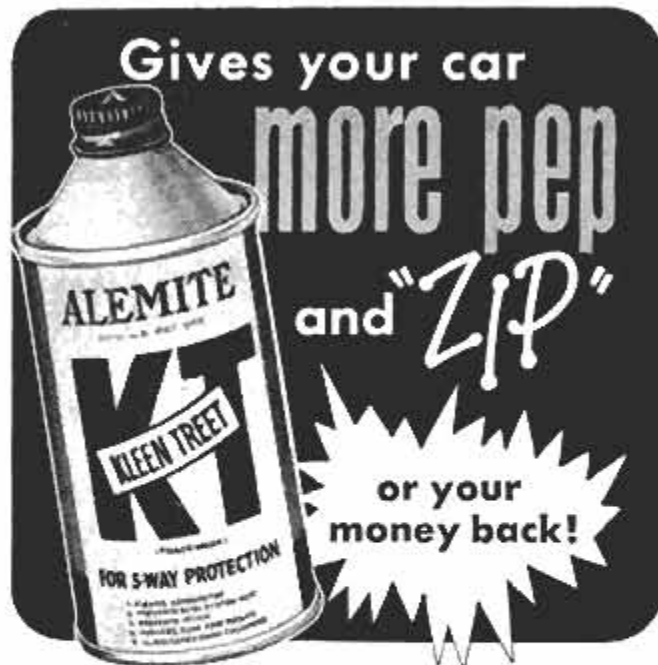
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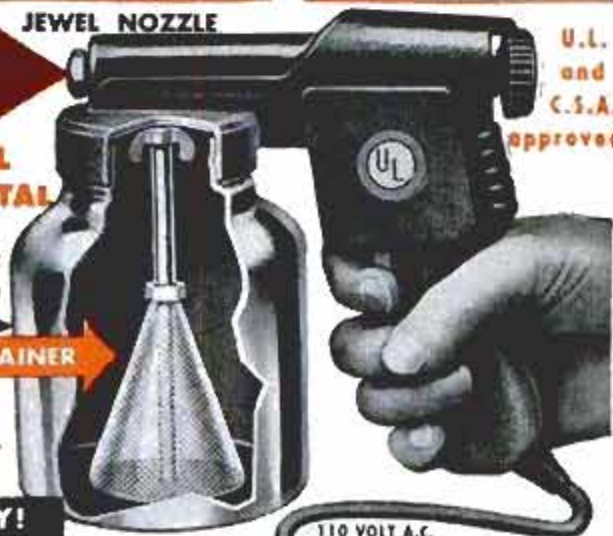
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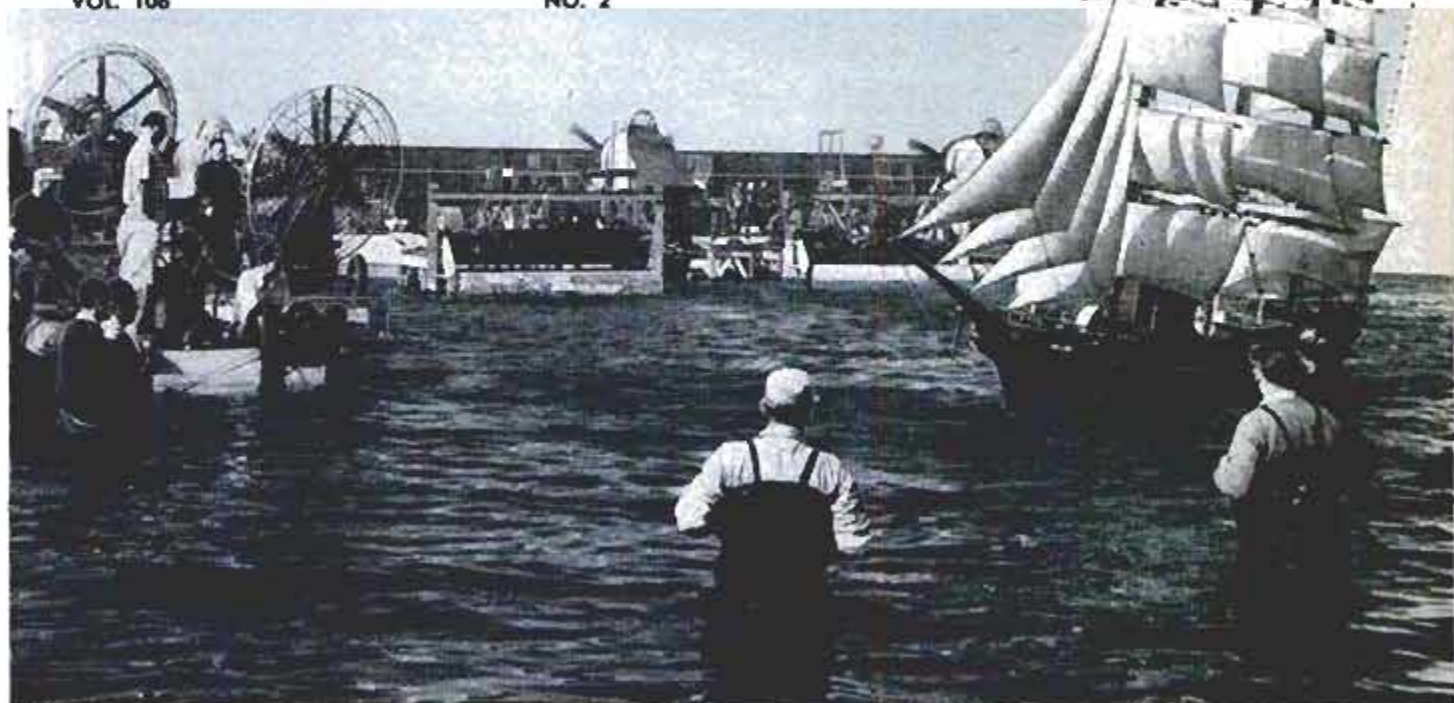
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WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 106 NO. 2



In a studio ocean *General Grant* sails again. Wind machines and modified plaxes in background ruffle water

## MOVIE MAGIC AND ILLUSIONS TAKE YOU *Around the World in 80 Days*

By Thomas E. Stimson, Jr.

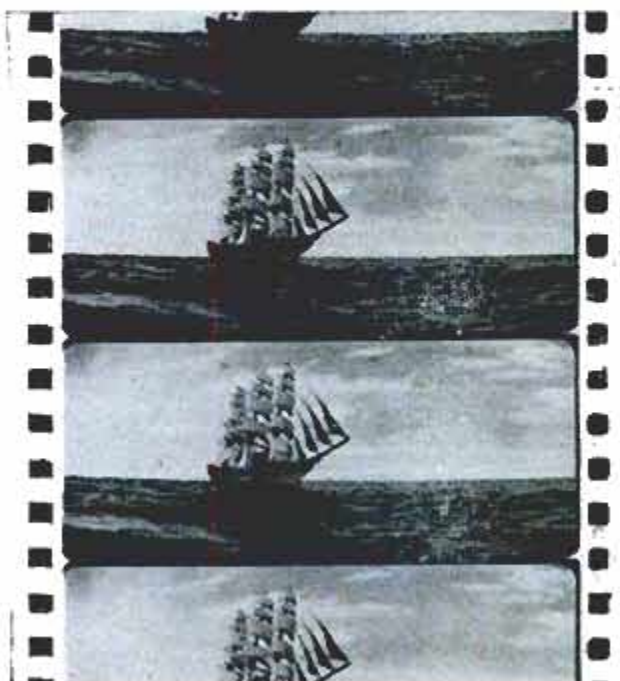
HOLLYWOOD ALWAYS TRIES to conceal the fact that some of its most spectacular movies are ingenious illusions. Rarely does a studio give away the secrets of how special scenes are filmed.

Yet when producer Mike Todd was filming his \$5,000,000 *Around the World in 80 Days* he invited *Popular Mechanics* readers to see things that even most studio employees don't get a chance to watch.

He believes mechanically minded readers may enjoy learning the exacting technical problems involved in putting a special effect together. *PM* readers, more than most people, may appreciate the detailed craftsmanship that goes into creating a miniature set that looks full size on the screen.

So, accompanied by a studio official (no ordinary pass will do) let's walk onto the closed lot in Culver City where the ocean sequences of the Jules Verne story are being filmed. Our guide explains that most

This is actual size of the film taken with special camera. Lens is nine inches in diameter. Film is projected on wide, curved screen without distortion







Workers tote coach of the model train to the tracks. Model duplicates a narrow-gauge train still in use

of the marine shots in the picture are made with models. It would be prohibitively expensive to round up three full-size clipper ships just for a few moments of action. Besides, the miniature shots will be technically superior to anything that could be made in full scale.

#### Water Dyed Blue

The studio "ocean" is a concrete tank 300 feet wide and 360 feet long. The water, dyed an ocean blue, is three feet deep. One

end of the tank is half an inch lower than the other sides and here the water continually overflows into a hidden trough, giving a realistic horizon. From the trough it is constantly pumped back into the tank.

Behind the trough is a 50-foot-tall background screen painted in imitation of a blue sky flecked with white clouds. The smog-brown Los Angeles sky won't be visible to the camera. Wave machines and wind machines are lined up along one side of the tank.

Special-effects men install a cartridge in locomotive which will provide realistic smoke during the filming





Here we shake hands with Lee Zavitz, veteran special-effects director, who is overseeing a trial run past the camera of the *General Grant*, a 27-foot-long scale model of an ocean clipper of the late '80s.

"Our problem," Lee says, "is absolute, convincing realism. Any tiny flaw will be magnified when the picture is shown.

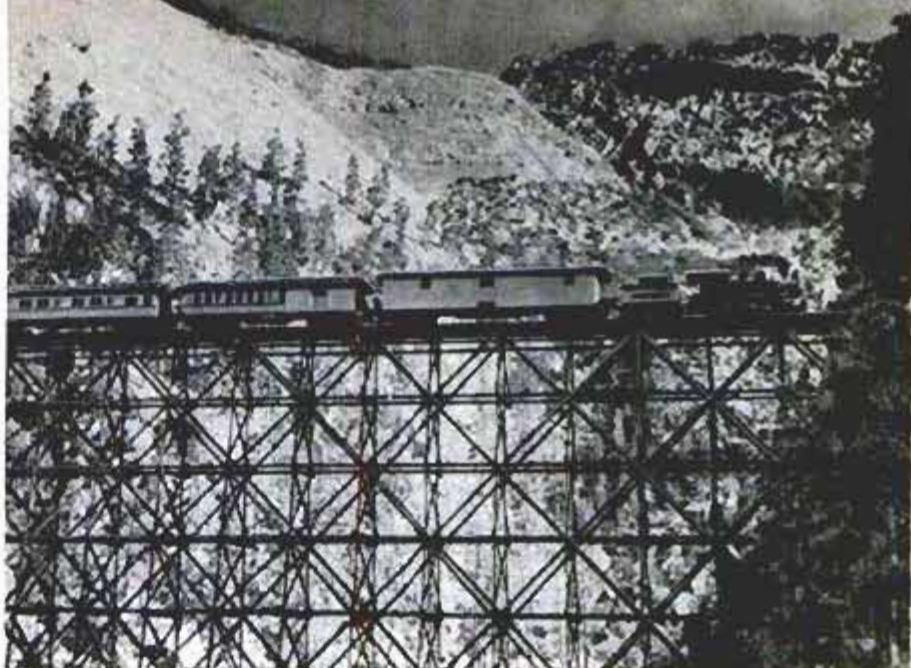
"This ship sequence is fairly simple, merely a shot of a ship under full sail in the open ocean. Yet more than a dozen technicians are dovetailing their work on a tight schedule to get just the right effect."

### Cable Tows Ship

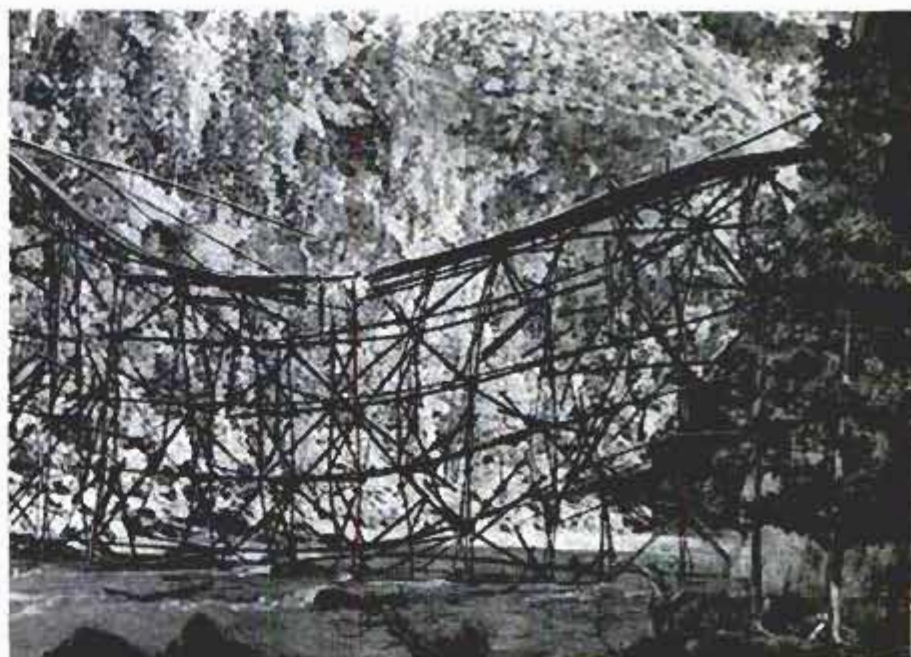
Lee explains that the miniature ship is attached to an underwater cable that tows it past the camera at the angle and speed desired. Steam and smoke that issue from the stacks of the auxiliary engine on the ship are produced by smoke cartridges. The tiny moving figures on deck are animated by battery-operated motors. The bow wave and stern wave are produced by jets of water from small water pumps attached below the model's water line. For complete realism, water is splashed along the model's sides just before a run is made. Not one detail is overlooked. Even the waves are scaled down.

"The appearance of the water more than anything else is apt to give away a miniature-ocean shot," Lee says. "The whole thing looks phony if the water isn't exactly right. First we set the wave machines to deliver an ocean swell scaled down to four inches instead of four feet. Next we want a little

Torrent of water, which supposedly weakened the structure, pours down miniature gully from hidden reservoir



Special-effects men produced realistic scene of train crossing trestle. Hidden in trestle are cables to pull it down



Cables are fastened to pipe hidden beneath the water. As the pipe turns, the timbers begin to break one at a time to bring down trestle just as the train thunders over the rails above







Sailing ship *Mongolia* actually is only 23 feet long. Lee Zavitz, special-effects director, adjusts rigging from the deck. Line behind the sails is top of the painted backdrop

chop on top of the water. This is created by wind machines that also fill the ship's sails and heel it over in the water. The wind machines also smooth out the crests of the swells so that rebounds from the sides of the tank won't be apparent."

In the long run it is the cameraman who makes or breaks a miniature scene. Head cameraman for *80 Days* is Lionel "Curley"

Sailmobile appears in film. The sail was made of rigid plastic so sequence could be filmed even in a calm



Ship appears to be full size in film. It is towed past the camera by an underwater cable

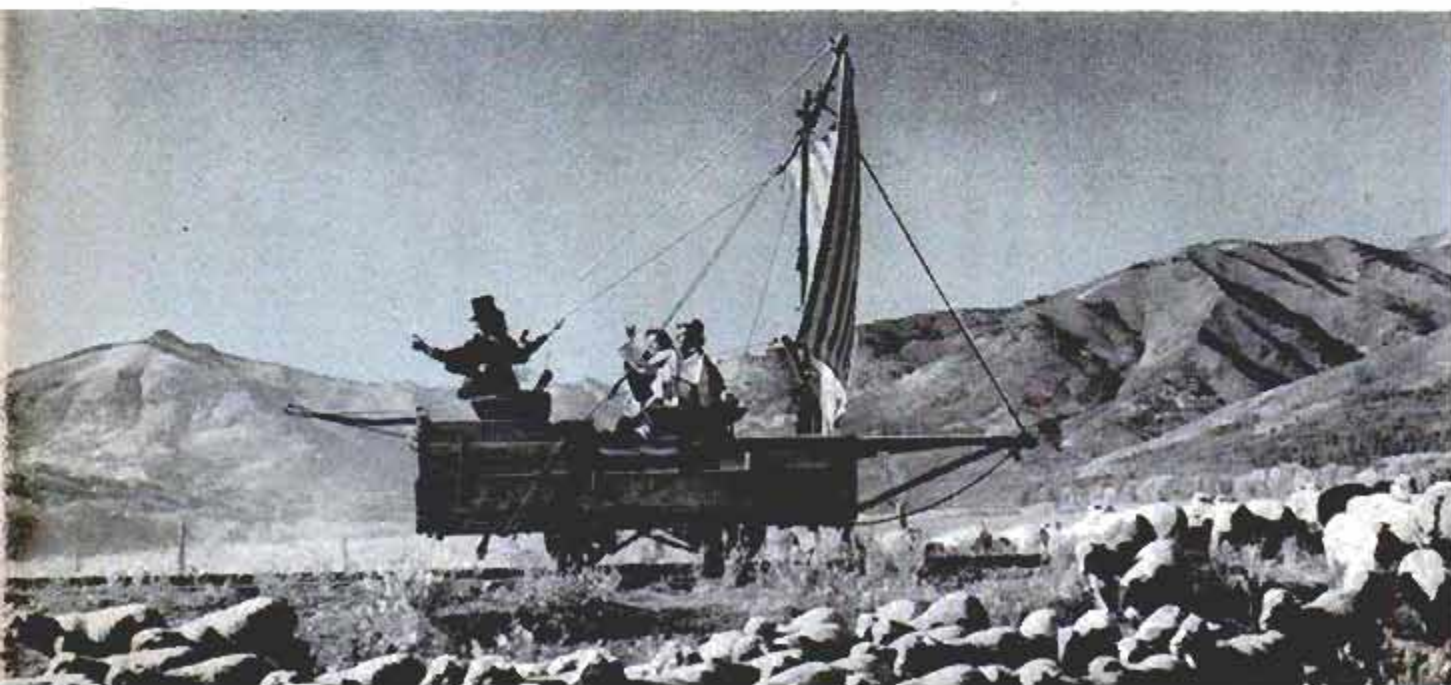
Lindon, who knows all the tricks in placing the camera so that a miniature looks perfect on the screen. Basically it is shooting from a low angle to get the proper perspective.

#### "Bug Eye" Lens

The Todd-AO (Todd-American Optical) process uses a 65-millimeter film in a camera fitted with a "bug eye" lens nine inches in diameter and of very short focal length. In the theater this film is projected on a wide, deeply curved screen without distortion. *Oklahoma!* was the first feature picture in which the process was used, and audiences were fascinated by the realism and third-dimensional effects that were achieved. The accompanying high-fidelity sound is projected from five or six loudspeakers placed above the screen.

#### World Adventure Story

*Around the World in 80 Days* tells the adventures of two travelers who hope to win a bet by traveling all the way around







Studio painter adds finishing touch to tree made of a stalk of yucca plant with small juniper branches

the earth in 80 days. This was virtually an impossibility in 1872, the year in which the Jules Verne classic is laid, but by using a balloon, trains and the fastest available ships, the travelers manage to win their bet. En route they are plagued by the many difficulties that Verne wrote into his story.

Special-effects man sets trees into rocky bank behind the trestle, then gives forest a touch-up with sprayer



Part of film shows trip by balloon. Here huge crane moves the balloon across scene in front of camera

Most motion pictures star only a few well-known actors but *80 Days* uses 45 top Hollywood stars. David Niven, Cantinflas and Shirley MacLaine play the leads, and other parts are taken by Robert Newton, Frank Sinatra, Ronald Colman, Marlene Dietrich, Buster Keaton, Red Skelton,

(Continued to page 226)

Prop man adjusts rock in stream. Hidden pipe produces the effect of water rushing around the rock





## Built-in "Visor" Shades Headlamp



Test installation of new lamp and photocell control

HEADLIGHTS and inventors seem to attract each other. And understandably so. A bout with today's headlight glare in heavy traffic stimulates inventive minds.

Latest (and one of the most interesting) of glare eliminators is the Bone-Midland lamps, invented by Evan P. Bone of Cincinnati, Ohio.

Key to the Bone system is a movable

vane that pivots in front of each headlight filament, casting a shadow in which approaching cars travel.

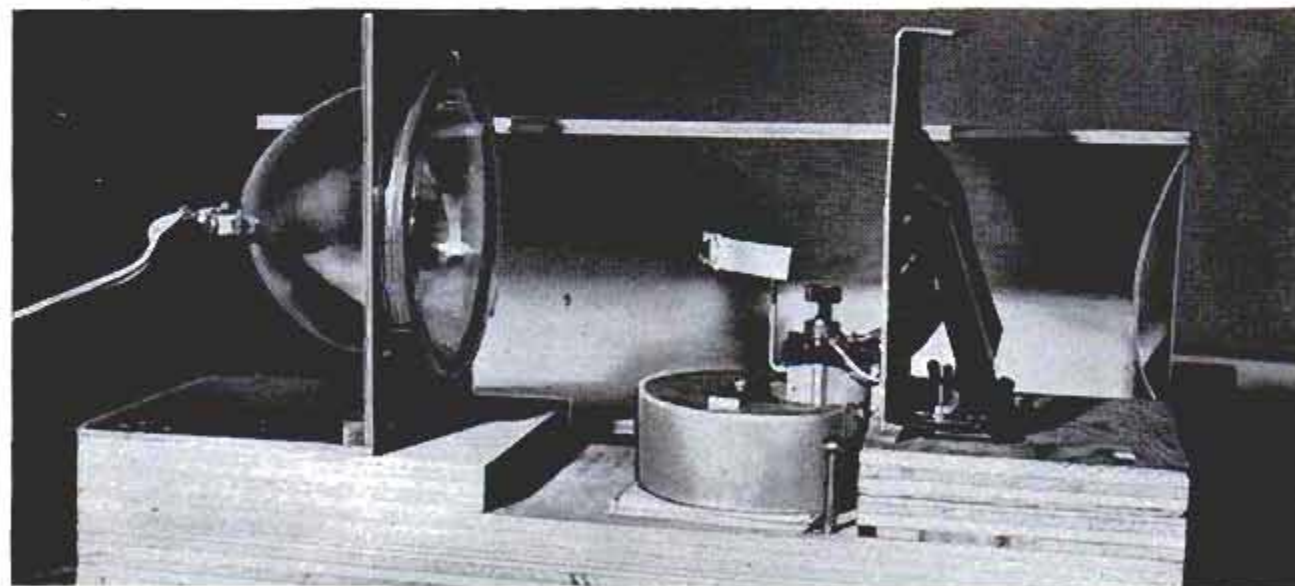
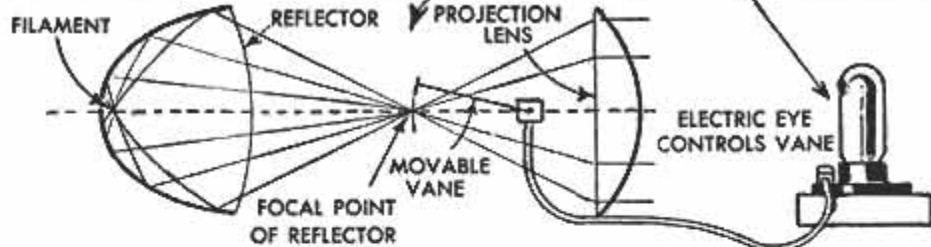
Two separate but connected parts make up the system: (1) a photoelectric cell mounted at about eye level in the car; and (2) larger, more powerful headlamps equipped with the pivoting vane.

Light from an oncoming car strikes the photoelectric cell which "senses" the direction and, by remote control, moves the vane in front of the filament, positioning it so as to throw a shadow in the oncoming lane. To make the shadow sharply defined, the lamp uses an elliptical reflector that focuses the light rays precisely at the point where the vane operates.

The vane is made of a filtering material that blocks the blinding light rays while allowing the infrared rays to pass through. These infrared rays activate the photoelectric cell.



Above, a bird's-eye view shows how lamp keeps the oncoming car in shadow. At right, diagram explains it. Not shown is another vane ahead of electric eye that "senses" where oncoming car is. Below, the Bone lamp



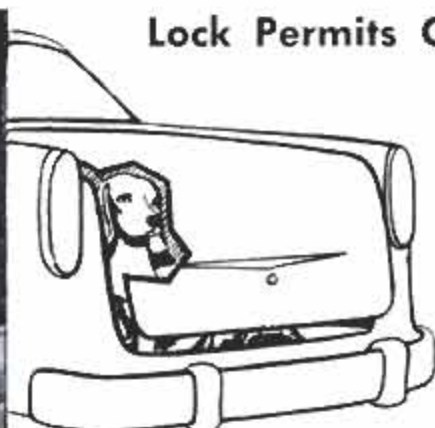




## Plane Mounts Retractable Rotor

Vertical take-offs and landings would be possible in a proposed plane that conceals a folding helicopter rotor in the wing above the fuselage. The rotor, powered by ramjet engines at its tips, would be unfolded and used only for up-and-down maneuvering. When cruising flight is reached, the rotor

would be stopped, folded to one third its 25-foot length and completely retracted into the wing. Installation would be relatively simple and light, since the unit is independent of the plane's principal power plant. Hiller Helicopters is preparing the design under an Air Force contract.



## Lock Permits Carrying Dog in Car Trunk

Now you can carry your dog safely in the trunk of your car. An auxiliary lock, attached to the striking block at the back end of the trunk compartment, keeps the lid open just enough to allow for ventilation of the compartment. When not in use, the unit can be flipped down out of the way for normal closing. The lock is available in several models to fit various cars.

## Lawn-Mower Accessories

Leg work is taken out of mowing by two accessories for a line of self-propelled lawn mowers. One is a stake-mounted reel with 50 feet of nylon cord that is payed out as the tethered mower automatically cuts an ever-widening circle. The other unit is a rubber-tired riding sulky that is hooked behind the mower. Its padded seat is at a comfortable height, and the sulky is so positioned that the mower's controls are easy to operate.

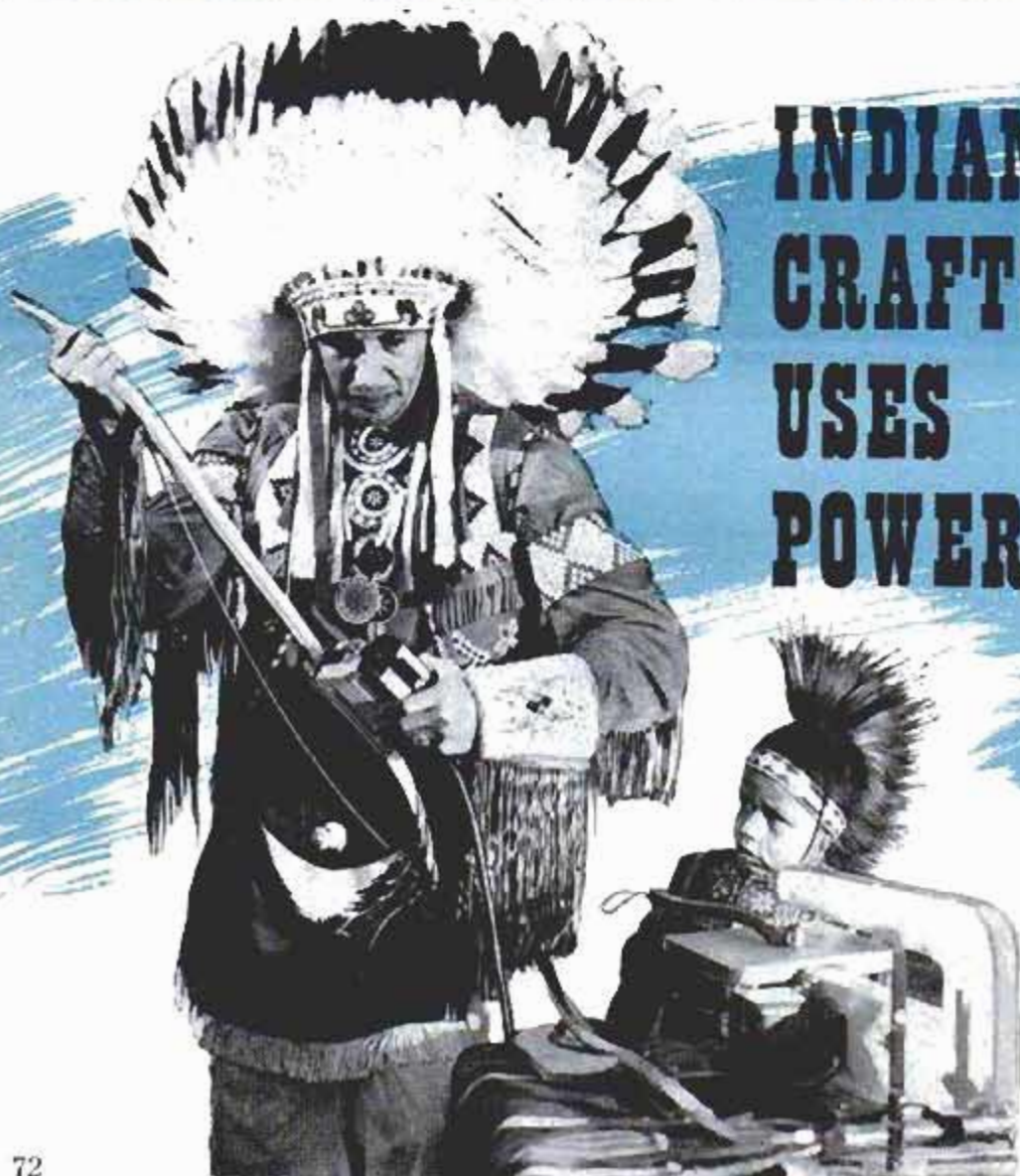
☐ The largest user of diesel engines in the world is the United States Navy.





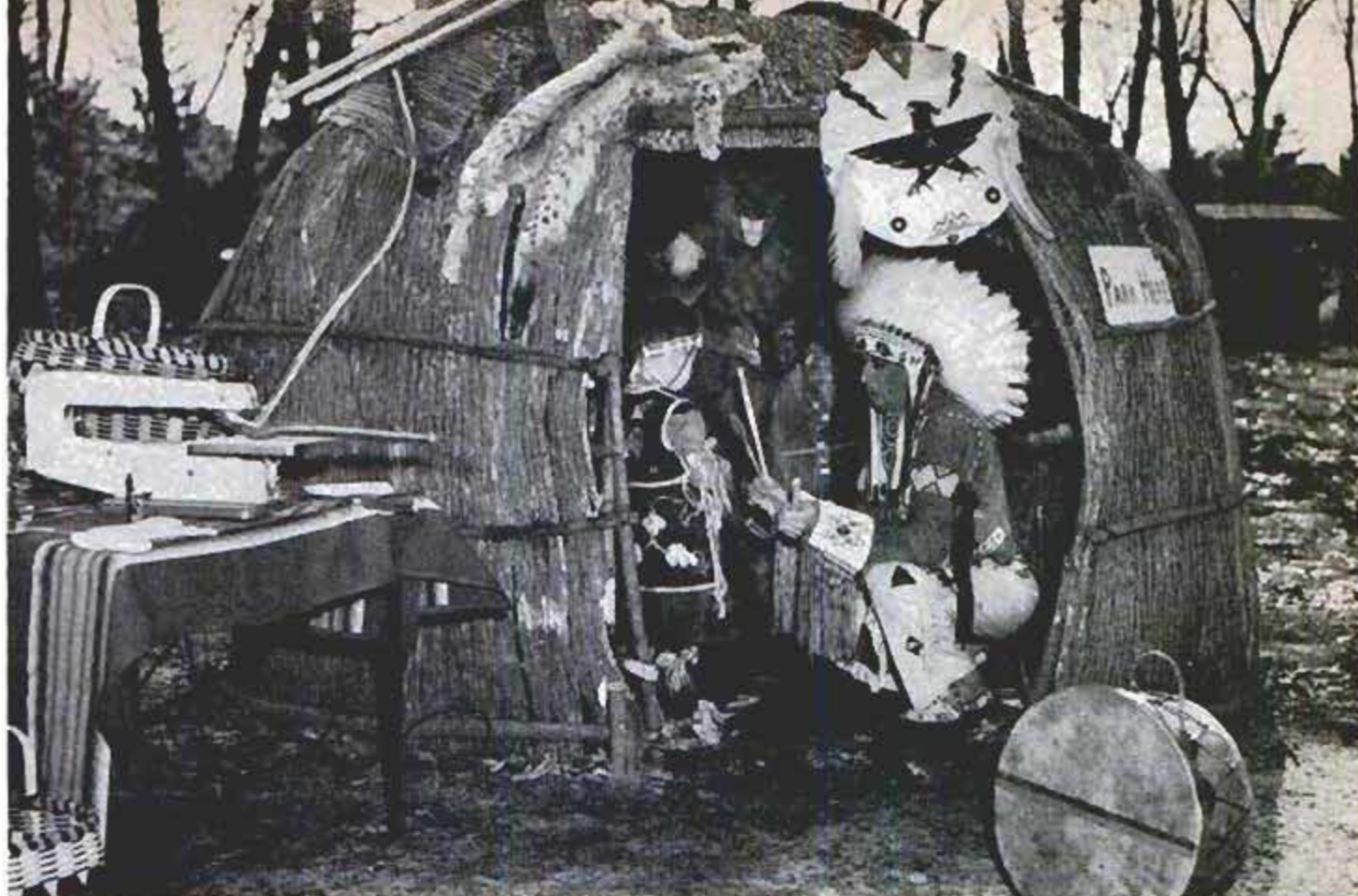


# INDIAN CRAFTSMAN USES POWER TOOLS



Photos by  
Frank P. Fritz





Chief Little Eagle deserts his tools to entertain young son in the wigwam he built as tourist attraction

**A**NCESTORS of Roger (Chief Little Eagle) Tallmadge of Wisconsin Dells, Wis., would be no more amazed than the tourists who visit there at the tools he uses to turn out traditional Indian craft. Little Eagle, a true 20th century Redman, uses an array of power tools to make tomahawks, spears, basket handles (hickory), peace pipes, totem poles and many other items. His drill kit has 36 small precision attachments—drills, grinders, sanders, buffers, polishers. He uses a portable jig saw and a bench-mounted circular saw. With these tools he figures he can turn out as much work in a day as all the men could in a week at the Sioux reservation where he was born. Time-saving power tools make it possible for Little Eagle to keep up his spare-time craft production while he serves as principal of the Davis Corner School, in Adams County, Wis. During the summer he works as a boat pilot on the Lower Dells and operates his own museum (admission free) adjoining his home on Highway 13. Helpers include his wife, Sannay-Me-Na-Ka; son, Walking on Blue Sky, and daughter, Shining Brightly. ★ ★ ★

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The chief fits a tomahawk blade in the handle as he stands behind array of his craft work. Below, at work in schoolroom





# Detroit Listening Post



By Leo Donovan

**I**T MAY LOOK QUIET, sound quiet and be quiet in hot, midsummer Detroit, but your Listening Post is buzzing with rumor. Under its placid surface, Detroit is turbulent as the industry rushes toward the '57 cars.

Here are some rumors, ranging from the wild, speculative to common-knowledge, informed-sources type. Take your pick.

## Long-Shot Rumors

**Chevrolet** may present a truly convertible hardtop model say spies. It may be announced after the regular announcement date which is late in October. It may even be part of a **Corvette** model. This is a real long shot, a rumor-monger's rumor.

Air suspension may be available as an extra-cost option on the **Buick Roadmaster**.

**Oldsmobile** may have a modification of the central-hydraulic system for accessories in its top line.

**Plymouth** may have a flashy sports-type station wagon, but cutbacks made necessary by the sluggish sales this year may force its postponement until 1958. But it just may make it for 1957.

**Hudson** and **Nash** are planning to go to air suspension, but not for 1957, unless they come up with a big surprise.

A good long-shot bet is that there will be no fuel injection in 1957 except in certain specials, notably the **Eldorado** and the **Chrysler 300**—even these two may not have it.

## Even-Money Rumors

It is likely (an even-money bet) that colored anodized aluminum panels will replace and augment chrome or stainless steel in many cars, especially **Chevrolet** and **Plymouth**. The favorite color (which is part of the metal and therefore nonchip-pable) will probably be gold.

**Ford** and **Mercury** will look unrelated in 1957—no more the brother act. Look for both to have considerable metal sculpturing (metal creases that eliminate the slab look from large stretches of sheet metal). Both will use sculptured roof panels. **Mer-**

**cury** will even have two-toned paint jobs on the roof. **Ford** may limit its roof sculpturing to the station wagons which will make them look less like panel trucks.

At least one of the **Chrysler** family will offer four headlights as optional in states that permit them. There are still some states that have not made four lights legal, although it is thought that police won't enforce the two-light law very strenuously if Detroit starts making cars that way.

**Cadillac** (with the **Eldorado**) is betting on police cooperation as is **Lincoln**. These three will have four large lights in front this year. They may not all be headlights though, two of them may simply be enlarged parking or "running" lights.

**Buick** may drop the regular four-door sedan in its Super and Roadmaster lines, limiting production of four-door models to the hardtop.

**Rambler**, now a separate line (not a **Hudson** or a **Nash**), is being beefed up to take a V8 engine. Rear end and driveshaft are to be modified to take added torque.

**Chevrolet** is expected to have a new transmission complete with a variable-pitch stator (like **Buick's**). The informant also hints that **Chevrolet** may offer two automatic transmissions so you have a choice between high performance and utter smoothness.

## Good-Bet Rumors

The entire **Chrysler** family will offer the three-speed PowerFlite (except **Plymouth**), torsion bars and ball joints in front (including **Plymouth**). In fact, everybody seems to be going to the ball-joint front end—it's simpler, maybe it's cheaper.

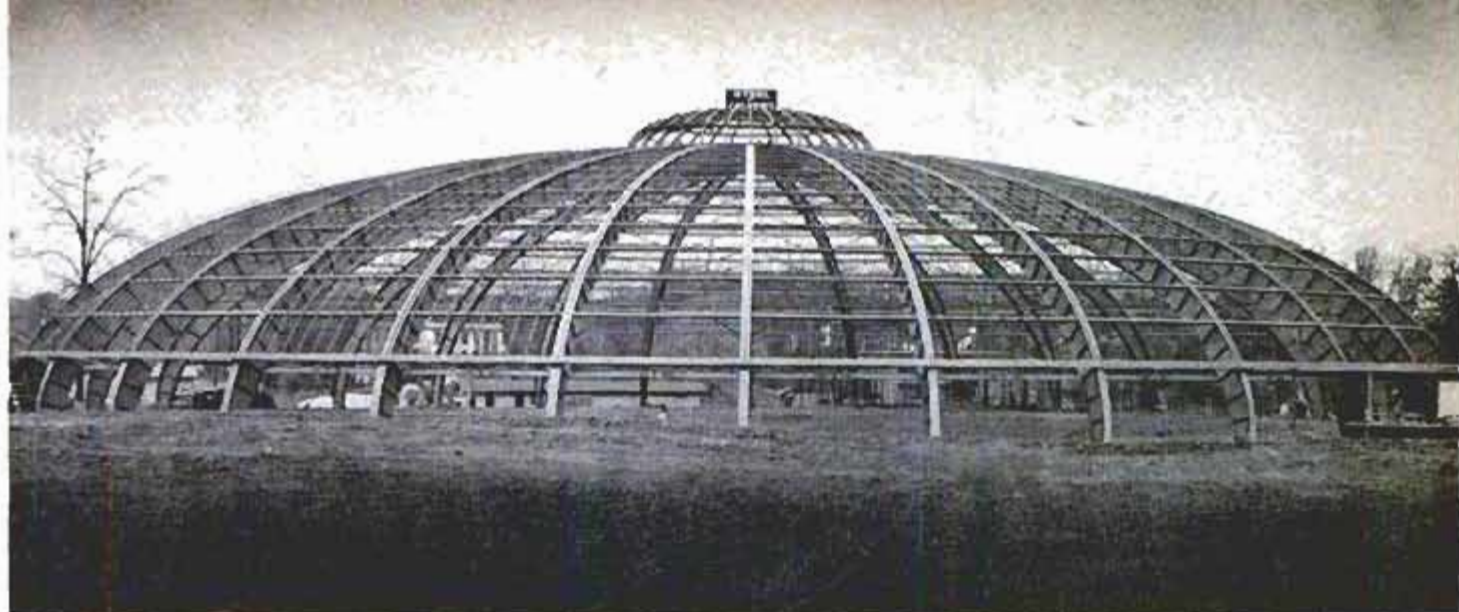
**Chevrolet** will not have a new body shell nor will **Pontiac**, but you'll never know it. Drastic sheet-metal changes plus 14-inch wheels, which are rumored to be on both of them, will make over-all appearance so different you'll swear they are all new. A lower, flatter hood and rear deck plus a sweeping aluminum panel of anodized aluminum will emphasize the rear fins of the **Chevrolet**. Taillights will be much higher.

**Ford** may have a General Motors' look about it, say insiders. Its windshield post will rake forward like **Oldsmobile**, its heater intake will be pressed into the cowl like **Chevrolet**. But then **Chevrolet** will probably have ball-joint front suspension like **Ford** and tailfins like **Plymouth**, so perhaps it's all part of the game.

Most certain of rumors is the fabulousness of the **Eldorado Brougham**. It is to be lush beyond belief. You'll want to take your shoes off before getting in. Likely are disk brakes and air suspension.

**Dodge's** fins will be spectacular and taillights as bright as Times Square.





Completed framework of Alexander Memorial Center, in Atlanta, Ga., required 615 tons of structural steel

## Domed College Arena Built Without Pillars

ALL SPECTATORS at basketball games held in the Alexander Memorial Center, built by the Georgia Tech Athletic Association in Atlanta, Ga., will have an unobstructed view of the court. The building is a huge dome with no supporting pillars to block the view. This giant dome, 270 feet in diameter at the base and 75 feet high at its center, was built by erecting a center pole with a circular girder on it and then setting huge preshaped rib girders in place on the foundation and against the circular girder. After the rib girders were in place, the center pole was removed, leaving the dome to stand alone. In addition to its use as a basketball and physical education arena, the Memorial Center will also house a local radio station. Two wings attached to the dome will have concession stands for use during the games.

At right, center pole with its circular girder is set in place. Below, one after another the welded-steel rib girders are hoisted into final position







Equipped with outriggers to prevent rolling, test cars make screeching turns as they "wring out" new tires

What you want is a 100,000-mile tire. A 13-inch tire for that lower-looking body. Maybe in color to match your car. It all adds up to headaches for the rubber industry as

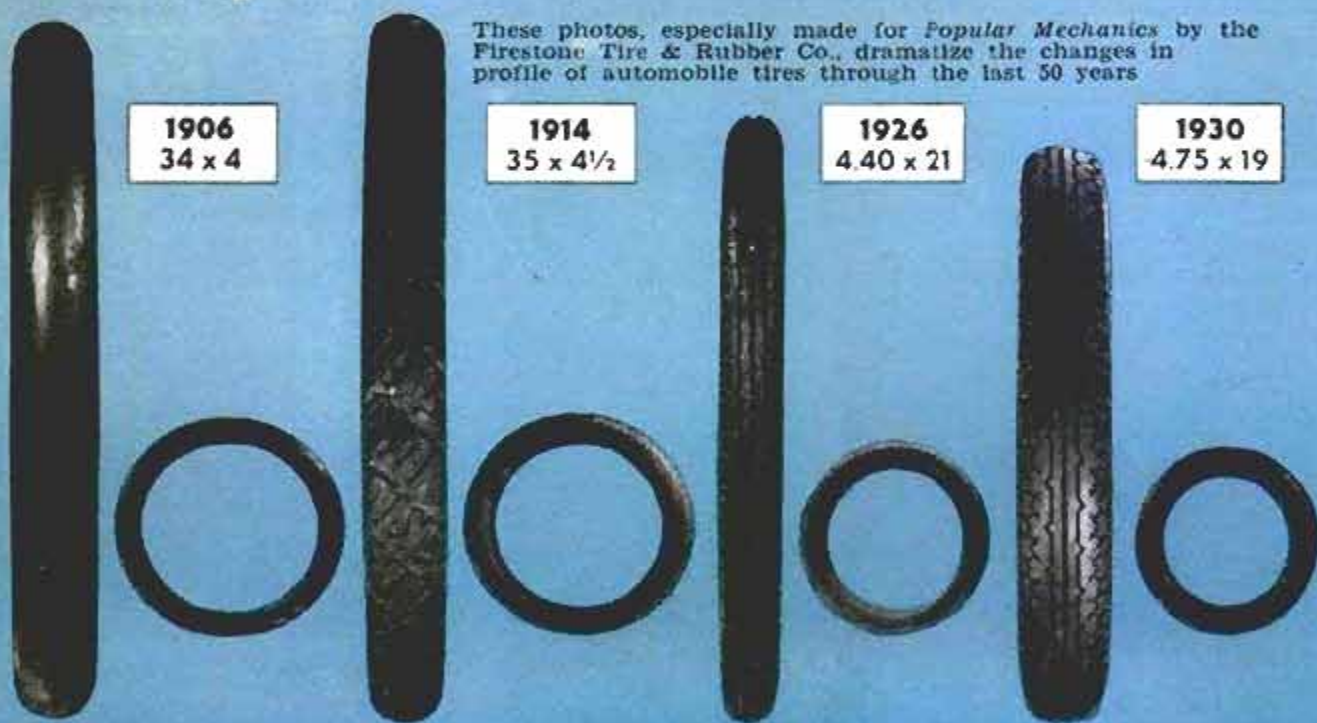
## TIREMAKERS RACE AGAINST TURNPIKE SPEEDS

By Leonard F. Hilts

**G**UARANTEED FOR 5000 MILES!" That slogan, painted on the side of an old red barn just outside of Chicago, has caused many a passing motorist to chuckle. It's part of a barely visible advertisement for automobile tires painted there some 40

years ago, and the brand of tire it extols is no longer made. But the old billboard sharply points up the progress the tire industry has made since then. For these days, 35,000 miles is considered average wear on a set of tires—and the industry has

Through the years, tires have become smaller and fatter. 1906 tire had life expectancy of about 2500 miles





its sights set on producing a 100,000-mile tire.

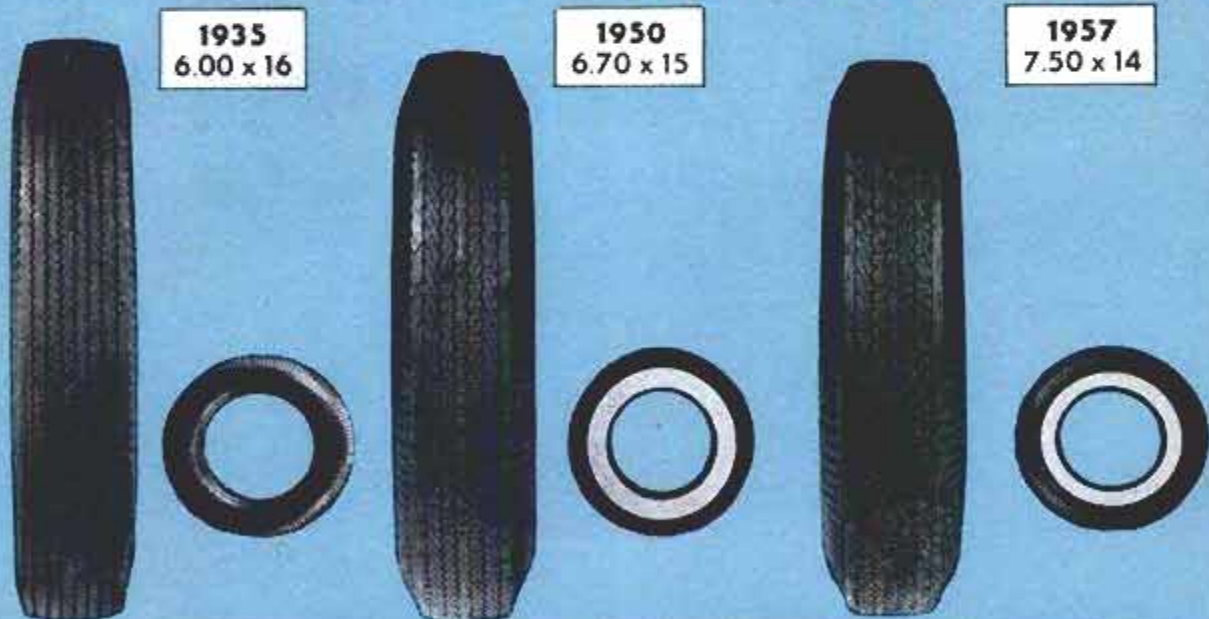
But in spite of this remarkable record of improvement, tire designers are in trouble, trying to keep up with automotive design as it surges ahead. Cars have increased in weight and there have been amazing advances in horsepower in the past few years — as well as such improvements as the automatic shift, power steering and power brakes. All of these make serious demands on the tires.

To emphasize the demands a car makes on a tire, Goodyear engineers point out that in 1926 their tires could be expected to give a normal service of 12,500 miles on the vehicles of that day. That same tire would give only 6250 miles on today's cars. And the present-day 15-inch tire, which might be expected to last for 35,000 to 40,000 miles, would have given 68,000 miles of service on a 1926 car.

And now, to complicate matters, new high-speed turnpikes and freeways are stretching out across the nation. You can now drive from New York to Indiana without encountering a stoplight, and before the end of 1956 it will be possible to travel 1800 of the 2100 miles between Oklahoma City, Okla., and Augusta, Me., on four-lane divided highway; and much of that mileage will be done over high-speed, nonstop turnpikes. This means prolonged periods of fast driving which, in turn, means harder work for the tires through greatly increased heat and wear. So, in spite of the remarkable progress they have made already, tire designers are being pushed harder than ever today.



U. S. Rubber Company runs new "wire" tires through a bed of broken glass to demonstrate their toughness







Above, tire makers delight in putting products through torturous tests. Pictures show Seiberling tire undergoing simulated jet landing at 125 miles per hour. Steel wheel was bent, but tire bounced back without single broken cord. At right, Firestone had to bring out forgotten molds as antique-car collectors demanded old tires for their prize automobiles

Tire men, too, are finding themselves squarely on the horns of a dilemma, because they have discovered that high-speed performance and passenger comfort don't go together. You can have one or the other, but you can't have both. And yet both are being demanded by automotive designers and the buying public. Coupled with this dilemma are the facts that tire cost must be kept down and tire design has to be in keeping with automotive styling.

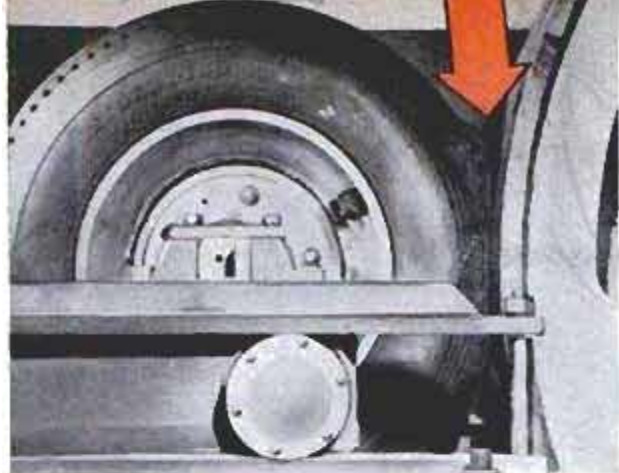
Tire development today is a long series of compromises which attempt to solve all of these problems with one tire.

Peering into their rubber crystal balls, tire men are making predictions about the future of their product. Here are some of the things they are saying:

**No spare tire needed:** It won't be long before the spare tire disappears from automobiles—much to the delight of automotive designers, who have plenty of ideas about what to do with the space thus gained. In fact, one 1957 prestige car will be delivered without a spare—but will supply one if the buyer requests it. Goodyear has taken a step toward this goal by introducing a tubeless tire with an inner chamber—virtually a tire within a tire. In the event of a blowout or puncture of the outer tire, the car can be driven (up to 250 miles in tests) on the inner tire, which is nylon-reinforced rubber. Unlike other safety-tube tires, there is no valve or connection between the two air chambers of the tire. Instead of stopping to put on a spare after a blowout with these tires, the motorist







Tire turning against test wheel at 100 miles per hour shows what happens to tread rubber on road



Laboratory technician tests samples of new rubber compounds on abrasive wheel for wearing qualities

simply continues on to the next garage—or goes on home and has the injured tire repaired the next day.

**The 14-inch wheel:** 1957 automobiles will come out with a 14-inch wheel in place of the present 15-inch. This smaller inside diameter has been demanded by car designers—and it doesn't make the tire designers very happy because it raises problems. Its main purpose is to help with the longer, lower body lines of the future. While this smaller wheel actually won't lower the car body much, it will give a lower appearance. At the same time, the cross section of the tire will be increased somewhat, perhaps half an inch, and the air pressure will be reduced from 24 pounds to 20 pounds. This fatter, smaller tire, in addition to lowering the lines of auto bodies, will provide a softer ride than anything produced thus far.

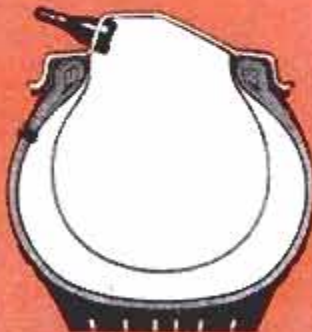
**Even smaller wheels:** In the foreseeable

### Tips on Tire Care

1. Never drive at high speeds on brand-new tires. Give them a 1000-mile break-in at normal driving speeds.
2. If you do considerable highway driving, equip your car with "high performance" tires, which will take prolonged high speeds better and safer.
3. Never permit tires to go below recommended pressure. Rapid heat build-up and possible tire damage results.
4. When planning a long trip where prolonged high-speed driving is certain, increase air pressure in tires. A 24-pound tire will run considerably cooler at 28 pounds.
5. Apply brakes intermittently; don't jam them on. Avoid "hot rod" starts, fast cornering and sudden stops.
6. Keep wheels in balance and rotate tires every 5000 miles. Keep front wheels in alignment to avoid uneven tire wear.



At left, soft gum in self-sealing tire may soften at high speeds and settle in middle of tread. At right, Seiberling solution to this problem provides tiny bulk-headed compartments to hold soft gum in its place



Left, Goodyear tire with separate inner and outer air compartments. After blowout, car rides on inner tire up to 250 miles. Right, Firestone tire with twin compartments has valve between. Slow deflation permits safe stopping







Engineers at General Tire Co. "fingerprint" huge tire to check area of ground contact under 18-ton load



U. S. Rubber engineer shows how up to eight miles of woven wire is bonded under tread of new "wired" tire

## Passenger-Tire Developments

- 1845—Robert William Thomson patents airtight tire for carriages.
- 1888—Dr. John Boyd Dunlop makes pneumatic tires containing air under pressure.
- 1889—Clincher tire.
- 1893—First cord tire.
- 1894—First pneumatic tire for automobiles.
- 1904—Straight-side, wire-bead tire.
- 1904—Average tire life 2000 miles.
- 1904—First use of carbon black to provide longer wear.
- 1907—First commercial demountable rim.
- 1908—Angular nonskid tread.
- 1920—Average tire life 10,000 miles.
- 1920—Gum-dipping of tire fabric.
- 1922—Balloon tire introduced.
- 1925—Twenty-one-inch tire.
- 1930—Average tire life 16,000 miles.
- 1930—Nineteen-inch tires.
- 1932—Experiments with tubeless tires.
- 1933—Experimental tires built with synthetic rubber.
- 1935—Mud and snow tires.
- 1937—First use of rayon fabric in passenger tires.
- 1942—Tubeless truck tires developed for war use.
- 1942—Major use of synthetic rubber to fill government orders for tires.
- 1942—Butyl inner tubes introduced.
- 1947—Nylon tires introduced.
- 1948—Superballoon tire.
- 1950—Fifteen-inch tire used on most new cars.
- 1954—General use of tubeless tires on 1955 cars.
- 1955—General use of tubeless tires on 1956 trucks.
- 1956—Fourteen-inch tires for 1957-model cars.

future there will be a reduction to a tire with 13-inch inside diameter—a tire size already being tested by several companies. In the old days, tires were 35 inches in diameter, with high air pressures—and provided a pretty hard ride. Tire size was gradually reduced and by 1935, when the 16-inch wheel with a tire carrying 28 pounds of pressure was introduced, tires began to mean something to the comfort of the passengers. This arrangement was replaced in 1950 by the 15-inch wheel. Each reduction in size has brought a smoother, softer ride.

However, tire men are worried about this trend to smaller and fatter tires. Their research shows that to obtain the best high-speed performance, the largest practical tire should be used—because at a given speed, the larger the tire the less the revolutions per mile and the cooler the tire temperature. And they know, too, that in a smaller, fatter tire there is some loss of stability and steering response. On such tires, for example, cornering would be sloppier.

Tests with two tires, one with a 28-inch outside diameter and the other with a 29.7-inch outside diameter, demonstrated the effect of size at high speeds. The smaller tire ran an average of 10 degrees hotter than the larger one at all speeds starting at 35 miles per hour. However, as the speed went over 85, the smaller tire became considerably hotter, and at 100 it was running 30 degrees hotter. Tire scientists noted that the larger tire ran cooler at 110 than the smaller one did at 100—which means that the larger tire would have a 10-mile-per-hour advantage in high-speed performance.

A few years ago such tests would have been important only to racing cars. But today's assembly-line passenger cars are



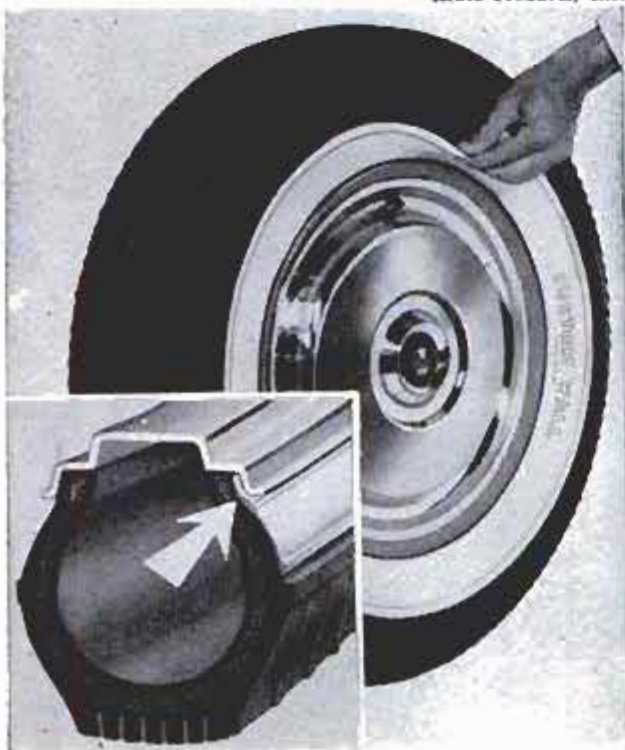
often capable of 100 to 120 miles per hour; and tomorrow's roads will give them the opportunity to run at high speeds for long periods of time. This means the high-speed performance index of a tire is important—and tire designers have good reason to be concerned over the smaller tires.

### Researchers Finding Answers

At the same time, rubber researchers are bringing some answers to this problem out of their laboratories. Nylon and super-rayon cords are being used for strength and cool running. Better carbon blacks and better synthetic-rubber formulas are producing longer-wearing qualities. Cord-dipping processes which help to bind the tread rubber to the body of the tire even in the presence of high heat are a big step forward. The main hope of researchers is to offset the undesirable qualities of the smaller tires by improving the qualities of tire materials and tire construction.

*Disappearing inner tube:* Within three years, the inner tube will have gone the way of the dodo bird. Most new cars reached dealers in 1955 equipped with tubeless tires, which Goodrich pioneered in 1947. Trucks have appeared with big, heavy-duty versions of the tubeless design and by 1957 the majority of all new trucks will be so equipped. To adapt the tubeless principle to trucks, a new rim had to be designed and standardized for the trucking industry. This has now been done and has resulted in a large saving in weight—as much as 120 pounds per axle for cast

Answers to problem of colored tires seems to be the detachable colored sidewall, held in place by rim  
Kraze Products, Inc.



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spoke mountings and 160 pounds per axle for disk-wheel mountings. Whether used on cars or trucks, tubeless tires suffer less from blowouts and punctures than older types, providing an increase in safety at lower operating costs for the driver.

*Self-sealing tires:* Borrowing an idea from the self-sealing gas tanks developed for aircraft during the war, tire makers coated the inner walls of tubeless tires with soft gum. When a nail or other object penetrates the casing, the gum seals the hole and prevents air from escaping. Tires with this safety feature have been on the market for some time, but improvements continue to be made. In earlier models, the gum tended to soften and run toward the center of the tread at high speeds. This not only made the tire more vulnerable to punctures, but also threw the wheel out of balance.

### Bulkhead Construction

Typical of the effort to overcome such problems is the bulkhead construction recently offered by Seiberling. In this design, the gum is contained in bulkheaded compartments on the inside of the casing, and cannot change position even if softened by heat. Firestone has taken another step with a tubeless tire with gum-dipped nylon cord that has the self-sealing gum on the interior wall. Then it also has a safety diaphragm made of rubberized nylon cord—again, a tire within a tire. A valve connects the inner and outer chambers. In the event the casing is ruptured, the wheel will roll on the inner tire long enough to permit the driver to bring the car to a safe stop.

The tire buyer should keep in mind that such plus factors are usually offered only in higher-priced premium lines, with cost running considerably more than a standard set of tires.

*Colored tires:* One big debate in the industry is on the colored tire. Consumers have indicated that they want color in just about everything they buy, and some tire manufacturers think this will hold true for tires, too. In their premium line, U. S. Rubber already offers sidewalls of bright blue, green and brown. But others point out that to get shades to match or harmonize with all of the colors appearing on car bodies they would have to make and stock too many different colors. Next best answer seems to be the detachable colored sidewall, which fits against the tire and is held in place by the rim of the wheel. A number of manufacturers have them on the market now, including Goodyear and Firestone. Half a dozen colors are offered, all pastels which harmonize easily.

(Continued to page 232)



# Right Behind the Firemen Come the Salvage Squads

By Creighton Peet



Rolled-up cloth serves as dam to keep water pouring down the staircase from spreading

After 30 hours, firemen working in zero cold keep hoses on Michigan State Office Building

Flexible smoke-ejector tube is poked into basement to rid it of noxious fumes and gases

Los Angeles Fire Dept. photo





**E**VEN TODAY many people believe that firemen take a fiendish delight in smashing up furniture, kicking out windows and chopping needless holes in floors and walls. As for water—it's obvious, you will hear, that they keep pouring it in just for fun long after the need is over.

But the fact is there are more trained firemen today than ever before, and although firemen often must break windows and chop away a smoldering ceiling to save a house from "rekindle," there are, and for many years have been, special fire-patrol crews whose sole job is to look after property.

Whether they are working for the older outfits supported by the fire-insurance companies, or regular city fire departments, they have a rugged, dangerous job. They must enter a building almost as soon as the fire fighters do, and in a few seconds their chief must decide how much property can be saved from water damage, and how to go about it, before ceilings fall and floods of water, sometimes boiling hot, pour down on them. Fire patrols, which usually consist of around a dozen men, do their most extensive jobs in big mercantile buildings filled with valuable merchandise, where the fire may be confined to one or two floors. They also operate in private homes, but have less opportunity to do this particular kind of salvage work in small one-story structures.

#### **Meanwhile—Beneath the Fire . . .**

The difference between regular firemen and the fire-patrol men is that the latter usually work on the floors below those on which the fire is actually located. They cover everything possible with big 14 by 18-foot treated canvas or rubber covers, which they lug up stairways which have often turned to waterfalls. On occasion, if they are lucky, they may find an elevator still operating. But nearly always they will have to force locked doors with special tools, cut padlocks with giant nippers, and operate with no light but that from their flashlights. Water may be hot when it pours down from the region of the fire, but in winter the water flowing down into floors from which windows have been



Milwaukee Fire Dept. photo

This is what happens when salvage facilities aren't sufficient. Water from fire in Fargo, N. D., hotel poured into lobby and froze. Below, fire-patrol man carries tarp upstairs to spread over contents of floor below the fire, where water is coming in







Los Angeles Fire Dept. photo

Los Angeles firemen cover store shelves with tarpaulin to protect the goods from smoke and water damage

knocked out will eventually turn the floor into a skating rink, adding to the hazards.

From drills and experience, the men immediately know what to do. Small movable items of furniture like desks and typewriters are quickly pushed into piles in the center of the room to be covered, as are piles of merchandise. Open stock shelves are covered as well as possible. If necessary,

Water must be moved out quickly. Here, water from floor above is directed to runoff point with tarp

Fire Engineering photo



protective covers are nailed to any convenient surface through eyelet holes in the covers.

In older buildings the holes in ceilings where lighting fixtures are fastened, and those through which steam and water pipes pass, soon become gushing waterfalls. A big fire may take thousands, or even tens of thousands of gallons of water to extinguish,

Smoke exhaust fan ventilates area through hole chopped in floor. Smoke damage can ruin many goods

Fire Engineering photo





and it's only a matter of minutes until this water starts working its way through floors and ceilings to lower floors, and flowing down stairwells and elevator shafts.

And if it doesn't find a weak spot to work through in a hurry, the firemen on the floor above will soon chop a hole to speed it on its way. Disposing of this water as rapidly as possible, with a minimum of damage to the material in the building, is the job which keeps the fire patrol jumping.

### The Big Flush

In some older industrial buildings there are built-in scuppers or drains in corners of the floor, to take off any water which might be involved in the work done there. But these may be buried under tons of merchandise, or plugged up. In any event, fire patrols have a faster, surer way of finding access to a sewer. With big crowbars, they quickly pry up enough toilets from the floor to provide drainage for the water which is now rising all around them, and threatening the contents of still another floor—the one below them.

There are still other tricks to this trade. Using rolled-up covers, they form "dams" or dikes to channel the flood and keep it from spreading. A fire may be confined to one part of a big floor, but the water will quickly cover it all if not stopped.

### Out the Window

Another technique is "bagging." When a hole in a ceiling is pouring out a gusher, a big cover is placed under it with its sides supported to a height of two or three feet by chairs, tables, boxes or anything handy. Then, as this lake continues to rise, portable gasoline or electric pumps are rushed in with a short length of hose which discharges this water out of the nearest window. Because the building's electric line may be out, most fire patrols carry portable generators and lengths of cable to operate small portable pumps.

Covers can also be formed into troughs under a stream of water pouring from a ceiling, to discharge water through a window. At other times a number of covers

(Continued to page 234)

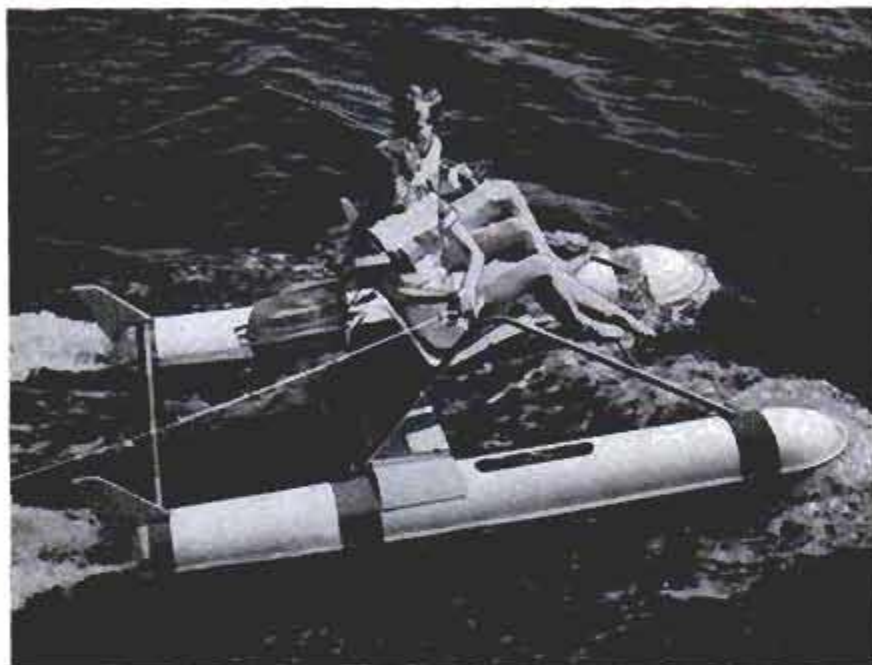


Los Angeles Fire Dept. photo  
Water channeled down stairway from fire above is directed to street by sawdust dikes that leave the surrounding carpets dry

Ballooned cover is hung from ceiling where opening has been made to let the water flow down and be chuted out window  
Underwriter's Fire Patrol photo





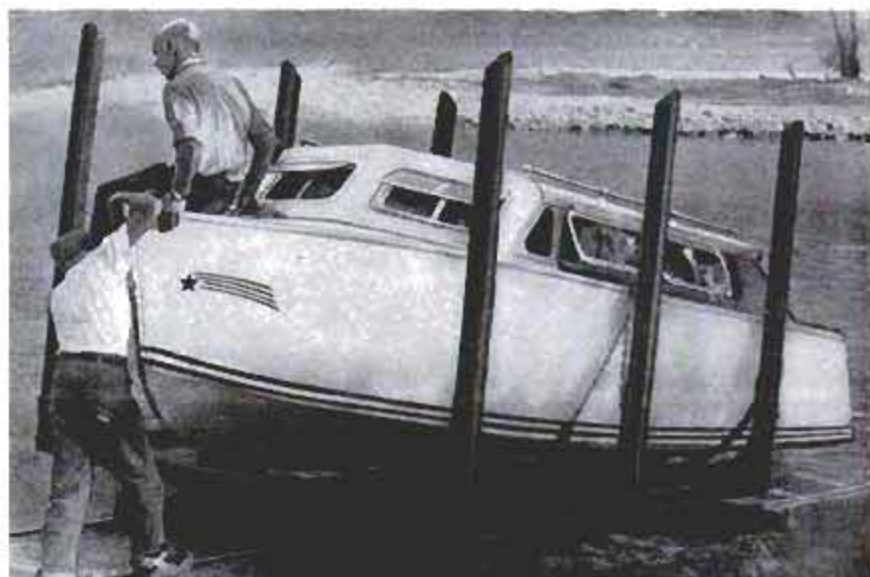


## Motor-Powered Pontoon Boat

Two 9-foot pontoons, made of polyester resins and glass fiber, are the hull of a new wave-skimming little pleasure boat for two persons. Each pontoon contains four airtight compartments for maximum safety. Power for the little craft can come from an outboard motor, a small airplane motor and propeller, or from paddles driven by pedals. A control stick attached to the seat operates a rudder for steering the lightweight craft.

## Cradle on Rails Totes Boats Across Land to Bypass Dam

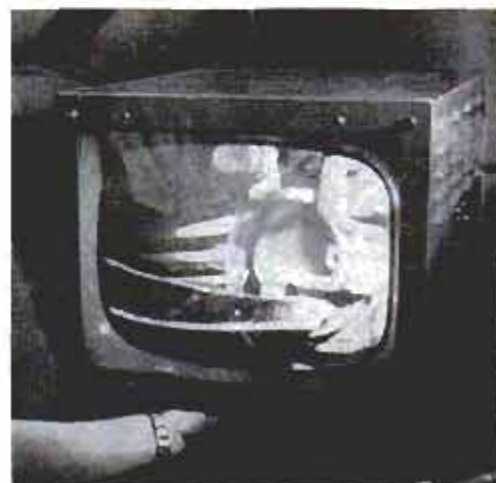
Members of the Rock River Boat Association in Wisconsin have built a boat lift to bypass a dam, making 40 miles of the river navigable. A cradle rides on rails which go down into the water. The boat is floated into place and strapped to the cradle. The operator starts a motor which pulls the cradle out of the water. When the boat reaches the halfway mark in its 200-foot trip, the cradle is rotated 180 degrees to back the boat into the river.



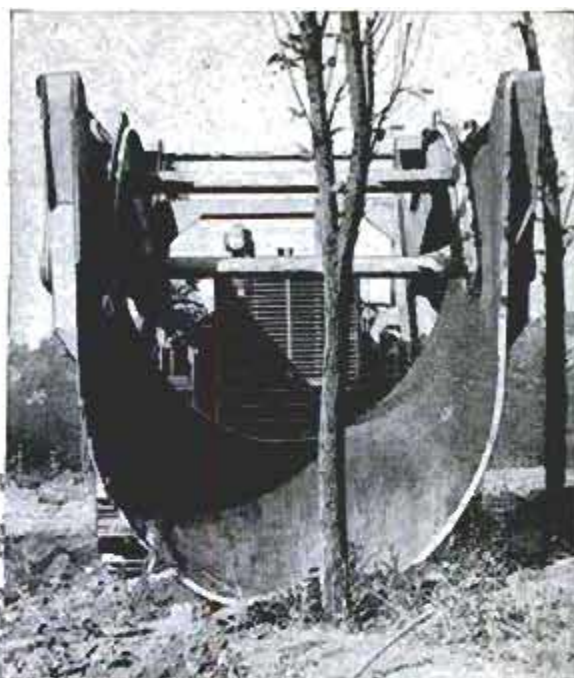
## Television Camera Lets Engineers See Under Car in Road Tests

Automotive engineers use television to see what happens under a car during testing. A small bomb-shaped camera that can be mounted almost anywhere beneath the car transmits to a television screen in the back seat. It can also broadcast the picture to the engineering laboratory so many engineers can watch the picture of the test at the same time.

Below, an engineer gets a TV closeup of the action of front suspension during the test



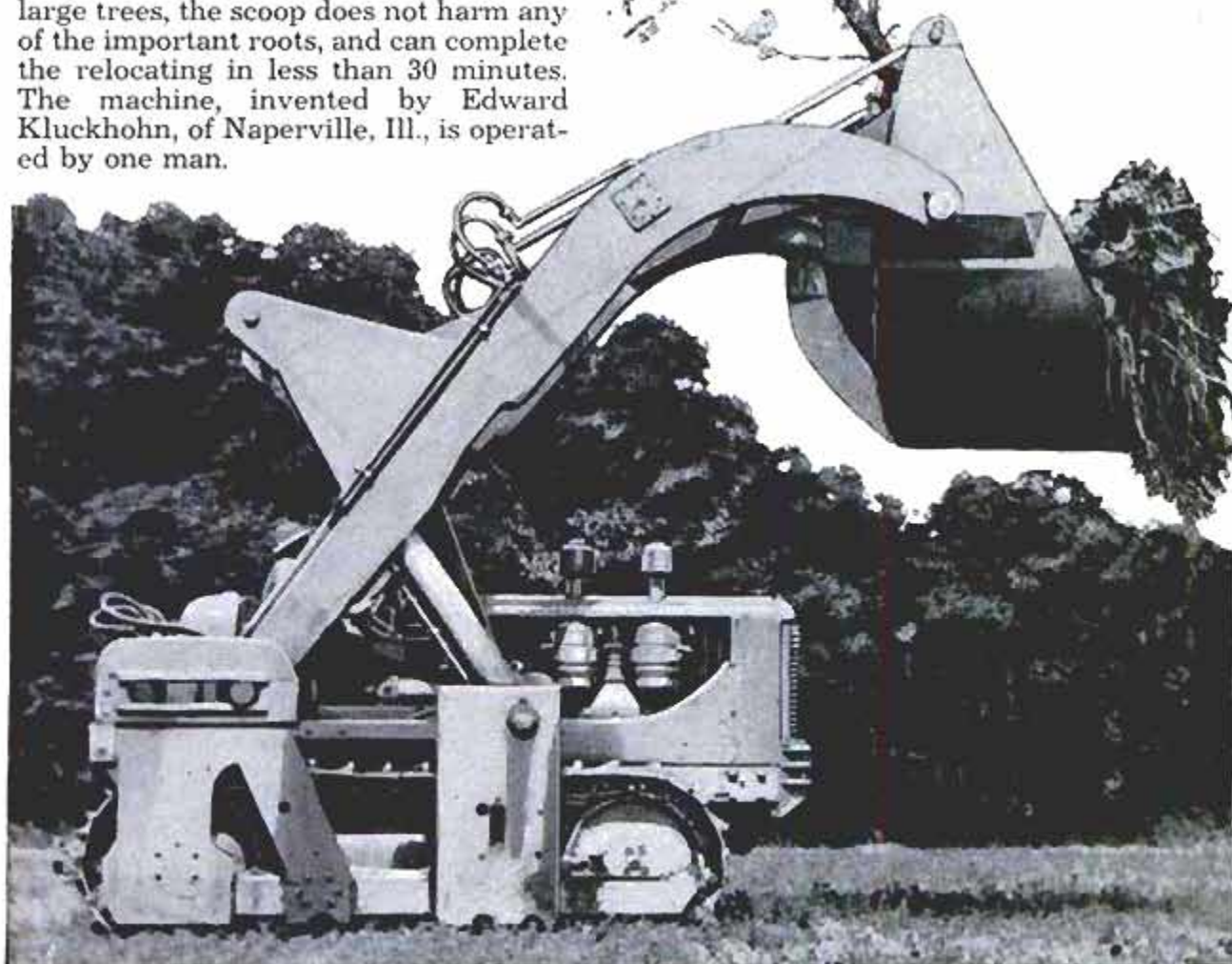




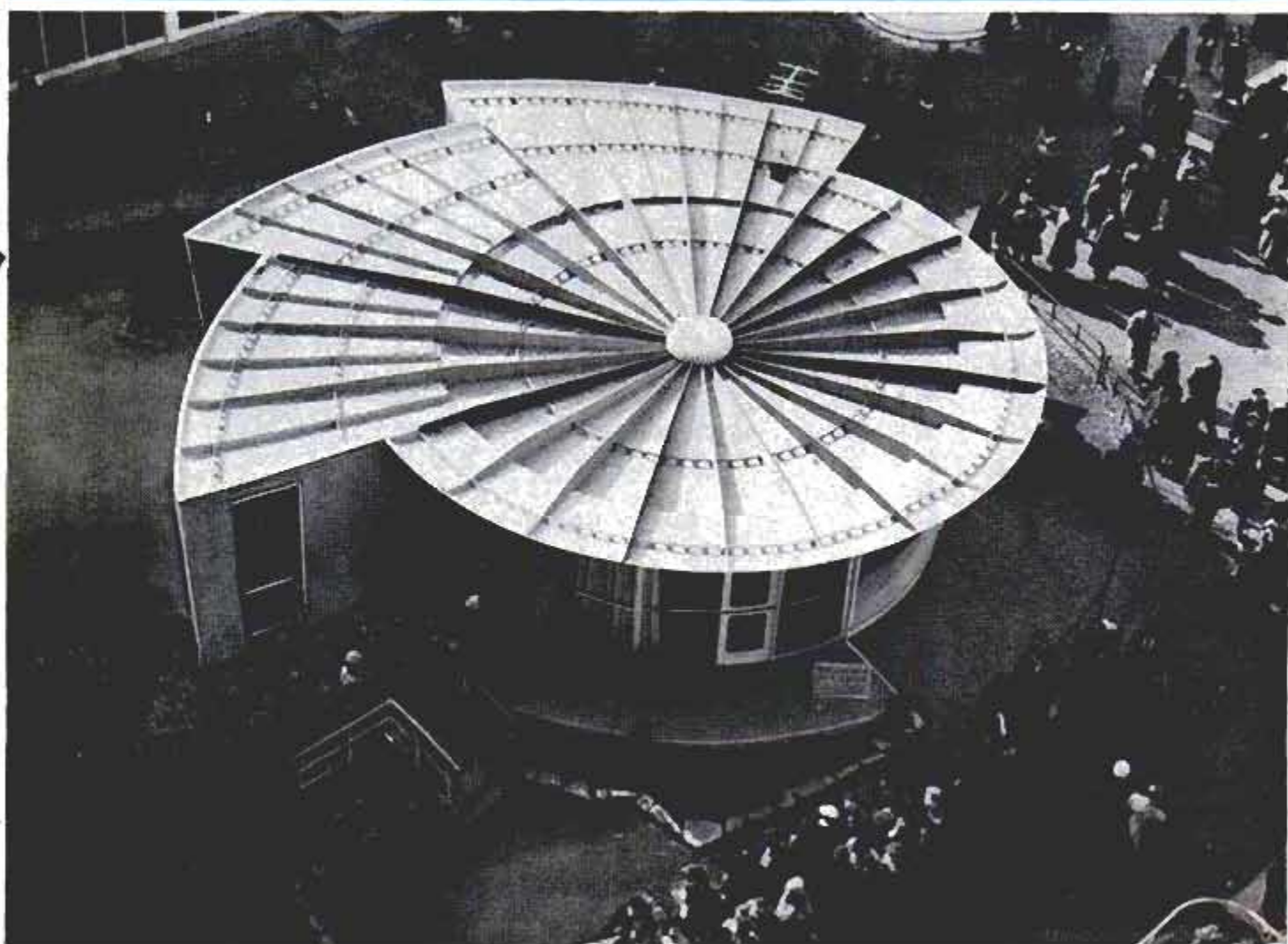
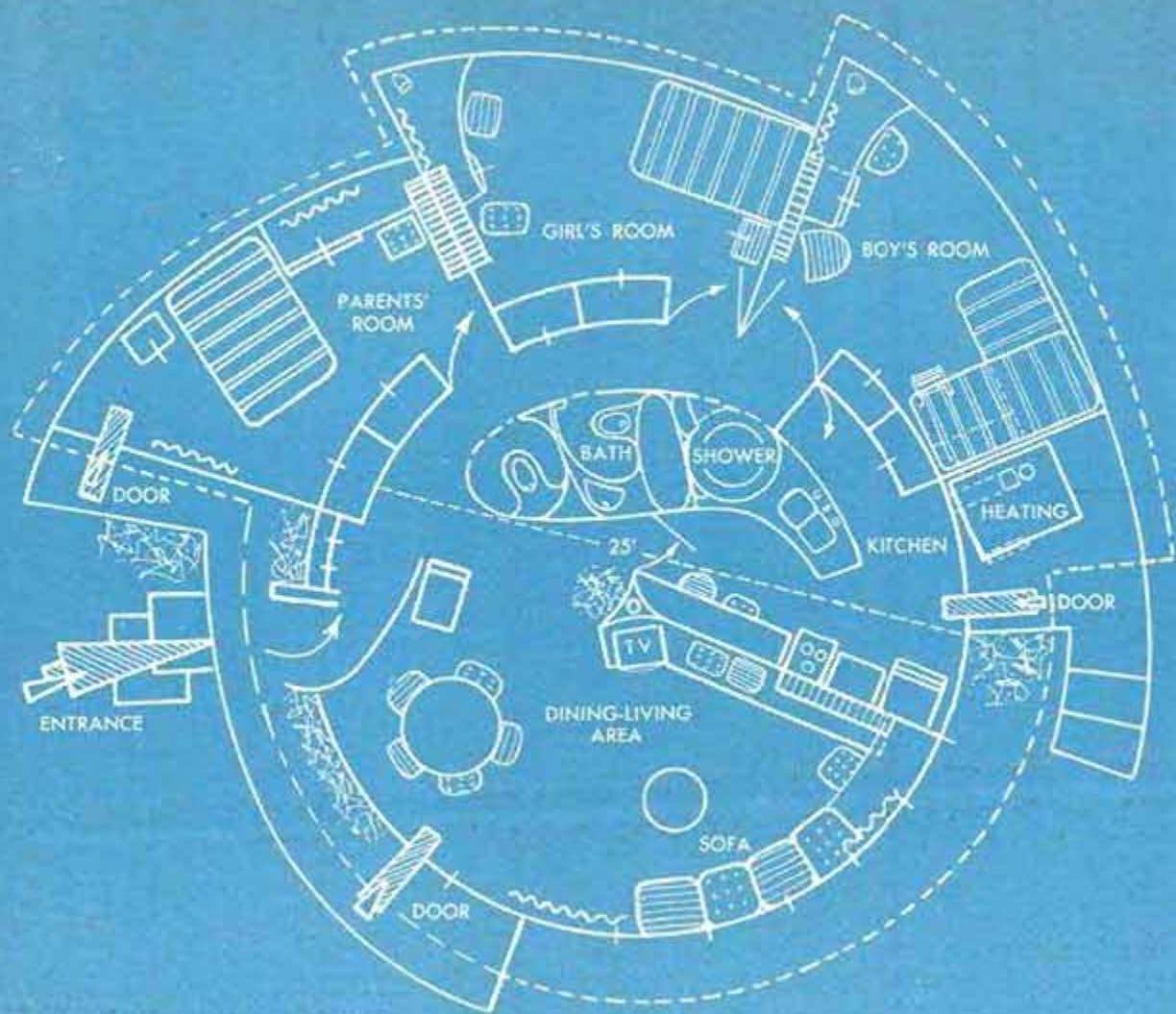
## BIG TREE DIGGER

SCOOPING UP a big bite of dirt six feet in diameter and three feet deep, a hydraulically operated tree digger is capable of transplanting trees up to 12 inches in trunk diameter and 40 to 60 feet in height. When transplanting even large trees, the scoop does not harm any of the important roots, and can complete the relocating in less than 30 minutes. The machine, invented by Edward Kluckhohn, of Naperville, Ill., is operated by one man.

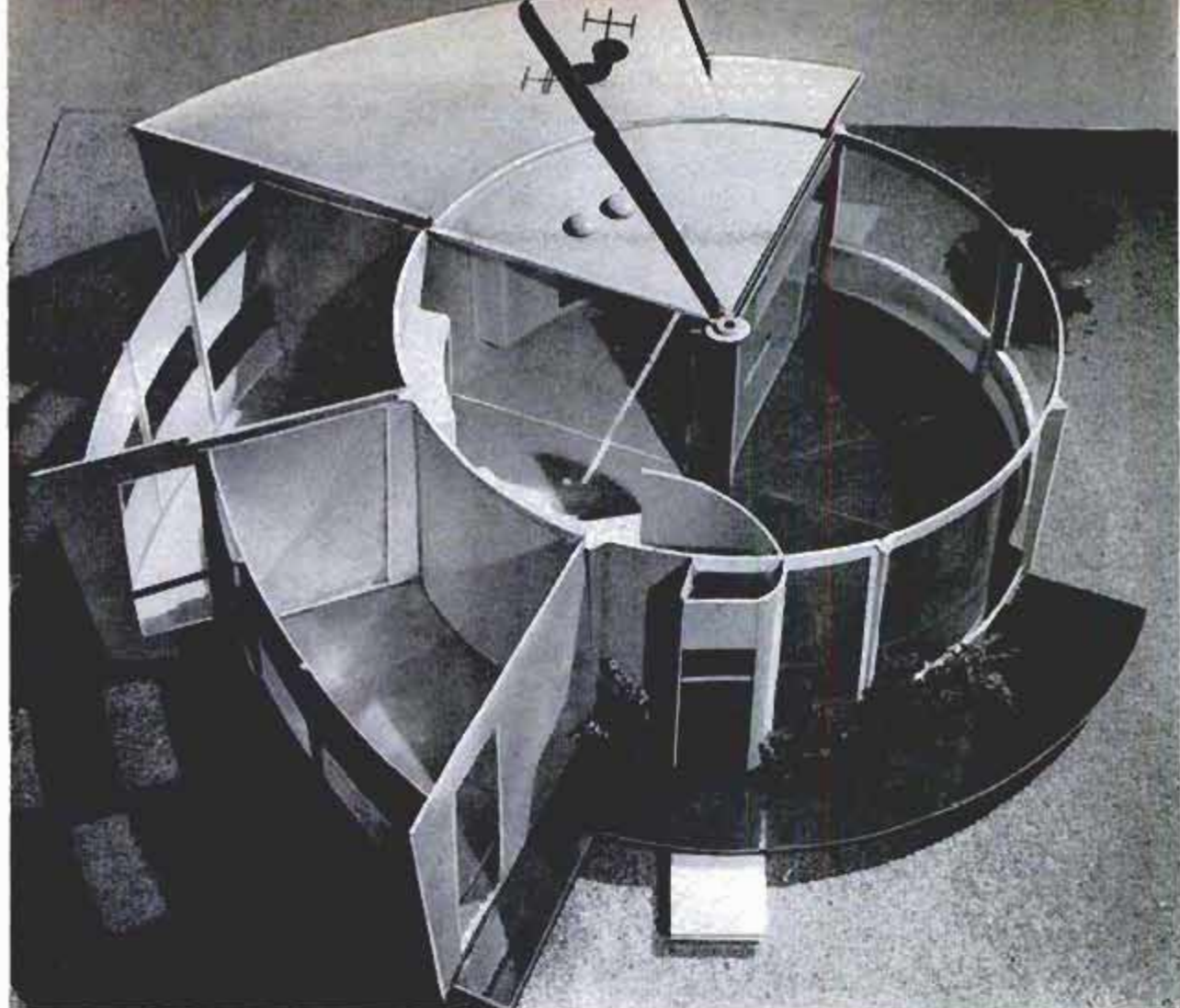
Scoop lip is sharpened, and can cut through one foot of frozen ground. It will transplant trees up to 12 inches in trunk diameter and 60 feet high. One man can operate it











Cutaway model shows central living unit with curved window wall. Bedrooms are attached at the left side

## ***The Latest From Paris—an*** **ALL-PLASTIC HOUSE**

*By Leone and Lester Hayes*

**T**HE WORLD'S FIRST all-plastic house was recently exhibited in Paris at a home-furnishings show under the joint sponsorship of a French publication and the coal industry. Everything about the house is plastic—walls, ceilings, floors. The windows are Plexiglas; the entire bath and kitchen units and even the furniture and decorative fabrics are plastic. Only chair and table legs are metal. The house weighs nine tons or about  $\frac{1}{15}$  as much as if it were made of conventional materials. The central part of the house—itsself a complete living unit—can be set up in a few days, and from one to three bedrooms can be added in two hours each.

This is the first major plastics-molding job ever undertaken in France. There was no factory equipped for the project and no specialized workmen; the house was fabricated in an exhibition hall at the Paris

Furniture in boys' bedroom is all plastic, including "shell" beds and desk-book shelves. Walls and furnishings are washable and have "built in" color





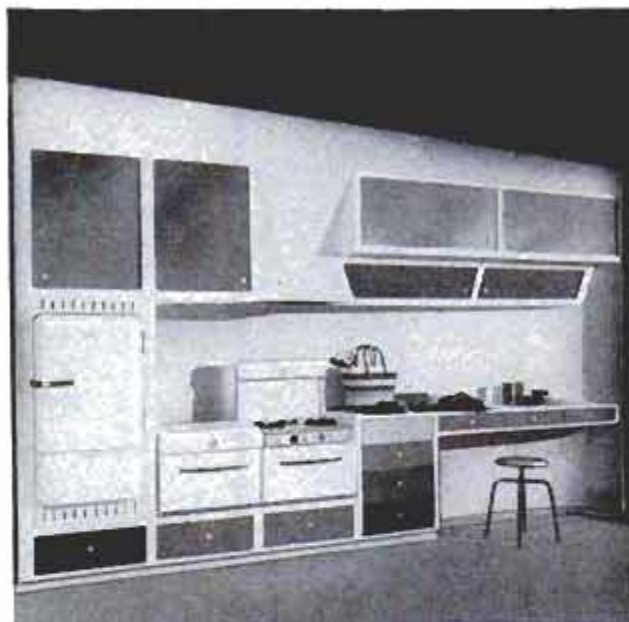
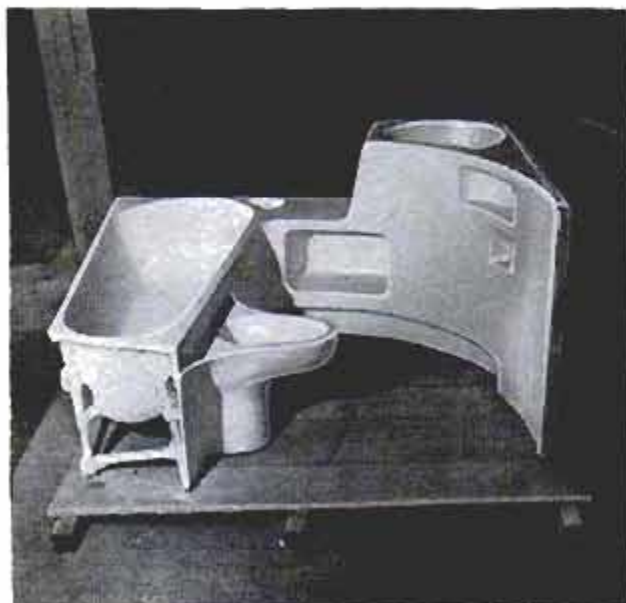


Living room has nylon-cushioned sofa of molded plastic, glass-fiber chair and Plexiglas desk. Carpets in this all-plastic house are made of colorful nylon

fairgrounds by a crew of 40 men trained on the spot. Building the molds and casting the parts took four months, but the house is designed for low-cost quick mass production. At this preliminary stage, no price has been quoted for the house.

Five basic and 20 auxiliary wooden molds were constructed and polyester resin was hand applied over glass-cloth reinforcement (the same materials that go into glass-fiber chairs and auto bodies). For insulation, the outer walls are sandwiches of  $\frac{1}{16}$ -inch polyester-glass-cloth sheets with a filler of polystyrene foam (the brittle foamlike plastic used for Christmas ornaments). Floors are layers of the polyester sheets with inner core of two-inch Bake-

Single-mold plastic bath unit simplifies installation. It can be made in any color of the rainbow. Shower units are molded as separate compartments



Entire kitchen unit, 12½ feet long, was cast in one mold. The doors and drawers are in various colors for decorative purpose and for ease in identifying

lite-treated honeycomb paper for sound-proofing. Inner walls are double layers of the polyester sheets.

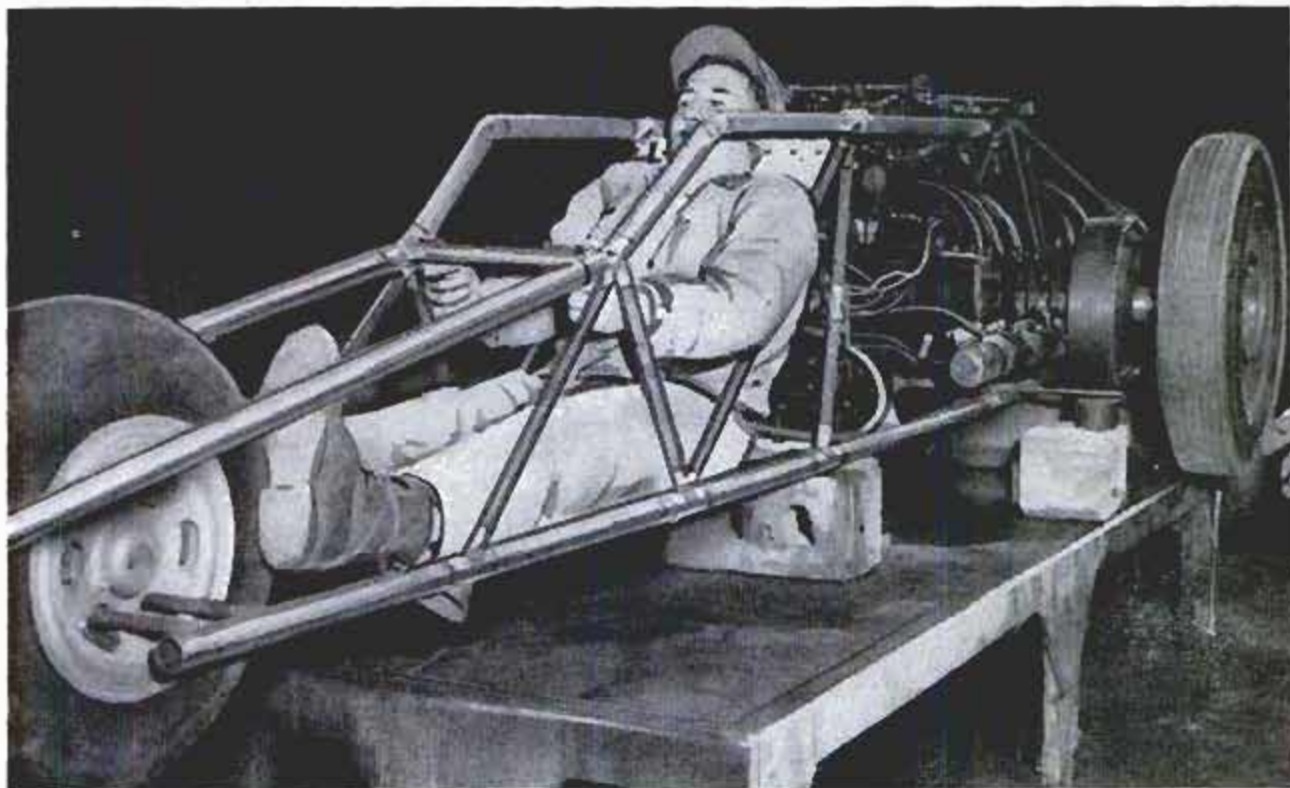
The frame and floor of the central round unit are molded in wedge-shaped eighths of the whole that fit together like a pie. The roof-ceiling sections are also in eighths and lock together with fins that act as rain gutters, leading to the central drain that also services the kitchen and bath which are situated in the center of the house. Hot-air ducts are molded into the ceiling. Heat is supplied by an automatic plastic-encased coal-burning furnace.

"La Maison Plastique" is making headlines in France for the revolutionary use of plastic as a construction material. ★ ★ ★

To make section of house, workmen are coating glass-fiber reinforcement with polyester resins which set to an almost metal-like hardness. Crew numbered 40







Art Arfons demonstrates driving position in the Monster. Car will have streamlined body as in sketch below

## Helicopter Engines Power This Dragster



MOST OF US would agree that airplane engines belong in airplanes. But not the three Arfons brothers of Akron, Ohio.

This trio of speed-seeking hot rodders (in the good and true sense of the term) have a habit of making airplane engines accelerate flightless vehicles to breathtaking speeds on a quarter-mile dragstrip.

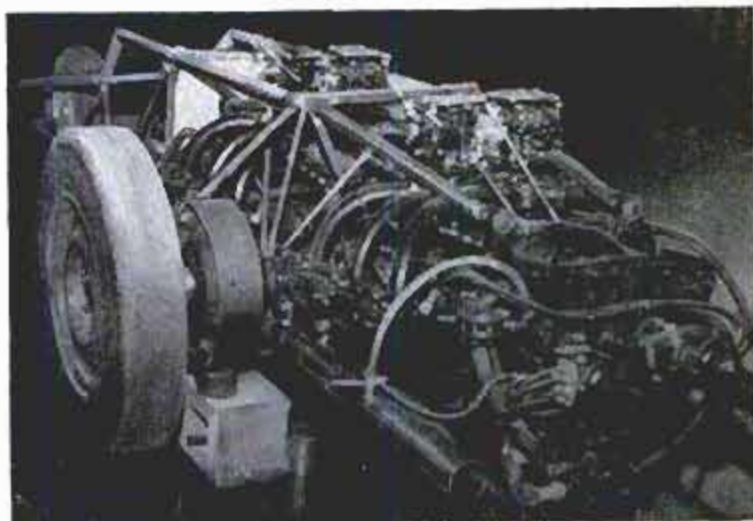
Newest of the Arfons' kiwi-like speedsters is the Green Monster 9, powered by two helicopter engines. Combined, the two engines develop about 800 horsepower and, the three brothers claim, give the car power enough to break the record of 151 miles per hour held by another twin-engined car. That dragster combined an Oldsmobile and a Cadillac engine to set the record last year.

The Arfons held the record themselves in 1954 when an earlier Green Monster hit 132.35 miles per hour. It was powered by a 1450-horsepower Allison aircraft engine. Their 1955 version of the Green Monster used a Ranger Aircraft engine. The air-cooled helicopter engines (lighter than the water-cooled aircraft engines used

before are expected to provide more speed despite a lower power rating.

Along with more than 1000 hot rodders from all over the country, the Arfons' Monster will compete at the third annual World Series of Drag Racing held at Lawrenceville, Ill., sponsored by the Automobile Timing Association of America.

Two helicopter engines, below, are mounted over rear axle, the crankshafts joined by two pinions and a ring gear. Fluid clutches are inboard of the wheels. Original plans call for car to have three wheels, another may be added after testing







## DO NOT ENTER INFECTIOUS DISEASES

There is enough polio virus under strict control in this one small room to infect everyone in the world

By Thomas E. Stimson, Jr.

*Based on an interview with*

**Dr. Wendell M. Stanley, Nobel Laureate**

*Director of the Virus Laboratory,  
University of California*

**B**IOCHEMISTS believe the day is coming when they will be able to use laboratory chemicals to create organized structures that have some of the properties of living things.

Specifically, they hope to manufacture viruses that will grow and reproduce just as do their natural counterparts. When they succeed they will have taken a tremendous step toward the artificial creation of life itself.

Already, at the Virus Laboratory of the University of California, scientists have

gone part of the way toward building viruses from inert materials. Last year Dr. Heinz L. Fraenkel-Conrat and Dr. Robley Williams of the laboratory were able to create active viruses from the two materials of which these structures are composed.

Working with the virus that causes the mosaic disease in tobacco plants, they used a detergent to break down the virus into its two constituents, protein and a substance called nucleic acid. Each of these materials was rubbed on tobacco plants and was found to be totally inactive. Neither was



capable of causing disease. But when they were brought together again in a slightly acid solution, the mixture soon acquired the typical opalescent appearance of a virus solution.

Within 24 hours the protein and nucleic acid had arranged themselves into structures that had all the characteristics of the original viruses. They proved to be just as destructive. They had the same ability to reproduce.

This reconstitution marked the first time that a self-duplicating system had been assembled from inactive materials.

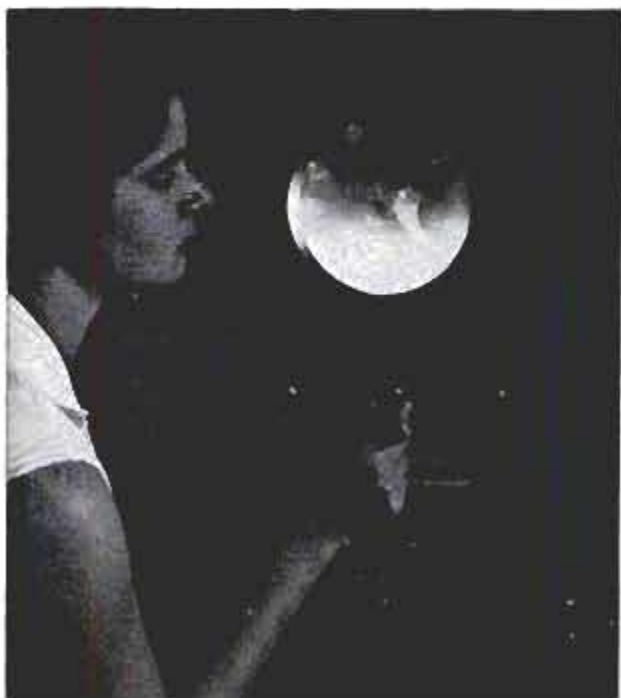
### Hybrid Viruses

More recently, protein from one strain of tobacco-mosaic virus and nucleic acid from another strain were used to produce hybrid viruses. These might be called wolves in sheep's clothing. One might expect them to behave as does the parent that contributed the protein, for it is the protein that largely determines the size and shape of the organism. Instead, the hybrids caused the same disease and did the same damage, or lack of damage, as did the parent from which the nucleic acid was taken.

The tobacco-mosaic virus is often used in basic research because it is easy to work with and can be produced in quantities. By studying it, general conclusions about other viruses can be reached and then followed up in detail.

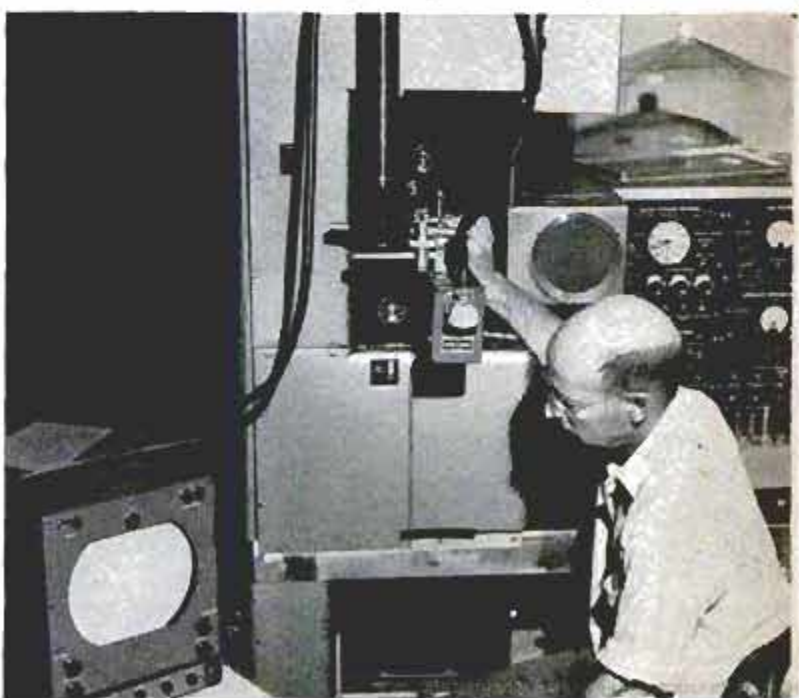
Most viruses are smaller than bacteria, larger than the largest nonliving molecule. They occupy a sort of twilight zone between the living and dead. Many can be crystallized like inanimate matter, yet they reproduce just as if they were alive. They can mutate; that is, they can alter their character and pass on their new characteristics to their offspring.

Photographs made with color-translating microscope permit viewer to watch virus attack on tissue cell



Refrigeration coils in centrifuge keep viruses alive while molecular weight of the substance is determined

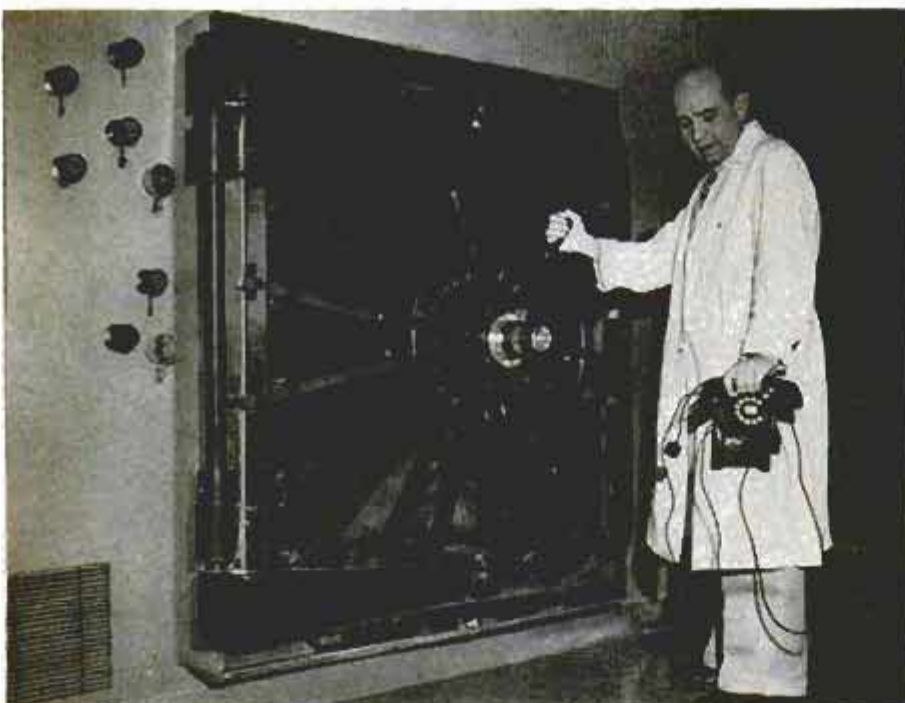
Microscope, focused by TV, permits viewing under ultraviolet light, photography by visible light







Complicated model is built to show a complex protein molecule. Such molecules, along with nucleic acid, form the viruses



Equipment that must be removed from the isolation section goes into a steam autoclave for sterilization. Below, laboratory is one of the best-equipped centers for virus research. New type of electron microscope gives better photographic resolution



They come in many shapes. Photographed through an electron microscope that magnifies as much as 200,000 times, viruses that cause polio are found to resemble tiny tennis balls. Others that attack and destroy bacteria are hexagonal and are shaped somewhat like clubs. Those that cause tobacco mosaic resemble long rods.

The protein molecules of a virus are made up of smaller molecules of the amino acids, which are the basic building blocks of living tissue. There are about 21 varieties of amino acids. Basically, each is a different arrangement of carbon, nitrogen and hydrogen atoms, sometimes joined with atoms of other elements.

Generally the amino-acid molecules arrange themselves in the form of a helix in making up a protein molecule. This is the case in the rodlike protein of the tobacco-mosaic virus.

The nucleic-acid portion of a virus is arranged like strands that appear to be woven in and out among the protein molecules. Not very much nucleic acid is present, yet it appears that the nucleic acid determines the heredity of the whole organism. That is, it is responsible for the duplication of the structure, generation after generation. Recent evidence indicates that under certain very special conditions the nucleic acid alone may possess virus activity.

### Virus Diseases

Viruses are the cause of infantile paralysis or polio, influenza, yellow fever, smallpox, virus pneumonia and encephalitis, among other ills. They infect domestic animals with cattle plague, hog cholera, foot-and-mouth disease and the Newcastle disease of chickens. Still others attack almost everything that man grows. They destroy vegetables, grain and fruit. They cause the quick decline of citrus, tomato spotted wilt, alfalfa mosaic, tobacco mosaic and many other crop diseases.

They cause some cancers in animals and are suspected of causing some important forms of cancer in man. Cancer is not "catching," of course, like such virus diseases as mumps or polio.

Vaccines are excellent protection against some viruses, such as





Diagram shows how a hybrid strain of virus is made. "Doughnuts" in photo at left are fragments of the protein portion of virus. They formed the rodlike viruses at right when they were mixed with nucleic acid

smallpox. The smallpox virus mutates into a less virulent strain when introduced into the body of an animal such as a cow. The weak cowpox virus is then used to vaccinate humans. The human system produces antibodies to fight off the vaccine, and this protects against smallpox itself.

Some viruses can be inactivated with such a chemical as formaldehyde, then used as a vaccine. During the war the laboratory employed this technique to develop a vaccine that gives considerable protection against three strains of influenza, and this is now commercially available. The Salk vaccine against polio is a similar development.

(The common cold is probably made up of a whole family of ailments, some of which may be caused by influenza-type viruses and the so-called APC viruses—adenoids, pharynges and conjunctiva—of which there are more than a dozen strains. Investigators at the National Institute of Health have made some of these into a vaccine. It is reported that preliminary tests indicate that it may become very useful against common colds.)

#### Possible Hybrid Vaccines

But vaccines do not always provide 100 percent immunization. Thus the Salk vaccine has been described as being only 60 to 90 percent effective against paralytic

polio. At the Virus Laboratory the scientists are seeking new, positive ways of providing immunity to virus diseases. One field that is being explored is the hybrids. The research people want to take advantage of the fact that hybrids can be created that have the appearance of their "bad" parents but that are just as harmless as the "good" ones. It seems possible to create hybrids that are nonvirulent and that will cause the body to develop antibodies against virulent strains.

A further step would be to create a vaccine that consists only of the protein portion of a virus, with no nucleic acid at all. This, similarly, should immunize against attack, as has been demonstrated in studies of plant viruses. The protein structures, of course, would not be able to reproduce.

An eventual goal is to synthesize the protein portion; that is, to create it from laboratory chemicals. This may take five years or it may require 20 years of study. When this occurs, it should be possible to manufacture immunizing agents with ease, avoiding all the tedious and exacting steps that are now required.

Still other research is concerned with the unpredictable mutations that sometimes occur in viruses. This is important because mutation appears to be the reason why a normal cell suddenly changes into a cancer cell which then begins an uncon-





These are polio-virus crystals produced in laboratory. Largest contains 1,000,000,000 virus particles

trolled growth. Viruses are the simplest level upon which mutations can be studied.

The Virus Laboratory in Berkeley is possibly the world's most completely equipped center for research on the basic chemistry of living things. Aside from electron microscopes and ultracentrifuges, the laboratory uses a mass spectrometer, devices for making microbiological assays, and radioactive-tracer equipment.

One room is set up for chromatography and electrophoresis, new techniques for separating biological compounds. Experimentally, a television circuit connected to a microscope has been used. This combination makes it possible to view tissue cells on a TV screen while preparing to photograph the cells through a microscope.

In one small room alone there is enough active polio virus to infect every person on earth. Similar amounts of influenza and other disease-producing viruses are kept on hand, for these are the raw materials on which research is performed.

The portion of the laboratory in which these viruses are kept and studied is designated as an isolation section. It can be completely sealed off from the rest of the world. Its locked doors can be opened only with special keys. During studies on virulent cultures the research staff enter and leave through decontamination locks in which they take showers and change clothes.

A "contaminated vacuum" system pulls exhaust air from the isolation section through a bank of ultraviolet sterilizing lamps before the air is discharged to the atmosphere. No debris of infectious material ever leaves the isolation section; all such material is burned in a special incinerator in the section itself. A huge autoclave is built into one exterior wall of the section. Apparatus that needs to be removed from the area for overhaul can be placed in the autoclave for sterilizing, then removed via an outside door.

Reconstitution of viruses and the development of virus hybrids are only two of a number of important discoveries made at the laboratory. Here the freeze-drying technique was developed, by means of which minute organisms can be viewed through an electron microscope in their native, undamaged state. Here the purification and crystallization of the polio virus was first achieved, the first time that any animal virus had ever been crystallized. Here, too, the discovery was made of the value of human amnion tissue for culturing and growing polio virus. Not only is this material a safer medium for testing polio vaccines, but it may soon eliminate the need of importing from India the monkey keys that have been vital in polio studies.

The big job of the laboratory is to help in conquering the host of virus diseases that plague the world. At the same time, it is learning more and more about the big mystery of life, the way in which inanimate materials are joined together to become living things. ★ ★ ★

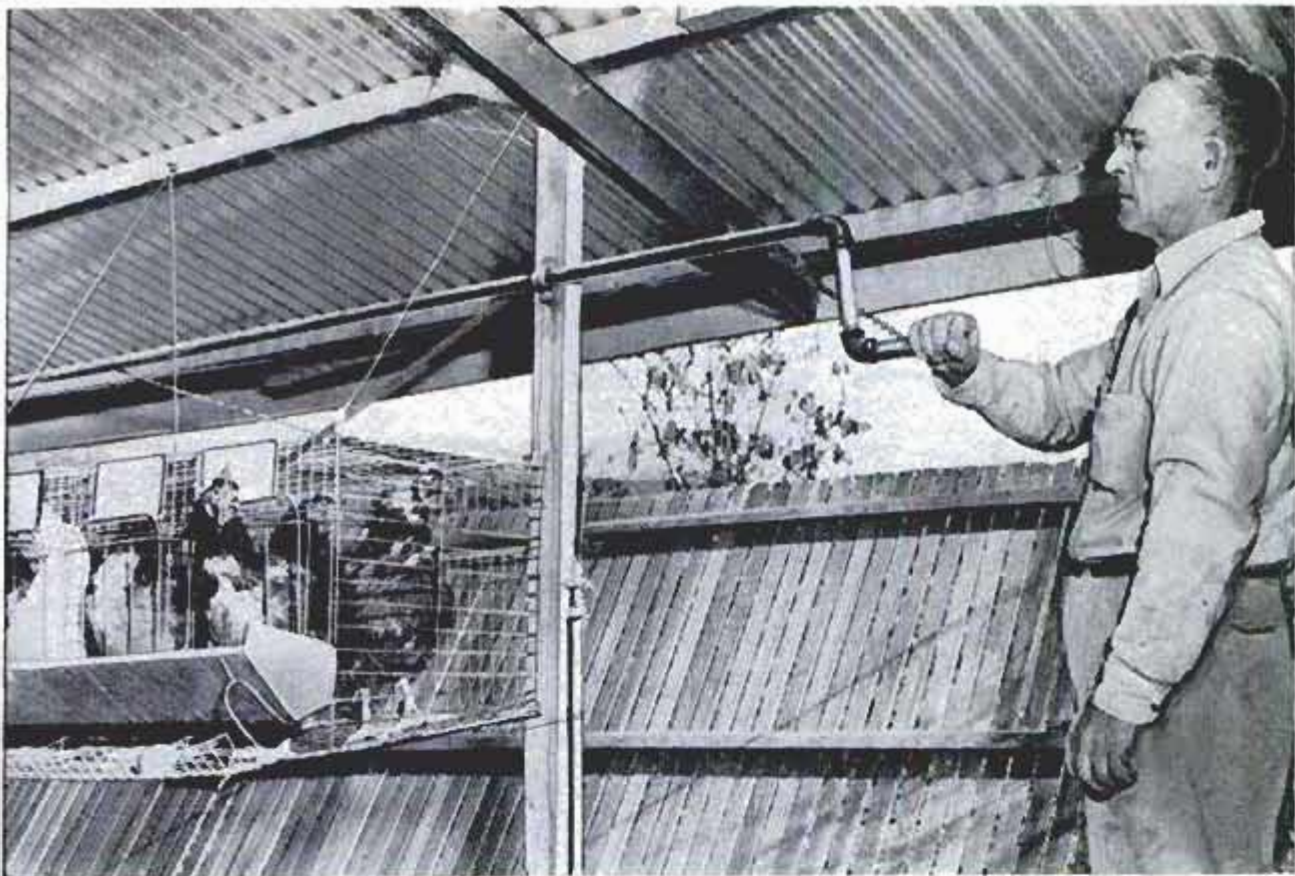
## Convair's Skylark 600 Is America's Newest Jetliner



Aimed at the medium-range air traffic of the future, the Convair Skylark 600 is the newest American jetliner to be announced. The Skylark will operate from 5000-foot runways, cruise at 609 miles per hour and carry 80 to 99 passengers. Cruising altitude will be 35,000 feet, and range will be 2000 miles. Four General Electric CJ-805 engines will power the craft.

Scientists have developed a new cold-cathode-type fluorescent lamp that causes no radio interference.





W. T. Ferris turns crank to lower or raise the side of chicken house and regulate the entry of cooling air

## Air Conditioning for the Chicken House

ENTIRE SIDES of buildings and large roof sections opened by a crank are among the many ingenious weather-control systems used by California poultrymen to fight the heat that can kill their birds.

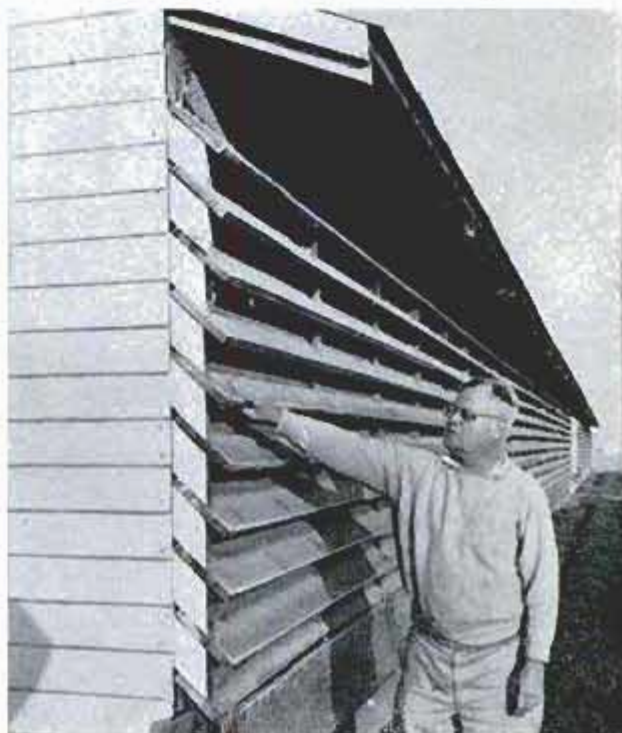
The torrid temperatures which struck southern California the first three days of last September killed 1,000,000 chickens. One ranch lost 31,000 out of 50,000 birds. Some flocks of 500 to 1000 were completely wiped out.

But poultrymen who had the means of giving their birds plenty of roof shade, of allowing fast movement of hot air out of the buildings and a continuous flow of fresh air into them suffered only small losses. One well-protected flock of 25,000 birds had a mortality of only 100.

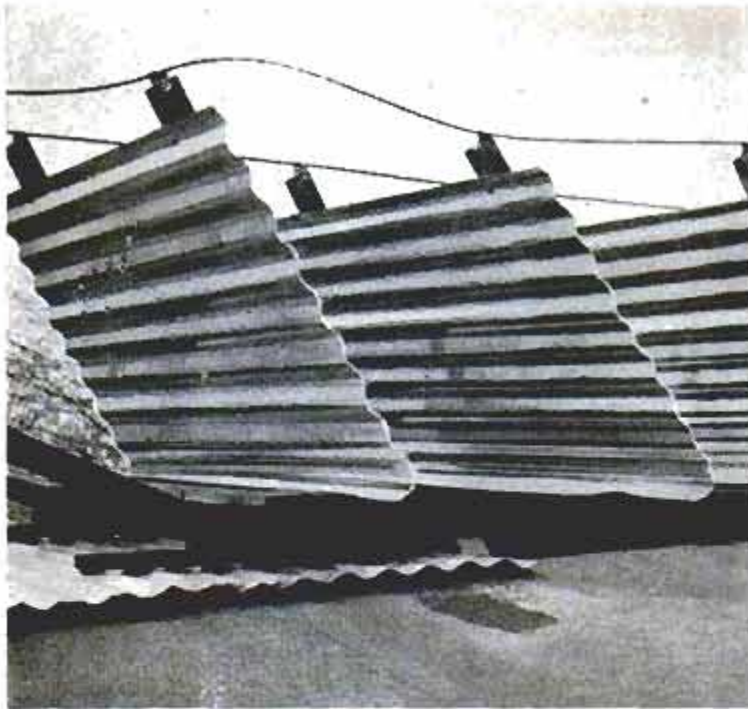
### Air Conditioning Saves Chickens

An excellent example of this type of "air conditioning" that eliminated loss is on the W. T. Ferris ranch near Yucaipa, Calif. The entire walls of each 100-foot house can be opened or closed at one time. Each wall is a single redwood-lath panel, six feet high,

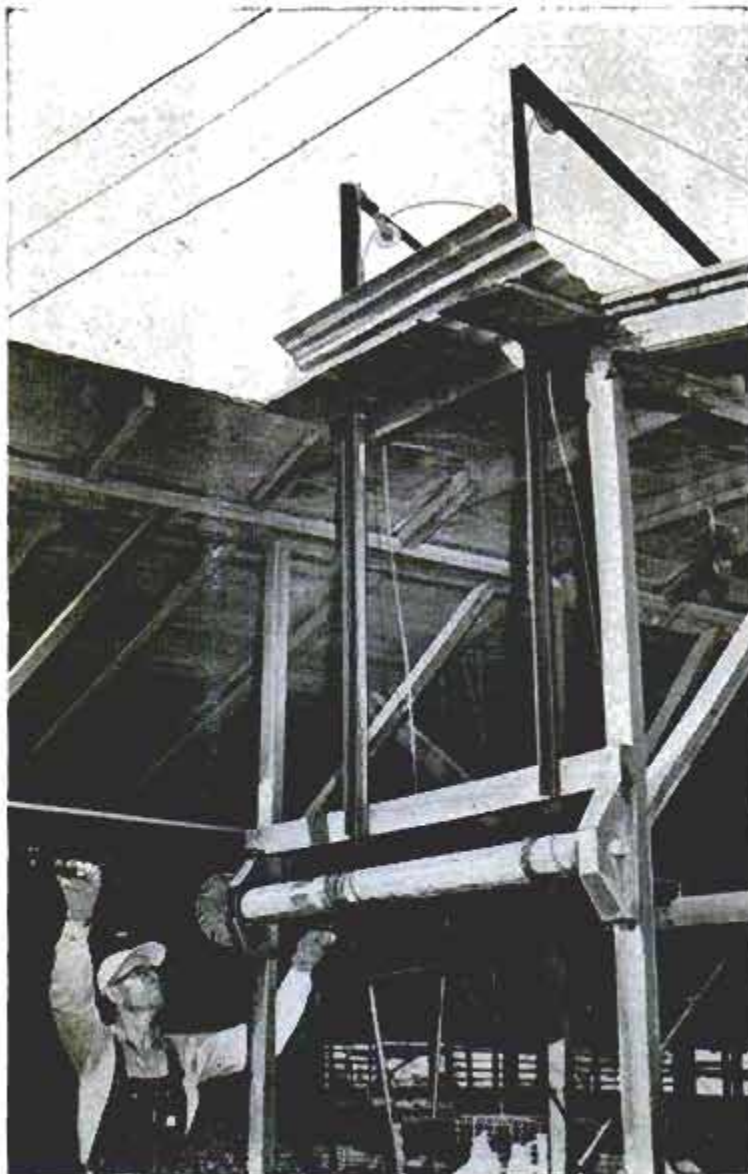
Nonadjustable louvered side of Sheldon Crow poultry house helps keep inside temperature 10 degrees cooler







Fins on top of Clayton Smith laying house are raised to permit hot air to escape. Wires lead to winch that Smith cranks to open or close four-foot-wide roof opening that runs length of house



that is tilted outward and down by turning a crank. The wall is hinged at the bottom, and when it is opened it drops back from the eaves.

Short chains, fastened at five-foot intervals to the top cross piece of the wall, wind up on a 100-foot-long pipe that runs the length of the building. The  $\frac{3}{4}$ -inch pipe, held in place by metal clamps to the inside of the building studs, has a crank at one end made of short lengths of pipe and two elbows. The wall can be set at any angle desired or lowered flat to the ground to open completely the side of the house.

Clayton Smith of Palmdale, Calif., has developed a system that opens the roof as well as the sides of his laying house. This is necessary because the 200-foot-long building is 150 feet wide and not enough air can move in from the sides. The saw-tooth roof pattern has five peaks that run parallel to each other.

Each peak is ventilated from end to end with a series of five by two-foot aluminum fins that open up to allow foul air to exit through a four-foot-wide roof opening. The fins, connected by wires that lead to a winch, open or close together when the winch is turned with a crank.

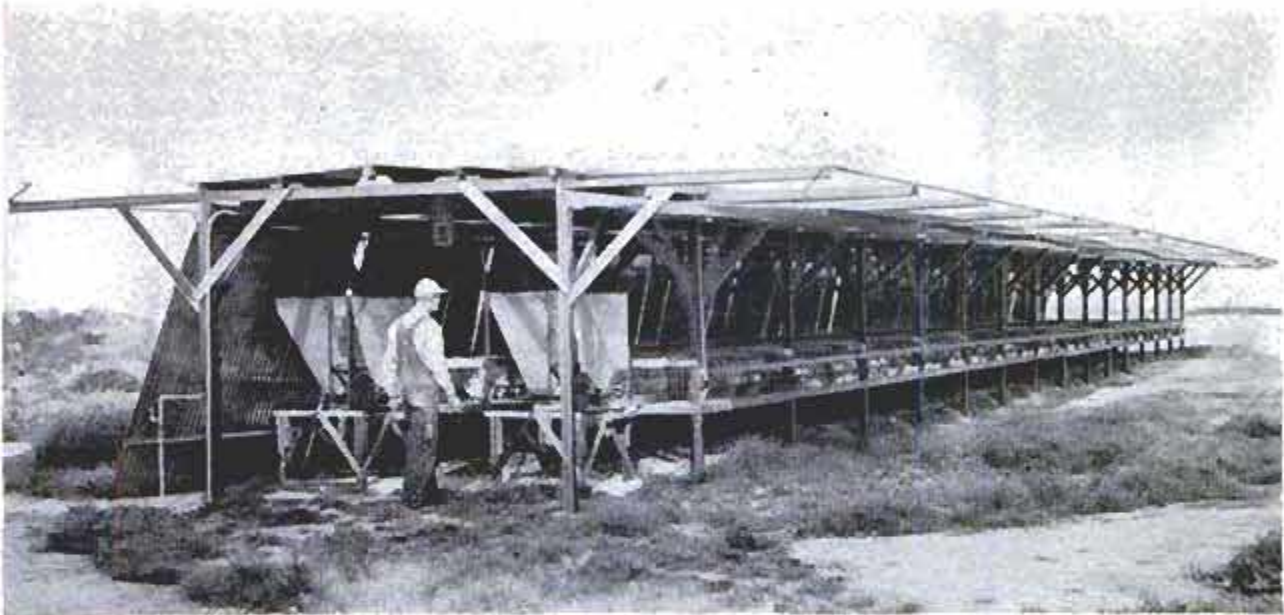
The fins can be set at any angle from straight up to closed, enabling them to vent a maximum amount of air or to catch a prevailing breeze. In closed position, the fins rest on two by fours that leave a four-inch-high vent on each side.

The walls of this house are nothing but a series of doors, hinged at the sides, which open the sides of the house completely during warm weather.

The three by six-foot doors are made of corrugated aluminum mounted on frames of one by six-inch boards. Each door is hinged to a two-by-four wall stud and closes against the next stud, against a top plate and a bottom plate. Pulling or pushing a connecting rod enables one to open or close four doors at a time.

Smith's 112-foot-long rearing houses are of quite different design. Because the houses are narrow, no roof openings are necessary. Each wall is hinged at the





The sides of Smith's pullet house can be raised for cooling and extra shade. This house has no roof panels

top so that the sides can be opened for ventilation and extra shade.

The wall consists of eight-foot-wide aluminum panels mounted on a continuous frame. The space between the panels allows the building's side studding to set in the opening when the side is closed.

The horizontal rafters of the house are extended far out on each side to support a half-inch pipe that runs the length of the building. At each break between panels a length of sash chain fastens to the frame and up to the pipe. A crank is used to turn the pipe and wind up or unwind the chain, raising or lowering the entire side of the building. The lightweight aluminum and

the medium-weight framework boards make the arrangement possible.

Some poultrymen have found that opening only a portion of building sides gives good results.

Leo Zumwalt of Fulton, Calif., opens half of one wall of his poultry house by pulling a number of rods that raise sections of the galvanized-iron wall to form tiered awnings.

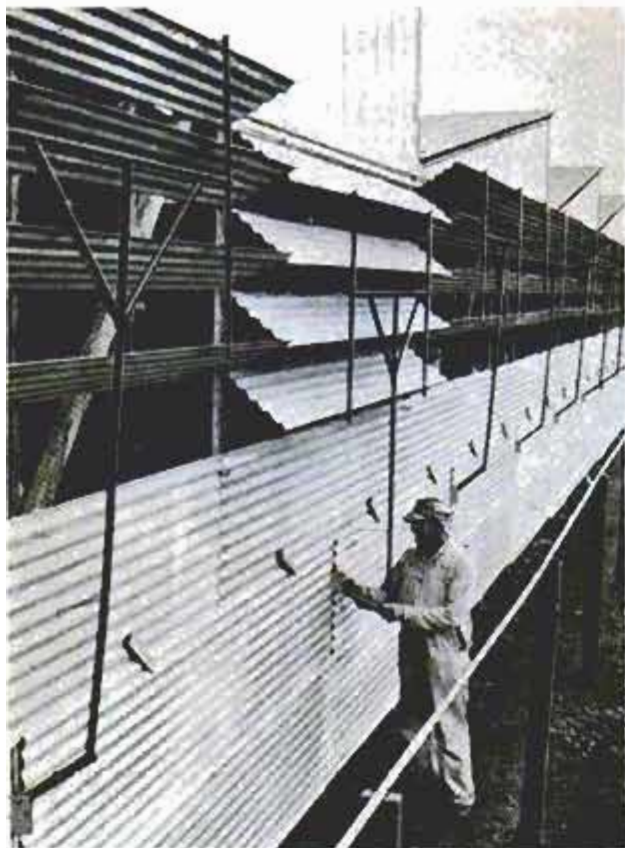
Weather is controlled in the Max Glick poultry houses at Lancaster, Calif., by adjustable wooden louvers installed along the entire length of the house.

Air conditioning on the Elmer Moreland ranch at Palmdale, Calif., is introduced by

Doors on Smith's laying house swing out rather than up. Connecting rods allow opening four doors at once







Panels in upper wall of Leo Zumwalt house open to any angle. Below, Elmer Moreland drops slatted panels. At right, Max Glick house has adjustable louvers



dropping sections of the slatted double wall, leaving every other slat open.

Sheldon Crow of Newman, Calif., has found he does not need a removable wall for good weather control. His walls consist entirely of heavy louvers that help to keep the inside temperature 10 degrees below the outside temperature.

Fred Ferris of Yucaipa, Calif., has developed a system of lath ventilator panels that are hinged at the top and attach to the outside eave of the building. The four-foot panels are swung up and outward and propped with a stick. They also furnish shade along the side of the poultry house.

#### Ventilation Is Necessary

Proper ventilation, poultrymen have found, is almost as necessary in winter as it is in summer. Plenty of clean, fresh air without drafts is always needed for the birds to breathe and to carry away the excessive moisture they create. A poorly ventilated house is an ideal environment for respiratory and other diseases.

The homemade California ventilation systems, by controlling air movement into the building and allowing hot and moist air to escape, promote poultry health and poultry profits. ★ ★ ★



### Elephant Takes to Florida Waters on 15-Foot-Long Skis



Latest Florida "tourist" to thrill to the joys of water skiing is a 1300-pound elephant recently seen gliding over the waves near Sarasota. Three-year-old Sunny, firmly anchored to a platform mounted on special skis 15 feet long and 2 feet wide, put on his act at a show sponsored by Sunshine Springs and Gardens. Supporting members of the cast included two humans.

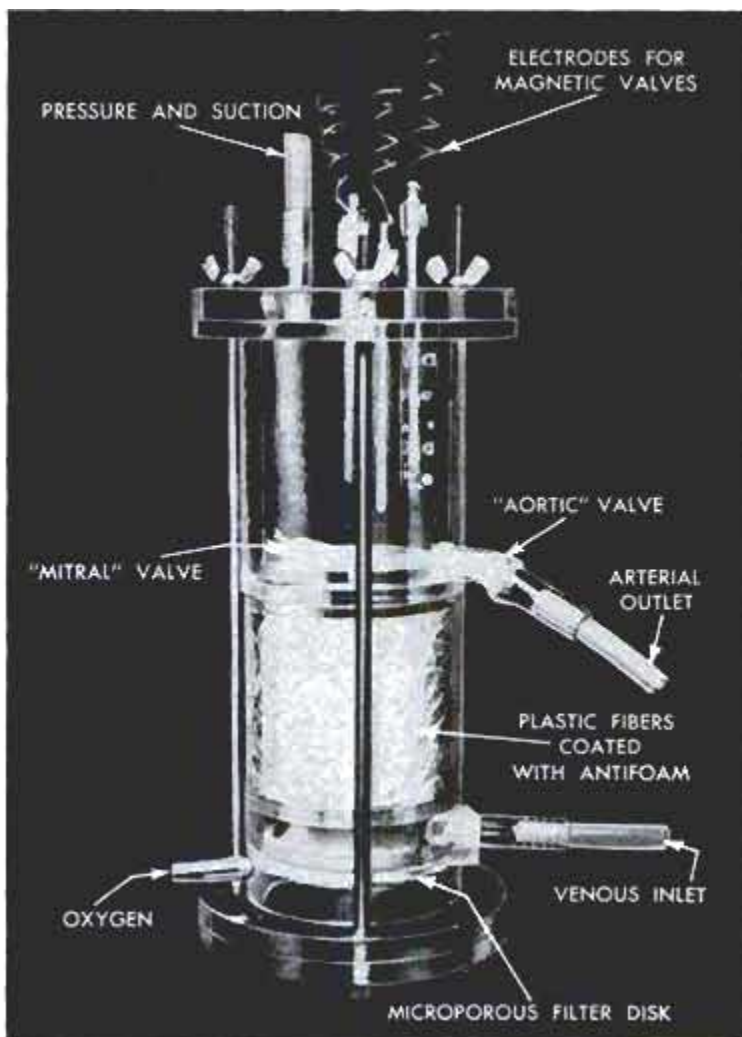


## Tiny Mechanical Heart Will See Use on Humans

Not much bigger than a water glass is a low-cost oxygen pump that substitutes for the heart during operations. It has been successful in over 500 animal operations and its use on humans "is now imminent," according to Dr. Frank Gollan of the VA hospital in Nashville, Tenn. The \$250 unit is designed to replace previous large complex machines costing thousands of dollars and manned by several technicians.

## Degreaser in Spray Can

Removing grease from engines, motors and machinery is an easy project now. First the engine or motor is warmed up. Then a degreasing compound which comes in a spray can is sprayed over it and allowed to stand 15 to 20 minutes. During this time it softens the grease, so that later a simple flushing with water from a hose is all that is needed to wash off the grease. One can of the degreaser is enough to clean an automobile or truck engine thoroughly.



## Electronic Bank Clerk Processes 50,000 Accounts a Day

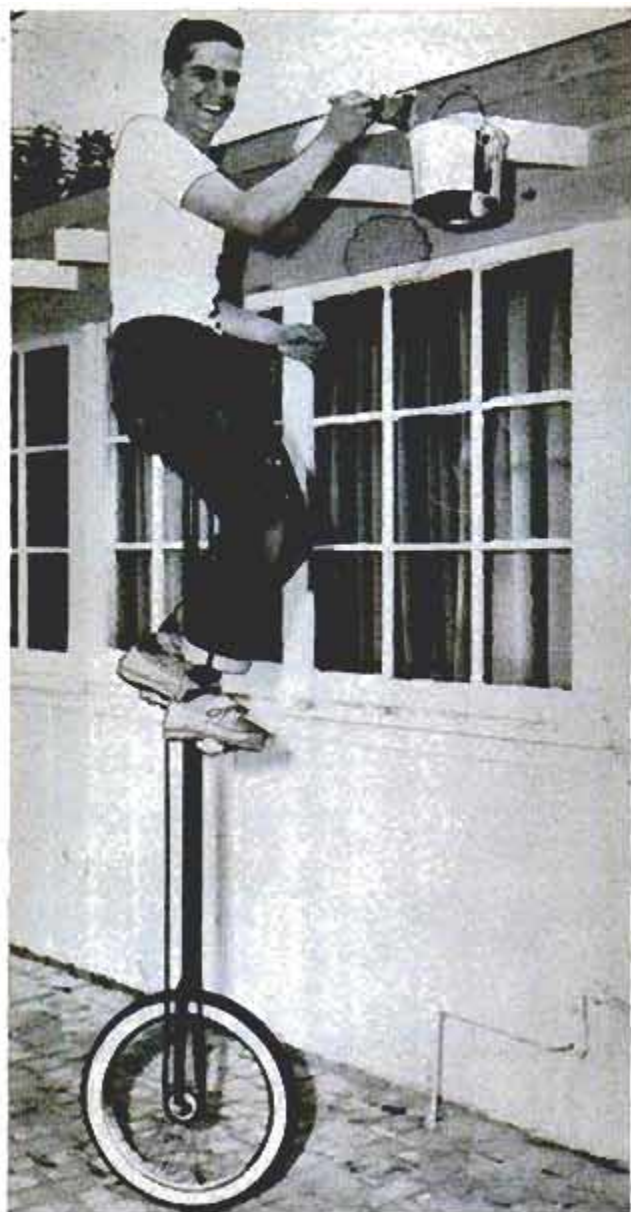
Capable of handling bookkeeping details on 50,000 checking accounts daily, the Bank of America's newest development in automation is an electronic brain made up of more than 1,000,000 feet of wiring, 34,000 diodes, 8000 vacuum tubes and weighing 25 tons. The machine reads checks by sens-

ing information printed on the back of each in magnetic ink and can't make mistakes. At the end of the month, printed statements for the bank's customers are turned out at the rate of 600 lines a minute. The machine has a special air-conditioning system to lower the heat it generates.

Electronic unit deposits, debits withdrawals, maintains balances and even prevents overdrawing of accounts







## House Painting the Hard Way —On a Unicycle

Sixteen-year-old Dale Bradley, of Santa Ana, Calif., is an expert unicycle rider who found himself faced with a problem when painting his house. He couldn't reach the eaves—and lugging a ladder around the job seemed cumbersome. So out came his unicycle, which put him at exactly the right height. (Note: This method is not recommended for those still riding the old-fashioned bicycle.)

## Tiny Bulb Designed to Twinkle

You can achieve a firefly effect in your garden with a string of bulbs that twinkle on and off. In each bulb is a small bimetallic strip that bends in one direction when it is heated up, in the opposite direction when it cools. This makes and breaks the electrical circuit to flash the bulb on and off.



The tiny bulb, the size of a rosebud, is intended for use in transformer-operated string sets like those used on Christmas trees. Wide use of the twinkling bulb during the Yule is expected.

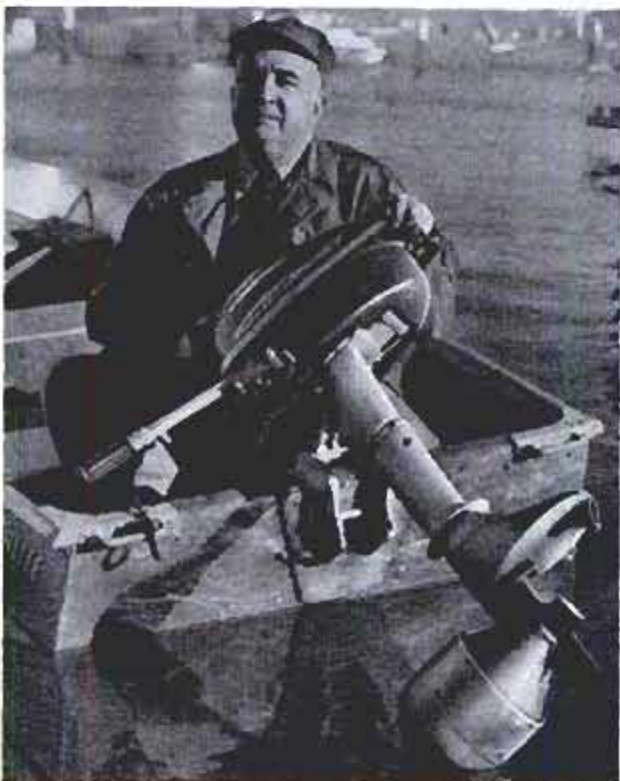
## Inflatable Canoe of Rubberized Fabric Rolls Up for Portage

Pioneers once struggled to carry their canoes over portage trails between streams. The modern canoe owner, however, will simply let the air out of his inflatable craft, roll it up under his arm, and re-inflate it at the next river. The new canoe is a single seater, measuring seven feet in length, and is made of a rubberized fabric. The backrest and seat are cushioned in sponge rubber. The craft is manufactured in Great Britain.



☛ Synthetic blood vessels of knitted Orlon and woven nylon, used in artery grafts, are made without seams by a new method.





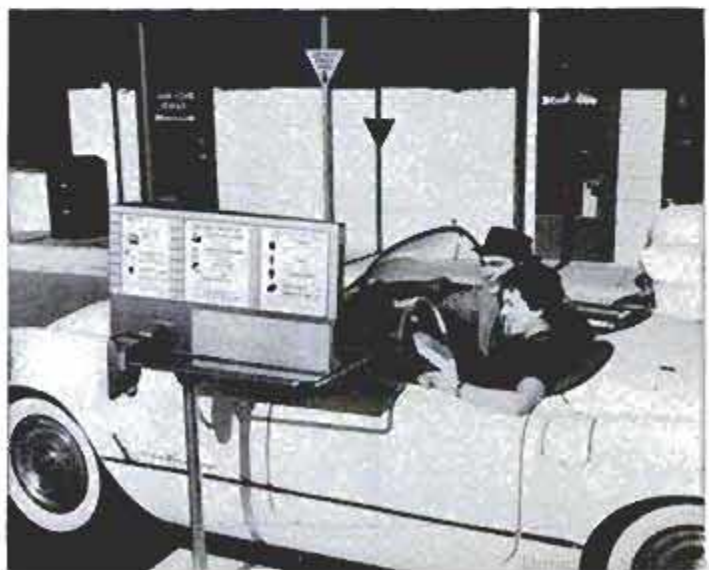
## Outboard-Motor Hydrojet Takes Place of Propeller

Underwater weeds and obstructions don't bother an experimental hydrojet that takes the place of a propeller on an outboard motor. Since it has no blades, the compact, inexpensive unit can't injure swimmers. When perfected and in production, the hydrojet is expected to equal the efficiency of a propeller and to cost little more. Water enters the cast-aluminum ovoid through a two-inch opening in its streamlined snout. A turbine-type impeller forces the water out through a ring opening halfway back to eject it over the streamlined tail without turbulence. The shape of the unit is said to make it superior to standard hydrojets. The new unit can also be adapted to inboards.

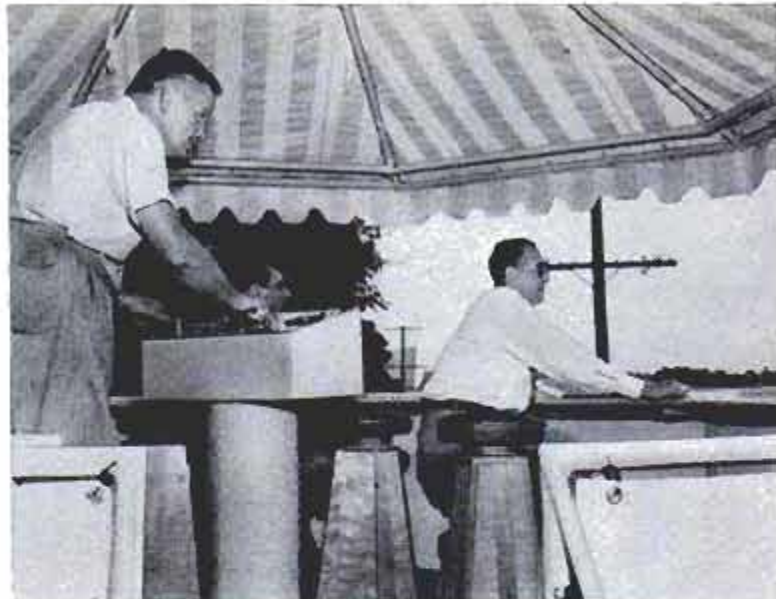
## Electronic Order Taker Put to Work at Drive-In Restaurant

Customers at electronically up-to-date drive-in restaurants can glance at a lighted menu card and phone their orders in by using a small intercom. The number of the customer's station appears on the receiver inside the restaurant. By flipping a switch,

the chef or cashier inside can reply to customer's questions. While waiting for his meal, the customer listens to music coming over the intercom. Brain of the entire system is an automatic "switchboard" inside the restaurant.



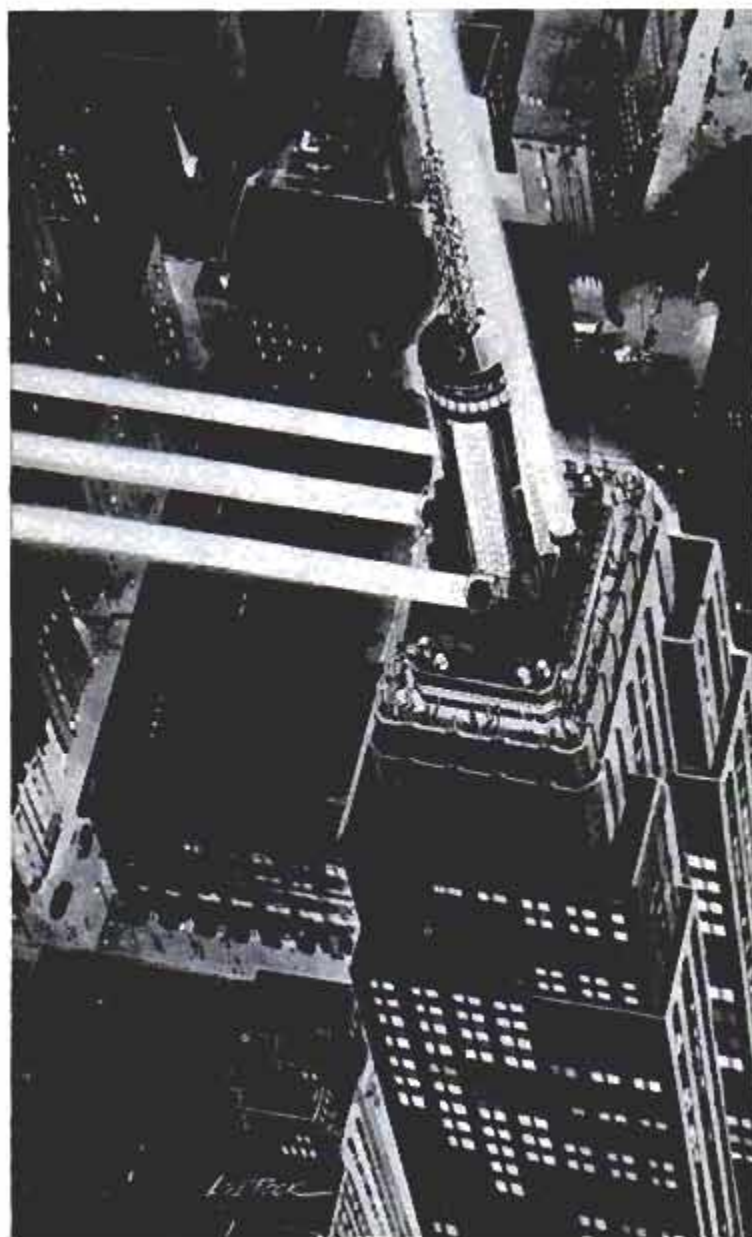




## Judges' Stand at Race Track Rotates to Follow the Running

Horse-race judges at the Indiana State Fair sit in a stand that rotates as the race progresses. Electrically operated, it turns at a variable speed controlled from a panel. The stand faces the starting gate and quick-

ly reaches top speed at the start, slows down for the back stretch and third turn, at times almost stopping, until finally it picks up speed for the finish. It gives eight officials an unobstructed view.



## Empire State Beacons Can Be Seen 300 Miles

New York's already spectacular skyline has been made even more so by four revolving beacons atop the Empire State Building. Under perfect conditions, engineers say, the lights could be seen 70 miles away by ground observers and 300 miles away by airline passengers. Generating a total of 1,800,000 candlepower, the beacons are said to represent the brightest continuous source of manmade light in the world. The path of the beams describes a complete horizontal circle around the building. After each beam completes a 180-degree horizontal arc, it turns upward and illuminates the tower as it completes the remaining 180 degrees in the circle.

## Antimoth Virus

British scientists have developed a virus which is deadly to the clothes moth. It can be sprayed or dusted on and kills the grub, not the grown moth. One disadvantage is that the virus will not stand up to dry cleaning, and treated fabrics would require a fresh application for every trip to the cleaners. Not yet available, it could be produced cheaply.



# Driverless Tractor "Stunts" for Safety

INSTEAD OF models, a riderless tractor is showing farmers how and why tractors tip over, killing some 700 persons each year. Agricultural engineers at Iowa State College rigged up the demonstration.

Two grounding switches were installed on the ignition system of a standard tractor, with ropes leading from them to shut off the engine at any time. Another rope led to the clutch. An inverted V-frame shields the steering wheel and another frame the radiator when the tractor tips backward. The fuel cap is sealed to prevent spilling when the tractor upends itself.

Spectators are shown that hitching to the rear axle or to any point above the center of gravity tends to make the tractor rear up and backward to crush the driver.

To show the danger of driving across slopes, the rear wheel is driven over increasingly steeper ramps—first with the rear wheels set close together, then with the wheels set to their maximum tread. A much steeper ramp is needed to tip the wide-tread tractor. "Once they see this, they spread the wheels out as soon as they're through plowing," engineers say.

With the steering wheel tied, the tractor is then run in a circle at a set speed. To illustrate the danger of hitting holes or obstructions when turning, a seven-inch block is tossed under the inside rear wheel, causing the tractor to topple. In a similar demonstration, the tractor makes increasingly smaller circles until it tips over at a speed of only six miles per hour.

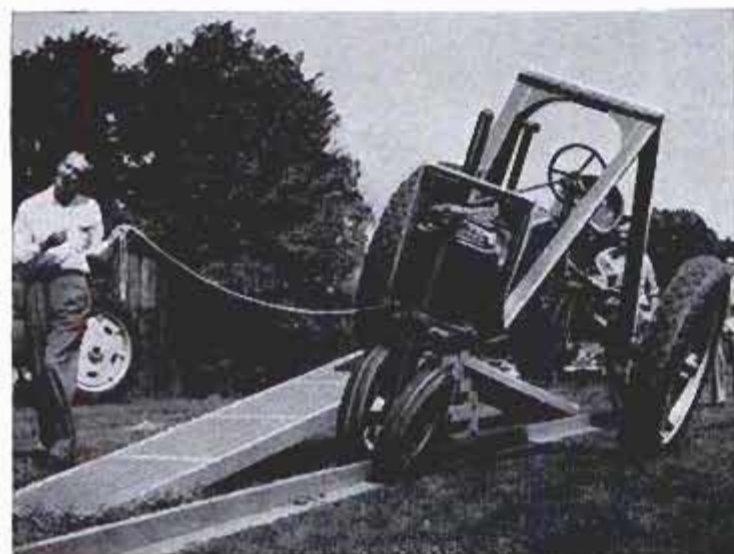
When one wheel is run over ramp, tractor is guided by wooden rail between two front tires. Yank on rope will stop engine



Rear-axle hitch causes tractor to rear backward



Upended tractor rests on V-frame. Below, tractor jumps the steering rail of ramp and starts sidewise tip. This tractor was used because it adapts to remote control





WHAT'S NEW FOR  
Your Home



1

**1. CANVAS PLAYPEN** is portable and can be washed in washing machine. Indoors, tentlike pen protects baby against drafts; outdoors, it serves as a sunshade. A canvas floor is sewn right in. Front panel is adjustable in height, so that pen can be used by children of various ages  
Tend-A-Tot Corp., Box 6009, San Diego 6, Calif.

**2. RUBBER WEBBING** replaces springs in new type of furniture construction from Denmark. Foam-rubber cushions, covered with fabric, are placed on the webbing to complete piece. Frame is of teakwood. Designs became available in this country this year  
Modernize, Inc., 660 Lake Shore Drive, Chicago



2

**3. COOKIE DROPPER** scrapes itself clean as it places dough on cookie sheet, eliminating need to use two spoons, and both hands. Made of stainless steel and six inches long, it requires only a squeeze of the hand, after dough is scooped up, to shape cookie  
Foley Manufacturing Co., Minneapolis 18, Minn.



3





**4. NURSING-BOTTLE HOLDER** suspends the bottle on an elastic cord over the baby's mouth where he can feed easily without danger of losing the nipple. Any size or shape of bottle can be used, and between feedings tripod can serve as a toy holder. Support is adjustable to fit any crib, bassinet or buggy

Stuart F. Faunce, 404 Sauk Trail, Park Forest, Ill.



**5. RUFFLE IRON** adapts for home use, an idea long used by tailors providing a small heated head across which material to be ironed, such as ruffles, pleats, etc., is pulled by hand. Only slight hand pressure is required. Dial regulates temperatures for different fabrics. Iron clamps easily to counter

Harris Industries, Inc., Stamford, Conn.

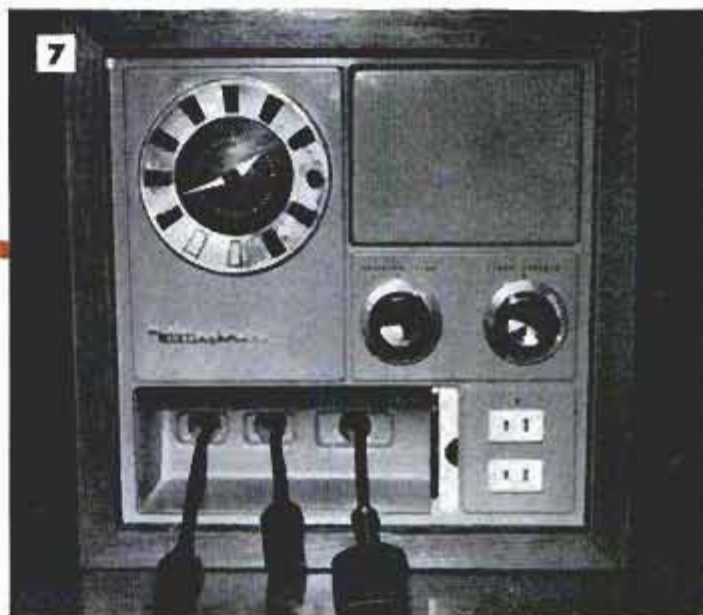
**6. HOSE COUPLER** snaps hose to faucet, eliminating tedious threading-on, dripping and corrosion-lock common to standard screw-on type of garden-hose coupling. Coupler works on patented vacuum-lock principle so that when water is turned on, pressure locks coupling, which is plastic, in place

Hunter Tool Co., 6608 S. Gretna Ave., Whittier, Calif.



**7. AUTOMATIC APPLIANCE CENTER** for kitchen provides ample current for simultaneous operation of five electrical devices. Wired for 220 volts, unit has provision for timing all five circuits. Three extension cords for plug-in appliances are built in, and the unit has its own circuit breakers with reset switches

Westinghouse Electric Corp.,  
246 E. Fourth St., Mansfield, Ohio







White arrow points to the gas-turbine starting pod. The pod can be carried on plane or mounted on wheels

## Gas-Turbine Pod Mounted on Navy Fighter Starts Jet Engine

Navy F3H-2N Demon jet fighters get started with the aid of a pod containing a gas turbine that compresses air for actuation of the starter. The unit can be attached to the plane or fitted with its own "landing

gear" and operated on the ground. The five by two-foot, 450-pound pod is of particular value during ferry flights or at bases where standard starting equipment is not available.



## Fire Escape Swings Out

Two and three-story dwellings can be equipped with a fire escape that swings out of concealment and lowers a rigid telescopic ladder at the touch of a lever. When not in use, it is folded compactly against a door. When the door is opened, an iron platform is swung down around the top of the ladder to aid descent. The unit operates by gravity and spring action. It is not yet in production.





Snoozin' in the shade on a summer afternoon is pleasanter under an umbrella that is easily adjusted to follow the path of the sun. A ball-and-socket joint at the top of the stem permits it to be tilted forward, back or to either side, and also permits the umbrella to be swung to any position in a full circle. The stem is offset to one side, so that all of the shade area under the umbrella may be utilized without interference. The cover is 54 inches square, of heavy-duty canvas and comes in solid colors or two-tones set off with a valance and fringe.

## Adjustable Lawn Umbrella Follows the Sun



## Golf-Ball Retriever Used Like Cane

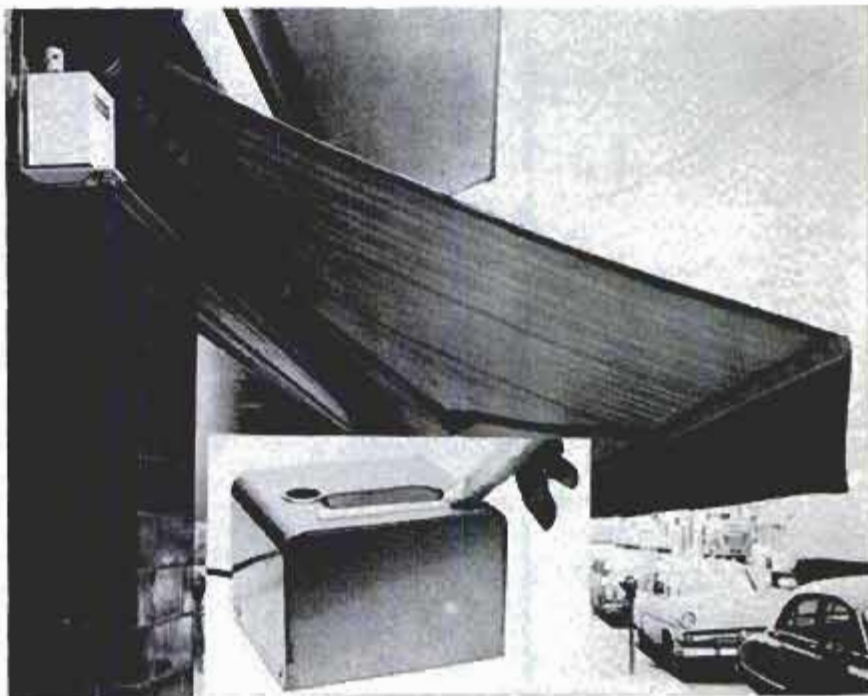
For the practice driving range, a new device takes the work out of picking up golf balls. Used like a cane, the device will hold up to 20 balls, and picks them up when forced over them. A flexible plastic ring in the lower end permits the balls to enter the plastic cylinder, but will not let them drop out. A screw cap at the top makes it easy to unload the balls.

Retrieving a golf ball with the cane is simply a matter of placing the open bottom end of the cane over the ball and pushing down

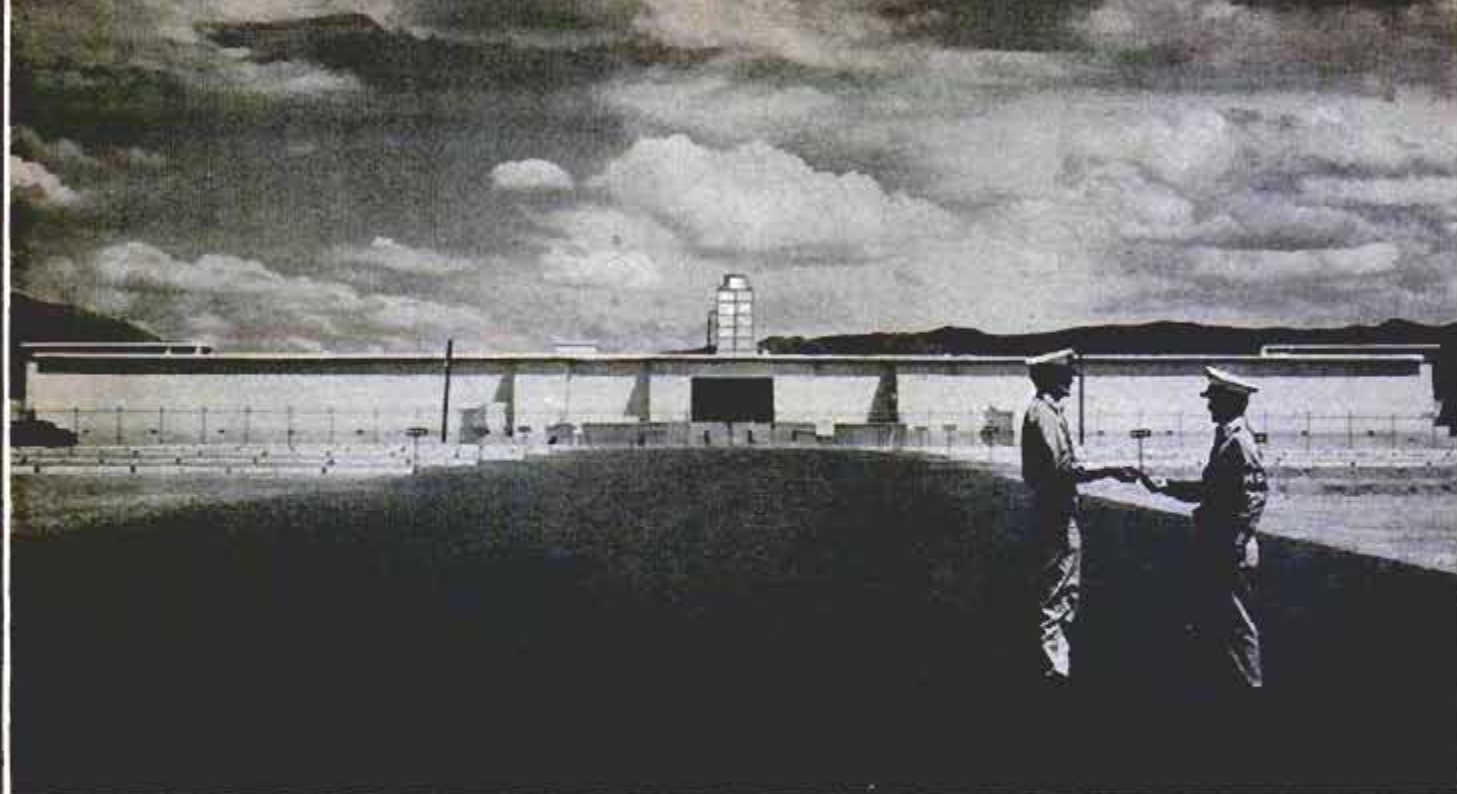
## Push-Button Awning Driven by Motor

Store awnings are rolled up or down at the push of a button by a motorized unit that is installed on the average awning in an hour. A time clock or electric eye can be attached to the inside unit to roll the awning up or down automatically. The unit will operate any size awning and combines small size with simple installation.

☐ Ten million homes have been built in the United States since 1945, according to the National Association of Home Builders.







Grim facade of nation's atom-bomb school is windowless, has only one door. Tight security is maintained

*Out on the New Mexico desert is a concrete blockhouse nicknamed by its GI students "The Kremlin." This is where*

## Privates and Generals Study A-Bomb

*By William Harnin*

**T**HE "VAULT" is windowless. Its single door is threaded with silver burglar-alarm foil. About the entrance to the huge ultramodern structure in the New Mexico desert, armed MPs pace a 24-hour vigil, and a miles-long security fence warns off the unwary visitor.

This desert blockhouse, a honeycomb of classrooms, lecture halls, movie theaters and atomic laboratories, is called the Vault or, more ironically, by its GI students, "The Kremlin." It's the fortress heart of the nation's nuclear-training program for military personnel.

Located in the top-secret, heavily guarded military technical area on Sandia Base, home of the Armed Forces Special Weapons Project in Albuquerque, N. Mex., the hulking stone building is an atom-bomb college, a nuclear-weapons institute for privates, captains, corporals, even four-star generals who are learning in short four-day to six-week courses what makes an atom bomb tick. Here, Uncle Sam's military men of all services are studying the capabilities and limitations, the hazards and precautions of nuclear special weapons.

Mission of the Armed Forces Special

Weapons Project at Sandia Base is the training of service people in all atomic weapons: Bombs, artillery shells or any weapon which carries an atomic warhead. AFSWP is a partner in a giant interservice, interagency joint effort aimed at providing the United States with a supply of atomic-trained technicians.

Working closely in the program are the Atomic Energy Commission, which builds and develops nuclear weapons, later stockpiles them; the AFSWP which trains personnel, and develops and procures equipment for atom-weapons handling; and the Air Force Special Weapons Center at nearby Kirkland AFB which modifies and tests airplanes to transport and deliver nuclear bombs.

Students at the Kremlin, the nation's sole atom-bomb school, for the most part volunteers, study toward diplomas in nuclear supervision, atom technology and special-weapons mechanics. They wear no distinctive badge or insignia. Many are fresh from high school. Others are college graduates with several degrees. Their average age is 23 to 29. They're young, willing, possess good mechanical aptitudes. They hold one





of the highest IQs and educational levels of any military installation in the country. Even military policemen assigned to Sandia Base, because of the rigid security screen thrown about all of the Kremlin's atom instruction, are hand-picked.

### Study Nuclear Technology

Atom students at the Kremlin learn nuclear technology in lectures, movies, classroom demonstrations, in libraries and study halls. Daily, the atom men struggle with unfamiliar concepts of critical mass, radioactive decay, isotope and binding energy. They run through complicated preparatory drills, field-strip bombs, rebuild them again. A typical examination question:

"Explain the neutrino hypothesis." Another: "When is the critical mass level realized?"

Although the atom-bomb school was originally established to train military men, many senators, representatives of the Joint Committee on Atomic Energy and the Joint Chiefs of Staff visit the project periodically to be briefed on the latest developments in atomic ordnance.

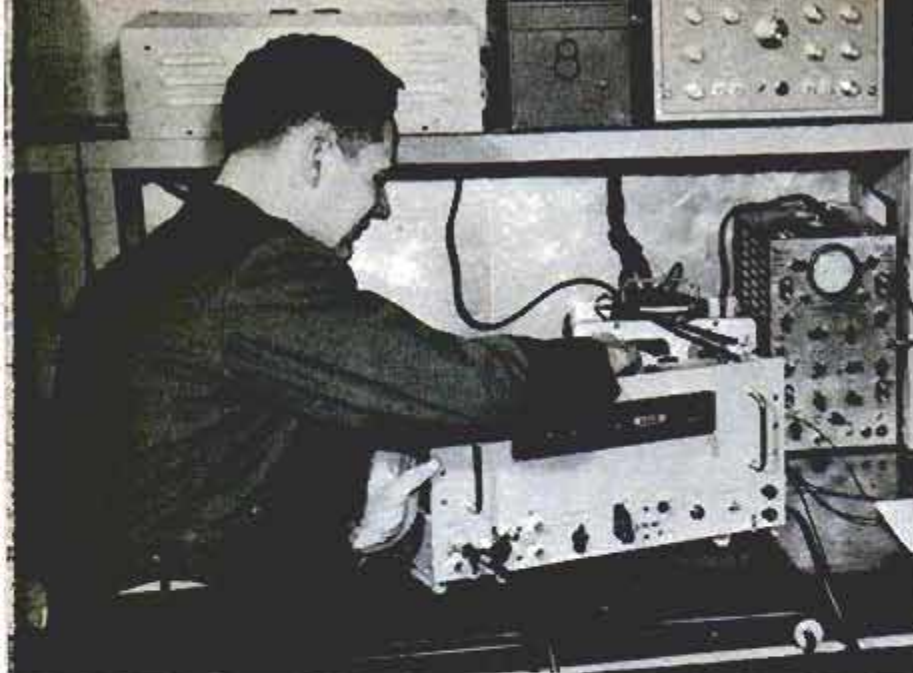
During his term at the school, a student may learn the assembly, loading and handling of nuclear bombs and weapons. He memorizes the bomb inside and out. But only dummy bombs are handled, not live units.

Apart from a restricted study of atom

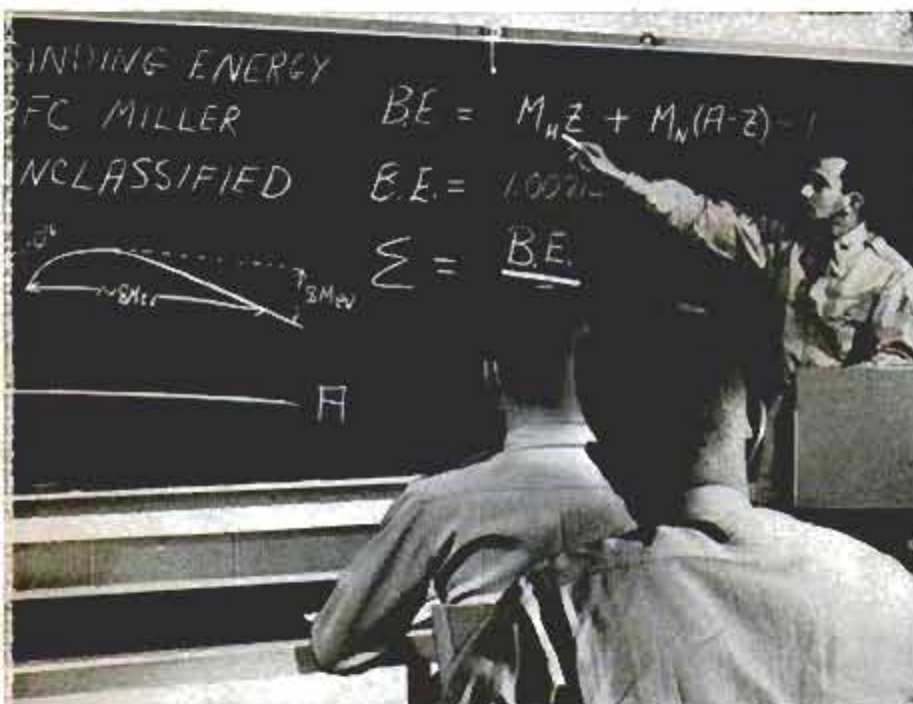
Left, a student learns safe-handling techniques. Right, books and class notes are kept in safe overnight







Courses at Sandia require from four days to six weeks to complete, and include nuclear electronic and electrical systems



Above, a private first class who is an atomic physicist by trade teaches fundamentals of nuclear energy. Below, undergraduates are told about the Periodic Chart of the Atoms. Passing grade at Nuclear U. is 100; 15 to 20 percent fail



bombs and their structure, undergraduates at "Nuclear U." are given an educational foundation in radiological defense, effects of atomic explosions and military and elementary aspects of atomic energy. They are taught, essentially, atomic capabilities, not strategy or atomic tactics.

### Eager to Learn

A spokesman reveals that younger students are right at home in the Kremlin. They're eager to study the atom. They learn faster, retain it, are well motivated. Ten years ago when the bomb first became known, some military men experienced a natural reluctance when meeting an atom bomb face to face; the idea was too big, too unreal. But in the last decade, professional military men began to cultivate a familiarity with atomic weapons. "Now, because of the pressure of world events, some ask for assignments to the Kremlin."

Nowadays, these eager atomic technicians rehearse M-Day maneuvers, dressed in radiationproof clothing. In desert laboratories, under expert instructors, students pick up the essentials of radioactive monitoring. They reach out into the desert in Jeeps and carryalls, searching for hidden radioactive sources with geiger counters, scintillometers and other monitoring devices. Under conditions which re-create actual after-effects of an A-blast, Uncle Sam's atom scholars come to recognize the grim realities of nuclear warfare and atomic defense.

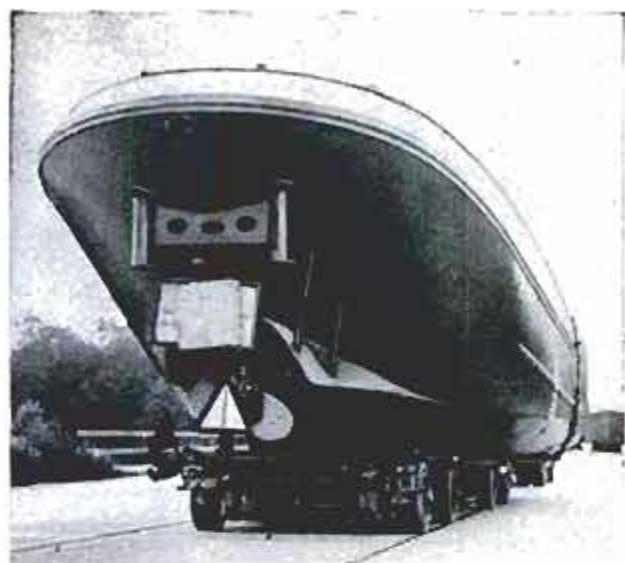
Instructors are selected for their knowledge, their atomic know-how and sometimes they're far outranked by their students. Corporals instruct captains; CPOs assist airmen. A brigadier general once needed refresher lessons in physics before attending important atom lectures in the Kremlin. The Army ordered a private first class to tutor the general!

### Under Tight Security

Despite heavy work loads and intensive study schedules, all work is carried on behind a tight security screen. Students are investigated by the FBI and AEC before beginning their studies; a top-secret security clearance is required

(Continued to page 210)





## 126-Foot Ship Moves in Two Sections Down German Highway

If you think portaging a canoe is hard work, you'll sympathize with a German firm that had to transport a 126-foot ship overland from one river to another. The ship, 16 feet wide and 14 feet high, was built as a front section of 71 feet and a

stern section of 55 feet. Two 16-wheel trailers, pulled by trucks at nine miles per hour, carried the sections down the highway. The ship was moved from its building site on the Danube to its launching point on the River Main and assembled there.

## Coal Car Stands on End to Dump Load

In a matter of seconds, a heavy-duty hoist upends and empties a freight car carrying 40 tons of coal. The hoist is installed at a gasworks in West Berlin. A winch arrangement does the work



AUGUST 1956



## New-Look Water Tower

There are still enough steam locomotives around Hamburg-Altona, Germany, to justify the erection of a new water tower to slake their thirst. Its shape, tapering outward from a narrow base, marks a new era in design. Atop it is a railroad-radio antenna

113





# PLAYGROUND WITH AN IMAGINATION

By Lee Elam and Leo Rosenhouse

**T**HERE is a gradual revolution taking place in playground design and equipment. Uninviting gray iron-pipe swings, slides, teeter totters and bars are being replaced with a new concept in play equipment that stimulates a child's interest, requires physical accomplishment and creativeness and the use of his imagination.

"Play is not a luxury but a necessity," explains William Penn Mott, Jr., president of the American Institute of Park Execu-

tives, and superintendent of the Park Department in Oakland, Calif. "It is something a child must have if he is to grow up properly.

"We know that play is an instinctive thing in a child, but this does not mean there need be no special provision for it. Thus we recognize that play-area equipment today needs revolutionizing so that it is radically different in its environment from anything that the average child encounters in his customary day-to-day existence."

When the Oakland Park Department cleaned house of all dilapidated and dangerous play equipment on its playgrounds and parks, it replaced outmoded toys and apparatus with new safe-sculptured play equipment, colorfully designed toys and functional play areas.

One of the most unusual and popular toys is a massive "fun tree" in Lakeside Park, on the shore of Lake Merritt, so-called because boys and girls can climb in, over, around and through it. The fun tree was designed to make

Ramplike walk extends over sandboxes to give children a place to run. Giant arch in background supports an array of swings



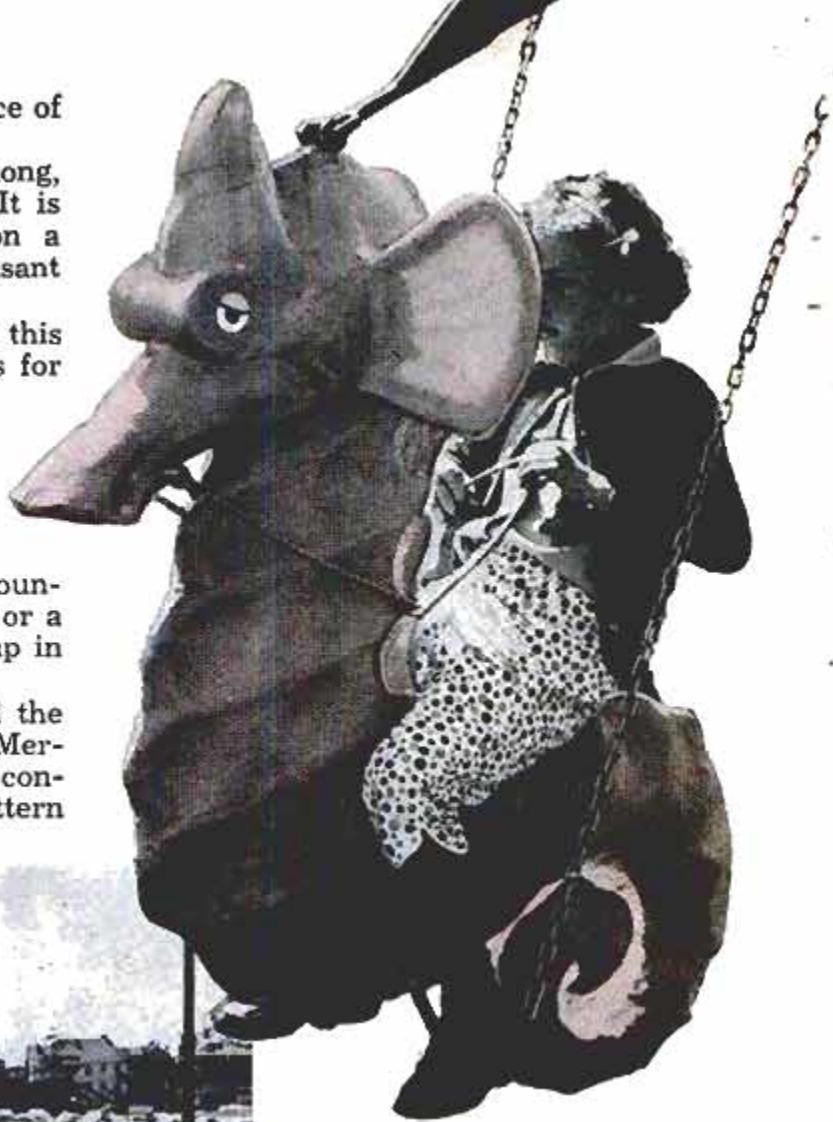


the small fry happy by the ingenious device of imaginary visualization.

The fantastic-looking "toy" is 30 feet long, 12 feet wide and several feet in height. It is made of plastic-laminated glass cloth on a metal-lath frame. The color is a pleasant lemon yellow.

Young minds make great things out of this creative piece. It has hand and foot holds for climbing, a limb shaped like a giant fish tail, tunnels for crawling, areas that look like the wings of an airplane and smooth surfaces that become slides. One day a youngster may pretend the fun tree is a ship from outer space, and the next, a wild animal. It can become a cave, a mountain, an ocean liner, railroad train, whale or a thousand and one other things whipped up in youthful imagination.

In this Lakeside Park play area, called the Kiwanis Kiddie Korner because the Lake Merritt Kiwanis Club donated funds for its construction, the usual straight geometrical pattern



Seahorse swing, above, a novel jungle gym, left, and tiger slide, below, all tend to stimulate the imagination of children who flock to Oakland's new playgrounds featuring ingenious and safe equipment for all

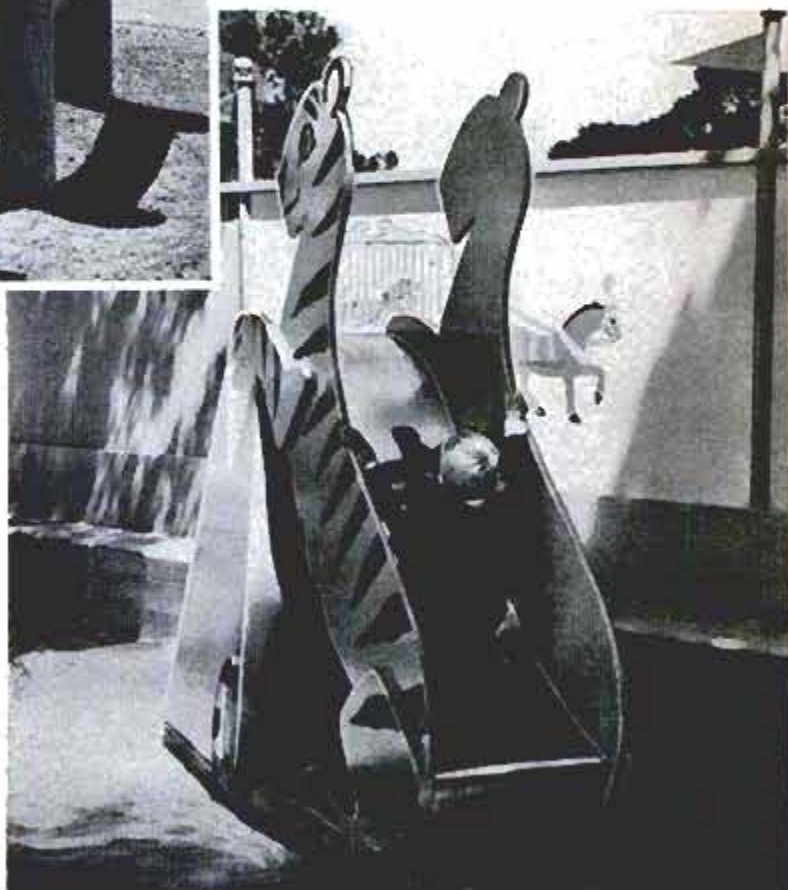


of the oblong or square playground was discarded and replaced by free-flowing curves.

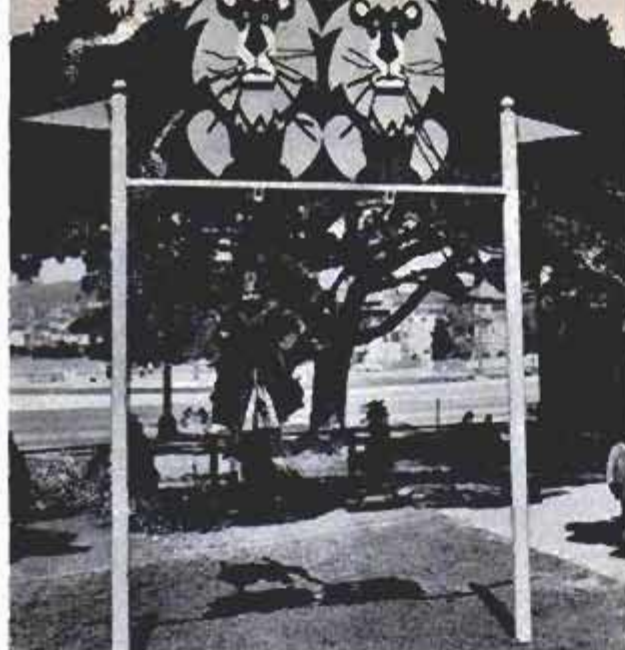
"Children don't play in a straight line," Mott explained. "They tend to run in a helter-skelter pattern. For that reason, we've made the Kiddie Korner an informal play area."

Curving sandboxes are set on various levels. A coral-and-black ramplike walk, arching over the sandboxes to give children a place to run, is terminated at one end by a drinking fountain and at the other by a circular pylon.

Swings hang from an arch that reminds







Above, brave child holds tails of "Soulful Lions" that form ropes for the swing

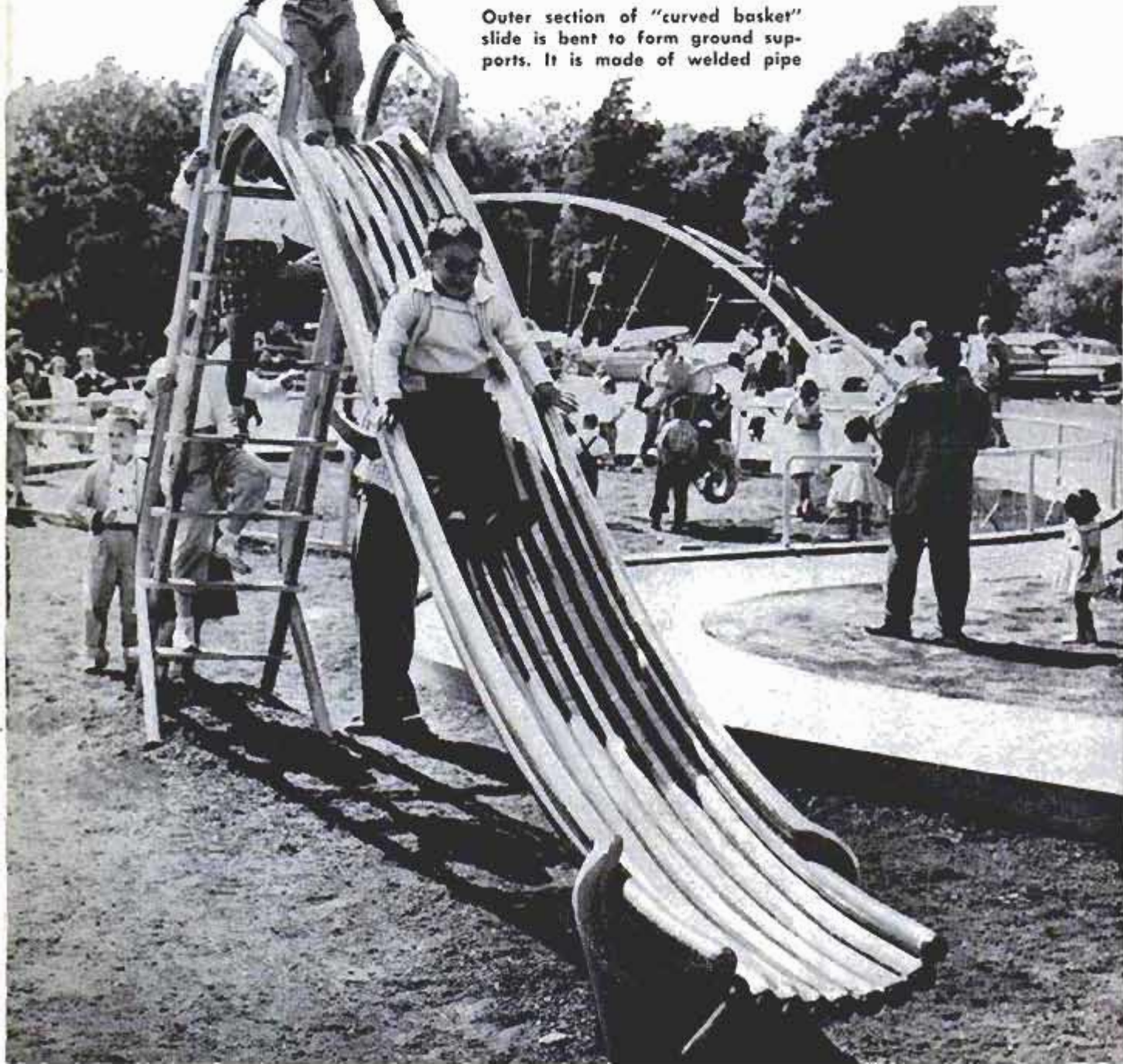
all of the nearby San Francisco Bay Bridge. The end posts are set away from the swings for safety. Two of the swings are in the shape of sea horses, made of plastic-laminated glass cloth set over a steel-lath armature.

#### Designed for Safety

The slide is designed for safety and simplicity. It is made entirely of two-inch pipe, with the exception of the steps. The pipes are welded together and, to form the slide floor, are arranged in a basketlike curve to give maximum safety. Legs, step mounts and hand bars are a continuation of pipe from the sliding surface, a design that gives maximum strength and makes it virtually indestructible by normal use. All sharp edges are eliminated.

An informally shaped play sculpture constructed of plastic-laminated glass cloth of lemon-yellow and sky-blue color, set over a steel-lath armature, provides the children with an opportunity for all types of cre-

Outer section of "curved basket" slide is bent to form ground supports. It is made of welded pipe





ative play. The sculpture resembles a giant curled leaf and because of its smooth construction, can be used as a slide or can be climbed over without tearing clothing or skin.

All these play units are surrounded by tanbark to take the shock of falls and tumbles and to prevent skinned knees and arms.

The Peralta Playground is a joyland for kids right in the heart of Oakland. It features a circus and carnival atmosphere, a portion of the grounds being given over to a circus play area and the remainder to a carnival of movement.

The playground was conceived by Mott when he visited a carnival on a vacant lot where the park is now located. He came away depressed after seeing girls and boys riding shoddy dangerous toys and play equipment. Also, he thought the carnival looked like a breeding ground for mischief and juvenile delinquency.

#### Ropes Are Lions' Tails

Now, the small fry who visit the circus play area ride a teeter-totter board that balances on the back of "Toto, the Roguish Clown"; slip down a slide formed by the backs of the "Kittenish Tigers"; sit in a swing whose ropes are the tails of two "Soulful Lions." A sandbox duplicates the sawdust in a circus ring.

The walls surrounding the circus area remind the tots of the legend of Humpty-Dumpty, for they are gaily decorated with fairyland figures. Other sections of the wall stress the circus atmosphere by pic-

turing gay animals. On top of the colorful wall circus pennants and streamers whip in the breeze. The wall serves as a protection for an area designated as a party center for the small fry who thrill to the circus atmosphere. All of the party furniture is of Lilliputian size to accommodate the kiddies at their fun fests.

"Every youngster lives in a fairyland and he should have a play area to match his imagination," reasons Mr. Mott.

"We adults look at things differently from youngsters, and the play areas grown-ups visualize for children are usually drab things that depress and disturb kids. We endeavor to make them so they will be bright, exciting and invigorating adventures. By watching the creativeness of small fry, we are able to give them toys and equipment which channel their boundless energy along favorable lines.

#### Piers Form Jungle Gym

"It was such an approach that brought us to placing in the circus area a jungle gym built to resemble the piers that jut out from Oakland's shoreline. Children, we found, need something massive they can climb in and over, like this grouping of smooth-painted concrete pipe and wood pilings."

The movement area of Peralta Playground features a dude ranch where children can ride on a live pony merry-go-round, a horse-drawn buggy, and an honest-to-goodness covered wagon pulled by lively but gentle horses.

There is a lake with a paddle-wheel boat

This merry-go-round provides live ponies and the junior cow hands are held to the saddles by safety belts







Playground's miniature dude ranch features covered wagon pulled by donkeys along "trail" of big corral

like the old Mississippi River steamboats. The children also have access to a mechanical merry-go-round and ride on beautifully carved horses in trotting or gallop position.

Surrounding this is a railroad track on which runs the Oakland Daylight, copied after the Southern Pacific's San Joaquin Daylight, made to one-quarter scale.

The recreational revolution in Oakland

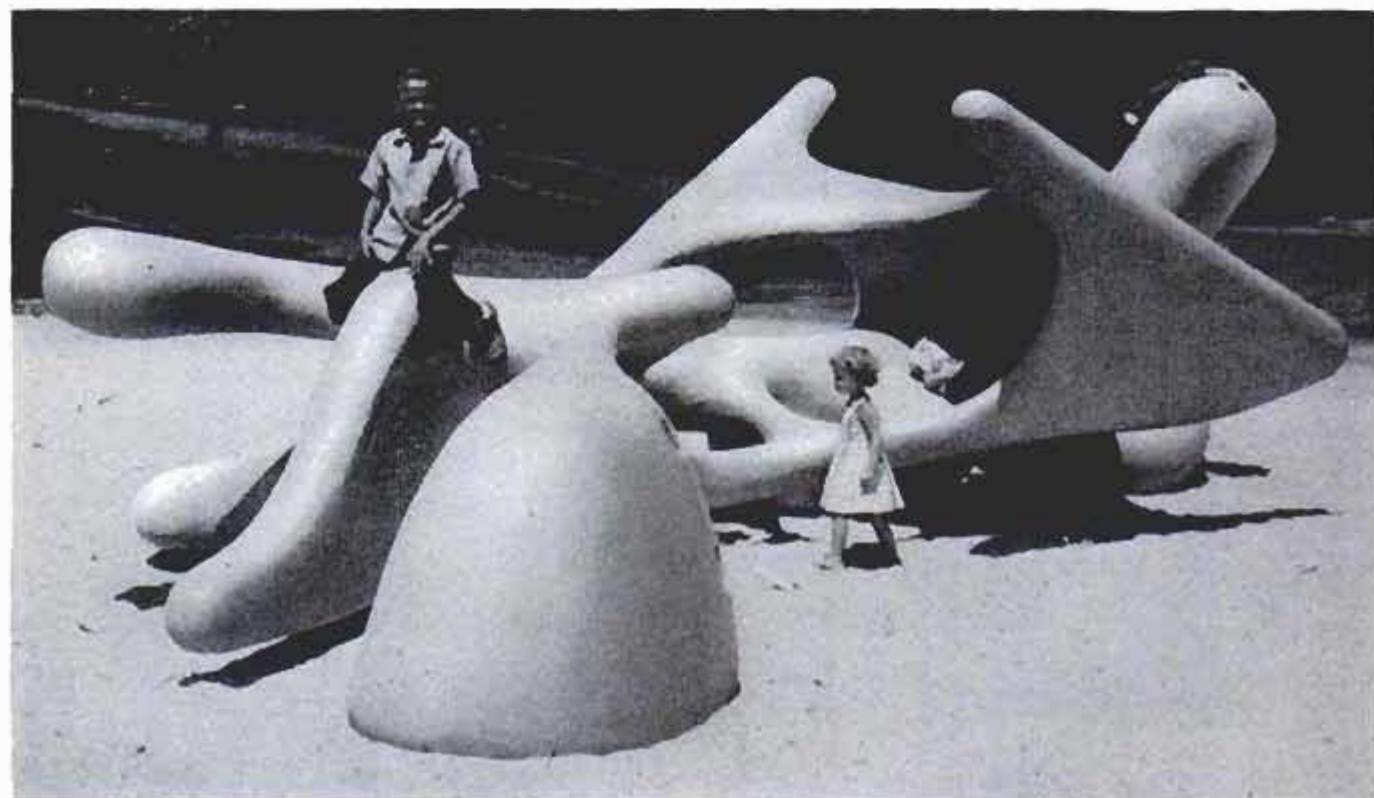


"Toto, the Clown" gets no rest as gleeful children ride the teeter totter placed across his "tired" back

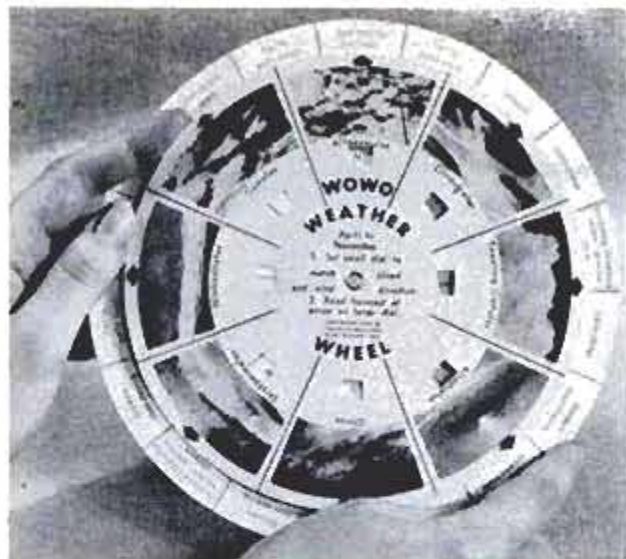
has created so much attention, the National Recreation Congress and the American Institute of Park Executives have asked for special reports and detailed plans on the design and features of the playgrounds.

Oakland citizens are pleased because their town has found the right way to blend creative ingenuity with their children's laughter and important recreational needs. ★ ★ ★

"Fun tree"—plastic-coated toy—is a boat to one child, a cave to another or perhaps a tricky space ship







### Weather-Forecast Wheel Predicts Day in Advance

Clouds and wind direction enable you to forecast the weather with a "weather wheel" invented by a former Air Force meteorologist. Inventor Charles Billiard, now an English teacher in Fort Wayne, Ind., says the wheel is right 75 percent of the time. Made of two cardboard disks, it is simple to operate. On the inner disk of the wheel are eight photographs of different types of cloud formations. Beneath each cloud formation is a small window through which the user sets wind direction. Opposite the cloud formation, the user reads on the outer disk the weather prediction for the next 24 hours. Two different weather wheels are made: one for winter, one for summer.



### Spray-on Patching Compound Covers Damaged Concrete

Concrete that has been chipped or cracked can be patched with a latex-type binder that is mixed with portland cement. The damaged surface first is cleaned with picks, pneumatic tools or by sandblasting. Pneumatic application is recommended for large areas, but patches need only be troweled. Patches mixed with the new binder adhere to old concrete and are watertight.

### Small Crawler Tractor With Automatic Transmission Does Many Jobs

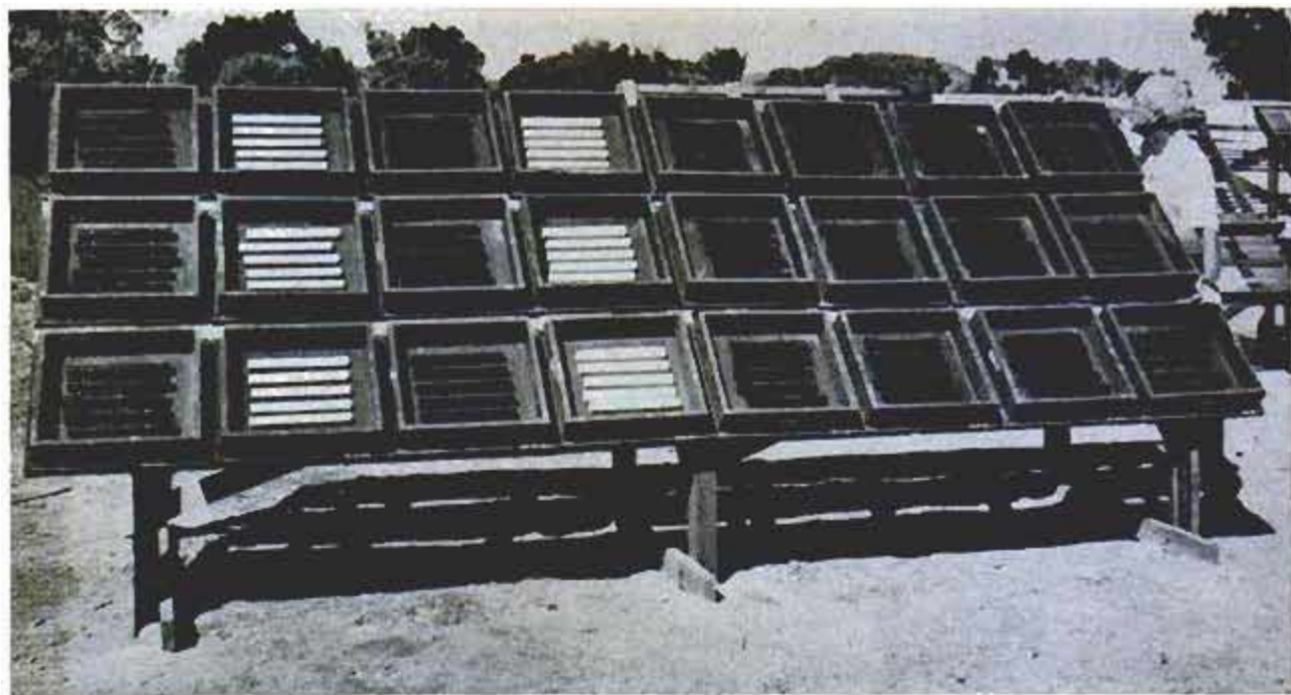
Both an automatic transmission and a torque-converter drive are standard equipment on a small, low-priced crawler tractor that adapts to many uses. The transmission features a constant-mesh gear train, combined with hydraulically operated clutches, which provide automatic shifting in any speed or direction without loss of momentum. The unit provides four speeds forward, up to 5.63 miles per hour, and four speeds reverse, up to 6.2 miles per hour. There is also an infinite number of in-between speeds with the torque converter. The transmission permits full-power turns with the touch of a finger, or

smooth pivot turns with hydraulic foot brakes. Many different types of tools can be affixed to the versatile machine.

Power shovel and leveler are among many tools that mount on the tractor







Mr. Caryl inspects samples of plastic pipe that are being exposed in glass cases to Arizona's sunlight

## The Sun Earns His Living for Him

By Joseph Stocker

**A**MERICAN INDUSTRY doesn't like to gamble with the sun. It prefers to have its facts well in hand before it ventures a new product onto the market. How, for instance, will an automobile finish stand up under the sun's heat? Will the plastic webbing of a patio chair fade in the sun and, if so, how quickly and how badly?

To get the answers, industry goes in heavily these days for exposure-testing. And exposure-testing has become an industry in its own right, albeit a modest one. In two of America's leading "sunshine states"—Florida and Arizona—resourceful entrepreneurs are making a living off the sun. Industry sends them its products, to be exposed to the brightest, hottest and most punishing sunlight to be found anywhere in the nation. Then they notify industry of the results—and get paid for it.

Cole R. Caryl of Phoenix, Ariz., is typical of these "sunshine scientists." He's founder, proprietor and one-man staff of a firm which he calls Desert Sunshine Exposure Tests. His clients include some of the largest manufacturing corporations in the country (and one in England). They send him just about everything under the sun for testing—plastics, paints, textiles, coated metals and whatnot. His job is to put them on outdoor racks, keep a careful eye on them, note any changes that take place under the impact of the sun's rays and so advise his clients.

Caryl, who's 63, is a chemist by profession. He used to work in the East, for big corporations. But eight years ago he decided he was fed up with crowds, commuting and cold weather. He headed for Arizona and bought a desert home on the outskirts of Phoenix.

How to make a living? Caryl scouted around and discovered that, while there were several exposure-testing businesses in Florida, there wasn't a single one in Arizona. And this despite the fact that Arizona could boast approximately 3700 hours of sunshine per year to Florida's 2400 hours. "Look at that sunshine going to waste," said Caryl to Mrs. Caryl. "We ought to make it work for us."

All in all, the desert state appeared to be a hot location for an exposure-tester, and Caryl decided to try his luck.

It sounds like an easy business to get into, and an even easier business to run. But Caryl says it isn't so. Although his capital investment was only \$100 (for his first set of racks and a promotional mailing to prospective clients), things were touch-and-go for a time.

Presently, however, the business took hold. Manufacturers paid Caryl good money for the use of his sunshine. He built more racks, and still more, until today he has racks scattered over an acre of desert.

An easy business to run? Hardly. Caryl works 12 to 15 hours a day at it. For ex-



posure-testing involves a good deal more than just putting things out in the sun and then taking them down a few months later.

Textiles, for example, have to be brought indoors every day at 3 p.m., then put out again at 9 a.m. the next day. That's because the American Association of Textile Chemists and Colorists decrees a standard test period of 9 a.m. to 3 p.m. for the sake of a uniform yardstick.

Then, too, various customers make special and exacting demands. One manufacturer sent sections of plastic garden hose to be exposed in the sun and directed that he be notified the very first day that a spot appeared on the hose. That would be evidence of what the manufacturer called "vinyl degradation." Caryl had to check the hose every day before the sun went down. (Sure enough a spot soon appeared.)

A wool processor sent Caryl 15 samples of his wool, in pastel shades, and ordered that they be given a one-hour exposure. That was all—just one hour. Caryl obediently mounted the samples on a rack, set his alarm clock and then, when the alarm went off, took down the samples. What the manufacturer wanted to find out was whether the wool would fade in that short period of time. It faded.

Then, at the other extreme, there was the case of the plastics manufacturer who sent Caryl sections of plastic pipe and asked him to leave them in water, out in the sun, for no less than five years. And still another firm, producing wires and cables, ordered a 20-year exposure of its products. "I call that my underground test," says Caryl wryly. "Twenty years from now I'll be underground."

At least one whole rack is given over entirely to automobile taillights. There's a reason for that. Some time ago a major carmaker came out with a new type of red plastic taillight. Within three months taillights were turning white in the sunnier sections of the country and motorists by



These are the exposed ends of plastic pipe Caryl is testing underground. Once a month he uncaps pipe ends and inspects them for water leakage, as shown

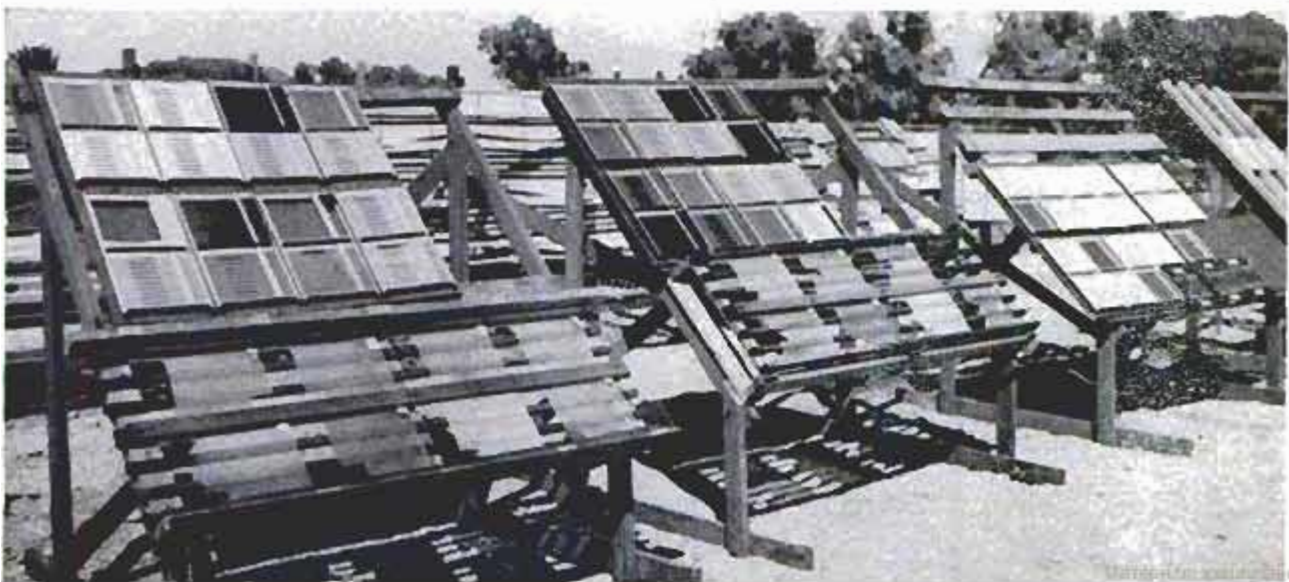
the scores were being stopped by traffic cops. "The manufacturer's face," says Caryl, "was as red as his taillights weren't." The carmaker decided to put his taillights through some exposure-testing since, quite obviously, the sun had been their undoing.

Besides keeping a weather eye on products he's testing, Caryl also needs to keep a weather eye on the weather. Some of his clients want to know, not merely that their samples are getting doused in sunshine, but exactly how much sunshine they're getting. To obtain precise measurements, Caryl had to invest in some scientific instruments. One is a pyrheliometer, which measures the energy of the sun. Another is an electronic recorder, which records the measurements on a graph. Still another is a machine which gauges the amount of ultraviolet in the sun's rays.

All told, these gadgets cost Caryl more than \$1000. But, even so, his unique business has an advantage over most other businesses. His principal raw material—sunshine—doesn't cost him a cent.

What about the future of the sunshine-exposure-testing business? Says Cole Caryl: "It looks very bright." ★ ★ ★

Part of Caryl's acre of exposure racks, these contain samples of vinyl film and other plastics for testing





# OWNERS REPORT:

A lineup of experts checks the '56 Chevrolet in this down-to-earth report. Here's the dope from an automotive engineer, a veteran road tester and the owners themselves.

## What Do Chevrolet V8 Owners Like Best?

"In western language it's like mounting a fresh horse. It gets away and keeps going."

OKLAHOMA REALTOR

"I like the way it handles on corners. Its steering is easy. You can't buy a more responsive car."

IDAHO SALESMAN

## What Don't They Like?

"Poor gas mileage. I drive 15 miles to work, two of them in city traffic. I average 12 to 13 miles per gallon."

CONNECTICUT INSURANCE WORKER

"It has picked up 6 or 7 rattles already."

ARIZONA HORTICULTURIST



## Chevrolet Claims It's the 'Hot One.' Do Owners Agree?

"Mine hasn't been cooled off yet."

TENNESSEE BOOKKEEPER

"Can always get out of a traffic mousetrap."

MASSACHUSETTS SUPERVISOR

"I have 'outdrug' everything in town."

NEBRASKA TEACHER

"Like riding a runaway steer."

KANSAS RANCHER

"I don't need more power, I need more economy."

OKLAHOMA RANGER

## Would They Like More Acceleration?

Yes, would like more	15.5%
No, would not	80.1%
Undecided, no answer	4.4%

## Would They Like More Top Speed?

Yes, would like more	8.3%
No, would not	77.2%
Undecided, no answer	14.5%





Chevy's lugging power in mud and loose sand is above average, as are its handling and cornering ability

## Chevy V8 Is Hot, Say Owners

*As Told by Chevrolet V8 Owners*

**H**OW IMPORTANT is power? More than enough power, that is. Chevrolet has been advertising performance for a year or more. It has been promoting stock-car racing. It calls itself the "hot one." These moves have apparently paid off. Its sales are up—one of few makes that are.

Most Chevrolet V8 owners praise highly the power of their cars. More than three fourths of them (77.2 percent) say they definitely do not want any more top speed—the car has enough now. Only 8.3 percent say they would like more speed at the top; the other 14.5 percent are undecided.

Even more of the owners are satisfied with acceleration—80.1 percent stating that they do not want more acceleration. Surprisingly enough, 15.5 percent want more acceleration and 4.4 percent are undecided.

Owners seem to like horsepower and may even buy horsepower, but an amazing number of them are not too well informed on the subject. Asked to give the horsepower of their new cars, 17.9 percent state that they don't know how much horsepower their cars have. Another 22.7 percent wrote an answer, but it was obviously

(Continued to page 126)



**FLOYD CLYMER  
TESTS THE  
CHEVROLET V8**

**T**HE CAR tested was a Bel Air V8 four-door sedan with Powerglide and the extra-cost power pack. I drove from Los Angeles to Yuma, Ariz., returning via Desert Center and Palm Springs for a total of 604 miles, including some back-road driving in mountains and desert.

Terrific is the word that describes the performance of this car. The V8 engine has

been much improved over the one I tested last year. The car now performs more like a high-price than a low-price car.

Acceleration from a standstill is amazing. Maneuverability and roadability are far above average for a 115-inch-wheelbase car weighing 3293 pounds. Handling is excellent at all speeds. There is some, but not

(Continued to page 216)



# An Engineer Analyzes the Chevrolet V8

By Dale Kelly, SAE

**MODEL TESTED:** Bel Air four-door hardtop with V8 engine, one four-barrel carburetor, dual exhausts, Powerglide transmission, power brakes and steering. Rear-axle ratio: 3.55 to 1. Wheelbase: 115 inches. Tires: 6.70x15. Curb weight: 3625 pounds with gas tank half full (54 percent of this

weight was on the front wheels, 46 percent on the rear). Car said to have the 205-horsepower engine with 9.25 to 1 compression ratio. Barometer: 29.3 inches. Temperature: 70 degrees F. Payload: 400 pounds for acceleration and speed tests; 200 pounds for fuel economy.



## ACCELERATION TIME IN SECONDS

	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Ignition timed for regular gasoline	3.3	7.6	13.1	23	19.6
Ignition timed for premium gasoline	2.9	6.9	12.0	21	19.1

(The watch was started at the instant the accelerator was floored. The engine was not run up against the brakes before the start. All tests were in Drive range.)

**ESTIMATED TOP SPEED:** Measurements of inlet manifold vacuum at speeds less than top speed show that the top speed is about 100 miles per hour on regular gasoline and 105 on premium.



## FUEL ECONOMY (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	23.5	19.9	15.8	12.6
Ignition timed for premium gasoline	23.3	19.9	15.95	12.75

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

**ESTIMATED ANNUAL GASOLINE BILL:** \$159 for 10,000 miles. Based on 2000 miles at 30 m.p.h., 5000 miles at 50 m.p.h., 1500 miles at 70 m.p.h. and 1500 miles in traffic, and on use of premium gasoline at 29 cents a gallon.



## SPEEDOMETER ERROR (MILES PER HOUR)

Indicated speed	20	30	40	50	60	70	80
True speed	18	28	37	47	56	66	76

## ODOMETER ERROR

The odometer was correct within one percent.



## DRIVER'S VISION

Some portion of the road could be seen 15 feet in front of the car (A in sketch) by an average driver (5 feet 9 inches tall); full width of the road could be seen 21 feet in front of the car (B in sketch).



## GROUND CLEARANCE

The bottom corner of the rear overhang would touch the ground if the car were driven through a dip whose profile had a radius of curvature of less than 28 feet (solid line in sketch). The center of the car would drag if the car were driven over a hump with a radius of less than 18 feet (dotted line in sketch). The exhaust pipes under the engine would drag if the car were driven in ruts deeper than 6.5 inches. The doors would open over a 12-inch curb.

## MISCELLANEOUS

**OCTANE REQUIREMENT:** The basic ignition timing had to be set to four degrees after top dead center for knock-free operation on an 85-percent-octane blend of octane and heptane, equivalent to typical regular gasoline (octane 82 Motor, 88 Research). The acceleration and gasoline mileage listed above for regular gasoline were obtained at this setting.

The best acceleration from standstill to 45 miles per hour was obtained with the ignition advanced to top dead center. The acceleration and gasoline mileage listed above for premium gasoline were obtained at this setting.

With any further advance, the engine knocked on a 90-percent octane blend of octane and heptane, equivalent to a typical premium gasoline (octane 85 Motor, 95 Research).

At the time of the test, the car had a 5000-mile accumulation of carbon. Another car of the same make and model could easily have an octane requirement several points higher or lower.

**STEERING:** From straight ahead, the steering wheel had to be turned 0.78 revolutions to complete a circle with an outside radius of 50 feet. The steering wheel turned 4.6 turns from lock to lock. Turn-circle diameter, curb to curb, was 40 feet; from wall to wall: 42.5 feet.

**TRUNK CAPACITY:** In addition to the spare tire and

tire-changing tools, the trunk could accommodate nine cardboard cartons of the size used for 48 tall cans of evaporated milk.

**WATER RESISTANCE:** The body was fairly well sealed against water leaks. In the high-pressure car wash a few drops of water entered the trunk, a few drops worked under the passenger doors, and about an ounce got onto one end of the rear-seat back.

In 9 out of 10 trips through the splash pan, several spark plugs shorted out for a few seconds. In three of these trips the engine stalled, but started and ran normally after 5 to 10 seconds. Brakes were not affected. A few drops of water worked under one door; no water entered the trunk.

**CENTER OF GRAVITY:** The center of gravity of the unloaded car was 23.6 inches above the ground.

**GASOLINE FILL RATE:** The gasoline tank could be filled at the rate of better than 14 gallons per minute when almost empty. No filling-station pump used during the test was capable of pumping faster than the inlet pipe could take it.

**BRAKES:** In general, the brakes worked well. The power-brake pedal required a very light pressure with vacuum assist and only a moderate pressure when the engine was not running. There was a vacuum reserve tank with sufficient capacity for two or three brake applications with the engine not running. The hand brake held the car on a 14-percent grade.



# Here's What Dale Kelly Tests—and Why

## Rear-Axle Ratio

Rear-axle ratio is the number of revolutions made by the driveshaft for one revolution of the rear wheels (3 to 4.5 in most modern American cars). In a car with a hand-shift transmission it is also the number of engine revolutions for one revolution of the rear wheels with the car in high gear. It is checked on each test car because almost every manufacturer has several rear axles available with different ratios. Normally, a low ratio is used with an automatic transmission, an intermediate ratio with a three-speed manual transmission and a high ratio with an overdrive transmission. There are usually other optional ratios that could be installed in the test car. Axle ratio does influence performance greatly. A low ratio usually results in quiet engine operation, improved fuel economy. A high ratio gives, with a manual transmission, better high-gear acceleration at moderate speeds and permits lower speeds without gear shifting.



## Weight Distribution

Measured simply by weighing front and rear wheels. A car with a substantial percentage of its weight on the drive wheels is less likely to be stuck in sand or snow. American cars have more weight on the front than rear.



## Weather Conditions

These have a slight bearing on power and acceleration. An increase of 0.3 inches in barometer reading or a reduction in temperature of 10 degrees will usually improve the power of an engine by about one percent.

## Fuel Economy

Constant-speed fuel economy is measured with a meter holding exactly 0.1 gallon. Traffic economy is measured over a half-mile course in which five equally spaced stops are made. The course is driven in two minutes. The gasoline is measured with a 250-cc. burette. The annual gasoline bill for 10,000 miles is first figured for each grade of gas. Then the average is calculated based on the estimated proportion of drivers who will require premium gasoline for satisfactory performance. For example, if substantial improvement is obtained with premium, we may estimate that 75 percent of the drivers would consider the extra two cents a gallon for premium gasoline well spent and our average will be based on three cars using premium for every one car using regular.



## Speedometer Error

We drive the car at a constant speed over an accurately surveyed distance noting the time on a previously calibrated stopwatch.

## Center of Gravity

We determine the height of the center of gravity by putting the front wheels on scales and noting the amount of weight transferred from the rear to the front wheels when the rear wheels are blocked two feet off the floor. A car with a low center of gravity is less likely to roll over in a tight turn or after a collision. It also feels more secure on the highway.



## Acceleration

With an automatic transmission, maximum acceleration is obtained by holding the car stationary with the brakes and pressing accelerator to the floor to bring engine up to its stall speed before starting a run. We do not believe such a figure is of interest to the average owner and therefore we use a more normal start. With engine at idle and brakes off, the accelerator is abruptly pressed to the floor and the stopwatch started at the same instant.

## Octane Requirement

All other things being equal, a car that can run on regular gasoline is more to be desired than one that knocks unless premium is used. Octane requirement is usually measured by running the engine on a mixture of two standard fuels: Heptane ( $C_7H_{16}$ ) and Iso-octane ( $C_8H_{18}$ ). Heptane knocks badly in any engine, no matter how low the compression ratio. Iso-octane will run without knocking at almost any compression ratio in use today. For our testing, two standard blends are used: 85 and 90 percent of Iso-octane. The 85-percent octane mixture is considered equivalent to a typical regular gasoline with an octane number of 82 when tested by the Motor method and 88 when tested by the Research method. The 90-percent octane mixture is the equivalent of premium gasoline with an octane number of 85 Motor and 95 Research. These percentages will be revised from year to year to keep up with gasoline improvements and with changes in the way engines respond to Motor and Research ratings.



Our tests are carried out in two parts. First, we determine how much the basic ignition timing must be advanced to get maximum power from the engine. Any more advance would result in a loss of power. Second, we find out how much the spark can be advanced without knocking on the 85 and 90-octane blends. These maximum-advance knock-free settings are used for our tests with premium and regular gasoline, except that the spark is never set for more advance than will deliver maximum power.





— Irving Seligmann photos

Sweptback fenders on some '56 cars make taillights vulnerable. Chevrolet's are 3 inches inside bumpers



Above, owners like the grille; in 1955, Chevy owners didn't like grille shape. Kelly praises the high-opening hood for engine accessibility, but distributor behind air cleaner, below, is quite difficult to work on



wrong. Guesses range from 45 (actually the taxable horsepower of the Chevrolet V8) to as much as 235 horsepower. Only 59.4 percent were able to state the horsepower of their Chevrolets correctly.

However, despite the power talk and the hot-one promotion, styling is the reason most often given by owners for buying a new Chevrolet. They seem to make their choice more on what a car looks like than how it performs. In fact, 58.8 percent state that styling is one of the important factors in their choice of a car and 20.9 percent say styling is the single most-important factor. Only 8.7 percent say the engine was the big reason, another 6.3 percent say Chevrolet's performance is the reason.

This year's Chevrolet V8 engine seems to be trouble-free for the most part. Only 1.5 percent of the owners had considerable engine trouble; 13.7 percent had some trouble; and 84.8 percent had no engine trouble at all to report. Most-frequent engine troubles are valves and carburetion.

Chevrolet owners do have complaints, although there is no single complaint that stands out as there often is in our Owners Reports. The most frequent complaint is a common one: Poor gasoline mileage (13.6 percent). Next come body rattles and squeaks (10.7 percent); third, poor paint and chrome (7.3 percent). The complaint percentages are lower than usual in our surveys.

Although they say they buy Chevrolet for its styling, more owners praise power and performance than any other single characteristic. Easily the best-liked features, power and performance are mentioned by 54.9 percent of the owners. Handling ease is second with 48.5 percent and third comes styling with 28.2 percent.

Supporting this attitude about performance is the fact that 81.8 percent of the owners say the Chevrolet is just as "hot" as claimed in the advertisements. A very small number (5.1 percent) say no, it is not the hot one. Another 13.1 percent say they don't know.

More than half the owners traded in a Chevrolet to buy the 1956 model, another 8.7 percent traded some other General Motors brand and 23.8 percent traded from outside the General Motors family.

About a fifth (20.4 percent) did not bother looking at any other car except Chevrolet before buying, 58.7 percent looked at Ford, 35.9 percent at Plymouth and 26.7 percent at Buick. Many, of course, looked at two or more competing cars before making their selection of a Chevrolet.

Only a few Chevrolet owners have safety belts in their new cars (7.4 percent). However, all these owners say they regularly use the belts: 57.1 percent wear them all



Owners from every state except Pennsylvania took part in this Owners Report on the 1956 Chevrolet

## The Owners Analyze the Chevrolet V8

### Over-All Rating of the Chevrolet V8

Excellent	Average	Poor
74.0%	23.0%	3.0%



#### Had trouble with V8 engine?

No trouble.....	84.8%
Some trouble.....	13.7%
Considerable trouble.....	1.5%

#### What was engine trouble?

Valves, tappets.....	2.9%
Carburetion.....	2.9%
Ignition.....	2.5%
Uses oil.....	2.5%

#### Performance Questions

##### Is it as "hot" as claimed?

Yes, it is.....	81.8%
Don't know.....	13.1%
No, it is not.....	5.1%

##### Would like faster acceleration?

Yes, would like it.....	15.5%
No, would not.....	80.1%
Undecided.....	4.4%

##### Would like more top speed?

Yes, would like more.....	8.3%
No, would not.....	77.2%
Undecided.....	14.5%

##### What is car's horsepower

Gave correct horsepower.....	59.4%
Gave incorrect horsepower.....	22.7%
Said didn't know hp.....	17.9%

#### Styling Questions

##### Best-liked exterior feature?

Grille.....	15.5%
Taillights.....	7.8%

##### Least-liked exterior feature?

Fender cutouts.....	8.3%
Gas-filler location.....	5.8%

##### Best-liked interior feature?

Upholstery.....	35.9%
Color matching.....	11.7%

#### Least-liked interior feature?

Dashboard design.....	18.4%
Floor covering.....	7.2%

#### Did styling influence choice?

Yes, did influence.....	58.8%
No, did not influence.....	34.4%
Undecided.....	6.8%

#### Miscellaneous Questions

##### Have safety belts in car?

Yes, have belts.....	7.4%
No, do not.....	92.6%

##### Are safety belts used?

(Asked of those with belts)	
Used all the time.....	57.1%
Used some of time.....	42.9%
Used none of time.....	0.0%

##### Would buy another Chevrolet?

Yes, would.....	60.0%
Might.....	35.0%
No, would not.....	5.0%

##### How is dealer service?

Excellent.....	52.5%
Average.....	33.5%
Poor.....	14.0%

##### Would buy from him again?

Yes, would.....	60.7%
No, would not.....	11.7%
Undecided.....	27.6%

##### What make car was traded?

Chevrolet.....	56.8%
Other GM make.....	8.7%
Non-GM make.....	23.8%
No trade, no answer.....	10.7%

##### Looked at other cars before buying?

No, did not.....	20.4%
Looked at Ford.....	58.7%

At Plymouth.....	35.9%
At Buick.....	26.7%
At Oldsmobile.....	16.5%
At Pontiac.....	18.0%
All other makes.....	24.4%

#### Why did they pick Chevrolet?

Exterior styling.....	20.9%
Previous experience.....	12.6%
V8 engine.....	8.7%
Trade-in deal.....	6.3%
Price.....	6.3%
Performance.....	6.3%

#### What should be changed?

Nothing at all.....	31.6%
Improve bodywork.....	7.8%
Gas-filler location.....	6.8%
Softer seats.....	5.8%
Restyle dashboard.....	5.3%

#### Best-Liked Features

Power, performance.....	54.9%
Handling ease.....	48.5%
Body styling.....	28.2%
Riding comfort.....	18.4%
Economy of operation.....	18.0%
Roadability.....	8.7%
Trouble-free V8 engine.....	4.9%

#### Most-Frequent Complaints

No complaints at all.....	30.1%
Uses too much gasoline.....	13.6%
Body rattles.....	10.7%
Poor paint, chrome.....	7.3%
Water, dust leaks.....	6.8%
Powerglide operation.....	6.3%
Dashboard design.....	6.3%
Poor tires.....	4.9%

the time and the other 42.9 percent wear them some of the time.

Here are some quotations from Chevrolet owners that describe how they feel about their new cars:

"In western language, it's like mounting a fresh horse. It gets away and keeps going."—Oklahoma realtor.

"There is no comparison between the 1955 and 1956 Chevrolets. The '55 gave me all kinds of engine trouble. The '56 has been wonderful and the mistakes are corrected. It is a wonderful car both for beauty and performance."—Ohio pharmacist.

"I have had it on the drag strip several times and have had no trouble with any car for the quarter mile. My best time on the quarter mile (dirt) was 16 flat."—Oklahoma used-car salesman.

"I drive about 40,000 miles a year. With

me economy comes first, then comfort, then performance. This car seems to excel in all three. If the top were an inch or two higher it would be nearly perfect."—Iowa feed dealer.

"Gas mileage before high-altitude jets were installed in the carburetor was 8.4 miles per gallon. It is now about 12 in city driving. But my car is noticeably slower on pickup since new jets were installed."—Utah truck driver.

"The gas mileage isn't too good because of the four-barrel carburetor plus Powerglide. It's a little hard getting into the back seat because it is a four-door hardtop."—North Dakota farmer.

"Horsepower keeps going up unnecessarily and gas mileage keeps going down. Top speed is too high."—Utah foreman.

(Continued to page 212)





## "Flying Footballs" Guide Plane

Described by one pilot as "resembling a white-hot football racing away in the fog," the electronic-flash approach system recently installed at New York International Airport is expected to reduce flight delays and lessen air-traffic-control problems. The system consists of 20 Strobeacon lights in a single row 2000 feet long in the approach path leading to the runway. Each Strobeacon employs a high-intensity xenon flash tube producing over 30,000,000 candle power. Each tube flashes twice per second, and the units flash in sequence toward the runway. To the approaching pilot, this gives the effect of an animated arrow pointing at the runway. In fog and low visibility, the Strobeacon units are visible long before other lights, and thus help to orient pilots just breaking out of instrument-flight conditions.

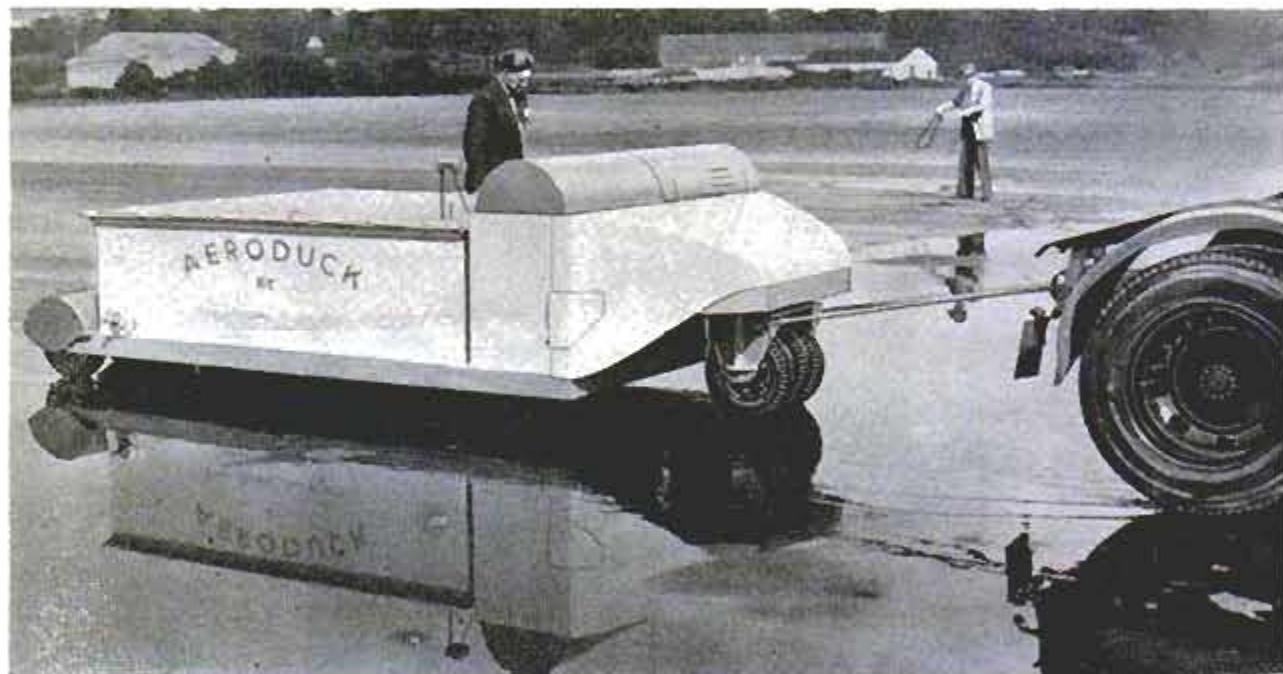
Line of high-intensity xenon flash tubes leading to landing runway flash in sequence to guide pilot

## Three-Ton Vacuum Machine Dries Airfield Runway in England

Flooded airfield runways are dried in a hurry with a vacuum machine that sucks up thousands of gallons of water in a day. (Water puddles are particularly dangerous for jet aircraft.) Used on English airfields, the three-ton suction machine dries a six-

foot swath as it is pulled behind a tractor. A three-horsepower engine drives the vacuum mechanism, which deposits water in a 500-gallon tank. The machine is an adaptation of a turf drier used for two seasons at a famous cricket grounds.

Pulled behind a tractor, giant vacuum sucks water into a storage tank, leaves behind a six-foot-wide dry strip







Remote-control fluoroscopic examination using Lumicon gives operator brighter picture to study



Bendix Aviation Corporation photographs

Attached to X-ray equipment, Lumicon can be used to prevent aircraft sabotage by screening passengers' luggage

## Electronic Amplifier Magnifies Light 40,000 Times

"SUDDENLY Mars stood out on the screen with a sharp steady image, giving us the best view of the planet we had ever had."

Thus Dr. Albert G. Wilson, director of the Lowell Observatory, described what he saw when the Lumicon, a new electronic device which amplifies light 40,000 times, was attached to the telescope at his observatory. Lumicon, actually a closed television circuit with amplifying lenses built in, is so sensitive that it will project a clear picture on a television screen when the subject is in a dark room lighted only by a glowing cigarette. When attached to the

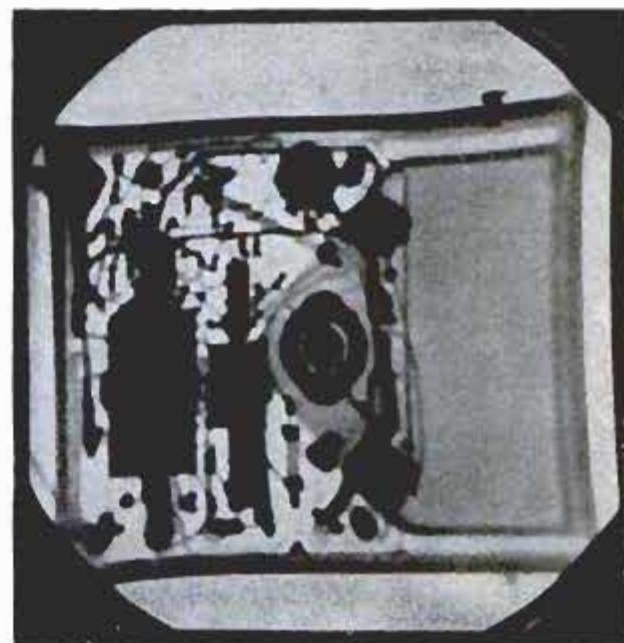
Subject of this televised picture sat in darkened room, lighted only by glowing tip of her cigarette



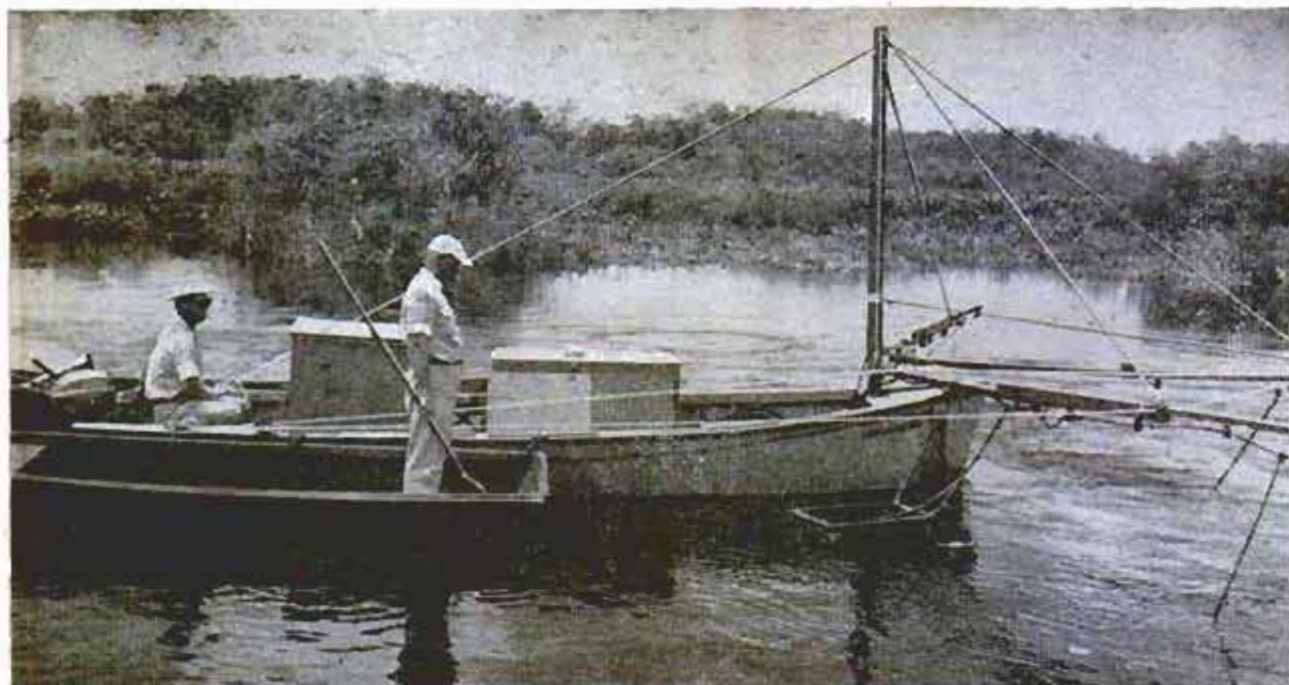
200-inch telescope at Mount Palomar, it will increase light-gathering power to the equivalent of a 1200-inch telescope.

In addition to uses in astronomy, the Lumicon has industrial and medical applications. Attached to a fluoroscope or X-ray machine, it will give brighter pictures and make remote observation of X-ray results practical. Industrial X-ray machines will be much more flexible in their uses with Lumicon attached. And the manufacturers expect that eventually it will be used in television to reduce the amount of light required to receive and send programs.

Lumicon-amplified televised X-ray picture of a suitcase in which an electronic test meter is concealed







Fish-shocking boat cruises slowly through waters of the Everglades in Florida, destroying unwanted fish

## FISH SHOCKER PICKS ITS VICTIMS

By George X. Sand

LIKE MOST STATES, Florida with its 30,000 lakes and 1 out of every 12 inland acres comprising fishable water, has been plagued with the growing problem of "rough fish": such valueless predators as gars and mudfish which not only consume food required to sustain bass and bream and similar desirable species, but actually destroy such game fish. Because the state's economy is directly dependent upon tourists who come to enjoy sport fishing, it was decided something would have to be done quickly when the Florida Game and Fresh Water Commission discovered that the predators had increased until they represented 75 percent of the fish that swam through the Everglades canals, streams and lakes.





After considerable research Timothy R. O'Connell, Jr., a fish-management technician for the commission and an ex-Marine radar instructor, produced an electronic fish paralyzer that is proving capable of removing 500 pounds of such rough fish hourly from Florida waters. Unlike similar devices, O'Connell's shocker distinguishes between game fish and undesirable species, stunning only the latter. This is accomplished by varying the operating voltage to "tune in" on the frequency that will control the approach of unwanted fish.

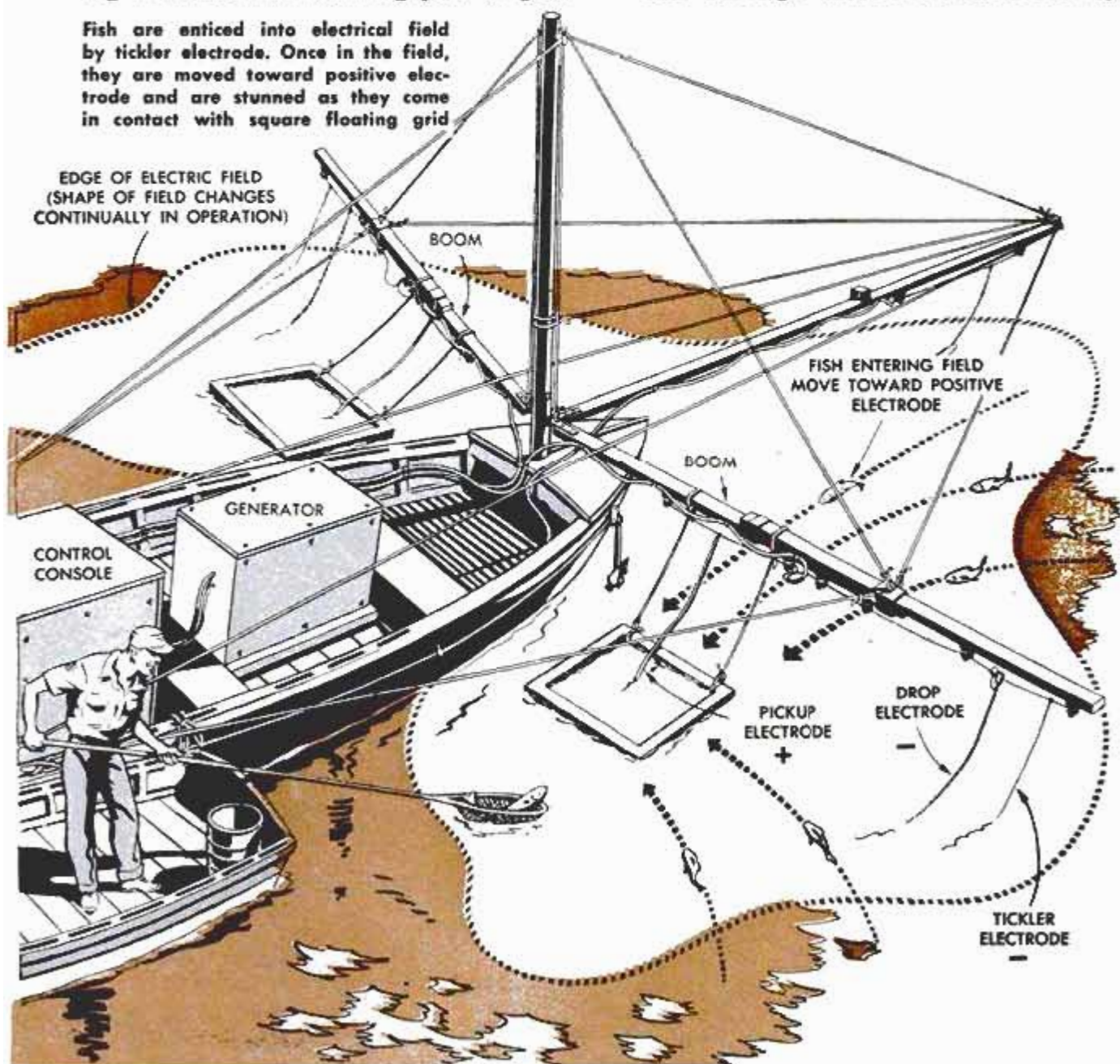
"Scientists have long observed that fish swimming in an electrical field tend to form a natural alignment from the positive pole, just as iron filings align themselves around a magnet," says O'Connell. "Our fish shocker employs an extension of this natural alignment, taking control of the fish's muscles and deliberately maneuvering it toward the stunning pole or grid."

Fish are enticed into electrical field by tickler electrode. Once in the field, they are moved toward positive electrode and are stunned as they come in contact with square floating grid

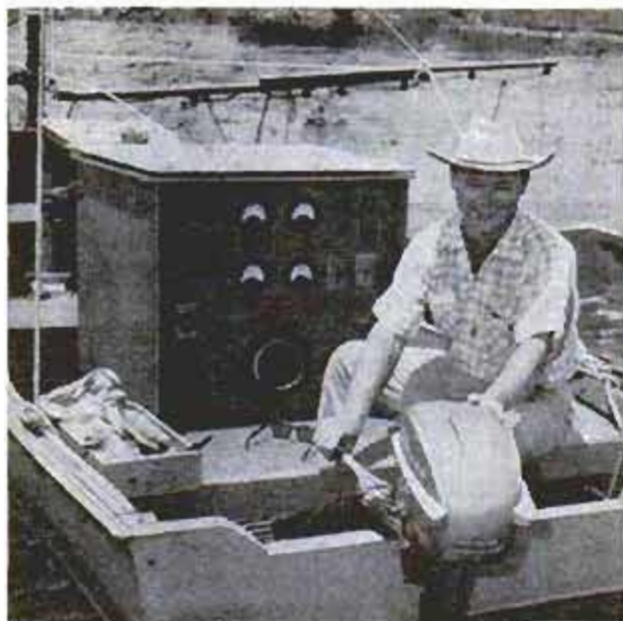
The equipment which makes this possible is housed inside two large wooden boxes aboard a 20-foot boat. Supported at the bow of this skiff are three wooden booms, one of which extends outward for about 15 feet on either side while the third points straight ahead. At the end of each boom a copper electrode drops into the water, in conjunction with a heavy steel link chain (also submerged, and located a few feet farther along the boom toward the boat), to set up a strong electrical field beneath the surface. This field, in turn, controls the victim's movement toward a pair of floating electrical grids, one located on each side of the bow and close alongside.

The floating grids stun the attracted fish so that attendants, who stand in dinghies on either side of the mother craft, can reach down with dip nets to remove them for disposal.

The strange craft is trolled slowly







Inventor Timothy O'Connell, Jr., sits before the control panel on equipment box of his fish shocker

through Florida's grassy inland waterways, while O'Connell sits at the stern, facing a control panel. The box closest to the bow contains a 5000-watt Kohler gasoline-driven power plant, its alternating-current output controlled by a Powerstat.

The resultant electrical field is believed to be about 0.35 volts per square inch. It will vary with the temperature, cleanliness and PH factor (acidity-alkalinity ratio) of the water, since these all influence the conductivity.

The fish are "teased" from hiding under surface growths, and up from holes at the

bottom, by the "tickler" electrode. Once they respond and enter the current field the operator's controlled electrical jolts carry them helplessly toward the floating "hot seat," a two-foot-square floating framework of wire mesh.

The outfit is effective to depths of 10 feet. During a recent six-week experimental run in canals of the cross-state Tamiami Trail 40,000 pounds of mudfish and gar were destroyed, without appreciably harming the bream, bass and similar desirable fish.

It was decided to stun the unwanted fish, rather than kill them outright, since this permitted use of lower operating voltages and less-costly equipment. Too, such operation is not hazardous to personnel.

"We have best results," says the inventor, "when trolling between 5 and 10 a.m., and late in the evening. It seems the fish prefer to lie low around noon."

Plans are being made for night operation, with banks of powerful lights to reveal the doomed fish as they enter the electrical field.

O'Connell's working model cost \$1725. Simpler models are planned for use by biologists who, unlike the inventor, do not have a knowledge of electronics.

Removal of such rough fish by poison and similar means has not proven practical in the past because of the expense. In addition, usually all the fish—including the game varieties—had to be destroyed. This invited the added expense of restocking, not to mention the complaints of sportsmen thus deprived of their fishing. ★ ★ ★

Carefully kept records have revealed that different voltages affect fish according to length and species





# KEEPING UP WITH THE ATOM

**WILL WE EVER** be driving cars powered by atomic energy? Will individual reactors ever heat and air condition homes? Will we fly cross-country in atomic-powered planes?

These are just a few of the questions that have popped up around the peacetime atom. The answers are wrapped up in a still bigger question: Can scientists and engineers overcome the hazards of radiation?

It's quite possible at this moment to design atomic-powered planes and cars, to build small reactors for heating and air conditioning homes. But whether reactors ever will be built for these purposes is another question.

Charles G. Manly of the AEC recently pointed out some of the basic problems of radiation hazards. Until 1942, about the only persons exposed to those hazards were a few workers who painted radium on watch and instrument dials, and a few nuclear physicists. Then suddenly thousands of people were working with materials that released more radiation than had ever been imagined.

Radiations from these materials are the invisible plague of the atomic age. The cost of warding them off is fantastic, which is the principal reason why nuclear reactors are so expensive. Manly gives a simple ex-

ample: A laboratory dealing with these radiations must have shields of lead brick, requiring workbenches many times as strong as ordinary ones, requiring a floor much stronger than a conventional one, requiring an extremely heavy foundation.

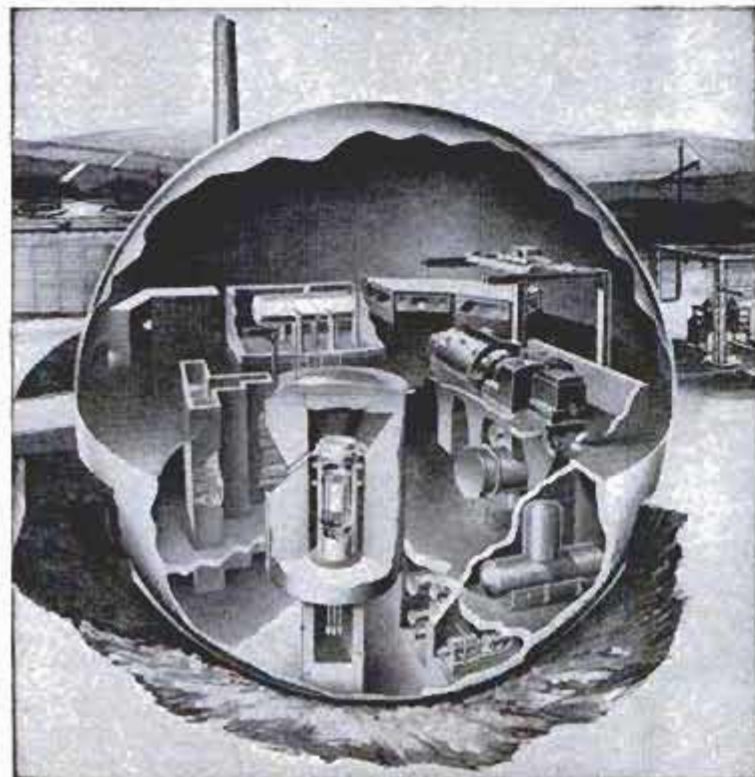
Not only must workers be protected from the reactor, but the reactor must be self-contained so it cannot spew radioactivity into the atmosphere. And what if, by chance, the reactor should outwit the controls and there should be a sudden surge of power? Recently such an accident happened to the experimental reactor at Arco, Idaho. It damaged the core and released radioactivity into the building.

Tests with a runaway reactor have shown that if the reactor is properly designed, the sudden surge of power will automatically "shut itself off" with relatively small damage. However, as in the case of the Arco accident, dangerous radioactive materials will be released into the immediate area. If these escape into the earth or air, they no longer are under human control.

For these reasons the reactor must be self-contained, must exist in its own tiny world, a world that will wrap up its own mistakes should the impossible happen. Such a world is shown in the drawing below. This is an artist's conception of a new General Electric 10,000-kilowatt atomic power plant.

The spherical container is engineered to prevent any leakage to the atmosphere. In the extremely remote event of an accident, the power surge would be contained within the structure, and any radioactive materials from the reactor core would settle to the bottom of the sphere.

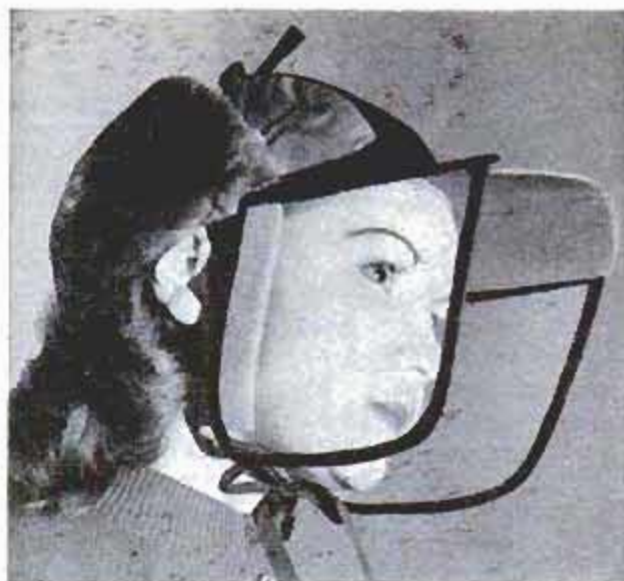
What does this mean in terms of cars and planes and atomic-heated homes? You could put a little reactor under your house or in your car, but obviously you'd spend a fortune protecting yourself from the radiation. Apparently there is no escape from this dilemma. The best guess of experts: No atomic autos. Homes heated and air conditioned by electricity from central atomic-power plants, but no individual reactors. Atomic military planes, where cost is a secondary factor, but no airliners.







Model that protects only the eyes fastens to the head with a strap and rests on a plastic nosepiece



Ski-cap model has side shields which protect entire face. Snap-down sunglasses can be carried under peak

## Open-End Eye Shields Stop Wind With Buffer of Stagnant Air

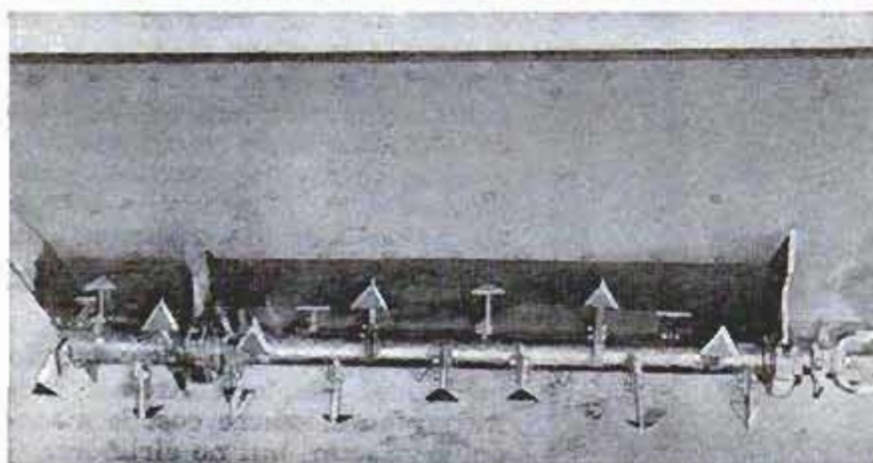
Eyes are protected from head-on winds by transparent, open-end shields that fit around the face or eyes. A dead-air mass is created in front of the eyes and acts as a buffer against wind, flying grit and snow. In tests, an engineer wearing shields leaned into a 70-mile-per-hour wind but felt no visual discomfort. Two models have

been tested in the antarctic. One consists of a shield which protects only the eyes. The other is a long-billed ski cap with side shields protecting the face. Under the ski-cap peak are sunglasses which may be pulled down to shield the eyes from glare. Sunglasses used with the shields won't fog up from eye moisture.



## One-Pass Tiller Grinds up Stalks

At one pass a new farm machine completely prepares the soil for planting. The machine covers two to six acres per hour, grinding up uncut cornstalks, grass and weeds and turning them under, all in one operation. Soil knives on a rotating shaft till the soil to a depth of seven inches. The machine, powered by a 180-horsepower diesel engine, has four speeds forward and travels from 1½ to 12 miles per hour. It has sufficient power to cut and grind sagebrush, cotton stalks, grass, wheat straw and willows.

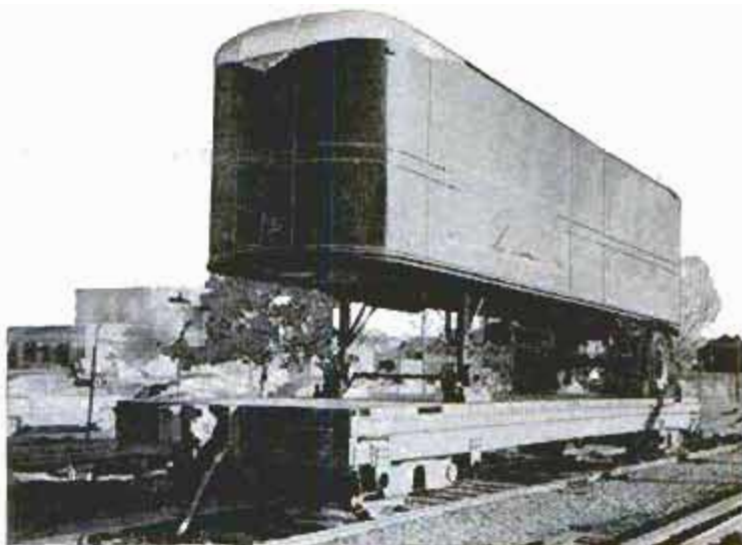


Tiller grinds up and buries cotton and cornstalks as it prepares soil for planting. Triangular soil knives shown at left have a tilling depth of seven inches



## Convertible Freight Car Cuts Shipping Costs

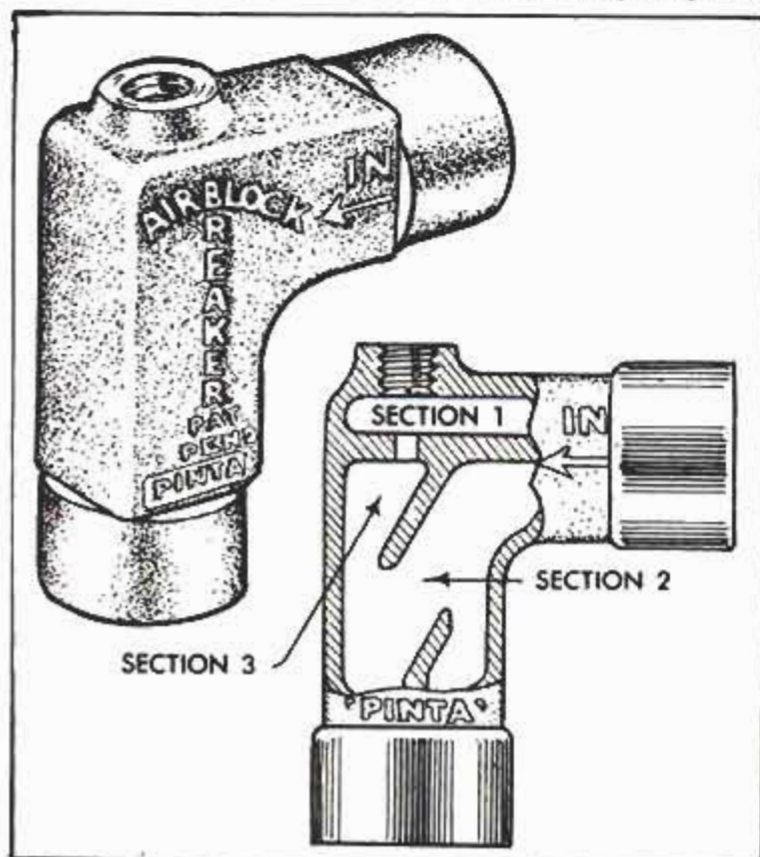
Freight cars that can be converted to whatever type of car is needed by a railroad are expected to cut shipping costs. Known as Adapto, the car is a 35-foot flatcar of new design. On this flatcar may be placed box, container-hopper, gondola, tank car, hopper car and caboose bodies. The car is capable of carrying over 70,000 pounds, three times its own weight, while the standard flatcar, weighing 56,000 pounds, can carry only twice its own weight. By eliminating 35 percent of the dead weight, an Adapto freight train will weigh as much as 800 tons less than an equivalent conventional freight train. On a 1000-mile haul, such as between New York and Chicago, this would mean a saving of approximately \$4000 in shipping costs. Two 17-foot containers or four 8-foot containers on the basic flatcar will make up the boxcar. These containers can be lifted off the flatcar at loading points and delivered to shippers for unloading and reloading, which will cut siding time for the flatcar.



Adapto flatcar, in addition to being convertible, also can be used in railroad-truck piggyback service, as shown above



## Air Blocks in Hot-Water Heating Pipes Relieved by Bubble Breaker



Air blocks are no longer a problem in hot-water heating systems, according to the inventor of a fitting for such systems. The fitting breaks up large bubbles which cause the blocks and mixes the air into the water. The manner in which the fitting works is shown in the drawing at the left. Water enters the upper end marked "in." Any air bubbles go into the area marked section one, while the water continues into section two. As the water passes through section two, it causes a jet action which pulls the air from section one. In section three, during this movement, the bubbles are broken and mixed so thoroughly, and traveling at such velocity, that they cannot form an air block through the rest of the hot-water heating system.

Less than two percent the size of previous models, a true-north-seeking gyrocompass of great accuracy has been developed for use in military aviation.





Show attracts 100,000 visitors during 10 days of Iowa State Fair. Exhibitors compete for \$500 in prizes

## KEYNOTE OF THE FARM GADGET SHOW:

*"I Just Built it  
Because I Needed it"*

*By Phil McCafferty*

**F**ARMERS who have turned inventors to concoct ingenious machines get a chance to exhibit their creations at the annual Farm Gadget Show of the Iowa State Fair.

Parts of automobiles, tractors and combines show up in surprising new forms.

Sixteen-year-old Marvin Negley copped a prize for his drill press made from the rear-axle assembly of a junked car he found on his father's farm.

Farmer Glen Stroburg, a proficient welder, found all the parts on his farm to build a rugged metal-cutting bandsaw. The frame came from a hay baler and the large wheels to drive the blade were originally auto flywheels. The unit performs as well as any commercial saw and features a worm-gear vise and adjustable hydraulic feed.

The Gadget Show, sponsored jointly by the Iowa State Fair and Cedar Rapids Radio-TV station WMT, draws 100,000 visitors each year. Among them are manufacturer's agents ready to clinch a deal with inventors for production of the best machines.

One exhibitor last year mingled unnoticed with the crowd to make notes of comments and criticisms and check the number of people who would buy his machine. He returned to his farm shop ready to tool up for quantity production.

Another entrant made stops along the way to the show to exhibit his brainchild to manufacturers. By the time he reached Des Moines he had a plant to produce it.

Greater production with less effort proved to be the main theme of the show.



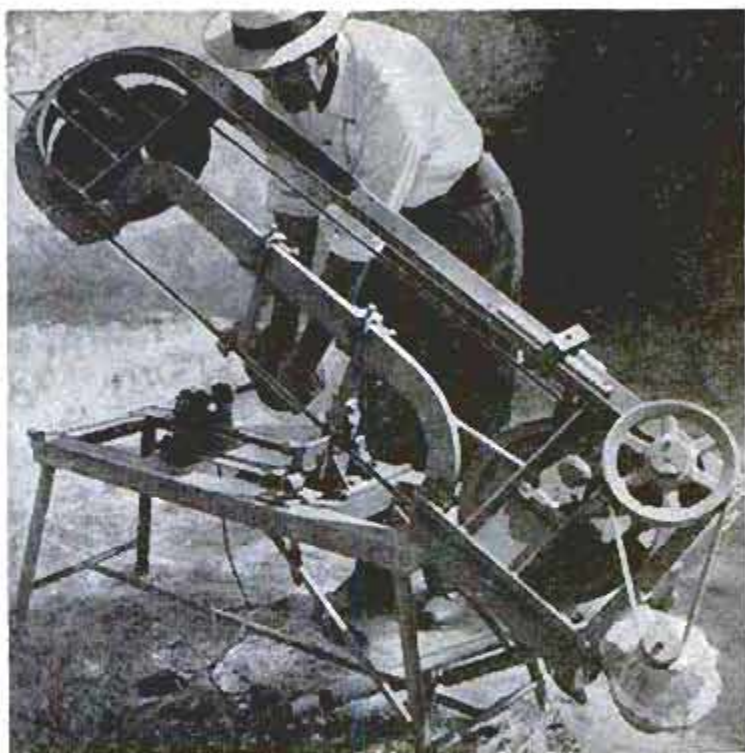
Clifford Cruzen made his tractor-mounted posthole auger serve a time-saving double purpose. He made the auger interchangeable with a long spool made from a discarded well pipe. He uses the powered two-direction rotation of the attachment to roll up and unroll fence wire.

Judges, spectators and manufacturers marveled at a farm-built corn planter that plants eight rows of corn at a time—twice as much as the biggest standard planter. Inventor Denton Myers solved its transportation problem by designing it so that it can travel endwise along the highway and through gates.

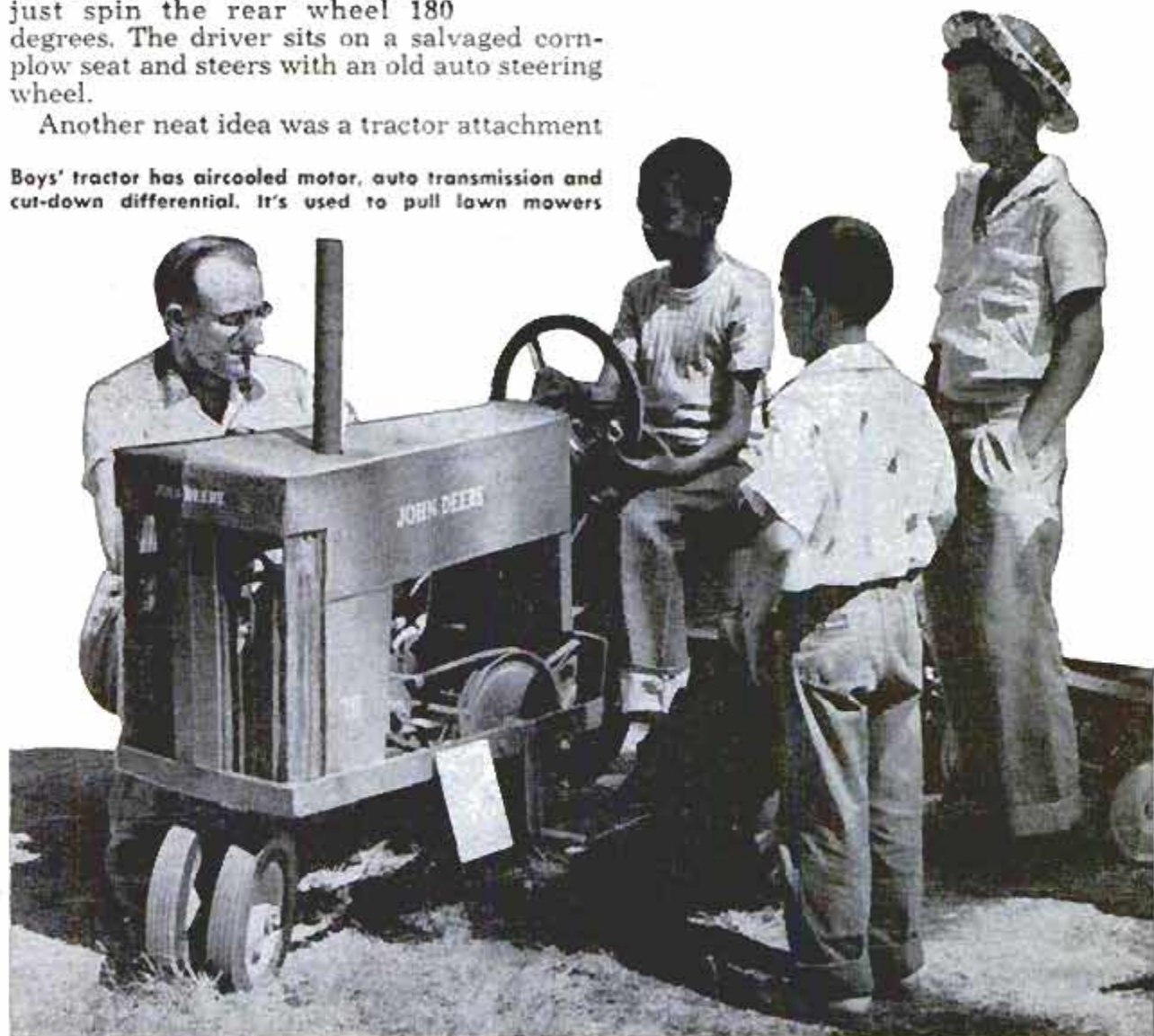
Outstanding ingenuity and simplicity of design marked two other inventions. The first was a rotary mower with only one control—a clutch that swings the entire motor to tighten the belts that drive the cutter blade and the single rear power wheel. To reverse, you just spin the rear wheel 180 degrees. The driver sits on a salvaged corn-plow seat and steers with an old auto steering wheel.

Another neat idea was a tractor attachment

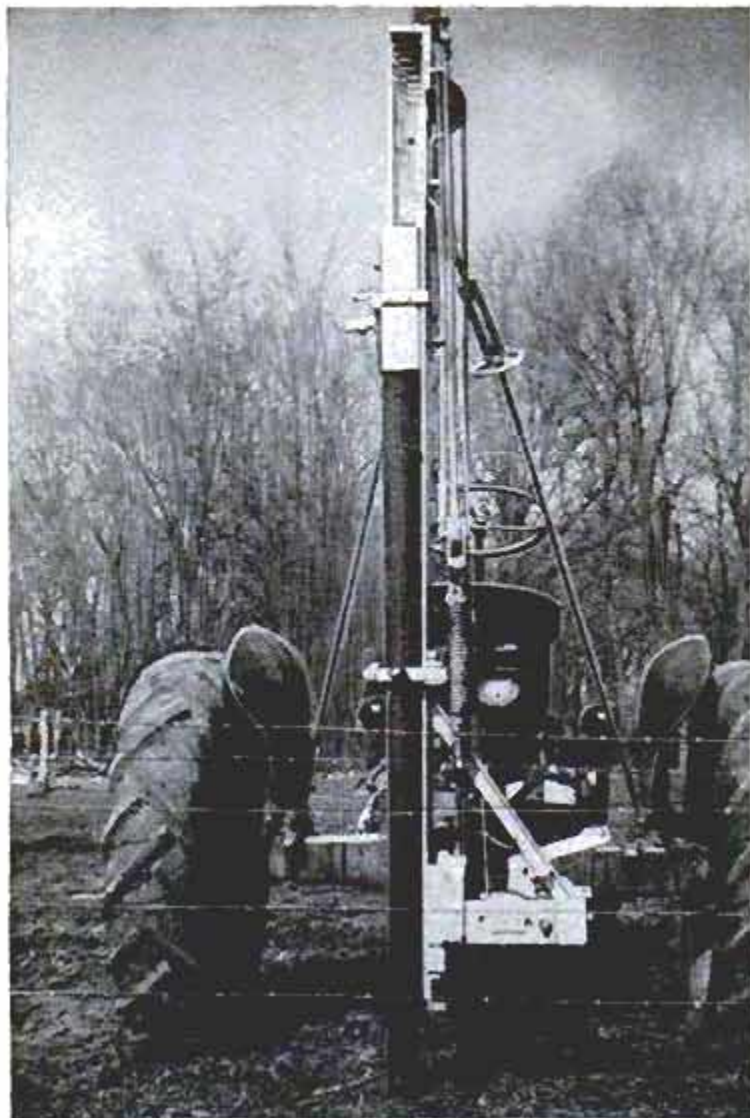
Boys' tractor has aircooled motor, auto transmission and cut-down differential. It's used to pull lawn mowers



Metal-cutting bandsaw was made from scrap parts. Wheels that blade runs on are auto-flywheel gears. Frame is from hay baler







Mounted on tractor drawbar and driven by power take-off, this tool drives fence posts, pulls them out, quickly converts to become a wagon hoist, crane and winch. Below, bar joins tractor clutch and brake pedals together for safety and convenience



that drives fence posts, pulls posts, hoists farm wagons for grain dumping and acts as a crane-winch. Made from salvaged steel angle irons and implement gears, it is powered by the power take-off and fastens to the drawbar.

It works like a pile driver to pound posts into the ground. A simple cam arrangement controls the hammer stroke and a simple stop halts the hammer when the post is driven deep enough. While still in the vertical position, it converts to pull posts out of the ground. Cable and hook are attached to hoist wagons and lift heavy farm implements for repair. With the mast tipped, it becomes a portable crane. In addition, the cable can be payed out and slowly wound in with the winch. Designer John Hartl plans to manufacture it.

The prime attention-getter at the show was a child's size tractor, built by a young eastern Iowa farmer for his children from discarded auto parts and powered with an aircooled engine. It proved practical, too. Inventor Don Buch showed the judges how the kids mowed the lawn at home. It pulled three handleless mowers, cutting a swath nearly six feet wide.

A spectator under pressure from his small son offered to buy the tractor for \$450, but the deal was quickly scotched by Buch's four boys.

Special emphasis was placed last year on safety devices and equipment.

One entrant displayed huge buttons covered with reflecting tape that he pinned on his clothing while working on or near roads at night. A conscientious fellow brought a large sign he placed on the edge of the highway near his farm to warn motorists of danger when he tracks mud onto the road with his equipment. Other ideas ranged from a complex lighting system for tractors to a locking gas cap an alert farmer provided for his tractor. The cap key was simply riveted to the ignition key, making it impossible to gas up while the engine is running.

Howard Fountain of Iowa City found commercial possibilities in a simple device that locks the tractor foot brake and clutch pedals together. With it, it is possible to





Eight-row corn planter speeds planting. Stand-by wheels are lowered hydraulically for endwise transport

throw out the clutch and apply the brake at the same time. Fountain explains that this is not only safer, but convenient and energy-saving in some types of field work.

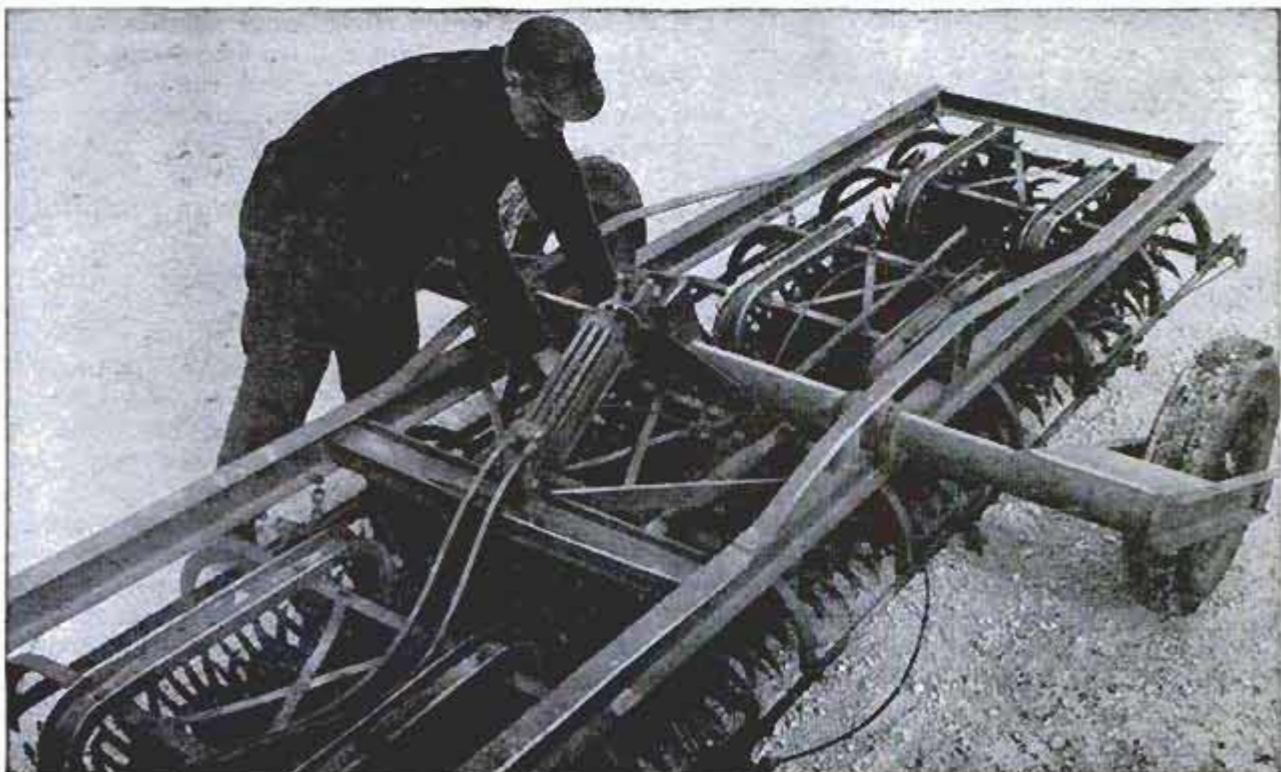
#### Rotary-Hoe Transport

First prize in the open class went to a transport for a rotary hoe, a wide machine that has a hard time getting through gates. Robert Louks made a carrier to pull the cumbersome hoe by its end rather than its

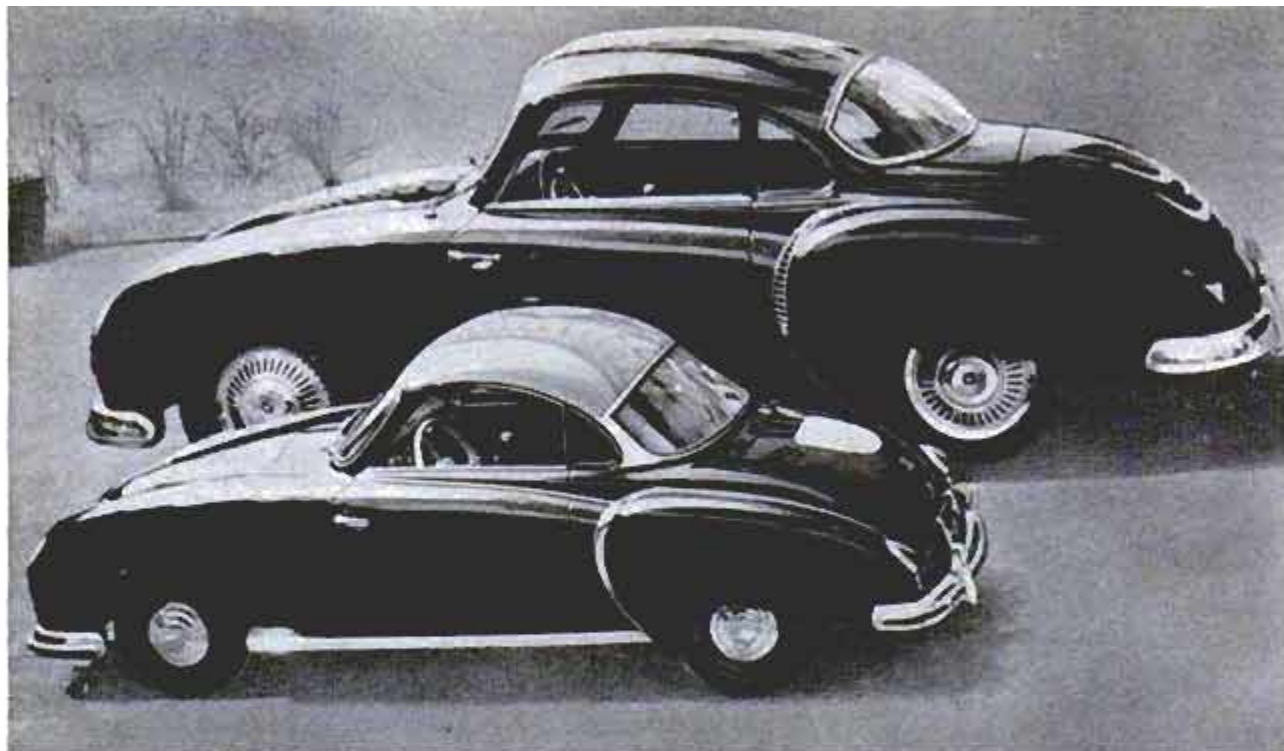
side. He was amazed at the reception the invention received. Hundreds of people asked about it and farm implement dealers vied to display their brand of hoe with the carrier.

Louks' modest comment was typical: "I don't know what all the fuss is about. It's just a couple of old combine wheels, some old scrap channel, angles, chain and a hydraulic cylinder. I just built it because I needed it." ★ ★ ★

Rotary hoes and other awkward equipment are chained to this transport, raised hydraulically for carrying







Manfred Goll photos



Little car duplicates its big brother in almost every respect. Big car is built on Renault chassis. Left, a small child towers over the Lilliputian automobile

### Child-Size Custom Car

At a cost of about \$400 and 2075 working hours, a master mechanic of Stuttgart, Germany, has built a faithful model of his custom sports car for his 13-year-old daughter. The car, powered by an air-cooled engine and equipped with three shifting gears, is 88 inches long and 31 inches high. It has a complete instrument panel, lights that can be dimmed, parking and stop lights, directional signals, a horn and windows that roll up and down. Adolf Hausle built the precision model in four years of his spare time, making all parts but the instrument panel, steering wheel, tires and horn. He exhibited it at the international automobile show in Frankfurt.

### Wireless Home Thermostat Transmits Radio Signals

No wiring is needed to hook up an experimental thermostat that controls a heating system by radio signals. Built into a standard heating thermostat is a tiny loop antenna and a crystal-controlled radio transmitter. When the temperature drops below the setting, the thermostat broadcasts a signal to a small radio receiver. The receiver converts the sound impulse into energy and operates a valve on hot-water and steam radiators, or opens and closes dampers. The unit is not in production, partly because of the lack of long-lived batteries to power the thermostat.

### Cosmic Rays Won't Stop Future Space Flights

Cosmic rays present no barrier to space travelers, tests at the University of California indicate. Yeast cells were bombarded with particles from a 60-inch cyclotron to determine the destructive power of heavy particles, which are present above 120,000 feet in the atmosphere. The heavy particles, which are widely dispersed in cosmic rays, caused little damage. Research suggests that a single heavy particle could not cause serious damage by striking a sensitive spot.



## ELECTRONIC MIXER For Home Recorders



By  
Dr. R. C.  
Hitchcock

WHILE TODAY'S tape recorders, even the low-cost, home-recording types, are capable of excellent performance, they suffer from one common limitation: Most of them can record from only a single source at a time. True, some have separate input jacks for high and low-level signals, but few of them have provisions for combining these so that signals from several sources can be recorded simultaneously.

By the simple addition of this compact mixer, any recorder can be converted to a professional-type instrument. With it, you can become your own audio engineer, mixing and blending up to four separate signals in any desired volume ratio. This greatly increases the variety of programs that can be recorded, and adds a professional touch to your recordings.

The mixer not only increases the ver-

satility of a recorder, but converts any ordinary amplifier into a public-address system, where it is often desirable to combine the output from two microphones, or mix a mike with a record player. Its high inherent amplification makes it suitable for use even with low-gain amplifiers.

### Design Features

A picture of the completed mixer, together with its companion recording-level indicator, is shown in the title illustration. Construction of the indicator will be described in a subsequent issue. From the schematic diagram, Fig. 1, it is seen that the unit contains two dual-triode 12AX7 tubes and a selenium rectifier, thus giving five-tube operation. This permits the isolation of the various channels to have a minimum of "break through" or "cross



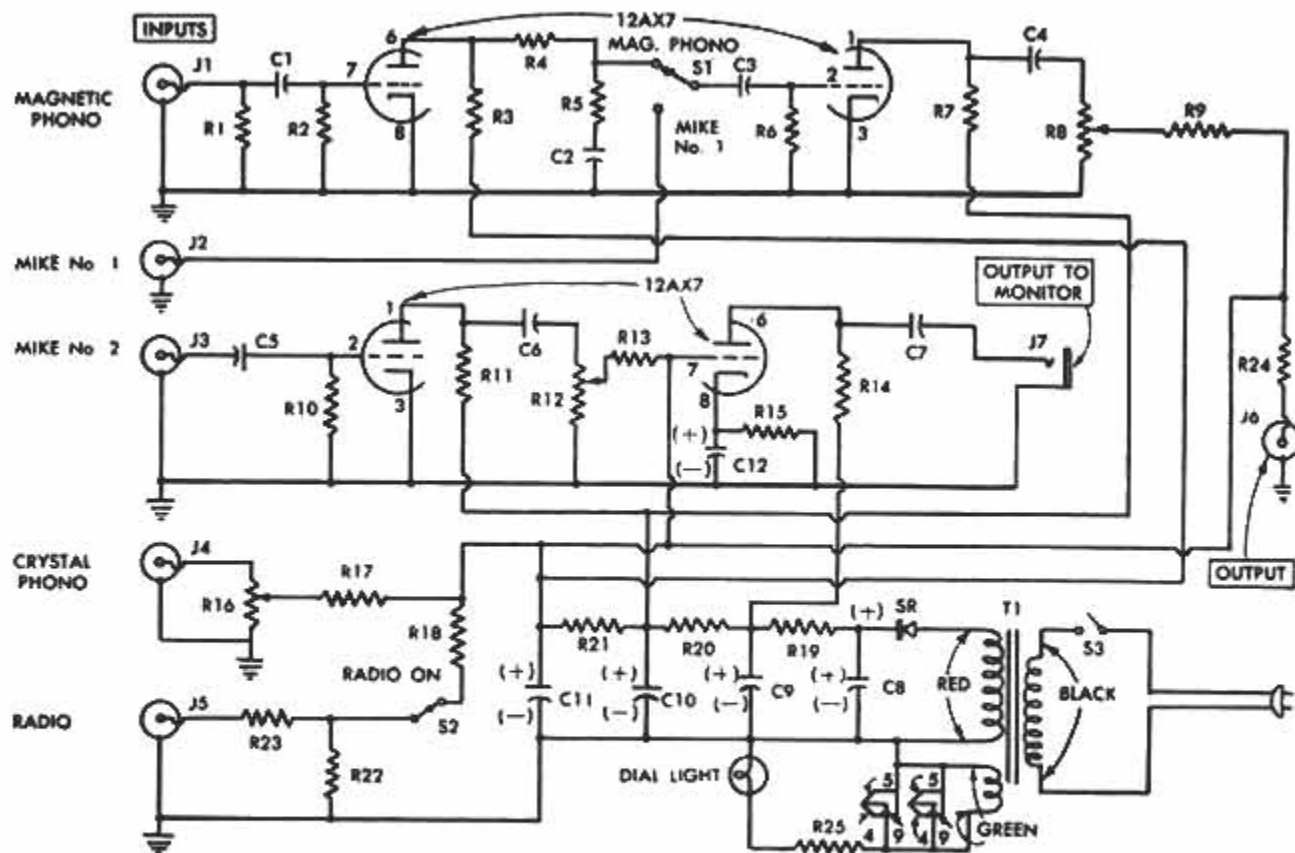


Fig. 1. Schematic diagram of versatile mixer-preamplifier for recording and public-address systems

### LIST OF MATERIALS

Resistors—All  $\frac{1}{2}$ -w. carbon unless otherwise specified

K=1000 M=1,000,000  
 R1, R19, R21=10K  
 R2, R6, R10=6.8M  
 R3=68K  
 R4=180K  
 R5=27K  
 R7, R11=33K  
 R8, R12, R16= $\frac{1}{2}$ M pot. audio taper, I.R.C. type Q13-133 or equiv.  
 R9, R13, R17, R18, R23=1M  
 R14=100K  
 R15=2.2K  
 R20=4.7K  
 R22, R24=470K  
 R25=10 ohms, 1-w., wire-wound

#### CAPACITORS

C1, C3, C5=.05 mfd. 200-v. tubular  
 C2=.01 mfd. 400-v. tubular  
 C4, C6=.02 mfd. 200-v. tubular  
 C7=.1 mfd. 200-v. tubular  
 C8=10 mfd. 150-v. electrolytic, Cornell-Dubilier type BBR or equiv.

C9, C10, C11=20/20/20 mfd. 150-v. electrolytic, Mallory type FP 311.2 or equiv.  
 C12=25 mfd. 6-v. electrolytic, C-D type BBR or equiv.

#### MISCELLANEOUS

T1=Power transformer—sec. 125-v., 15 ma. and 6.3-v., .6a. Stancor PS8415 or equiv.  
 SR=65 ma. selenium rectifier  
 S1=S.p.d.t. toggle switch  
 S2, S3=S.p.s.t. toggle switch  
 J1 through J6=Dual phono jacks (3 reqd.)  
 J7=Phone jack, Mallory infant type A-1  
 Tubes=12AX7 (2 reqd.)  
 Sockets=9-pin miniature, mica filled, Eby 9718 or equiv.  
 Cabinet=Bud type CU1581  
 12-point terminal strip—Jones type 2012  
 Knobs (3); line cord with plug; rubber grommet for  $\frac{1}{2}$ -in. hole; pilot light bracket (Johnson 147-306); pilot bulb (type 51); tube shields (2); package of 6-32 $\times$  $\frac{1}{4}$  machine screws and nuts; 15/32-32 hex nuts for switches (3); 3/8-32 hex nuts for controls (3); hookup wire; rosin-core solder; material for chassis and name plate (see text).

talk" before the actual mixing occurs in the output circuit. Five separate inputs are provided, three of which have independent volume controls.

Channel 1 is for a record player using a magnetic phono cartridge such as G-E or Pickering. This utilizes both sections of a 12AX7, one as an equalizer, the second as an amplifier. A switch, S1, converts this channel into an amplifier for mike 1, a high-impedance (crystal) microphone. Since such a microphone requires no equalization, the first tube section is cut out when the switch is thrown to the mike position.

The first triode of the other tube serves

as an amplifier for mike 2. The output of this stage is coupled through the volume control R12 and resistors R13 and R24 to the output jack, where it is combined with the signals from the other inputs. These combined signals also appear at the grid of the second triode section for further amplification. The output of this stage is great enough to drive a recording-level indicator or a low-gain amplifier.

Channels 4 and 5 are for crystal phono and radio inputs, respectively. Since the signals from such units are much stronger than those of a microphone or magnetic cartridge, they are attenuated by resistive



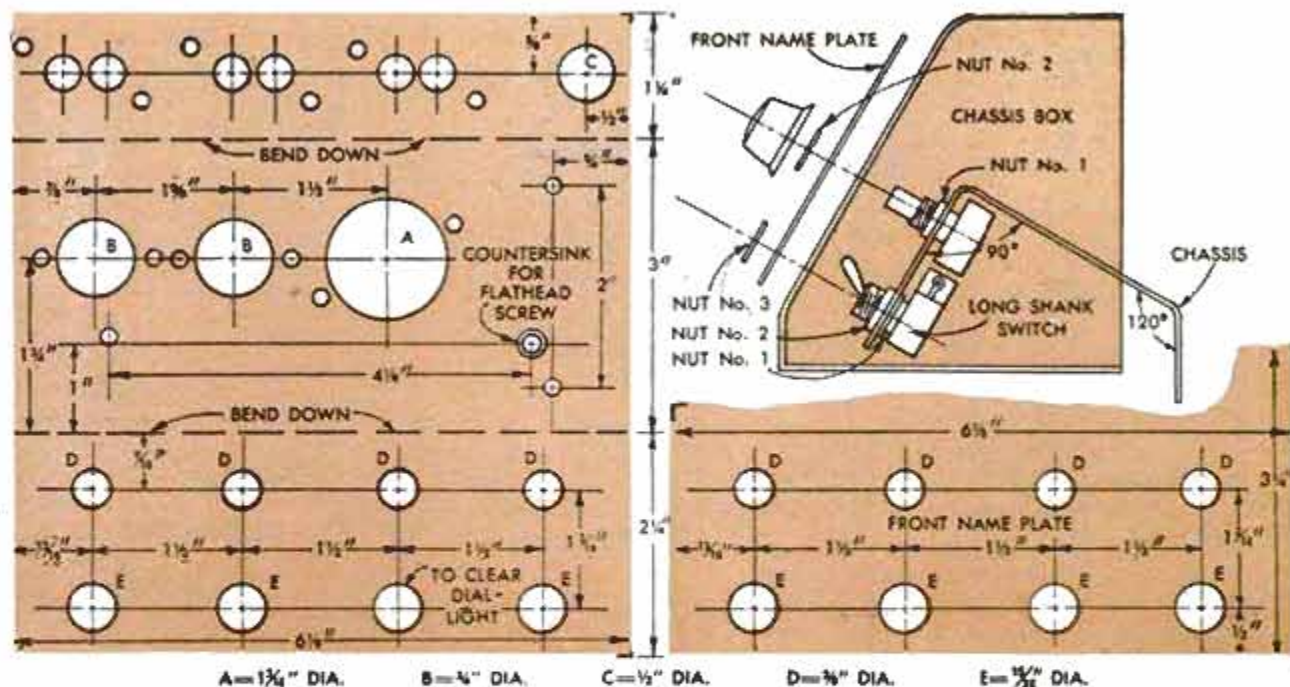


Fig. 2. Left, chassis layout, top view. Right, front name-plate layout and final installation details

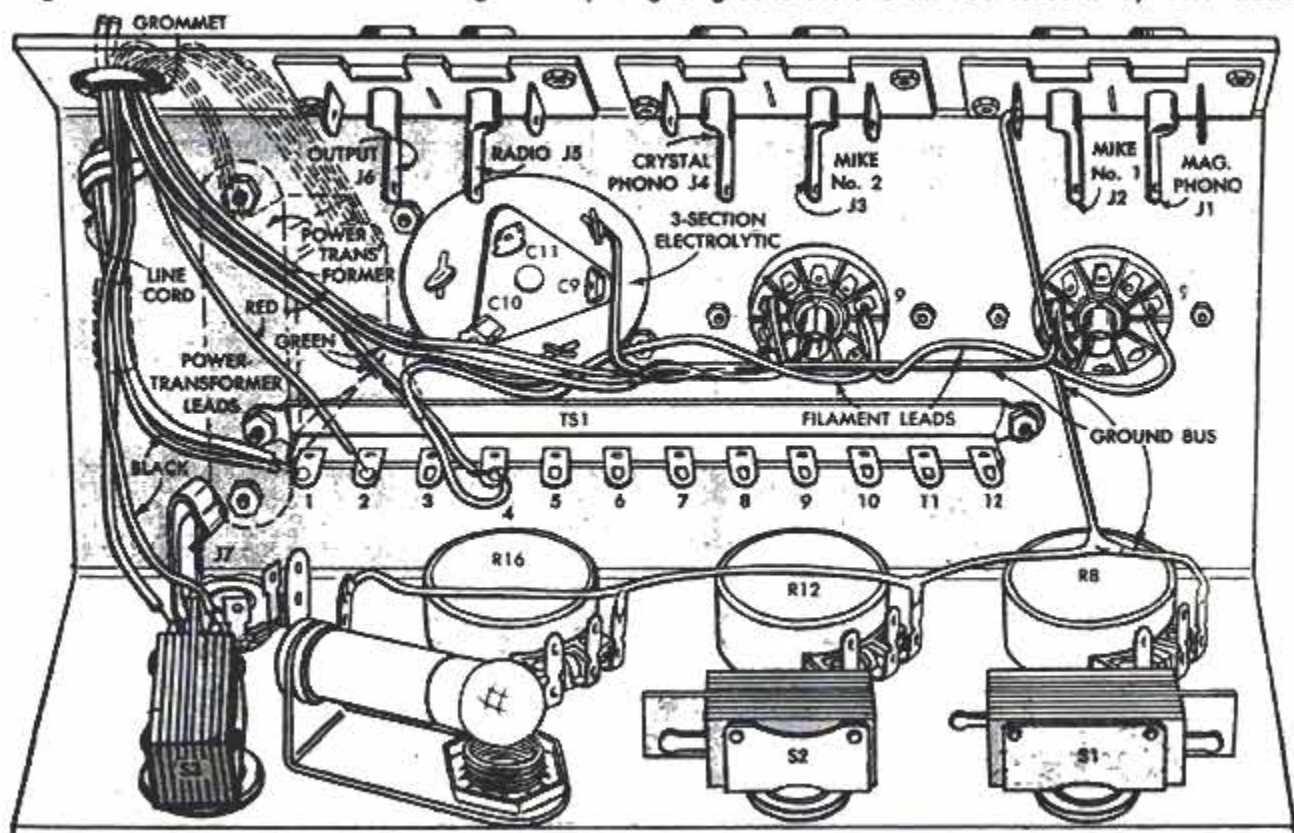
voltage dividers so that they can be successfully mixed in the output. The approximate gain of each channel and the input voltage needed for .05 volts at the mixer output jack, J6, is as follows:

CHANNEL	INPUT	GAIN
Mag. phono	.003-v.	24 db
Mike 1 and 2	.01-v.	14 db
Crystal Phono	.5-v.	-20 db
Radio	1.0-v.	-26 db

### Construction

Layout and assembly for the chassis, name plate and case are illustrated in Fig. 2. The chassis is made from a piece of 1/16-in. soft aluminum which is easily bent to fit the commercially available metal case after the necessary holes have been drilled and punched. The holes in the name plate must line up with those in the front part of the chassis and in the case. To assure accuracy in the layout, drill small No. 27

Fig. 3. Parts location and initial wiring. Note spacing of ground-bus and filament leads away from chassis





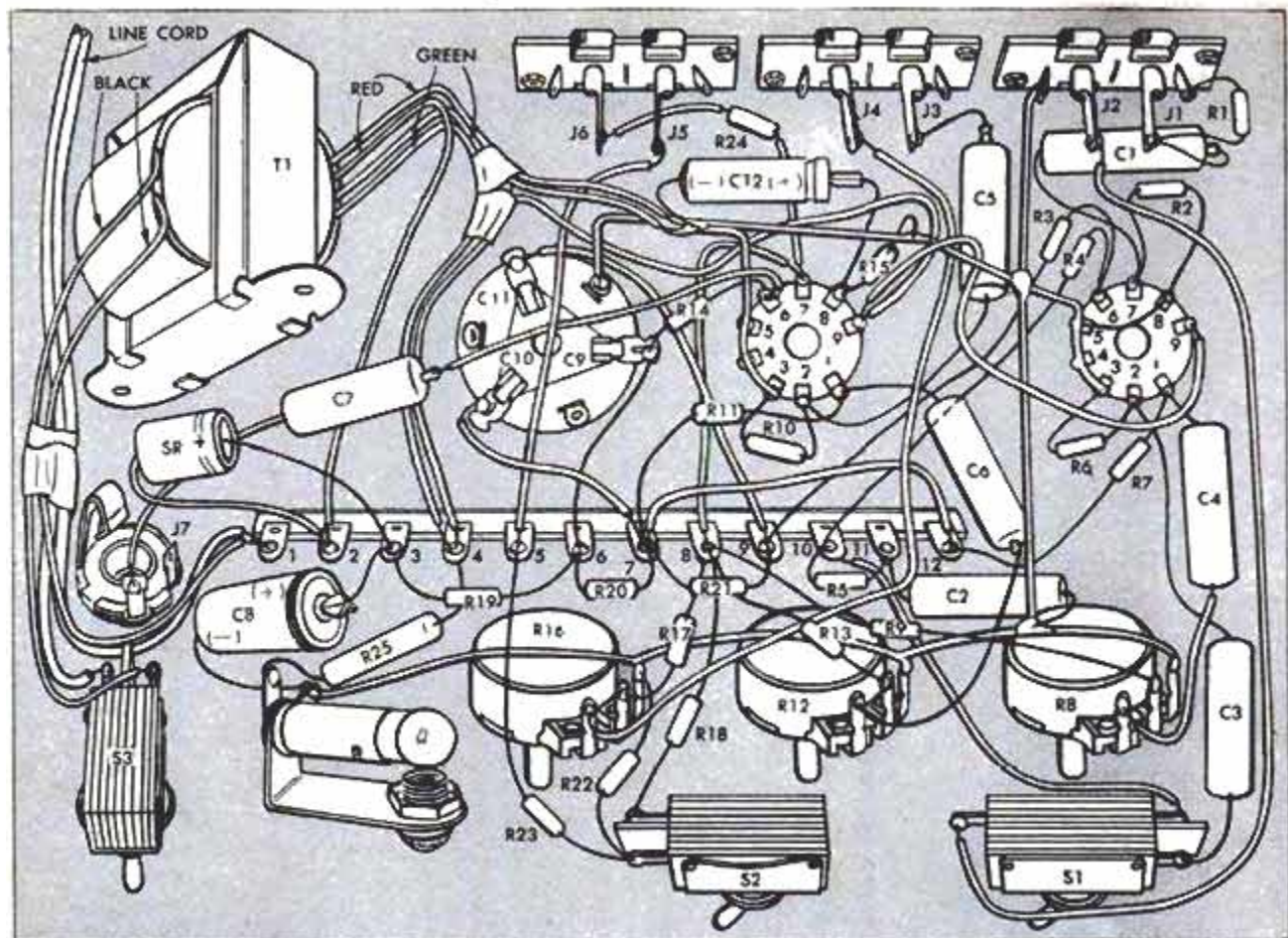


Fig. 4. Pictorial diagram. Point-to-point wiring of complete mixer-preamplifier, including initial wiring

pilot holes in the name plate at all hole locations. Then, use the name plate as a template for drilling corresponding holes in the chassis and case. Thereafter, drill the remaining chassis holes (before bending it to fit the case) and enlarge all holes to the proper dimensions.

India ink is used for all lettering on the name plate and back of the chassis. Roughen and clean the aluminum with an ink eraser before lettering and, when dry, cover it with clear lacquer to protect the finish.

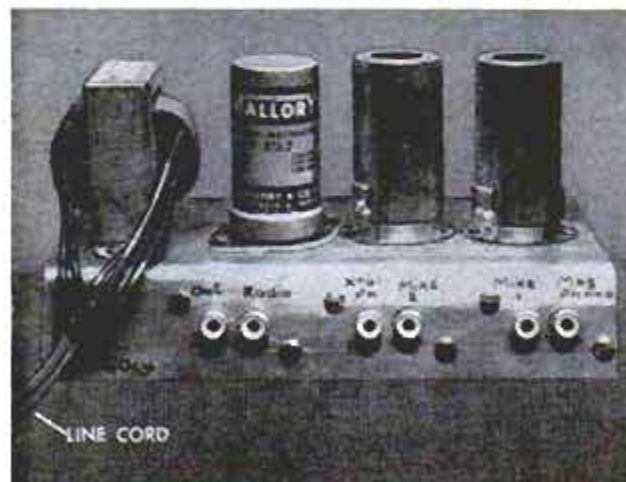
Fig. 3 shows the location of the main parts on the chassis and the initial wiring.

Note that one of the terminal-strip mounting holes is directly beneath the power transformer. This hole should be counter-sunk from the top to permit flush-mounting of the transformer after the terminal strip is installed.

The electrolytic capacitor is mounted with its fiber insulating board above the chassis. All circuit ground connections are made to a common ground bus, No. 14 tinned copper wire, which is grounded to the chassis only at the input jacks. The ground bus wire from the electrolytic to

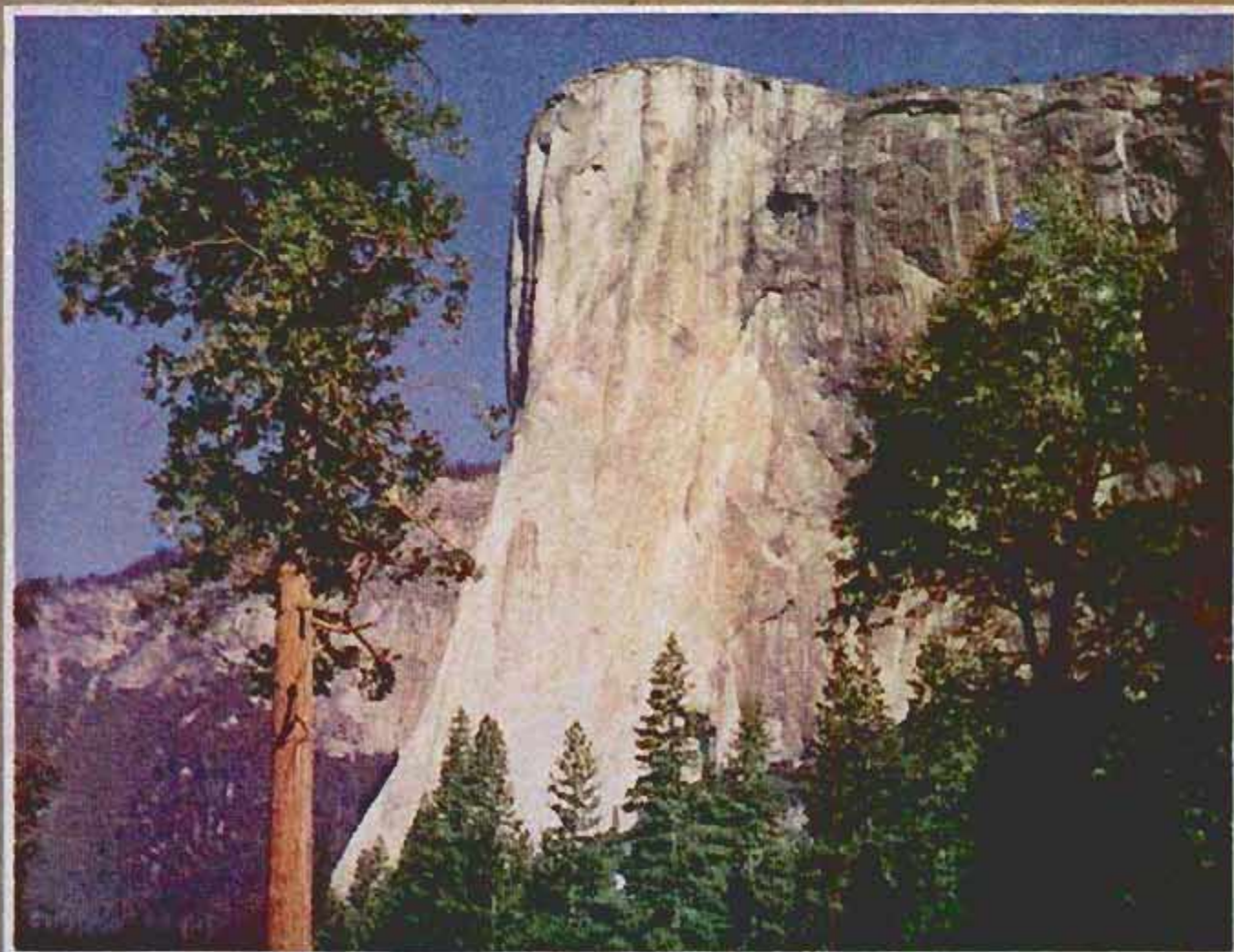
(Continued to page 222)

Fig. 5. Left, rear view of completed mixer. Right, under-chassis view shows exact location of small parts





# the **POPULAR MECHANICS** CRAFTSMAN



## Decorate with **PAPER TRANSPARENCIES**

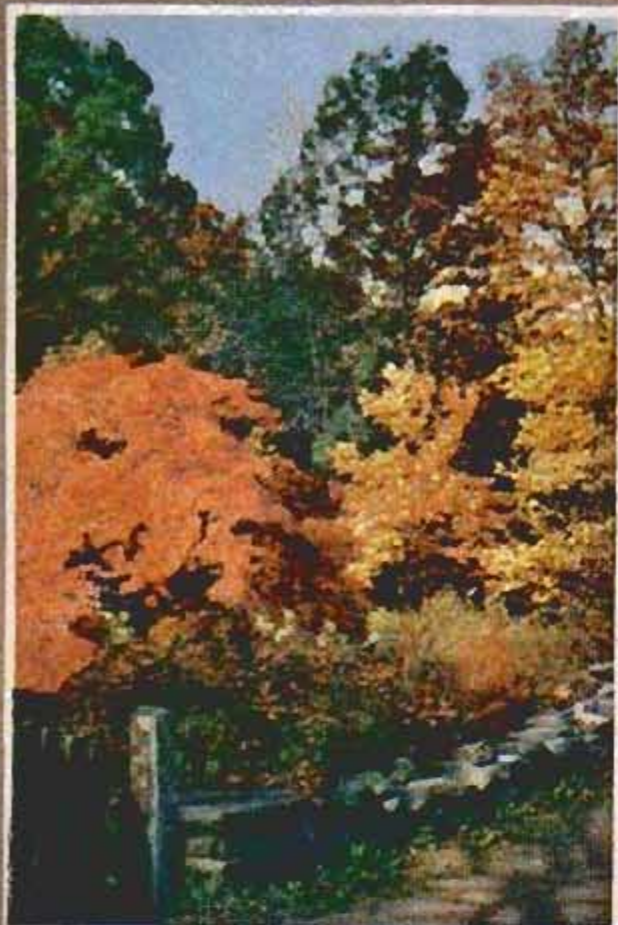
By Theodosia Carpenter

THOSE FULL-COLOR ILLUSTRATIONS you have admired in magazines and newspapers can be made into "paper transparencies" and used for decorative purposes in much the same way that is now so popular with photographic transparencies. Materials required are a tablespoon, warm iron, water and prepared frisket, which is available at art-supply stores.

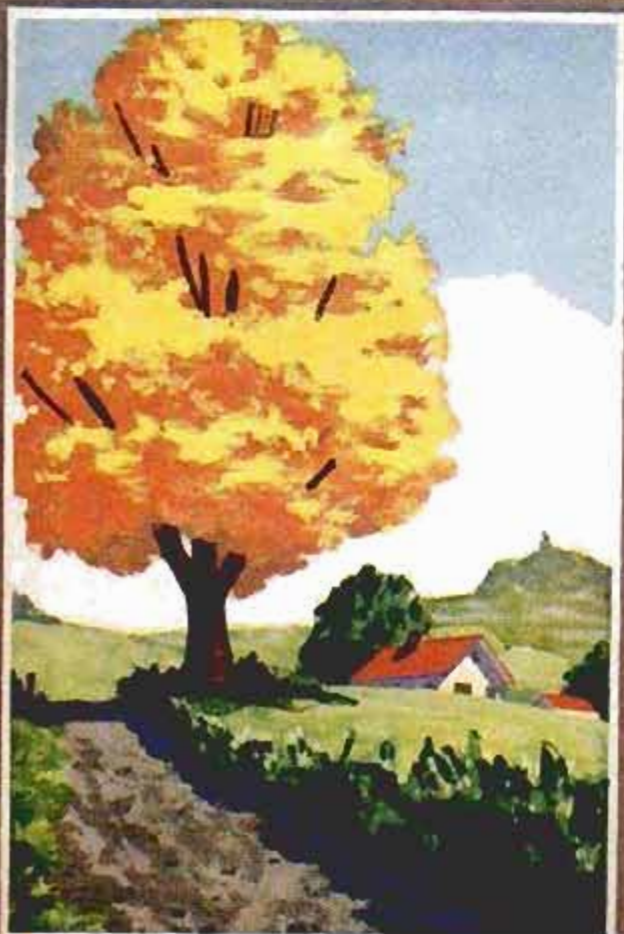
Frisket is a thin, transparent paper that has an adhesive coating on one side. When purchased, the adhesive is covered with a protective sheet of paper that must be removed before the frisket can







Above, brightly colored pictures small enough to be fitted in film-slide mounts can be used and handled in the same manner as color slides. Below, old lampshades can be renewed by applying paper transparencies to them to add beauty and character

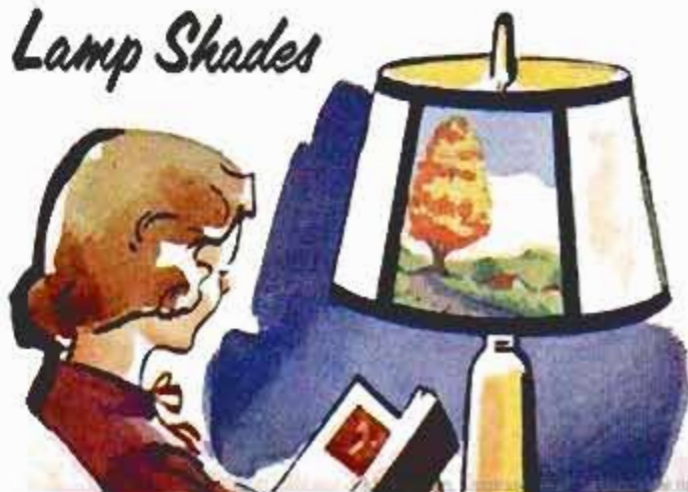


## Color Slides

be applied. However, before removing the paper, cut a piece of frisket to cover the illustration that is to be lifted. Then, as shown in the series of photographs on page 149, place the illustration on a flat, smooth surface and lay the frisket over it, adhesive side down. To assure that the frisket is in firm contact at all points, rub it with the back of a tablespoon until all air bubbles are removed. Next, place a piece of wrapping paper on the frisket and pass a warm iron over it which bonds the ink in the illustration to the adhesive of the frisket. Now immerse the frisket and illustration in a pan of lukewarm water. As shown in the illustration at the bottom of page 148, peel the paper away from the illustration as soon as it becomes loosened. If this is not done quickly enough, the paper may stick to the frisket and have to be rubbed off, which could very well damage the lifted illustration.

When the paper has been removed from the frisket you will have an illustration on a transparent sheet. Since the illustration is only as thick as the ink with which it was printed, it also will be quite transparent. However, because of the extreme thinness of the frisket, the transparency must be cemented to clear plastic sheeting to provide strength. To further strengthen and

## Lamp Shades







add to its clarity, spray the inked side with clear lacquer or plastic.

#### **Illuminated Pictures**

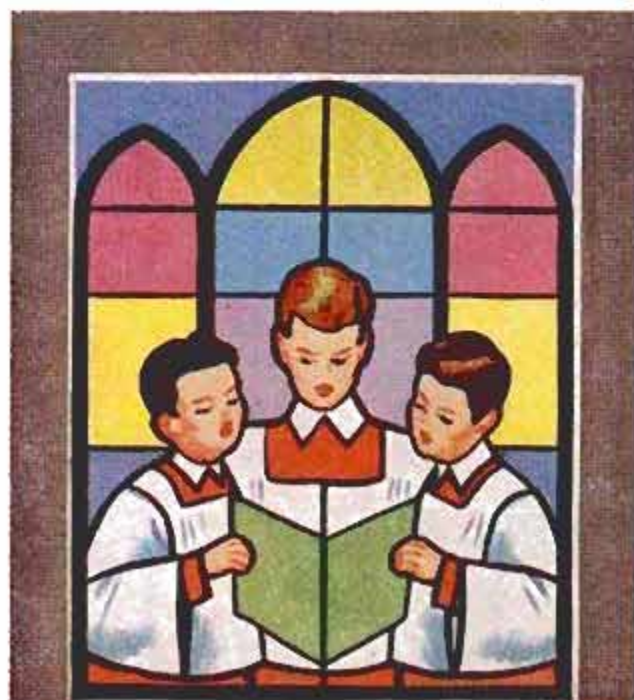
The brightly colored paper transparencies make excellent illuminated pictures and are used in much the same manner as film transparencies. First, cement the paper transparency to a sheet of translucent plastic. (Translucent, rather than transparent is used here because light diffusion is desired.) Then set the transparency into the grooved edges of a deep picture frame and mount a light behind it. A night light is made in a similar manner, as detailed at the bottom of page 149. Since a small bulb is used in a night light, the picture frame can be shallower than an illuminated picture used only for decoration.

#### **Color Slides**

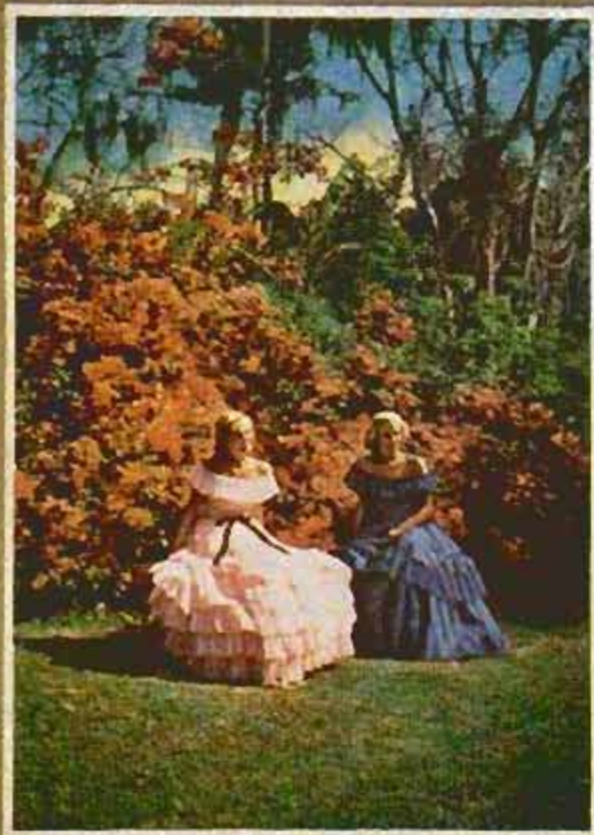
Pictures small enough to be fitted in projection-slide mounts can be made into paper transparencies and used in the same manner as film slides. Simply trim the transparencies to fit cardboard mounts and insert them in a slide projector. To protect the transparencies against handling, spray them with clear lacquer or plastic.

#### **Lamp Shades**

Translucent or transparent lamp shades can be given a new and striking appearance







Above, paper transparencies can be made of any scene or subject that has been printed, then fitted in a frame to make illuminated pictures for desk or wall. Below, lovely illustrations on greeting cards can be removed with frisket and used for other purposes

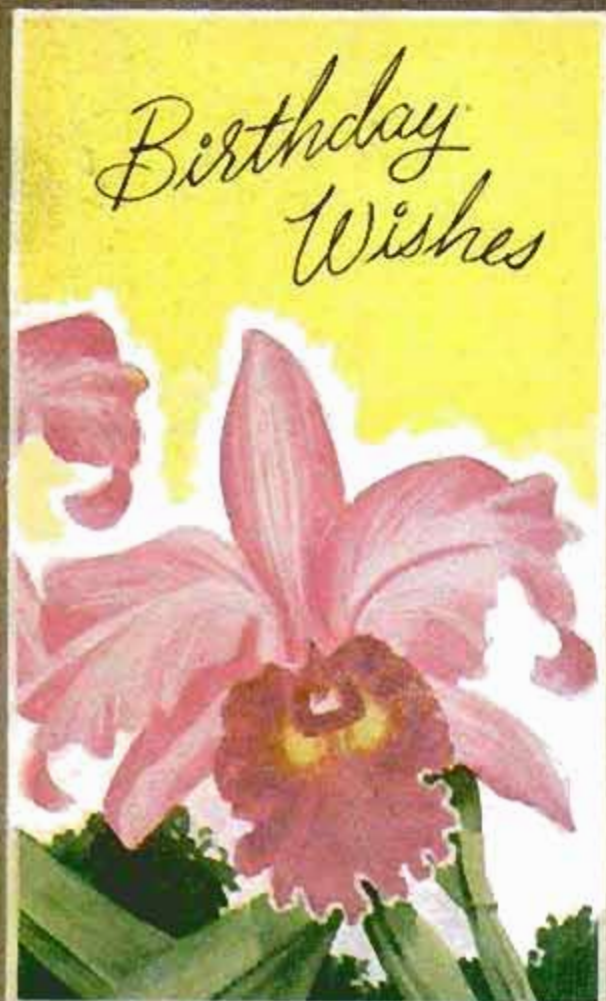


## *Illuminated Desk Pictures*

by cementing one or more paper transparencies to the inside or outside surface. Light shining through the transparencies will make them glow with color. Imagination is the only limit to the various effects possible on lamp shades. A montage of scenes from a foreign country you would like to visit might make an interesting lamp-shade covering for a lamp in a den or study. Animal pictures or Mother Goose characters would go well on a lampshade in a child's room. Sealed between sheets of clear plastic, a paper transparency would add a touch of color to the shade of an outside entrance light.

### **Greeting Cards**

Inexpensive greeting cards can be given a touch of luxury by cutting out the pictures on them and lifting them from the paper with frisket. After cementing the pictures to pieces of clear plastic larger than the pictures, cement them to the back sides of the cards from which they were







First step in using prepared frisket is to remove the sheet of protective paper from adhesive side



Next step is to place illustration face up on flat surface and cover with frisket, adhesive side down

cut, aligning them to fit the cutout areas. The cards then will have transparent illustrations, similar to those found on more expensive cards. Using a similar procedure you can make your own greeting cards. Illustrations clipped from magazines (including those shown here), removed from picture postcards or even discarded greeting cards can be made into paper transparencies suitable for greeting cards. Heavy white or colored paper is used for the cards. Make a cutout in each card slightly smaller than the transparency, which then is cemented to the back of the cutout. For a more finished appearance, cover the edges of the transparency with a paper frame.

#### Other uses

Ideas for uses for paper transparencies that have been described will suggest others. As examples: Illuminated pictures are just as attractive on desk or table top as they are on a wall. Making greeting cards with transparencies suggests the insertion of a transparent picture in the cover of a scrapbook for a novel appearance. Still another application would be illuminated faces for Halloween pumpkins.

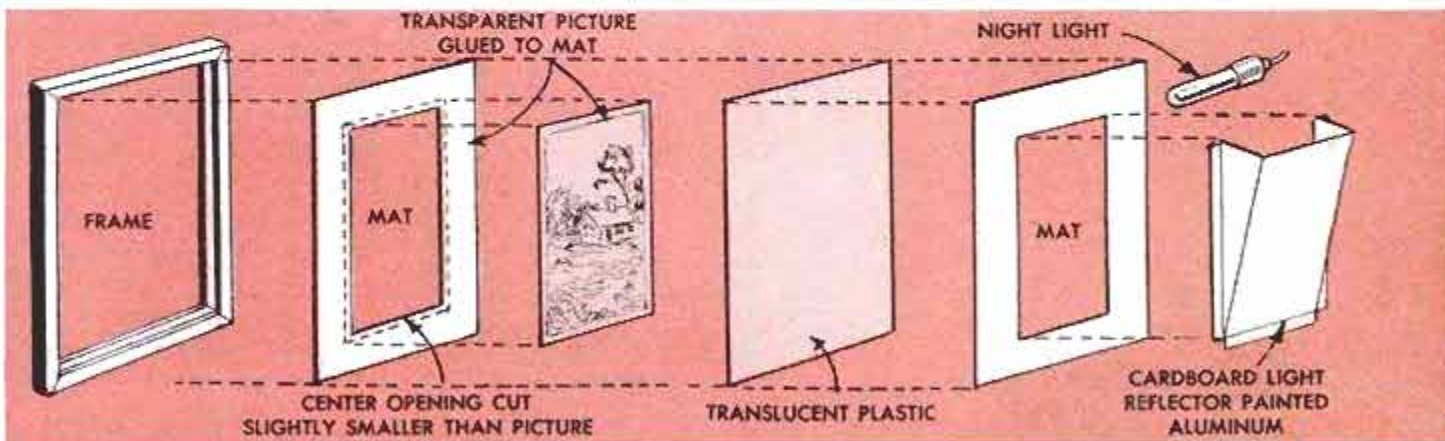
Children confined to the house during bad weather will spend hours searching through magazines for likely pictures and then making them into paper transparencies. Mother need help only when it comes to using the iron. ★ ★ ★



Above, smooth out all air bubbles with back of spoon. Below, ironing completes transfer of ink to frisket



Detail below shows construction of simple night light that uses paper transparency in picture frame





## End-Grain Facing Provides Durable Dart-Board Surface



A dart board that can really "take it" may be made from soft-wood-block ends, which are glued to a 2-ft. square of  $\frac{1}{4}$ -in. plywood. Any soft-wood can be used for the blocks, which should be sawed across the grain to produce  $\frac{1}{2}$ -in. width. If special care is taken to saw all the blocks the same width, much sanding will be eliminated.

A 2-in. border of soft-wood is cut to fit the plywood and nailed temporarily in place. Next, the blocks are

## Typewritten Sheet Aligned For Typing in Corrections



Next time you have to make perfectly aligned typing corrections, insert a piece of tracing paper with the sheet to be corrected so that it covers the error. The tracing sheet should be about one third the size

of the typed sheet so it can be removed without disrupting the position of the latter. With the tracing paper over the area to be corrected, make trial impressions on it and adjust the typewriter accordingly. When accurately aligned, remove the tracing paper and make the corrections.

temporarily in place. Then glue the blocks to the plywood with the end grain exposed, and held in place with weights, such as bricks or other heavy material. Use a generous amount of a good wood glue, since the porous end grain will readily absorb much of it. When the glue has set, remove the border and sand the target surface smooth. Then glue the border permanently in place and follow with two coats of tough resin varnish for an undercoat and two coats of white enamel for the finish coat. Paint the target with bright colors and mask the numbers in with tape.

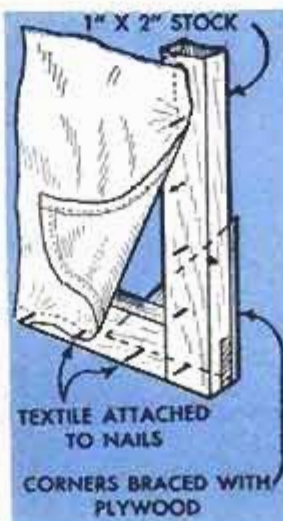
Confusion in scoring can be avoided when a dart strikes a dividing line on the target, if the rings are separated by a fine wire tacked in place. The completed dart board should be mounted on a large piece of fiber board for protection of the surrounding wall and dart tips.

Asa Warren, Pana, Ill.

## Bedding Material Stretched on Frame for Photo Backgrounds

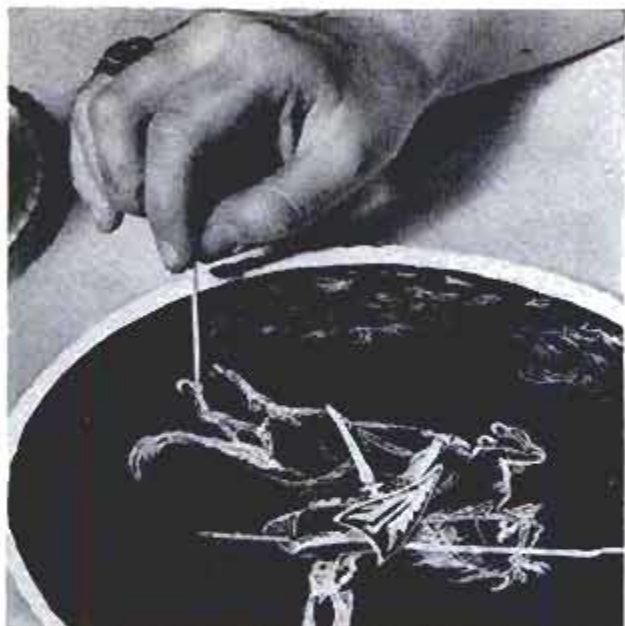
Effective backgrounds for many photographic purposes can be prepared by stretching bedding textiles, such as used

sheets, blankets and spreads, on a nail-studded frame. Such materials are obtainable in large widths without seams,



A framework of 1 x 2-in. stock is built as wide and long as the sheet to be normally used. The frame corners are braced with triangular pieces of plywood. Evenly spaced 4d finishing nails are driven through the frame and allowed to project. The bedding material is pushed onto the nail points and stretched just enough to eliminate wrinkles and present a smooth surface. —Michael Ligocki, Gary, Ind.





Above, pointed matchstick is used as "brush." Above right, plate is smoked over candle flame



## ETCHING IN SOOT

By Frank A. Woodfield

ALTHOUGH they have the appearance of steel etchings, the attractive sketches illustrated on this page are drawn in soot with a wooden splinter or matchstick. The "canvases" for the sketches are white dinner plates which have been prepared for use by holding them over a burning candle and allowing a thin, even coat of soot to be deposited. The edge of the plate then is wiped clean so that a white "frame" results.

The soot medium has both advantages and disadvantages over more conventional types of drawing materials. If a mistake is made, it cannot be corrected; the whole plate must be resmoked and the drawing redone. This also is an advantage since, if the artist is not satisfied with his work, he can erase the sketch by wiping the plate clean with a damp cloth. Resmoking the plate provides a fresh canvas.

To fix the finished sketch so that it will not smear, use thinned clear varnish. Pour about a tablespoonful onto the edge of the plate and let it flow onto the smoked portion. Move the plate slowly in various directions until varnish has flowed completely over the sketch, then stand the plate on edge and allow the surplus to drain off. When it stops draining, wipe the varnish from the unsmoked edge of the plate and allow it to dry thoroughly.



Samples of finished sketches are shown above. Below, artist displays one of her more detailed "etchings"







### Coffee Cans Under Ladder Rails Prevent Them From Sinking

When using a ladder on soft ground, place the rail ends in empty coffee cans. The cans will distribute the weight over a greater area and prevent the rails from sinking so deeply. Also, the cans prevent the ladder from sliding away from the structure against which it is leaning.

John W. Aberle, Saratoga, Calif.

### Babbitt-Metal Block Controls Soldering-Iron Temperature

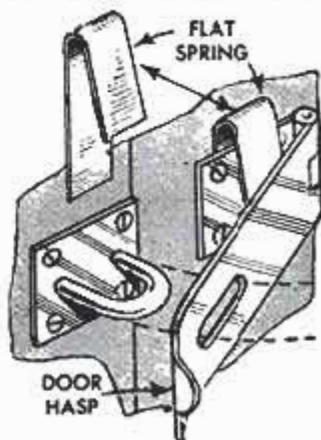
To do good soldering work the copper tip on a soldering iron must remain well tinned, a condition which is not maintained if it is allowed to overheat between jobs. If your iron is not equipped with a thermostat control, each time you lay it down let the tip of the copper rest on a block of babbitt metal. This provision will draw off the excess heat while the iron is temporarily idle.



### Dirt Floor of Crawl Space Sealed To Stop Excessive Humidity

Excessive humidity in a crawl space can be prevented by sealing the ground with asphalt-saturated roll roofing to produce a vapor barrier. All litter should be removed from the crawl space and the ground raked smooth before applying the roofing paper. Use 55-lb. paper, laying it on the ground with the adjacent edges overlapped about 3 in. and joined together with roofing cement. Bring the outer edges up against the building walls about 6 in. and cement to the walls. Pipes or posts penetrating the vapor barrier should be wrapped with pieces of roofing paper which are cemented to the ground layer and tied to the pipe or post. All surfaces cemented should be dry and free of dirt. For mechanical protection, a 2 or 3 in. layer of gravel can be spread over the vapor barrier. As additional protection, the crawl area should have adequate air circulation, and the building should be surrounded by a system of drainage tile to remove excessive water.

### Self Locking of Hasp Prevented



Where a hasp cannot be installed at an angle so that gravity will prevent it from locking accidentally, a small spring fastened under the hinged flange will serve the same purpose. Either a flat spring, as shown, or a coil spring can be used as long as it will

permit positioning the flange for proper locking when light pressure is applied. If a coil spring is used fasten it in place with one of the screws holding the hinged section of the hasp to the door.

### V-Block Holder for Drill Bits

This holder will simplify insertion of drill bits into their proper holes. Sloping sides guide the bits easily from either side to their respective holes drilled at bottom of the V-slot in the back. — G. E. Hendrickson, Argyle, Wis.

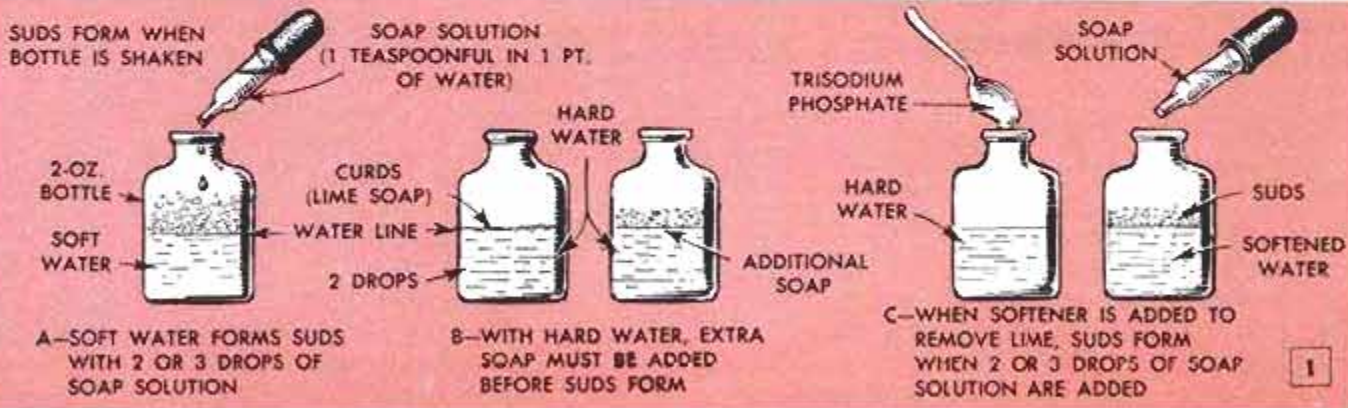




# USE LESS SOAP AND SAVE MONEY

*Excess soap is wasted in laundering, makes fabrics harder to rinse thoroughly*

By J. B. Mullen



**I**F THERE is a heavy layer of suds in the washing machine at the end of the laundering cycle, you are using too much soap. Excess soap, no matter in what form it is used, is not only waste, but its presence makes fabrics much more difficult to rinse properly. There are simple tests of soap action which will enable you to determine the proper amount of soap to use for best results.

As an example, you can judge the correct amount to use with fair accuracy simply by observing the amount of suds remaining at the end of a laundering cycle. If there is only a light layer remaining you are using very nearly the correct amount. Soap and most synthetic detergents form at least some suds which offer a guide to the full utilization of either or both in the cleansing process. The thin layer of suds

at the end of the washing cycle usually indicates that sufficient soap or detergent is present for good detergent (cleansing) action.

## Testing Soap Action

A simple test will determine more accurately the amount of soap required for the most-efficient cleansing. This is based on the action of soap which develops from the manner in which the soap molecule is formed. The long, fatlike end of the molecule dissolves in the oil drops, Fig. 2, while the sodium end of the molecule dissolves in the water, that is, one end is attracted to oily or fatty substances and the other end is attracted to water. This dual property, oil-seeking at one end and water-seeking at the other, is responsible for the emulsifying action of soap which helps to

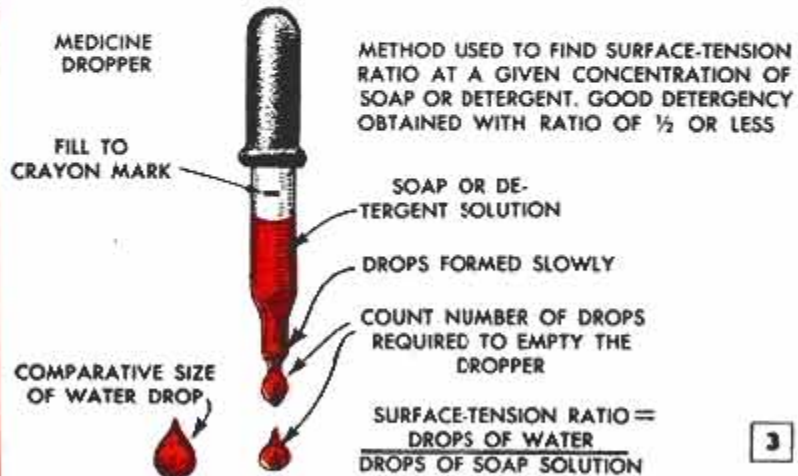
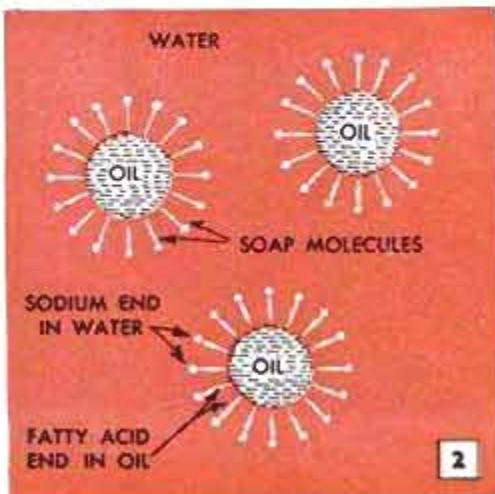




TABLE I EQUIVALENT AMOUNTS OF SOAP PRODUCT IN SMALL AND LARGE BATCHES		
Small Batch	Large Batch	
¼ tsp. per qt.	1 tsp. per gal.	
½ tsp. per qt.	2 tsp. per gal.	
1 tsp. per qt.	1 heaping tbsp. per gal.	
2 tsp. per qt.	3 tbsp. per gal.	

TABLE II WATER SOFTENING WITH SODIUM CARBONATE OR TRISODIUM PHOSPHATE		
Hardness of Water (grains per gallon)	Tsp. per gallon of Sodium Carbonate (Washing soda)	Tsp. per gallon of Trisodium Phosphate
10	½ tsp.	tsp.
20	1 tsp.	tsp.
30	1½ tsp.	1 tsp.

Photo courtesy The Permutit Co.

remove oil and grease from fabrics, your hands and other articles normally cleansed by washing in soapy water. The action of the molecules also has the property of lowering what is known as surface tension, or film strength, at the point where the watery liquid meets the oily liquid. This lowering of surface tension enables soap solutions to wet dirt particles and float them away.

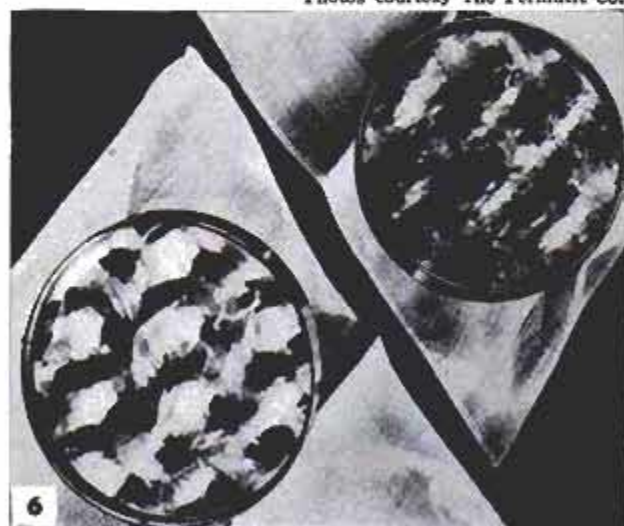
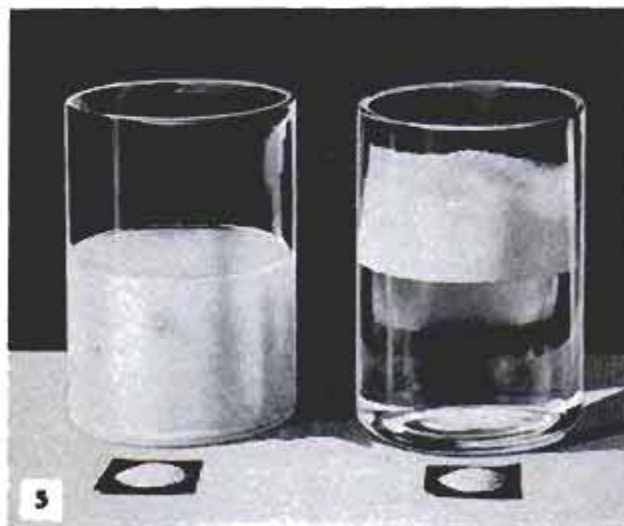
Low surface tension is closely related to detergent action and can be used to measure the effectiveness of soap solutions. One method of measuring tension is shown in Fig. 3. Make a crayon mark on a medicine dropper as shown. Fill to the mark with water. Then expel the water slowly, drop by drop, counting each one. When the dropper has been emptied and the number of drops recorded, make a solution of the soap, or detergent, you ordinarily use, the solution containing about ¼ teaspoonful to 1 quart of water. Rinse the dropper with this solution, fill with the solution and repeat the drop-counting process. This time you will count more drops because of the

lower surface tension. As an example, suppose 30 drops of water emptied the dropper, but that it takes 45 drops of soap solution to empty it. These values will give a surface-tension ratio of 30 to 45, or roughly two thirds that of water alone. A stronger soap solution will lower the surface tension still more, but by increasing the soap content of the solution you will reach a point where still stronger solutions lower the surface tension very little, if any. As a rule, if you add sufficient soap (or detergent) to reduce surface tension to about one half that of water, good cleansing action will be obtained. Table I, Fig. 4, gives conversions for soap concentration from amounts used in test batches.

### Hard Water

Calcium and magnesium contained in hard water displace sodium from the soap molecule. When soap mixes with hard water an insoluble curd, or "lime soap," is formed. This curd forms a scum which clings to utensils and fabrics and is difficult to remove, especially from fabrics. A reasonably accurate check on the hardness of water (which varies in different localities) is to make the soap solution shown in Fig. 1, detail A. If available use a tincture of green soap in making the solution. In soft water, Fig. 1, A, 2 or 3 drops will form a good suds when the bottle is shaken, preferably after each drop is added. The same solution, in the same amount, in hard water, Fig. 1, B, will form the curd, or lime soap. More soap must be added before suds will form. The number of additional drops of soap solution required to form suds is roughly equal to the hardness of the water in grains per gal. This variation also is an indication of the percentage of extra soap required for cleansing in hard water, Fig.

Photos courtesy The Permutit Co.





1, detail C. Rather than use the extra amount of soap required, which is expensive, you can add water-softening chemicals such as sodium carbonate (washing soda) or trisodium phosphate. Table II, Fig. 4, shows how much to add of either chemical, the amount depending on the hardness of the water. These chemicals are inexpensive and quite effective. As an example of how their use will reduce soap requirements in hard water, 1 oz. of trisodium phosphate used to soften water will save about 6 oz. of soap.

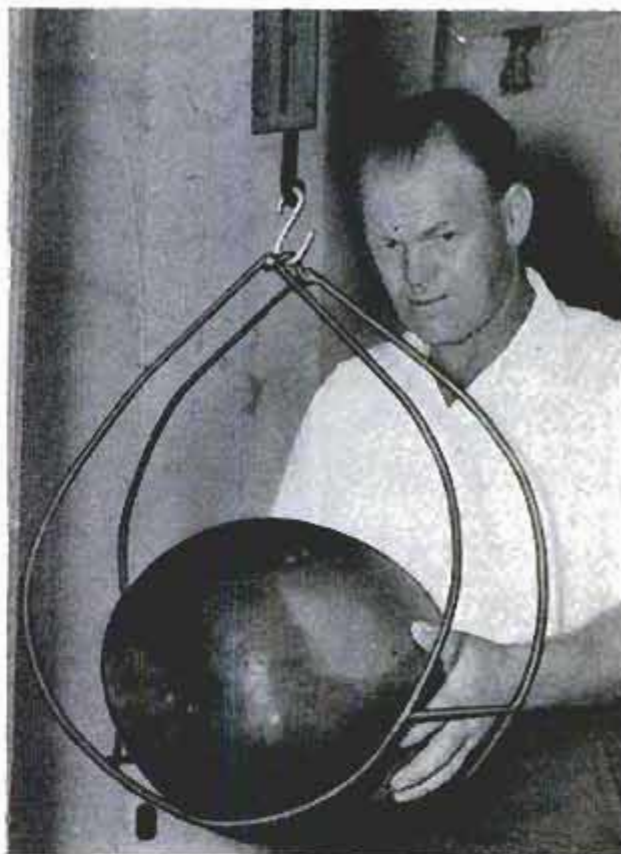
### Synthetic Detergents

When necessary to launder in hard water, synthetic detergents will prove economical. They do not react with the calcium in hard water to form insoluble, nondetergent scum. As a result fabrics rinse clean. This property gives detergents somewhat greater effectiveness when compared with softening chemicals, as soap will be precipitated on fabrics even when softening chemicals are added to the water.

### Water-Softening Equipment

Still another, and perhaps a better way to prepare hard water for laundering is the use of a water-softener unit, Fig. 4. The results of passing hard water through a softener unit are demonstrated in the two tumblers of water pictured in Fig. 5. Note the curd forming in the water in the tumbler at the left. Compare with the suds produced by adding a small quantity of soap to the water in the tumbler on the right, the water in the latter having been passed through a softener. Again compare the condition of the fabrics shown greatly enlarged in Fig. 6. That at the left in the photo has been washed and rinsed in softened water, while that on the right has been washed and rinsed in unsoftened water, leaving a deposit of scum which dulls the luster of the fabric. ★ ★ ★

## Hoop for Weighing Watermelons Made From Steel Rods

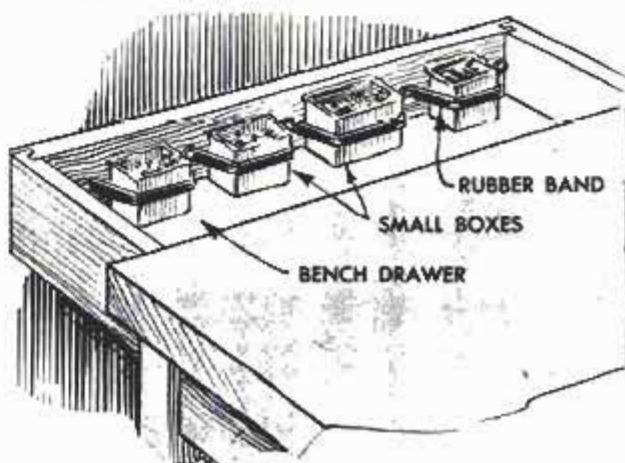


All sizes and shapes of watermelons can be weighed in this simple hoop attachment for a hanging spring scale. Two teardrop-shaped hoops, about 2 ft. in dia., are formed from light steel rods. Cross-bracing rods about 8 in. long are welded between the hoops near the bottom. A shorter curved piece is welded across the top to slip over the scale hook. Make a note of the weight of the attachment so it can be deducted from the amount shown on the scale when weighing watermelons. For weighing other produce, put hardware cloth on the cross-bracing rods.—C. F. Marley, Nokomis, Ill.

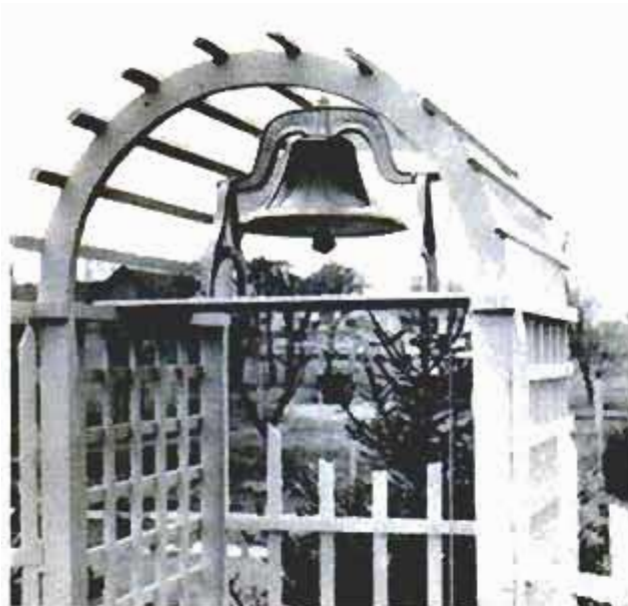
## Small Boxes in Bench Drawer Mounted Inside Front Panel

Small boxes of assorted hardware can be held against the front of the bench drawer by means of a long piece of elastic. Cut the elastic material from a discarded inner tube to a length slightly greater than the width of the drawer. Tack the strip, at both ends, horizontally across the inside of the drawer face board, and slip the containers in between the front of the drawer and the elastic band. Then place an additional tack through the strip and into the drawer panel between the containers.

☞ Your fingers will be kept cleaner when a handful of sawdust is mixed with the nails in your carpenter's-apron pocket.







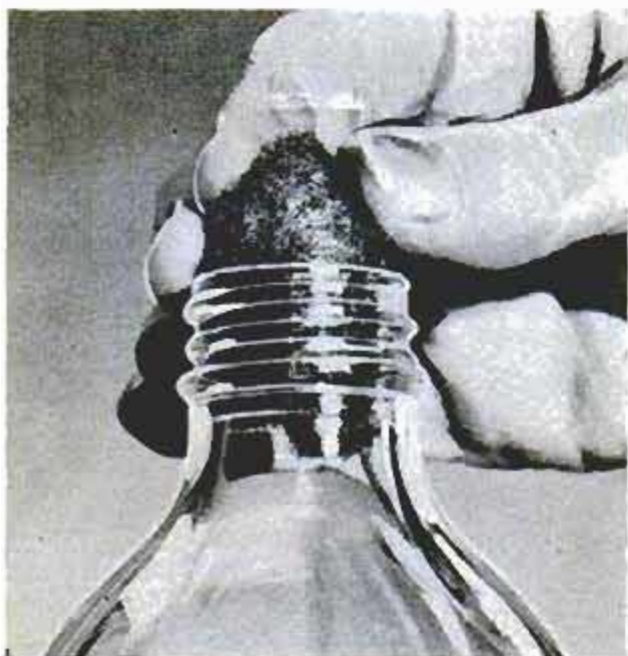
### Dinner Bell Adds Country Charm To Ordinary Lath Trellis

For a novel display of an old, farm-type dinner bell, mount the bell on a platform in a trellis as shown. The bell will be out of the way, yet add a distinctive touch of country charm to an ordinary trellis. To highlight its decorativeness, paint the bell and support members contrasting colors. Your family name can be applied on the finish with decal lettering followed by a protective coating of spar varnish.

Grover Brinkman, Okawville, Ill.

### Steel Wool Strains Solvent Poured Out of Bottle

Sediment can be strained out of paint solvent and other liquids by pouring them out of a bottle "corked" with loosely packed steel wool. Discard the steel wool when all the liquid has been poured through it.



### Brass Cap From Lipstick Tube Adds Glitter to Flagstaff

Add a touch of military glitter to a small flagstaff by fitting the brass-plated cap from a lipstick tube to the tip. If the cap is too large to fit snugly, plug it with a piece of dowel, then drill it out to accommodate the end of the flagstaff.



### Food Color Tints Book Edges

To improve the appearance of a book, and make identification easier, tint the edges of the pages with food color. Clamp the pages tightly between two pieces of wood and rub on the color sparingly, going over it a second time if a darker shade is desired. Leave the pages clamped until dry to keep from staining the insides of the covers.



### Tape Behind Fire Extinguisher Makes It Easy to Find in Dark

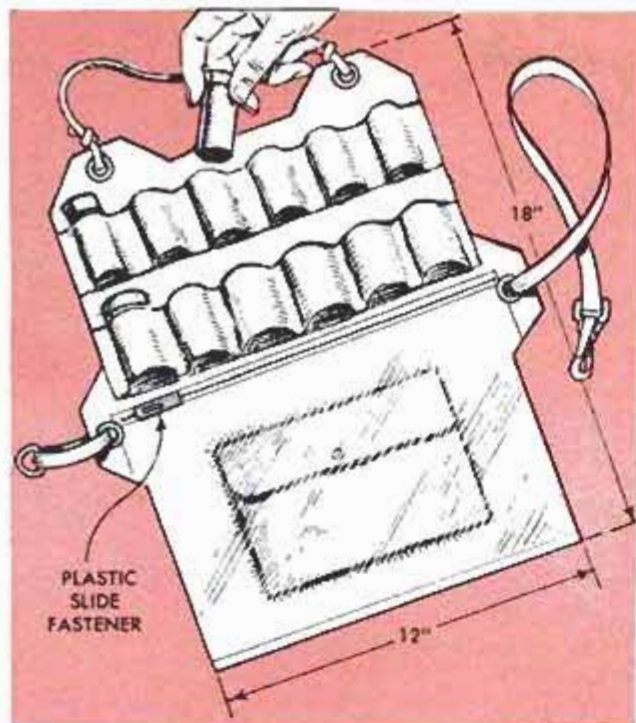
To avoid costly delay in locating fire extinguishers in an emergency, place strips of luminous tape on the wall behind each one as shown in the detail. The markings will also indicate where extinguishers are to be placed after they have been re-filled or recharged.

Position and pattern of the stripes can be used to indicate type of extinguisher.

G. E. Hendrickson, Argyle, Wis.







## Angler's Apron Is Transparent Waterproof Tackle Box

If you are a fishing enthusiast, this angler's apron is for you. No more fumbling through pockets for a particular lure, bait or leader. Everything is within easy reach in this apron that's really a transparent, waterproof tackle box. To make one, start with a piece of denim cloth approximately 14 x 18 in. (it's available in plaid as well as the usual blue) and trim it as shown in the detail, leaving tabs for straps to be attached later. Cover the denim on both sides with plastic material cut slightly larger, cementing or laminating it together along the edge. Then cement a transparent plastic pocket, equipped with a zipper, to the lower section of the apron. The enclosure used for the original apron also had a snap-

fastened envelope attached to one side. Obtain a dozen plastic vials of two sizes from your druggist. Hardware stores also sell nails and screws in small plastic containers which, though thinner, are still suitable. Position these along top of apron, with smaller vials above, and form pockets around them with a strip of plastic material, cementing it in place between them and below each row. Install metal grommets in the four tabs and attach a two-piece belt of 1/2-in. elastic. One section of the belt has a spring fastener which "locks" on a D-ring held by the other piece. Tie a length of rope to the upper grommets and apron is ready for you to use.

Lee Woods, Richfield, Idaho.

## Big Fish Held by Lower Jaw To Aid Hook Removal

To keep a big fish from thrashing around while trying to remove a hook grasp the fish firmly by the lower jaw and hold it open at an angle as shown. Few fish will move very much when held in this manner.

Clinton R. Hull, Santa Ana, Calif.

## How to Clean a Paint Roller

After scraping excess paint from a paint roller, remove the handle, insert a cork in both ends of the roller, and then place in a tennis-ball can with a small amount of solvent. The fibers of the roller will draw up the solvent which will then loosen the paint. For faster results, cover the can tightly and shake.

Leonard A. Kroll, Brooklyn, N. Y.







Boat is easy to launch on beach, hull is protected from sharp stones when inflatable rollers are used

# Launch Your Boat the Easy Way

By Ralph S. Wilkes

**W**HETHER you own a small rowboat or a large inboard runabout, use of one of these launching aids will take the backbreaking work out of getting the boat waterborne and also prevent damage to the hull.

A light boat or canoe can be protected from scratches and tears when it is hauled up on the beach by use of a wooden roller set in a frame similar to the one shown in Fig. 5. The roller can be turned to a cylindrical shape or shaped to fit the bottom of the hull. Inflatable rollers made of

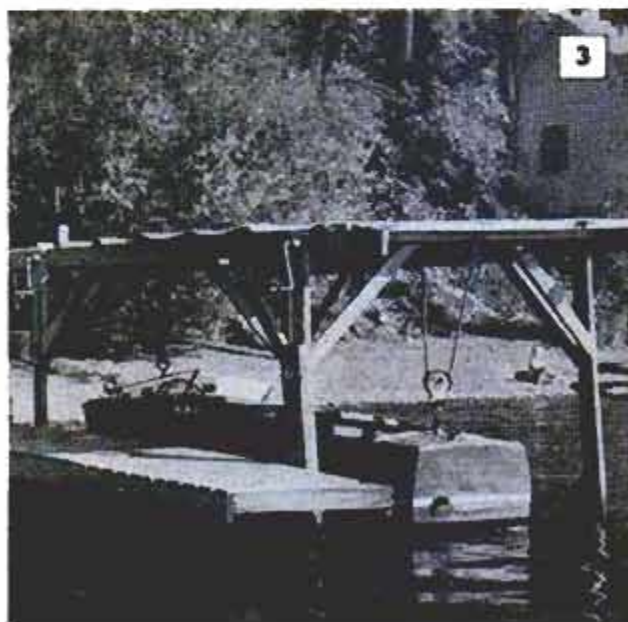
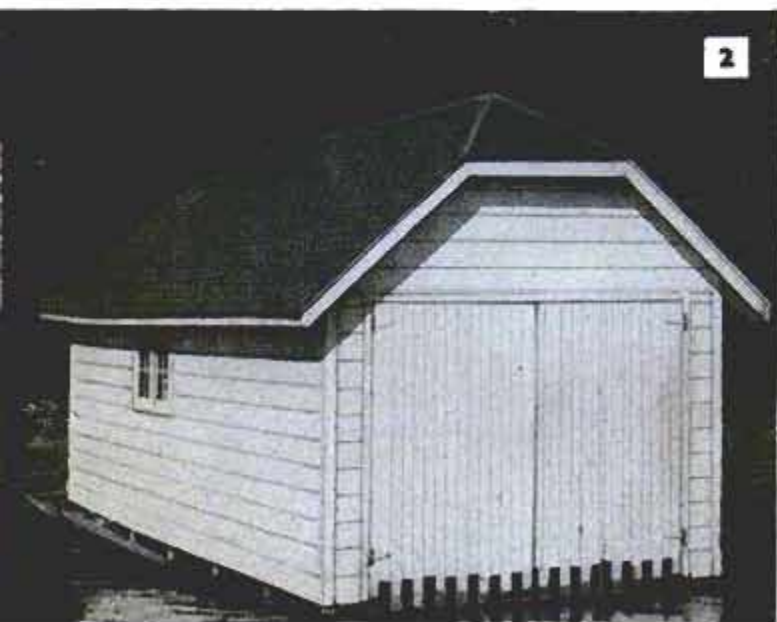
rubber-lined canvas, Fig. 1, afford complete protection for the hull when used to launch or beach a boat. The rollers, manufactured by Airoller Company, come in several sizes and are inflated to low pressure by mouth or tire pump.

## Launch Boat From Trailer

Most manufactured boat trailers are constructed so that it is relatively easy to back the trailer into the water for launching or loading the boat. Some trailers, like the Holeslaw, Fig. 4, carry the boat

Entire boathouse is on tracks and is moved two or three times a season as the lake level changes

Use crank and tackle at bow and another at stern if hoist is used for heavy boats. Cover with tarpaulin





suspended at the bow and stern. Others, such as the TeeNee, Fig. 6, support the keel. For a heavy boat, sometimes it is necessary to haul boat and trailer up on the beach with a block and tackle as shown in detail A, Fig. 7, so that it can be hitched to a car.

### Boathouses

If you own property fronting on a body of water, a permanent shelter can be built for the boat. An unusual arrangement is shown in Fig. 2, in which case the entire boathouse is on tracks and is moved two or three times a season as the lake level changes. The structure is held in place by a cable attached to a tree. It has an electrically operated winch for raising the boat; also a sliding bar is used for opening and closing the doors from the landward side, detail B, Fig. 7. By extending every second board below the water line, the doors prevent rough water inside the boathouse, yet waves do not cause the pounding action which occurs when solid doors are used.

A boathouse that is designed to permit dry docking under a stationary shelter is shown in Fig. 10. An electrically operated winch pulls the boat, cradle and truck on a track that leads from the water to the boathouse.

### Boat Hoist and Shelter

A temporary shelter and launching device, used primarily to keep the boat out of the water when not in use during the season, consists of a block-and-tackle arrangement with the hoist end of the line wound on a 2-in. pipe to which a



Above, lightweight boat trailer carries small boat suspended at bow and stern by sling and snap for easy launching at beach

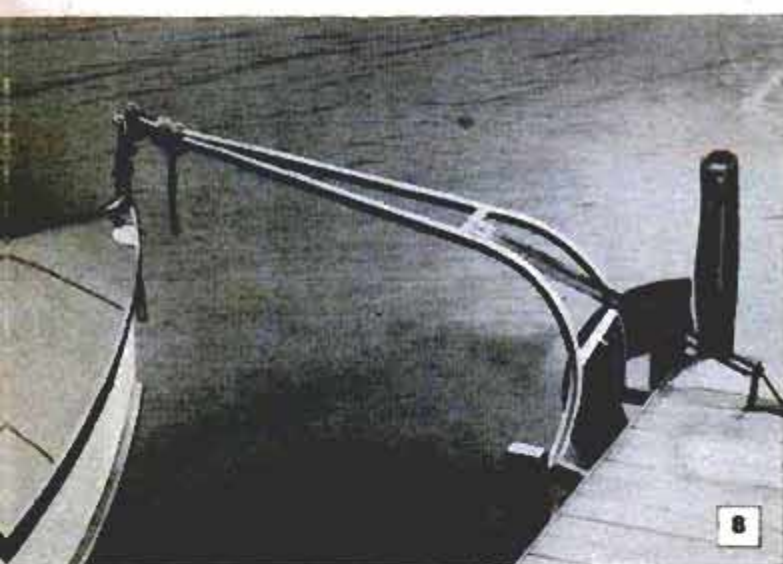
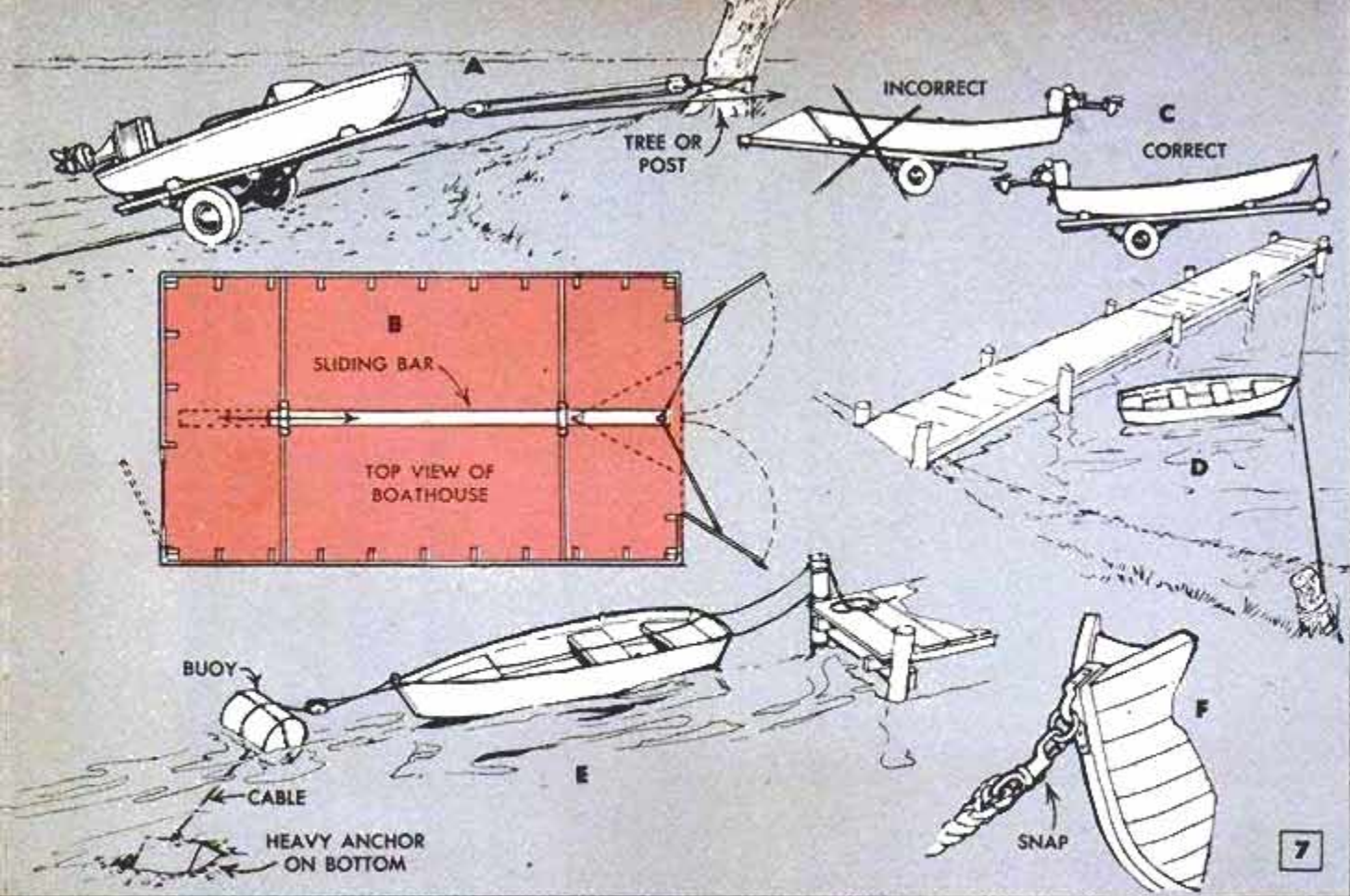


Wooden roller used for launching light boat or canoe can be turned to cylindrical shape or shaped to fit bottom of hull

Majority of trailers are type shown below, which carry boat supported by cradle with most weight on keel

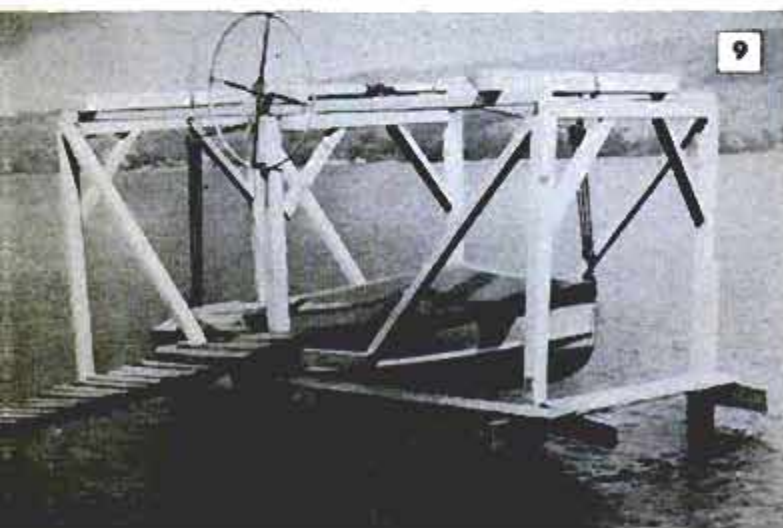






Davits mounted on dock and tied to boat at bow and stern rise and fall with waves, keep boat off dock

Treat wood framework of hoist with wood preservative before painting to prevent rot at water line



crank or wheel is attached. For light boats one crank is sufficient to operate both the bow and stern tackle as shown in Fig. 9; but heavier boats require a pipe and crank for each tackle, Fig. 3.

If you prefer to keep your boat at a dock, pad the piles and projecting parts of the dock with tire casings and keep two or more fenders between the boat and dock. For a mooring that will keep the hull entirely clear of the dock, tie the boat midway on a line secured to a post on shore and the end of the dock, detail D, Fig. 7. An alternate method is to tie the stern to the dock with one line and run another from the bow through a pulley attached to a buoy and secure it on the dock, detail E, Fig. 7. The boat also can be kept off the dock by two davits that rise and fall with the movement of the water, Fig. 8. ★ ★ ★

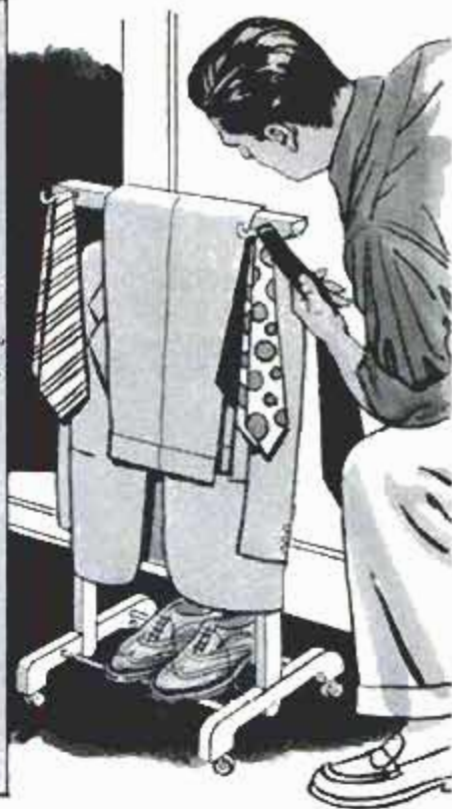
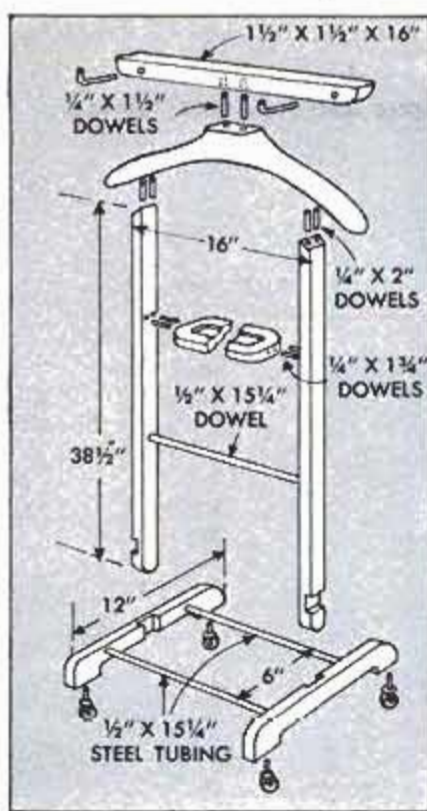
Electric winch, background, pulls boat cradle on track leading from water to inside boathouse





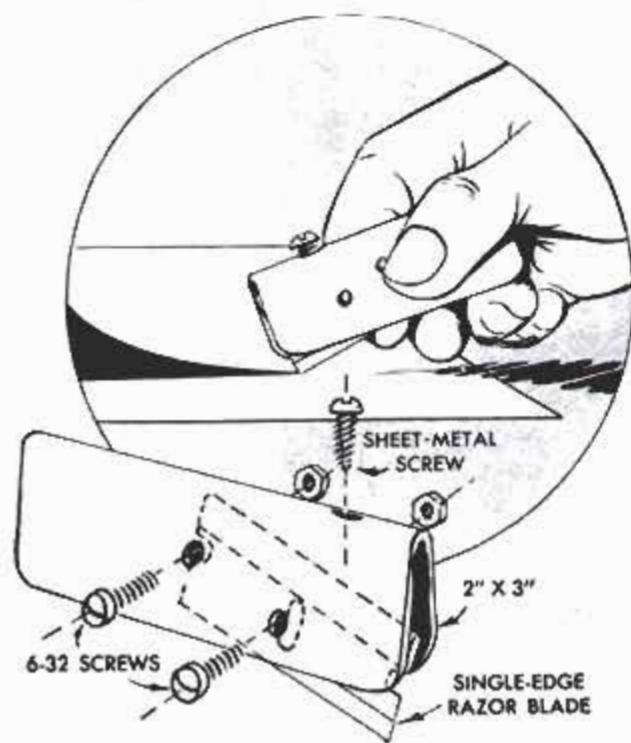
## Silent Valet on Wheels Holds Complete Outfit of Clothes

A full set of clothes for the man of the house from shoes to cuff links is held by this silent valet stand. A wooden contour-shaped hanger with the center hook removed is used to support a suit coat or jacket. The trouser bar above it is attached to the hanger with dowels and equipped with finishing-nail tie racks at both ends. Cut the tray for cuff links and tie bars from  $\frac{3}{4}$ -in. stock and recess the center of it to a depth of  $\frac{3}{8}$  in. Mount the tray between the  $\frac{3}{4} \times 1\frac{1}{2}$ -in. uprights which are beveled to the angle of the hanger at the top and have a dado at the lower ends to fit the caster rails.—Albert Leclair, Brownsburg, Quebec, Can.



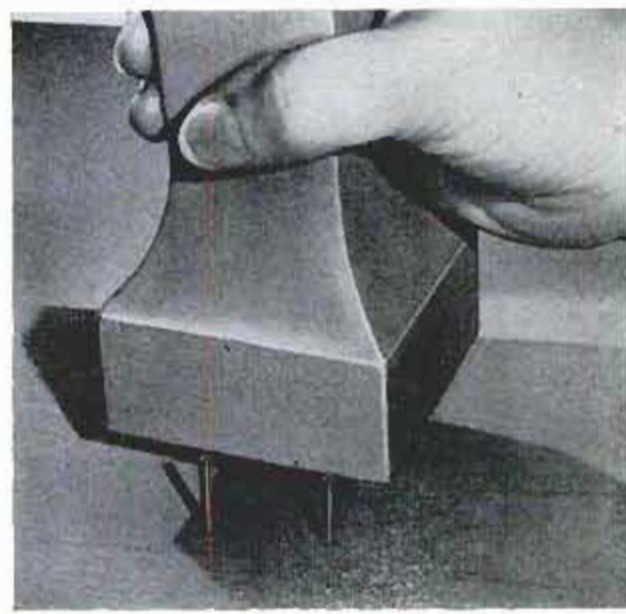
## Adjustable Blade Knife

This handy knife is made from a piece of metal  $2 \times 3$  in. folded in half and fitted over a single-edge razor blade. Three holes are drilled as shown, to accommodate screws that adjust and hold the blade in position. Blades having a reinforced back and three slots are preferred. The slots are necessary to obtain good adjustment of the blade in the holder.



## How to Do Blind Nailing

Where one side of the work is inaccessible and you do not wish to mar the other side with hammer marks or exposed nail-heads, blind nailing is used. A good example is the installation of bannister posts and pickets. Remove the heads from regular nails and drive the blunt end partially into pilot holes drilled in one of the surfaces to be joined. Apply glue to the two surfaces to be joined and tap the other piece down onto the nail points. If hardwood is to be used for both pieces, matching holes should be drilled in each.



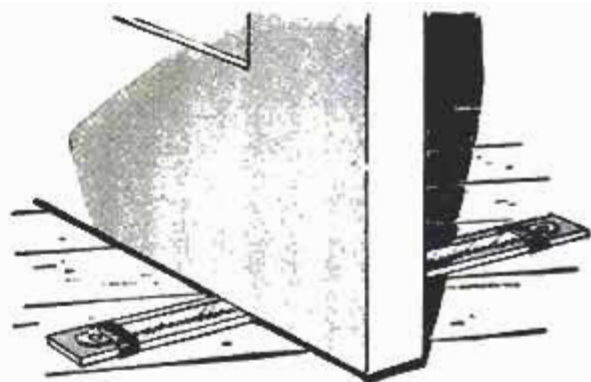
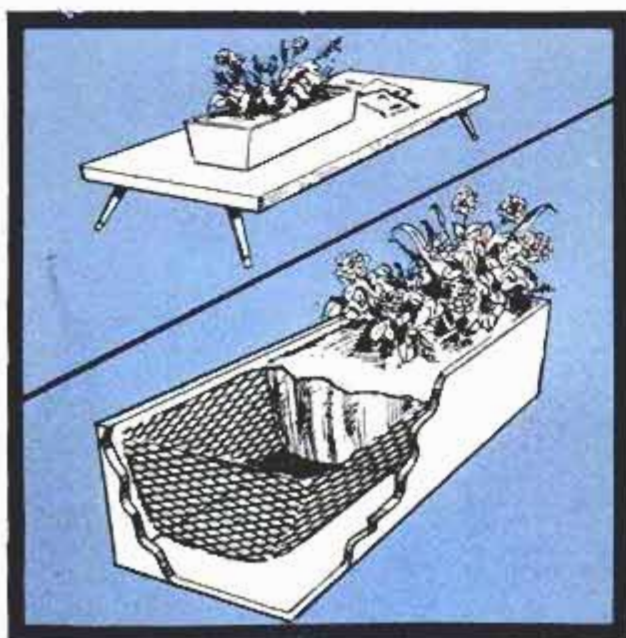


# SOLVING Home Problems

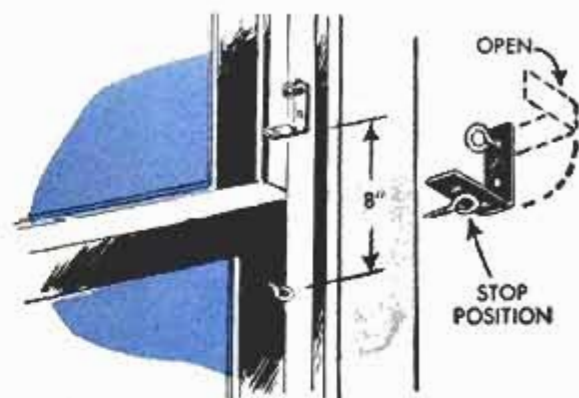


**FIRE-SAFE RECEPTACLE** for ashes emptied from ash trays can be provided by hooking tobacco can over edge of wastebasket. Even though ashes are hot they will not set paper in basket on fire. Bend lid of can back sharply to provide hook for holding it to basket

**TO PROVIDE BUILT-IN AERATION OF SOIL** in indoor planting box, install a liner of metal lath in the box before putting in the soil. Metal lath, which is cut easily with tin snips and can be shaped by hand, is available at most building-supply houses

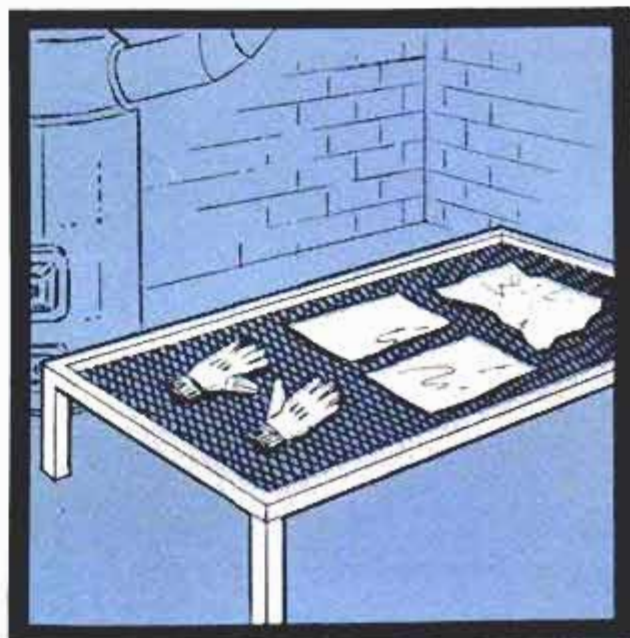


**HACKSAW BLADE TAPED TO RULER** will permit taking shallow cut across bottom edge of door that is binding or sticking without having to remove the door from its hinges. The blade does an effective job, while ruler protects the floor from damage

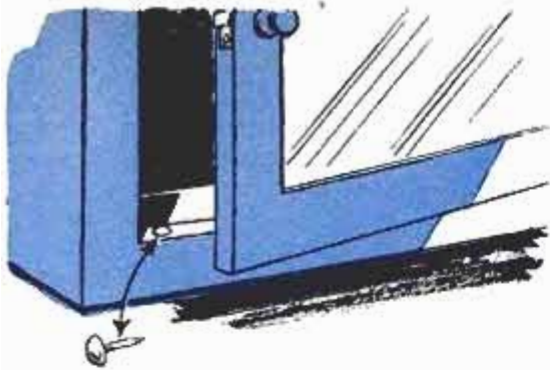


**WINDOW SAFETY STOP** prevents child from raising open window higher than predetermined point. Stop consists of screw eye driven into edge of lower sash as indicated, and short length of angle pivoted to stop strip with screw eye, 8 in. below upper eye

**METAL-LATH DRYING RACK** is lightweight and portable so it can be located wherever desired. Air circulates readily through mesh of the lath to assure fast drying. Rack can be made entirely of lath or fitted with wood or angle-steel frame and legs



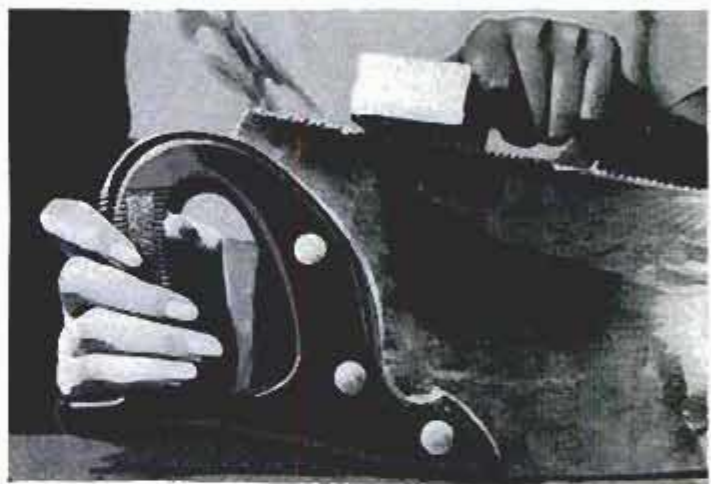




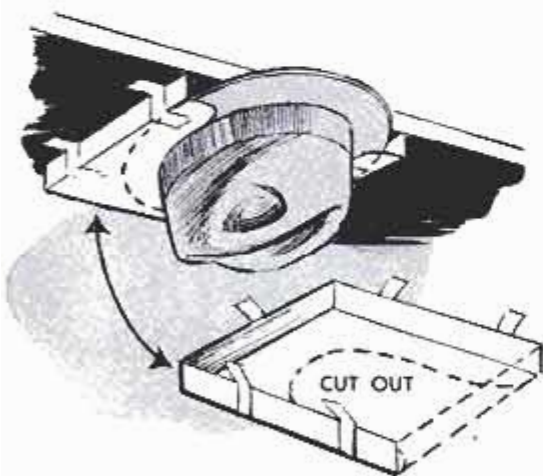
**SAGGING DOOR ON SMALL CABINET** will open and close with much less effort if an upholstery tack is driven into the cabinet frame at the point indicated. The round head of the tack will serve as glider to lift the door slightly and eliminate friction of wood on wood



**WOODEN DRAWER KNOBS** that pull off their metal screws because wood has worn away can be repaired by wrapping the screw threads with light cord or string. Dip wrapped screw in shellac, reinsert it in the knob and let it dry overnight before replacing knob on drawer



**HANDSAW THAT SQUEAKS AND BINDS** without cutting often can be made to cut by rubbing a bar of soap over the teeth and along sides of the blade. Soap also can be used to lubricate saw when cutting wood that is wet or heavy with resin that binds the blade



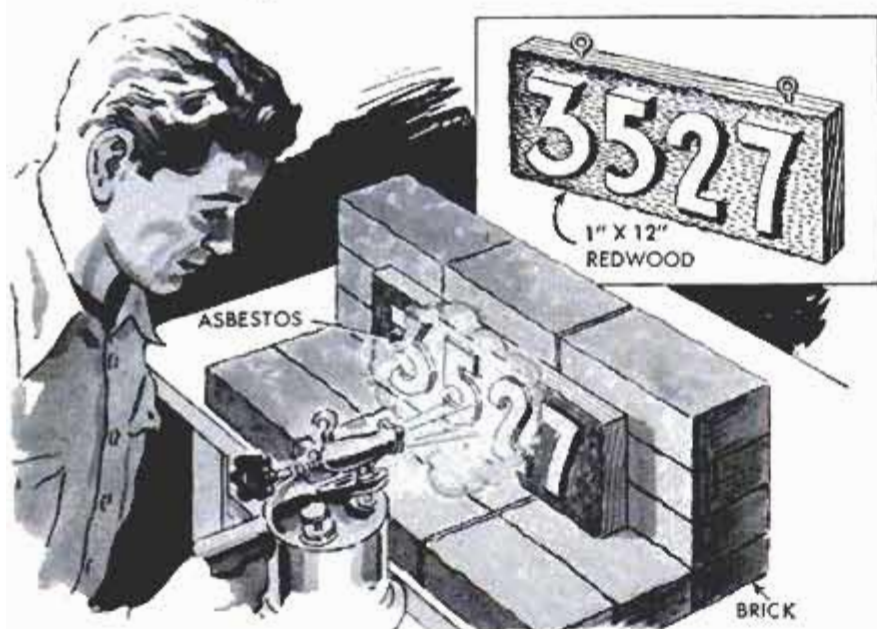
**RACK FOR MAN'S HAT** is made from shallow lid of large box. Cut lid as indicated in detail and tape it to lower surface of closet shelf so hat will be clear of other articles in closet and crown will not be crushed

**REMOVE GRASS STAINS** by first applying lard or other solid shortening to stained area and rubbing well. Then wash garment in hot suds. Alternate applications of peroxide and ammonia will remove grass stains from white materials





## Address-Plaque Letters "Carved" in Relief With Blowtorch



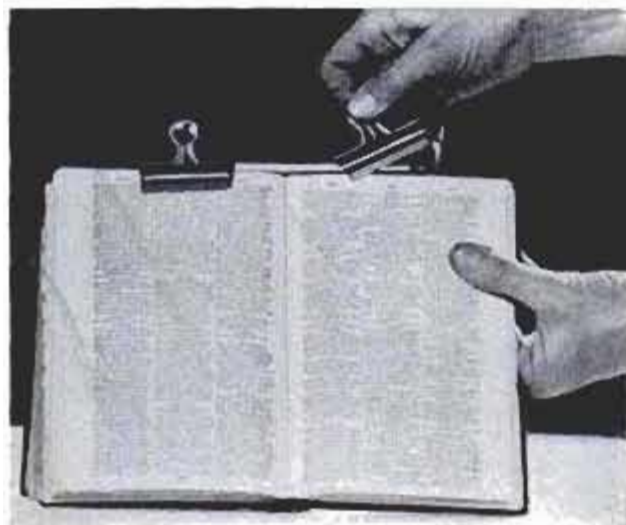
Using a blowtorch, you can easily "carve" your name and street number on a board to provide a rustic address plaque for the front yard. First, outline the letters on sheet asbestos and then cut out. After tacking them to the board, which should be at least 1-in. stock, apply the torch to the exposed wood around the letters, scraping away the charred wood and repeating the operation until the letters stand out in bold relief. To prevent a fire, arrange bricks as shown.—Russell Branch, Santa Cruz, Calif.

## Pressure Venting Tropical Home

Tropical homes are normally built with pressure-relieving openings in the closet ceilings to permit the doors to close. But on hot days these vents tend to exhaust the hot air from the attic into the rooms below. Covering them from above with a piece of rubber inner tube, nailed in place, keeps the hot air up in the attic and yet permits the doors to close.—Dick Downie, Oahu, Hawaii.

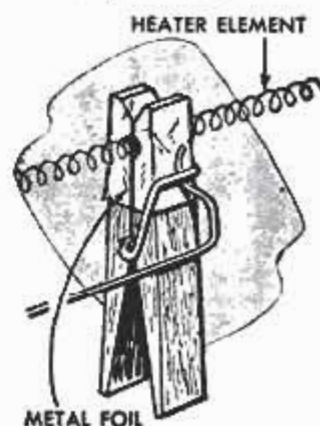
## Paper Clamps and Pencil Brace Hold Book Open for Reference

It is easy to keep a book open at a certain place for reference by using two paper clamps and a dowel or pencil. The clamps are fitted over the pencil and book pages as shown. Where such an arrangement is used frequently, it will be found better still to fasten a flat stick to the clamps permanently.



## Temporary Rheostat Improvised

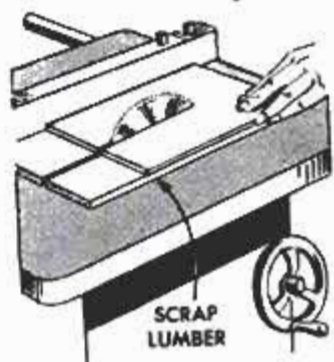
A rheostat for experimental or temporary work with very low voltages can be improvised from a length of electric-heater element and a wooden clothespin. Metal foil is wrapped around the jaws of the clothespin and a wire is forced under the clothespin spring in contact with the foil. The clothespin then becomes the sliding-contact side of the rheostat circuit.



K. G. Hadd, Montpelier, Vt.

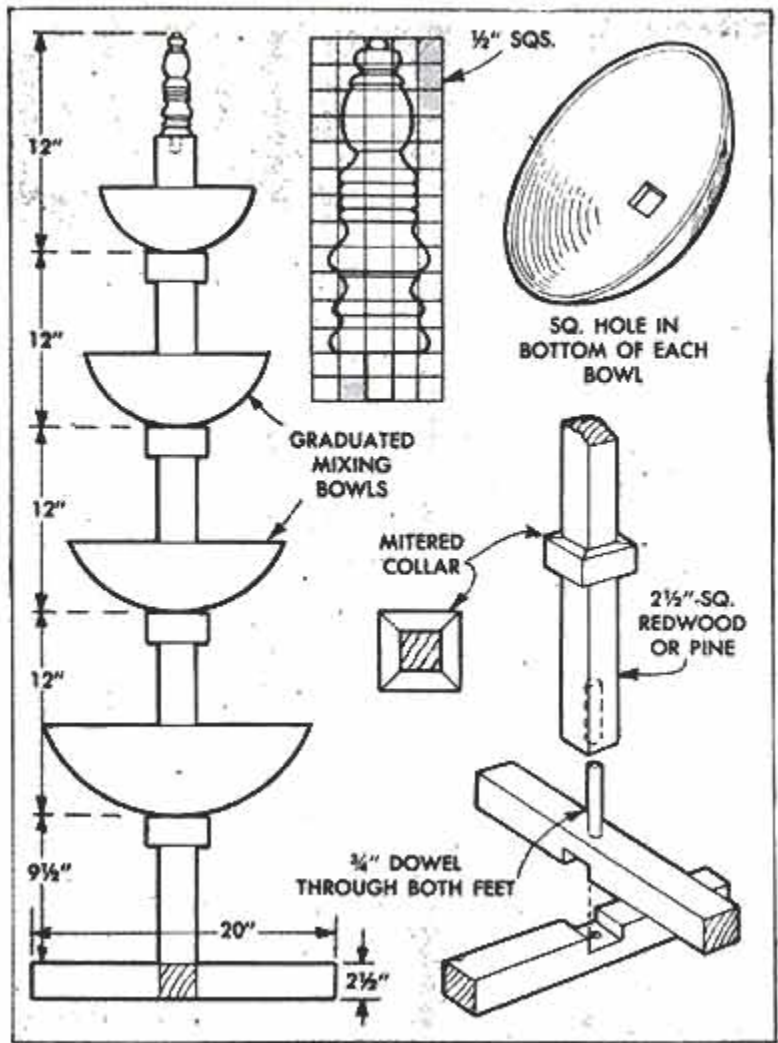
## Plywood Cut Cleanly by Table Saw When Placed on Lumber Scrap

To eliminate splintering on the underside of plywood when cutting it on a table saw, place the plywood on a piece of scrap lumber and run both pieces through the saw. Any damage resulting from the saw blade will be on the underside of the scrap and the cut in the plywood will be smooth and clean. The same procedure is used when sawing lumber that is to be finished on both sides.





WTM 58



## Novel Fruit and Flower Stand

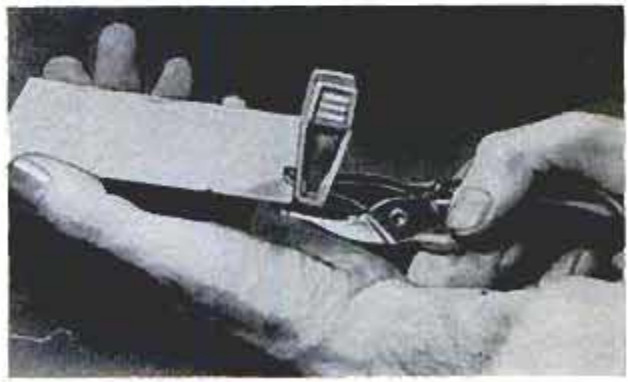
An interesting display for artificial flowers and fruit is this set of graduated mixing bowls mounted at 1-ft. intervals on a square standard. First, a 2½-in. square hole is cut in the bottom of each bowl, after which the bowls are slipped over the standard and a square, mitered collar is nailed under each bowl as shown in the detail. Mortise the members for the feet at right angles to each other and drill and insert a lightly glued dowel through both feet and well into the bottom of the standard. The

top piece of the standard can be turned on a lathe following the pattern outlined in the squared diagram, or a plain top piece may be substituted if desired. If wooden bowls are used, varnish bowls and stand. When bowls are metal or plastic, paint the stand a matching or contrasting color. Except for the bowls, the stand is made of 2½-in. redwood, with a length of ¾-in. dowel used to secure the feet to the standard. An inverted bowl could be used for the base.—Hi Sibley, Nuevo, Calif.

## Ticket Punch Used for Keying Index Cards and Negatives

For punch marks of uniform depth when keying index cards or sheet-film negatives, clamp a small plastic clothespin on one jaw of a ticket punch so that the cards can be butted against it. A punch that cuts a diamond-shaped hole is most suitable for this purpose. The clothespin should be clamped on the punch jaw with the hole in it and a rubber band wrapped tightly around both jaws of the pin to prevent the latter from moving off position.

Walter E. Burton, Akron, Ohio.





## Plastic Sheet Under High Chair Eases After-Meal Cleaning

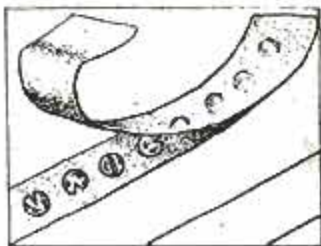


Rug or floor cleaning after each feeding of a small child is simplified when a sheet of plastic cloth is spread out on the floor underneath the high chair as shown. After the child has been fed, remove the high chair, fold the sheet in from all four corners and shake the contents off into a waste basket. The plastic will not become stained and is easily washed free of dirt and grease. Attach furniture glides to the chair legs to protect the plastic cloth.

Clinton R. Hull, Santa Ana, Calif.

## Tape Holds Fishing-Line Sinkers

Split-shot sinkers will not be lost or mislaid easily, whether carried in a pocket or tackle box, if first placed between two strips of tape. They may be readily removed with the point of a knife blade individually as needed.



## Slide Fastener on Seat Cushion Permits Quick Removal of Cover

In homes where pets are permitted to sleep on the seats of upholstered furniture, resulting in the need for more frequent cleaning, it is a distinct advantage to have the cushion covers quickly removable. This is made possible by installing a slide fastener at the rear edge of each cushion where it is not seen.



## Splash Shield for Paint Can

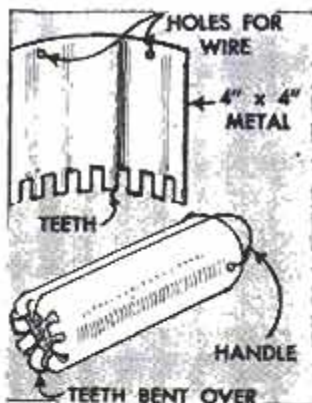
A section of automobile inner tube stretched over the top of a paint can provides a perfect splash shield when paddle-mixing. The shield also returns excess paint from the brush to the can. — H. J. Gerber, Stillwater, Okla.



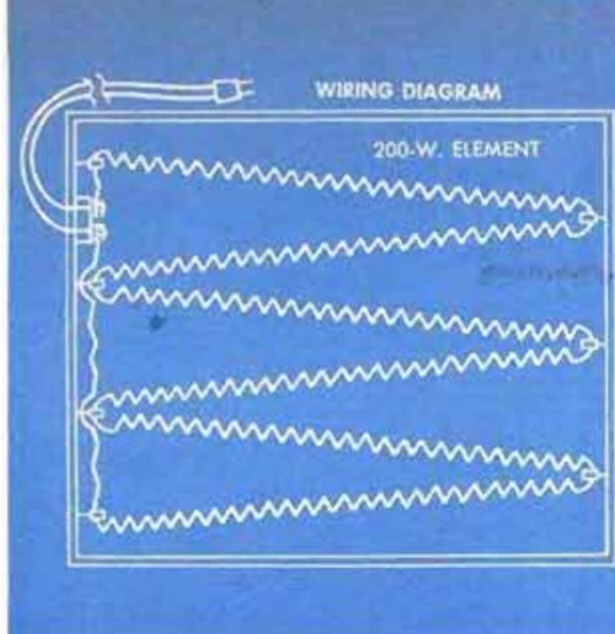
## Removable Drain Trap

Are you tired of the periodic job of opening the bathtub drainpipe to retrieve jewelry, a toothbrush, or other small article? Then this removable drain trap is your answer. Take a 4 x 4-in. piece of sheet copper or aluminum and cut rectangular teeth along one side as shown in the illustration. Bend the teeth upward, and then roll the sheet metal into a tube slightly overlapping the butt edges. Drill or punch two holes across from each other at the edge opposite from the curved teeth, and run a length of wire in an arc between them to form a handle. The trap is then inserted in the top of the drainpipe, far enough down so as not to interfere with the stopper, and still close enough to be reached by the hand for removal. The diameter of the tube should be adjusted so tension will keep it at any point inside the drain, therefore the vertical edges should not be permanently joined together.

S. N. Stresnic, Bayside, N. Y.







# PRINT DRIER

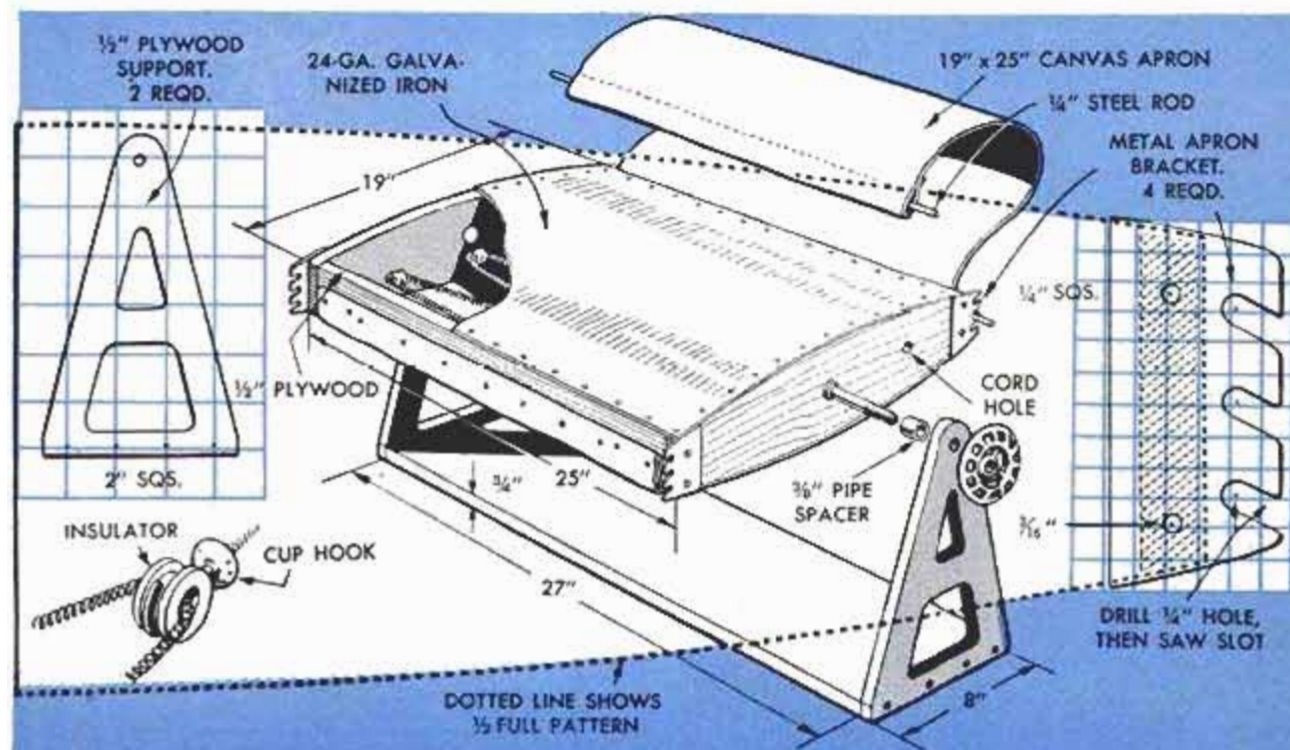
By Jack Wall

DRYING THE PRINTS is the most time-consuming part of printing your own pictures when you have to air-dry them on ferrotype tins. This is particularly true when drying 8 x 10 prints. In this case, an electric print drier is the answer and here's one that will dry eight 8 x 10 prints in about 12 min. The drier is designed to take two standard 18 x 24-in. chrome-finish ferrotype tins, which are loaded in the usual way and then placed in the drier under canvas hold-down aprons.

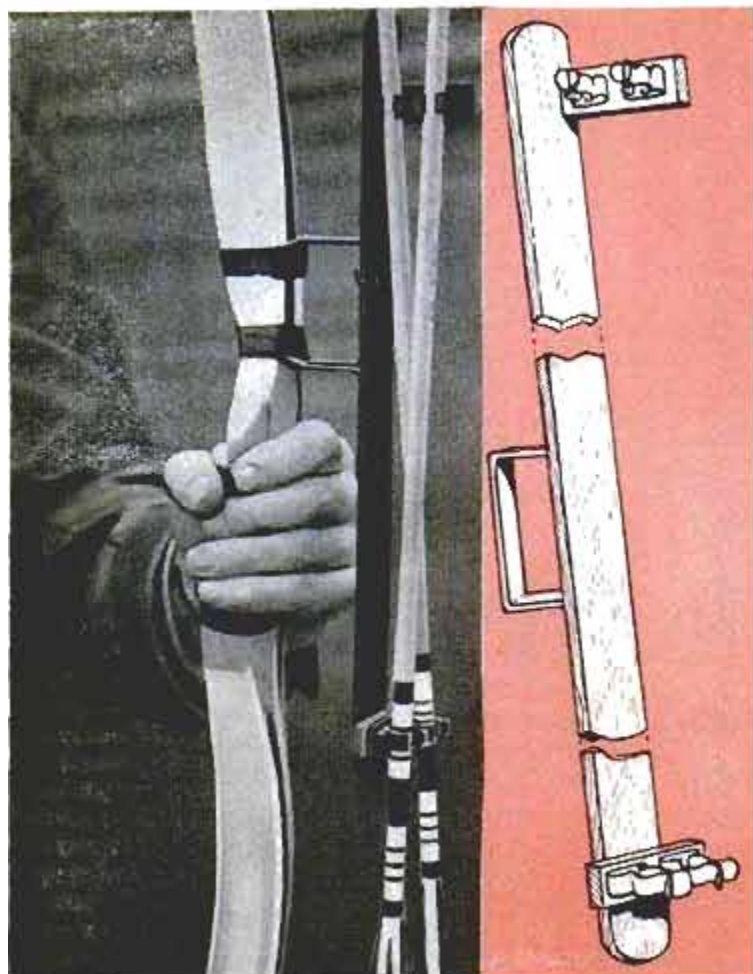
The heating element is housed in a curved plywood frame that is covered on both sides with sheet metal and which is pivoted between the uprights of a U-shaped

stand so the drier can be flipped over for loading both sides. The heating unit consists of three 600-watt toaster replacement elements that are wired in series by joining them end to end and twisting together. When stretched evenly between standoff insulators consisting of cup hooks and porcelain rings, the chrome-nickel wire provides approximately a 200-watt element. The connector between the element and heater cord is from an electric iron.

The pattern for the curved ends of the drier is given in dotted line. This is actually a half pattern which is one-half actual size. Notched metal brackets to which the hold-down aprons are hooked are screwed to the ends of each piece. A valve handle is used as a knob to flip the drier.







### Arrows Attached to Bow For Fast Repeat Shots

Bow-and-arrow hunters will be ready for the kill if additional arrows are carried on the bow as shown. The arrows are held in small broom clips which are screwed to two short pieces of wood mounted at right angles to each other on opposite ends of a long strip of wood. The 90-deg. twist gives tension to the arrows which holds them in place when the bow vibrates from a shot. A length of strap steel, bent in a U-shape, is screwed to the holder and taped to the bow joining them together.

Don Neal, North Warren, Pa.

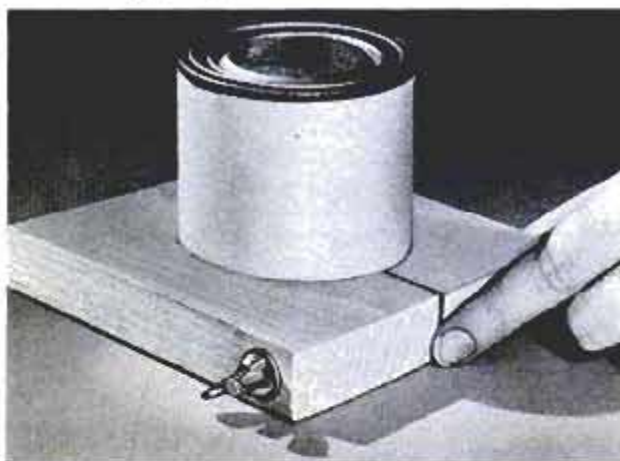
### Cleaning a Chimney

To clean a chimney, stuff a burlap bag with straw so it fits snugly inside the chimney, weight it with bricks, and suspend it from a rope. Lower and raise the bag inside the chimney from the roof. The soot will fall to the bottom where it can be removed through the clean-out door.

### Block Base Prevents Small Paint Can From Tipping

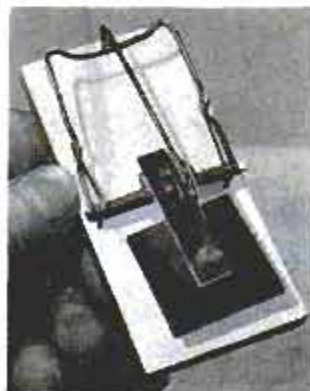
A small paint can or bottle can be prevented from tipping by clamping it in a wooden base as shown in the photograph. To make the base, place the container on a scrap piece of 1 or 2-in. stock and draw the outline on the top surface of the wood. Cutting in from one edge, jig or bandsaw along the inside of the circular line, returning the blade through the starting slot. Then drill a hole across the slot and insert a long bolt equipped with a wing nut. The slot should be wide enough so that tightening the wing nut causes the block to grip the side of the container.

Frank A. Javor, North Bergen, N. J.



### Improvise Better Mousetrap

A metal platform soldered to the trigger on a mousetrap will make it impossible for the mouse to reach the bait without springing the trap. If the trigger is made of wood, glue a piece of cardboard to it.



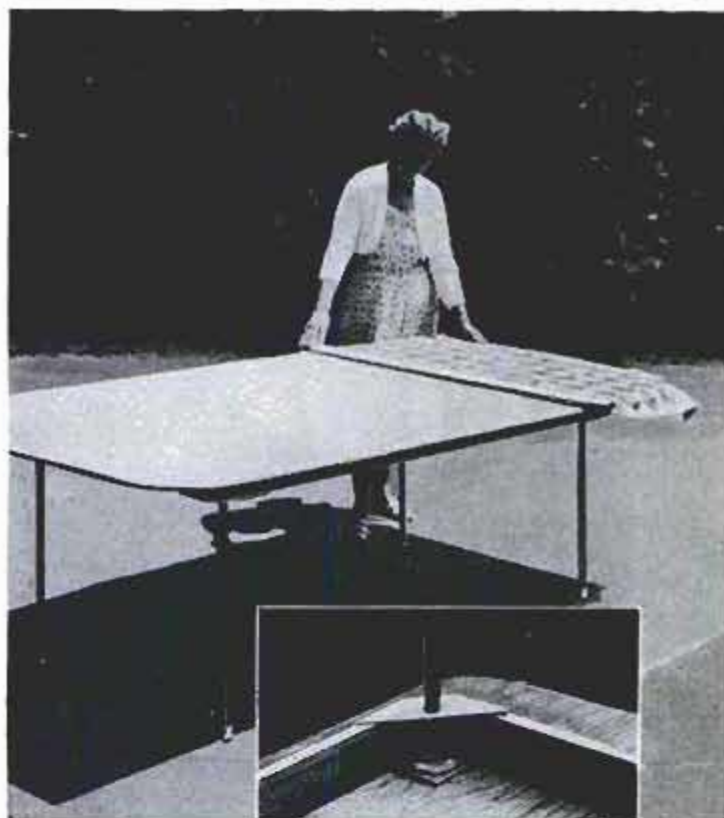
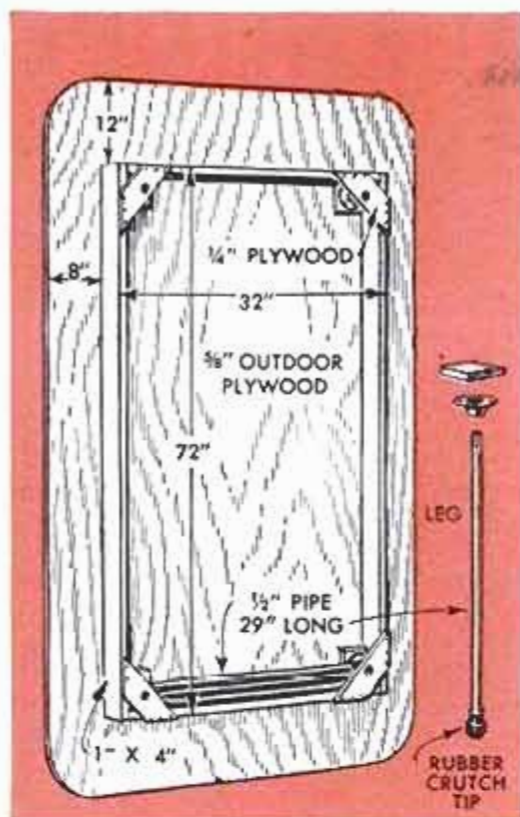
### True Waterline Marked on Model

Ship-model builders, here is a quick easy method for establishing the waterline on a hull, regardless of its shape. Using a container large enough to float the vessel in, fill it with water and spread a thin film of metallic paint on the surface. Holding the model fore and aft, lower it slowly into the water till it reaches the sailing or floating level. Remove and set it aside until dry and the mark of metallic paint will serve as a guide in painting.

Roger Hawthorne, Stamford, Conn.



## Knockdown Picnic Table Stores in Small Space



A 4 x 8-ft. sheet of  $\frac{5}{8}$ -in. exterior plywood serves as the top for this picnic table, which is equipped with removable pipe legs, and seats 12 comfortably. The corners are rounded and the top braced underneath with a box frame of 1 x 4s. Two pieces 72 in. long and two pieces  $30\frac{1}{2}$  in. long comprise the frame and are nailed on from above. Pipe legs with rubber crutch tips are turned into pipe flanges screwed to 4-in.-sq. blocks attached to the top at the inside corners of the framing.

To steady the legs, drill holes slightly smaller than the pipe through four 3 x 10-in. strips of  $\frac{1}{4}$ -in. plywood 1 in. from one side and equidistant from the ends. Fit the legs through the strips which are then nailed to the framing, after which the extending corners are cut off. When the table is not in use, the legs are removed and stored between the angular braces at one end as shown. Oil the pipe threads to make the legs turn easily in the flanges.

Clinton R. Hull, Santa Ana, Calif.

### Oversize Pilot Holes Shimmed With Lengths of Wire Solder

If you inadvertently drill wood-screw pilot holes oversize, drop a length of wire solder into each hole. As the screws are driven the soft solder will be jammed against the side of the hole and the screw and provide a snug fit for the latter.

Frank A. Javor, North Bergen, N. J.

### Quick Finish for Home Projects

Oil stain mixed with a good quality of furniture wax in paste form makes a quick easily applied finish for home woodworking projects. The mixture can be rubbed on with a rag or diluted for brush application. It is best to experiment on a scrap piece of wood to determine the proper proportions for the desired effect.

Arthur C. Shults, South Bend, Ind.

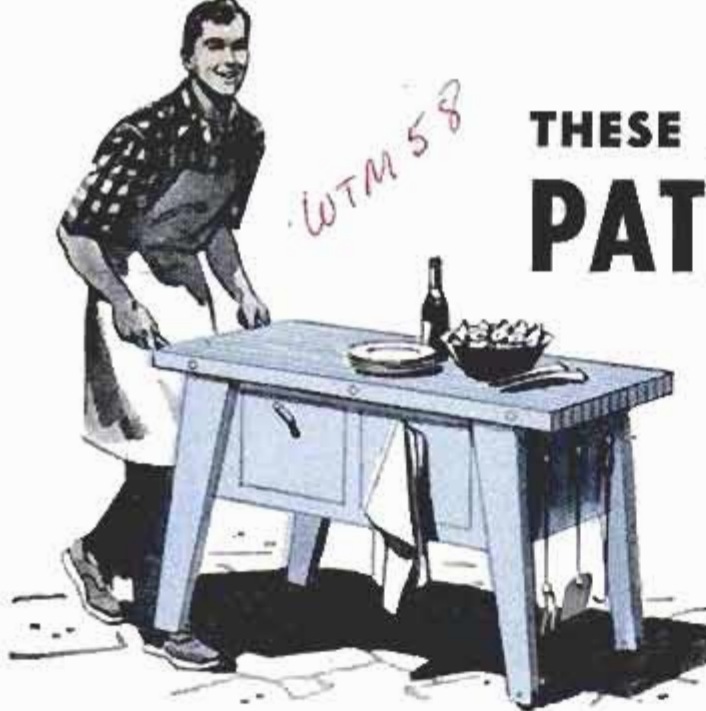




WTM 58

# THESE PIECES COMPLETE YOUR PATIO FURNITURE

By Tom Riley

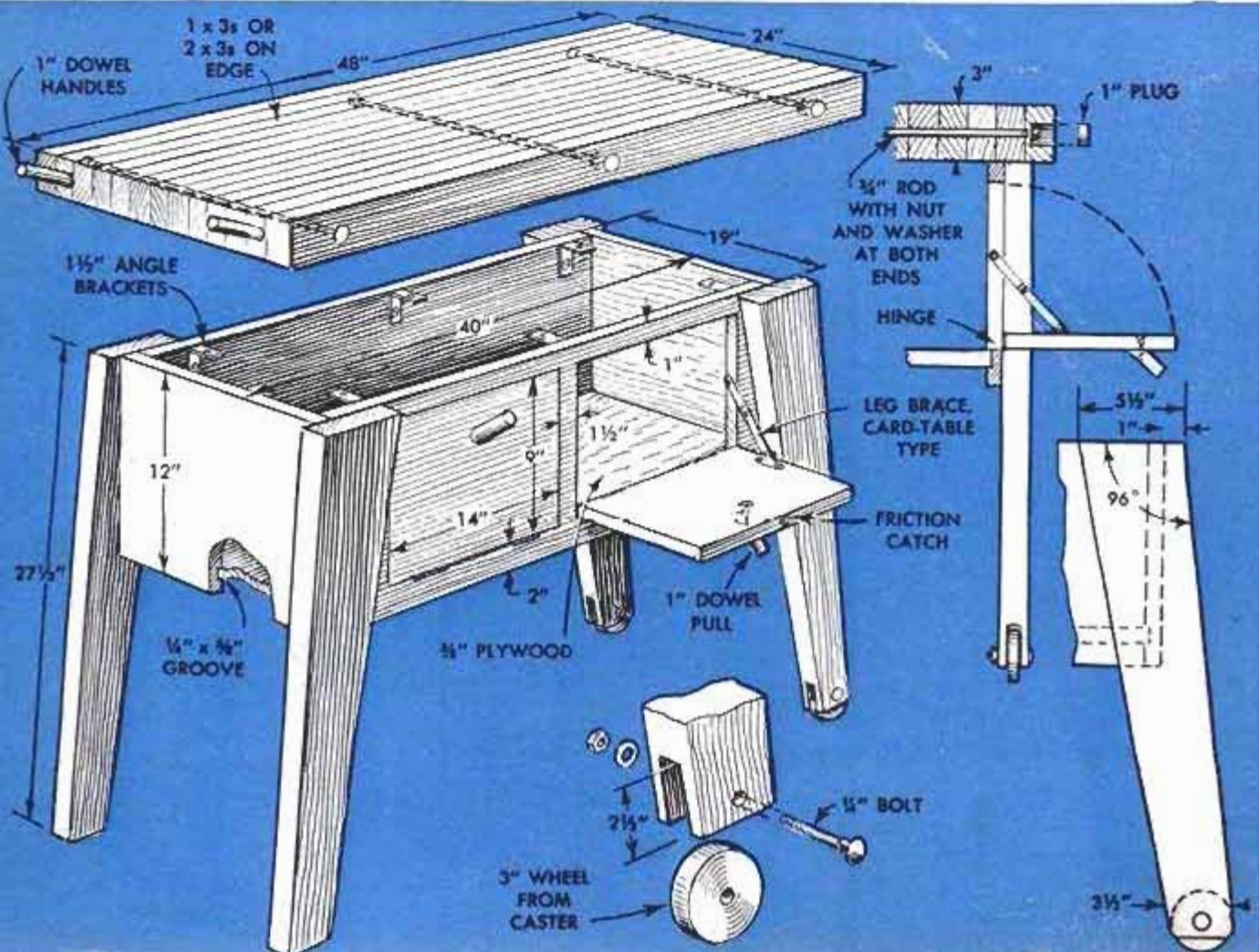
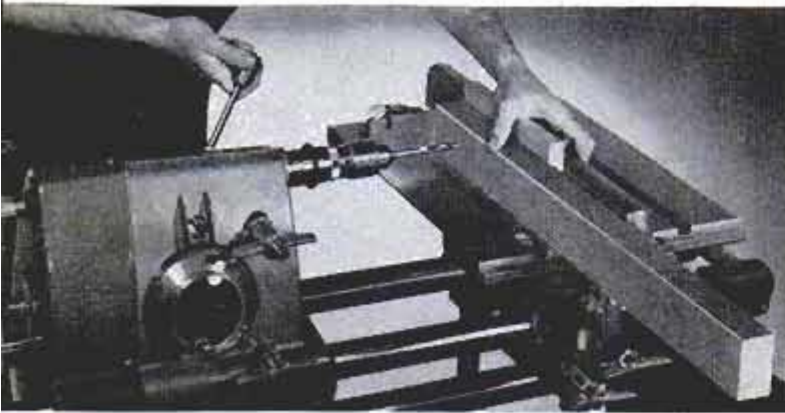


NOW THAT YOU have completed the two-way lounge and the barbecue cart presented last month, you probably are anxious to take on the remaining pieces of the group, namely, chuck counter, drop-leaf planter and patio "wheel chair."

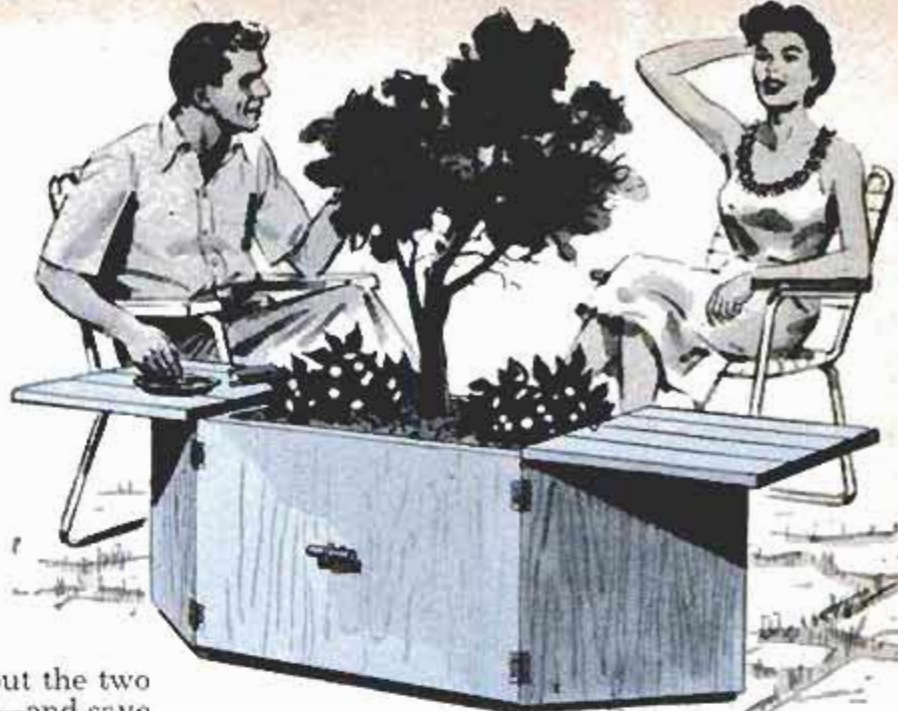
## The Chuck Counter

Designed for the outdoor chef, this rolling chuck counter will follow a portable grill anywhere on the patio. Its chopping-block top is practically immune to carving knives as well as the weather. The two doors open a large compartment that will store the miscellany of barbecue equipment, and the doors swing down when needed to give extra shelves for salts, basting sauces and the like. Both the chopping-block handles and door pulls are pegs that serve as hooks for the chef's towel and glove. One or both ends can have hooks for the barbecue fork, basting brush and tongs.

Left, both fence and miter gauge serve as stops in aligning tie-rod holes in pieces of chopping block

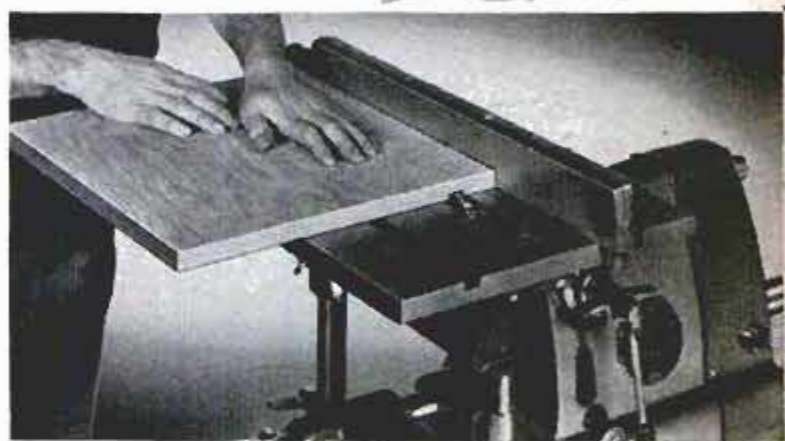




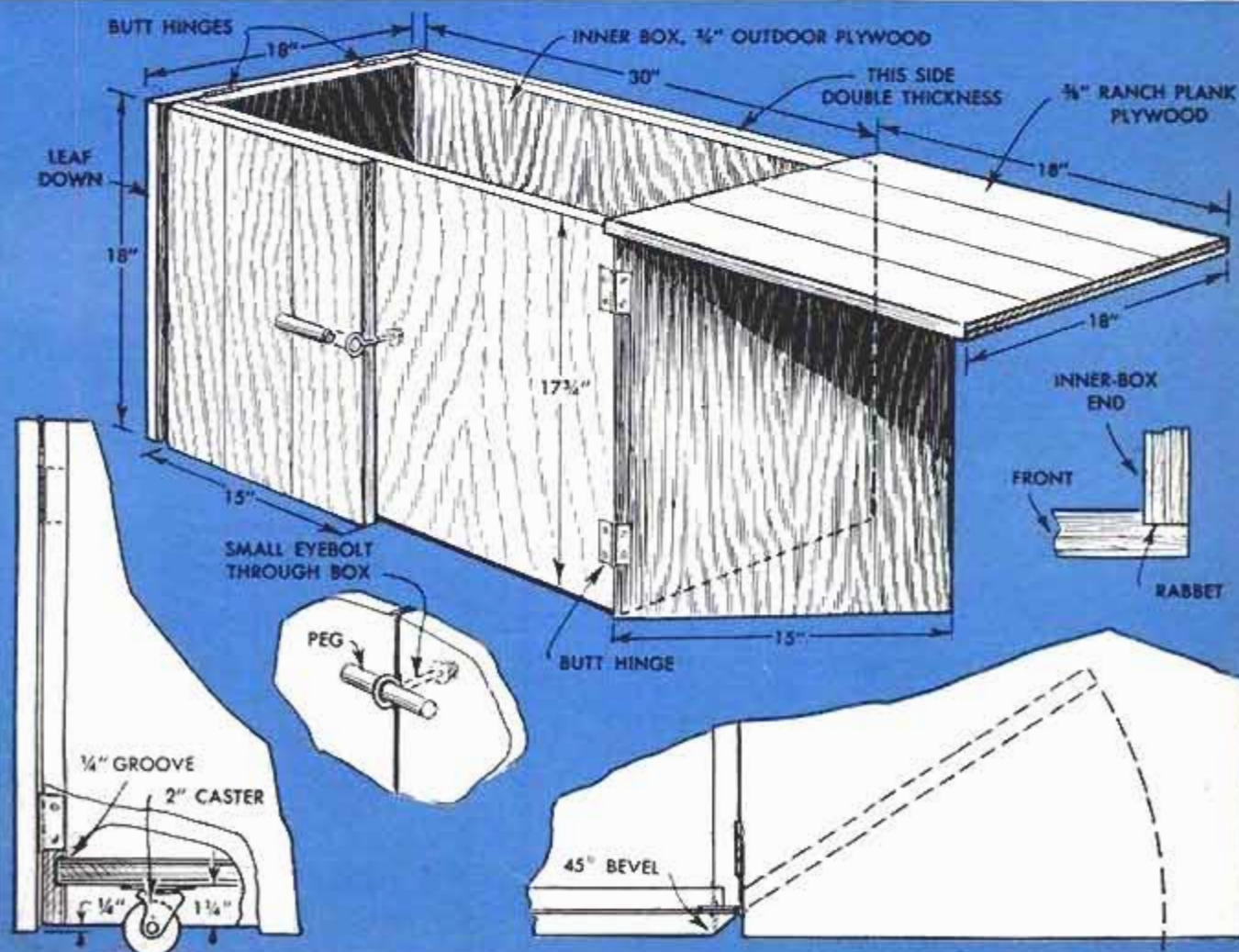


The counter consists of a box to which the legs are fastened and a chopping-block top that is attached to the box by six angle brackets. Construct the box of  $\frac{3}{4}$ -in. exterior plywood. On the door side, carefully cut out the two  $9 \times 14$ -in. openings with a jigsaw—and save the cutouts for the doors. Set the  $\frac{3}{4}$ -in. plywood bottom in grooves cut in the sides and assemble with waterproof glue and galvanized finish nails.

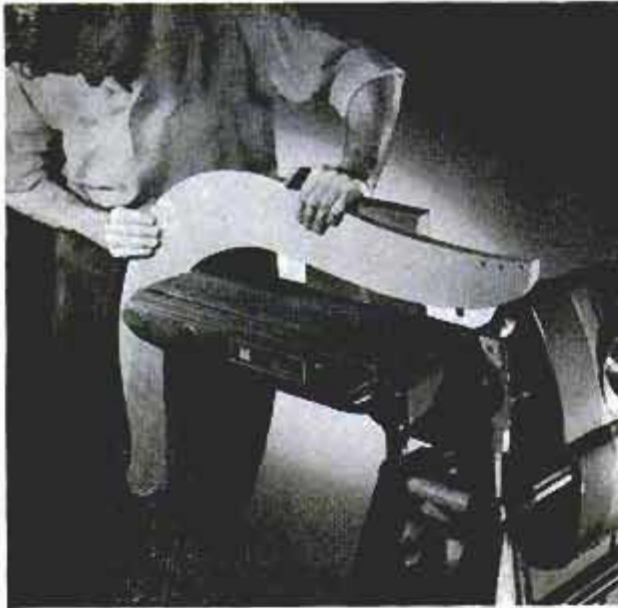
From 2 x 6 stock, first cut all four legs alike. Then shorten the two "wheel" legs  $\frac{3}{4}$  in. at the bottom and slot them as shown to receive rubber or plastic wheels obtained from 3-in. casters. Fasten the four legs to the plywood box with glue and 2-in. screws from the inside.



Right, grooves, in the side pieces of the planter, which house the bottom are cut quickly with dado saw







After each two-piece side frame of patio chair is glued and doweled, joint is sanded flush at edges

The chopping-block top can be of any clear soft or hard wood, 1 x 3 or 2 x 3 stock. Use dry wood so the block will not shrink and drill aligned holes through all the pieces so that three  $\frac{3}{8}$ -in. rods can pass through. Clamp pieces together evenly. The photo, page 170, shows how to do this on a multipurpose drill press. All pieces first are cut to same length. Then the miter gauge is locked in the table slot to space the holes evenly from the ends of the work, and the rip fence and table keep them square and at the same height. With an ordinary drill press, you can clamp two wooden blocks to the table to improvise a similar setup. Spread waterproof glue on the sides of the pieces and assemble, using the threaded  $\frac{3}{8}$ -in. rods as clamps. When dry, sand the top and edges, with a belt sander, if available, and simply finish the block with two or three coats of cooking oil. Stain or paint the rest of the counter as desired.

### Drop-Leaf Planter

Before constructing this unique planter box, you should decide whether it is to hold decorative plants or a dwarf tree for shade. The dimensions shown are ample for most plantings, but for a dwarf flowering tree the height and width are best changed from 18 to 24 in. Also note that casters (four of the platform type) are mounted underneath the box. Wood blocks will serve, but the casters will allow your planter to be rolled up to a chair at refreshment time and out of the way when hosing the patio floor. The drop leaves can be raised whether or not the planter is against a wall.

First, build the inner box of  $\frac{3}{4}$ -in. exterior fir plywood, rabbeting the corners and setting the bottom in grooves. For

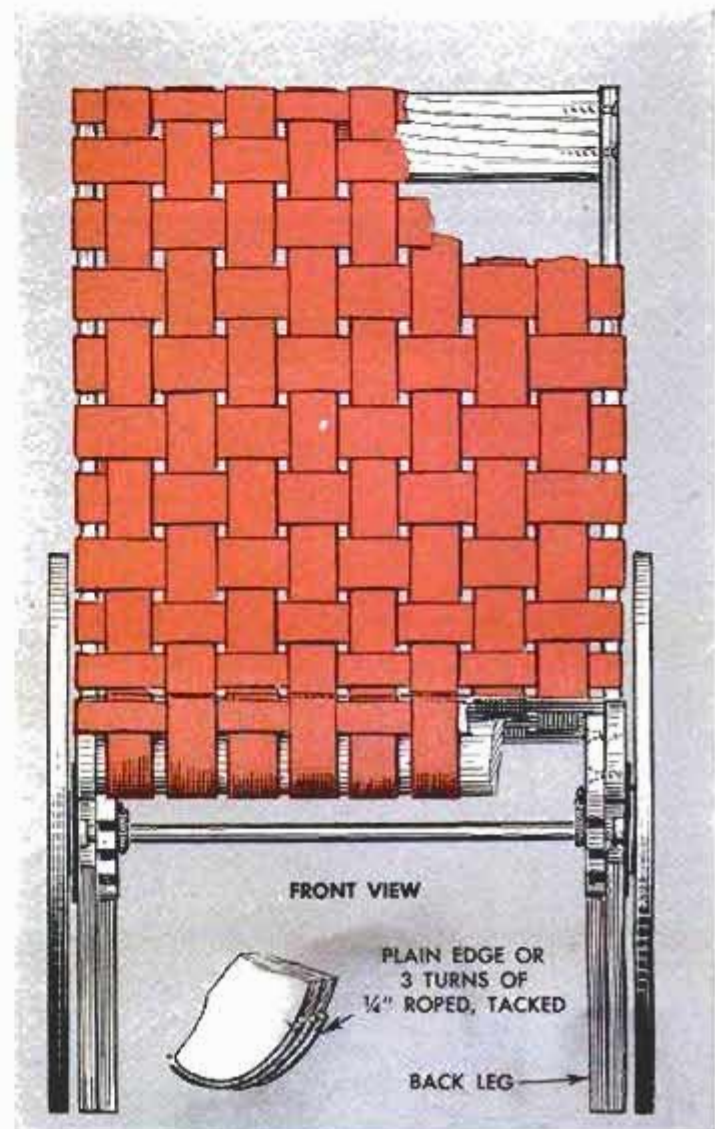
healthy plantings, fill the bottom of the completed planter with two or three in. of gravel to give drainage. Then add the soil and plants.

### The Patio "Wheel Chair"

This full-size lounge chair is designed for comfort, yet it can be moved about your patio as easily as a small folding chair. And it can be rolled out on the lawn, where its legs will not sink in when used. For a standard lounge chair, simply replace the wheel assembly with the alternate front legs.

By constructing the curved sides of two pieces splined together, all wood parts of this chair can be obtained from a 4 x 4-ft. piece of  $\frac{3}{4}$ -in. plywood. Use exterior plywood, vertical grain redwood or fir preferably. First lay out on wrapping paper a full-size pattern of the sides. Draw a line for the joint, but leave the pattern in one piece to be able to check your completed sides before gluing. It's best to mark out all chair parts on the plywood before cutting anything.

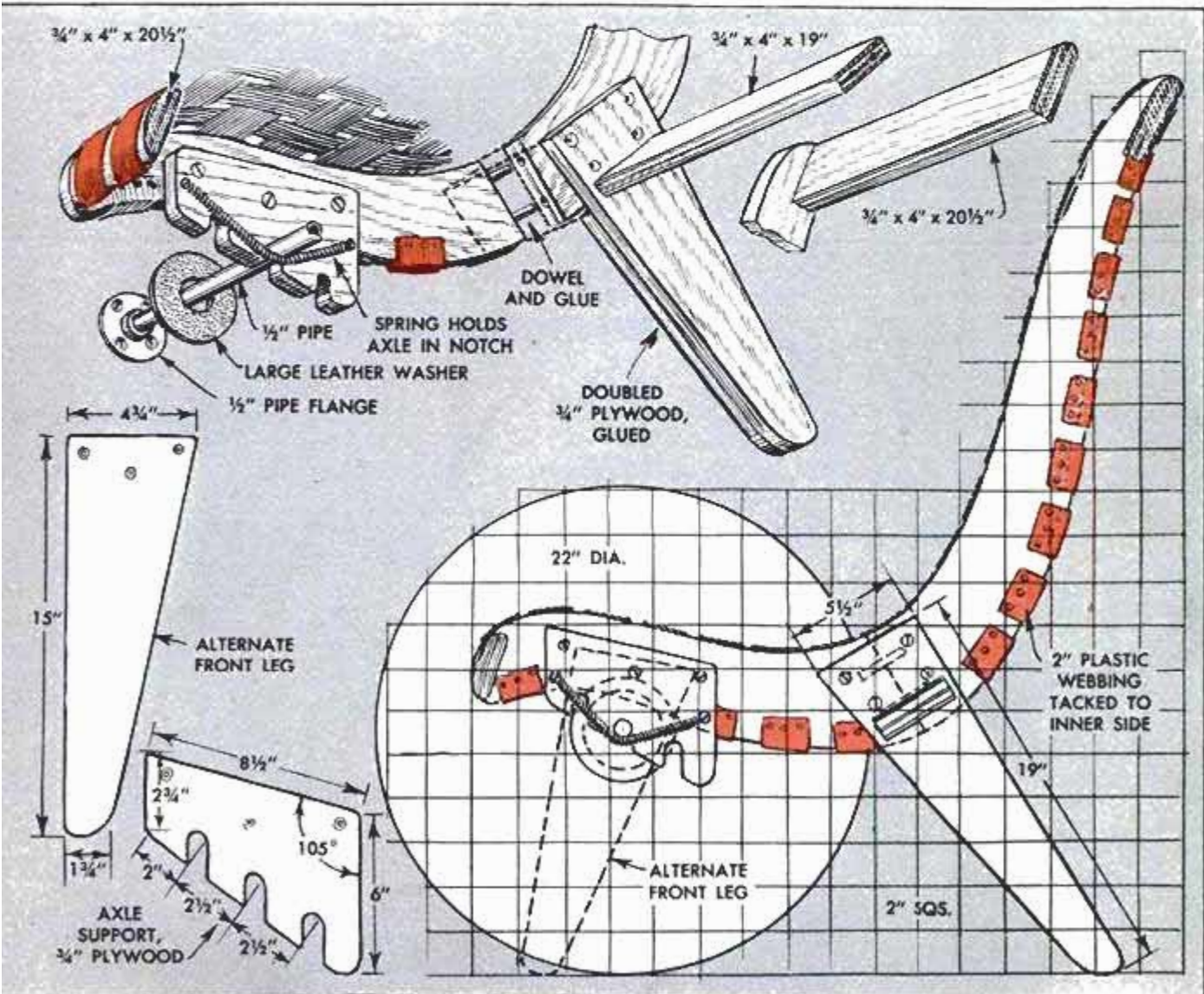
Sand the edges of the sides to finish







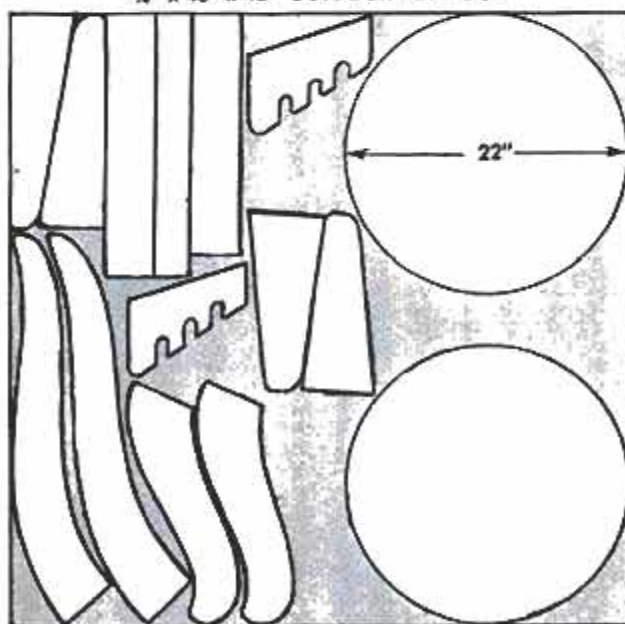
You have a choice of making the patio chair with or without wheels. If you make it with four legs, the front ones take the place of the large plywood disks and the notched brackets that provide a means of adjusting the chair. The drawing on the following page shows how all the parts for the chair can be laid out economically on a 4 x 4-ft. panel







$\frac{3}{4}$ " x 48" x 48" OUTDOOR PLYWOOD



Left, perfectly round wheels for the patio chair can be formed with a disk sander by pivoting the work

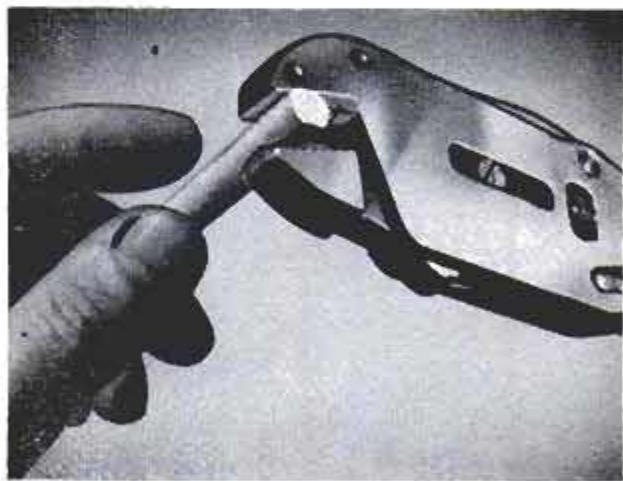
smoothness before attaching the three cross pieces with glue and #8-2 in. galvanized screws. If you have a belt or disk sander, use it to round the  $\frac{3}{4}$  x  $3\frac{1}{2}$ -in. front plywood cross piece. Otherwise, substitute a  $1\frac{1}{4}$  x  $3\frac{1}{2}$ -in. cross piece of solid wood here, which is easier to round by hand. Rear legs are of two pieces of the plywood glued together. Either curve the upper end of the shorter piece on your jigsaw or cut a flat on the chair sides at this point to have a tight butt fit. Attach the legs with glue and  $1\frac{1}{4}$ -in. screws, using the pattern to position them.

A slight change in the position of the axle supports, or alternate front legs, will give any tilt to the chair you may desire. Attach the supports with screws, no glue, at this time and make any final adjustment later. Cut shallow saw kerfs on the face of the 22-in. plywood wheels to simulate boards and, if a 12-in. disk sander is available, use the trick shown of pivot-sanding the edges perfectly smooth. Screw the pipe flanges to the wheels and place 5 or 6-in.-dia. washers of stiff leather or  $\frac{1}{8}$ -in. hardboard over them to prevent wear on the wood frame. Stain or paint the assembled frame. Then cover with 100 ft. of 2-in. Tufweb or similar heavy plastic webbing available at outdoor-furniture stores. Tack the crosswise strips first, stretch tight and space about  $\frac{1}{2}$  in. apart. Then interweave the eight longer strips. ★ ★ ★

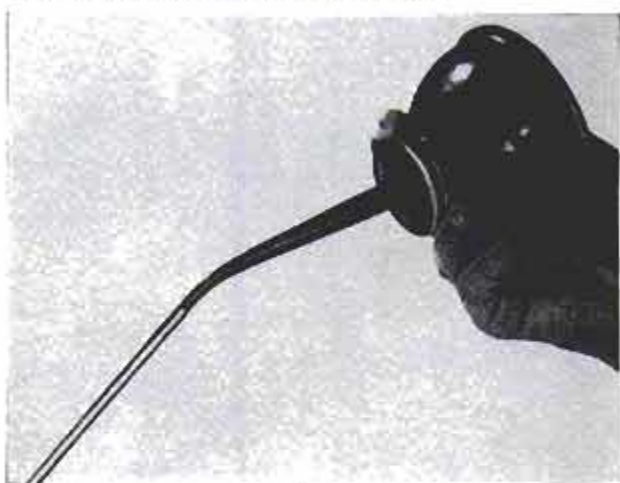
### Clamp Wrench Used to Flatten Dowel for Glue Escape

To prepare dowel pins for glue escape squeeze the sides with a clamp wrench. Use just enough pressure to put a flat on each side of the dowel. Moisture from the glue will cause the flat sides to swell back to the original shape for a tight fit.

Ken Murray, Colon, Mich.

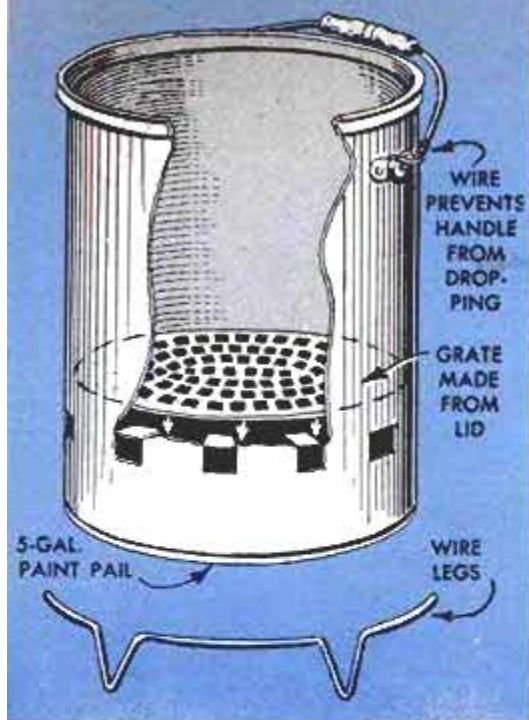


### Plastic Drinking Straw on Spout Extends Reach of Oil Can



Lubricating in hard-to-reach locations is less of a problem if an oil-can spout is fitted with an extension consisting of a plastic drinking straw. It may be necessary to warm the end of the straw and expand it with an ice pick or center punch to permit it to be slipped onto the oil-can spout.





Not as fancy, perhaps, as you'll find in a store but what could be more simple to make—and inexpensive

## PAINT-PAIL BRAZIER

By Larry W. Smith

TEMPTING, mouth-watering steaks can be done to a turn on this neat little charcoal brazier, which was once a 5-gal. paint pail. You'll need the complete pail, including the lid, since the latter is used for the grate. Burn out any hardened paint that's in the pail and scrape the interior clean. Tabs that support the grate 3 in. up from the bottom are formed by cutting square openings in the side of the pail and bending the metal inward. The holes thus formed provide necessary draft openings. The holes are located around the pail by first laying them out on a strip of paper. Make the openings about 1-in. square and spot about 12 along the strip so they will

be equally spaced around the pail. Stick the paper to the pail and make a punch mark at the corners of each square. Remove the paper and drill a  $\frac{1}{8}$ -in. hole at each mark. Now, using a narrow metal-cutting saw, cut from the top holes to the bottom holes of each square and then from hole to hole across the bottom. Bend each square inward to form a tab to support the grate.

The grate is made by first cutting away the rim of the lid with tin snips and then punching out square air holes with a cold chisel. A trim looking stand for the brazier is made by bending two lengths of heavy wire to the shape shown, following the curvature of the pail, and then snapping them in place against the inside of the bottom rim. Use a cake cooler for a grill.

Below, square air holes are cut in side of can with metal-cutting saw. Center, wire hook holds bail up and away from side of pail. Right, series of holes in lid converts it to grate. Use cold chisel to cut holes







PENCIL MARK

### Slit Section of Rubber Hose Anchors Tap-Wrench Handle



To prevent a T-handle of a tap wrench from sliding off-center inadvertently when cutting a thread, drill and slot a short piece of rubber hose and fit it over the handle as indicated in the drawing. The friction induced by the rubber will

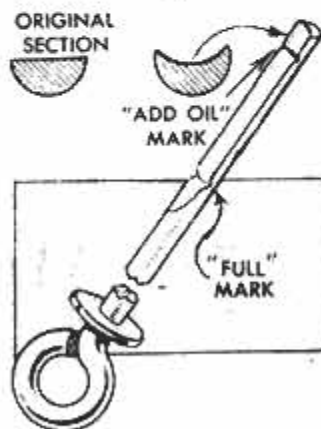
prevent the handle from sliding too readily, yet allow it to be centered without difficulty, or placed off-center for easier turning.

### Chalked Surface on Saw Table Takes Pencil Markings

To speed the work of cutting short lengths on a circular saw without using the fence and stop normally employed, chalk an area of the table top adjacent to the blade so that it will readily receive pencil markings. The marks are easily erased when no longer required or when necessary to change the length of the measurement.

### Auto-Engine Dip Stick Improved For Easier Oil-Level Reading

The difficulty of noting the crankcase oil level upon withdrawal of the dip stick from your auto engine can be avoided when the portion of the stick between the "add oil" and "full" marks is ground hollow. Grinding can be done with a thin, rounded-face wheel or with the edge of a flat-faced wheel. The depression will cause the oil to remain at the indicated level a sufficient time to permit a correct reading. Since the oil-level marks will be ground away, note their location on the back of the stick and file new notches on the hollowed face accordingly.

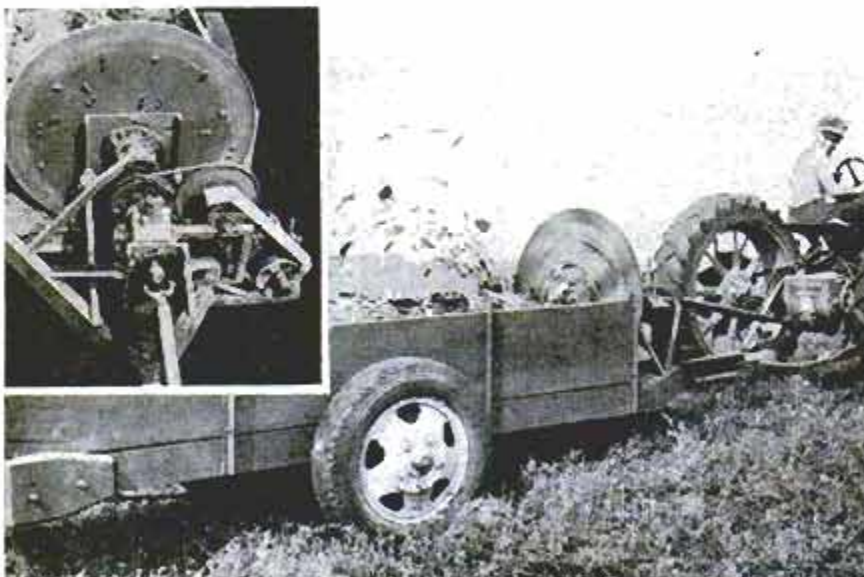


D. Coats, Winnipeg, Manitoba, Can.

### Automobile Transmissions Drive Front-Delivery Spreader

The spreader disk on this farm-built spreader is located at the front of the box for convenience in powering the disk and

apron by the tractor power take-off through two automobile transmissions. One transmission is located at the center of the wagon-frame extensions in front of the box and is coupled directly to the power take-off. The opposite end of the transmission drives the spreader-disk shaft, which is mounted in a roller bearing taken from discarded machinery. Teeth cut from steel angle are bolted to the face of the spreader disk, which is cut from sheet steel. A second auto transmission is belt-driven from the first transmission and drives the bar-and-chain apron. — A. M. Wettach, Mt. Pleasant, Iowa.





WTM 58

# Outboard-Motor Davit

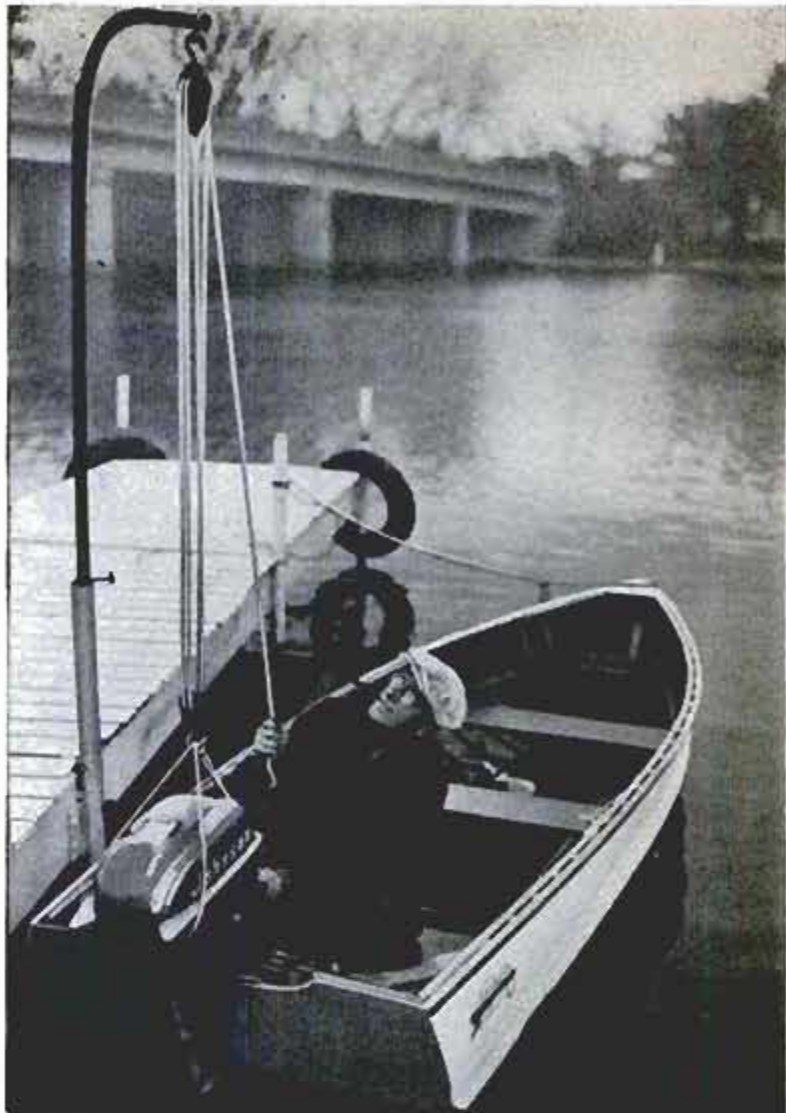
GETTING a heavy outboard motor in or out of a boat at a dock is easy with a davit and tackle like the one shown.

To make the davit bend an 8-ft. length of 1-in. pipe into an L-shape as shown and drill a  $\frac{1}{4}$ -in. hole  $\frac{3}{4}$  in. from the upper end of the pipe and another hole the same diameter 1 ft. from the other end. A  $\frac{1}{4}$ -in. eyebolt is fastened in the first hole to hold the tackle block and a  $\frac{1}{4}$ -in. carriage bolt 3 in. long is fastened in the second hole. The thread on the carriage bolt should be at least  $1\frac{1}{2}$  in. long, so that a nut can be turned on the bolt on each side of the pipe to lock the bolt firmly in place, leaving  $1\frac{1}{2}$  in. extending beyond the pipe for snubbing the tackle rope.

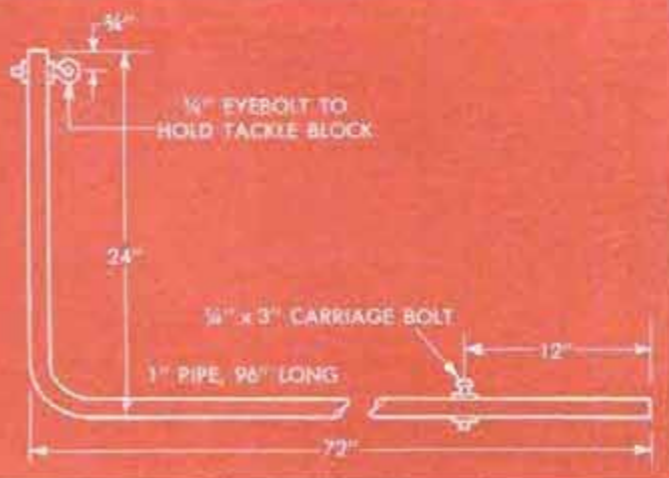
## Base Holds Davit Upright

As a base for holding the davit upright, drive a  $1\frac{1}{4}$ -in. pipe adjacent to the dock so that the top of the pipe is 18 to 20 in. above the floor of the dock. A piece of flat iron clamped over the pipe and screwed to a dock timber will hold the davit in position. Slip the lower end of the davit into the base pipe, attach the block and tackle and the davit is ready for use. Davit and tackle can be swung over the dock to pick up the motor and then swung over the water to lower the motor onto the transom of the boat. Reversing the procedure will permit the motor to be lifted from the boat to the dock where it can be placed on a motor cart.

When hoisting or lowering a motor the boat should be tied close to the dock by a stern line and bow line. Always secure the free end of the tackle rope on the davit or a dock cleat when stepping from boat to dock.—Walt Durbahn, Highland Park, Ill.

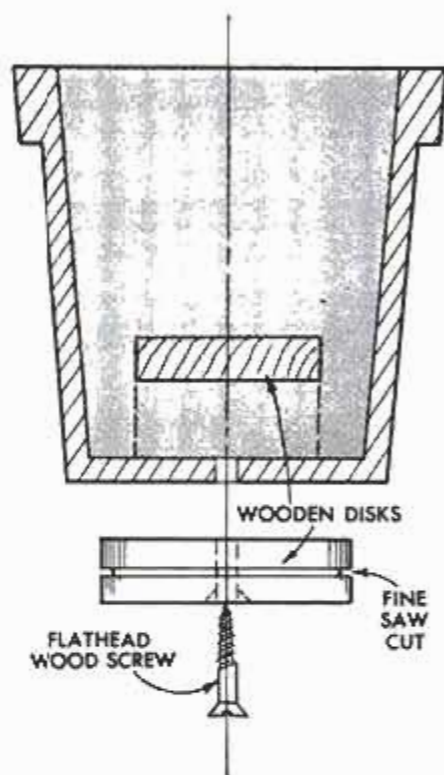


Above, motor is steadied with one hand until clear of boat to prevent damage to transom and propeller. Below, before lifting motor off dock make certain motor sling is well secured to lower-tackle block





# HANDWOVEN FLOWERPOT COVER

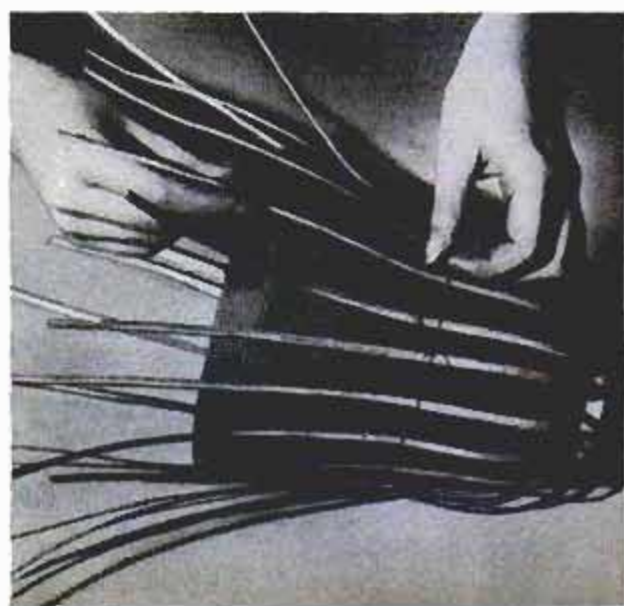
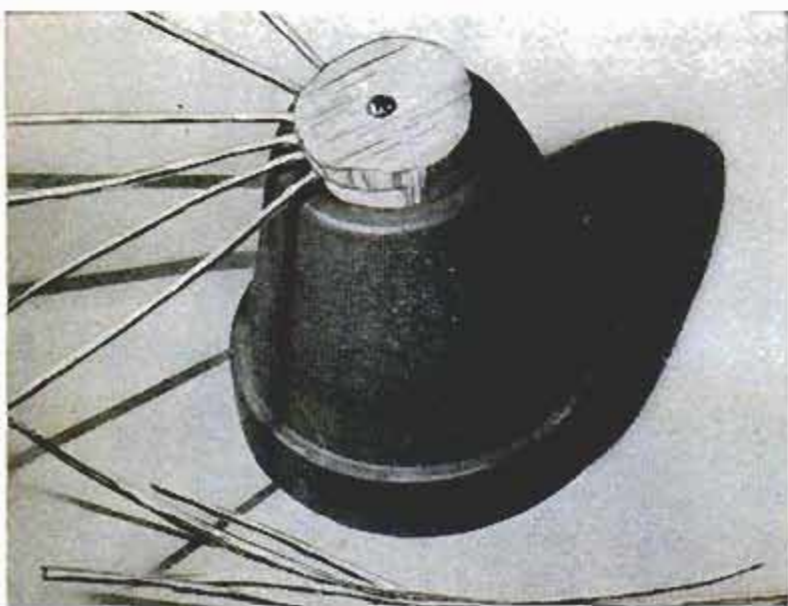


**C**LAY FLOWERPOTS, although extremely practical for growing plants indoors, are not especially attractive when placed in a modern decor, and have the added disadvantage of being broken fairly easily. However, any clay flowerpot can be given both beauty and resistance to shatter

**1.** Screw grooved base disk to bottom of flowerpot, then insert tapered ends of cane strips firmly in groove

by weaving a cane basket to fit it. No special skill is required to weave the basket, and the only fixtures needed, besides the pot, which is used as a form, are two wooden disks. Both disks are cut from  $\frac{3}{4}$ -in. stock, one being smaller and fitting inside the pot. The other disk should be large

**2.** Slip rubber band or wire ring up around strips so that they are forced up against side of flowerpot





enough to provide a firm base for the flowerpot, since it will become part of the finished basket. A groove is cut around this base disk with a fine-toothed saw to receive the tapered ends of the vertical cane strips that are used for weaving the basket. To hold the base disk on the pot, drill and countersink it to accommodate a flatheaded wood screw. Pass this screw through the disk and through the hole in the bottom of the pot and drive it into the smaller disk inside the pot, as indicated in the detail. Now, taper the ends of a number of cane strips and insert them in the groove around the base, Fig. 1. When a full circle of strips has been inserted, bend them up alongside the pot and hold them with a heavy rubber band or piece of wire as indicated in Fig. 2. Cane strips now are woven between the vertical strips as in Fig. 3. Pull each strip firmly and push it down against the lower strips so the weave is solid and

even. After a few horizontal strips have been woven, the rubber band or wire can be removed and the vertical strips will stay in place. Continue weaving up to a point just below the widened rim of the flowerpot. At this height a reinforcing strip is inserted, Fig. 4. The reinforcing can be several of the flat strips, or a single round one. Besides providing rigidity, the reinforcing produces a finished appearance at the basket top. After the reinforcing has been woven in, remove the wood screw and slip the basket off the flowerpot. Weave the projecting ends of the vertical strips around the reinforcing strip and trim off any that are too short to be woven. If the cane has been soiled or stained by your hands, scrub it with a brush and water, then allow to dry thoroughly. To permit easy cleaning, varnish or shellac the basket. It also can be painted, but the natural color of the cane usually is more attractive. ★ ★ ★



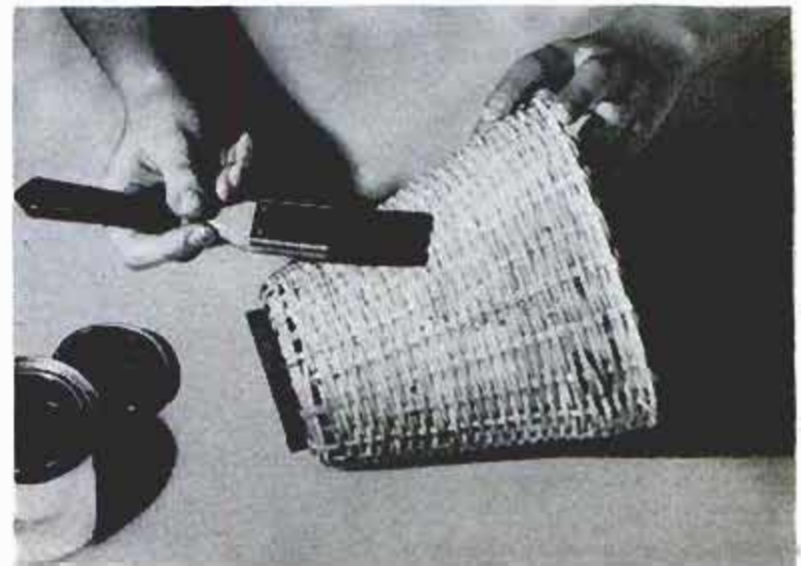
**3.** Weave horizontal strips between the vertical strips, pushing each row down against the next lower row

**5.** Remove basket from flowerpot and weave projecting ends of vertical strips around reinforcing strip



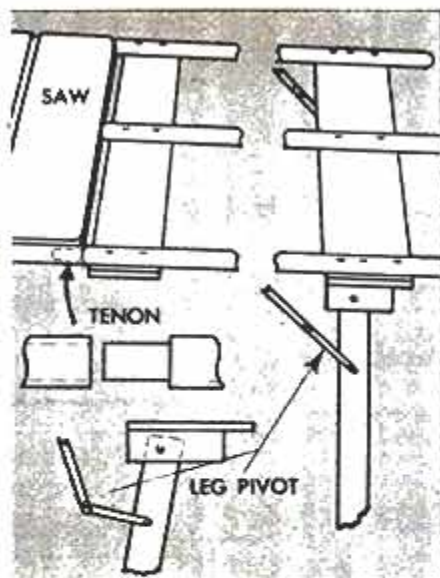
**4.** At point just below rim of flowerpot, insert reinforcing strip to strengthen finished basket

**6.** Finished basket is left its natural color, then varnished or shellacked to permit easier cleaning





## Saw-Table Extension Folds for Storage



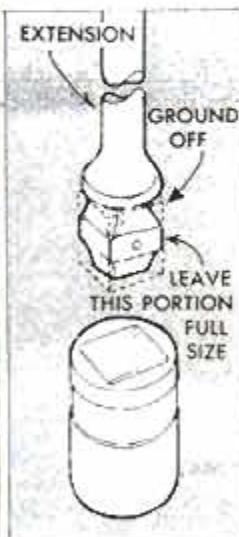
An extension for a saw table, utilizing dowels for its top, will enable one man to handle and cut large pieces of stock, such as plywood and hard-board sheets. On saws like the one illustrated, that have tubular ripping-fence guides, a tenon is cut on the ends of the dowels to slip snugly inside the open tubes. On saws with flat guides, the dowel ends can be squared and clamped on the table against the guides. Another method of attaching would be to drill holes in the flange on

### Vibrationproofing Setscrews

Setscrews used to hold pulleys on the shafts of power tools often become loose due to vibration. To prevent this from happening, replace each original setscrew with two shorter ones. The first screw is turned down tightly against the shaft, and the second is turned down against the first, locking both in place.—Burton L. Wollenzien, Grand Junction, Colo.

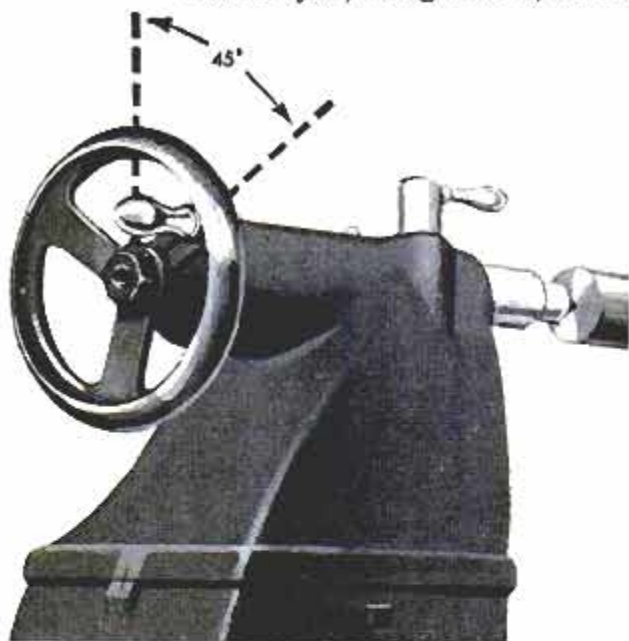
### Modified Socket-Set Extension Provides "Universal" Action

Universal-socket action is provided for the straight sockets in one mechanic's toolbox by using a modified socket extension. The drive end of the extension is ground off as indicated in the detail, so a straight socket can "rock" on the extension. The center portion of the extension end is left intact to provide a positive connection for driving the socket.



the side of the saw table to allow bolting on a 2 x 2 that has been drilled to receive the ends of the dowels. The cross pieces of the extension are made of lengths of scrap wood. The two legs are pivoted and fitted with folding braces, permitting the extension to be folded for storage. In the photo, the saw guard has been removed for purposes of illustration. The guard should be used at all times wherever practical.

Paul Fryar, Long Beach, Calif.

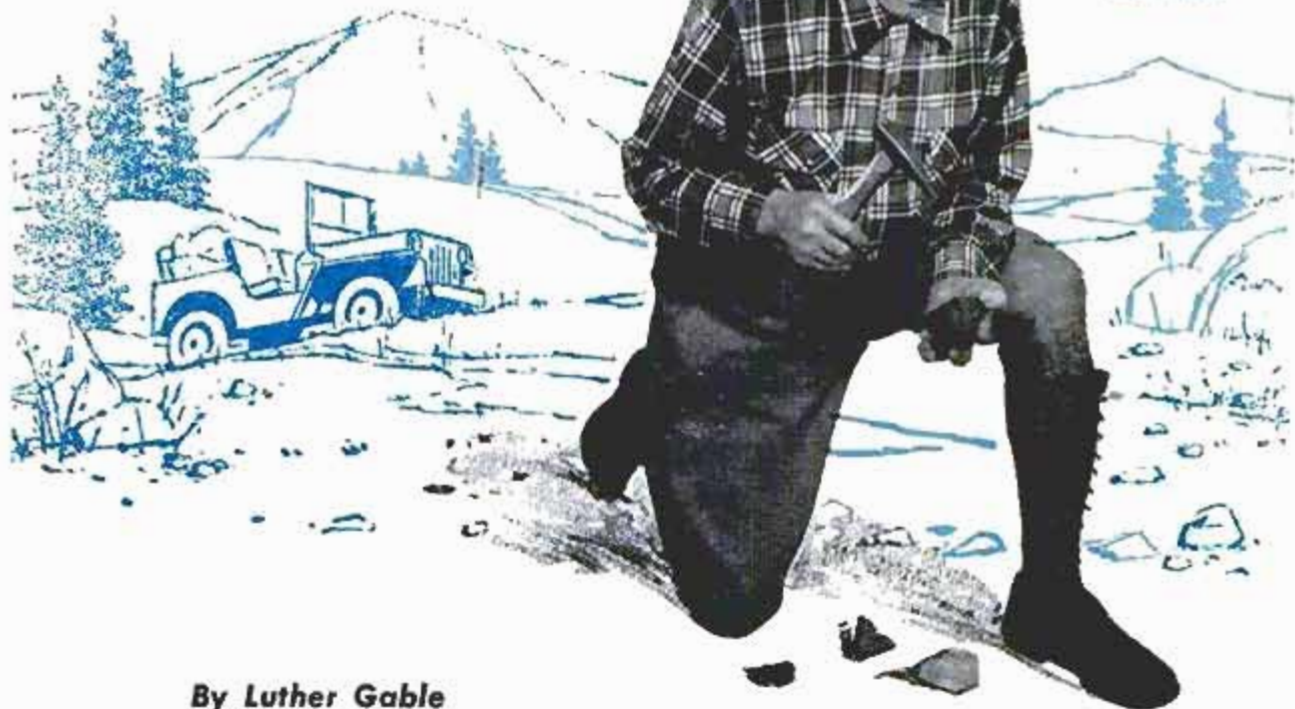


### Proper Setting of Tailstock

When properly set, the knob on the tailstock-spindle handwheel should be between the top and one-eighth of a turn down clockwise. This has proven to be the most convenient position for the knob if the wheel has to be backed up (counterclockwise) due to the work expanding when heated.



# Prospect for Uranium With a Roll of Film



By Luther Gable

**YOU DON'T NEED** an expensive geiger counter to prospect for uranium. Just look for rocks, sand, ledges and outcroppings that bear a canary-yellow stain—one of the characteristics of the oxide of uranium visible to the naked eye. If a sample of one of these materials is found to be unusually heavy for its size, there may be uranium present. When collecting specimens suspected of bearing uranium, enter the location and date of each find in a log book. Then, place the specimens on unexposed photo film in a light-tight container for several days. At the end of this time, develop the film and if light-struck areas appear on the negatives, it is likely that you have found uranium.

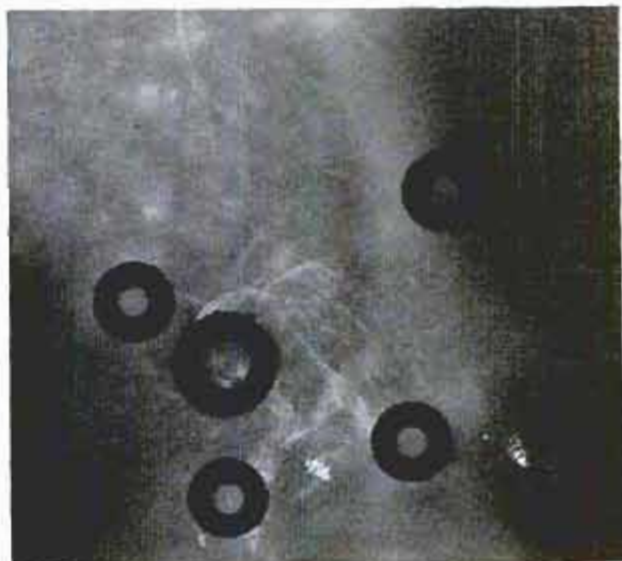
## Comparing Values

A good means of providing a comparative scale of values for determining the approximate percentage of uranium contained in a specimen, which has been checked by the film-exposure method, is to obtain an ore sample of known uranium content and prepare a negative with it. Samples of specimens that prove valuable by this rudimentary assaying can be sent to the nearest State Bureau of Mines or State Geological Survey for a percentage-analysis report. Be sure to include an estimate of the amount of ore available for each specimen.

When preparing specimens for processing, cut the film, which may be of any size

or index, a high index number being preferable, into 2-in. squares. Then slip the squares into opaque envelopes. These may be made from black construction paper. (Note that this entire procedure of cutting film and inserting it in envelopes must be done in total darkness.) Place the envelopes in a lightproof drawer or box with one or more small, flat metal objects on top of each envelope. At this point it is important that the emulsion side of the film face upward. Use one penny on one envelope,

When print is made from negative exposed by radioactive specimen, light-struck areas appear white





two on another, dimes, quarters, flat iron washers or keys on the envelopes so that no two are alike.

### Mark Samples With Tape

At the time ore specimens are collected, attach a small piece of adhesive tape to each. In the log book, opposite the number, record the exact location for each specimen and an estimate of the quantity of ore at the location, in addition to the date of the find. Then, number the negative envelopes and place the appropriate specimen on each. Record in the log book the location of specimens according to the number and type of metal objects on a particular envelope. The pieces of metal serve to identify the specimens and produce a silhouette on the negatives for easier evaluation. Allow a space of at least 3 in. between the film packages to avoid contamination between specimens.

If sand or fine fragments are being tested, place the material in a coin envelope and treat it the same as a rock specimen. Seal the drawer or box containing the specimens with adhesive tape.

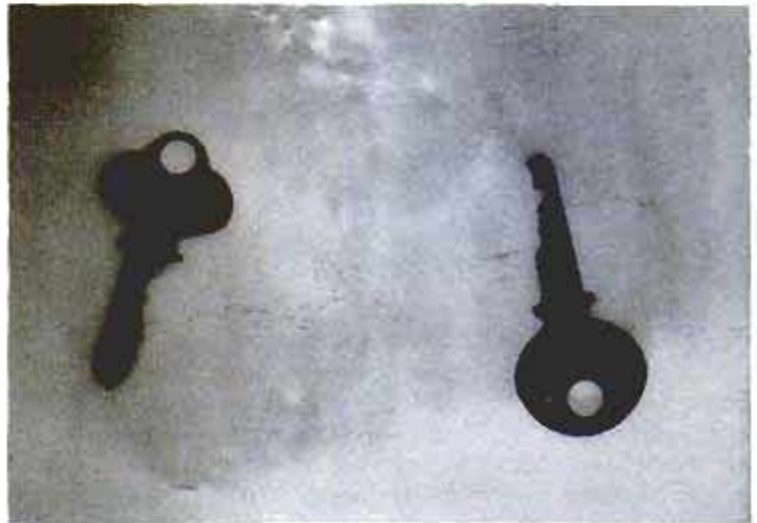
### Examine Carefully

At the end of a week remove the film from each envelope and develop it the same as film used for photographic purposes. Then, examine each negative carefully for light-struck or fogged areas which, if present, may have been caused by radiation from uranium in the sample. A small amount of radiation will penetrate the envelopes and affect the emulsion on the negatives, leaving a light silhouette where the metal objects are located.

If you have been fortunate enough to have found a high-grade ore, the entire film may appear light-struck, including the area under the metal. For more-accurate test results in the latter case, run the specimen through another test under the same conditions but for a period of only one or two days. If a strong silhouette is produced on the negative this time, you have a very high-grade ore. For information on how to stake out a claim and begin mining operations, write your State Bureau of Mines or the AEC, Washington, D. C. ★ ★ ★



Above, uranium in specimen acts like X ray, penetrates opaque envelope and film emulsion except where blocked by metal



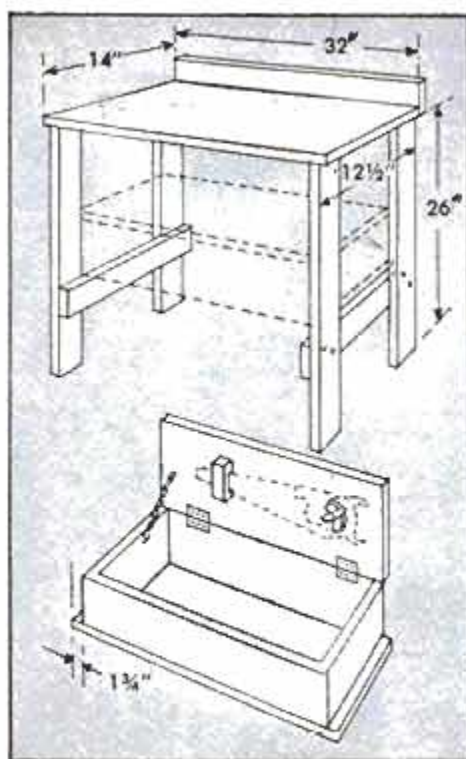
Above, heavy white area on print made from this test indicates a very rich ore sample. Below, ore samples are placed on envelopes containing squares of unexposed film in drawer





## Junior-Size Bench and Tool Chest for the Young Craftsman

Keep Junior interested in crafts by helping him build this junior-size workbench and tool chest. Cut the four legs and two cross pieces from 1 x 3-in. stock and assemble them with wood screws. Then fasten the legs to a  $\frac{3}{4}$ -in. plywood top using right-angle metal brackets. A length of 1 x 4-in. stock is attached to one edge of the top for a backstop. The floor of the tool chest is  $\frac{1}{2}$ -in. plywood cut to fit on top of the cross pieces between the legs. The box frame of 1 x 4-in. stock is made  $3\frac{1}{2}$  in. shorter than the bottom panel so that the cover will clear the legs.—J. R. Tate, Ottawa, Ont., Can.



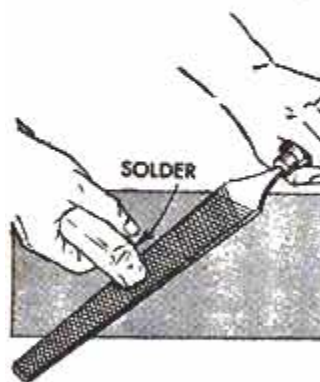
## Practical Light-Duty Anvil



An old flatiron mounted in a wooden block provides a good light-duty anvil for working small metal parts. Gouge a recess in the top of the block to bring the soleplate flush with the top

surface, taper one end of the block to the contour of the iron and then bolt it in place.—M. C. Anderson, San Lorenzo, Calif.

## Bar of Solder Cleans File Teeth

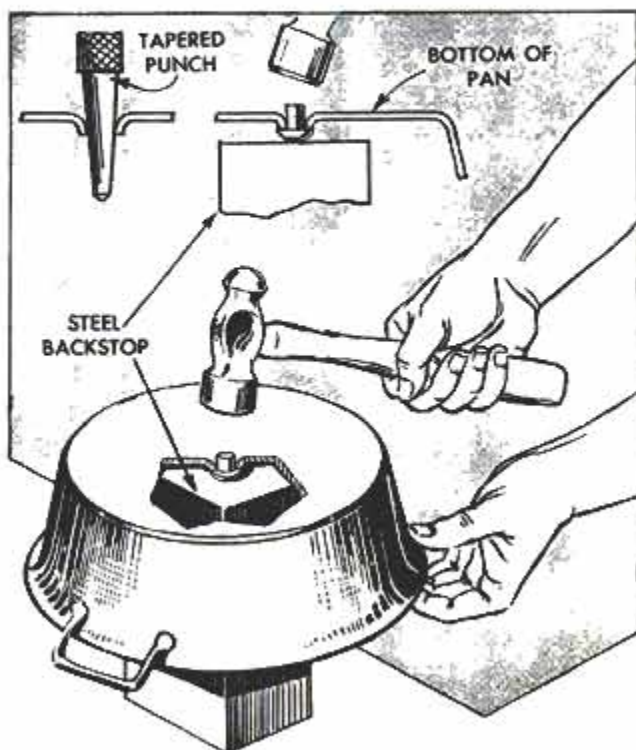


If a strip of copper or other soft metal is not at hand, a badly clogged file can be cleaned by using a bar of solder in the same manner as the other metals would be used. The solder is rubbed across the

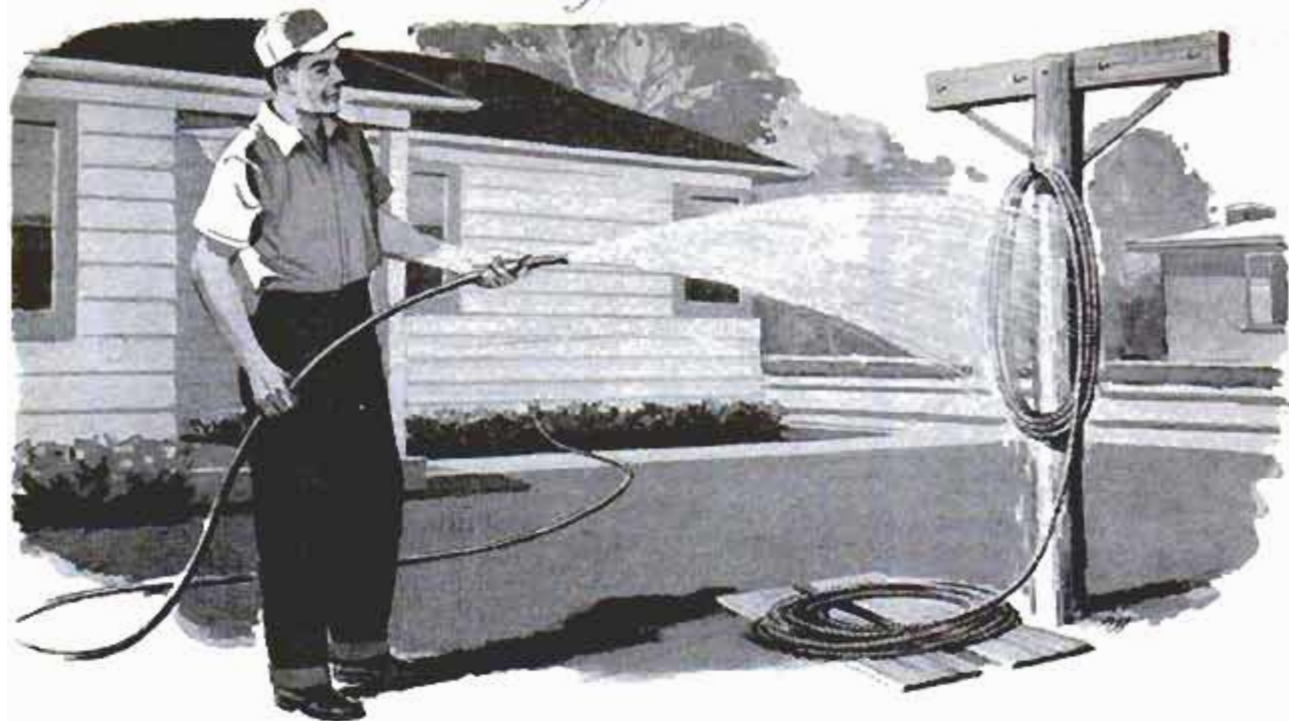
teeth so the embedded material is pushed out the side of the teeth. Occasionally drawing a file across a piece of carpenter's chalk will keep the teeth from becoming clogged when filing lead, babbitt or other soft material.

## Holes in Aluminumware Repaired With Rivets

It is not practical to repair small holes in aluminum containers by soldering, but they may be plugged with aluminum rivets. First, round the hole by turning a tapered punch into it, leaving the burr to be crushed against the rivet. Then, insert the rivet with the head inside the container and resting on a steel block, and complete the riveting.







# Make Your Rope Last Longer

By Earl F. Wobek

**W**HETHER YOU USE rope around the home, farm or for other purposes it will last longer and afford safer, more dependable performance when a few simple rules are used to guide you in its selection, care and handling. Rope construction has a definite effect on all its characteristics, such as flexibility, tensile strength and abrasion resistance.

In the manufacture of rope, fibers are twisted into yarns, yarns into strands, and then three or more strands are twisted into a complete rope, Fig. 1. By controlling the amount of twist, a hard, standard, medium-soft, soft or extra soft rope can be made. For most uses a standard-lay (twist) rope is best. A hard rope has less strength but more abrasion resistance. A soft rope handles easily but abrades more readily.

For most purposes rope made from natural fibers (Manila, sisal, hemp, cotton and linen) is more suitable than rope made from synthetic fibers, such as Dacron, nylon and glass fiber. Rope of the latter type is designed for use around chemicals, high temperatures and other special uses. Natural-fiber rope is pliable, resists surface abrasion well and is available in a variety of sizes.

A third factor to be considered when selecting rope, in addition to lay and type of fiber, is the size and breaking strength. How strong should a rope be? Good practice dictates a 5 to 1 ratio between the rope and load it is to lift, when the rope is new. For example, if you intend to

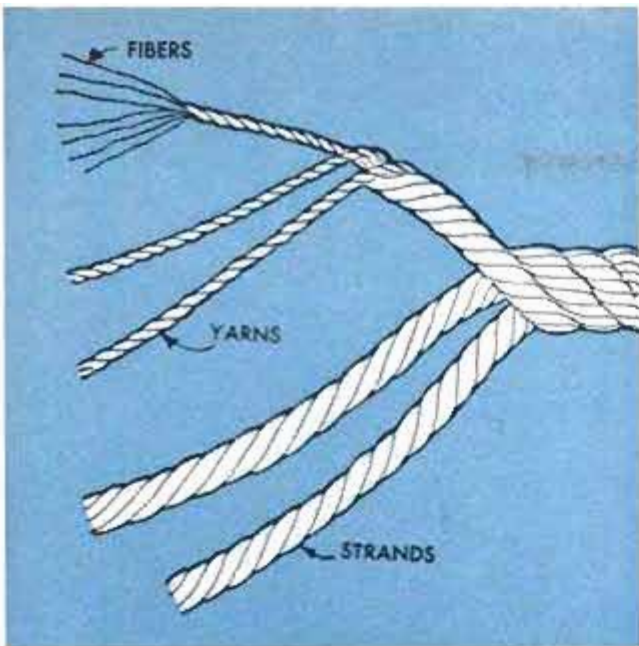
lift a load of 1000 lb., a rope with a minimum breaking strength of 5000 lb. should be used. Referring to a manufacturer's size-and-strength specifications sheet, Plymouth Cordage Company, Plymouth, Mass., in this case, Manila rope  $\frac{3}{4}$  in. in dia. with a minimum breaking strength of 5400 lb. is a safe rope size to use. As rope becomes older, that ratio should be increased.

## Block and Tackle

The tackle ordinarily used for hoisting, lowering or moving heavy objects consists of two blocks and a rope. The strength of the block, not the strength of the rope, determines the load limit. A good rope is always stronger than the block for a given size of pulley or sheave. Use the largest diameter sheave practicable and reeve the rope properly as shown in the diagrams in Fig. 4. In reeving, what is to be the becket end of the rope should be passed through the blocks away from the fall (hauling part) and toward the becket. This eliminates having to pull all the rope through all sheaves of the blocks.

When tackle is used to lift a weight, the pull required on the fall rope can be determined by dividing the weight by the number of ropes, or parts, running from the movable or lower block in most cases. Add a friction loss of 10 percent for each sheave 3 in. in dia. or larger, in both fall and movable blocks. For example, a load to be lifted is 1000 lb. The tackle consists of 2 double blocks, 4 sheaves, 4 rope parts





1. Fibers are twisted into yarns, yarns into strands, then three strands are twisted into a right-laid rope



2. Unwind new right-laid rope counterclockwise from inside of coil, unwind left-laid rope, clockwise

at the movable block. Mechanical advantage is 4. Friction loss at 4 sheaves is 40 percent.

1000 lb. plus 40 percent equals 1400 lb.

1400 lb. divided by 4 equals 350 lb.

Pull needed on fall rope is 350 lb.

### Proper Use of Rope

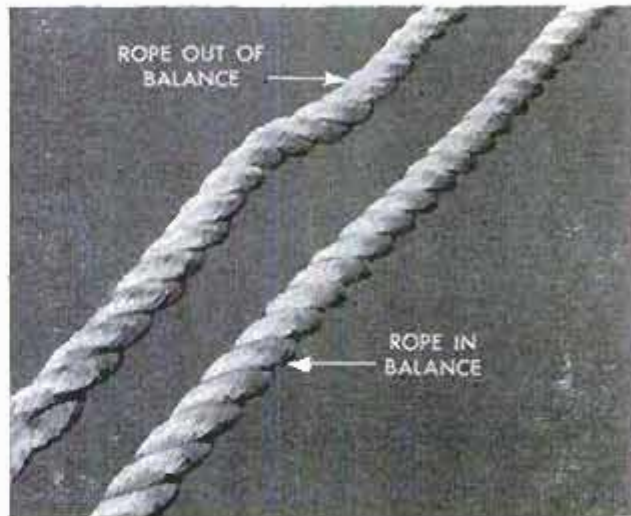
Good rope usage starts when the new coil arrives. To avoid kinks, which weaken a rope, lay the new coil on the floor with the inside end on top. Unwind right-laid rope counterclockwise, Fig. 2. If it uncoils clockwise, turn the coil over, pass the end through the coil, and uncoil.

Adding or removing twist from a rope destroys its balance. Too much twist results in kinks, Fig. 3; too little causes the strands to harden and lose their strength.

A knot should not be used to join ropes permanently. Always splice. A knot retains only about 50 percent of the strength of the rope, while a properly made splice retains 85 to 95 percent. The free ends of a rope should always be bound or "whipped" to prevent unraveling of the strands.

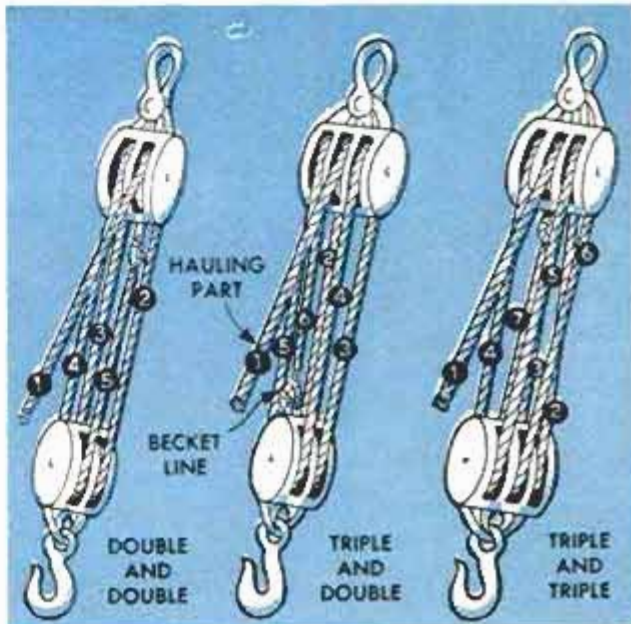
### Keep Rope off Ground

Needless surface wear can be avoided by keeping rope off the ground. Grit and sand not only abrade the surface but also work into the rope lays and cut the fibers. Avoid tying or pulling rope over sharp corners. If it is necessary for rope to be in contact with the ground or a sharp corner, protect the rope at that point by wrapping it with canvas or other soft material. The diagram, Fig. 6, shows weights of pull exerted on rope parts of slings at various angles. In each case a 2000-lb. load is lifted. Note that the pull required to lift 2000 lb. is the same as the load only at zero



3. Adding or removing twist from rope destroys its natural balance, producing kinks and loose strands

4. When making up block and tackle, pass bucket of rope through blocks according to numbered sequence





degrees from the vertical. At a 120-deg. angle the strain on the rope is doubled, and is almost four times as great with an angle of pull at 150 deg. There is an absolute disregard for rope economy and a real danger to life and property when slings are used at an angle of pull greater than 90 deg. Some of the strain put on the outer fibers of rope at sharp bends can be reduced by using pads of burlap or cloth between the load and the rope, Fig. 5.

### Rope Care

When not in use rope should be stored in a dry, cool room that is well ventilated to avoid dry rot or mildew. Place rope in loose coils on open grates high above the floor, or hang it on wooden pegs. Never store a wet rope before drying it thoroughly. A rope subject to alternate wetting and drying loses its strength more quickly than when it is wet all the time.

Rope that is badly soiled or laden with dirt should be washed in clean water and dried before it is stored or used again. To do this dip the rope in a basin of water, or hang the rope in loops over a bracket outside and hose it as shown in the illustration at the beginning of this article. Be careful not to drive the dirt in deeper by too much water pressure.

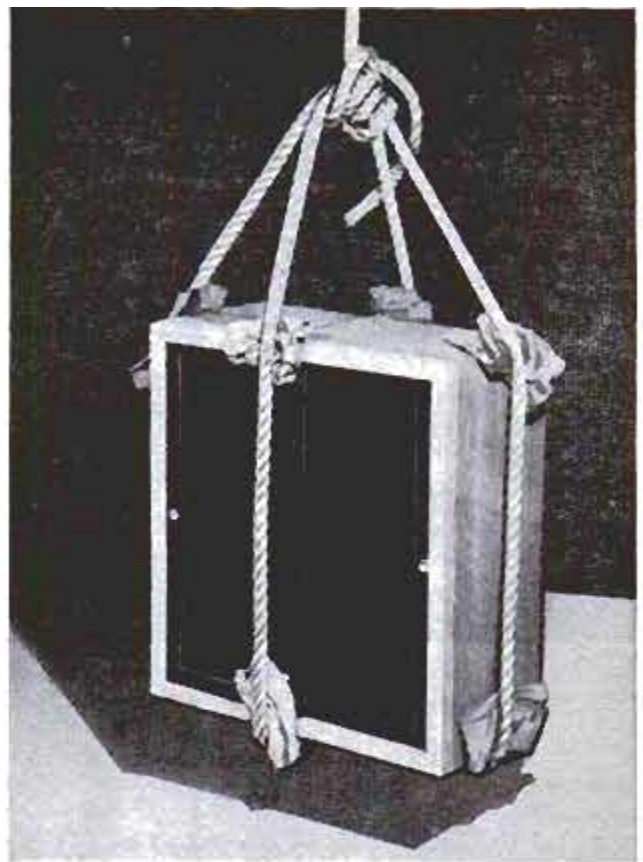
### Check Rope Regularly

Inspect new rope carefully for damage before using it. It may have been carelessly stored or handled after leaving the manufacturer. New, good Manila rope is hard but pliant, with a smooth silky feel. Its color is yellow, with a silvery or pearly luster. Sisal rope is yellowish-white with no gloss. Hemp is softer than Manila and usually dark gray in color.

Rope that is in use should be inspected periodically for defects. When checking on external wear, look for abrasions and broken or cut fibers on the outside. When surface threads are worn halfway through on small rope, discard it.

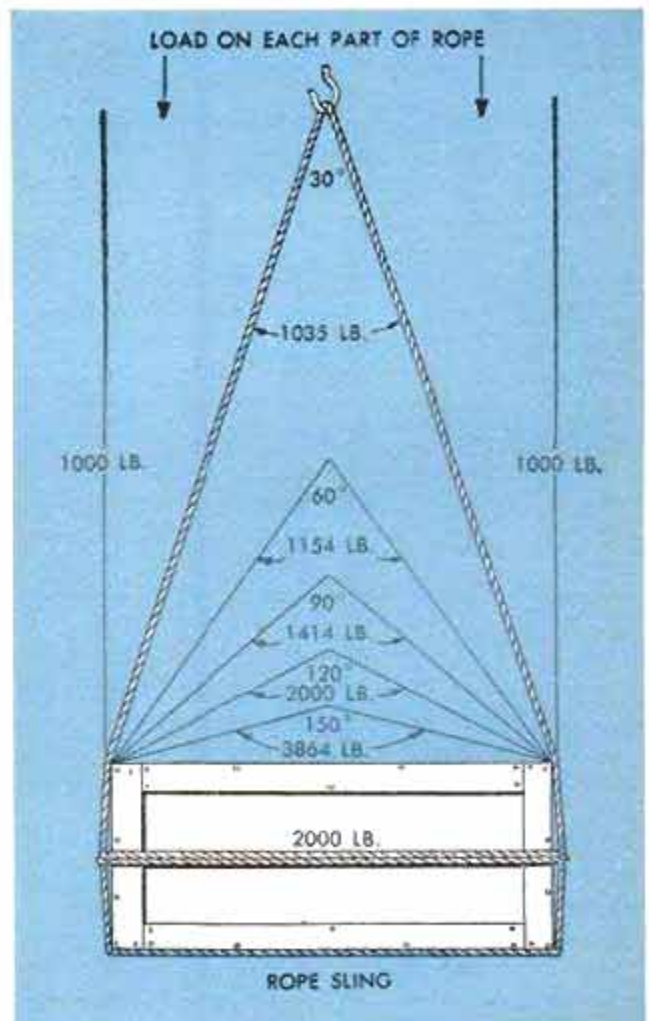
To detect internal wear look for variations in size or roundness of strands, indicating torn or cut fibers. Suspicious places can be checked by unwinding the rope. Also look for white powdery residue caused by grinding the fibers at a bend in the rope that is under heavy strain.

Color of a rope is a good indication of its condition. Chemicals or animal excretions burn brown spots into rope, making it unsafe. A rope that has lost its luster, or is discolored and has a musty odor is not safe. If inner yarns are bright, clear and unspotted, the rope still has life. But a rope that has lost its feel, pliability or stretch, or appears dry and brittle should be replaced at once. ★ ★ ★



5. Strain put on rope at sharp bends is reduced by placing burlap or cloth between container and rope

6. Weights between arrows are for each part of rope, showing wide-angle slings cause excessive strain





# Painted Stripe Outlines Edges of Driveway

Winding driveways, and straight ones, too, are easier to follow at night if a border stripe has been painted along each edge. Asphalt driveways can be marked with white or yellow paint, and concrete pavement with black paint applied a few inches in from the edge. If luminous concrete paint is available in your area an even more significant stripe can be painted, which will glow and indicate from a distance the location of the driveway and where to turn in off the street. The stripes help prevent your driving over the edge of the lawn, or into an adjoining drainage ditch.

## Eraser Aids Thumbtacking

If you frequently are required to thumbtack notices to a bulletin board, try putting a  $\frac{1}{16}$ -in. slice of rubber eraser under the head of each tack. The rubber protects the paper against tearing out at the corners and holds the tack head away from the board so it can be removed easily.—Mrs. Michael Fey, New York City.

## Soft Sanding Block for Curves

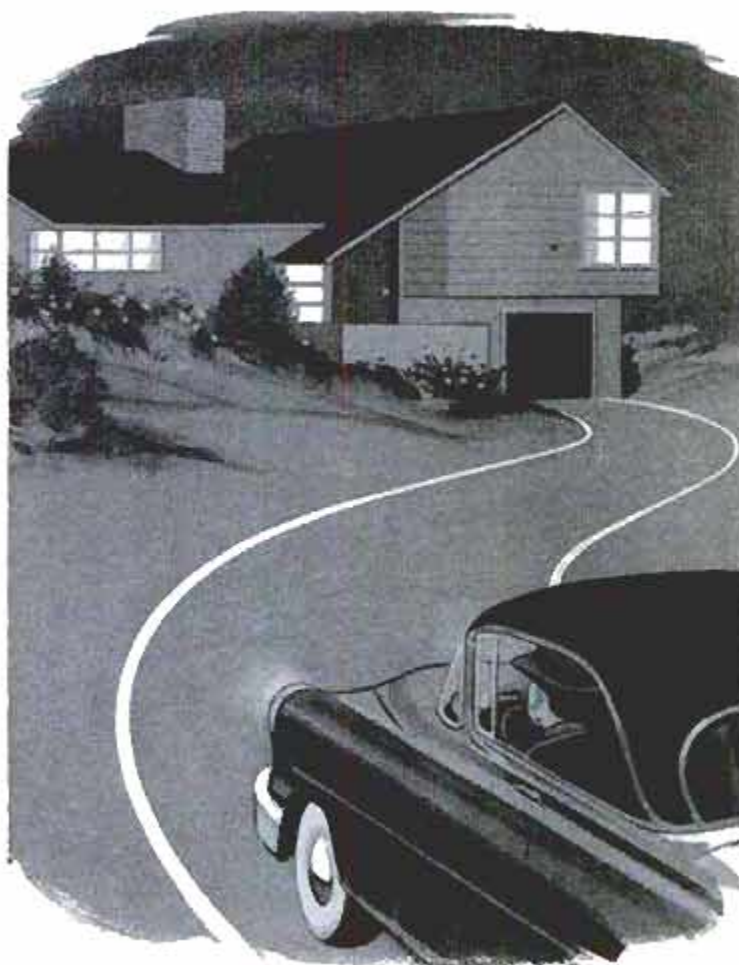


A soft sanding block for sanding curved surfaces can be made by wrapping sandpaper around a rolled scrap of sponge rubber. A double fold is made at the point where the edges of the sandpaper join, and they are bound together with paper fasteners. An old

sponge-rubber kneeling pad can be cut up to supply the soft core, or a rubber bath sponge may be used. In some cases, a small hand towel rolled tightly will do as a substitute for the rubber.

## Problem With Tire "Thump"?

What causes tire "thump" and what can be done to eliminate it, is the subject of a feature in the September issue. Included is a simple test any motorist can make to quickly determine which tire is causing the trouble.



## Particles Removed From Paint With Cheesecloth

Paint that contains hardened particles and other foreign matter is restored to a useful condition by straining it through cheesecloth. Hold a small piece of the cloth tightly over half of the open end of the can and pour the paint through it into another container. It may be necessary to fold the cloth double to remove all the small particles from the paint.

O. A. Nelson, Seattle, Wash.





## Buried Crossrail on Child's Swing Eliminates Side Braces



An underground crossrail fastened to the upright posts of this child's swing prevents them from working loose in the ground and eliminates the need for exposed braces and guy wires which cause falls and injuries. The crossrail and surfaces of the posts that are below ground level should be adequately treated with a wood preservative to prolong the life of the swing. Better still, embed the timbers in concrete allowing for a depth of a few inches of soil or sod between the posts to prevent injury from striking the concrete should the child accidentally fall off the swing.

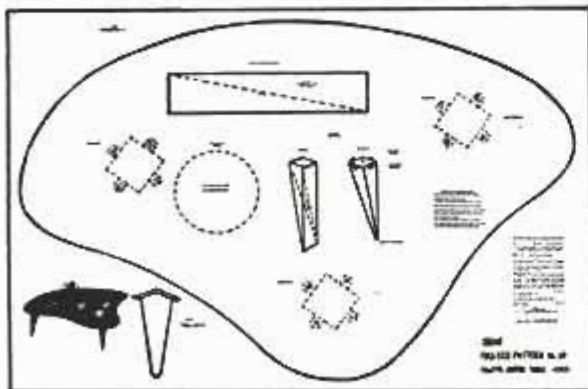
## Iron Removes Wallpaper

In removing wallpaper there are always several stubborn areas where the paper does not come loose with the usual wetting and scraping method. An ordinary steam iron held over these spots for a few seconds will loosen the paper sufficiently to allow removal by the usual scraping method.

R. M. Woodbury, Natick, Mass.

## Beautiful, Useful Furniture You Can Build WITH FULL-SIZE PATTERNS

You can make sturdy, good-looking furniture, toys, valances, metal lamps—even a 12-foot utility outboard with PM Full-Size Patterns. They were all drawn by a professional designer and built in our shop to test fit of parts and construction details.



No. 116. Palette Coffee Table

Above is an actual photograph of Pattern No. 116, a Palette Coffee Table, which is 31½ x 47½ inches at its widest points. It can be made in one evening, if you have a bandsaw for making the curved cuts. Pattern includes complete construction and finishing details. 50c.

Modern Cocktail Table, No. 103. This table is 40 x 19 inches; 15½ inches high. With its metal grill inserts and plank top, it's modern in design and solid as a rock. One pattern—costs only 50 cents.



Love Seat, No. 114. Designed in the Lawson style, this love seat goes with either modern or traditional settings. Uses sag-less type wire springs and foam-rubber padding. Two patterns in the set: \$1.00.



Trundle Beds, No. 102. These beds save space and are safer for youngsters as there is no ladder to climb; have storage headboards, and use standard size mattresses. Three patterns: \$1.50.



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## POPULAR MECHANICS PATTERNCRAFT

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# SHOP NOTES

## Lathe Drawbar Operates This EXPANDING MANDREL

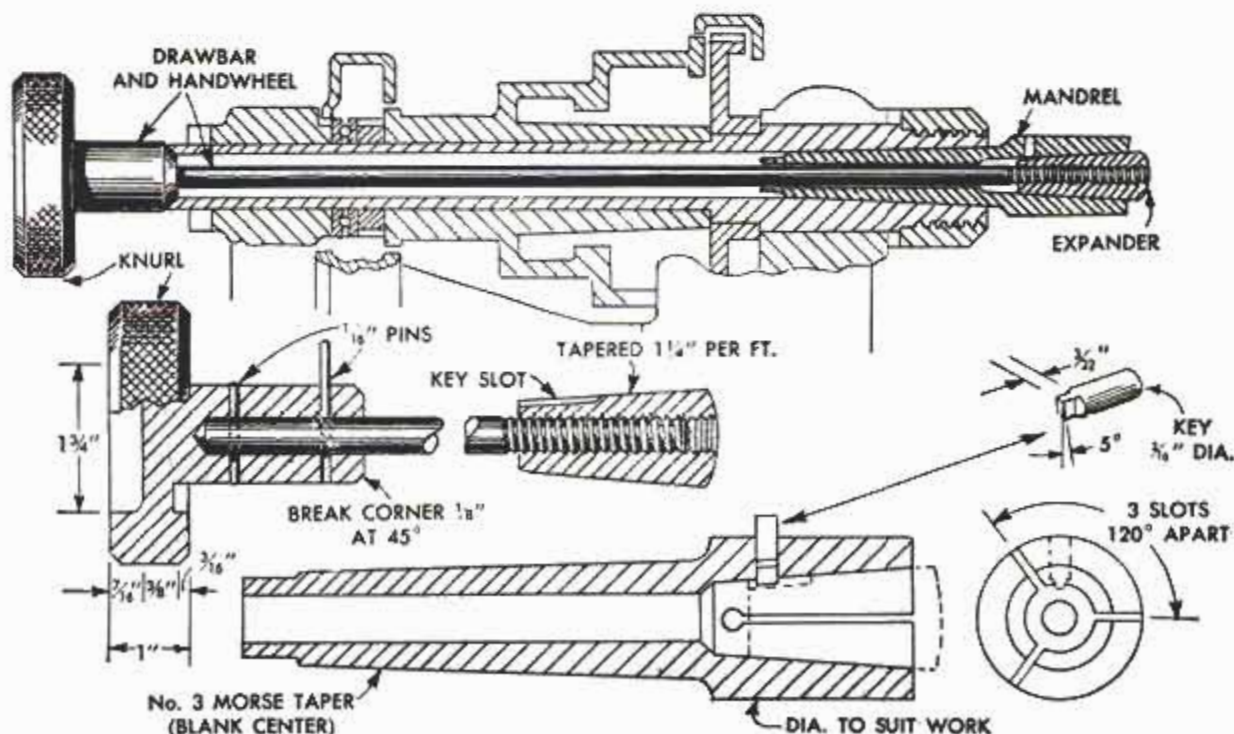
By C. W. Woodson

FOR MATCHING WORK having a hole through the center, there's nothing that will speed up the operation like an expanding mandrel that can be rapidly tightened and untightened by the lathe drawbar. In use, the work is slipped over the end of the mandrel and the latter is expanded to lock it securely by a turn of the drawbar handwheel.

The basic part of the tool is made from a blank No. 3 Morse-taper center. The hole for the drawbar is drilled the full length of the blank and the large end is tapered to receive the expanding plug, or expander. The large end is then slit as indicated, a hole being first drilled at the end of each slot, and a hole is cross drilled to take a round key which keeps the expanding plug from turning when the drawbar is tightened. The expanding plug itself is turned to shape by threading it on the end of a rod and chucking it in the lathe. This should be turned to a perfect fit in the



mandrel hole. The hole through the center is tapped for the drawbar, which consists of two parts, the threaded bar and the handwheel. These parts are shown in the center detail. The handwheel can be machined to any diameter desired with the face chamfered and knurled. The hub of the handwheel is pinned to the round drawbar with two  $\frac{1}{16}$ -in. pins as shown. If desired,  $\frac{1}{8}$ -in. pins can be used.





## Sandbag Supports Football on End for Place Kicking



Filled with sand, a cloth tobacco sack will serve as a handy tee on which to prop a football for practice or place kicking. The tee will be especially useful when playing on grass or hard ground where dirt can not be scraped into a mound on which to prop the ball. It is also small enough to be carried in a pocket between plays.—G. E. Hendrickson, Argyle, Wis.

## Envelope Liner Protects Pocket

An ordinary envelope, of the size used for personal stationery, can be made into a shirt pocket protector. Cut the envelope as shown, seal the remaining flap and fold one of the severed ends over the outside of the pocket. Pencils and pens are then inserted inside the envelope, protecting the pocket and the shirt from lead and ink marks.—Robert L. Hay, Rochester, N. Y.



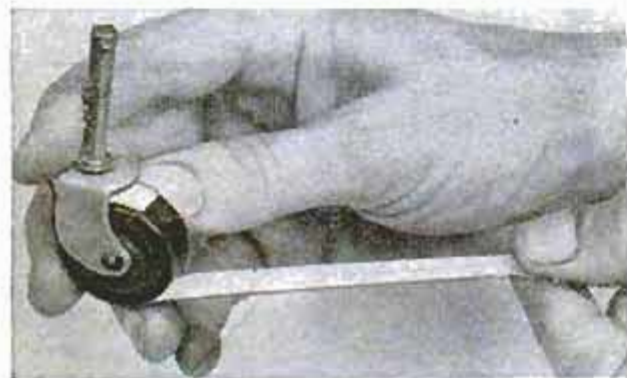
## Eraser Removes Scuff Marks From Tile Floors



A hard-rubber eraser will usually remove spots and scuff marks from tile floors. Even when rubbing with steel wool while the floor is wet proves futile, erasing may easily eradicate the blemish after the floor has dried.

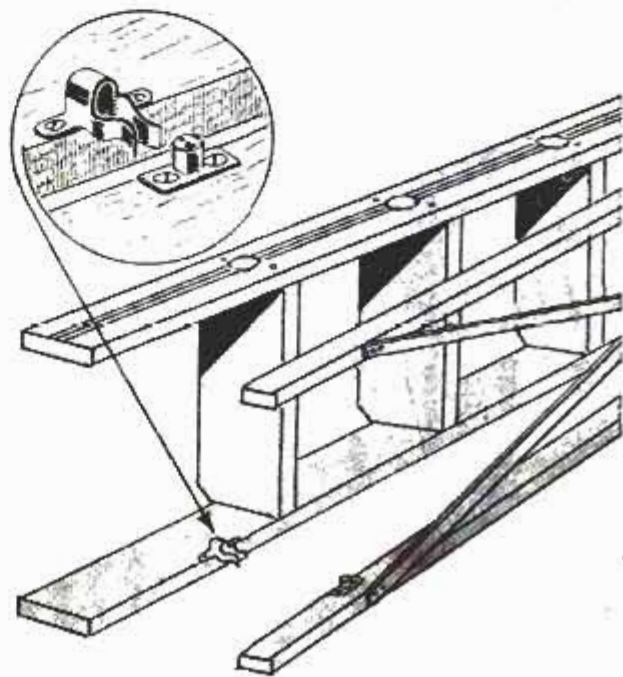
## Antimar Surface for Casters

A covering of adhesive tape on rubber or composition casters that are mounted on furniture will prevent them from making unsightly marks on the floor. Wrap the tape around the caster wheels two full turns to prevent it from unraveling. The tape will also reduce the noise caused by rolling the furniture across the floor.



## Stepladder Legs Locked Together With Cabinet-Door Catches

The annoyance of having the legs of a stepladder swing apart while it is being carried can be overcome easily with one or two friction-type cabinet-door catches installed about a foot from the bottom end of the ladder. The legs are simply pulled apart when the ladder is set up for use, and snapped back together for carrying.





## Installing or Replacing SMALL WATER SYSTEMS

Careful planning and proper installation are vital for efficient and convenient operation

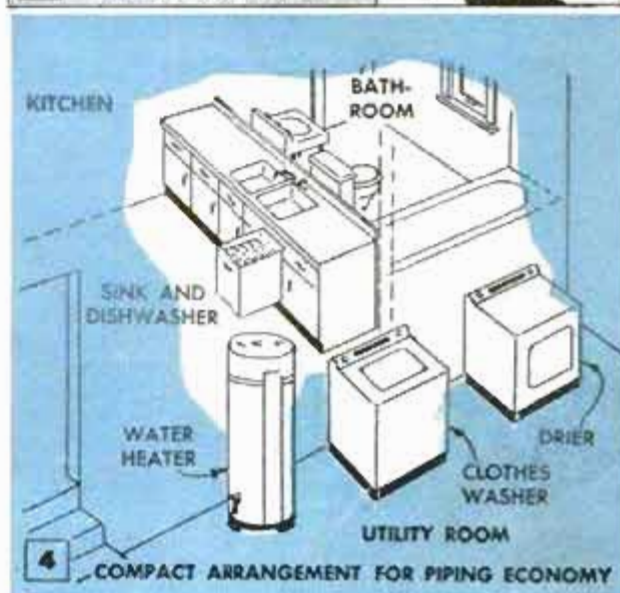
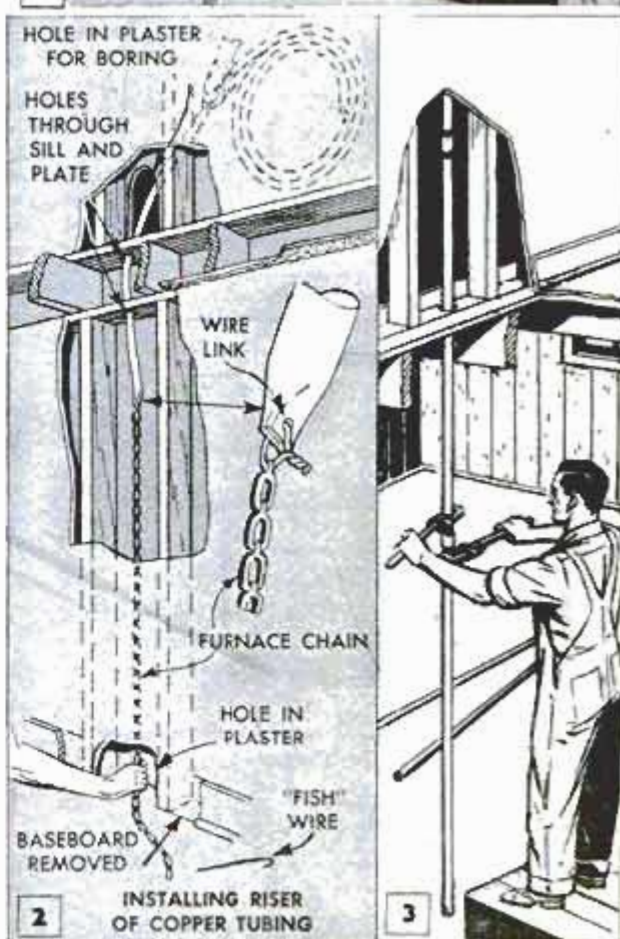
By Enno R. Haan

AS THE GREATER PORTION of a plumbing system usually is concealed, careful planning, good workmanship and the best quality of materials will minimize maintenance troubles, including possible replacement of pipe at considerable expense and inconvenience.

### Adequate Pipe Size

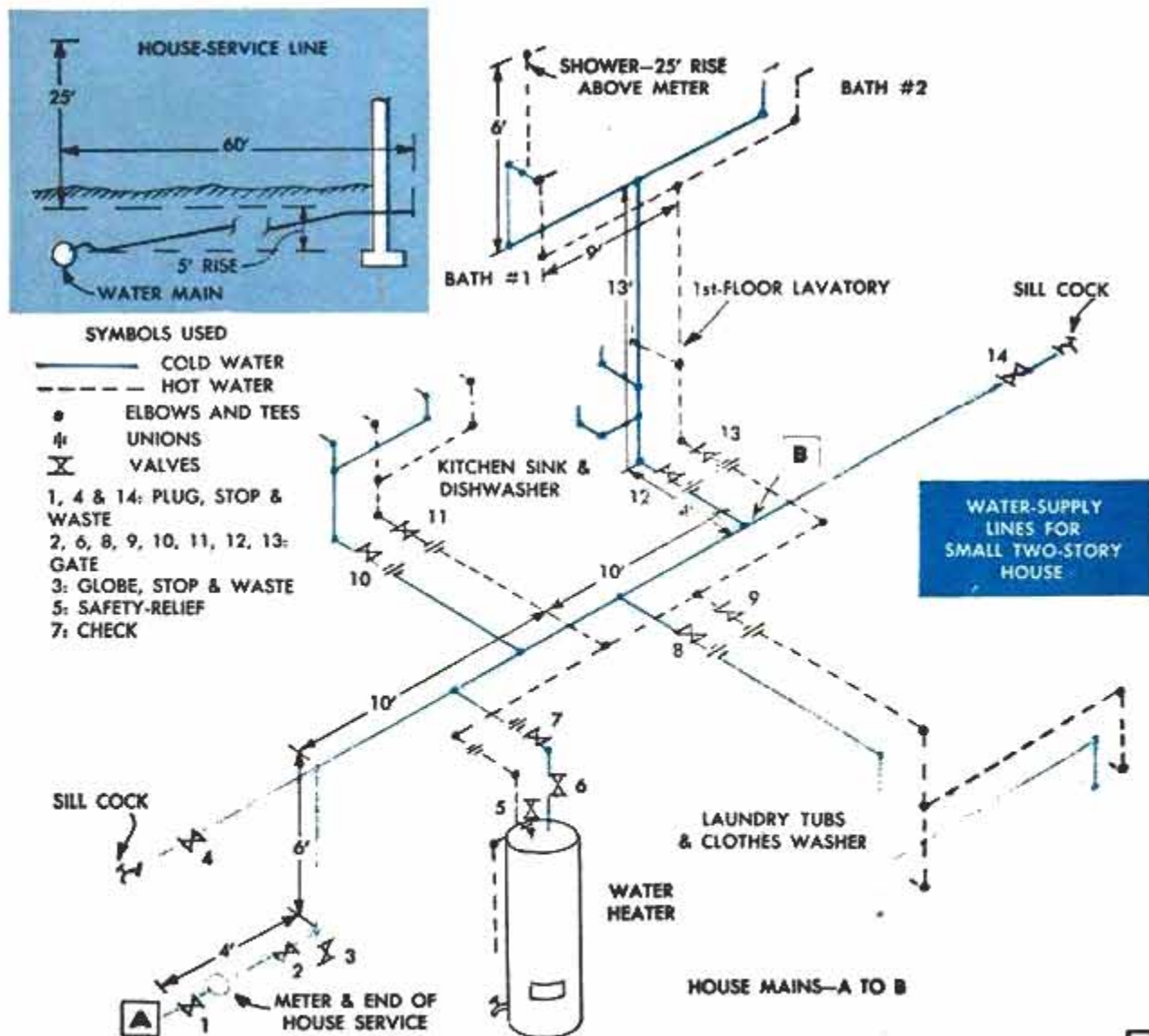
Increased water demands occasioned by modern conveniences such as automatic dish and clothes washers, water softeners, air conditioners that use water for cooling and extra showers frequently tax a system beyond its capacity. Most plumbing complaints, outside those easily cured by minor repairs, generally are caused by undersize piping. Piping that is too small can cause whistling noises due to high water velocity, aggravate water hammer and permit back-flow. The latter condition exists when undersize pipes restrict the flow of water so that if a faucet on the first floor of a house is opened, there is not enough volume of water to flow up to a faucet on the second floor. Often a partial vacuum will result in the piping on the second floor. Should a spray hose be connected to a faucet and dropped in the bottom of a filled bathtub, opening the faucet will permit the vacuum in the lines to siphon the water from the tub and discharge it through an open faucet on the floor below. The remedy for this condition is to replace the existing undersize piping.

Piping that was of adequate size originally, may become undersize because of lime and corrosion deposits inside. Another cause of insufficient flow and pressure in water pipe, which has the same effect as undersize pipe, is too many changes of direction in pipelines, involving an excessive number of fittings and often the wrong kind of valves. To determine the proper size to use is comparatively easy by following the

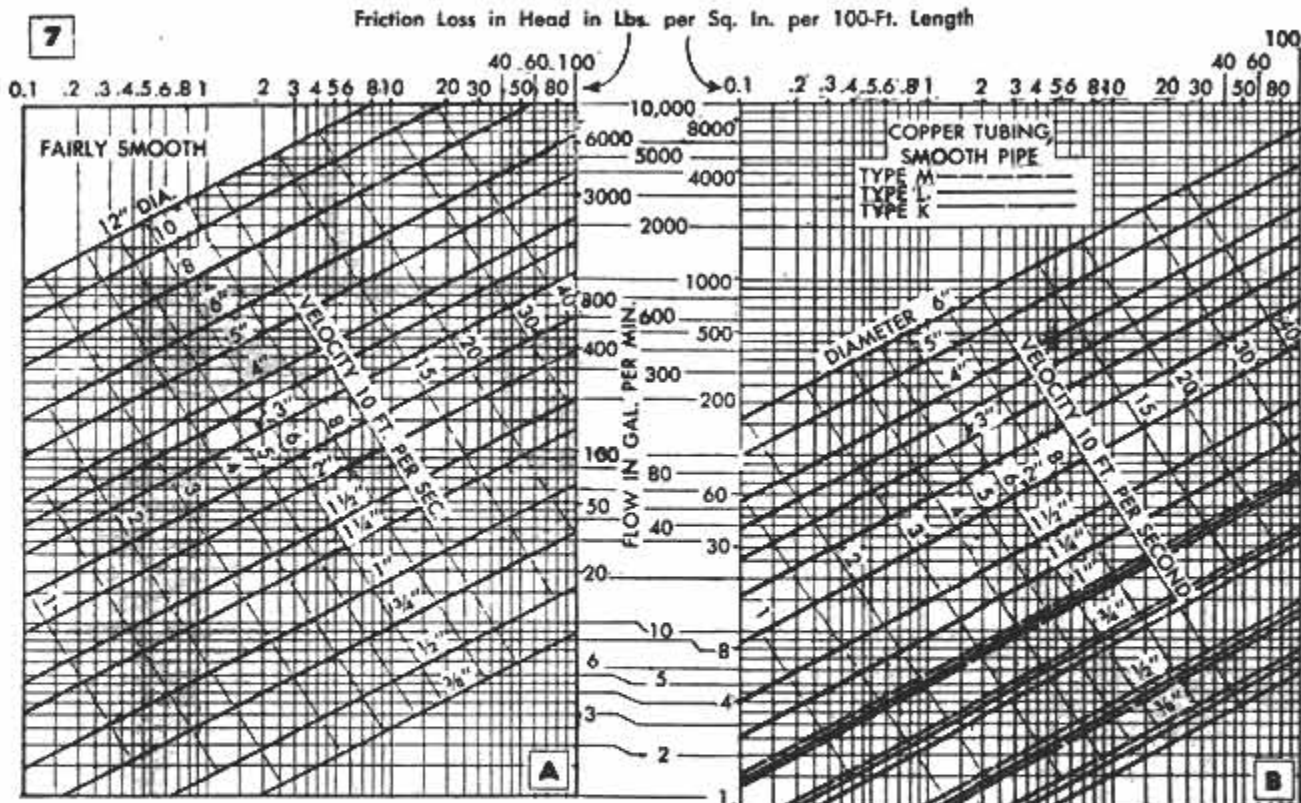




A WATER DEMAND			B FLOW RATE AND REQUIRED PRESSURE FOR COMMON FIXTURES					
A—Rate of flow in gallons per minute (g.p.m.) per fixture B—Estimated peak demand for each branch under conditions of simultaneous use			FIXTURE	G.P.M.	P.S.I.*			
2 sill cocks	10	5	Lavatory	5	8			
Laundry tub	8		Bath tub	10	5			
Clothes washer	8	8	Shower	8	5			
Kitchen sink	7.5		Flush-tank water closet	3	12			
Dishwasher	7.5	7.5	Flush-valve water closet	15 - 40 <sup>†</sup>	10 - 20 <sup>†</sup>			
1st floor lavatory water closet*	5		Sill cock and 50 ft. hose	5	30			
Bathroom No. 1 lavatory water closet*	5		* Flow pressure per sq. in. at entrance † Due to design variations					
Bathroom No. 1 shower	8	8	C APPROX. RESISTANCE TO FLOW OF THREADED FITTINGS, ETC., IN EQUIVALENT FOOT VALUES OF SAME-SIZE PIPE					
Bathroom No. 2 lavatory water closet*	5		FITTING OR DEVICE	PIPE SIZE OF FITTINGS				
Bathroom No. 2 bath tub	10	10		1/2	3/4	1	1 1/4	1 1/2
Total flow of all fixtures	83		90° elbow	0.9	1.3	1.8	2.2	2.7
Peak demand for house		38.5	45° elbow	0.6	0.9	1.2	1.5	1.8
*Tank-type water closets			Tee, side to end or reverse	2.2	3.4	4.4	5.5	6.7
			Tee, end to end	0.7	1.1	1.5	1.8	2.2
			Union or coupling	0.6	0.8	0.9	1.2	1.5
			Globe valve	10.0	15.0	20.0	25.0	30.0
			Angle valve	5.0	7.0	10.0	12.0	15.0
			Gate valve	0.4	0.5	0.7	0.9	1.1
			Swing check valve			3-20		
			Vertical check valve			10-26		
			H.w. tank, vert. 30-gal.		17.0			
			H.w. tank, horiz. 30-gal.		5.0			
			Water meter		14.0			
			Water softener equals 50 to 200 ft. (if unknown use 125)					5







**Table C**

**STEPS OF PROCEDURE**

1. Multiply rise by .43 (weight of water 1 ft. high having a cross section of 1 sq. in.) This gives loss of pressure due to rise.
2. Add 10 to finding of step 1. (10 is average minimum p.s.i. pressure for satisfactory flow at top outlet, not including a flush-valve type of water closet.)
3. Find length of pipe from water source to highest and farthest outlet. (If water softener is to be used, add its pipe-equivalent resistance also, Table C, Fig. 5, when size of house service is figured.)
4. Subtract finding of step 2 from pressure at water source. Multiply result by 100 and divide by the finding of step 3. This gives approximate pressure loss (average) per 100 ft. of pipe, caused by friction.
5. Locate finding of step 4 on or between vertical lines of Chart A or B, Fig. 7 (depending on pipe type). Locate peak demand on or between horizontal lines. If intersection coincides with, or is very close to a diagonal line, this line indicates proper pipe size to use. If intersection comes between diagonal lines, use next higher one.

**EXAMPLE** (Refers to drawing and water-demand list) Object: To find required size of house-service line.  $30 \times .43 = 12.90$

$$12.90 + 10 = 22.90$$

$$60 + 4 + 6 + 10 + 10 + 4 + 13 + 9 + 6 = 122 \text{ ft.}$$

Assume pressure at water main is 50 p.s.i.

$$\frac{(50 - 22.90) \times 100}{122} = 22$$

Galvanized wrought-iron pipe is used. Refer to Chart A, Fig. 7. Locate 22 with vertical lines and 42 with horizontal lines. Intersection shows size pipe to use is 1 1/4 in.

procedure given in table C, Fig. 7. Information from the tables in Fig. 5 is used to determine factors that can be interpreted on chart A or B in Fig. 7.

**Solving Installation Problems**

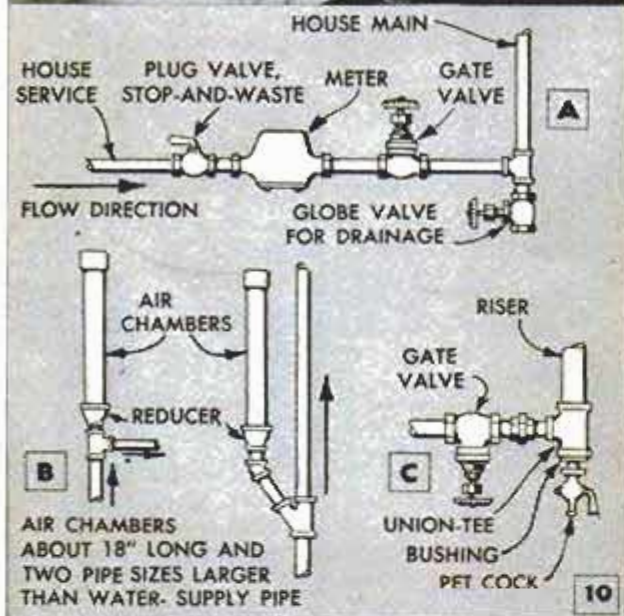
Installing water lines in an existing house usually involves some difficulties. Where concealment of piping in an unobstructed partition is desired, one method is to use copper tubing, Figs. 1 and 2. When rigid pipe is used it can be cut in lengths of about 6 ft. and passed up through a partition from the basement, Fig. 3. Each length is screwed to another length by means of a pipe coupling. A cap is screwed to the upper end of the first length to protect the

threads and keep out debris. To avoid removing more plaster than necessary when these methods cannot be followed, risers sometimes are run through closets where they are not conspicuous. Or, they are run up in a corner of a room and concealed with a panel. Cold-water lines in such locations should be insulated to prevent them from sweating when the warm air in the house contacts the cold pipe.

**Short Pipelines**

For economy and efficiency, pipelines should be as short as possible. Often risers that supply appliances in adjacent rooms, Fig. 4, can be run through a common partition. If hot-water lines are short, only a





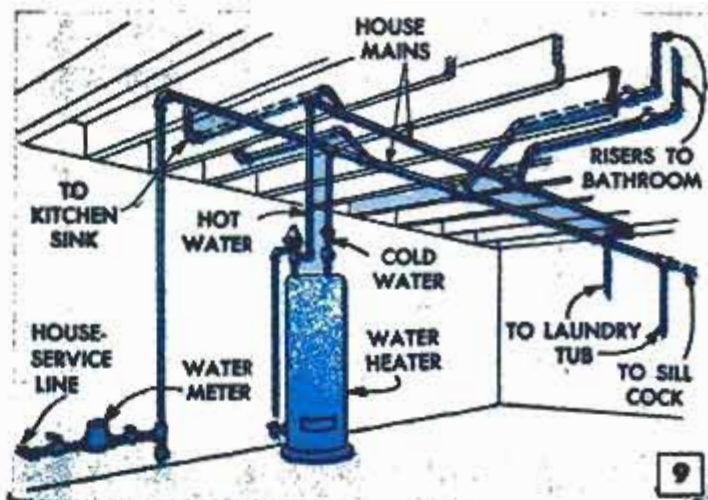
small amount of water need be wasted before hot water is available.

### Where to Insulate Pipes

Insulation on hot-water lines, Fig. 8, prevents losses from heat radiation, prevents warming of adjacent cold-water pipes and makes hot water available quicker in frequently used lines. Usually hot and cold-water lines run parallel but not closer than 6 in. Do not install water pipes in outside walls unless absolutely necessary and then only if they are adequately insulated against freezing or, in warm climates, against heating. Use waterproof, antisweat insulation on cold-water pipes where water is likely to drip on plaster, furniture or tools, or where it can collect at the base of risers and cause rotting of a sill.

### House-Service Line

The supply line from the water main to the house generally is buried 4 ft. underground to protect it from freezing and mechanical injury. It should be run as straight as possible, sloping toward the water main for drainage. It should never pass underneath a sewer line, it should be laid at



least 12 in. above the top of the latter—always on compact, undisturbed earth. Generally, galvanized, wrought-iron pipe is used, although copper is more durable and is required by some building codes. The line should not be smaller than  $\frac{3}{4}$  in. A plug-type, stop-and-waste valve often is installed at the house end.

### House Mains

These lines, shown in Figs. 6 and 9, start at the service-line entrance and supply all branch lines. Horizontal lengths are supported at 5 to 8-ft. intervals, securely but not rigidly. A gate valve for shut-off purposes and a globe valve for drainage are installed as shown in detail A, Fig. 10. Pipe must have a slight slope for drainage, without sags, pockets and U-sections to trap water. Generally it is best to have the house mains the same size as the house-supply line. Pipe to a water heater or softener should not be less than  $\frac{3}{4}$  in.

### Branch Lines

Use gate valves to shut off branches individually. Globe valves are used only if there is surplus pressure, as they introduce considerable resistance to water flow. Pipes supplying two or more fixtures should not be less than  $\frac{3}{4}$  in., and those to individual fixtures  $\frac{1}{2}$  in., although  $\frac{3}{8}$ -in. pipe often is used for short runs to home lavatories or toilet flush tanks.

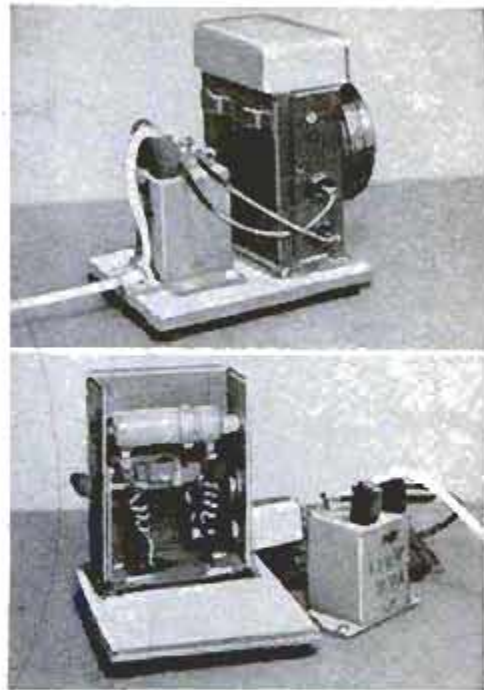
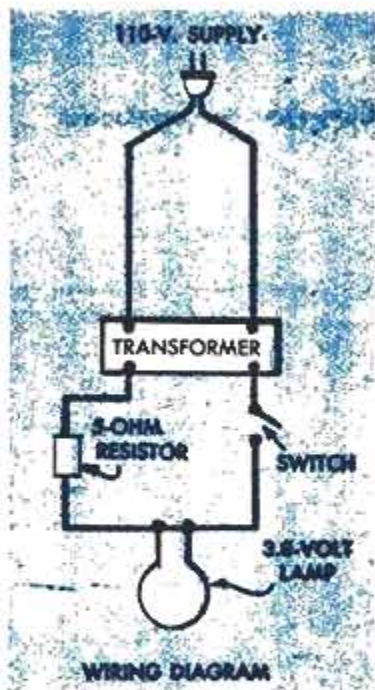
### Air Chambers

Air chambers, which eliminate or reduce water hammer, are shown in details B and C, Fig. 10. For best results, air chambers in average home-plumbing systems should be about 18 in. long and two pipe sizes larger than the supply pipes to which they connect. Periodic renewal of the air which gradually is absorbed by the water compressing it, is done by "bleeding" the line. A drain petcock at each riser, detail C, permits this without shutting off the entire system. ★ ★ ★



## House Current Replaces Batteries in Focused-Beam Lantern

A portable lantern used primarily to illuminate work indoors can easily be converted to 110-v. house current eliminating the constant replacing of dead batteries. The best type of lantern to adapt is one that can be focused on the immediate work area. Mount the lantern on a piece of plywood large enough to also accommodate a step-down transformer. The transformer should have only a few volts' output from the secondary. To determine the correct voltage for the bulb in the lantern, temporarily wire a rheostat into the circuit, measure across its terminals after it has been adjusted for the best brightness possible from the bulb and permanently wire a resistor of the required amount into the circuit. The switch on the



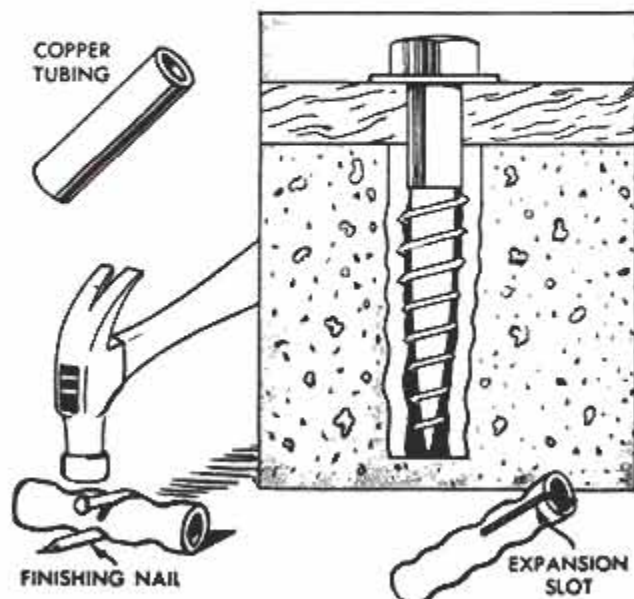
lantern is also wired in for turning the light on and off. Be sure to insulate the power cord connection to the transformer.

George P. Pearce, Albuquerque, N. Mex.

## Copper Tubing Makes Grip-Sleeve For Lag Screw in Concrete

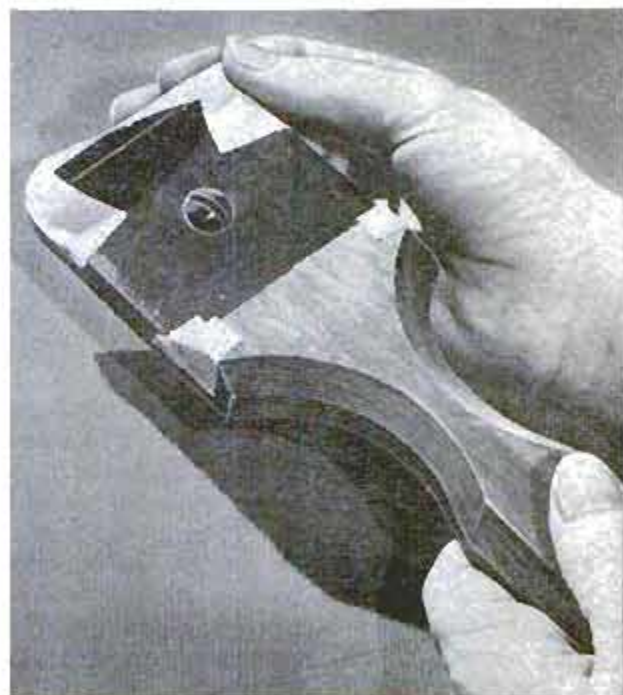
Fastening material to a concrete or brick wall is made easier and the job more permanent when a length of copper tubing is dented with a staple or bent finishing nail as shown and inserted in the hole in the wall as required. A slot sawed into the outer end of the tubing will make it easier to insert and allow for expansion as the thicker part of the screw is turned in, fastening the work to the wall as shown.

Carl S. Bates, Chicago.



## Tape Sheathes Scraper Blade When Stored in Tool Chest

The edge of a wood or paint scraper is less likely to become dulled when stored with other tools if covered with masking tape. Also, apply the tape to any other sharp edges or projections on the scraper to protect against the possibility of accidentally injuring the hands when removing the scraper from the tool chest.







### Two-Wheel Drum and Barrel Truck

Moving steel drums and wooden barrels is an easy task with this two-wheel hand truck. Axle and wheels may be purchased, or removed from a broken wagon or tricycle. Handles are formed from two lengths of pipe, and may be equipped with rubber grips. The circular base, cross piece and angular braces are cut from  $\frac{1}{8}$  x 1-in. flat steel.—C. F. Marley, Nokomis, Ill.

### Gutters and Metal Roofs Patched With Glass-Fiber Screening



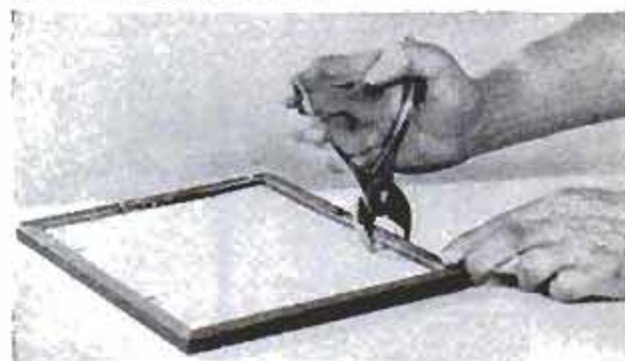
surface around the leak. Then press a piece of screen down into the cement and allow it to dry. After a few days, add a finish coat of cement to cover the screen.

Sharp edges on chipped glass can be rubbed smooth with fine sandpaper, making the glass safe to handle.

### Proper Storage of Sandpaper Improves Performance

Storage conditions for sandpaper affect its performance and wearing qualities. Too frequent changes in relative humidity will cause strains to be set up between the backing and adhesive which may weaken the bond. Excessive humidity just prior to use will cause it to clog rapidly, while extremely dry conditions will tend to curl the paper. Attempts to straighten it will only result in cracking and disintegration of the abrasive surface. To prevent these reactions, sandpaper should be stored in a room having a reasonably constant temperature of from 60 to 80 degrees and a relative humidity of about 50 percent. Do not store sandpaper near a source of heat or where moisture is excessive, such as next to windows which show signs of condensation.

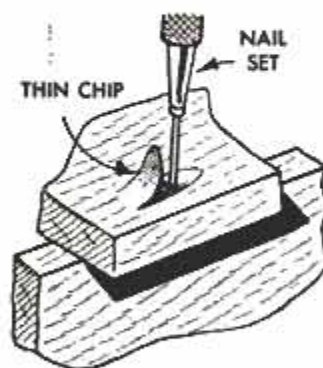
### Pliers Used to Drive Brads Into Picture Frame



Ordinary slip-joint pliers opened to the widest setting are handy for pressing brads into small picture frames. This method is much safer and easier than using a hammer. One jaw of the pliers is covered with adhesive tape to prevent marring the frame. The brad is held in position with one finger until it is started.

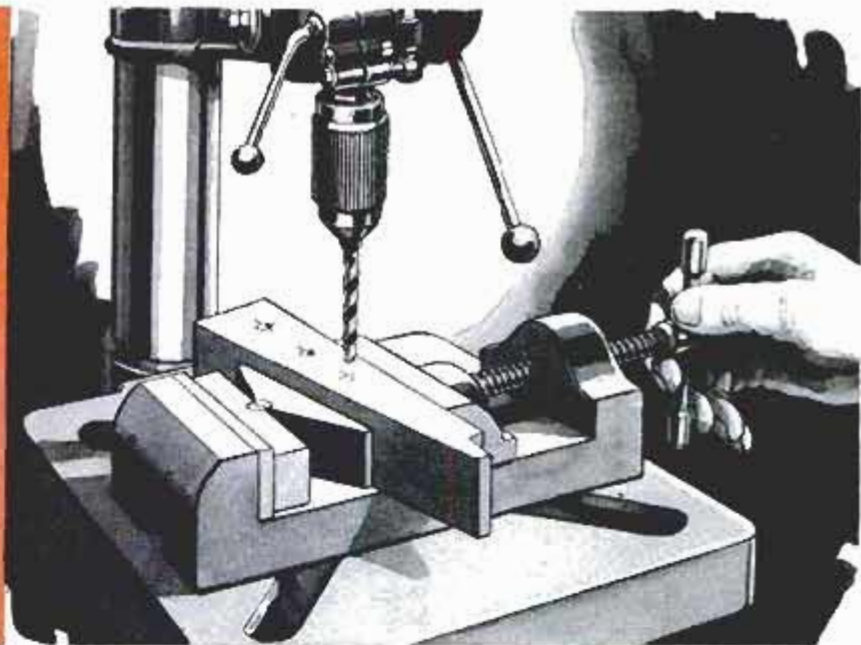
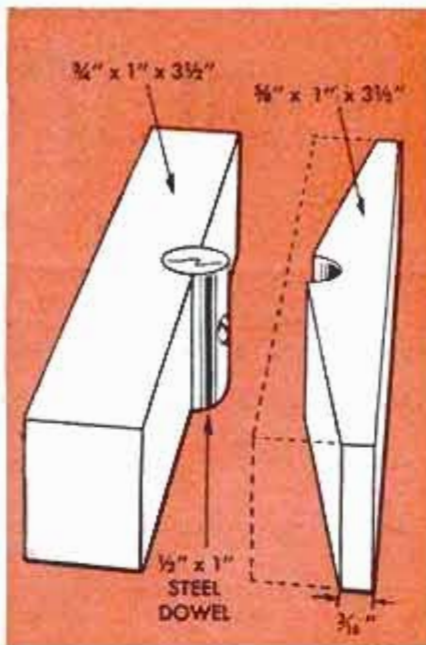
### Concealing Nails in Cabinetwork

For exceptionally fine cabinetwork, the heads of finishing nails can be completely concealed by "blind setting," in preference to filling the nail holes with putty or crack filler. At the point of nailing, a small chip of the wood is lifted with a gouge, and the nail is driven into the resulting recess, and set. Then glue is applied and the chip resealed.





## Swivel Blocks Hold Tapered Work in Vise

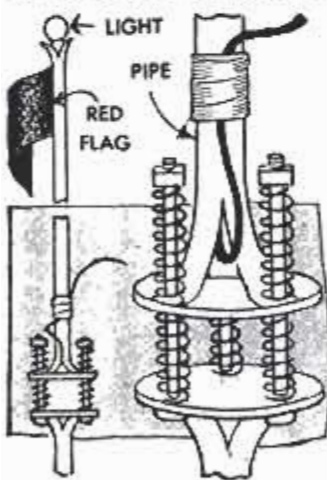


Holding tapered work in a drill-press vise is no problem when this set of swivel blocks is used. The set consists of a fixed, flat block and a triangular-shaped swivel block that pivots on a steel dowel screwed to the fixed block. Two  $\frac{3}{4} \times 1 \times 3\frac{1}{2}$ -in. pieces of cold-rolled steel are clamped to-

gether and a  $\frac{1}{2}$ -in. hole is drilled so that half the hole is in each piece. Next, one of the pieces is beveled and reduced to  $\frac{5}{8}$  in. at the center. A  $\frac{1}{2}$ -in. steel dowel then is cross-drilled to receive a flatheaded screw that turns in a hole in the fixed block.

C. W. Woodson, Chicago.

## Light and Warning Flag Rocks To Get Motorists' Attention



This wig-wag warning flag and light make a good safety marker for use on tractors and farm equipment driven on highways after dark. The red flag is mounted on a 4-ft. length of pipe, each end of which is cut lengthwise with a hacksaw to form three segments. Those at the top are spread to hold a small light, while those at the bottom are spread to form feet, which are drilled to accommodate bolts. One end of a shorter length of pipe also is cut into three segments and spread and drilled to match the bottom end of the longer pipe. A pair of transmission rings fitted with springs and bolts as shown are connected between the two pieces of pipe. A universal-joint clamp installed at the bottom of the assembly permits easy attachment. The signal light has a cord to reach an on-off dash switch.

## Power-Tool Vibrations Dampened By Using Garden-Hose Washers

Annoying sounds resulting from vibration in power tools often can be eliminated by using garden-hose washers as vibration dampeners. In many cases only one washer is needed, as in the example shown, where a single washer is placed under the wheel-guard nut on a bandsaw to silence a rattle. The rubber washers also can be used as replacements for the rubber collars used on the bolts between power tools and stands.



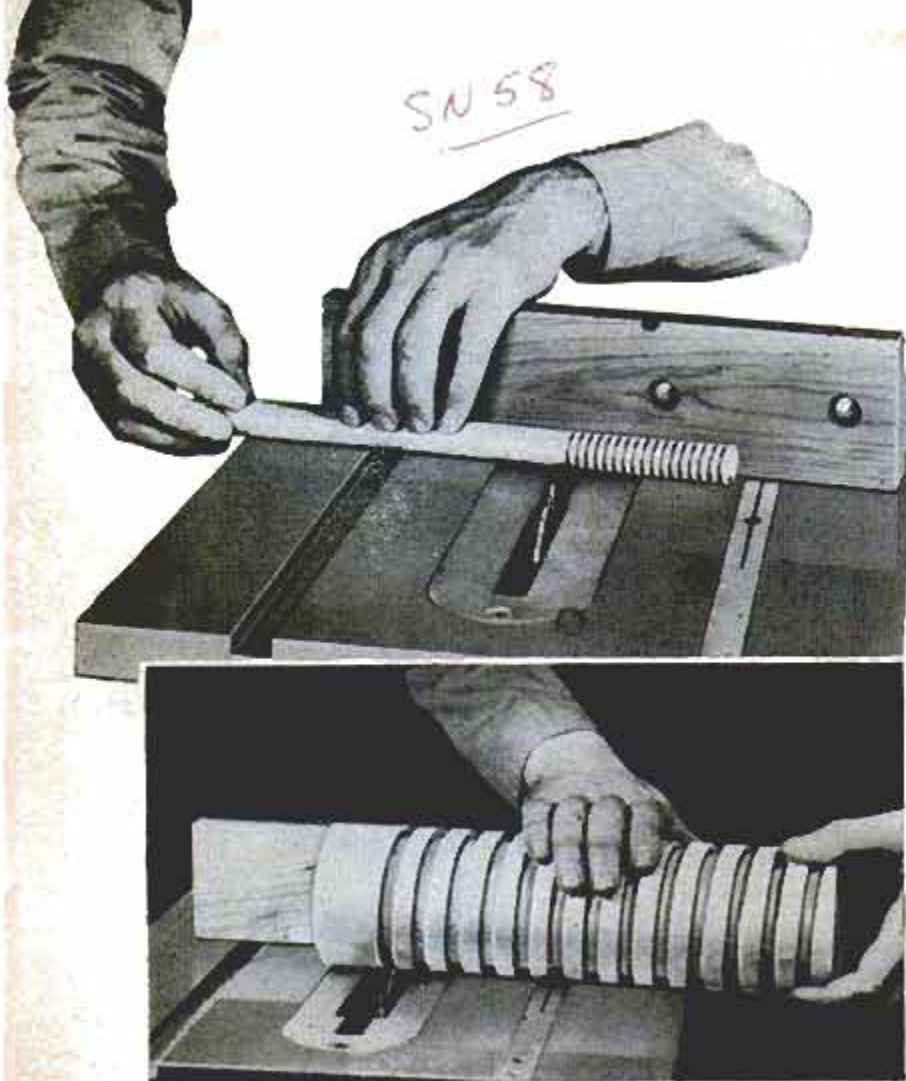


# HOW WOULD YOU DO IT?

By Chris Nelson

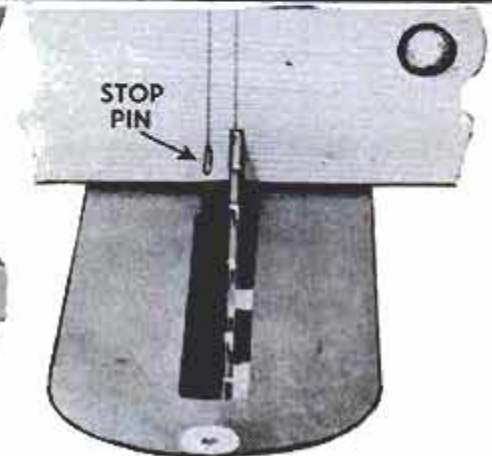
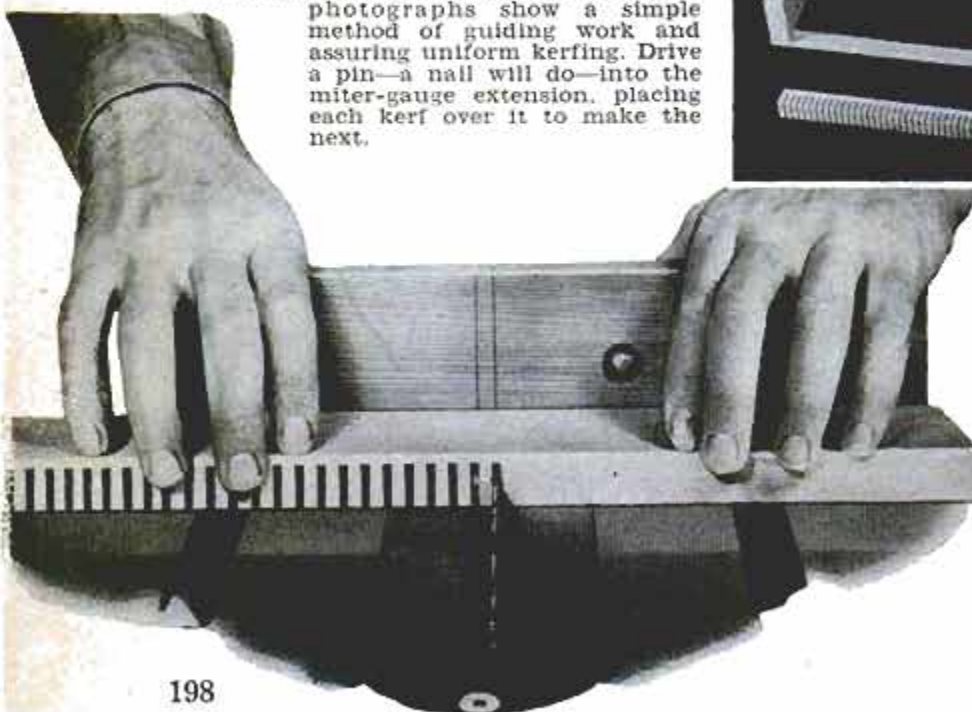
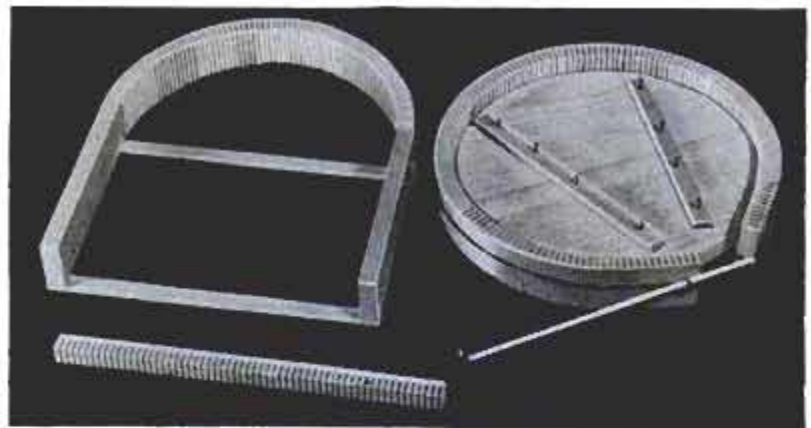
*In what way can a circular saw be used to cut a spiral groove in a dowel or larger cylinder, such as a table leg?*

**ROTATE THE WORK AGAINST THE BLADE.** First, clamp the miter gauge solidly to the table with a C-clamp. The angle at which the gauge is set will determine the spacing of the spiral, while the depth of the spiral is fixed by a combination of the spacing between the miter gauge and the blade and the height of the blade above the table. Hold the stock down against the table firmly and turn it slowly against the blade. Use a crosscut blade to cut a fine groove, as shown on the dowel in the upper photo. For a wider groove on heavier stock, as on the cylinder in the lower photo, use a dado blade. To assure a clean-cut groove, use a sharp blade. Cut the groove in one pass, since successive passes usually will chip the edges of the groove.



*How can you use a circular saw to prepare wood so that it can be bent without being steamed?*

**KERF THE STOCK ON ONE SIDE.** Make a series of saw cuts across part or all of a piece of wood and it can be bent to a remarkably small radius without being soaked or steamed. This is a useful technique when you are making such items as garden arbors, drum tables and round stools. The two lower photographs show a simple method of guiding work and assuring uniform kerfing. Drive a pin—a nail will do—into the miter-gauge extension, placing each kerf over it to make the next.





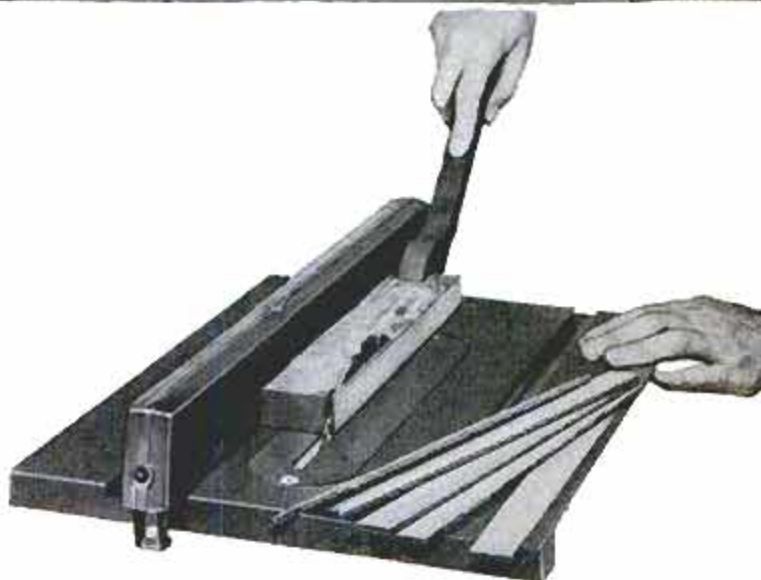
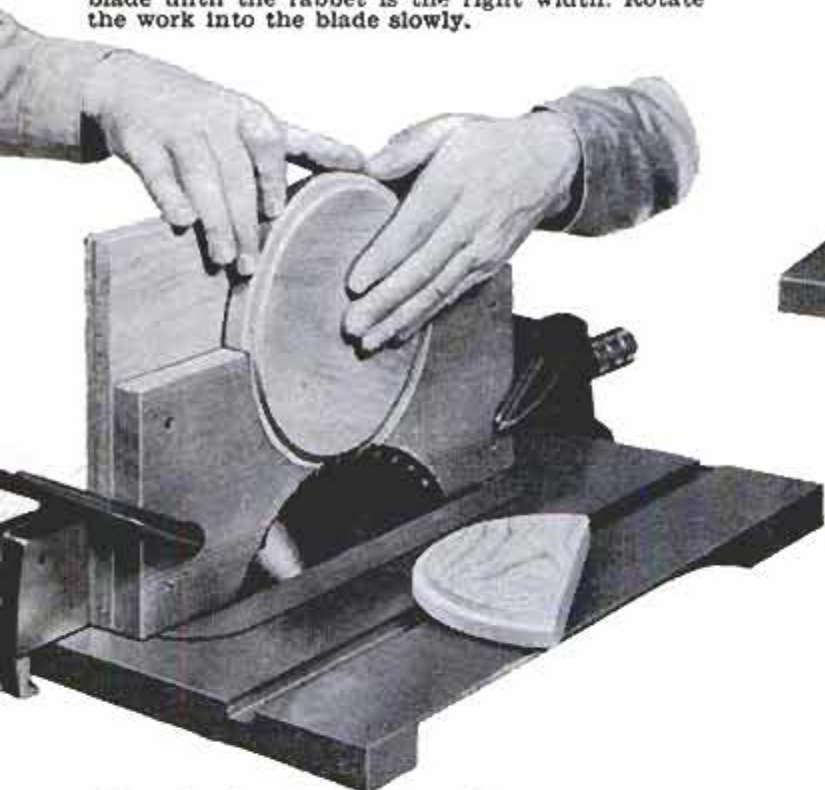
**To make fancy molding strips on a circular saw, what do you do?**

**KERF BOTH SIDES OF THE STOCK, THEN RIP IT IN STRIPS.** Alternate the kerfs as shown in the photograph. Use either a saw blade or a dado head. Kerfs can vary both in width and depth to provide a variety of moldings. Rip the kerfed pieces into strips as thick as you wish the molding to be deep, since what was the edge of the stock now will be the face of the molding. Some cove molding can be kerfed in this manner to provide unusual designs. To keep the kerfs evenly spaced, use a stop pin on the miter-gauge extension in the manner previously described for kerfing stock for bending.



**What kind of a jig can be used on table saw to permit rabbeting the edges of circular work?**

**USE A VERTICAL JIG.** The jig is made of two pieces of 1-in. lumber, one of the pieces having a semicircular cut in it to receive the work. Clamp the jig to the rip fence, then gradually raise the blade until the rabbet is the right width. Rotate the work into the blade slowly.

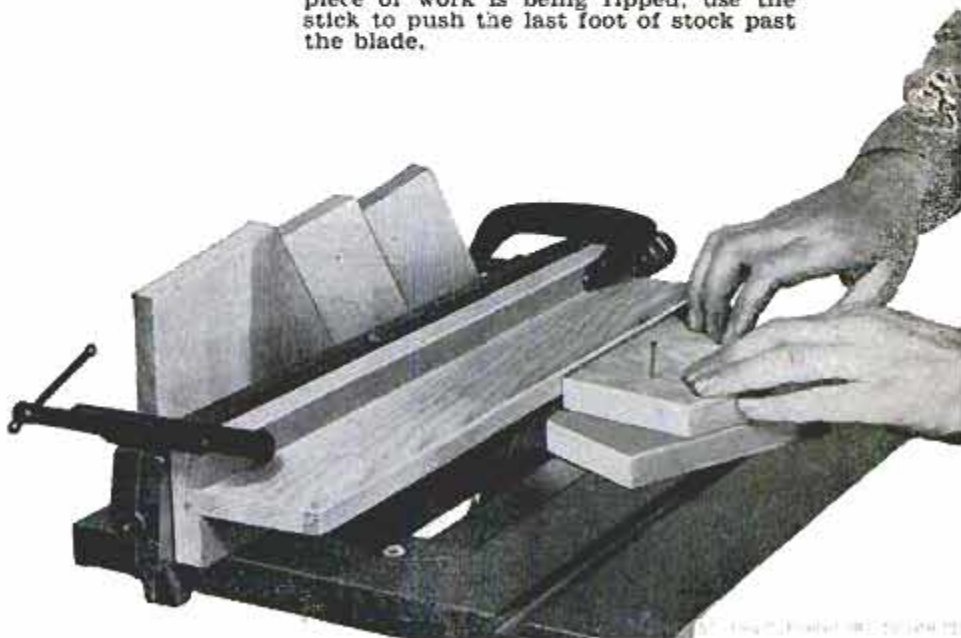


**For maximum safety, what method should be used for ripping thin strips on a circular saw?**

**USE A PUSH STICK.** As shown above, a push stick permits you to keep both hands clear of the blade when ripping thin strips. Be sure the blade is sharp. A dull blade easily jams, and may kick the work up and back into the operator's face. For any narrow ripping operation, a push stick should be used. When a long piece of work is being ripped, use the stick to push the last foot of stock past the blade.

**What is the expert's way of cutting a large number of odd-shaped pieces to identical size and shape?**

**PATTERN SAWING.** Begin by making a master pattern—a piece cut to the size and shape you want. Drive two nails through it so they project slightly. Press the pattern down on the work, which should be cut to approximate size and shape. Run the pieces through the saw with the pattern riding against a guide block. The guide block is a T-shaped block clamped to the rip fence as shown in the photograph. The outside face of the saw blade must be flush with the edge of the guide block.





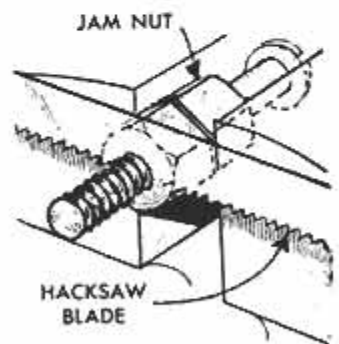
## Siphon of Pipes and Fittings Drains Pasture Stock Tank



Livestock tanks are quickly emptied for cleaning or moving by using a U-shaped siphon of pipes and fittings. The siphon is held under water until full, then one end is sealed with the hand and lifted out of the tank to the position shown. The siphon should be long enough to reach the bottom of the tank so it will empty practically the entire contents. Do not rest the end of the siphon flat against the bottom of the tank as it will become clogged with silt and shut off the flow of water.

## Threaded End of Bolt Cut Without Burring

Threaded ends of bolts and screws can be cut without leaving a burr by running two hex nuts onto the threads, the face of the second nut being flush with the line of cut. Clamp the inner nut in a vise and run a hacksaw blade along the outer edge of the two nuts as shown in the detail.



Clamp the inner nut in a vise and run a hacksaw blade along the outer edge of the two nuts as shown in the detail.

Carl S. Bates, Chicago.

## Avoid Clashing Gears When Shifting Into Low

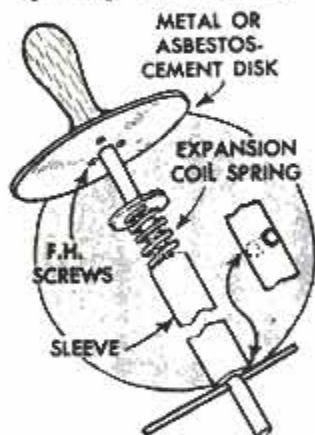
To avoid clashing gears in an automobile transmission when shifting from neutral into low, first shift from neutral into second and then into low. Second gear has a synchromesh mechanism which stops the gears quietly enabling smooth shifting into low.

Charles E. Cohn, Chicago.

## Anvil Made From Length of Rail

For an extra-heavy-duty anvil with plenty of work space use an inverted length of railroad rail as a striking plate. The one shown in the photograph is supported on three pipe legs braced with pieces of angle iron all welded together to form a solid work surface.

## Spring Holder for Welding Rod

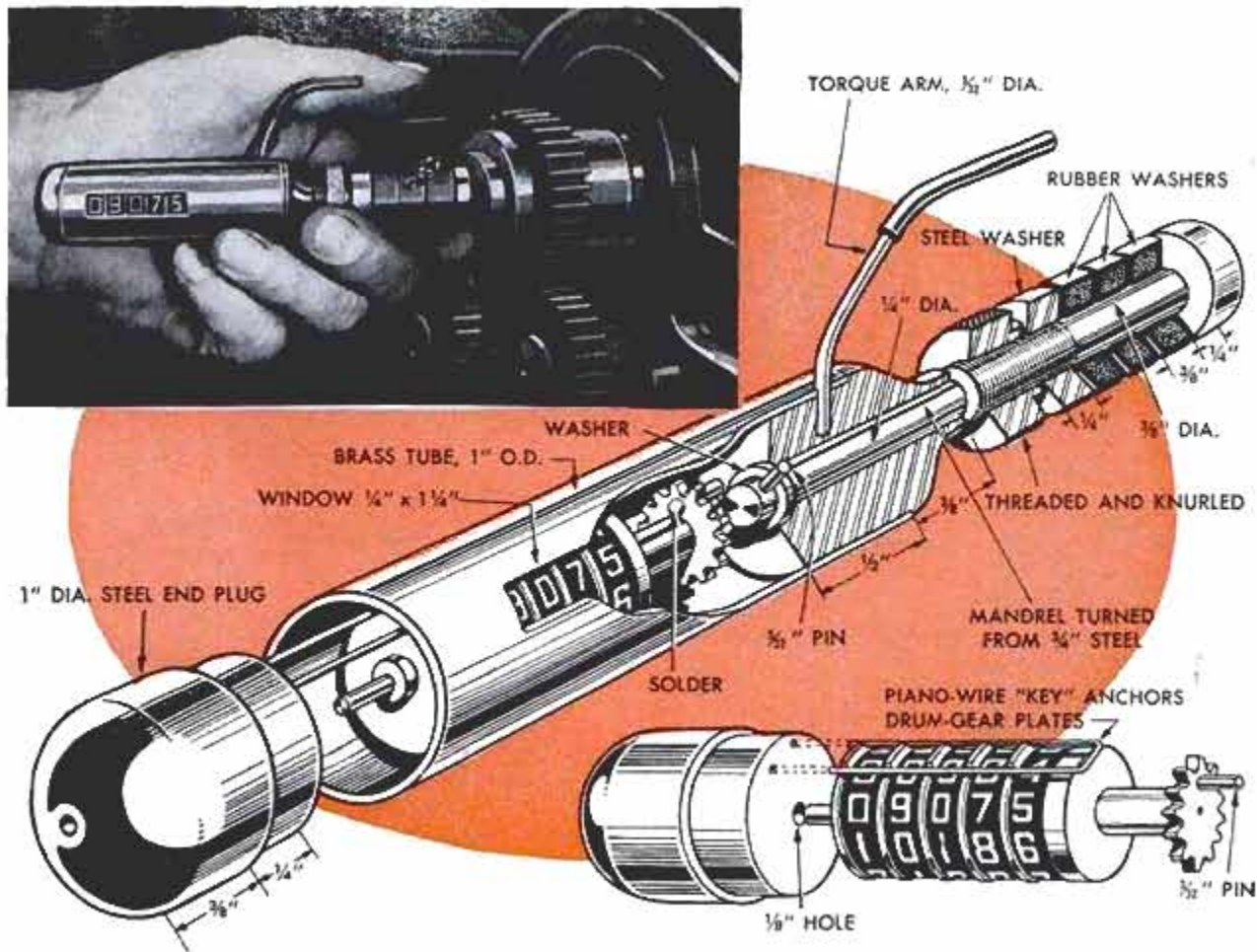


Under constant pressure of a coil spring, the sliding sleeve of this welding-rod holder bears tightly against the welding rod, which keeps the latter in position, assuring good electrical contact between the holder and the rod. A disk of  $\frac{1}{4}$ -in. metal or asbestos-cement board 6 in. in dia. is drilled to fit on the shank and is attached to the end of the wooden handle by means of three flathead wood screws.

Enno R. Haan, Evanston, Ill.







## Revolutions Counter From Speedometer Mileage Indicator

This revolutions counter, designed for use on lathes when winding transformer coils, is built around the mileage indicator of a discarded speedometer. The mandrel is turned from a length of steel rod and threaded to accommodate a knurled sleeve. Rubber washers followed by a steel washer of the same size are slipped on the mandrel ahead of the sleeve. The wide end of the mandrel and the washers should be a sliding fit inside the lathe spindle so that turning the knurled sleeve against them will "lock" the counter in place. The small

end of the mandrel is cross-drilled to receive a pin which drives the counter by means of another pin mounted off-center on the drive gear. The housing is a length of brass tubing in which a window has been cut to reveal one row of indicator numerals. Machine the two plugs to fit tightly in the housing and then center-drill them for the shaft of the counter. A torque arm is mounted in the side of the housing which, when held, keeps the counter from turning with the spindle.

Keith Heryford, Cedarville, Calif.

## Implement Wheel Guards Tree Against Dogs Digging at Base

To get certain protection against dogs digging in the loose ground at the base of a young tree, remove the hub from an old iron farm implement wheel and place the rim with spokes attached around the trunk as shown in the photograph. Loose ground within the rim is left undisturbed by the dogs so that growth of the sapling is not disrupted.—C. F. Marley, Nokomis, Ill.

When storing a roll of rosin-core wire solder after using it, pinch the end shut with a pair of pliers. This will prevent the rosin core from leaking out.





# SHOPPING FOR TOOLS



**BUILDER'S LEVEL** has replaceable snap-in vial holders having magnifying crystals, or lenses, which give accurate readings, even at a distance. Four-screw mountings prevent distortion of crystals. Frame is of aluminum or magnesium with precision-machined edges and flats. Comes in lengths from 24 to 48 in.

Empire Level Mfg. Co., 10930 W. Potter Rd., Milwaukee, Wis.



**ORBITAL SANDING ATTACHMENT** for  $\frac{1}{4}$ -in. portable electric drill can be mounted quickly without disassembling any part of either unit. Dismounts just as easily. Bottom, or sole, plate of sander unit is wider than drill housing, permitting tool to work within a fraction of an inch of any surface at right angles

Black & Decker Mfg. Co., Towson 4, Md.

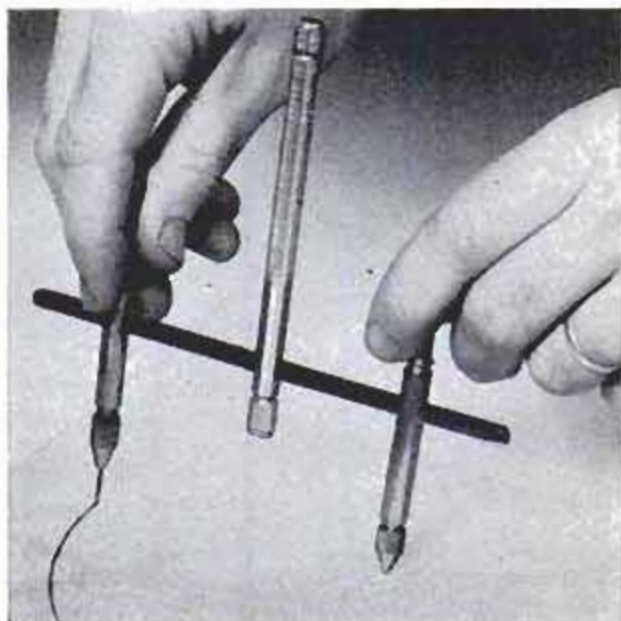
**ELECTRIC GARDEN CULTIVATOR** hoes, mulches, aerates, blends fertilizers and kills weeds in vegetable and flower gardens. Full-length control handle permits operator to work from standing position. Works between closely spaced row crops. Motor-driven tines loosen and pulverize soil, forming fine mulch

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

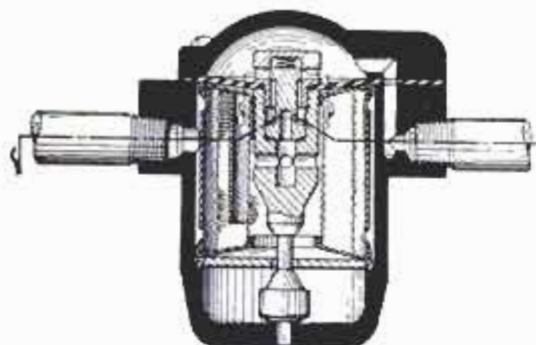
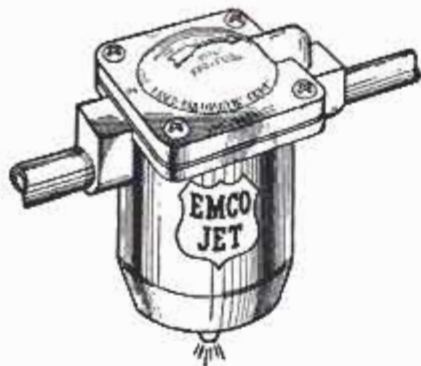


**CIRCLE CUTTER** is the answer to the problem of cutting true circles in paper, cardboard, masking materials, negatives and film. Centering leg is fitted with a chuck which holds an ordinary phonograph needle. A specially ground cutting blade is chucked in the swinging leg. Both legs and handle are adjustable

Mark Specialty Co., 183 St. Paul St., Rochester, N. Y.

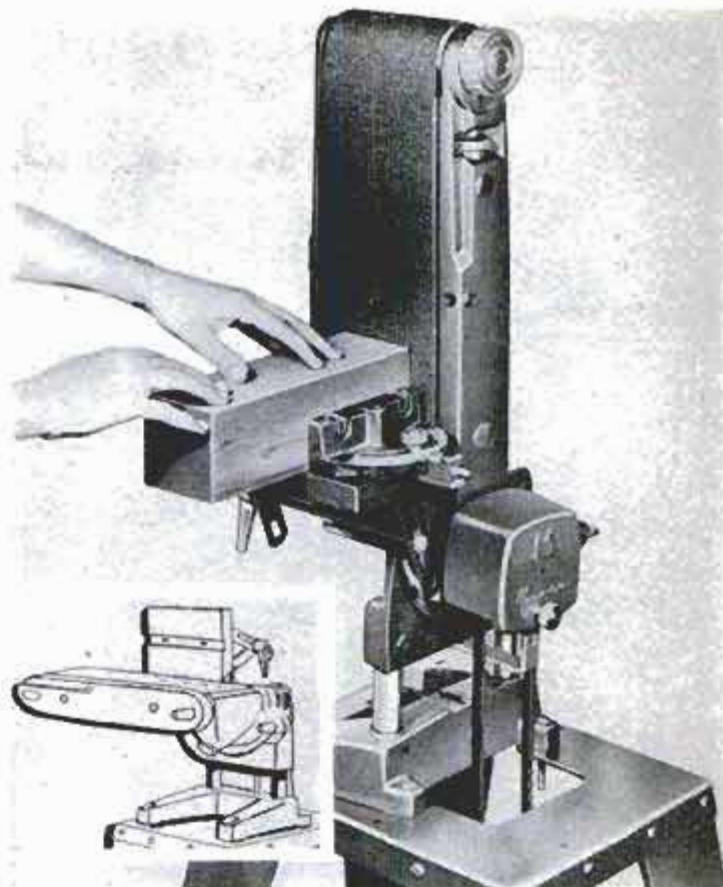






**AIR FILTER** attaches to nearly all types of pneumatic tools. Traps and discharges the sludge, rust and other abrasive substances that sometimes find their way into air lines. Parts will not corrode, become inoperative

Emco Pneumatic Corp., 1317-19 Locust St.,  
Des Moines, Iowa

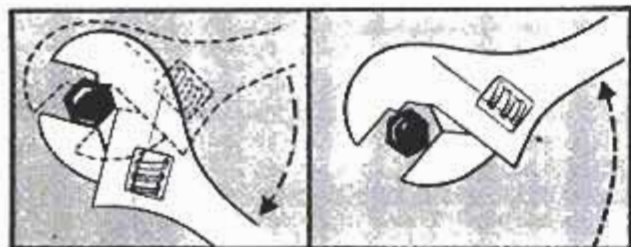
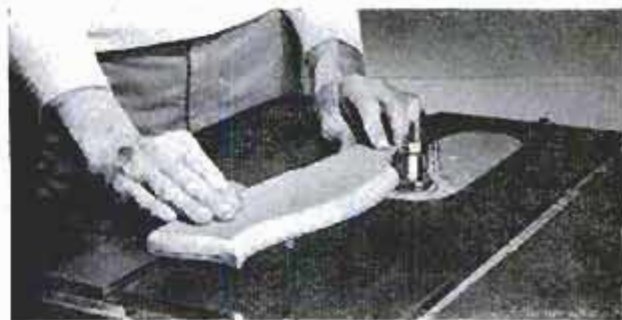


**BELT SANDER** takes a 6-in. abrasive belt and can be used in the vertical position for squaring stock, or in the horizontal position for surface-sanding. Grooved sanding table can be changed quickly to either of the positions pictured. In the horizontal position, table can be used on either side of belt

Magna Engineering Corp., Menlo Park, Calif.

**SHAPER ATTACHMENT** fits on a table saw with spindle projecting as pictured. Special insert replaces regular insert in table. Shaper spindle takes any shaper cutter having  $\frac{1}{2}$ -in. bore. Cutter can be raised and lowered  $\frac{3}{4}$  in. Spindle is driven by the saw motor through a half-crossed belt. Special table insert includes a vertical pin for starting curved cuts

Lee Tool Co., P.O. Box 12, Galeburg, Ill.



**ADJUSTABLE WRENCH** with two-step upper jaw permits a ratchet action without added mechanism. Second step holds on work stroke but releases nut when handle is reversed, thus giving a ratchet action without use of conventional ratchet and dog. Works equally well as regular wrench when outer step of jaw is used. Of course, it is then necessary to lift wrench at end of stroke, swing handle, and replace on nut

The Tedd Co., P.O. Box 1021, Rockford, Ill.





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FOR THE DO-IT-YOURSELFER

**CONCRETE REPAIRING AND TOPPING MATERIAL** (left) comes in a package containing cementing materials, latex in liquid form and a handy trowel. To prepare, powder is mixed with latex according to instructions and applied with trowel. Repairs cracks or holes in concrete walls, floors, driveways, walks, steps

Latex Concrete Co., Div. of the Camp Co.,  
10 W. 70th St., Chicago 10

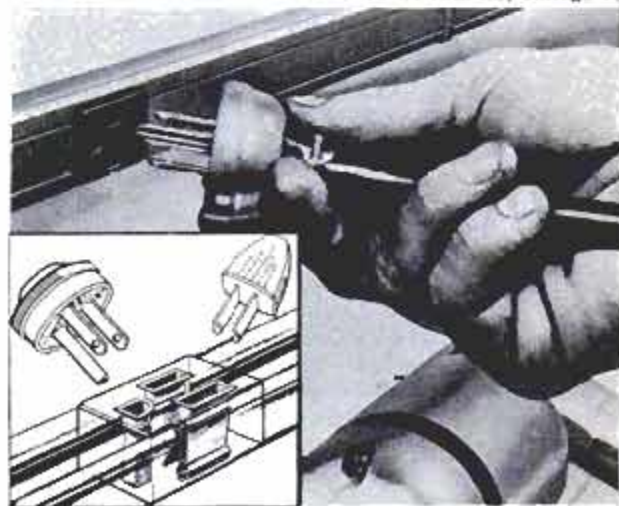
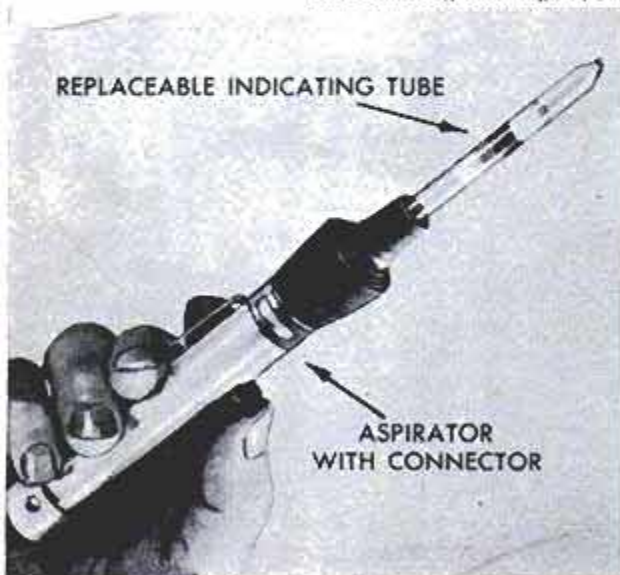


**SOLDER-FLUX PASTE** is supplied in a plastic squeeze bottle. Cleans, fluxes and solders all common metals with application of heat by soldering iron, torch, or furnace. Comes in 1/2 and 1-lb. plastic containers

Anchor Metal Co., 244 Bnorum St., Brooklyn 6, N.Y.

**CARBON-MONOXIDE DETECTOR** shows instantly the presence of concentrations of carbon monoxide in garages, autos and in homes where coal-burning furnaces, gas appliances may be in faulty operation

Richard Industrial Instrument Co.,  
7301 Penn Ave., Pittsburgh 8, Pa.



**GROUNDING PLUG-IN STRIP** with receptacles located 6 to 18 in. apart protects both tools and operators. Plug-in receptacles take two or three-pronged plugs. Strips can be installed in any convenient location

National Electric Products Corp.,  
2 Gateway Center, Pittsburgh 99, Pa.

**PORCH AND FLOOR ENAMEL** is formulated especially to withstand the heavy foot traffic in homes and offices. Covers and levels without brush or lap marks. Spreads easily. Available in 11 attractive floor colors

Sapoli Paints, Inc., 229 E. 42nd St., New York City





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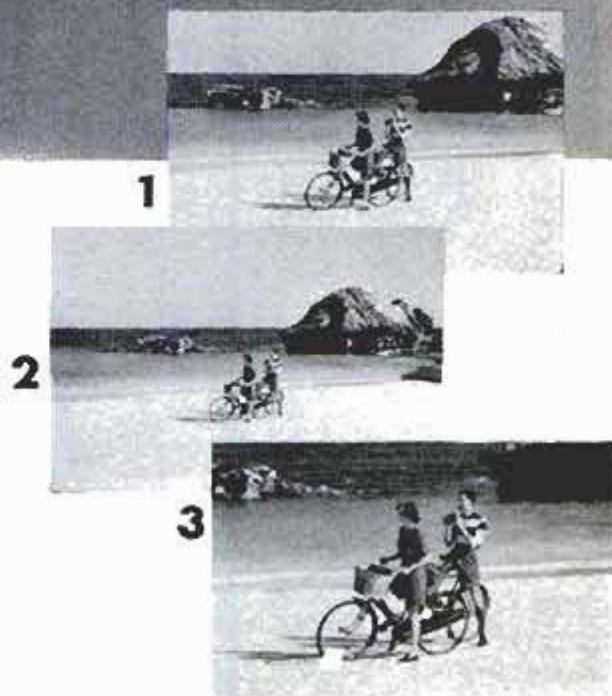
There's a wonderful feeling of confidence that goes with owning a Kodak Retina Camera. By itself, it is unsurpassed as a top-quality picture-maker. As the heart of a *complete system of photography*, its versatility is almost limitless. Whatever field of 35mm picture-making intrigues you next month . . . next year . . . you have a camera capable of helping you explore it!

Your photo dealer will gladly show you the great combination of features available *only* in a Retina. And ask him about the wonderful family of specialized Retina Photo Aids that will open the doors to a lifetime of exciting picture-taking adventures. Retina IIc Camera, *f*/2.8, \$139.50. Retina IIIc Camera, *f*/2 with built-in exposure meter (shown above), only \$190.

**Ask about small down payment, easy terms**

*Prices include Federal Tax and are subject to change without notice.*

**Eastman Kodak Company**  
Rochester 4, N. Y.

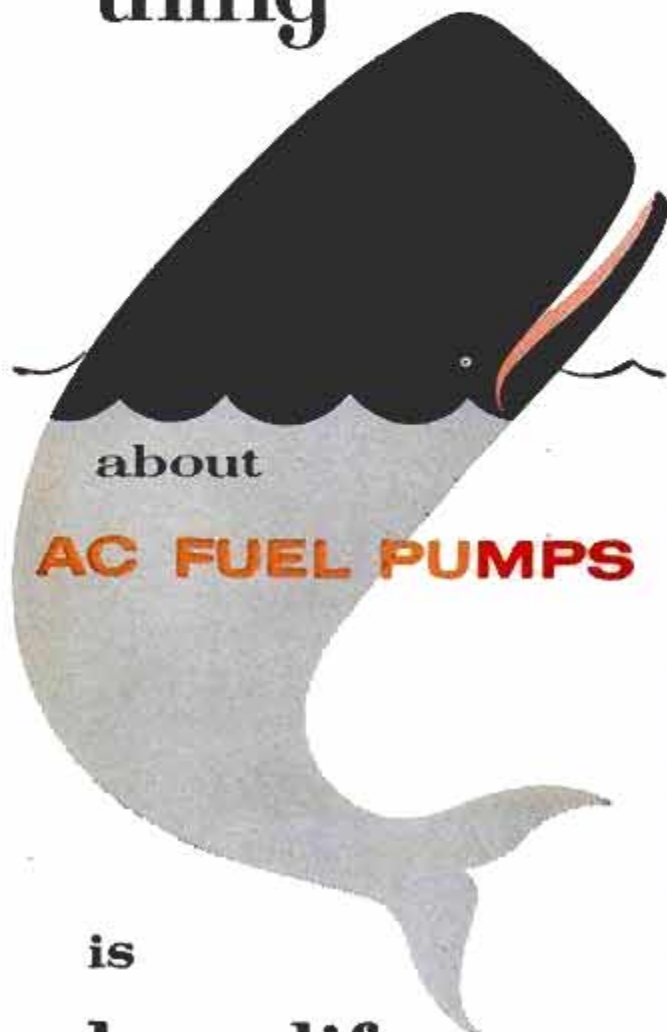


1. Regular view with the Retina 50mm lens that comes with the camera
2. Wide-angle view with auxiliary Retina Curtar 35mm Lens Component, \$62.50
3. Telephoto view with auxiliary Retina Longar 80mm Lens Component, \$82.50
4. Kodak Retina 35-80 Optical Finder for use with wide-angle, telephoto lenses, \$17.50

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AC SPARK PLUG



THE ELECTRONICS DIVISION OF GENERAL MOTORS

## Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

### Metal-Sash Putty



**Q**—The large picture window in my living room has a metal frame and I have recently noticed that the putty is cracked and broken away from the glass in several places. It appears that the whole sash needs puttying, as otherwise it may leak in time. I understand that ordinary putty, such as is used on wooden sash, cannot be used on metal sash frames. What do I use and do I mix it myself, or can I buy it in ready-to-use form?

—Y. O., R. I.

**A**—There are specially prepared glazing compounds available. These are elastic; that is, they never harden to the extent that ordinary putty does, and are not affected by extremes of temperature and exposure. Specially treated oils are used in the compounds to maintain this elasticity over long periods of time. When applying these compounds be sure to follow the instructions in all details, and do a thorough job of removing rust and old putty, or compound, before reputtying. Be sure that the glass is clean. If you wish you can prepare a compound yourself by mixing about 60 percent whiting, 30 percent paste white lead and 10 to 15 percent litharge with sufficient linseed oil to bring the mixture to a workable consistency. However, we would recommend that you use a prepared compound, rather than making your own.

### Defective Joists



**Q**—We live in an older two-story home and lately I've noticed that the ends of the floor joists have apparently crushed somewhat where they bear on the center beam. There is a wall directly above the beam on the first floor and the plaster is cracked at the point where the wall meets the ceiling in an upstairs room. How can I repair this defect?

—A. K., Mass.

**A**—If we can judge correctly from your description it would appear that undue weight is concentrated on the floor joists at the points where the

(Continued to page 208)





## Chain-Saw Sculptor Carves Paul Bunyan Statue

Ex-logger Paul Bresee might be called the Paul Bunyan of whittlers. In 1949 Bresee quit the woods to sell chain saws. An inveterate whittler, he put away his pocketknife and began carving with a chain saw. The results are not only spectacular, but they demonstrate the saw's versatility to prospective buyers. To date he has carved a 16-foot chain, a six-foot woman and a 16-foot statue of Paul Bunyan.



# Summertime is fix-up time

Summer chores can be simplified if you keep your lawn and gardening tools sharp with a Nicholson or Black Diamond file. For example:



Blades of your rotary lawn mower should be touched up regularly with the famous Handy file. The double-cut side is used for fast metal removal, the single-cut side for smoothing and sharpening.



Sharp hoes and rakes cut down on achin' backs! Use the popular all-around Mill file for garden cutting tools.



Stop that screen door from sticking with the versatile 4-in-Hand. Half round and flat, file and rasp, it's four files in one. Ideal for a multitude of summer uses.

*Nicholson and Black Diamond files are available at all good hardware stores.*



**NICHOLSON FILE CO.**

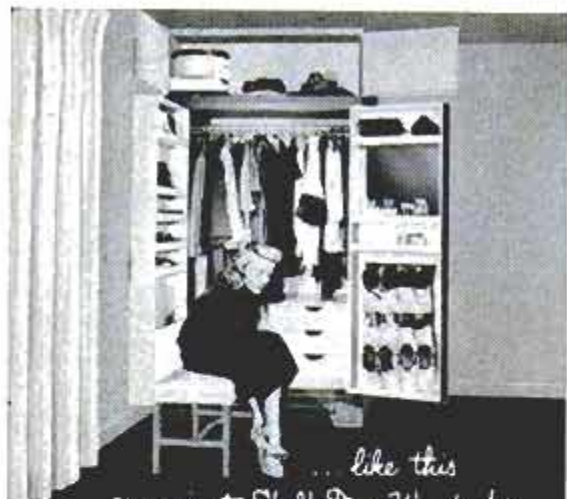
Providence 1, R.I.



(In Canada: Nicholson File Company of Canada Ltd.,  
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**A FILE FOR EVERY PURPOSE**





... like this convenient Shelf-Door Wardrobe

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Grademarked for your protection, fir plywood comes in standard grades as well as special textured or overlaid panels. DFPA industry grademarks attest quality, performance, value.

Plans Available; See your lumber dealer or write (USA Only) Douglas Fir Plywood Association, Tacoma 2, Wash., Dept. 9. Please order plans by name, enclose 10c for each.

(Continued from page 206)

edges are being crushed. This may be due to some peculiarity of the house construction, or to undue weight concentrated on one or both of the floors above, or to a defect in the floor joists themselves. However, judging from your description, adjacent joists are affected and from this one would ordinarily assume that the crushing of the wood is due to excessive load. You do not say whether or not the beam has sagged under the strain. Check the possibility of excessive load first (two pianos, one above the other on the first and second floors, might possibly do it). Redistribute the load if possible. Then examine the joists carefully to determine if they have been weakened by dry rot. If not, then it may be practicable to raise the floor by means of jacks and install new joists, bolting the new joists directly to the original ones.



#### Water Hammer

Q—I have an older type hot-water heating system and, near the end of this year's heating season, we noticed a sharp hammering sound in the water pipes. Sound was similar to that one would hear if the pipes were struck a sharp blow with a hammer. There seems to be no other source of this peculiar sound. What is the cause of this and is there a remedy?—H. E., Minn.

A—Are you sure that the sound you hear is in the heating system and not in the plumbing? In some cases it is difficult to determine with certainty. In a heating system such as you describe the sounds you hear usually—but not always—are due to a partial stoppage somewhere in the hot-water lines near the boiler. This interferes with normal circulation of water, often to such an extent that steam is generated. Steam forcing its way past the partial obstruction, usually a hard lime deposit, causes the sound you describe. In some plumbing systems air pockets develop, generally in a long riser to a faucet. When the faucet is opened water forcing its way past the air "bubble" causes the sharp hammering sound referred to by plumbers as water hammer. A common remedy is to install an air chamber at the end of a long horizontal run of pipe. The air chamber is simply a length of pipe 2 to 4 ft. long and a size larger than that in the horizontal run. The air chamber is capped and the lower end turned into a street elbow. The horizontal run is cut, the ends threaded and a pipe tee with coupling is installed. This arrangement permits installation of the air chamber. Of course, the method of installation must be adapted to each system. This may require some changes in procedure from that described.

#### Fireplace Smokes

Q—I live in a new basementless home. My fireplace smokes each time a fire is started. There are no trees or other obstructions nearby. Does the small size of the house have any bearing on the problem? If not, what is the cause and remedy?—F. L., W. Va.

A—We assume the fireplace has been properly constructed and that the flue is of the correct height and size. This being so, the only other likely cause is a variation in air pressure. Even a slight variation can cause a fairly strong downdraft in the flue, forcing smoke back into the room. The trouble occurs most frequently in new homes of exceptionally tight construction, with weather-stripped windows and doors which are kept tightly closed during fall and winter months. Often a smoking fireplace is cured simply by opening a window a few inches to permit atmospheric pressure to equalize. Some homeowners have cured a smoking fireplace by fitting a fresh-air intake to the heating system, thus equalizing pressure and preventing a reduction of the oxygen content of the air inside the house. This is especially helpful where the furnace is installed in a utility room.



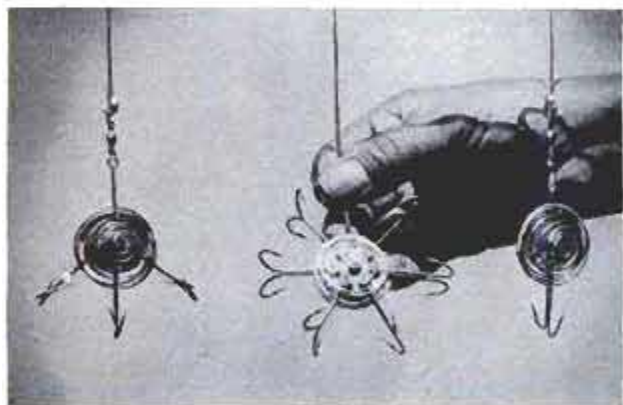


### Kit for Outdoor Grill Assembled in Minutes

Ten minutes is all the time needed to put together an outdoor grill made from patented concrete blocks supplied in kit form. And when the grill must be shifted to a new spot in the yard, it is only a matter of minutes to tear it down and rebuild it. The kit comes complete with the concrete blocks, a counter which rings the unit like a collar and a heavy wire cooking grill. The concrete blocks are made in an attractive mulberry color.

### Lure Bristles With Hooks

Hooks project in every direction from a new fishing lure. The lure has a central cage formed by a spiral wire. Worms or bugs are tucked inside this steel coil. Around the perimeter are six double hooks which also can be baited if the angler desires. The hooks are held by machine screws and some can be removed to comply with local regulations if necessary.



for quick clean cuts . . .

## RIDGID Heavy-Duty Pipe Cutter

Powerfully built—guaranteed not to warp or break, always tracks perfectly . . . Famous RIDGID thin-blade or heavy-duty cutter wheels of tool steel roll easily, cleanly through any pipe. Special wheels for stainless steel, cast iron. Every cutter factory-tested. For your work or home, it's most for your money—buy it at your Hardware Store!

Genuine  
**RIDGID**  
The World's Most  
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The Ridge Tool Company, Elyria, Ohio, U. S. A.



# This TRUSCON DOUBLE-HUNG STEEL WINDOW is easy to install *Yourself!*

It's the Truscon® Series 138 Steel Window. Your dealer has them ready to install. Hammer, screwdriver and level are all you need. And because they're steel, they can't rot, warp, swell or shrink—*will never stick or rattle.*



All bronze hardware is factory-attached. Stainless steel weather stripping and tape balances are built in. There are types and sizes for every home style—with storms and screens available, too.



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C-1963

## Privates and Generals Study the A-Bomb

(Continued from page 112)

before they learn the nation's atom secrets. No classroom notes are taken home or to the barracks. All written notes, manuals, material, computations, are locked into safes overnight.

The highly secret atom training is conducted in two phases: Individually, at first; later as a member of a nuclear team.

### Grade Must Be 100

There are no "passing" grades. A man either learns his atom lessons 100 percent or he doesn't pass. Tough examinations weed out 15 to 20 percent of each class, one school spokesman said. "A nuclear technician's got to know his stuff. No one makes mistakes with the atom."

Because nuclear weapons comprise the nation's major striking potential in event of war, students at the school are bound with terrible responsibilities. They're aware that each bomb may create wind up to 800 miles per hour, fires at 20,000,000 degrees. They know that each weapon—according to David Lilienthal, first chairman of the AEC—costs about \$1,000,000.

Instructors at the school hold master's and Ph.D. degrees from the nation's best scientific schools and universities. Some are draftees who served as physicists and scientists at the Los Alamos, N. Mex., scientific laboratory. Others are fresh from engineering schools.

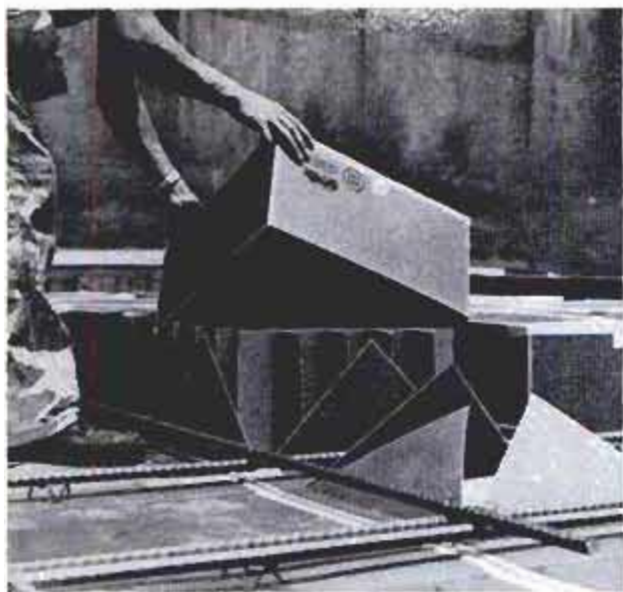
### Admiral in Command

Head of AFSWP Field Command which operates Nuclear U. is youthful-looking Rear Adm. Frank O'Beirne, USN, a naval aviator who was in command of Naval Patrol Squadron 22 when the Japanese attacked Pearl Harbor. He is 52. An air-minded naval officer, he once participated in the National Air Races with Charles Lindbergh.

Surprising development during daily classroom lectures at the nation's first nuclear university has been GI improvement in design and operation of nuclear weapons. The Kremlin's students frequently suggest alteration of the weapon under study.

Graduation from the Albuquerque school is entered on the student's military-service record. Nuclear studies continue for each student after graduation, however, during his assignment to posts around the globe. Servicemen are often reassigned to the Kremlin for postgraduate study of new weapons. This has become necessary due to the fantastic rate of improvement in the nation's nuclear armaments. ★ ★ ★

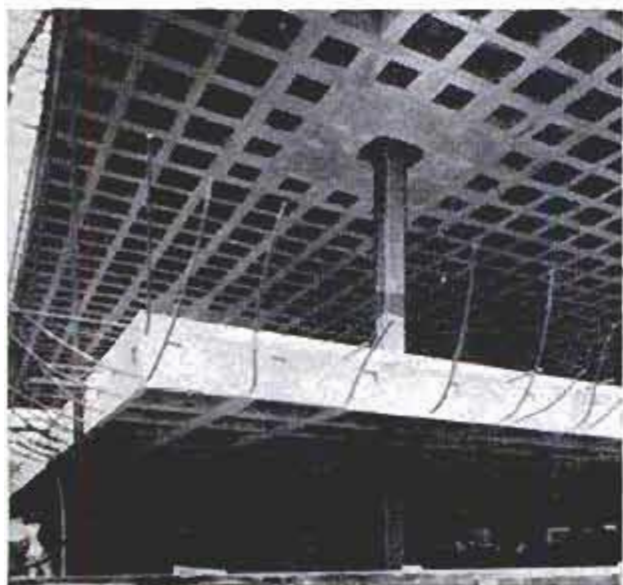




Photos courtesy Fiber Containers and Paperboard Mills

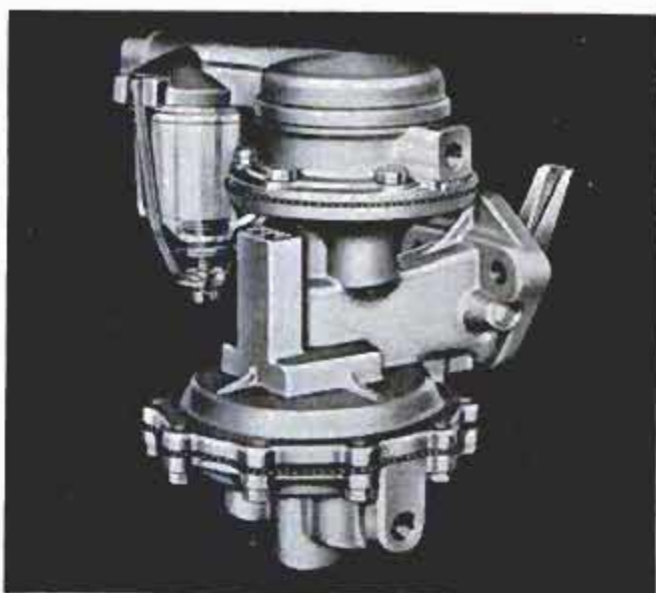
## "Grocery Boxes" Make Concrete Forms

Fiberboard boxes, similar to ordinary grocery boxes, now are being used as inexpensive forms for concrete work. The boxes are used in a new construction technique in which the successive floors of a building are cast at ground level and then jacked into place. Egg-crate partitions strengthen the boxes, and triangular flaps anchor them in place. The boxes are placed to form hollow areas or coffer in the slab. When the slab is jacked into place, the forms can be removed. The resulting hollow spaces save up to 40 percent of the steel and concrete required for a solid slab, yet are said to give the same floor-load capacity.



Graphite lubricant is sprayed into hard-to-reach corners with a new six-ounce aerosol bomb.

## Two pumps in one!



## ... THE CARTER



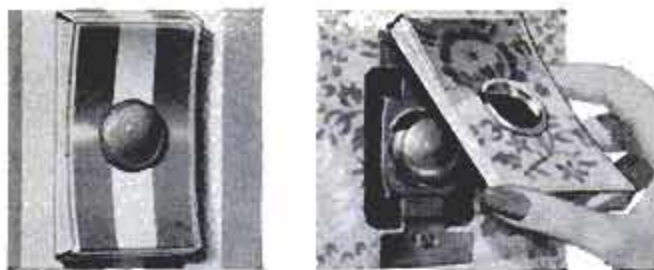
## FUEL AND VACUUM PUMP

This versatile CARTER combination fuel pump provides continuous vacuum for your windshield wipers—at any speed or on acceleration.

You also have the high capacity of the CARTER fuel pump and the high-efficiency of the CARTER ceramic fuel filter... all built into one compact unit. It's easy and economical to install. See your CARTER dealer, or ask your serviceman.

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\$1.95 complete—at leading hardware, electric and department stores.

## Ever See A Light Switch Like This?

New decorator light switch easiest yet to install! Honeywell Tap-Lite is a new kind of wall switch. Transparent plate snaps off for decorating; just add your own wallpaper, drapery material, or one of the colored inserts provided. It's simple to replace old switches; Tap-Lite has screwless terminals. Quiet and easy to operate. Tap—it's on! Tap—it's off!

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\$1 19 at your hardware store.

Other Stanley Rules from 75¢ up, 6 ft. to 12 ft., and each in the reuseable plastic box with the magnifying lens. You'll use the rule—you'll use the box.

Write Stanley Tools, 6208 Elm St., New Britain, Conn., for free booklet on measuring tools and how to use them.

**STANLEY**

## Owners Report on the '56 Chevrolet

(Continued from page 127)

"I like the smooth, fast pickup of the Powerglide transmission. But they should build in more economy (this car should give 20 miles per gallon on the highway) and leave horsepower where it is for the next 20 years."—Connecticut sheet-metal smith.

"Seems to have a very sensitive carburetor or timing setup. Tuneups seem to last only 1000 miles and, even though I use same type of gasoline, it invariably ends up loping."—Florida Air Force man.

"Hugs the corners. It's catlike. Climbs hills easily. Clean lines."—Maine salesman.

"Nice looking. Good vision from all seats. Good brakes."—South Carolina mechanic.

"Handling excellent at over 75 miles per hour. No mushy feeling on corners."—Louisiana foreman.

"I drive 100 miles every day taking my son to school. I go through several small towns and numerous stoplights. Easy handling, automatic transmission and instant response make this chore a pleasure."—Indiana housewife.

"Rides very well, especially on rough country roads. Lots of punch for such a little engine. Seems like it's empty under the hood."—Iowa farmer.

"Dealer service is the best I have heard of in this section."—Kentucky truck driver.

"Heater air intake below windshield should be sloped to take in more air. I have a 60-mile rural mail route I cover daily, averaging four stops a mile. It's a good place to bring out faults in an auto. I am very well pleased, generally speaking. It could steer easier. Would recommend it to anyone for rigorous service."—Kansas mail carrier.

"I like the almost vertical steering wheel and the solid body."—Nebraska teacher.

"Car has to be brought into the dealer too many times for little adjustments which have been taken care of very satisfactorily."—New Hampshire realtor.

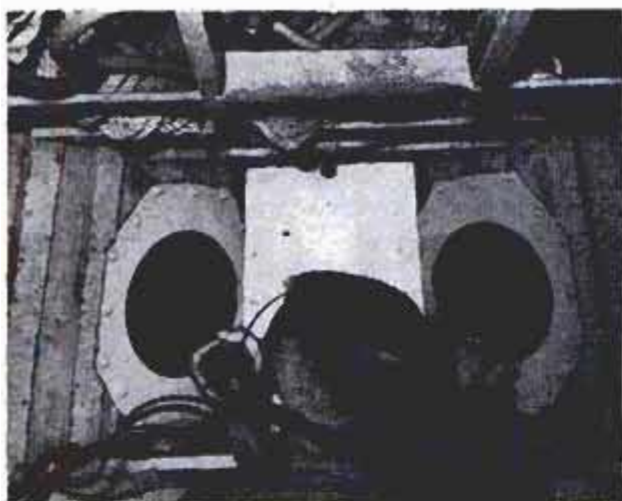
"Too much junk in the taillights. Too hard to keep clean. Grille is the same way."—Washington, D. C., mechanic.

"Don't like location of gas cap inside taillight. Gasoline is usually spilled when filling. The taillight wires are generally soaked with gas and I worry about a spark causing a fire."—Connecticut printer.

"A baffle in rear fender would keep small rocks from getting in around gas cap. When you open the taillight the small stones fall around the frame and you can't close it until you pick them out. In winter it packs

(Continued to page 214)





## Boat Has Underwater "Eyes"

Underwater "eyes" in the bow of a skin divers' boat enable a crew member to keep a sharp lookout for good fishing grounds, buried treasure and dangerous reefs. Reports to the skipper are made by sound-powered phone. The two underwater viewing ports are Navy-surplus port-light lenses the same thickness as the hull. Inner and outer brass reinforcing plates serve as window frames. Rubber gaskets and calking compounds keep the water out. The boat is the *Maray*, which makes charter trips to Catalina Island, pausing en route for skin-diving forays by its passengers.

## Teach Trout Not to Get Caught

Conservationists at Michigan State College are teaching hatchery-raised trout to be wary as their wild cousins. The fish were in the habit of surfacing when they heard the splash of rations being tossed on the water at feeding time. In the wild state, a similar splash means a fisherman's fly, a predatory otter or blue heron. Now, baby trout that surface at the sound of a splash are given a mild electric shock that teaches them to hide from a splash.

# KLEINS

**AID TO YOUR CRAFTSMANSHIP**

These three pliers—a Klein Side Cutting Plier, Long Nose Plier and Oblique Cutting Plier—belong in every workman's kit. They put the exclamation point after your good workmanship! For a century Klein has stood for the finest in pliers and Kleins are still the standard of comparison by which other pliers are judged. There is a type and size of Klein Plier for every job—all famous for Klein quality "since 1857."



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.

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It's a fascinating, exciting hobby to listen in on the whole wide world by short wave with Hallicrafters S-38D radio. With this exceptional receiver you enjoy not only standard broadcasts . . . but can choose from the 3 international short wave bands. You, too, will praise the performance of Hallicrafters S-38D radio . . . the choice of countless governments as well as radio experts the world over. Hear the S-38D at your nearest Electronic Parts Distributor today—\$49.95 . . . or write

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CHICAGO 24, ILLINOIS

full of snow and has to be blown out before you can put in gas."—South Dakota farmer.

"Don't like radio speaker on right-hand side. Driver can't hear it unless volume is turned up until passenger complains. I installed a rear-seat speaker for this reason."—Vermont salesman.

"Only one ash tray in front. Good for driver, not for passenger."—New Jersey salesman.

"Sun reflects from dashboard. Should be covered with nonglare material."—Wyoming editor and publisher.

"It has just enough trim not to be plain. It's not a chromed zebra. Trouble-free operation. I may not have a prestige car, but I've got peace of mind with this car."—California serviceman.

"As a family car the Chevrolet station wagon is tops. Horsepower is about all anyone can use on the roads we have today."—Washington service-station owner.

"Low, flat hood gives very good forward visibility."—Nebraska farmer.

"I know my car is always ready to go at the turn of the switch. Has plenty of pickup and after a long day's drive I am always relaxed. I'm proud to drive it."—New Mexico private secretary.

"I have never checked gas mileage on a trip. On my rural mail route I average about 12 miles per gallon. This is good for the conditions. The trouble with cars is they just aren't made for use under the conditions that we have."—North Dakota mail carrier.

"Rear-view mirror is in the way when looking to right. Battery is hard to get at for checking water."—Maryland printer.

"Exterior paint isn't as good as it should be, but other makes aren't any better."—South Dakota student.

"Too much wiring visible under dashboard."—Florida watchmaker.

"Oil filter and distributor hard to get at to change or repair."—Kansas rancher.

"Steering wheel should be lowered and extended. Seats need more padding."—Idaho salesman.

Here are some owners' complaints and suggestions which are not limited to the Chevrolet but are general comments on the industry:

"Outside rear-view mirror should be standard equipment for safety reasons."—Missouri housewife.

"Cars of today have too many gadgets."—Wyoming custodian.

"As a highway patrolman I see too much speed being displayed, but if some cars had the extra power for passing, in my belief, there would be fewer accidents."—Nevada police officer.

(Continued to page 216)





Courtesy of Parents' Magazine



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"FRIENDLY HOME IDEAS IN WESTERN PINE"—85 photographs, many in color. Traditional and contemporary ideas and finishes for building and remodeling with cheerful Western Pines. Write for FREE copy to WESTERN PINE ASSOCIATION, Dept. 513-N, Yeon Building, Portland 4, Oregon.

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are manufactured to high standards of seasoning, grading, measurement

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## Goal Lowered for Small-Fry Teams

Two public-school officials of Midland, Mich., have developed a device to permit the standard basketball goal to be lowered from the regulation height of 10 feet to a more convenient one of eight feet for small-fry basketball teams. The device is a frame of welded magnesium extrusions that can be attached to any backboard, and adjusts through a screw mechanism operated by a long crank. The device has proved so successful that a company has been formed to market it.

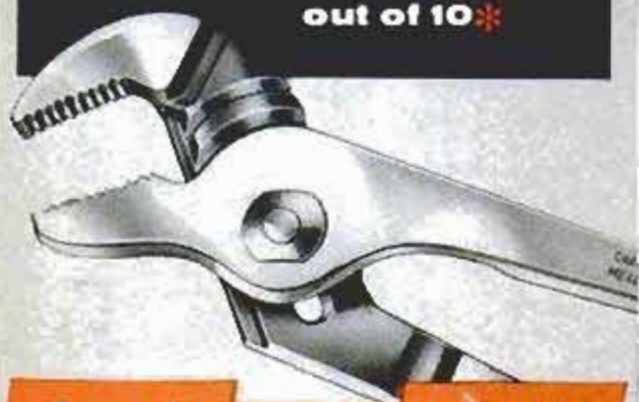
## Transistorized Switchboard

There are no vacuum tubes and no mechanical stepping switches in a transistorized all-electronic telephone switchboard developed for the Navy. It is one fourth as heavy and less than one half the size of a corresponding electro-mechanical board and has no dust, wear or corrosion problems. The unit is not yet in production.





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9 times  
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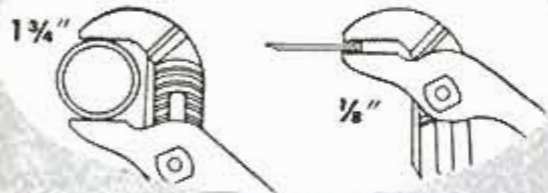


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**GRIPS LIKE A  
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Mechanics tell us that our Channellock No. 420 is the handiest plier of them all . . . the plier they reach for more often than any other. They like its all 'round usefulness . . . its pipe-wrench grip . . . its big jaw-opening . . . its streamlined design for hard-to-get-at jobs. And you'll like Channellock for the same reasons. Ask your hardware man for a Channellock 420.

**BE SURE IT'S A GENUINE CHANNELLOCK**



**CHAMPION DEPARTMENT TOOL CO. MEADVILLE, PA.**

"To me a horn ring which extends completely around the wheel is very important. I can think of at least eight times my horn has prevented an accident. Would have bought a competitive car (better trade-in allowance) if it had a full horn ring. I was amazed at their dealer's attitude that the horn was not important. I would rather blow my horn at a child about to run into the road than to depend upon a safety belt to keep me alive and forget about the child."—Connecticut insurance man.

"I believe Chevrolet and all manufacturers would do well to discontinue quoting misleading so-called records made by specialized cars."—Indiana office worker.

"All manufacturers should improve soundproofing to quiet road noise. They should refuse to use tires that thump."—California machinist.

That's it—the story of the 1956 Chevrolet V8 as told by those who know it best, the owners themselves. For a technical analysis of the car turn to Dale Kelly's report on page 124. For the opinions of a veteran car tester, read what Floyd Clymer says beginning on page 123. ★ ★ ★

## Floyd Clymer Tests the 1956 Chevrolet V8

(Continued from page 123)

excessive, body roll on sharp curves. Only on the hardest bumps at above-average speeds would the springs bottom.

There is little road shock or vibration at the wheel and but slight hood and fender flutter at high speed. There is a slight steering-wheel drag to give some road "feel" to the power-steering unit. Steering should be faster than it is, especially in view of the power assist.

### Engine Has Power Pack

The test car had the 265-cubic-inch engine that develops 205 horsepower with the power pack which includes a four-barrel carburetor, dual exhausts, a 9.25:1 compression ratio. Without the power pack, the V8 engine develops 170 horsepower. The engine runs with unbelievable smoothness and has very little vibration at any speed. Low-speed torque is excellent. The car really gets down and lugs under a heavy engine load. In the desert heat and on long pulls up sandy, steep inclines there was no evidence of overheating.

Powerglide is a torque converter plus planetary gears. Any automatic transmission takes a beating when driven in low gear in desert heat or up long, steep grades, but I found no troubles of any kind with

(Continued to page 218)



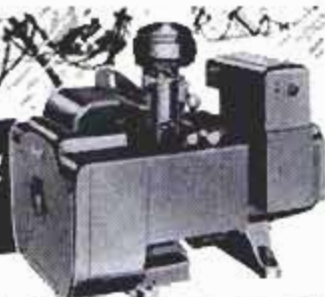
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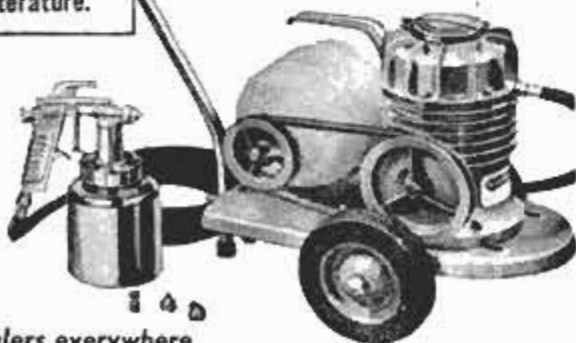
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this one. Shifting is smooth at all speeds. By depressing the throttle you can downshift at speeds below 50 miles per hour. One objection I have to Powerglide is that no downshift from top gear is possible above 50. I'd like to see this downshift take place at any speed up to 65, which would help in passing.

When slowing from high speeds there was some evidence of brake fade, but the fade was not excessive. There was no squeak to the brakes such as on some earlier Chevrolets I have tested. Pedal operation is easy and smooth.

### Vision Is Good

Front, side and rear vision is good. The body is solid and the doors open and close easily. There were no inside body dust leaks. A high-pressure hose test showed no water leaks. Body rumble and wind noise at high speeds are below average. Cranks require 3½ turns for opening or closing the windows. All doors can be locked without using a key when leaving the car. This is convenient although occasionally I have locked the key inside and no doubt others have done the same.

The interior finish is of high quality. Driving position is comfortable. Seat-cushion springs are good, but the springs in the back or vertical cushion of the front seat seemed weak. The small of my back sometimes hit the brace inside the seat back when going over rough bumps.

On long, open stretches, the speedometer needle hit 104 miles per hour. I estimate the actual top speed at over 100. The speedometer on the test car was one of the most accurate I have used.

### Dash Has Good Design

The instrument panel is well designed. However, the upper portion of the horn ring is in line of vision of the speedometer numerals—an annoying feature. I once said if I owned a Chevrolet I'd saw off the upper half of the horn ring and I haven't changed my mind. Nicely arranged and in clear view is the shift-indicator quadrant. I like the fact that Low and Reverse are alongside each other to allow for quick shifting when rocking the car in mud or snow. Chevrolet continues to use warning lights for oil and generator. I prefer needle indicators.

Throttle and brake pedals are close together and about the same height, facilitating quick movement between the two.

The top of the dashboard on the test car was padded and black, thus diminishing reflections. The center of the steering hub comes to a point. It may be attractive, but

(Continued to page 220)



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for as little as  
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## T-58 Turboshaft Engine to Power Helicopters

An aircraft gas-turbine engine called the most powerful turboshaft, pound for pound, packs more than 1000 horsepower into a 59-inch, 325-pound frame. Made by General Electric for the Navy, the engine, designated the T-58, will give superior performance to helicopters in terms of endurance, payload, range and speed. It is expected to increase the payload of the average utility helicopter by 100 percent. The Sikorsky S-58 helicopter has been announced as the flight-test vehicle for the engine, which is only five feet long and 16 inches in diameter.

### Copper-Glass Bonding

Copper is bonded to glass by a new method in which the bonding temperature exceeds the melting point of copper. The bond is integral and permanent, it is reported. The copper won't peel or discolor, retains its bright color where it contacts the glass and can be plated and soldered.



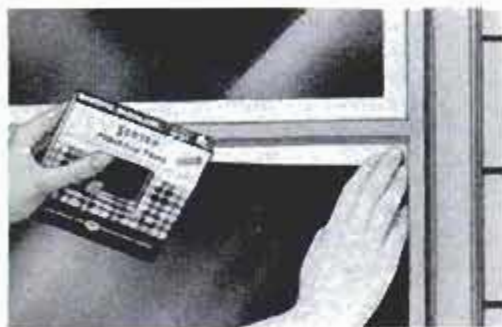


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MASKING TAPE



**PAINTING A WAGON?** Use this stretchy tape to make professional-looking stripes. Tape fits tight on curves, paint won't bleed through.



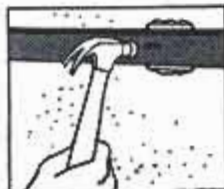
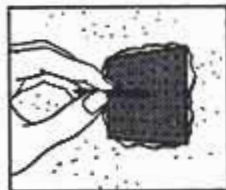
**SPEED YOUR JOB,** keep it neat with "SCOTCH" Brand Masking Tape. Applies easily from cutter-edge carton, strips clean. Get 39¢, 69¢, 98¢, \$1.69 sizes wherever paint is sold.

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from a safety standpoint it is not good. It should be flattened and lowered.

The emergency brake is efficient, but requires considerable pressure to operate. The steering wheel is too close to the left front door. The column should be moved farther to the right. The key-switch starter is well located. Chevrolet sticks to the design that permits the key to be removed while the engine is running. This is necessary on cars that use single-key arrangement if the trunk is to be made theftproof in parking lots.

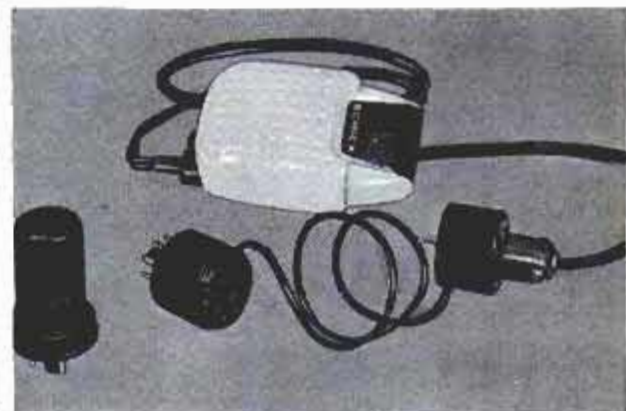
### Exhausts Below Bumper

I like the dual exhausts extending below the rear bumper and not through it. This keeps the bumper cleaner and there is less danger of soiling clothing as you walk past. The front bumper is impractical because of its pointed projections which may cause trouble when pushing a stalled car or parking in close quarters. The large parking lights in front are well located and seem well protected.

Gasoline mileage was good, considering that the power-pack Chevrolet has terrific acceleration and top speed. These, of course, reduce economy, but the public seems to want these features and is willing to accept less economy as a result. Premium gasoline is desirable, there being considerable pinging on regular gas. ★ ★ ★

## Attachment Permits Shaver To Be Run in Car

Electric shavers usually run on 115-volt house current can be operated in an automobile on current drawn from the car radio. One end of an attachment called "Radio-Shaver" is plugged into the socket of the rectifier tube of the radio. The shaver is plugged into a socket on the other end which is fastened to the dashboard. Once the attachment is installed, the tube is replaced so that the radio will operate normally. Installation of the attachment requires no soldering.





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Insurance*	120	Insurance*	100
Interest on loan	66	Interest on loan	14
License*	16	License*	5
Gas and oil (5200 miles annually, 15 miles per gal., 30¢ per gal.)		Gas and oil (5200 miles annually, 100 miles per gal., 30¢ per gal.)	20
Plus \$5 per year for oil	109		
	<b>\$811</b>		<b>\$226</b>

\*Based on average figures.

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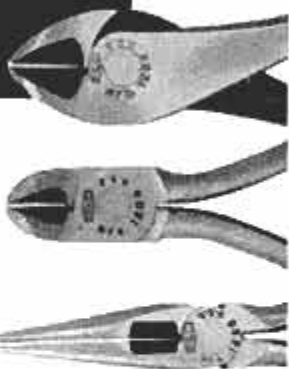


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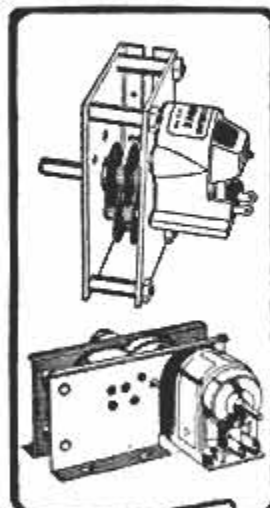
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## Electronic Mixer For Home Recorder

(Continued from page 144)

pin numbers 3, 4 and 5 of the two 12AX7 tube sockets should be installed so that it is spaced about 1¼ in. below the chassis base. The filament lead from pin 9 of the first tube is wrapped around this bus before being connected to pin 9 of the second tube. Another lead from pin 9 of the second tube is again wound around the bus before being finally connected to lug 4 of TS1. This keeps the "hot" filament leads away from the chassis and prevents the induction of hum into critical grid and plate circuits.

The complete point-to-point wiring of all parts is shown in Fig 4. The "initial wiring" is repeated here to present an over-all wiring diagram. Although the parts in this diagram are shown in their approximate positions, they have been spread out in order to show each connecting point. The under-chassis photo in Fig. 5 will help you in the correct placement of the various resistors and capacitors. Be sure to observe polarity in wiring the tubular electrolytics C8 and C12. The 6.8-meg. grid resistors R2, R6 and R10 should be installed close to, but not touching the chassis.

### Cables

The mixer is connected to a recorder or amplifier with shielded cable. The cable should not exceed 6 ft. in length to prevent loss of high frequencies. Terminate each end of the cable with the type of plug required to fit the particular jack with which it is to be used. Prefabricated cables with various types of connectors on each end are commercially available from radio-parts houses.

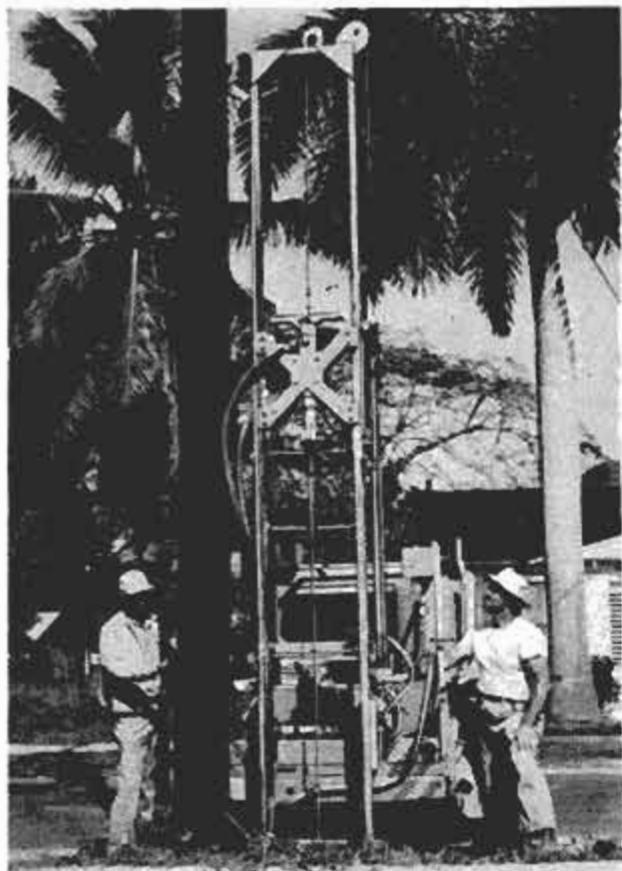
### Operation—With Tape Recorder

Since the mixer provides a relatively high gain, the recorder may be operated at reduced-volume level where hum and noise are at a minimum. To set up the recorder for best results, turn up the volume control about halfway and record a few feet of tape with nothing connected to the recorder input. Play the tape back to see if there is excessive hum or hiss. If so, turn the volume down a little and repeat this process until tape reproduction is "quiet."

Now connect the mixer output to the recorder microphone input jack and connect a cable from your microphones, record player or radio to the proper mixer input jack. All volume adjustments to obtain

(Continued to page 224)





### Air Hammer Drives Ground Rod

Power-company workers in Florida are using a mobile air-hammer outfit mounted on the tail of a light truck to speed the setting of ground rods around transformer and transmission poles. The air hammer slides in a tall steel frame. The 10-foot copper-clad steel ground rod is held by spring-hinged guides as the descending hammer sinks it into the ground. Additional rods may be coupled to the first rod to extend the rod to 20 feet or more. Hydraulic power from the truck's power take-off raises the guiding frame from its horizontal carrying position and lifts the hammer into operating position.

### Vaccine for Pneumonia And Grippe

Army scientists have developed a successful vaccine against the pneumonias, grippe and certain other acute respiratory diseases. Trials with the vaccine at Fort Dix, N. J., have cut the number of such cases by more than 80 percent. The viruses against which the vaccine protects cause more than half of all hospitalized cases of respiratory disease in military recruit-training camps. The vaccine, developed with killed viruses, reaches maximum effectiveness within one week, enabling doctors to stop training-camp epidemics before they really get started.



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the correct recording level are made with the mixer controls. When recording from a radio, the signal is taken from across the speaker voice coil and the volume is adjusted with the radio volume control, since no separate mixer control is provided for this function.

Unless a recording-level indicator or some other type of monitor is used, you may have to experiment a bit to determine what volume-control settings will provide the best mixing action. But, with a little practice, you will soon be able to obtain the desired effects.

#### Operation—With Audio Amplifier

To operate the mixer with a low-gain amplifier, as a PA system, connect a cable between the monitor jack and the phono input of the amplifier. The signal voltage at this jack is approximately two volts, operating into a high-impedance load. This is more than enough to drive any amplifier to its full rated power output. For high-gain amplifiers, the signal is taken from the regular output jack of the mixer and fed to the microphone input of the amplifier.

#### Operating Suggestions

If the mixer introduces excessive hum, reverse the line-cord plug of the mixer and recorder, one at the time, to find the combination which reduces hum to a minimum. Connecting a wire from the mixer case to a cold-water pipe or similarly grounded metal object may reduce hum by as much as 10 db.

If hum persists, check for a poor or missing ground connection. Try new 12AX7 tubes. Make sure that the phono plugs are making good contact with the grounded shells of the input jacks. Reverse leads to speaker voice coil if hum occurs while recording from radio.

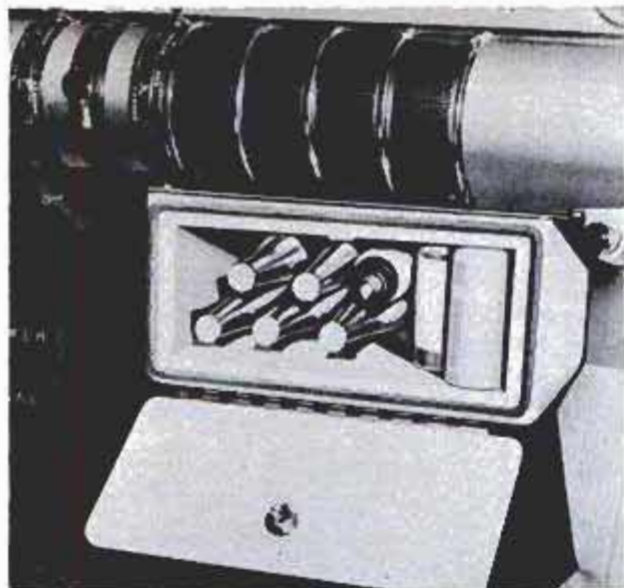
While using the mixer, turn the volume controls of any unused channel fully counterclockwise.

The magnetic phono and mike 1 inputs cannot be used simultaneously. Make sure that the front-panel selector switch is in the correct position when recording from either of these. ★ ★ ★

#### CORRECTION

Our May article on speaker enclosures states that the "Klipschorn" is available in kit form. Actually, only the Klipsch-designed "Shorthorn" can be purchased as a kit. The authentic reproduction for which the "Klipschorn" is famous can be obtained only from a factory-assembled model.



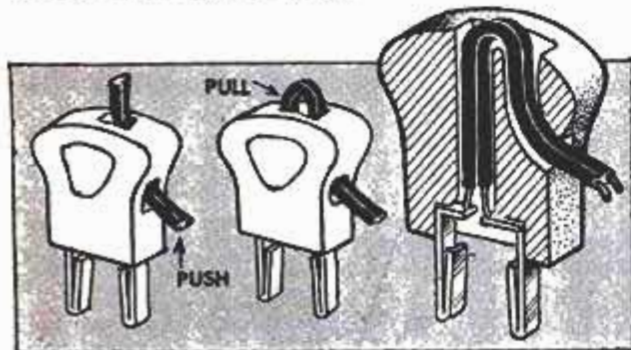


### Car Refrigerator Fits Under Dash

Easier to install than a car radio, a mechanical refrigerator mounts under the center of the dashboard. In it, the motorist can keep beverages and perishables cool as he drives. It is excellent for families traveling with bottle-fed babies. The refrigerator operates on power provided by vacuum from the manifold, according to the manufacturer. Gasoline from the fuel tank is used as the refrigerant and is piped into the carburetor after use. The price of the unit is around \$90.

### Self-Tightening Electric Plug

You can wire a new type of electric plug in a few seconds without the use of tools. The cord is pushed through a top slot and out a side slot. The free end of the cord is then pushed down on top of a copper prong that furnishes the contact. Any pull on the cord simply tightens the contact. The plug keeps the cord close against the wall to prevent it from being yanked out accidentally. Its spring prongs fit tightly into the outlet and finger grips aid in inserting or disconnecting the plug.



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## Around the World in 80 Days

(Continued from page 69)

George Raft and Joe E. Brown, to name only a few. Some of the stars are on the screen for only a few moments and you catch only fleeting glimpses of them.

The Todd players traveled to England, Spain, India and Japan to shoot portions of the picture, but most of the special effects were created in Hollywood or near Durango, Colo., where some of the highlights of the race across the United States were recorded.

Part of this journey had to be undertaken on a sailmobile improvised from a wagon that was made to travel along a railroad track. The vehicle looks like a wagon with a sail, to be sure, but it was built around a motor handcar. The picture company couldn't afford to wait for a stiff wind. Glass fiber and plastic were used to shape a sail that appears to be bellied by the wind.

In Colorado, Lee Zavitz had the job of finding a way to photograph, close-up, the thrilling ride of a bareback rider who was dashing through a forest. With the 140-degree bug-eye camera this promised to be a spectacular sequence on the screen.

### Invisible Saddle

Zavitz built a tiny saddle for the horse, invisible to the camera, and attached a pair of shafts to it forward of the rider's legs. The shafts went straight toward the ground, then trailed to the rear where they were attached to the wheeled dolly that carried the camera. The horse actually tows the camera. The audience gets all the thrills of a wild ride through the woods.

Stunts like that are easy. The big special effect that called for lots of study and weeks of preparation was the building and wrecking of a miniature railroad trestle. In Colorado the film company made full-scale scenes of the locomotive and old-fashioned cars of a narrow-gauge railroad that is still operating. The story called for the train to make a dash across a trestle that had been weakened by a raging river below it. The 100-foot-tall trestle was to collapse just as the train safely cleared it.

The trestle is part of an existing railroad and couldn't be wrecked, so the scene was filmed in Hollywood.

First the mountain background had to be matched on a scale of about two inches to the foot. A small canyon in the Hollywood hills, literally a gully, was reshaped to conform to the appearance of the Rockies. A forest of miniature trees, each consisting of a stalk from the desert yucca bush drilled to accept juniper branches,

(Continued to page 228)



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dressed up the mountainsides. The rocky gorge and the rushing river at its bottom were matched by using photographs of the actual scene as guides.

There's more to creating a realistic river in flood stage than you might think, even in miniature. One of the problems is the sheer volume of water required. This was solved by storing all the water in a small reservoir and in a number of huge dump tanks, all upstream out of camera range. When the water was released into the river a satisfactory flood came pouring downstream.

### Water Pipes Add Swirls

But the torrent didn't have the swirling white crests and the swift treacherous currents of an actual river in flood, so these were added artificially. Water pipes were laid in the river bed with spray heads attached to provide swirls of current.

Lee Zavitz explains that building the miniature trestle was easy, but engineering it so that it would collapse at the right time and in the right manner took a lot of thought. The trestle was built of wood, each small stick representing an actual timber in the real structure. Construction details had to be perfect. A flaw such as a hammer mark around a nail would be magnified to the size of a basketball on the screen, giving away the whole scene.

### Pipe Collapses Trestle

"After the trestle was built we placed a four-inch pipe across its bottom, extending from one side of the river to the other," Zavitz says. "The pipe was hidden by the water. Then we ran concealed cables from various parts of the trestle down to the pipe and attached them at different points. Thus, when the pipe was rotated by a motor the cables wound around it. The cables tightened one at a time and successively brought down different portions of the trestle. The whole collapse had to occur in just the same way that an actual trestle would weaken and fall."

The scaled-down train used in the scene was a modern miniature that was rebuilt to match the actual train used in Colorado. Such details as the engine cab, stack, headlight and whistle were all reproduced exactly. Batteries were used for interior lighting. The engine had its own boiler and produced its own steam. Black smoke for the stack came from a smoke cartridge.

"It would have been simple to send the train across the trestle under its own power," Zavitz remarks, "and we might have done this if the story called for the train to run off the trestle and crash in the river. But the running of the train and

(Continued to page 230)



# IDEAS FROM WELDWOOD

## THIS MONTH'S PROJECT—POWER SHOP WORKBENCH



It's a workbench, shop cabinet and power tool table, all in one. Designed by the DeWalt Power Tool people, for use with the DeWalt radial-arm power shop, this handsome bench is also adaptable to other power equipment, or to a plain work surface-storage cabinet. (See coupon for free plans.)

To be sure of sound, sturdy construction; DeWalt specifies Weldwood Products for this project. Weldwood Fir Plywood is used for sides, bottom and doors, while Weldwood Perwood is used on the back to hold extra blades, grinding wheels, etc. And this workbench will take a lot of wear and tear because

the work surface is Weldwood Duraply®—the plywood with the special tough overlay that's twice as wear-resistant as ordinary plywood. Duraply's supersmooth surface also assures you of no splinters, virtually no checking, and better painting qualities.

### This Month's Hints

**Leaky cellar doors?** If your cellar is constantly wet because rain leaks through battered cellar doors, replace the doors with panels of  $\frac{3}{4}$ " Duraply®. A Duraply panel has no cracks or seams so water can't leak through . . . and Duraply is weather-proof, too. You'll find that Duraply's supersmooth surface makes painting easier. E. G., Lynn, Massachusetts.

Got a table, TV set or bench with a worn, scratched top? Here's how to fix it up like new. Get a  $\frac{1}{8}$ " thick piece of Weldwood Plywood (birch, oak, or any other wood); cut to proper size and glue on as a new top with Weldwood Contact Cement. Then you can paint, or finish natural. To conceal plywood edges, edge the furniture with new Weldwood Flexible Wood Trim. C. F., Van Dyke, Michigan.

**Traveling fun.** Take a square of Weldwood Plywood—about  $6\frac{1}{2}$ " x  $6\frac{1}{2}$ "—drill holes in it about  $\frac{3}{4}$ "

### THE WELDWOOD QUESTION BOX

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**HAVE A QUESTION?** Send it to "The Weldwood Question Box," 55 West 44th St., New York 36, N. Y.

apart and you have the beginning of a nonslip checkerboard to use while traveling. Checkers can be made of dowels cut to about 1" length. T. P., Albany, New York.

#### \$10 FOR YOUR IDEAS

for "This Month's Hints," if accepted for publication. (Hints must apply to some Weldwood product.) Send them to "Weldwood Hint Editor," 55 West 44th St., New York 36, N. Y.



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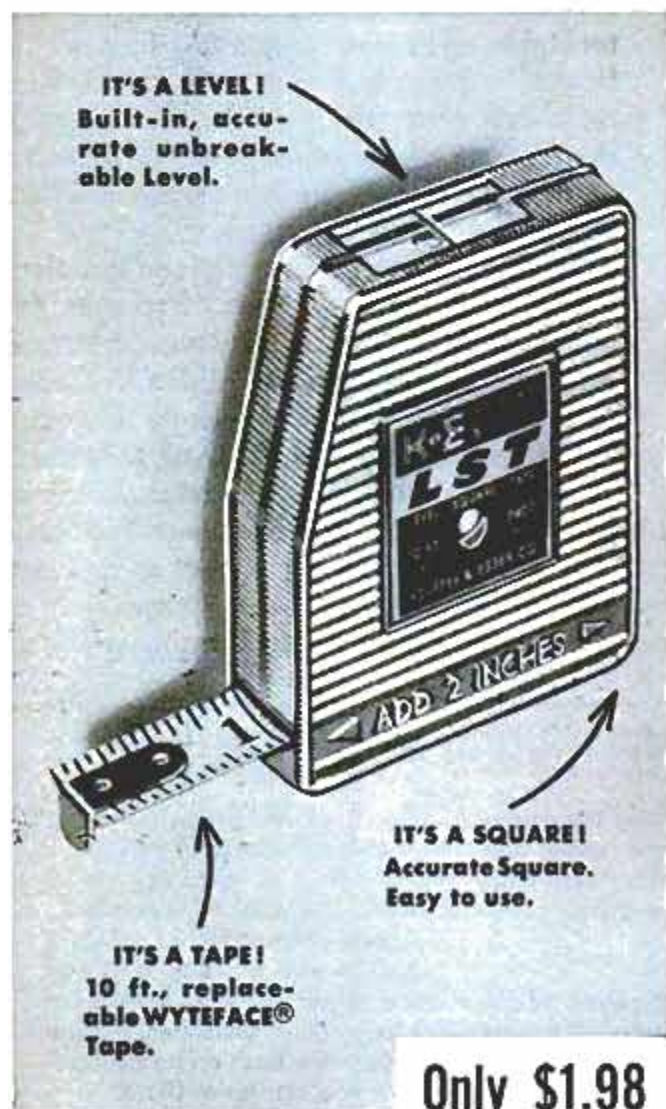
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collapse of the trestle had to be timed to a fraction of a second. Nothing could be left to chance. There could be no trial runs, no rehearsals.

"So the train was dragged across the trestle by a cable you don't see on the screen. It was hidden between the rails at the top of the trestle. The cable was attached to a winch that was geared to move the train at a speed of five feet per second. That way we dovetailed its run with that of the motor that turned the pipe to wreck the structure."

The scene went off exactly as planned, with the train rushing across the trestle which collapsed immediately behind it. The effect cost all of \$40,000 to create and lasts about half a minute on the screen. It was worth it. Todd defies any readers to find one flaw in the scene that would reveal it as a miniature. ★ ★ ★

## Lawn Drinking Fountain

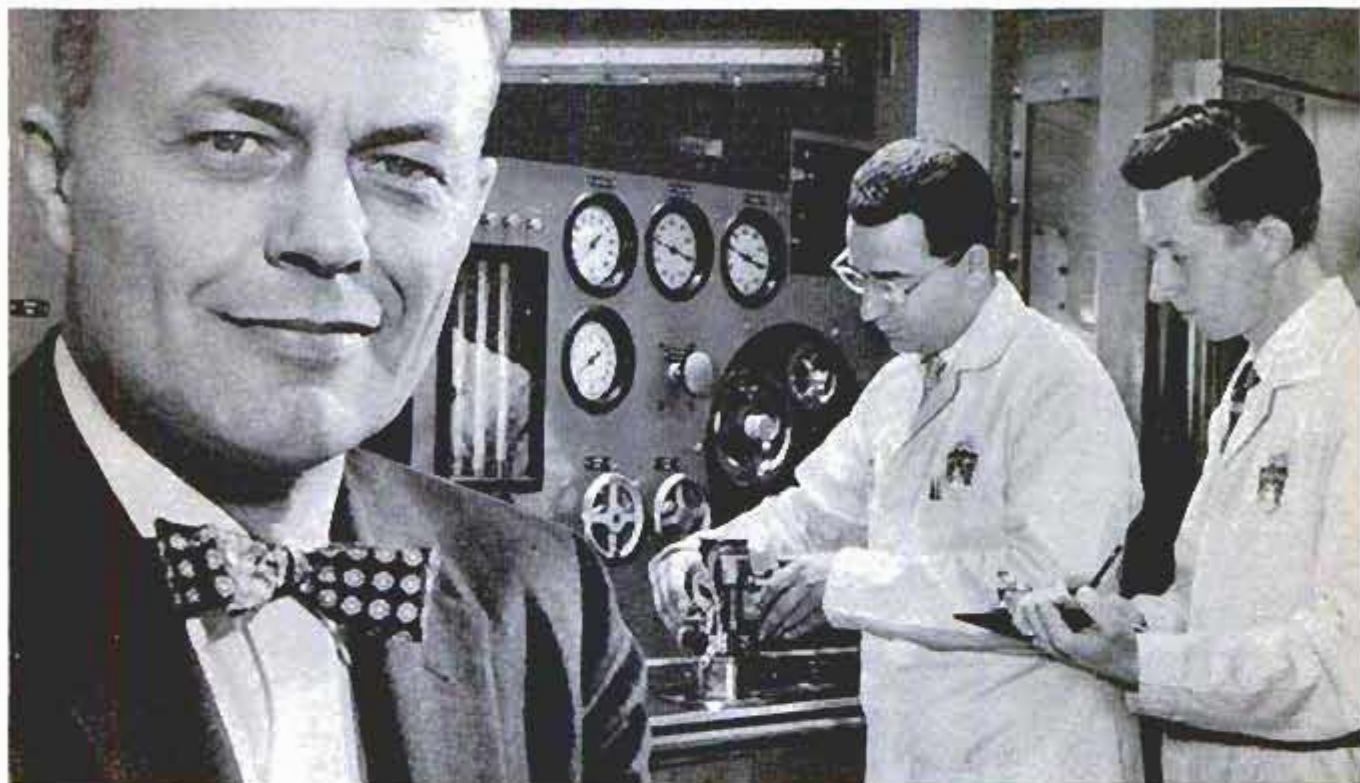
Hot, thirsty kids are encouraged to drink more water—outside—by a drinking fountain connected to the garden-hose hydrant. A special sill cock provides two outlets so that the hose need not be detached. Six feet of supply line permit placing the fountain away from shrubs or flower beds. The nylon valve is easily operated by the smallest youngster. The fountain has an aluminum stand, plastic bowl and a movable drain line that can be used to water flowers.





For your Ford—always specify the carburetor with the

# THRIFTY FLOW



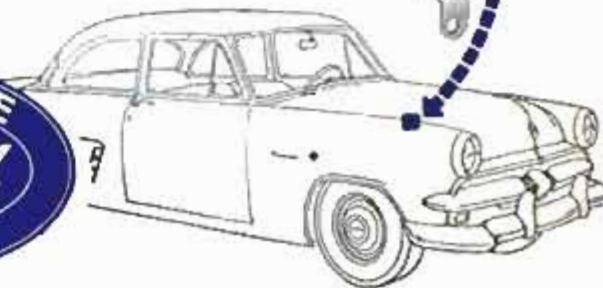
"Genuine Ford Carburetors are inspected before assembly and 100% flow-checked (above) after assembly," says Paul Clayton, Ford's Executive Engine Engineer. "Duplicating the flow of fuel and air to your engine from idle to high, this check makes sure the carburetor delivers to your engine *no more gas than necessary* for top performance. You can be sure of a thrifty flow when you specify a *Genuine Ford* carburetor."

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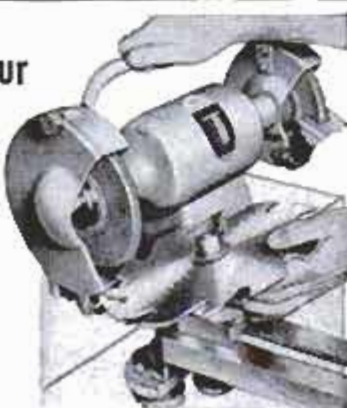
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**Tiremakers Race Against  
Turnpike Speeds**

(Continued from page 81)

**Wire tires:** The use of wire in tire construction isn't new; it's been done in Europe for years, and Firestone in this country has been making wire-reinforced tires for use on buses and trucks since 1943. But during the past year "wired" tires caused a stir as U. S. Rubber brought out its wire-shielded tire. This is a tubeless tire with a fine screen of wire mesh embedded in the casing between the tread rubber and the cord. The wire strengthens the tire, increases its resistance to cuts and makes it rupture-proof. Chief difference between U. S. Rubber's wire tire and others is that others use wire in the cord in the sidewall. Such tires must be carefully watched to see that pressure is kept up, for any running at low pressures will flex the wires in the sidewall to the breaking point, ruining the tire. By putting it only in the tread, U. S. Rubber solved this problem and produced a rugged, safe tire.

**High-performance tires:** Developed originally for use on sports cars and during races, high-performance tires are getting more attention now because of the high-speed driving problem in the years ahead. These tires are engineered to run better and cooler at sustained high speeds—with less emphasis on comfort. They have nylon cords, special compounds in the cord body to give adhesion between plies and between tread and casing, and tread patterns to distribute the weight better at high speeds.

Tire engineers say that original-equipment tires in recent years have improved high-speed characteristics, so they will have long lives at speeds driven by most motorists. They also say that if you drive a late-model car at high speeds regularly, it would be wise to consider equipping your car with high-performance tires.

There was a time when a motorist planning a trip of several hundred miles allowed for two or three stops for tire repairs. Last year, the American Automobile Association estimates, out of 60,000,000 cars on the road, 12,000,000 stops were made for tire troubles—in other words, one motorist in five had difficulty. Each year this figure gets better, in spite of tougher driving conditions, so the tiremakers are staying ahead in their race against speed. But to maintain that lead, they have to burn the midnight oil, because the turnpikes are coming up fast. ★ ★ ★

☐ Baghdad, Iraq, is the site of the first television station in the Middle East.



## 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. AN OUTSTANDING BUY!

F.O.B. Chicago **21.50**

## HYDRAULIC LIFT CYLINDERS

• For Fork Lift Trucks • For Presses • Loading Ramps • Lifts 12500 lbs. Heavy duty hydraulic cylinders, at big savings.

ITEM #502—4" Bore—36" Stroke—134" Piston Rod. Wt. 95 lbs. F.O.B. Chicago..... **72.00**

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ITEM #315—Rated 24 volts, 90 amps, 4000 R.P.M. Has 1/2" spline shaft on both ends of motor. Ball bearing construction, as specified for use with electric wheelchair design Popular Mechanics March issue, 1953. Convertible for use on 6 to 12 volts. Shipping Wt. 21 lbs. Dimensions: 11" x 5" x 6 1/2". F.O.B. Chicago..... **13.00**

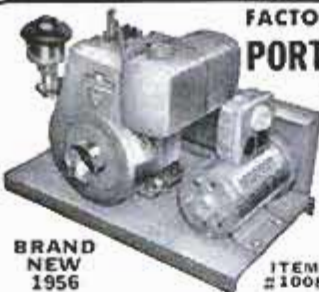


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**1000 WATTS OUTPUT**, continuous duty. 115 Volts A.C. 60 cycles, 9 amps. Powered by husky, easy starting Clinton engine. Engine and generator operate at 3600 R.P.M. for maximum efficiency at minimum weight. Both units are mounted on steel base, with heavy sheet metal belt guard. Generator is self regulating, and is equipped with outlet box containing fuse and 2 A.C. convenience receptacles. Cost only 5c an hour to operate. Dimensions: Length 20 1/2", Width 12", Height 16". Shipping wt. 100 lbs. F.O.B. Chicago..... **149.50**

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## Right Behind the Firemen Come the Salvage Squads

(Continued from page 85)

are laid end to end and overlapping, so as to form a channel down a stairway or even down a fire ladder.

In modern buildings with concrete-slab floors, there is not so much danger of water pouring through holes around light fixtures or pipes, but it is often necessary to form dams of rolled-up covers to keep water out of elevator shafts and stairwells. However, unless ample provision is made to drain this water off in a very short time their precautions will be useless, as it will rise above these cloth dams and go flooding down to lower floors. When it is realized that anywhere from 6000 to 10,000 gallons of water per minute are often thrown into a fire, it is obvious that getting rid of it can be a serious problem. Pouring down the stairwells, it can do damage on a dozen or more floors—and in the case of a fire on the 18th floor of the Pennsylvania Hotel (now the Statler) in New York some years ago, water rose several inches in the lobby before the situation was under control.

### The Cover-Up

In a small fire in a suburban house two or three covers may be sufficient to pro-

tect the piled-up furnishings of one or two rooms. But a big industrial building may make use of 20, 50 or even 100 covers. In the spectacular Lansing, Mich., fire some years ago when the upper floors of the state's office building filled with irreplaceable community records caught fire, all fire companies in town contributed covers until a total of 250 were in use.

The Minneapolis Fire Department, typical of modern, well-equipped outfits, requires that each ladder company report to a fire with 10 covers, and each engine company with two more.

### No Sale for Smoked Fur

Venting smoke is also an important function of fire-patrol companies, not simply for their own safety, but to prevent damage to merchandise. Hundreds of thousands of dollars worth of furs, for example, can be ruined by a comparatively brief period in a smoke-filled room. Once thoroughly impregnated with smoke, the smell is extremely difficult to remove permanently. For this work firemen either use existing air ducts, or chop holes in walls or floors and install portable electric exhaust fans. Even after the fire is out and the hoses have stopped pouring water into a building, the fire-patrol men have a lot to do.

(Continued to page 236)

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LISTS:

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AMAZOY comes direct to you in pre-cut living grass plugs - NOT messy sod or wasteful seed. When planted on 1-ft. centers in checkerboard pattern, gives hundreds of transplants yearly. Grows where other grasses have failed. Perfect for hills, for clay, sandy soil - even beaches. Guaranteed not to winter-kill.

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But not long after this, the Association of Fire Insurance Companies was formed which hired 40 men (at \$250 a year) to patrol the mercantile district of New York City during the night.

### Whee!

In the early days, fire companies were often more social clubs than anything else, and the members had more zest than knowledge of how to put out a fire. Very often they did more damage with axes and water than the fire. One fire-fighting technique of early days called for the use of a tremendous iron hook fastened to a long rope. A fireman would climb a ladder, snag the hook into the framework of the building, and the crew would then pull the building to the ground, where "it was easier to fight the fire." By 1866 fire-patrol units supported by insurance companies were operating in 21 major cities, and many of these are still in existence.

But just as private fire-fighting companies have given way to municipally supported fire departments, so the insurance companies' fire patrols have been disappearing, and their functions taken over by city fire departments. The first of the old fire patrols closed in 1921 in Mobile, Ala. Today only nine cities still have such outfits, and many of these are much reduced. Fire departments are, generally speaking, so well trained today that they do as little damage as possible, and nearly all of them have special salvage outfits.

Locally, still another factor is at work to keep damage in homes, stores and factories to a minimum today. It has been strongly impressed on fire-department personnel that it is extremely bad public relations to smash up property needlessly. Firemen who want raises, better pension plans and the good will of the communities in which they live and work might find this to be expensive fun. ★ ★ ★



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<p style="text-align: center;"><b>FRONT DRIVE WITH FREE-LOCK</b></p> <p style="text-align: center;"><b>LOW OPERATING COSTS</b></p> <p style="text-align: center;">ONLY WHEELS MOVE ALL PARTS STOP</p> <p style="text-align: center;">IN 2-WHEEL DRIVE NO PARTS MOVING!</p>	<p style="text-align: center;"><b>FRONT DRIVE WITHOUT FREE-LOCK</b></p> <p style="text-align: center;"><b>HIGH OPERATING COSTS</b></p> <p style="text-align: center;">WHEELS MOVE ALL THESE PARTS MOVE</p> <p style="text-align: center;">IN 2-WHEEL DRIVE OVER 100 PARTS MOVING—WEARING!</p>
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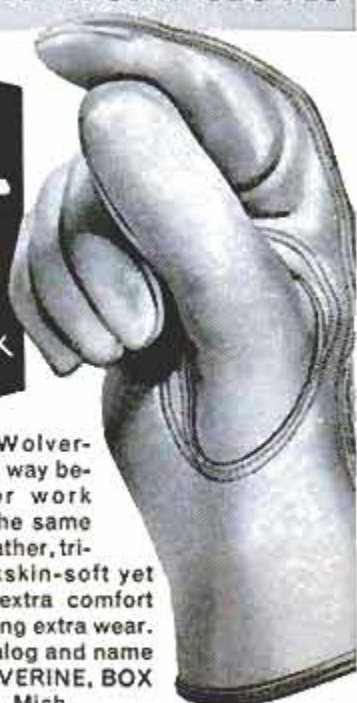
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**1998** Complete with  
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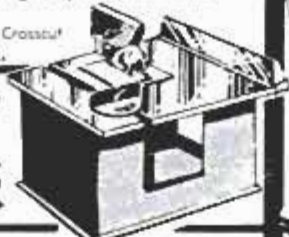
A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable 0 to 6" rip fence. Safety-trigger switch on handle. Full 1/2 HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6 1/2 lbs. Thousands already sold. Your satisfaction guaranteed.

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1 1/2"	25 ft.	14.75
2"	10 ft.	16.50
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110-120 v. 60 cyc. AC. Absolutely the best made—exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for portable starting. Skid mounted—portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price \$585. Special at... **\$299.50**  
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(Item 1660) Diesel Master—11-12 kw. 110/220 v. AC single or 3 phase. 1800 rpm direct connected. Electric Self-starting. Engineered for permanent power where continuous low-cost, heavy duty service is important. Wt. 1350 lb. Reg. list \$850.00. Factory Price... **\$1895.00**

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Factory price... **\$134.50**  
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Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any 1/2, 1/2 or 1 1/2 HP motor. Overized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" h x 18" x 16 1/2". Outlet opening 13" x 11 1/4". Wt. 45 lbs. Item 245. Reg. \$54.50. **\$29.50**  
Factory Special  
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Sure... you're his hero. You *know* that. But sometimes it can get kinda tough if the other kids don't seem to understand about the "old man."

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- Painting Contractor
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- Cartooning
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- Fashion Illustrating
- Magazine Illustrating
- Show Card and Sign Lettering
- Sketching and Painting

### AUTOMOTIVE

- Auto Body Rebuilding
- Auto Elec. Technician
- Auto-Engine Tune Up
- Automobile Mechanic

### AVIATION

- Aeronautical Engineering Jr.
- Aircraft & Engine Mechanic

### BUSINESS

- Advertising
- Bookkeeping and Accounting
- Business Administration
- Business Correspondence
- Public Accounting
- Creative Salesmanship
- Federal Tax
- Letter-writing Improvement
- Office Management
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- Sales Management
- Stenographic-Secretarial
- Traffic Management

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- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry
- Natural Gas Prod. & Trans.
- Petroleum Engineering
- Plastics
- Pulp and Paper Making

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- Construction Engineering
- Highway Engineering
- Reading Struct. Blueprints
- Sanitary Engineering
- Structural Engineering
- Surveying and Mapping

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- Architectural Drafting
- Electrical Drafting
- Mechanical Drafting
- Mine Surveying and Mapping
- Plumbing Drawing and Estimating
- Structural Drafting

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- Electrical Maintenance
- Electrician  Contracting
- Lineman

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- High School Subjects
- Mathematics

(Partial list of 256 courses)

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- Industrial Supervision
- Leadership and Organization
- Personnel-Labor Relations

### MECHANICAL AND SHOP

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- Heat Treatment  Metallurgy
- Industrial Engineering
- Industrial Instrumentation
- Industrial Supervision
- Internal Combustion Engines
- Machine Design-Drafting
- Machine Shop Inspection
- Machine Shop Practice
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- Quality Control
- Reading Shop Blueprints
- Refrigeration
- Sheet Metal Worker
- Tool Design  Toolmaking

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### TELEVISION TECHNICIAN

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- Car Inspector
- Diesel Engineer & Fireman
- Section Foreman

### STEAM AND DIESEL POWER

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- Diesel—Elec.  Diesel Eng's
- Electric Light and Power
- Stationary Fireman
- Stationary Steam Engineering

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- Loom fix'g  Textile Des'g'ng
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- Warping and Weaving

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- Marine Engineering
- Ocean Navigation
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*with that*

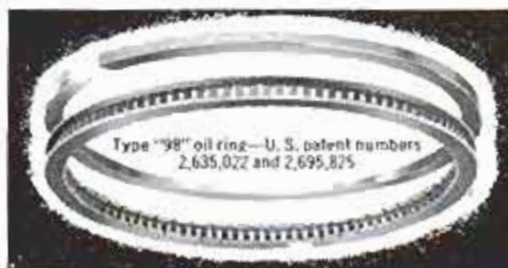
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