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See page 112



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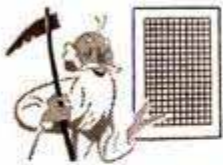
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This One



Read these interesting facts about your own automobile

Listen to what the men who build automobile engines have to say about your car. At 40 miles an hour on a smooth, level highway, 50% of your gasoline is used up to overcome engine friction. Yes, half of the power your gasoline produces never gets to the rear wheels to make your car go faster or farther or climb a steeper hill.

Friction eats a lot of gas, doesn't it?

Now just suppose you can *reduce* that friction. Then some of the power that was being used to overcome it will be *released* to *help* drive your car ahead.

And that's exactly what happens!

In hundreds upon hundreds of scientific Dynamometer tests using cars like yours, the average motorist got 8% more *usable* power from the same amount of gasoline after he had changed from whatever oil he had been using to Macmillan Ring-Free Motor Oil.

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Popular Mechanics Magazine

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H. H. WINDSOR, Founder

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



this month's cover

HIGH ABOVE the concrete lawn of the city this steeplejack plies his trade. On our cover he's painting a TV and FM radio antenna; but before he could paint that spire he had to build it. He works higher than any earthbound mortal in history, for his business takes him, not only to the top of the highest skyscrapers in the world, but on up the needle-shaped towers that he may erect more than 200 feet higher into the clouds. Dangerous? Of course. But the steeplejack only shrugs his shoulders and philosophizes that a 50-foot fall can kill you just as dead as a 1400-foot plunge. TV has put a premium on cloud-scraping real estate—the higher the tower the farther a picture can be transmitted. Antennas are sprouting like weeds on skyscrapers all over the country. For the stomach-squeezing story of the new steeplejacks who build and maintain these masts turn to page 112

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; William Harrison Petridge, vice president; D. F. Windsor, vice president and secretary-treasurer; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year \$3.50; 2 years, \$6.00; 3 years \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both your old and new addresses.

Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Registered as Second Class Matter at the Post Office at Mexico, D. F., Mexico, June 20, 1950.

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APRIL 1951

Volume 95 APRIL 1951 Number 4

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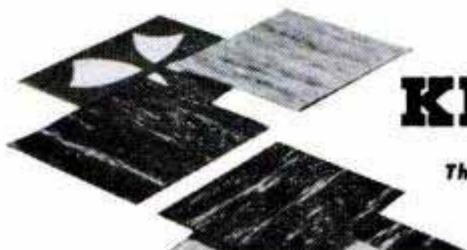
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THE EDITORS

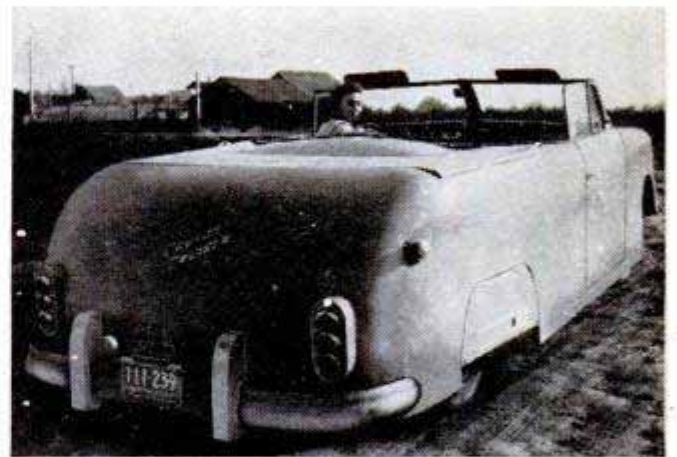


WOULD YOU LIKE to have a newly built, modern ranch house at half price?

Tom and Vinita Riley of Portland, Ore., will move into theirs very soon. They built it themselves, from plans provided by *Popular Mechanics*, and by their own labor saved half the cost of the new home.

Next month, in the Craftsman Section, Tom Riley begins his story. It is a sort of triumphant confession. A confession that he is a rank amateur as a carpenter, bricklayer, cabinetmaker, glazier and roofer. But his triumph in the completion of a beautiful plywood home proves that, as Tom says, "If I can do it, anyone can!"

Don't miss the beginning of this great story in the May issue, with seven pages of full-color illustrations. It may bring the inspiration for your own new home.



Letter to the Editor

Enclosed herewith please find negatives showing a car built at home by the Juchli Brothers of Edmonton, Alta., Can.

(Continued to page 8)



To the man who wants to enjoy
an ACCOUNTANT'S CAREER



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

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(Continued from page 6)

The car is made from a wrecked half-ton Chevrolet truck and is 7 feet 2 inches wide, the seat is 70 inches wide, wheelbase is 116 inches and it weighs 4500 pounds. The car has an unusual one-piece roof with large Mercury rear window which hinges at the back and disappears completely in the trunk. The body is made of 18-gauge black iron. This car operates well.

A. C. Juchli,
8840 - 87th St.,
Edmonton, Alta., Can.

Letter to the Editor

In the December issue of PM there is an article about "Weapons With a New Wallop." In this article there is a short discussion of the effects of the bazooka and shaped charges on a tank. I would like to find out what would happen if two or three thicknesses of one-inch armor plate spaced about four inches apart were hit by this type of shell. . . . It seems to me that the power delivered from this shell is due to impact, very much like a die-punching steel, which is very effective on solid armor plate of great thickness. If the shell were exploded at a distance from the main armor, it would have relatively little effect.

Charles K. Maxey,
Vallejo, Calif.

According to information provided by the Army Ordnance Laboratories, two or three thicknesses of armor plate would not make any difference to a shaped-charge shell. In the December article reference is made to the fact that the shell does not work on impact, except for triggering purposes. What does the job is a thin stream of supersonic metal proceeding from the apex of the cone-shaped metal lining behind the nose of the shell. This will bore through any number of thicknesses, up to about 11 inches of solid metal, or the equivalent in spaced armor plates.

Letter to the Editor

It has just been my good fortune to read Floyd Clymer's article on the Nash Rambler in your January issue, and I feel I must drop you a line complimenting you on it. This article is refreshingly different from the individual opinions you read on different makes of cars. Here the actual owner voices his opinion, and, you will agree, it is the collective opinions of owners of any product that ultimately will make or break a manufacturer. . . . I feel sure that Mr. Clymer's article will go a long way to increase Rambler sales and popularity.

(Continued to page 10)



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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

(Continued from page 8)

Without a doubt, Mr. Clymer's findings will also prove of great value to Nash engineers.

Let's have more of Mr. Clymer's frank and informative articles.

W. E. Kleimenhagen,
Advertising Manager,
Harley-Davidson Motor Co.,
Milwaukee 1, Wis.

Letter to the Editor

Recently I have had the pleasure of reading an article in your January 1951 issue entitled, "The Owners Report on The Nash Rambler" by Mr. Floyd Clymer.

I have found this report extremely interesting and I hope that it will be possible for many such reports as this to appear in the immediate future. There is one thing for sure, that the facts contained in the article are the absolute truth and there remains no doubt in anyone's mind that any apple polishing exists.

I have always been a reader of the *Popular Mechanics Magazine* and I have always been interested in articles pertaining to motors.

Carl A. Vollrath,
Major AGC,
Camp Pickett, Va.

Letter to the Editor

Since my business is lubrication I have always found your magazine intensely interesting. All articles you publish relative to automobiles, trucks, tractors, engines, etc., I find are distinctly informative.

While your magazine has always been tops in matters pertaining to the mechanical world, I think you do deserve an extra word of praise for the very fine article that appeared in your January issue under the title of, "The Owners Report on The Nash Rambler" by Floyd Clymer.

Mr. Clymer has made a very exhaustive test of the Nash Rambler and has submitted detailed data that most definitely will interest many car owners. Both Mrs. Wynn and I found the article most interesting, in fact, I read it aloud to her. . . . No doubt, there are many other people like ourselves who will enjoy reading further articles written by your very competent field tester, Mr. Floyd Clymer.

Again my congratulations to you for doing a grand job.

Carl E. Wynn,
President,
Wynn Oil Co.,
Azusa, Calif.

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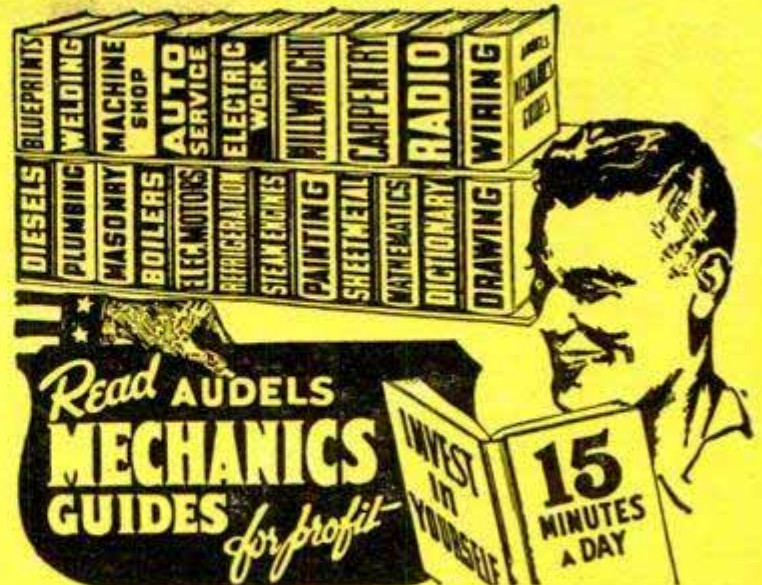
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WEATHER RESISTANT

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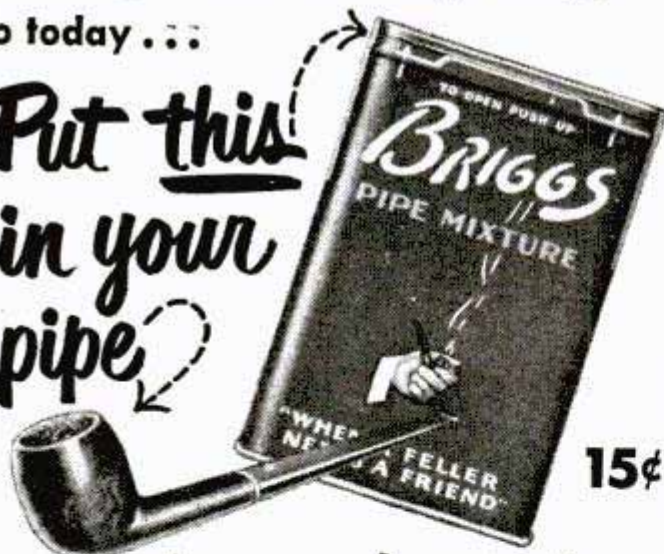
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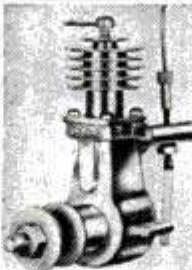
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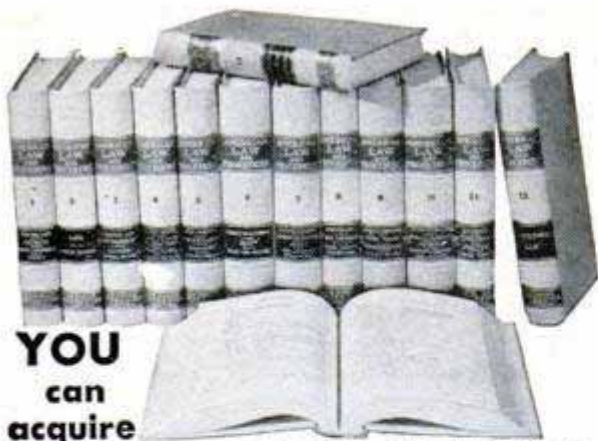
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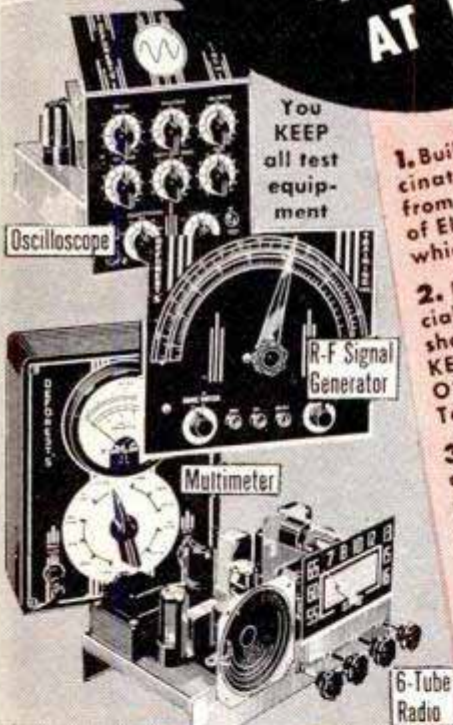
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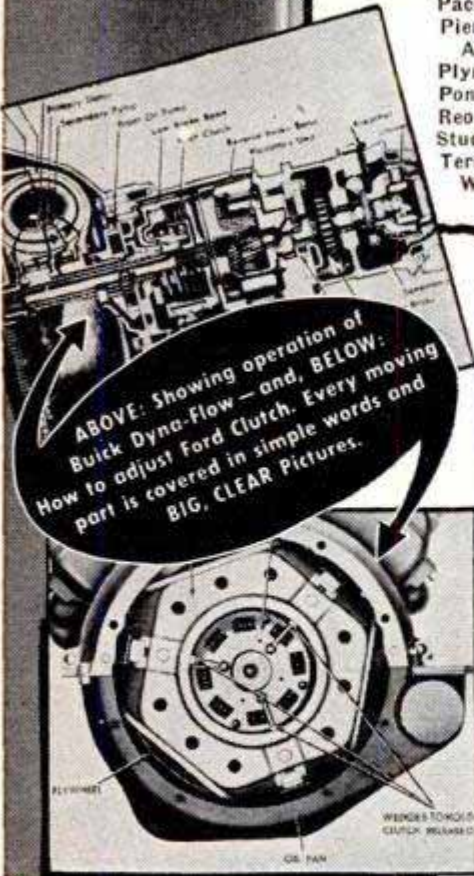
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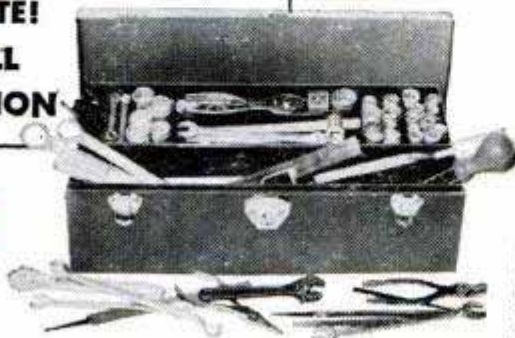
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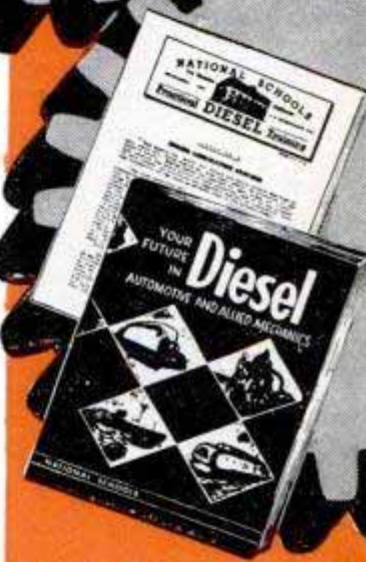
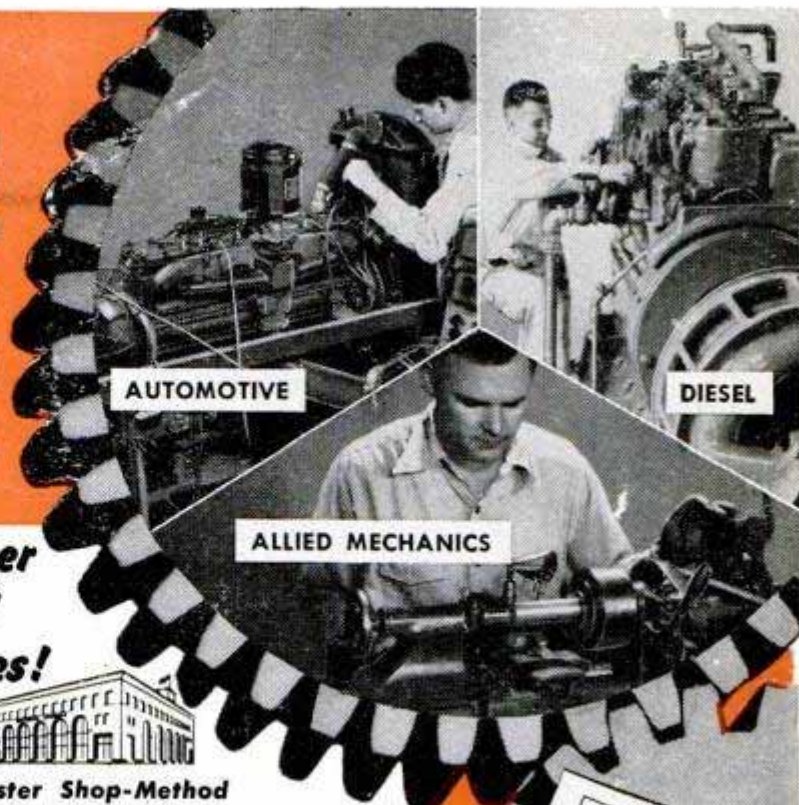
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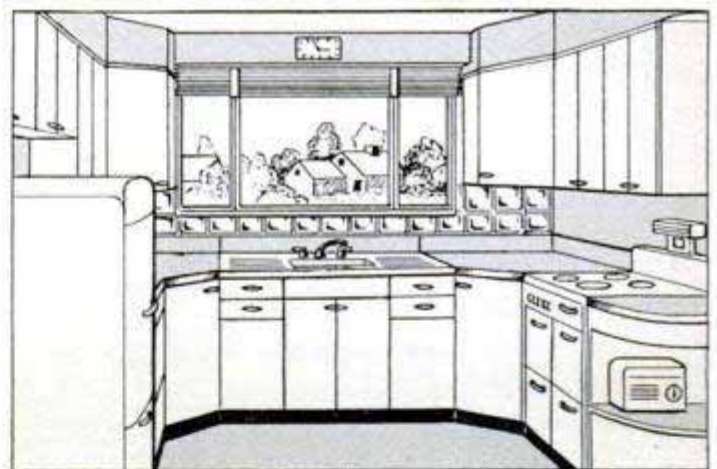
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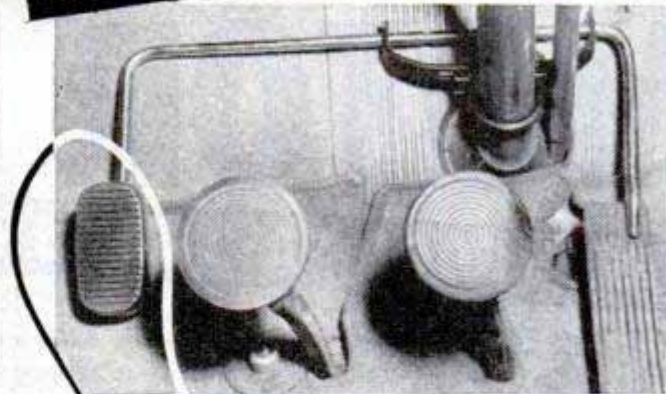
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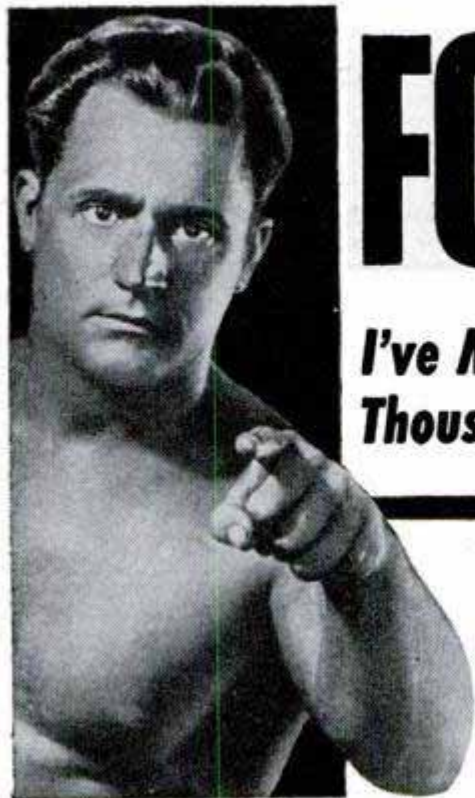
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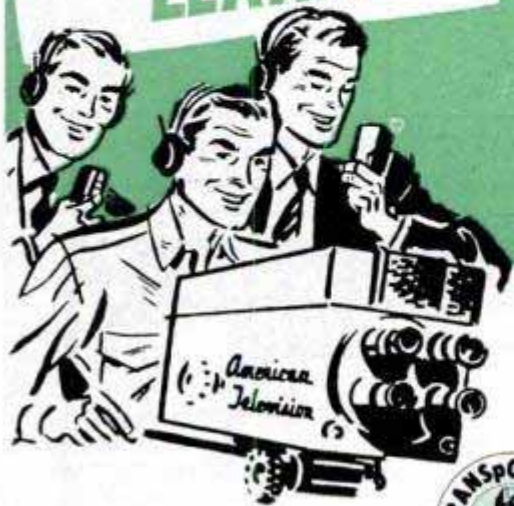
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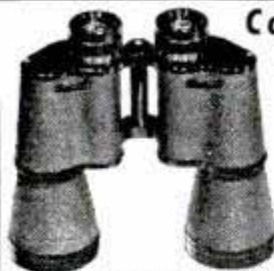
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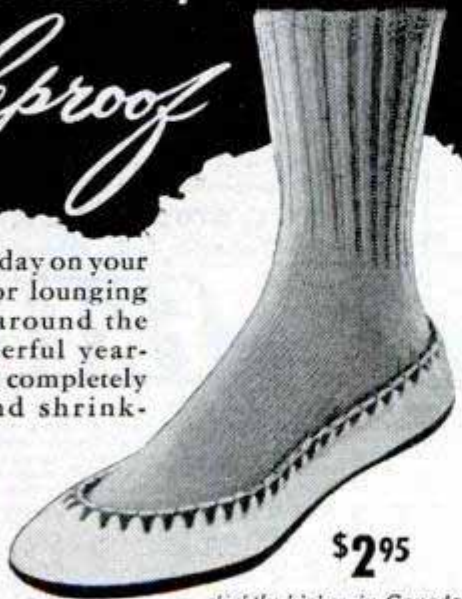
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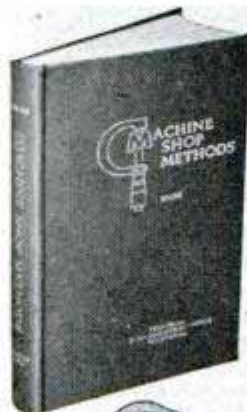
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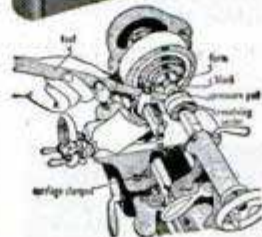
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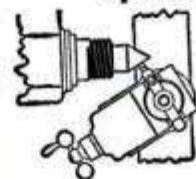


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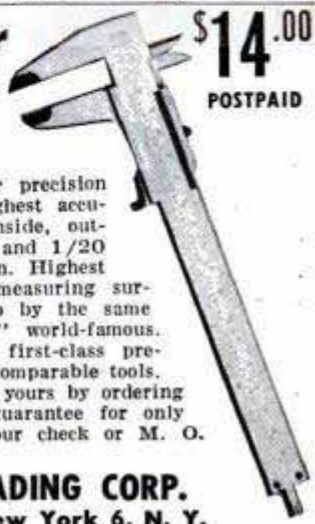
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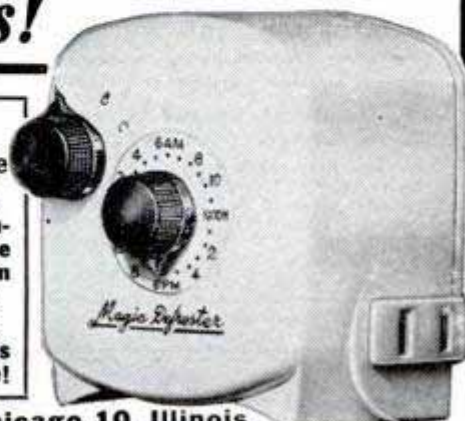
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NYLON Uniforms. Immediate delivery. Immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P-4, 3936 Market, Philadelphia 4, Penna.

\$3.00 AN Hour selling cushioned shoes direct. Advance commissions. Bonus. No investment. Experience unnecessary. Free outfit. Samples. Paragon Shoes, 739 Columbus, Boston, Mass.

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

POSITIVELY New—Over 100% profit. Two sided reversible neckties. Free details. Farrell Company, Dept. P-21, 1377 Van Zandt, Cincinnati 31, Ohio.

SELL Greeting cards—Big profits! Quick sales! Catalog free! Elfco, 432 North Wells, Chicago 10.

POLISH Floors without wax. New invention. Lightning seller. Leaves floors lustrous, beautiful. Samples sent on trial. Kristee 127, Akron, Ohio.

FREE Samples, and amazing plan, giving you gorgeous dress without penny cost. Rush name today, with dress size. Harford, Dept. D-535, Cincinnati 25, Ohio.

SELL Ward's perfumed starch, 140 other fast sellers. 100% guaranteed. 100% average gross profit. Nearly 100 year old company. We sell cash or credit. Details: The Ward Company, Dept. PM-4, Winona, Minn.

ORNIN Leather cleaner and conditioner. Good seller. Developed to distant competition. Maintains oil content. Keeps leather flexible and soft. Takes care of all kinds of leathers. Suede, horse-hide, calf-skin, etc. Sports, upholstery, luggage, garments, saddles, jackets, military goods, shoes, gloves, etc. Territory barely scratched. Sidelines or full time. Ornin Company, 1017 Thirteenth Street, Des Moines, Iowa. This cleaner specializes cleaning suede shoes.

FAST Profits—No investment. Send for big, free catalog. Plastic aprons, tablecloths, etc. 150 sure-fire items. We guarantee sales. Write The Halliday Company, Dept. M-4, 15-19 Pennington Ave., Passaic, N. J.

NYLONS—New "2500" superfine nylons. Direct from mill. Free sample outfits. Guaranteed against snags and runs, any original defects. They are "four-way" checked. Its "2500" superfine nylon threads assures maximum wear. Improvements new finish process, laboratory tested, proved strongly resist snags and runs 40% more. Thousands of women are waiting to buy them. We pay high commissions. 25% on prepaid orders. Nylon neckties \$2.00 at 90c prepaid. Ergim Hosiery Mills, 992 Columbus Ave., New York City.

SUMMER Money maker. Every lawn owner wants it! Over million dollars sold last summer. You cash in this summer. Approved by four Universities. Barclay Co., Box 883, Plainfield 5, New Jersey.

HOT! New! Novel! Practical! Cigarette lighter in miniature whiskey bottles. "Crazy" labels get laughs everytime used. Smokers buy several for table, desk, den and bar. Sells on sight. Fast, easy profits. Send \$2 for sample set of 3 and complete sales data, prices, and exclusive territory plan. Mercantile Enterprises, Dept. 3, Frost Bldg., Norwalk, Conn.

ALL-Purpose gas mower. For grass, weeds, brush. Rotacut, RM-2014, Excelsior Springs, Mo.

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

RELIGIOUS Goods—Add plastic collection plates to your line. Mumpower's, Fairfield, Alabama.

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

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

MEXICAN Feather pictures. High profit selling gift shops, etc. Adelphi, Box 57-B, Bellerose 6, N. Y.

SELL Ward's double strength vanilla, 140 other fast sellers. 100% guaranteed. 100% average gross profit. Nearly 100 year old company. We sell cash or credit. Details: The Ward Company, Dept. VM-4, Winona, Minn.

CASH In on tremendous demand for new cheap oil burner that fits in cooking-heating stoves and furnaces. Burns all kinds of oil including crankcase. Lifetime guarantee. Big profits. Be first. Write quick to Northwest Mfg. Co., 315 Main, Mitchell, South Dakota.

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

FREE Sample nylon stocking of world's only nationally advertised hosiery line actually guaranteed against runs, snags or excessive wear, regardless of cause! It's amazing but true. Every weight from sheerest 15 denier to heavy 70 denier—all gauges to luxury 60 gauge. Amazingly low prices, starting at \$1.08 prepaid for sheerest 15 denier 51 gauge. Not sold in stores. Good Housekeeping guarantee seal. Also complete line men's hosiery guaranteed one full year or replaced free. Full variety lingerie in crepe, satin and nylon, featuring all nylon slip at \$2.95, satin slip at \$1.58, etc. Housecoats and robes. Kendex sales people will earn one million dollars this year. Get your share. No money or experience needed. Pay nothing now or later. Just show free outfits. Write orders. We deliver and collect. Advance cash plus huge bonus. Earn money spare or full time. Become manager; appoint others to sell for you; earn steady income on their sales. Man or woman—young or old, you can earn more money than you ever thought possible. Everything you need is furnished free and prepaid, including nylon stocking, samples of materials, sales books, 36-page salesmanual, color cards, etc. Simply write your name and address on postcard and mail to Kendex Corporation, Babylon 43, N. Y.

FERTO-Pot, plant eats pot, 33 $\frac{1}{2}$ %; lawn-seeded-Ferto-soil, for patching or building new lawns. 40% commission. Allen Co., Pittstown, N. J.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BIG Spring sales! Scat Wick Deodorant gets rid of unpleasant odors quickly. Sample Scat and Kitty \$1.00. Write for 16-page catalog of household items. Sunshine Sales, Dept. WP-8, Loudonville, Ohio.

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

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

TRANSPARENT Liquid rubber coating, non-slip, speed drying, for automobiles, floors, walls, woodwork, linoleum. Damp proof basements. Costs 98c, sells \$2.98. Big demand. Rubber Products, Inc., Station A, New Haven, Conn.

HIGH-GRADE SALESMEN

SELL Ward's floor wax, waxers, 140 other fast sellers. 100% guaranteed. 100% average gross profit. Nearly 100 year old company. We sell cash or credit. Details: The Ward Company, Dept. FM-4, Winona, Minn.

BIG Cash profits for men and women introducing Flexiclogs, sensational new flexible footwear. Experience unnecessary. Nationally advertised styles for women, children, men. Excellent sideline, no investment. Easy to average hundreds of dollars weekly. Free sales helps and sample offer. Get details now! Flexiclogs, Dept. L-4A, New Holstein, Wisconsin.

WRITE 3 Words—Collect \$7.65 on 10-second demonstration to merchants. Write on glass with amazing magic crayon—Presto! 5 color advertising message takes fire, glows like brilliant neon. Three sales daily bring \$22.95 profit. Rush postcard for details. Complete sales kit, free! Maxilume Co., 125 W. Hubbard, Dept. CL-84, Chicago 10, Ill.

DON'T Be discouraged. Let us help you get in business for yourself. Free sample outfit! Tested selling methods. Be your own boss. Sell comfort shoes direct from factory. Write today! Consolidated Shoe System, Dept. S-102, Chippewa Falls, Wis.

TAVERN And grocery salesmen wanted, new fast selling nut display. Foodkraft Distributing Co., Hamburg, N. Y.

IS \$210 A week worth a penny postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator defroster "like hot cakes!" Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. PMC-4, 6 N. Michigan, Chicago 2, Ill.

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

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SELL Our waterproofings, floor mastic, cement hardener, etc. (30 items) to maintenance men, building owners, contractors. Can start part time. Commission. Territory. Write Haynes Products Co., Desk 6, Omaha 3, Nebr.

LOW Cost memo books sell on sight. Every business a prospect. Free sample kit. Clayton Advertising, Cardiff, N. J.

BIG Profit selling perfumes. Trial oz. \$1.00. Details free. Roberts, 432 Fremont Ave., Springfield, Ohio.

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

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

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

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

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

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CAN A man my age become a hotel executive even though he has no previous hotel experience? Would you like to step into a well-paid position as hotel or club manager, purchasing agent, social director or assistant manager, etc.? The success of Lewis graduates from 18 to 50 proves you can—though you have no experience in hotel work. Harry E. Roorbach says: "While in the hospital I enrolled for Lewis training. Shortly after completing the course, the Lewis Placement Service informed me of an opening. At present, I am night manager in the largest hotel in Rochester. I owe my success to the Lewis course." Our free book explains how you can qualify for a well-paid position in leisure time, how you are registered free of extra cost in Lewis National Placement Service. Write today. Course approved for Veterans' Training. Lewis Hotel Training School, Desk TD-324, Washington 7, D. C.

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INFORMATION

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

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

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

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

FREE Copy, layout service. Mailorder ad, 1,700,000 nationwide circulation, \$25.90 inch, 24-word classified, 20 big Sunday newspapers, \$30.00. Advertising ratebook free. Chicago Advertising Agency (established 1900), Chicago 4.

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

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125 LETTERHEADS. Full size, and 125 envelopes, \$2.00 postpaid. Maywood Publishing Co., 1133 Broadway, New York.

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

THREE Day service on printing, multi-graphing, mimeographing. Prices, samples free. Progressive, 270c Burkhardt, Cincinnati 15, Ohio.

100 8½ x 11 HAMMERMILL Letterheads and 100 envelopes \$1.95. H. Hudson, Centredale, R. I.

48-HOUR Mimeographing service! Samples, prices, free. Thompson, Loganville, Wisconsin.

GUMMED Labels, stationery. Free list. Reed, Box PM-135, Spiro, Okla.

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5,000 6¾ ENVELOPES Printed \$3.10 per thousand, price list free. 1,000 simulated engraved business cards \$4.00. Michel, Box 76F, New York 16.

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

PRINT Your own cards, stationery, circulars, advertising. Save money. Simple rules. Print for others, nice profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, L-11, Meriden, Conn.

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

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

PRESSES, Supplies, paper. Catalog 10c. Printers Supply, 211, Springfield, Missouri.

PATENT ATTORNEYS

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

INVENTORS: Write for free brochure "Evidence of Invention." Labiner, World Building, New York 38.

C. A. Snow & Co.—M-427, Snow Build- ing, Washington 1, D. C. Registered Pat- ent Attorneys. Write for information.

INVENTORS—For "Record of Inven- tion" form, contact Carl Miller, Regis- tered Patent Attorney, Woolworth Build- ing, New York.

INVENTORS: Without obligation, write for information explaining the steps you should take to secure a patent. John N. Randolph, Registered Patent Attorney, 203 Columbian Bldg., Washington 1, D. C.

PATENTS—Irving L. McCathran, 315 McLachlen Bldg., Washington 1, D. C. Registered Patent Attorney.

CANADA—Ramsay Company Registered, 273 Bank Street, Ottawa, Canada.

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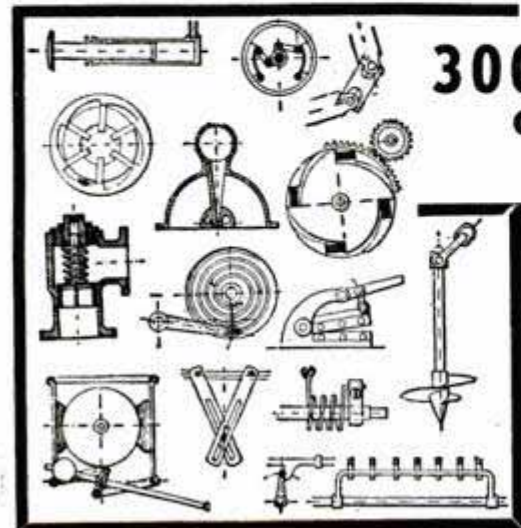
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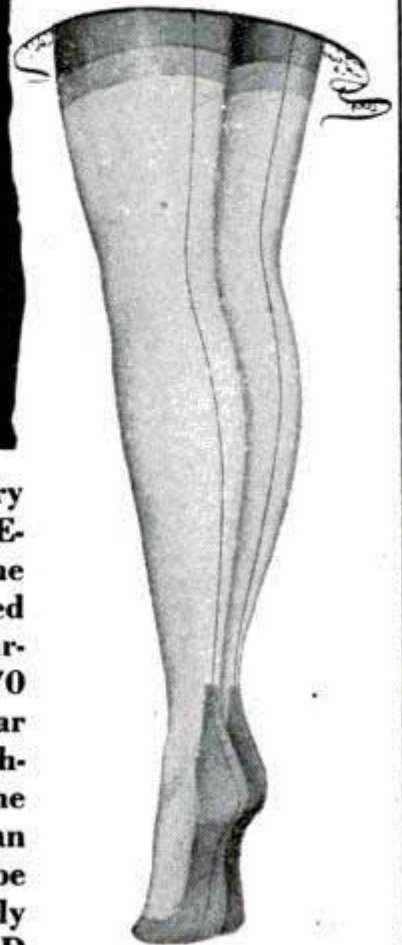
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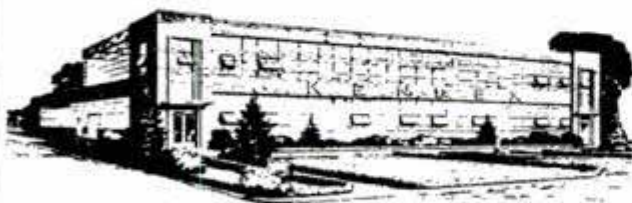
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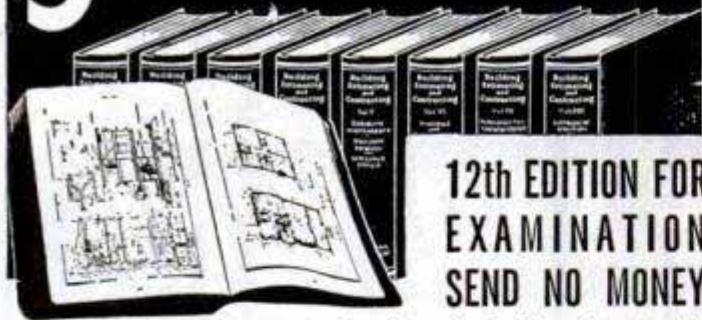
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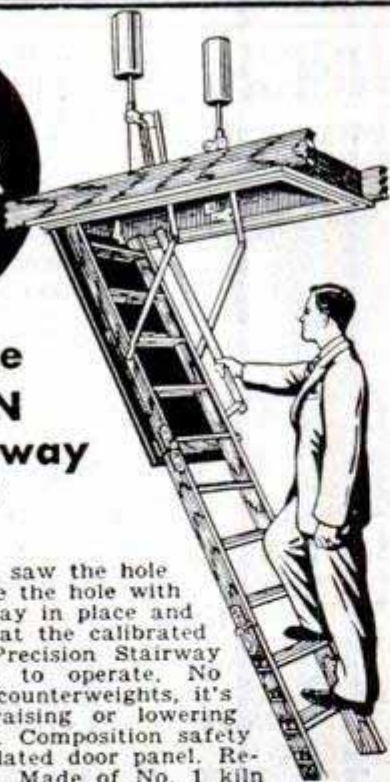
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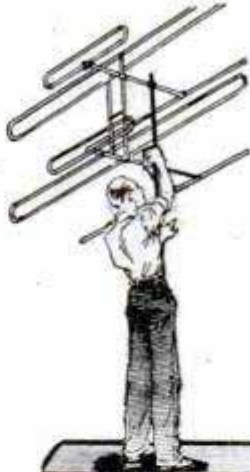
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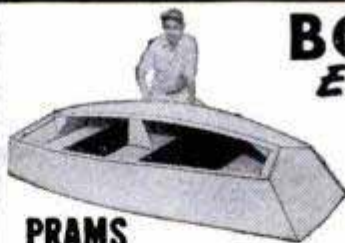
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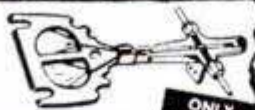
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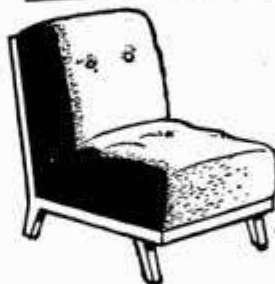
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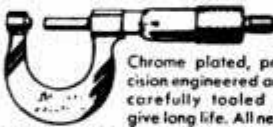


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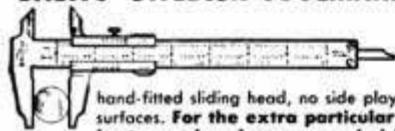
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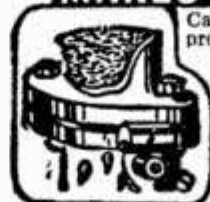


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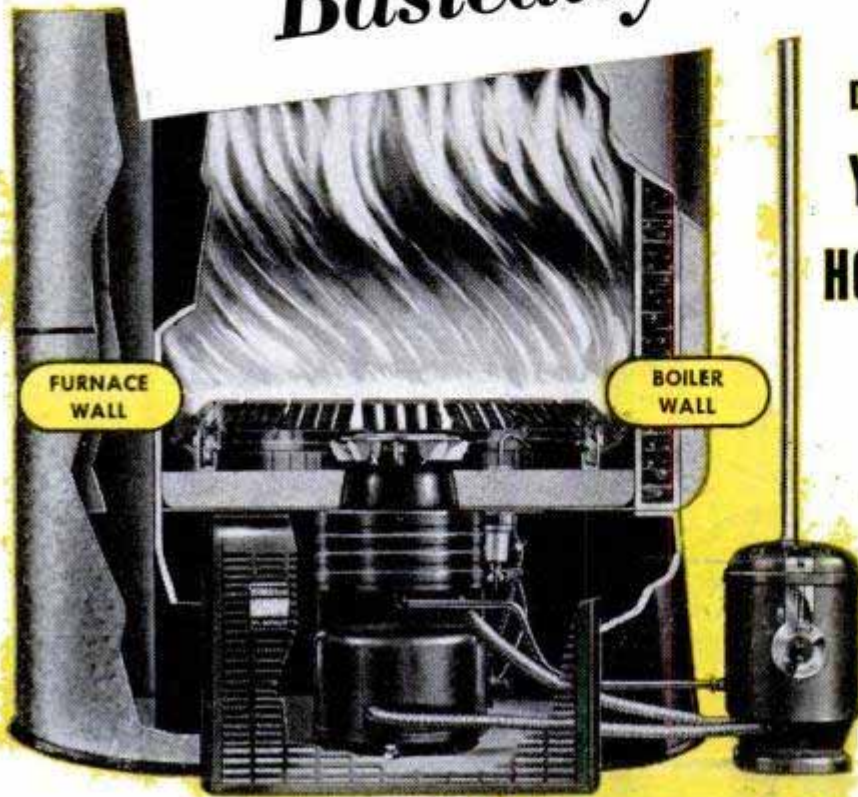
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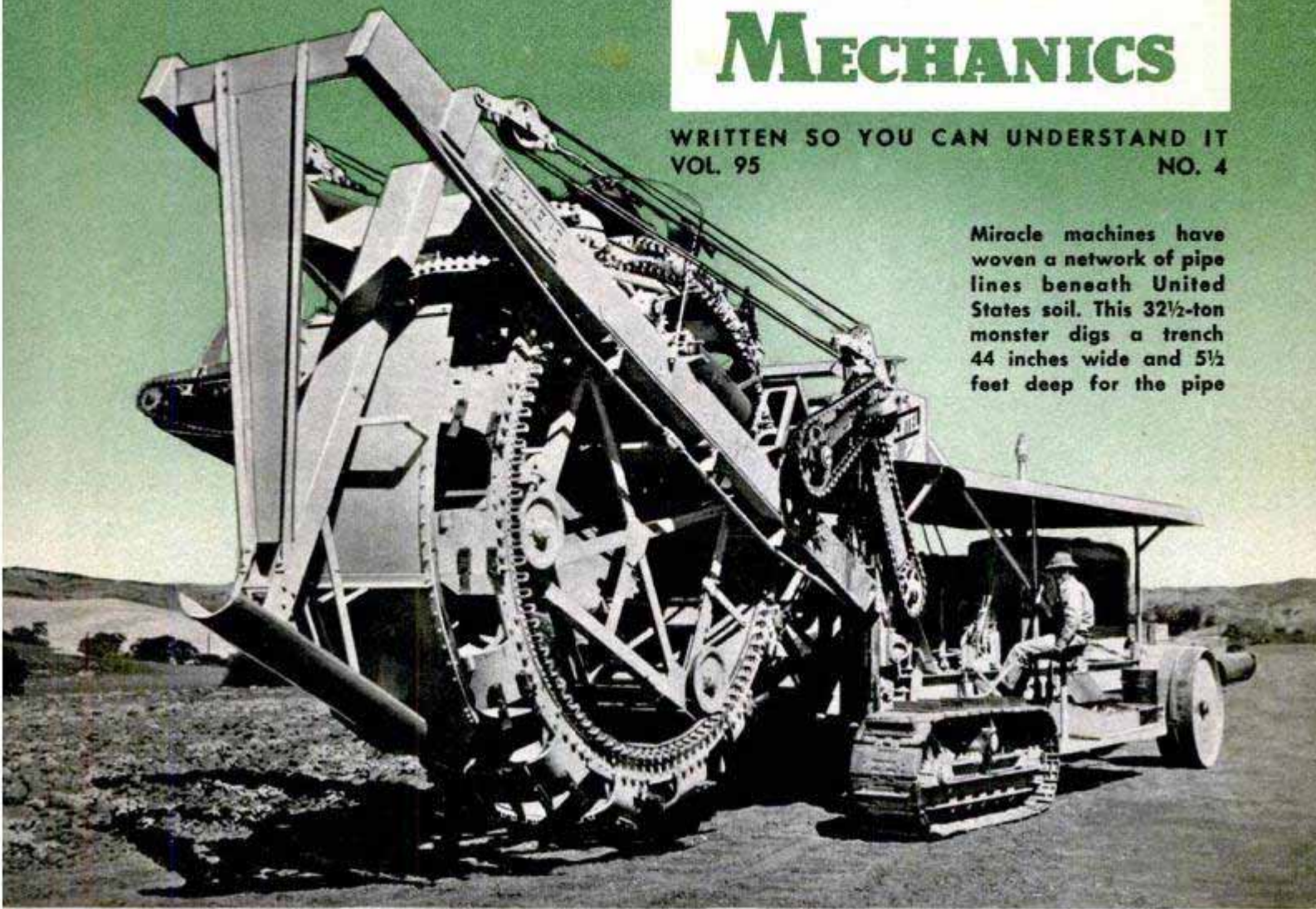


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TIMKEN SILENT AUTOMATIC DIVISION
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The Timken-Detroit Axle Company of Canada, Ltd., Toronto, Ont.



Miracle machines have woven a network of pipe lines beneath United States soil. This 32½-ton monster digs a trench 44 inches wide and 5½ feet deep for the pipe



Pacific Gas & Electric Co. photo

FUEL with a 260,000-MILE REACH

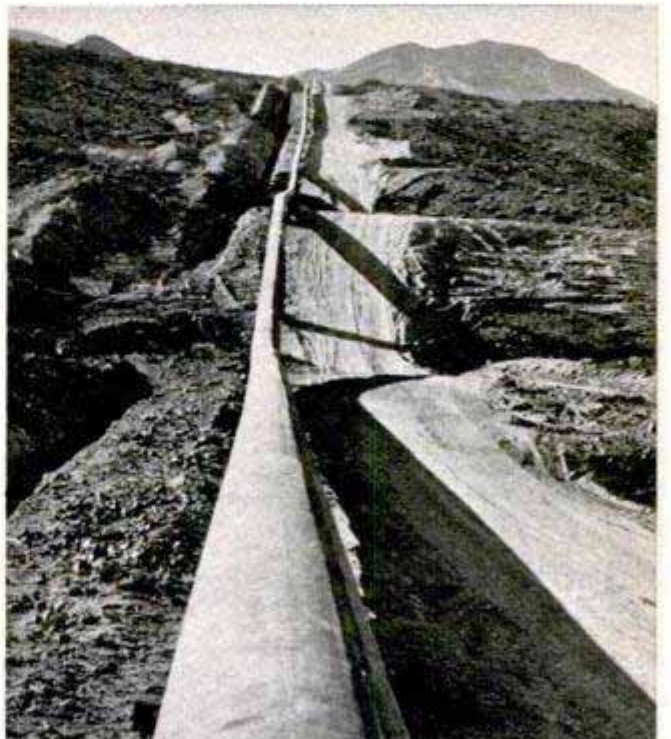
By *Thomas E. Stimson, Jr.*

NEW YORK CITY and San Francisco this spring are beginning to use natural gas piped direct from the tremendous underground gas fields of Texas.

The New York line is 1840 miles long and required 20,000 freight cars loaded with 30-inch pipe for its construction. The San Francisco line, the "Super Inch," is 30 and 34 inches in diameter and 1350 miles long.

Completion of these two high-pressure transmission lines at the beginning of the half century is rather appropriate, engineers say, because natural gas will be an increasingly important industrial fuel during the next 50 years. Coal has been losing ground to petroleum in the last couple of decades, they point out, and natural gas in turn may put industrial fuel oils in second place within a few years. America is only now beginning to take full advantage of a great natural source of heat and power.

Line snakes along the right-of-way beside the trench in which it will be buried. The sections of pipe are bent and welded to conform to curvature of the earth





New pipe line is purged of dust and other foreign matter by blowing gas through it under high pressure



Ingenious machine coats the pipe line with asphalt, felt and paper before it is lowered into the ditch

Natural gas is cheap, efficient and clean. Best of all, it is far more plentiful than our known reserves of petroleum. The nation's proved gas reserves amount to some 180 trillion cubic feet, equal on a heat-unit basis to 30 billion barrels of oil. This is five billion barrels more than our known re-

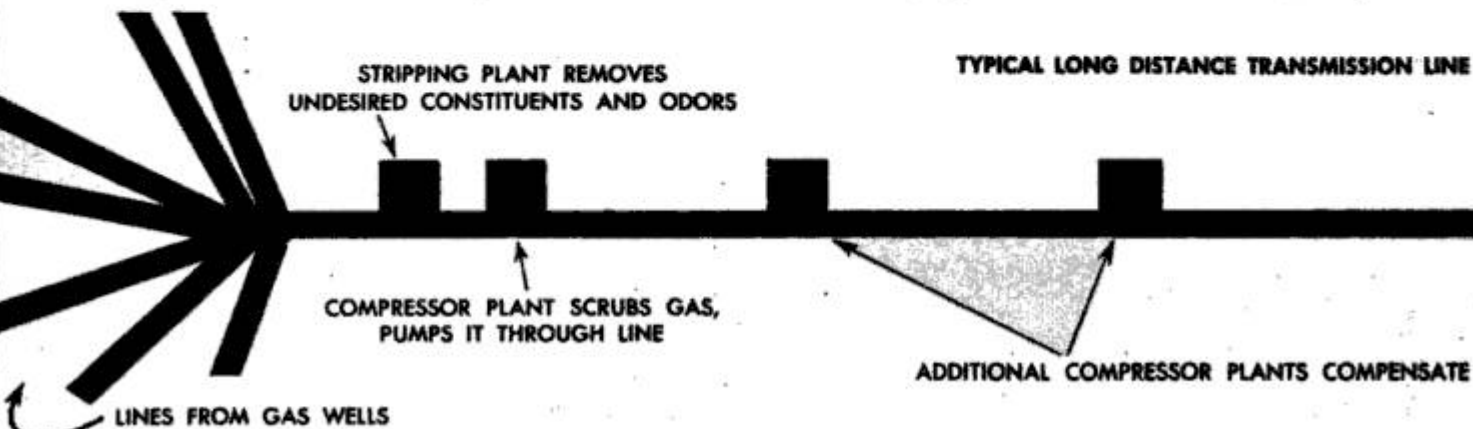
serves of petroleum at the present time. The invisible, combustible stuff consists mostly of methane and other light hydrocarbons of the paraffin series. It is twice as hot as the average manufactured gas. In addition to its widespread household uses, it can take the place of other fuels used by industry. In some areas it produces the steam that spins the turbines of a city's electric-lighting plant. In one new application it is burned underwater in submerged combustion chambers to use every unit of heat efficiently.

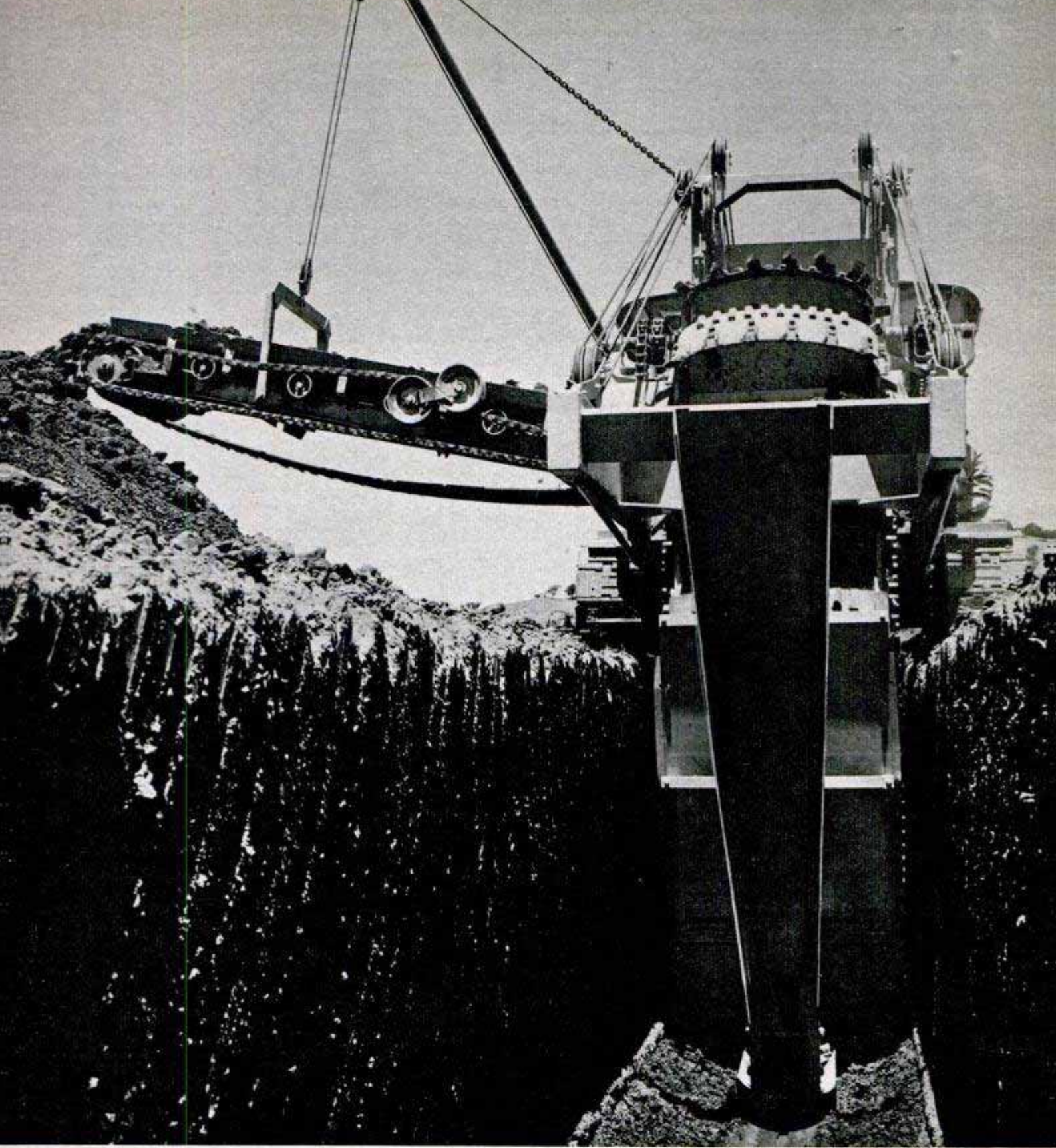
It is so dependable, once it is hooked up, that it is used as fuel for emergency motor-generator sets that automatically take over a power or lighting load if the ordinary source of electric current fails. Numerous department stores have installed such emergency equipment in their basements.

Similarly, gas-fueled emergency generators are used at some Atomic Energy Commission installations where a power failure would be disastrous. An interruption in current would be so calamitous, in fact, that not even this safeguard is completely trusted. There's one chance in several million that the flow of gas to an emergency motor generator might be cut off so, as a further precaution, a supply of gasoline is stored alongside the engine. If the power should fail, and if the emergency engine doesn't start up at once on natural gas, liquid fuel starts flowing to the carburetor.

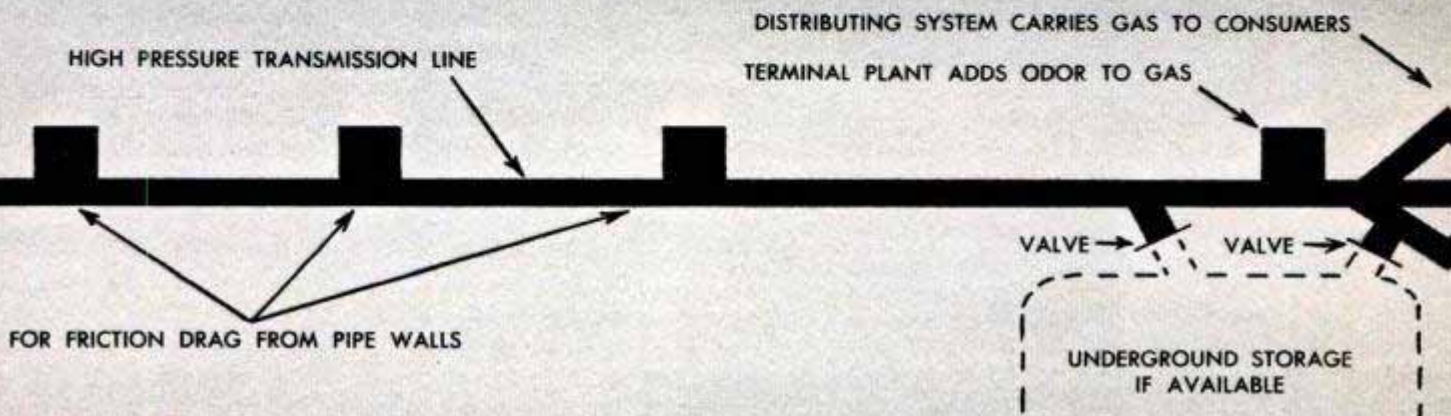
Natural gas is a pretty good fuel for internal-combustion engines, although it wouldn't be practical to connect your automobile to a pipe line. Yet the natural-gas industry is doing just that, in a sense. Propane and other fairly heavy hydrocarbons that are stripped out of the gas at field sources are widely used as liquid fuel by trucks, busses, tractors and by some private cars. The liquefied petroleum gases give about the same miles per dollar as does gasoline, with less maintenance expense. Converting an automobile engine to propane or butane costs less than \$200, including dual-purpose carburetor, pressure fuel tank, electric safety solenoid lock-off and excess-flow check valve.

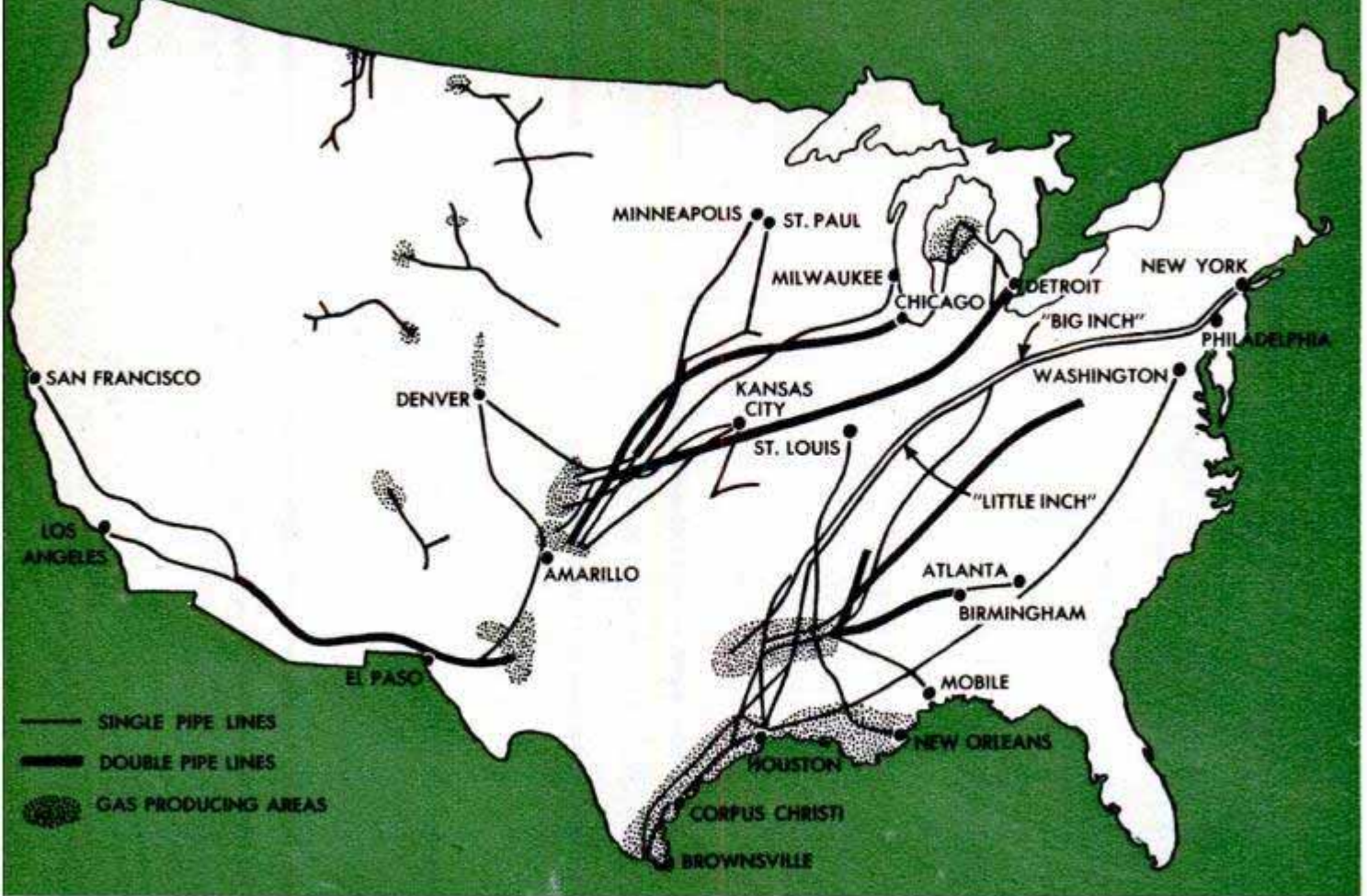
Diagram shows how natural gas is "scrubbed" and forced along typical transmission line to your gas stove



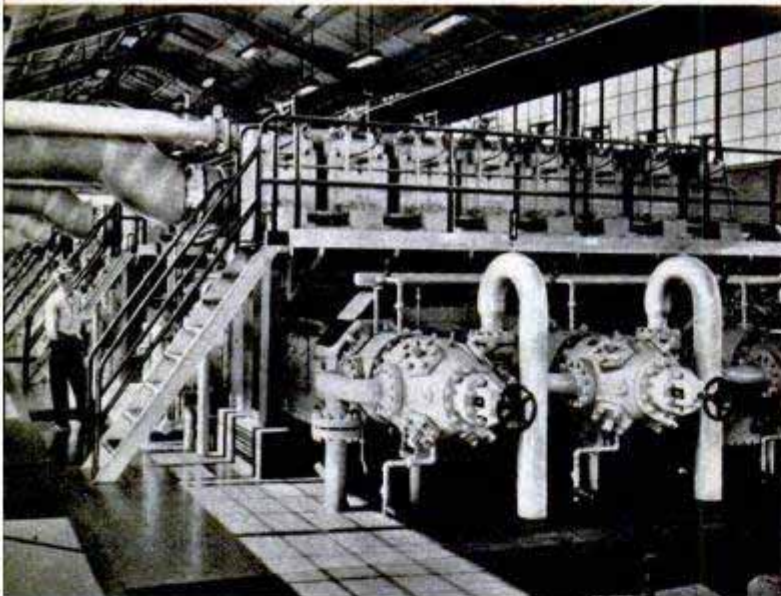


Worm's-eye view of a ponderous trencher at work. The machine can dig more than a mile of trench each day





Major pipe lines today carry gas to virtually every industrial sector except New England and Pacific Northwest



Battery of compressors at pumping station repressures gas to overcome the friction "drag" inside the pipe. Below, side-boom tractors working as a team gently lower welded and wrapped pipe into the deep trench



Today, there's enough natural gas in the proved reserves to keep us going for the next 29 years at the present rate of consumption. We'll double the withdrawal rate in the next few years but geologists say that in the same period we can expect to discover several hundred trillion additional cubic feet of gas that we don't yet know about. All in all, they expect that there's enough gas in the ground to provide heat and power until at least the year 2000.

About half the known supply lies in four major producing areas in Texas. Other important gas fields are in Louisiana and Oklahoma. Smaller fields are supplying local demands in California, Montana, Wyoming, Colorado, New Mexico, Kansas and Mississippi.

These dry-gas fields were discovered accidentally, usually by men prospecting for oil, and they account for 70 percent of the known gas reserves. The balance is in the form of casing-head gas that flows out of an ordinary oil well together with the crude itself. Much of this gas is pumped right back down into the ground again to repressure the formation and keep the crude coming up. After all the recoverable oil has been extracted from a formation, the natural gas itself can be piped away.

Geologists find that the ratio of gas to oil increases with the depth of the formation. Since most future oil discoveries probably will be at great depths, the reserves of gas

will increase considerably from this source alone.

Twenty-five years ago the gas had to be consumed near the wellhead, or not at all, because there were no pipes strong enough to carry it for long distances at high pressure. The development of seamless steel pipe plus improvements in welding techniques changed this situation. The first important long-distance transmission line was built from the Texas Panhandle to Denver in 1928, and was followed by a 900-mile line from northwest Texas to Chicago. Chicago is now serviced by two long gas lines and still a third is under construction.

The first lines were a success so more long lines were built to supply Detroit, Minneapolis and other midwestern cities. After the war the "Big Inch" and "Little Inch" pipe lines that were built to transport Gulf crude oil to Eastern refineries were converted to natural-gas transmission. Meanwhile more lines were built to serve the Midwest, a 1204-mile line was built to Los Angeles, and most recently of all the new San Francisco and New York lines were completed.

Today the country's gas-transmission lines, exclusive of local distribution systems, add up to 260,000 miles. That's greater than the nation's point-to-point railroad mileage.

Every major industrial area is now supplied with natural gas with two exceptions, New England and the Pacific Northwest. The New England states may get a line this year or next that will connect with Texas and Louisiana wells, and the Northwest is seeking one or more lines that would tap



Spiderweb of cables 1200 feet long carries the new West Coast gas pipe line across the Colorado River

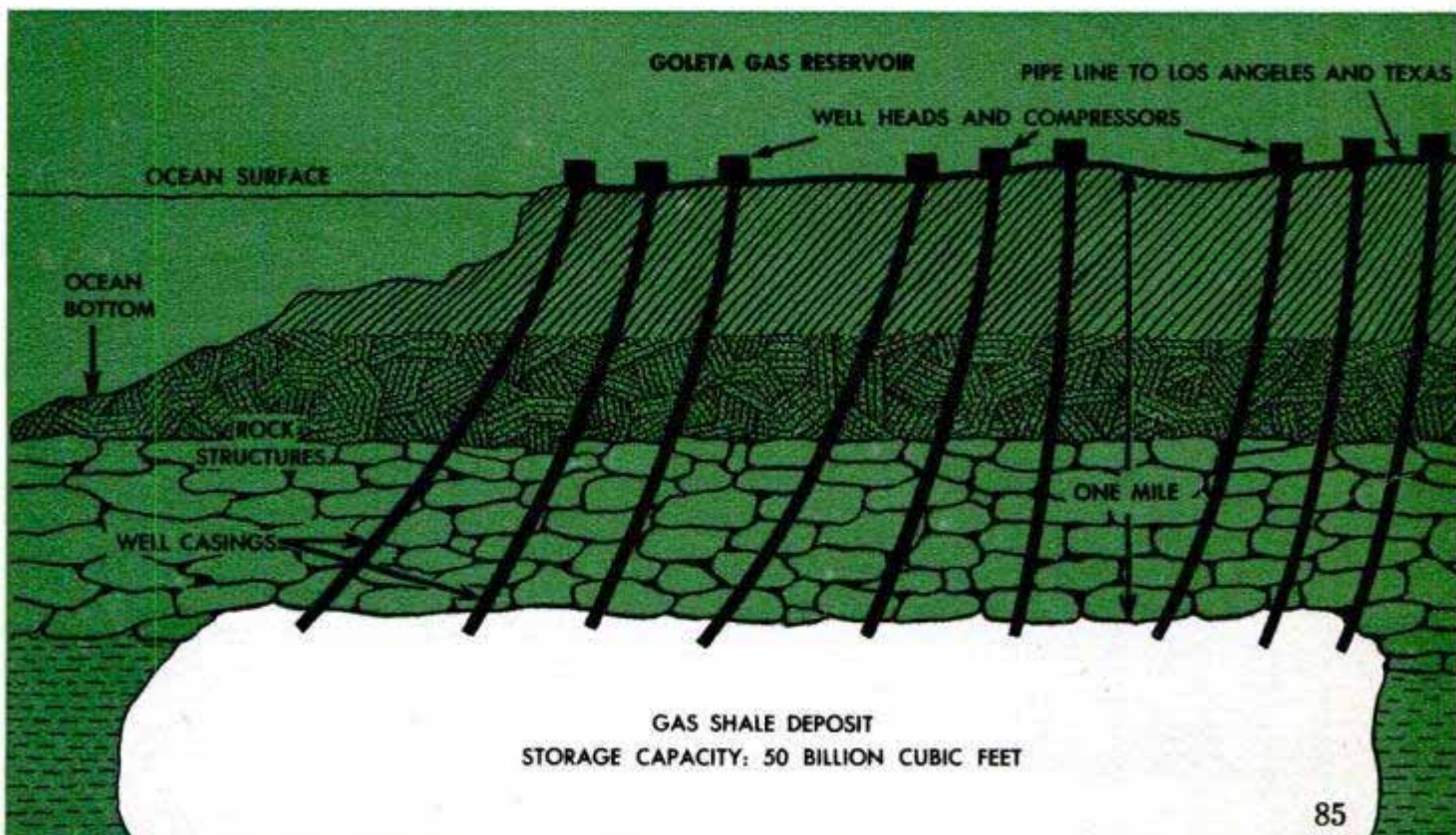
gas fields recently discovered in Alberta.

Technically, the natural gas that flows through a pipe line to market is a residual gas because several ingredients are removed from it in the field. Propane and butane constituents are stripped from it because these hydrocarbons would condense into liquid in cold weather and settle in low spots in the line, eventually plugging it. Hydrogen sulphide and considerable water vapor occur in the gas from some fields and both must be removed. Otherwise, they would rust and corrode the steel-alloy pipe.

The so-called sour gas from some formations has a highly objectionable odor caused

(Continued to page 248)

Old oil field in California is biggest underground gas-storage chamber. Gas is pumped in, drawn off as needed

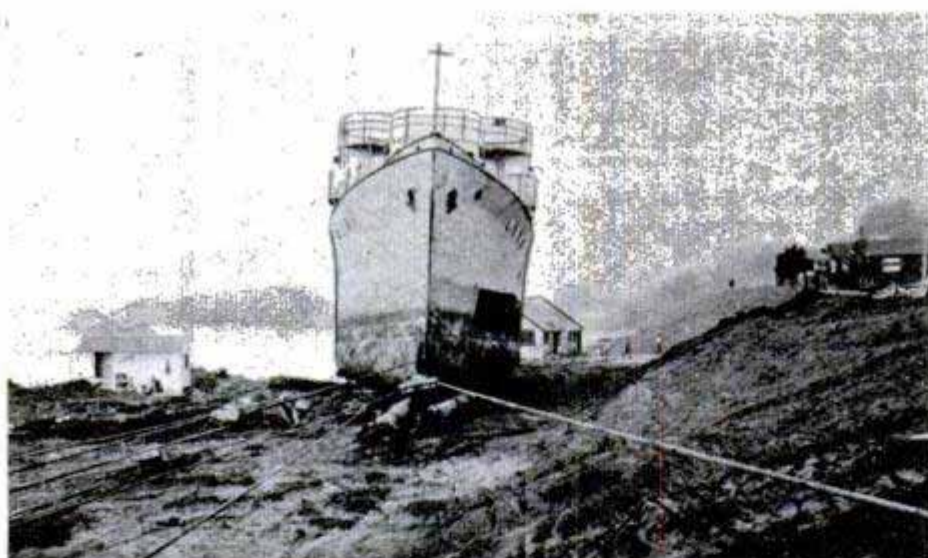




Flying Car Ferry Across English Channel

Twenty-four daily trips are made by an air ferry shuttling automobiles across the English Channel to France. Two automobiles, 12 passengers and their baggage can be carried each trip in the Bristol Freighter

airplanes used for the 20-minute flights. Motorized ramps speed loading and removal. Travelers can be driving along a French highway within an hour after arrival at the English airport.

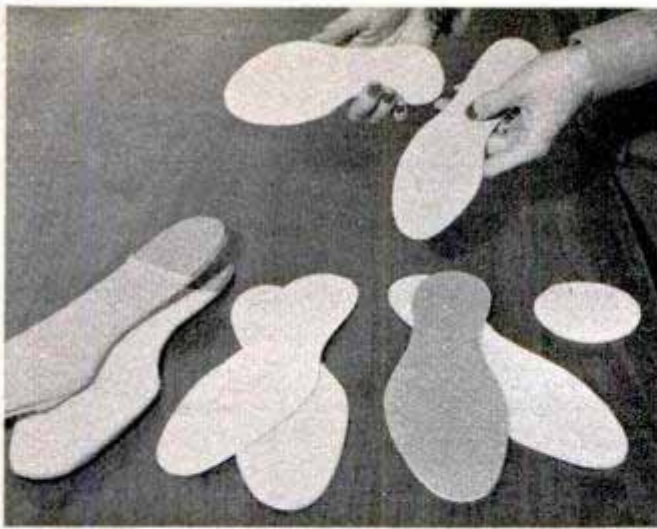


Ship Ashore

Salmon fishermen in northern California can eat their meals and buy their tackle aboard a 156-foot steel yacht which rests on dry ground 20 feet above the Smith River. After serving with the Navy during the war, the grounded ship was sold for its scrap value. The new owner towed it to the mouth of the Smith River and hauled it up on shore along an inclined roadway which was graded out of the bank. When the ship was firmly mounted on dry land, he installed restaurant accommodations and living quarters for his family.

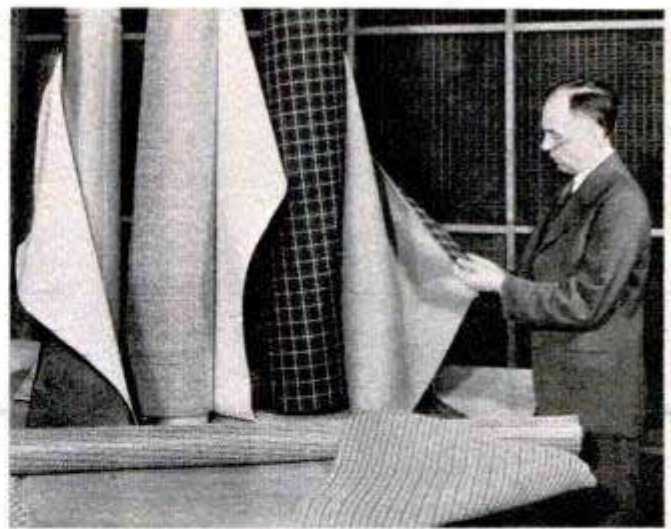


☐ All races of man have the same types of blood and scientists cannot tell, even by microscopic examination, whether a given blood sample came from a Negro, an Indian, a White man or an Oriental person.



Andrews-Alderfer Processing Co., 120 Ash St., Akron 8, Ohio

Above, inner soles made by laminating foam rubber and fabric. Right, ideal for upholstery and seat covers are foam rubber and fabric combinations like these. Below, rubber-backed carpeting has built-in padding



Foam-Rubber Backing "Welded" to Fabric

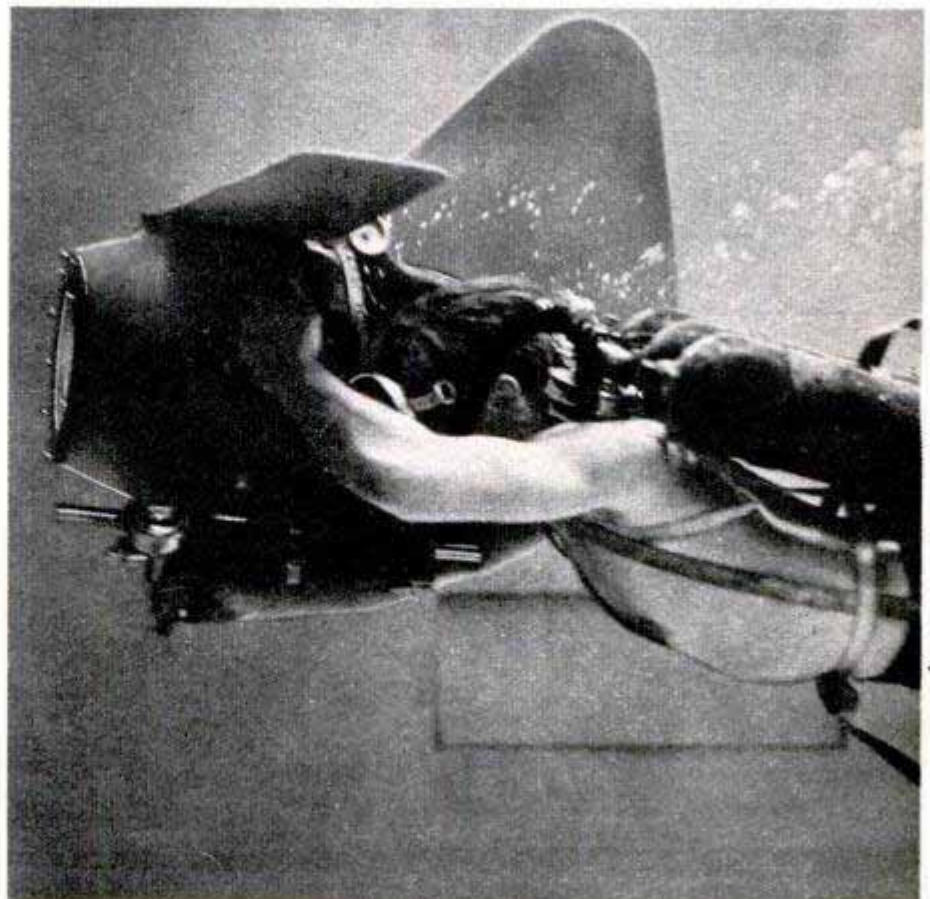
Fabric and foam rubber can be bonded together to form carpeting, padding and even an unusual cleaning cloth that replaces chamois skin. The unvulcanized latex foam is spread on the fabric in thin sheets. A special curing process interlocks the rubber and fabric so tightly that the joint is stronger than the rubber itself. Because the foam rubber is porous, the combination fabric makes excellent inner soles for shoes. The foam-rubber cleaning cloth feels and acts like chamois. The carpeting consists of a thick pad of foam rubber bonded to rug material. Throw rugs made of the material are nonskid because of the rubber. Seat covers for cars are made by the same process.



Submarine Camera

Like a submarine, the Navy's newest underwater movie camera can be adjusted for positive, negative and neutral buoyancy to allow the cameraman to ascend, descend or float in the water. The camera actually weighs 107 pounds, but when underwater it can be adjusted to "weigh" less than nothing. Fitted with vertical fins and horizontal wings, the camera is controlled by a diver who carries his own air supply.

Four-door sedans currently are the most popular body type among the purchasers of new cars, according to the Automobile Manufacturers Association.



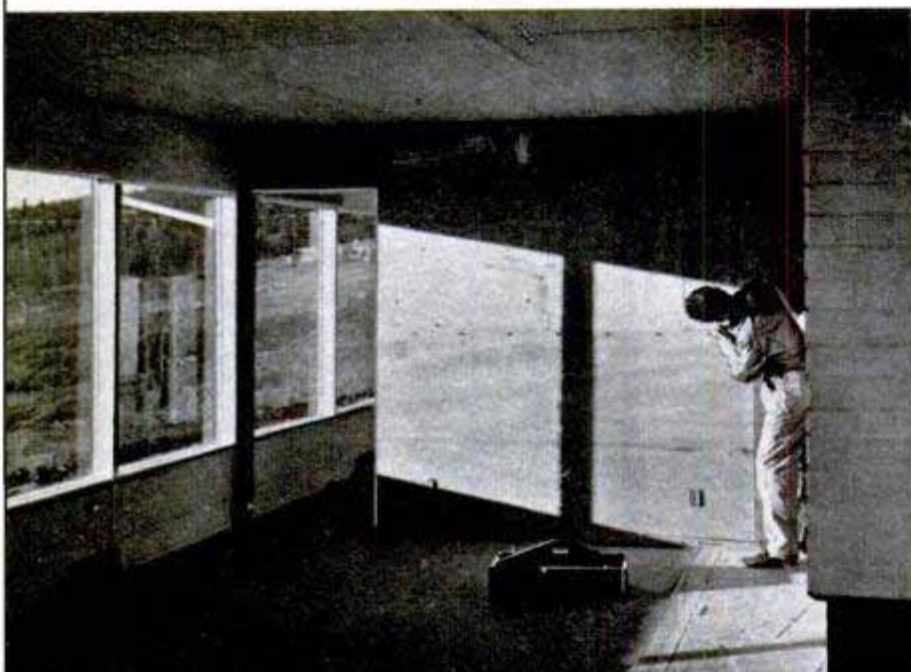
I'm Building the Popular Mechanics

PLYWOOD

Ranch House

By Tom Riley

Part 6



Fir plywood forms the sub-wall in the living room. The finish wall of walnut plywood will be nailed and glued to it later



All lights in the house can be controlled by a 24-volt master switch in the bedroom

NEARING COMPLETION, the amateur-built Ranch House is undergoing its final test—interior finishing. Here is where the novice is apt to leave his mark in easily spotted errors that brand the construction job as nonprofessional.

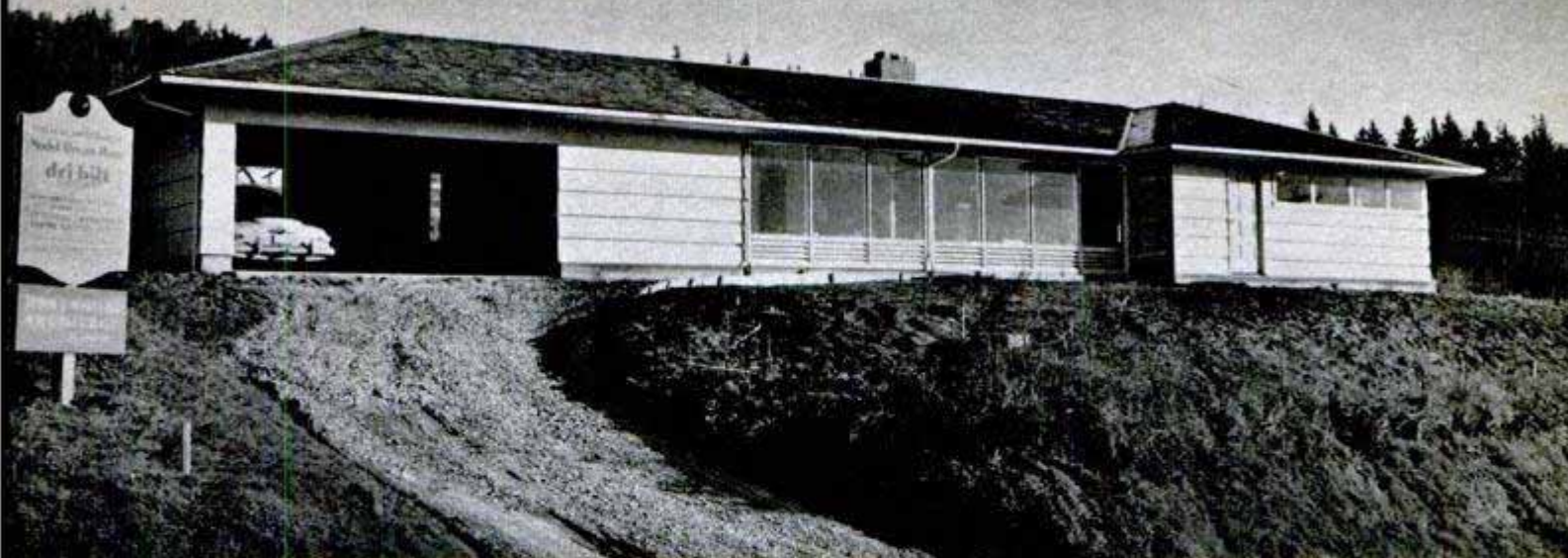
Now I can tell you enthusiastically that the four-foot module, dry-wall construction we are using is a beautiful job of practical planning. Throughout, I have found that it follows the basic idea of previous *Popular Mechanics* Build-It-Yourself Homes—the 1½-story Frame House and the Concrete Block House—and has such ease of construction that a man can do the job with little or no help. Believe me, if this writer can build it, you can! And here we amateurs can have a genuine home with modern room treatments, open planning and today's other good features in a way that we can afford even in these times!

Starting in next month's *Craftsman's*

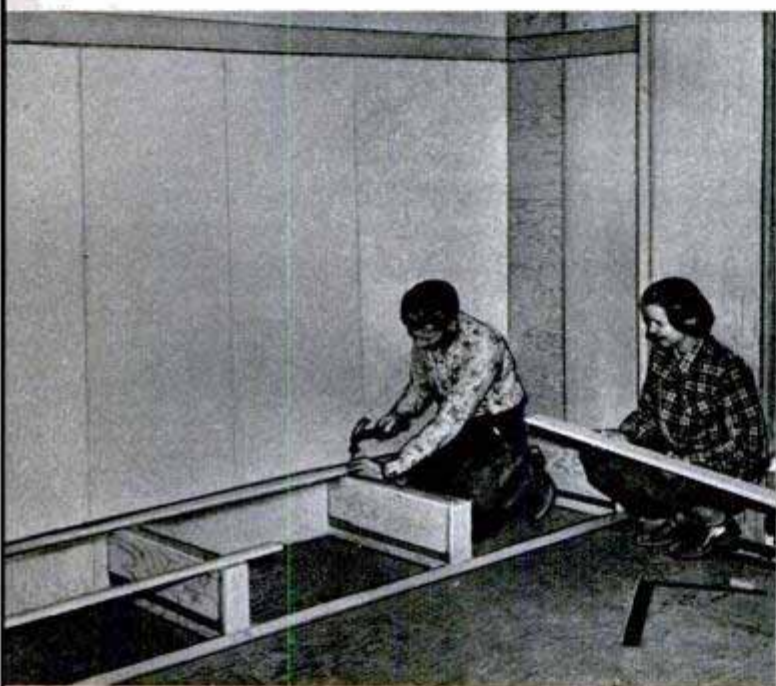
Section, the construction details of the Ranch House will be shown.

You will like the final interior finishing and cabinetwork that I am now doing under the supervision of architect John Whelan. This is the modern dry wall which was developed from the research and needs brought on by World War II. Difficult? Not at all. Visitors tell me that finishing is usually the slow, tedious part of house building. That was probably true with woodwork fitted against plaster. But I find it altogether different with dry-wall construction. In the kitchen, for instance, the cabinets fit easily on plywood walls and when you use flush hinges the cabinet doors (usually the tricky part) are just flush pieces of ¾-inch plywood, as simple to make as a box top.

By the way, the little wife will be enthused over the kitchen cabinets which you can build yourself. The upper cabinets that



Riley's home, ready for its final coat of paint and landscaping, looks roomy, sturdy and modern



Mr. and Mrs. Tom Riley collaborate on construction of a wardrobe-closet partition between the bedrooms

I am building are of $\frac{3}{4}$ -inch oak plywood and will have a limed-oak finish that gives the kitchen the modern grained-wood effect so popular today, yet blends with the porcelain of range and refrigerator.

The Ranch House kitchen will have the food-preparation center you have asked for. That extra counter space alongside the refrigerator with maple chopping-block top is not difficult to build. All the lower kitchen cabinets are simplified in their construction by being planned so they can receive the new steel drawers which simply screw into a wood frame. There are no drawers to make, and you get all the ad-

vantages of both steel and custom-fit wood cabinets — flour bins, sliding trays, vegetable drawers and the like—without the high cost of ready-built cabinets.

In the past, plywood has been thought of as either a cheap plaster substitute in its common grades or as an expensive wall paneling in its costly hardwood varieties. Today, builders realize that the common, inexpensive plywood is not limited to use as a substitute for plaster. It is an attractive building material in its own right. Plywood companies are now producing unusual grained and textured surfaces that make attractive paneling which is easy to put up and pay for.

John Whelan is a whiz of an architect at achieving luxurious interiors inexpensively and he definitely proves this in the living room of the Ranch House. One short 12-foot wall, alongside the fireplace, is earmarked for hardwood. It requires only three 4 by 8-foot sheets of hardwood plywood. I am using walnut plywood. Thus, with an "island wall" closet of the same material forming the partition between the living room and hall and with the two other walls of the living room being the island-wall fireplace and an expanse of windows, the effect is of a luxurious walnut-paneled living room when actually little of the expensive material is used.

(Continued to page 242)

Next month in the Craftsman Section we will publish the first of three construction articles, including plans, sketches and photos to show how you, like Tom Riley, can build the Popular Mechanics Plywood Ranch House





Souped-Up Scooter

Can a motor scooter go 100 miles per hour? Tony Capanna of Los Angeles thinks so, after having been clocked at 83.53 miles an hour on a scooter that he streamlined with a plywood body. He reworked the stock 10-horsepower engine to deliver slightly more power, reduced the height

of the steering assembly and replaced the stock fuel tank with a one-quart tank to cut down frontal area. Air for the carburetor and engine cooling enters through ports. Capanna rode prone on the body and was clocked at a California dry lake. By further reducing the scooter's weight and adding other refinements, he is positive he can go 90 to 100 miles per hour.



Unsinkable Folding Boat

Wrapped around the hull at the gunwales, two air-filled tubes make the Foldboat unsinkable even though it's completely filled with water. This portable boat has been a favorite in Europe for years. The two-seater model weighs only 56 pounds

The Klepper Co., 28 East 31st St., New York City 16. complete with sails, paddles and leeboards. The collapsible frame is made of seasoned mountain ash. The fabric "skin" is a combination of rubber and canvas. It comes apart to form two compact bundles that can be carried by one person. The bundles will fit into a car trunk. Assembling the boat takes less than 15 minutes.



Wood Mfg. Co., San Fernando, Calif.

Self-Heating Pavement Iron

Asphalt patches in pavement are smoothed and compacted faster by an iron that has a built-in heater. The heater is a blowtorch fitted inside the handle so the flame is directed into the hollow cast-iron smoothing head. Use of this iron eliminates the usual practice of hauling a large furnace trailer to heat the smoothing irons.

Pocket Telescope

Not much larger than a fountain pen, a telescope with a six-times magnification can be carried in the pocket always ready for use. It's useful to sportsmen, motorists and small-boat enthusiasts. The end of the barrel slides in and out for sharp focusing. A clip holds the telescope in the pocket.



Grover Photo Co., 201½ E. Broadway, Glendale, Calif.



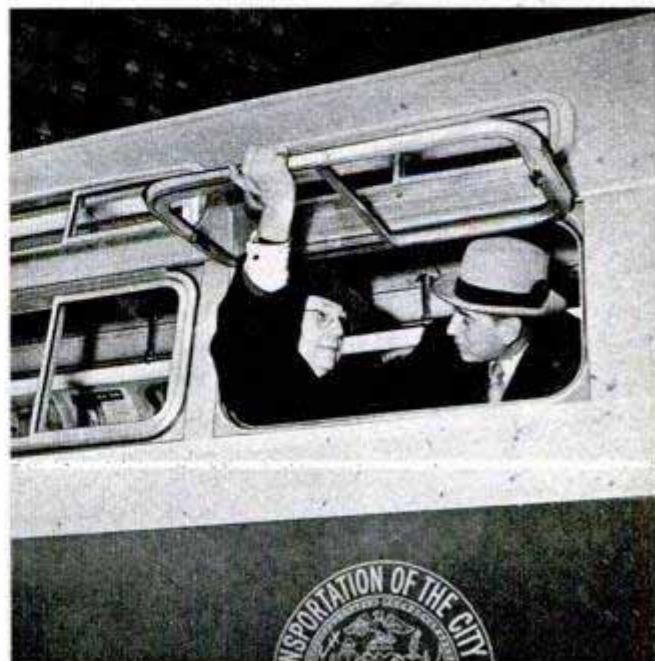
Perfection Stove Co., 7609 Platt Ave., Cleveland 4, Ohio

Picnic Broiler for Steaks

Steaks can be cooked on a portable broiler that clamps onto the side of a kerosene camp stove. The broiler lid covers the stove top. Convected heat cooks the meat.

Escape Window on Bus

Four hundred modern busses now in operation in New York City have individual escape windows through which passengers can crawl in event of an accident. The busses also are equipped with loops which hold stretchers so the vehicles can be converted into emergency ambulances. Other innovations are staggered seats, wider doors and nonglaring fluorescent lights.



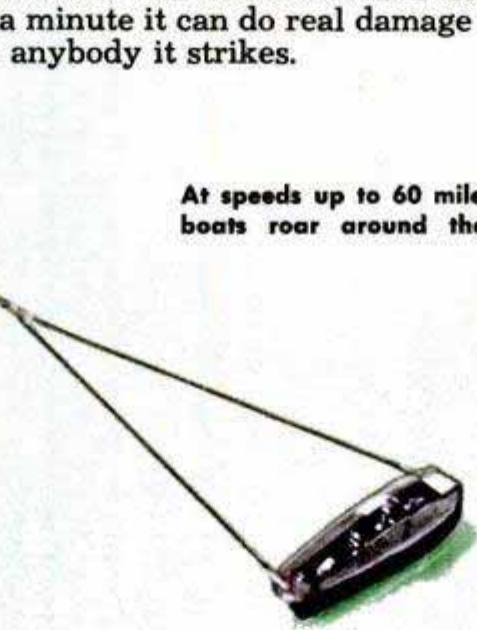
Quarry-Pit Racers

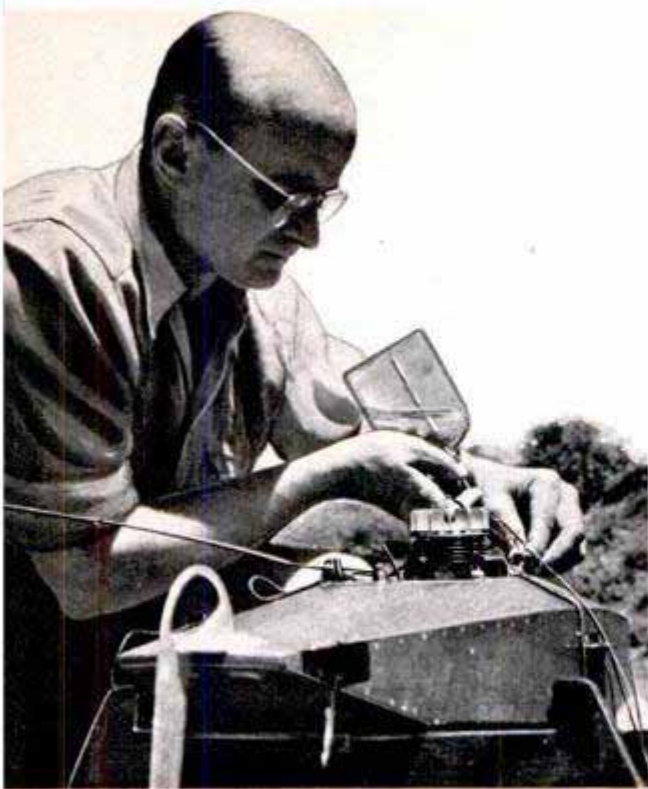
MINIATURE SPEEDBOATING has come of age. In the wake of modern streamlined trains came a new generation of model-railroad fans; and to emulate great schooners that crossed oceans, builders began to fashion small models to cross park lagoons. Now, fascinated by the sleek lines and spectacular speed of today's big power craft, hobbyists are racing hundreds of trim miniatures across the ponds of the nation. From engines up to $\frac{1}{4}$ horsepower, small enough to fit into a drinking glass, they get speeds of 40 to 60 miles an hour. The boats, less than a yard long, are so highly developed now that for competitive purposes they are divided into five classes, varying in engine displacement, total weight and as to whether the power plant is homemade or manufactured. Their racing even has its hazards. The boats spin around circular courses on cables, and when one of them breaks loose at a mile a minute it can do real damage to itself and anybody it strikes.

At speeds up to 60 miles an hour, the pigmy power boats roar around their 1/16-mile racing course

Three Lions photos

For further info write:
Mr. Robert Graham
127 Cottage St.
Jersey City, N.J.



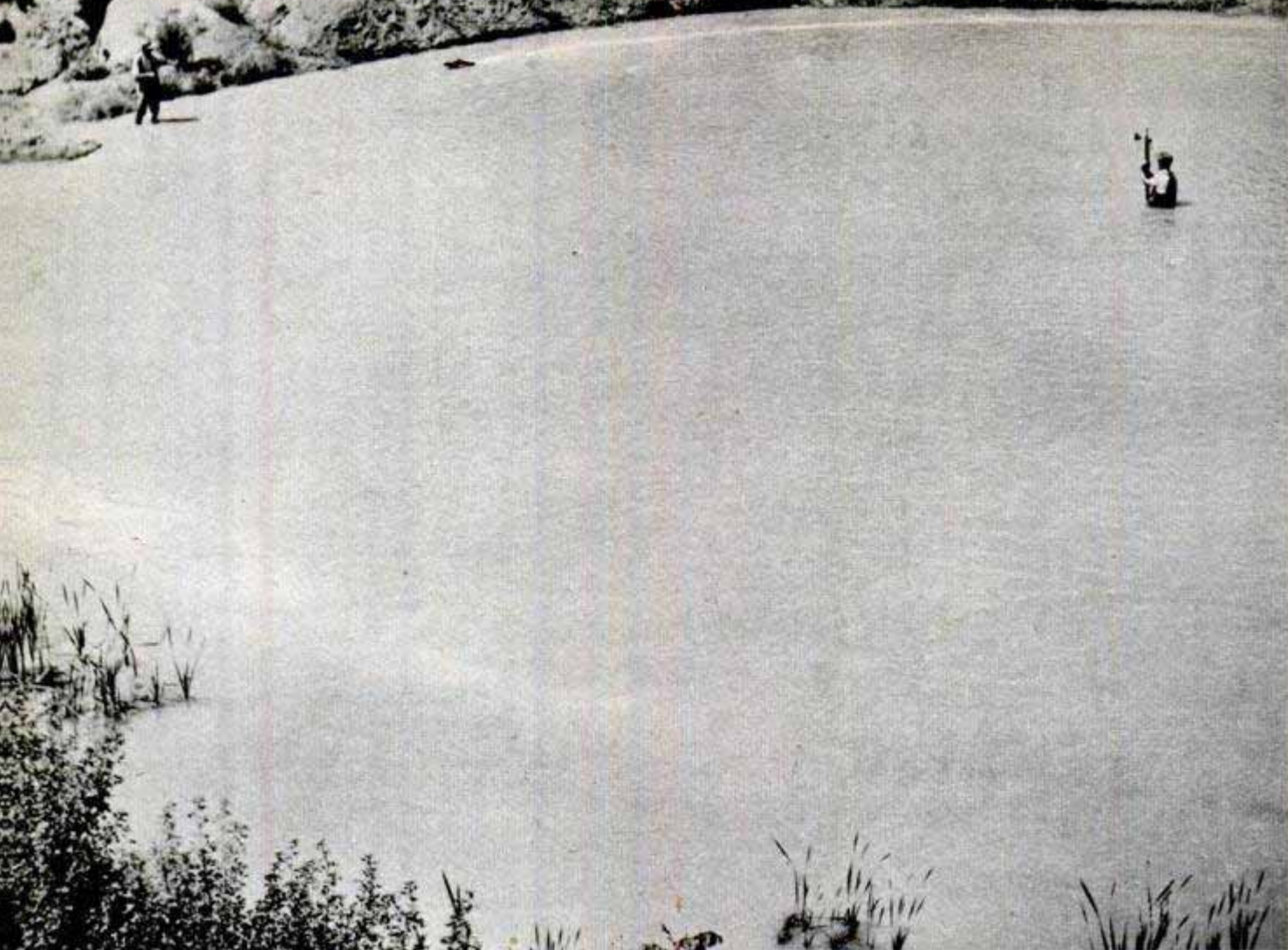


Fuel for the miniatures is a mixture of alcohol and castor oil. Some engines are small enough to fit into a drinking glass



Physical problems don't stymie miniature-racing fans. For a competition at Poughkeepsie, above, they used a bulldozer to scoop out a hole 200 feet wide, then diverted a stream to fill it up

To keep racing records uniform, the boats are held 52½ feet from pole in center of the pond by a bridle and a cable

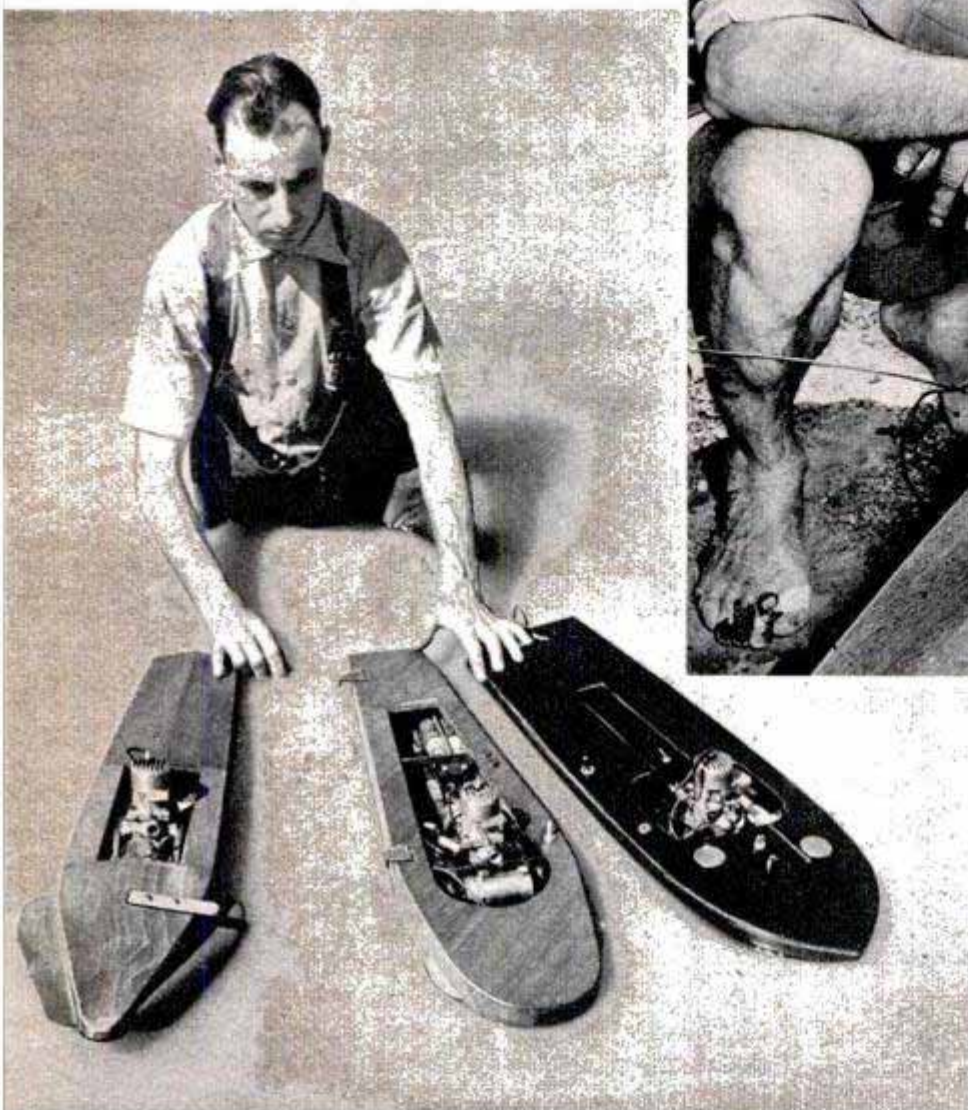


Attachment pole in the center of the pond, where the boy is standing, is greased to reduce friction

Fine equipment deserves extra care, so this owner slips his tiny boat into a handmade canvas rig

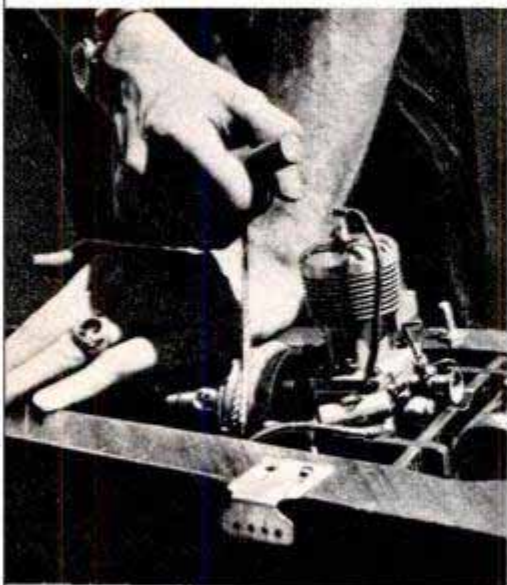


Most of the miniatures use stock engines. Note the small toggle switches that turn on ignition in two models (below) at right



While a young admirer listens avidly, a miniature-boat enthusiast describes working of an engine he built. The rod projecting at left, when touched, stops the craft. Another easy, quick way to stop a boat is to splash water into it as it passes, shorting the ignition

Steps or pontoons on their bottoms enable the boats to hydroplane more effectively. They barely skim along the surface. As a sample of painstaking work, even the mahogany grainings are matched in model at right



Either a piece of shoestring or a piece of light rope will spin flywheel to start motor





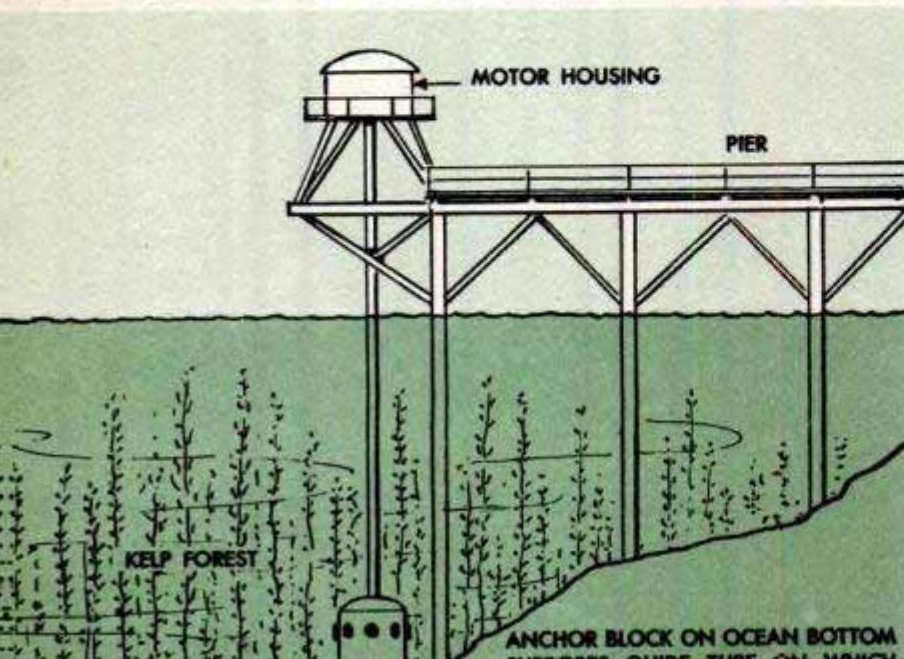
Left, the buoyant bell shoots up from the bottom, breaking through the surface, when the cable is released. Above, ports in the wall provide a view of ocean-bottom scenes

OCEAN-BOTTOM SIGHT-SEERS

LIKE TO TAKE a close look at the ocean bottom? You can do it on Catalina Island, Calif., and you'll be as safe and comfortable as you are in a department-store elevator. You descend 40 feet to the ocean bottom in a diving chamber roomy enough for 12 persons. Glass ports around the walls let you watch brilliantly colored fish dart among tall strands of underwater kelp.

The three-ton steel bell is moved up and down on a central guide shaft by a motor-driven cable. Normally, the car returns to the surface slowly, held back by the cable. But for a real thrill, the grip on the cable is released, allowing the buoyant bell to shoot to the surface like a cork. Motor and air compressor are mounted in a superstructure atop the shaft.

Below, left, sketch explains diving-bell operation. Right, structure above bell houses motor and compressor



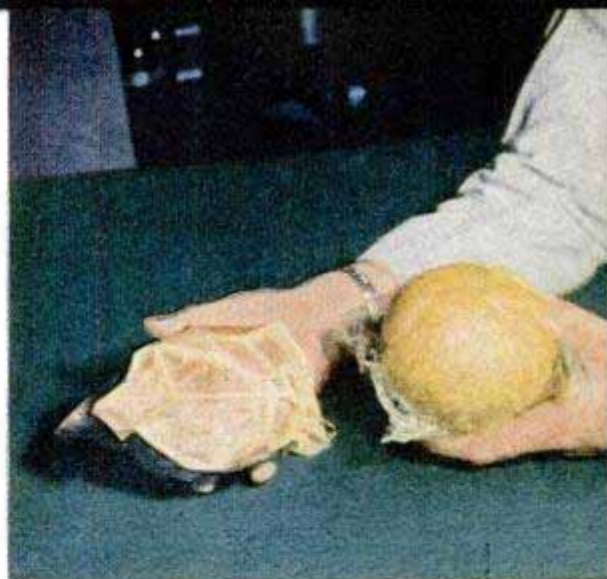


LIGHTNING STRIKES YOUR DINNER

By Richard F. Dempewolf

IT'S DINNERTIME. You open an ordinary kitchen closet, haul out a cellophane-wrapped steak, leg of lamb, hamburger or fillet of flounder which you bought two or three years ago. In a few moments, the aroma of fresh sizzling meat on the stove fills the kitchen. In that same closet, besides meat, are cartons of raw peas, carrots, cheeses, eggs, fruits—practically everything in the way of ordinarily perishable food—stacked up on the shelves the way you'd store sugar, cereals, spices and herbs. They've been setting there at room temperature for months or years. But they're all as fresh and tasty as the day you bought them.

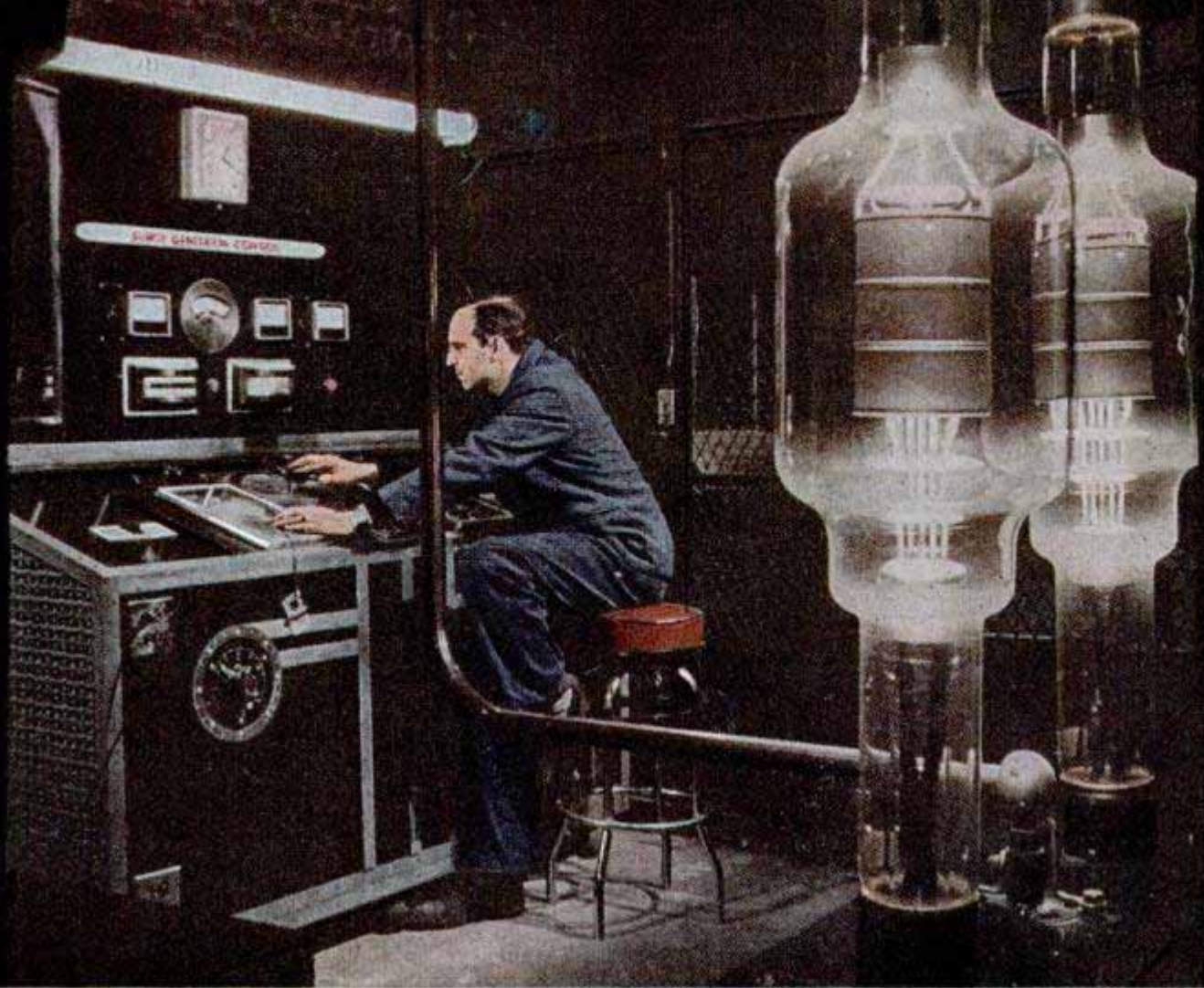
A dream for 1980? Not at all. The first commercial prototype of the machine that does the job will go to work this year. Its inventors believe that the first products from it will find their way to American homes within a matter of months. Already stored away at room temperature in a laboratory in New York City are remarkably fresh samples of four-year-old food. This reporter will attest to their flavor—peas and carrots that taste as though they'd just been brought from the truck patch; raw, red hamburger as fresh as though it had been a cow yesterday. Besides the food, a startling assortment of other well-preserved items line the shelves in glass ampules, aluminum cans and other airtight containers. There are year-old cut flowers as fresh as the instant they were snipped. There are perishables, such as vaccines, hormones, antibiotics, human plasma and other blood derivatives that have been lying around for a year but can be used



Top left, a technician places corn and grapefruit beneath waffled window of capacitron. Through the window will jab a 3,000,000-volt shot of electrons to destroy bacteria and keep the food fresh indefinitely—without refrigeration

*Dr. Arno O. Passch
Wolfgang Huber
Electrochemical Chemicals
Corp., 842 Lefferts Ave*

Above, test sample of grapefruit at right is still as juicy and appetizing as it was a year ago when it was "electronized." At left is untreated fruit, rotted though kept under refrigeration



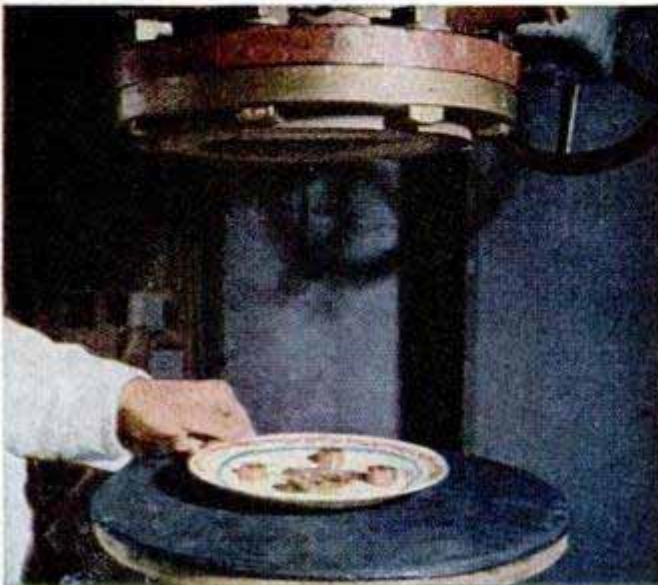
Pix Incorporated photo

Man at control panel hurls lightning bolts at food. Current passes through big rectifier tubes in foreground

safely and effectively at a moment's notice.

The secret preservative behind these amazing products is a monumental bombardment of the same atomic bullets that paint the pictures on your television screen and bring radar pictures to navigators—electrons. In this case, however, the electrons are let loose with a crashing discharge of three million or more volts, in man-killing flashes a millionth of a second long.

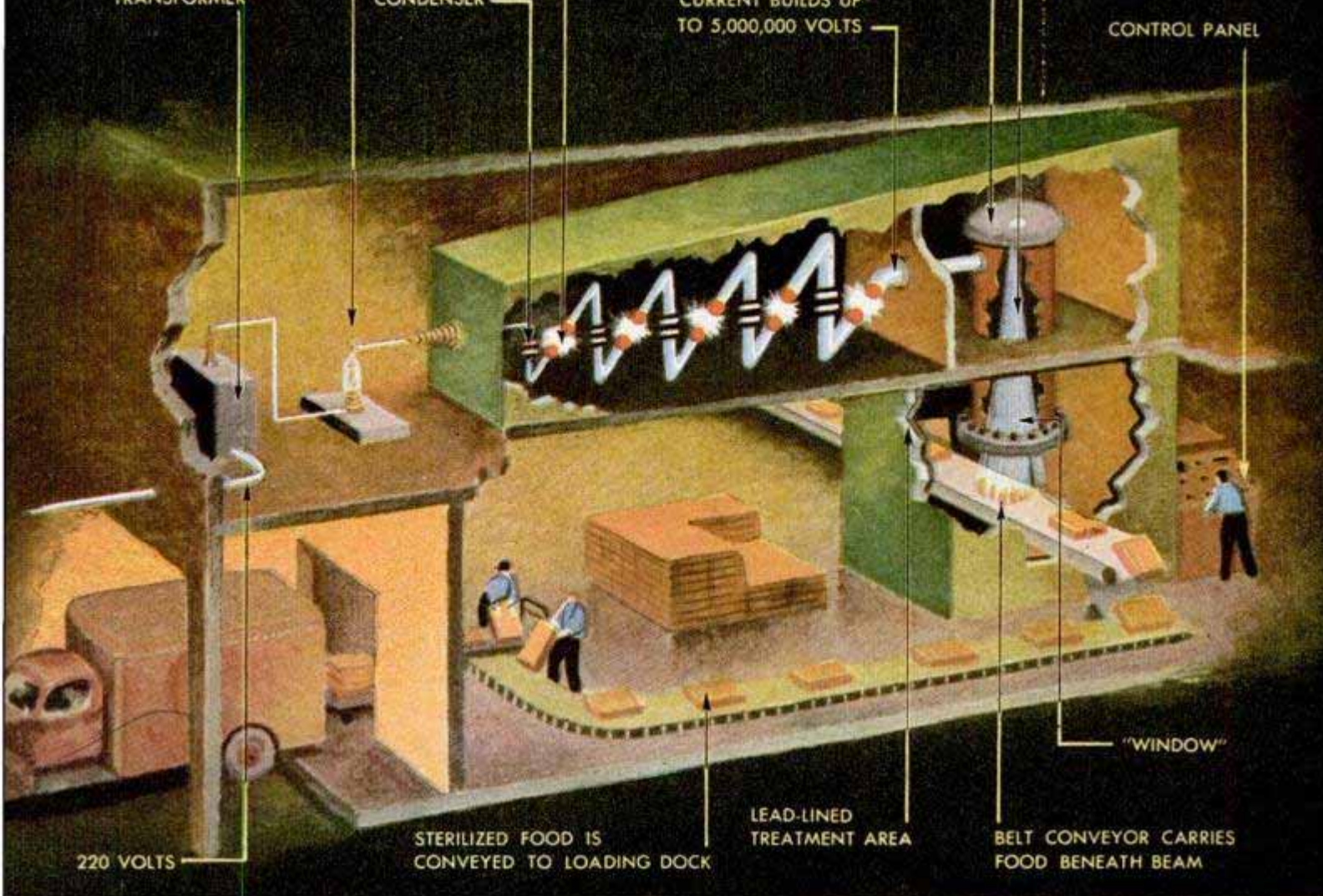
Ordinary china plate is placed on the target table and covered with a pattern of heavy metal templates



In that time, a light beam would only travel about two city blocks. Under this atomic barrage, every microorganism that makes food decay is destroyed, and the action of enzymes (which can change chemical structure of food) is inhibited. But, due to the singular effect of the electron bursts, the food itself is not injured or changed, since the radiation has no chance to go to work on anything else but the microorganisms.

Here's the same plate after the jolt of electrons. China has been tinted, pattern remains white through plate





Commercial model of capacitron will stab bacteria-killing electrons into food moving along a conveyor belt

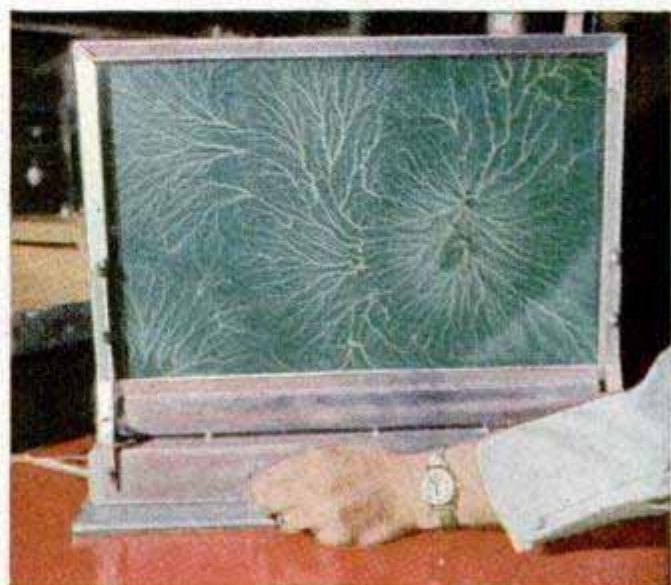
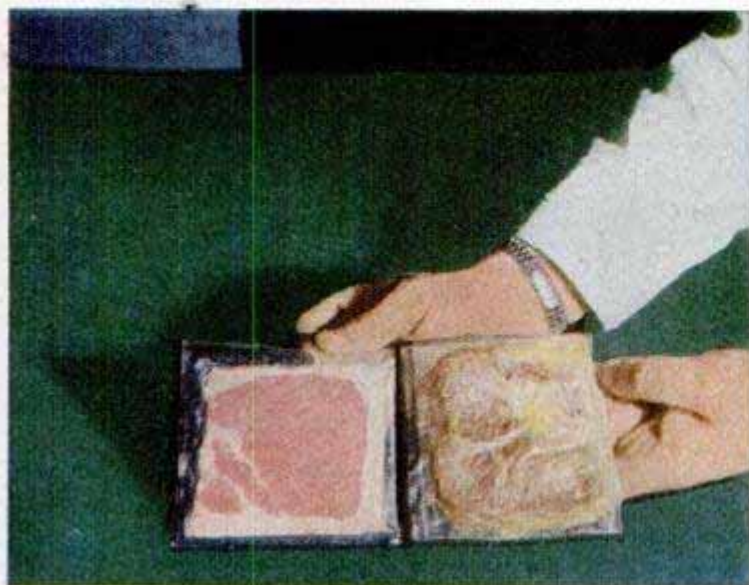
Though the eerie beams that will soon jolt into your steak are equal to the beta radiation of a ton of radium, these electrons leave no harmful residual radiations, such as the gamma rays that poisoned Bikini Lagoon. What they actually do is sterilize all bacteria and viruses by breaking down the nuclei of these one-celled menaces. By wrapping objects to be treated in airtight packages (such as glass jars, heat-

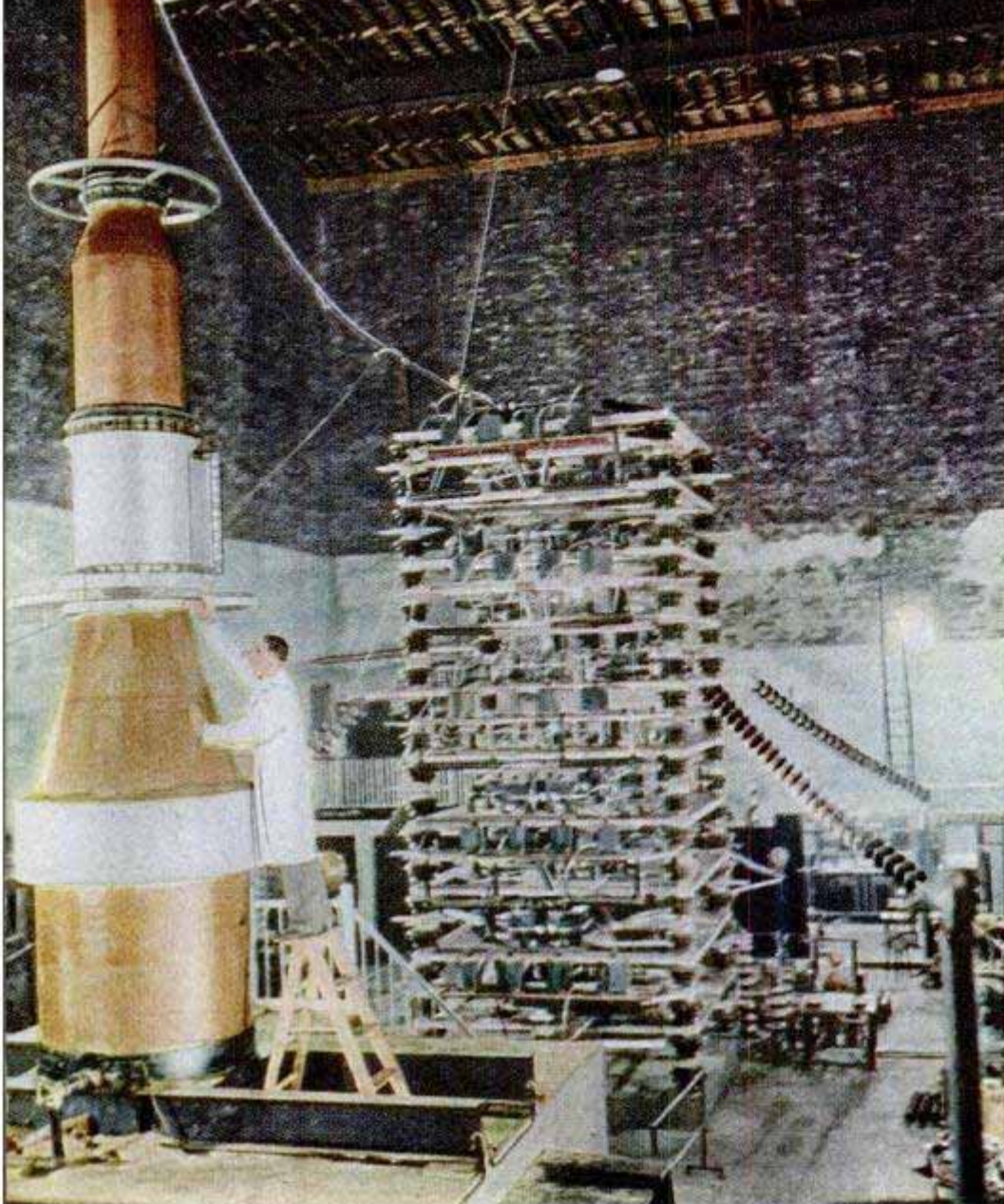
sealed cellophane envelopes or cans) before "electronizing" them, all the microorganisms in and around the food are destroyed by the bombardment, and no new ones can get in. Result: fresh food stays fresh in its container—and appetizing in most cases, regardless of temperature.

The pilot machine that first produced these workable electron showers sets in a cavernous, gloomy icehouse in a remote

Slice of ham "shot" two years ago is fresh and tasty. Untreated slice at right, two years old, is inedible

Electrons tunneled through sheet of Plexiglas to form a lacy pattern. Surface of panel is unaffected





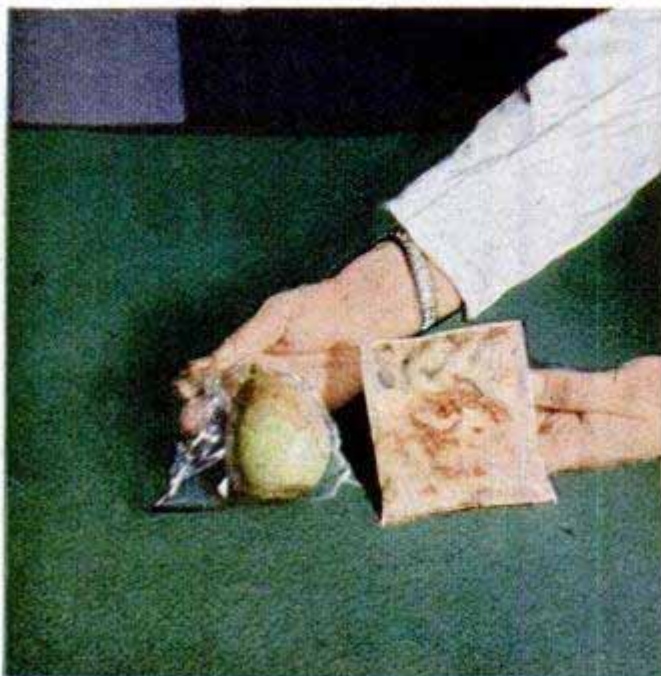
section of Brooklyn, N. Y. Dubbed the "capacitron," this second cousin to a cyclotron particle accelerator is a weird, towering jungle of insulators, transformers, glowing monster electronic tubes, jagged, crackling blue sparks and odd noises. The ice-house looks like an overdone set for a Frankenstein movie. Amid this Buck Rogers clutter, Dr. Arno Brasch, co-inventor of the machine, and his associate, Dr. Wolfgang Huber, have been feeling their way slowly for the past four years. "When you know you have an elephant by the tail," says Doctor Brasch, "you don't try to push him around."

Beside the huge pilot model of the capacitron is the virtually completed commercial model which will begin sterilizing edibles for a large food processor in a few months. It is in a compact, steel-enclosed case, 35 feet long, 6 feet wide and 10 feet high. It will pack a five-million-volt charge and is designed to fit into a special space in a factory above a

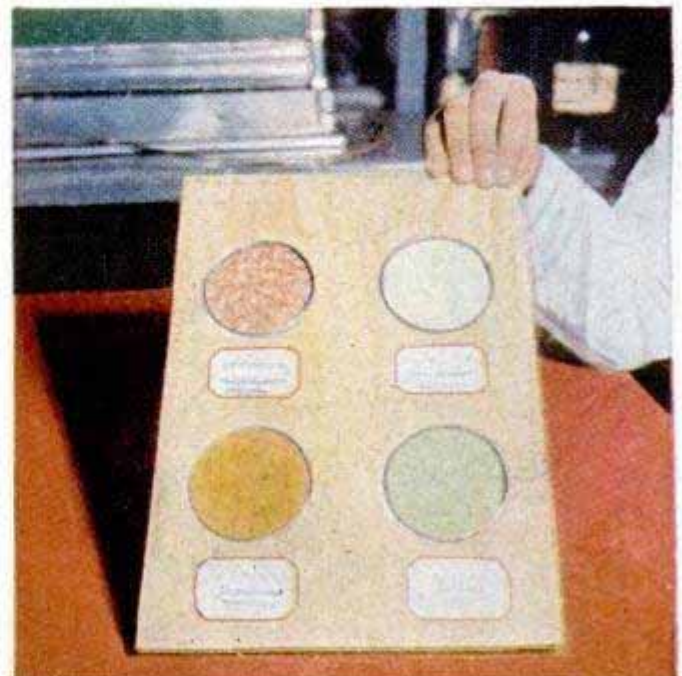
Pix Incorporated photo

In pilot model, ordinary house current is stepped up to 3,000,000 volts by tower in the background, then discharged through the huge vacuum tube

Perfectly preserved pear was "shot" two years ago and put on shelf. Beside it is an untreated pear



Four-year-old foods, still appetizing, include raw hamburger, fish pudding, raw carrot and pea puree



conveyor belt. It will process up to 50 million pounds of produce a year at a cost of about one-half cent a pound.

Doctor Brasch, formerly of the University of Berlin, is a serious, 44-year-old nuclear physicist, who strolls around his electronic kingdom with the faraway look of any scientist deeply absorbed in his brain child. He first grabbed this particular "elephant" by the tail in 1927. He was then working on atom-splitting projects in Berlin, and needed more voltage than anyone could produce to do the job. So, he decided to use lightning during thunderstorms, pull in its staggering voltage and split atoms with it. He built a plant in the Italian Alps, waited for bad weather, and got it—along with brief jolts of power from the heavens that registered up to 20 million volts.

"But you can't make lightning strike when you want it," he says, grinning, "so the next thing was to make my own." Within a year, the first capacitron for atom-splitting was shooting controlled, Brasch-made lightning around a laboratory at a rate of 2½ million volts a whack.

It wasn't easy. First, vacuum tubes kept blowing their walls. "The tremendous cascade of electrons," explains Dr. Adnan Waly, another Brasch associate, "created a negative charge inside the tube. It was so great it shorted out through the tube's walls. Result: breakdown." To solve this, Brasch designed a tube with what he calls a "built-in breakdown." It consists of laminated-plastic rings, interspersed with metal rings that carry the unwanted charge out into the air without disrupting anything.

While working with this lightning-spewing machine, Brasch first noticed the unique behavior of his short jolts of high-volt-

age electrons. Other machines, producing steady streams of low-voltage electrons, inactivated microbes, all right, but they also destroyed the structure of everything else in their path. The sudden flash of the first capacitron, lasting only 1/10,000 second, was so short it didn't seem to hurt anything but the electron-sensitive bugs. Brasch saw visions of his lightning jolt killing plague and tuberculosis organisms without hurting people; sterilizing drugs without changing the substance—and perhaps getting at cancer without harming surrounding tissue. And he saw his lightning playing over conveyor belts of food.

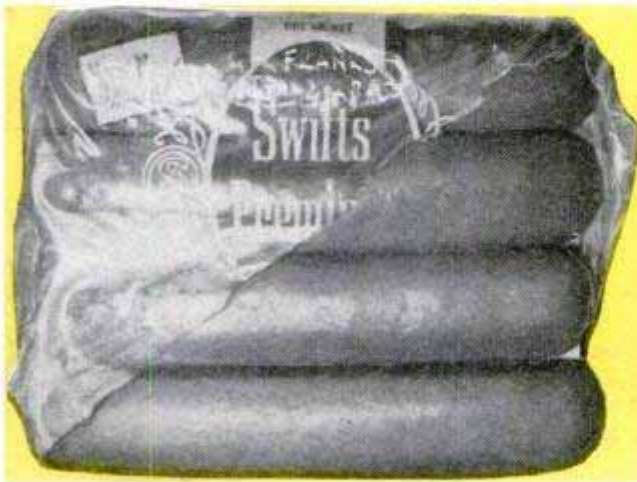
To test his theory, he sealed up a banana and put it under the business end of his machine. "It was perfectly preserved," he recalls, "but it turned an ugly brown—an indication that the blast still did some injury to the food structure. What I needed was more time and money to investigate the effects of this type of radiation on food."

But Hitler wasn't interested in bananas. Brasch, after an altercation with Nazi agents, who didn't see eye to eye with his plans (nor he theirs), packed off to America. After years of heroic "selling," he managed to round up half a million dollars. He rented his icehouse and went to work.

It was 1943. Everything was in short supply. Brasch beat the bushes for material. He haunted secondhand stores in lower New York's junk hardware mart, snagging a condenser here, insulators there. Toward war's end, he got 2000 Navy radar capacitors for his condenser tower at one time.

By the end of 1945, the electronic jungle in the icehouse was full-grown, and in January of 1946, 3,000,000-volt lightning flashes, a millionth of a second long, were

Partial jolt was given hot dogs at left, which kept for many weeks. Refrigerated package at right was untreated



rocketing onto a target table in a lead-lined room.

Despite the gawky size of the impulse generator, which towers three stories in the air toward the icehouse ceiling, even the pilot-model capacitron is a relatively simple affair.

It merely takes ordinary 220-volt alternating current you'd find in a home, converts it to direct current and steps it up through platform after platform of spark gaps and condensers. Each time it leaps, the voltage is doubled. Finally, at the top, it has built itself up to a lightning-like jolt of 3,000,000 volts. Then this king-sized charge is unleashed in a single bolt, through the monster laminated vacuum tube about two feet in diameter and five feet long. A cathode gun atop the tube supplies billions of electrons which are sent cascading down the tube when the lightning bolt hits. In one microsecond, that flood tide of electron bullets whams through an aluminum-foil "window" at the bottom of the tube and stabs into the hamburger, beans or vaccine on the table.

Some of the capacitron's secret of success lies in the controllability of its electron bursts, which can be varied from 1/10,000 to 1/1,000,000,000 second depending on the thickness, density and texture of the material being "shot." Electron bursts can be adjusted to penetrate part way into a potato, for instance, prevent it from growing "eyes" in storage and increase its life for weeks without any airtight container.

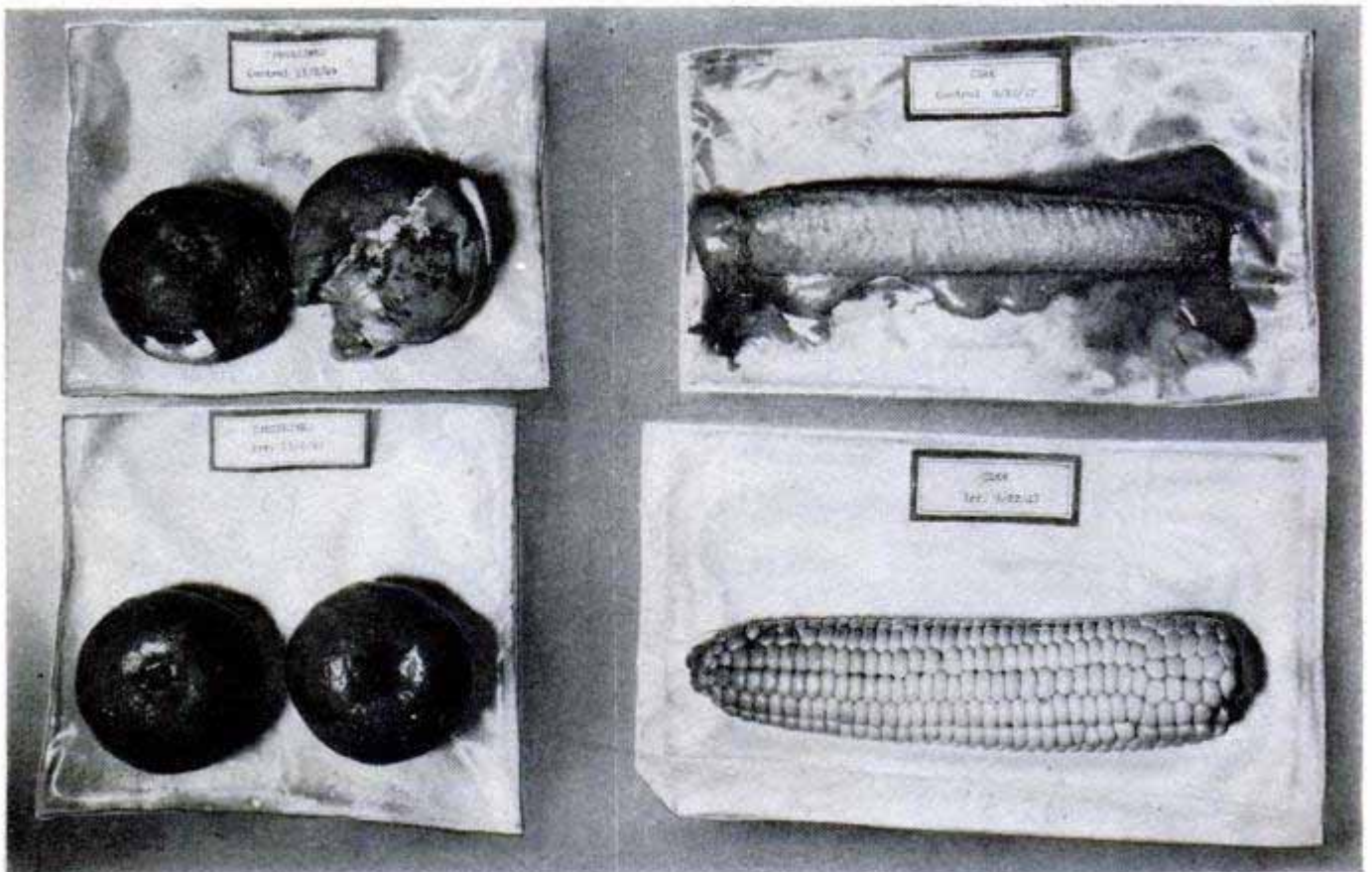
Higher acceleration of electrons allows penetration to greater depths, and produces sterilization throughout.

An odd characteristic of electrons is that they do most of their work inside an object, leaving the skin of a potato or apple, for example, unmarred. To illustrate this, Doctor Brasch will show you samples of heavy Plexiglas, shot with heavy jolts. The surface is smooth as glass, but the inside looks like the circulatory system in a bat's wing, where the zipping electrons have tunneled into the substance and carved a lacy pattern of thousands of veins.

What's more, the rays of this incredible machine can be confined to the tiniest imaginable beam. Brasch has a miniature vacuum tube that looks like a slightly oversized hypodermic needle, through which his massive charges can be directed to narrowly confined areas of infection inside living creatures—an invaluable tool for work on cancer, for instance. By governing the amount of charge and voltage, he can tell just how far the beam will penetrate. Its tiny beam will hit only the parts he wants, without damaging surrounding tissues. To find out how to achieve proper dosages, Brasch not only removed tumors from mice, but even directed the beam against himself. By trial and error, penetration figures were worked out. The errors are now dozens of little brown scars that never stop flaking, on the doctor's left arm and his back.

(Continued to page 234)

Comparison photographs prove tangerines and corn on cob retain freshness after high-voltage treatment





Detroit Listening Post

By Siler Freeman

THE "GUNS AND BUTTER" phase of production is beginning to take shape as defense orders become increasingly important in the automotive plants. While the "butter," or civilian, end is expected to continue for some time, it is on the decreasing scale with the "guns" part emphasized.

An official of the National Production Authority has announced that he doubts there will be any new models appearing "after this fall." In other words, the 1951 models may be with us until some drastic change in the international situation relieves the metal shortages. NPA spokesmen tell of a 25 to 40-percent cut in basic metals allocated for automotive production. The federal agency suggests that resourceful manufacturers may keep up production by conserving materials and using such substitutes as plastics in place of metals. It is doubtful if John Q. Public will enthuse over a 1952 model with plastic fenders and painted bumpers. The result of such substitutions would undoubtedly put a premium on '50 and '51 cars.

Despite the pinch, new models in various lines have been making belated 1951 debuts. The Nash Healey sports car (featured in the March issue of *Popular Mechanics*) is one example. Nash had originally planned to introduce the car in May but decided to advance the date. Then there is the sleek new Ford Victoria, the Packard hard-top Mayfair and convertible.

Already some of the 1951 models are beginning to look different. Here and there plastics are appearing in places never planned by the designers. Iron pistons are replacing aluminum ones and the chrome on some bumpers is only a thin veneer, which could quickly be replaced by body paint. In fact, some have been and others are in the works.

The "combined operations" in the automobile plants haven't stopped companies from planning the 1952 models, however. As the industry works a year ahead, everything is about complete for the new models except the tooling. Of course, the tooling is the crux of the whole situation.

Any mechanical changes in '52 models

will deal with the high-octane requirements of the high-compression-ratio engines. Oldsmobile's 1951 Rocket was brought up to 7.5 to 1, or .25 more than its predecessor. The combustion chamber has been redesigned to obtain advantages that are not entirely dependent upon higher-octane fuels. Some of these changes may have been made to facilitate a change-over.

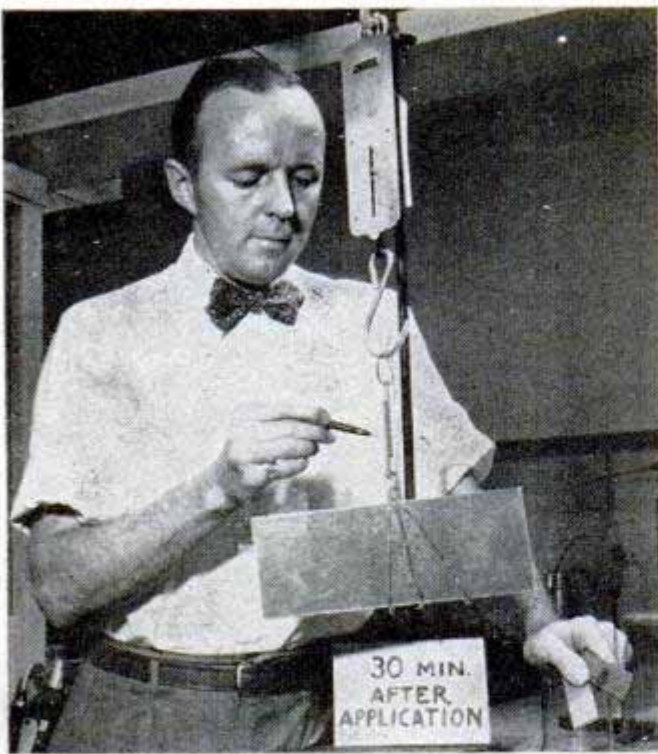
There is a move afoot to put ceilings on octane ratings to conserve the high-test fuel for the enlarging Air Force. The ceiling on premium would be from 91 to 92 and on regular fuel from 82 to 84. Despite the suspicions of many motorists that this already has been done, the oil companies deny there has been any change so far for the worse. In fact, an Ethyl Corporation researcher stated the octane ratings had gone up slightly since January in the Midwest.

The slowing up of new-car production will be a boon to the tire manufacturers who have been unable to build up inventories and supply the replacement demand in the past few months. The amount of synthetic rubber which they have been receiving from the government plants has been far below the quota.

Synthetic plants, however, are beginning to fill their needs better and the supply for replacements is expected to return to normal in a short time. There is no question that, once the rubber plants are working at full capacity, motorists need have no fear of a tire shortage.

What will be in short supply, however, are things which caused new-car buyers to curse the dealers not so long ago — accessories. Radios, heaters, radio antennas, side-view mirrors, etc., are not being sprinkled as liberally on the cars. Materials which go into accessories are being used to make more profitable items.

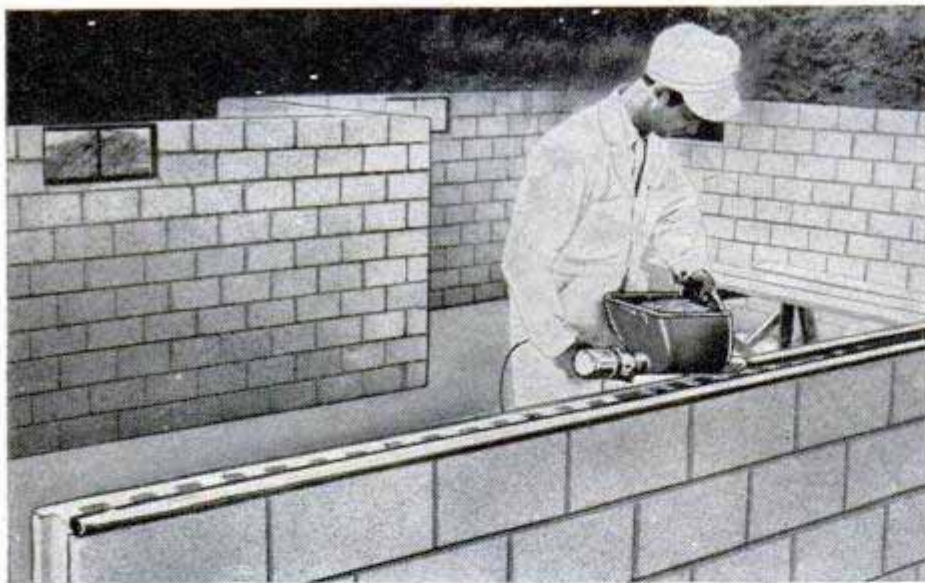
Labor shortages, as well as material shortages, are becoming acute. On the factory side, it is the skilled technicians and engineers who are being lured away by firms with defense contracts. On the dealer end, it is the dwindling supply of skilled mechanics. The draft is edging into the service shops.



Bonding Agent Hardened by Lack of Air

Lack of air hardens a new General Electric developed material that may find use as a bonding agent or as a "pipe dope" for sealing threaded unions. It is not yet commercially available. Called "anaerobic permafil," it is the latest in a series of solventless varnishes that harden without the

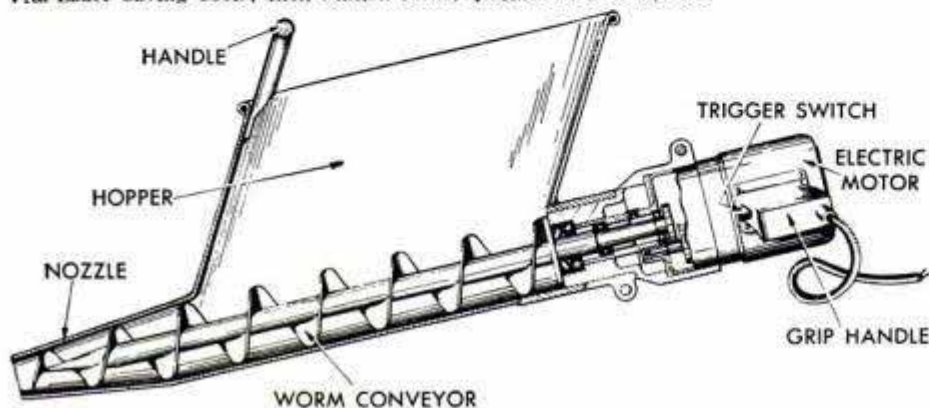
necessity of evaporation. Two metal strips coated lightly with it and clamped together will support 100 pounds after 20 hours. A few drops of the material on the threads of a bolt just before the nut is screwed on hardens so tightly that considerable force is needed to remove it.



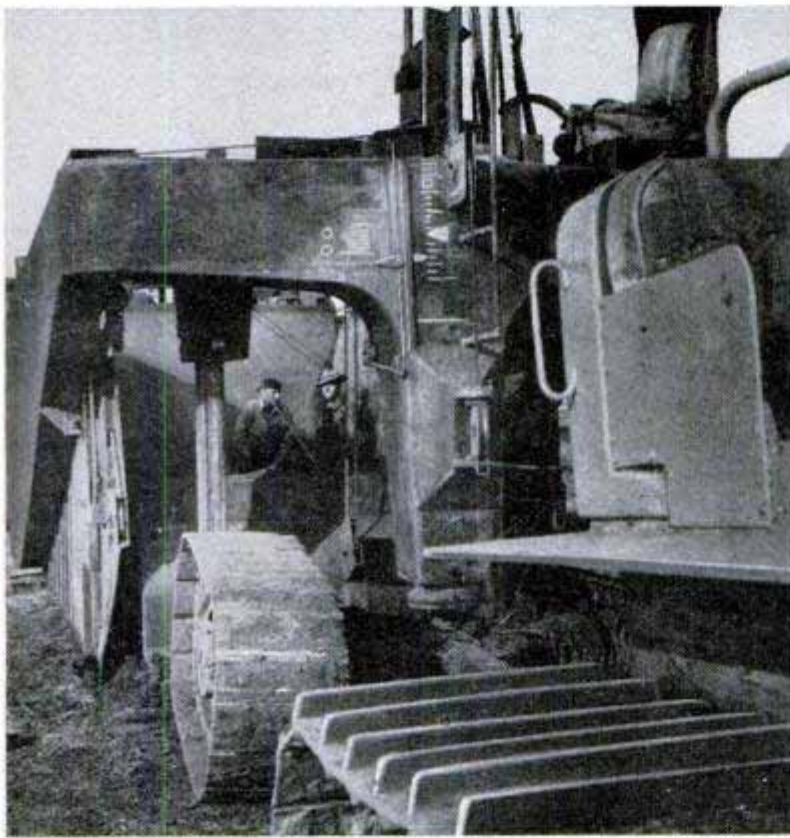
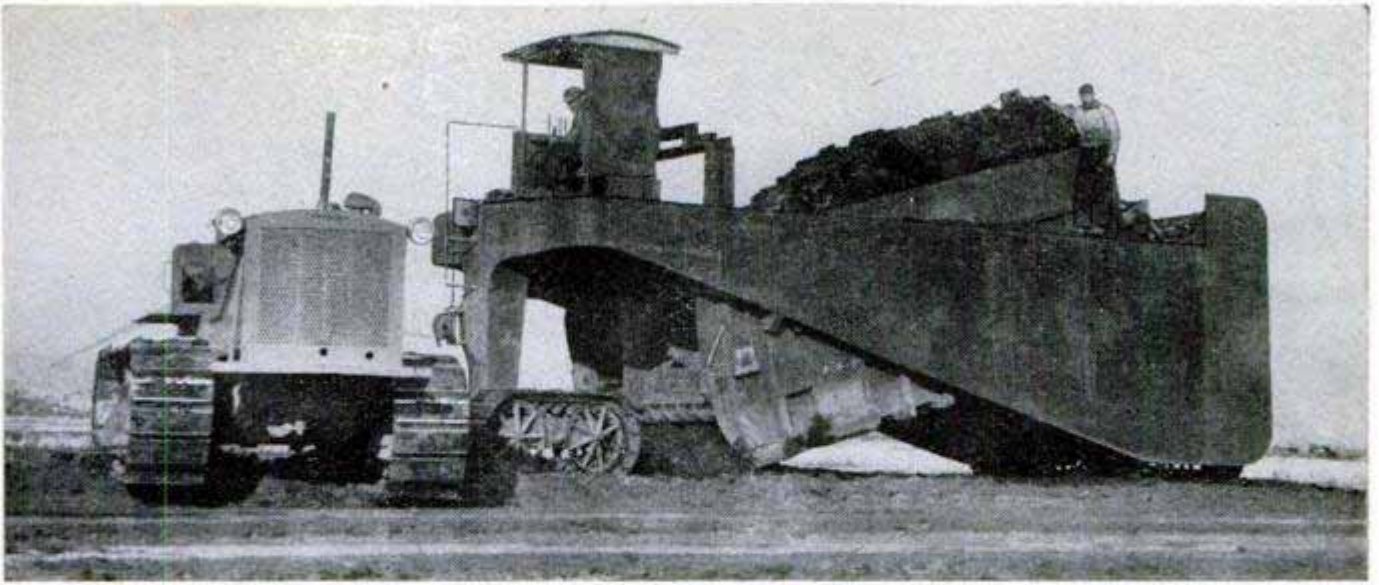
Vita Labor Saving Tools, Inc., Station Plaza, Smithtown Branch, N.Y.

Mortar Gun

Mortar is applied in an even layer along the thin walls of concrete and cinder blocks by an electric-powered mortar gun, reducing the costs on such construction. Mortar is placed in the hopper of the gun and is forced out the nozzle by a worm conveyor. The gun eliminates waste due to spillage that is virtually unavoidable when a hand trowel is used on block construction work. Vertical joints can be filled while the blocks are in place.



Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, available from the Bureau of Information, 200 East Ontario St., Chicago 11



Monster Earthmover Packs Itself Full

Capable of handling 1000 cubic yards of earth in one hour, a giant tractor-drawn scoop has a built-in bulldozer blade that pushes the material to the back of the hopper as it is scooped up. This is said to be about 10 times faster than the hourly rate of standard earthmovers. The strokes of the packing blade inside the bucket or hopper are controlled by the operator who rides in a small cab at the front of the machine. Empty, the machine weighs about 28 tons and rides on four sets of tracks instead of the conventional wheels. A 180-horsepower engine, mounted at the rear of the machine, drives the packing blade. The machine was invented by Barney Hooper of Klamath Falls, Ore.

Flour Mixed With Compressed Air Flows Through Pipe Like Water

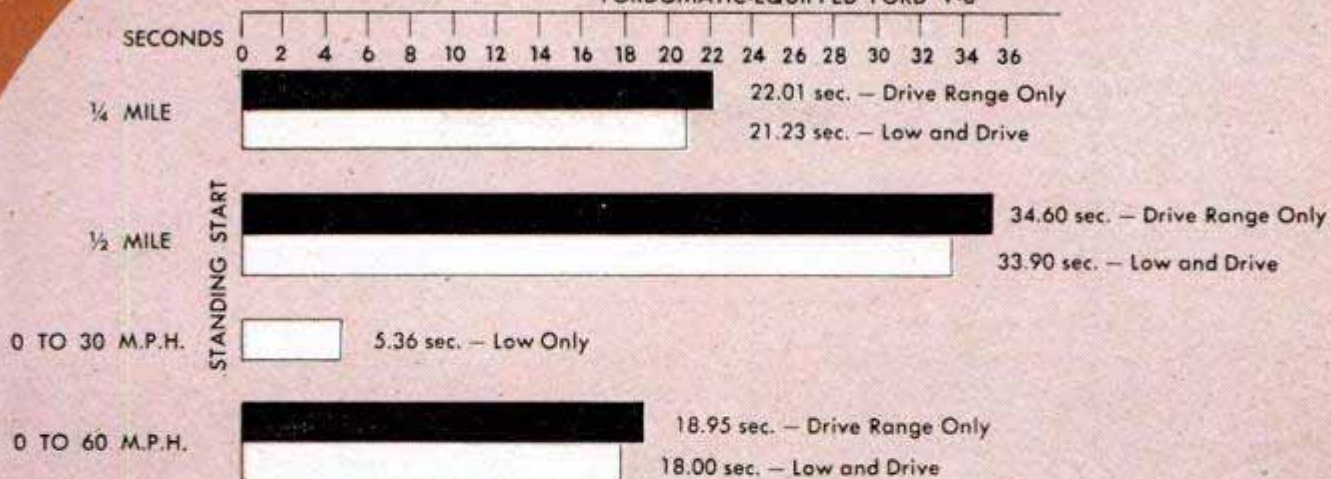
Dry flour that behaves like water is flowing through test conduits at the University of Minnesota. The experiments may provide millers with a more economical method of moving large quantities of flour during processing. Compressed air is passed through a membrane into a chamber containing the flour. The mixture of flour and air becomes a "fluid" which can be handled like water. Booster chambers keep the flour particles in a fluid state as they pass through conduits.

□ In 1950 the United States produced a record 96,713,276 net tons of steel, exceeding the output of 1944—the previous record year—by 7,000,000 tons.



ACCELERATION TESTS

FORDOMATIC-EQUIPPED FORD V-8



(In tests using both Low and Drive, shift from Low to Drive was made at 30 m.p.h.)
Top Speed (by Speedometer) 93-95 m.p.h. Actual Top Speed, About 6% Less

on the '51 FORD

By Floyd Clymer

IT WAS PRESS TIME for the April issue. The returns on the *Popular Mechanics* questionnaire sent to one thousand '51 Ford owners from coast to coast were in. Percentages had been compiled, charts carefully made, engravings completed and everything in place except this type. Then along came a tardy reply which upset at least one pretty applegart.

After the line, "Would you buy another Ford?" this tardy owner marked "No." This spoiled an amazingly unanimous record for the survey, for all other owners polled had reported they would either definitely or possibly buy another Ford.

The late arrival (too late to enter in the percentages list which still shows no dissenters) explained on the margin of his questionnaire that after six Fords, his next car would be in the top-price bracket. His switch, it seems, reflected his wallet rather

than any dissatisfaction with his '51 Ford which he rates "excellent."

The survey shows that this owner with six Fords in his past is not unusual at all. Almost half of those answering the questionnaires (44 percent) had owned four or more Fords before buying a '51! A man in Kansas has owned 16 Ford passenger cars and seven trucks. Three owners reported they had owned 20 previous Fords. Eighty-four percent had owned one or more Fords before buying a '51.

One of the most neglected questions in the survey was: "What do you dislike about the car?" Thirty-nine percent either left this space blank or wrote "nothing." One wag wrote: "Nothing except the driver. Ha! Ha!"

On the other hand a man from Massachusetts wrote a serious 600-word criticism of his car. He prefaced his criticism by

Slight thumb pressure on the door handle swings the Ford's door open



PERCENTAGES FROM P.M. POLL

Bought Fordomatic Drive	16%
Bought overdrive	39%
Bought standard transmission	45%
Average gasoline mileage (in country).....	20.2 m.p.g.
Average gasoline mileage (in city).....	16.3 m.p.g.
(6-cylinder owners reported an average of 1.9 m.p.g. more than V-8 owners. Fordomatic owners 1.3 m.p.g. less than owners having conventional transmission.)	
Use regular gas	62%
Use premium gas	38%
Change oil	87%
Average mileage for change of oil.....	1441
Add oil	13%
Average mileage for adding oil	1177
Mileage increase by use of overdrive.....	2.1 m.p.g.
Fordomatic was factor in selection.....	16%
Maneuverability excellent	85%
average	15%
unsatisfactory	0%
Size of car just right	98%
too large	1%
too small	1%
Acceleration outstanding	71%
fair	28%
poor	1%
Road clearance satisfactory.....	99%
too low	1%
V-8 engine	82%
6-cylinder engine	18%

BEST-LIKED FEATURES

Interior details, dash, etc.....	45%
Style, design, appearance	38%
Maneuverability, handling	38%
Seating, riding qualities	38%
New mechanical features	33%
Acceleration, pick-up	26%
Gas and oil economy	20%

(These percentages are based on the fact that some owners commented on more than one feature.)

RATING OF CAR

Excellent	63%
Good	31%
Average	5%
Poor	1%

GENERAL INFORMATION

Prefer in-line engine	13%
Prefer V-type engine	32%
Prefer eight cylinders	89%
Prefer six cylinders	11%
Prefer side-valve arrangement	50%
Prefer overhead-valve system	50%
Prefer automatic transmission	45%
Prefer Fordomatic Drive	37%

(The above figure means 37% of 45% preferring automatic transmissions.)

Prefer makes other than Fordomatic	53%
Undecided about automatic transmissions	10%
Owners who like low-pressure tires	77%
Previous Ford owners	84%
Will buy another Ford	81%
Might buy another Ford	19%
Will not buy another Ford	0%
Dealer service good	69%
Dealer service average	30%
Dealer service poor	1%

Most disliked features—

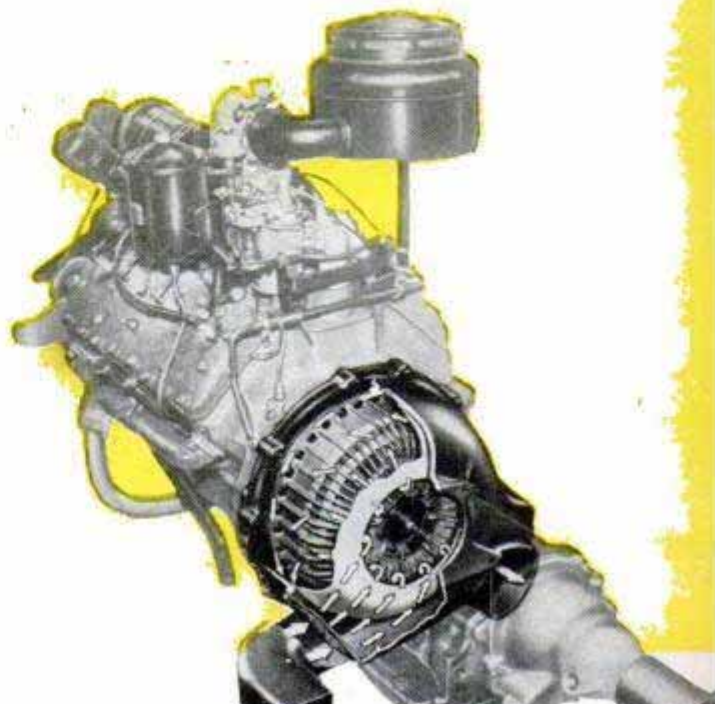
Instrument-panel lighting, horn ring on custom model interfering with speedometer vision, left-side location of starter-switch.

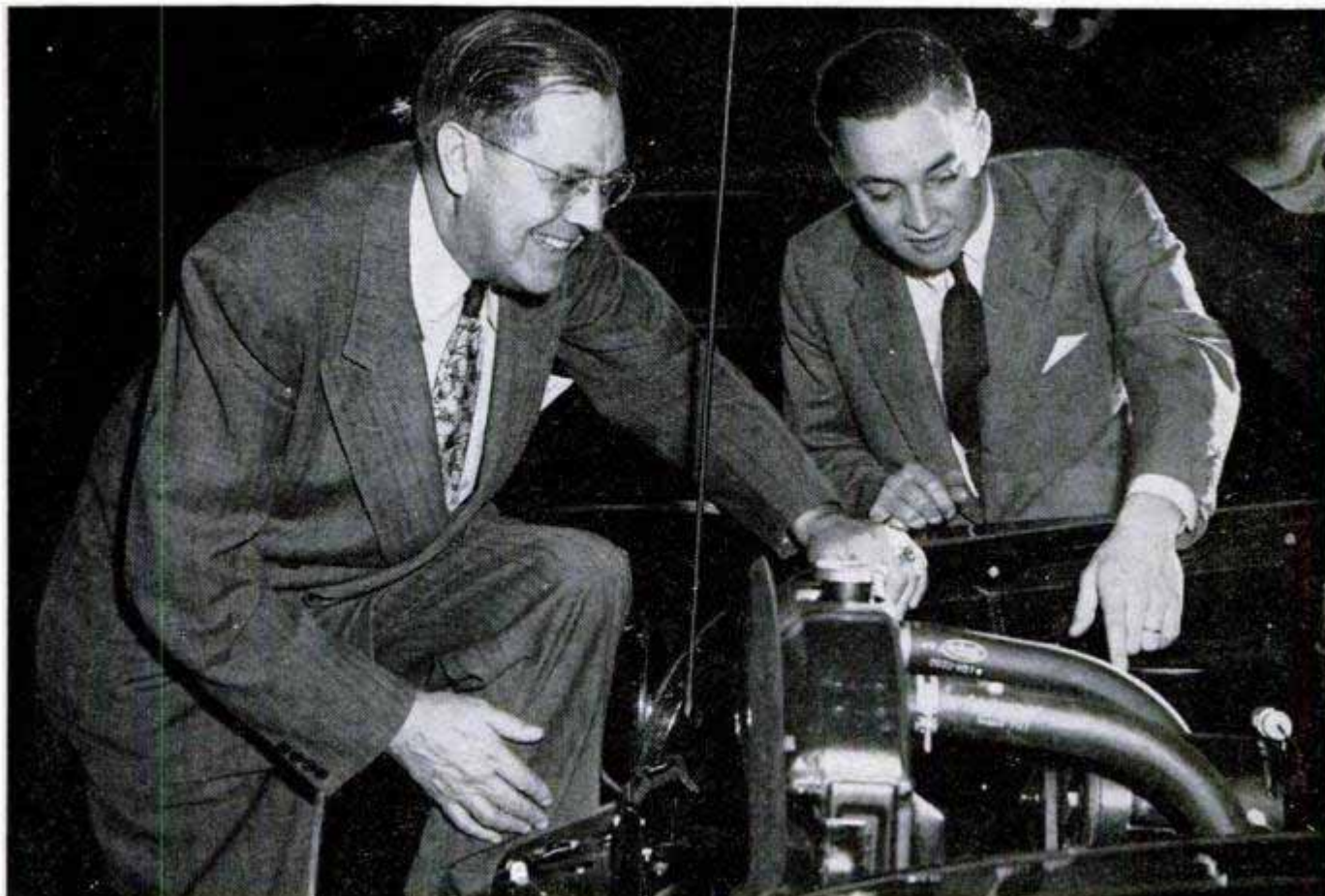
saying "despite its faults, I like my Ford." He objects to the new instrument panel and calls it a "poor substitute for the easy-to-read, easy-to-use dashboard of the 1947 Ford." He finds the new starter switch not to his taste because he used to step on his starter in the old days to move his car without starting the engine. He says the instruments are hard to read at night and that the horn ring obscures the speedometer at 45 miles per hour. This owner complains that the windshield pillars are too thick, creating a bad blind spot. After many other detailed criticisms involving a leaky trunk, too soft tires and squeaky front springs, he concludes: "Despite all these criticisms, I still feel I own a good-looking easy-handling car that I enjoy driving."

Although Ford's new automatic transmission—Fordomatic—is a big feature of the '51s, only 16 percent reported they bought cars thus equipped. This low figure does not give a true picture of the public's acceptance of Fordomatic, however, for many indicated they wanted the automatic transmission but were unable to get it. Many (39 percent) settled for overdrive which was introduced as optional equipment in 1949. Forty-five percent bought standard transmission. Here are a few reactions of Fordomatic owners:

"It's fine because in shifting a

Cutaway of the torque converter shows the unique arrangement for air-cooling the unit





Clymer talks over the weatherproof ignition system of the V-8 engine with Bill Ford, grandson of Henry Ford

driver does not have to pass through drive gear to get into reverse," writes a man from Colorado Springs.

From Newbern, Tenn., the owner of a six-cylinder Ford reports: "Fordomatic smoothness is wonderful. Best automatic I've driven, smooth change, up or down. I like the maneuverability, economy, pickup, comfort, visibility. Some vibration at slow speed."

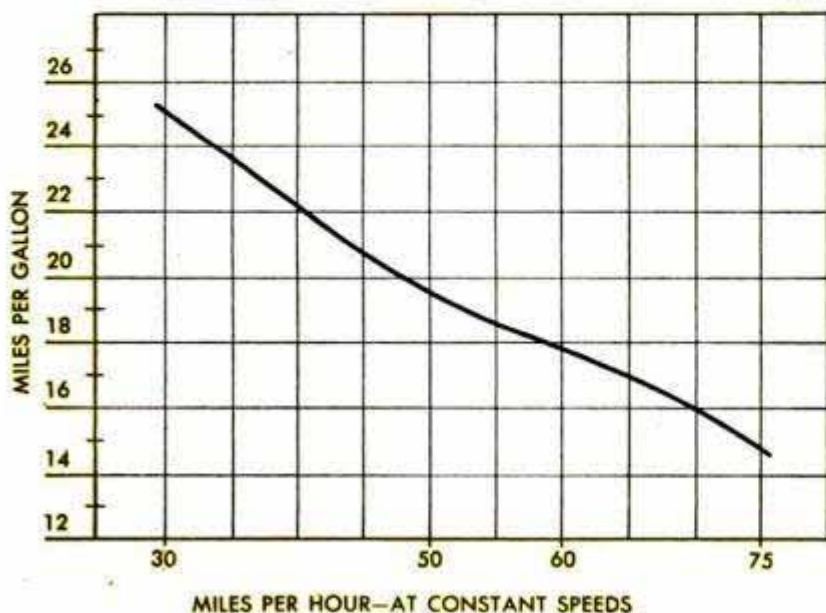
An aircraft engineer writes: "The 1951 Ford is very stable at all speeds. Fordo-

matic seems to accelerate without too much slippage or engine speedup. It gets going quickly."

An Emporia, Kans., mail carrier says: "The Fordomatic has made my driving the easiest part of my job. The car is excellent."

A Maryland owner says: "I think they could improve that automatic transmission for I don't like the lost time you have shifting from "N" to "D" when you start out—but maybe it's me. I have owned 12 other Fords and this one is the most comfortable

CLYMER'S ECONOMY TEST OF FORDOMATIC-EQUIPPED V-8



Miles Per Gallon—V-8 Fordomatic

At constant 30 m.p.h.	25.11
At constant 50 m.p.h.	19.48
At constant 60 m.p.h.	17.92
At constant 75 m.p.h.	14.87

Mileage After Car Was Broken In

Kansas City to Denver	17.95
Denver to Holbrook, Ariz., through Rockies over Continental Divide (300 miles through snowstorms)	15.12
Holbrook to Los Angeles	21.72



Gale-Hall Engineering photo

Clymer used a Mile-O-Meter during his test. It was helpful in measuring gas mileage at various speeds

riding I've ever had. The reason I like my Fordomatic, a week after I bought it I got caught in the big snowstorm they had in Pennsylvania and I was going places that most people couldn't go with chains on."

A Clawson, Mich., owner says his Fordomatic "has noisy transmission and rear axle" and that "mechanics so far are not too well versed on Fordomatic service; gas and oil mileage poor."

Most Fordomatic owners seemed to accept the fact that an automatic transmission



Rotary door lock is good, owners report, and they like the locking system—keys can't be locked in car

reduces gasoline mileage. Our poll shows they get 1.3 miles per gallon less than conventional-transmission owners. Ford "6" owners reported an average of 1.9 more miles per gallon than V-8 owners, and owners with overdrive reported 2.1 miles more per gallon than with conventional. (For other figures see the Percentages From Poll chart and my own economy chart.)

A Palm Beach, Fla., owner writes: "Engine is noisy while accelerating. Think gas

(Continued to page 252)

Clymer drove 4000 miles in road test, partly over slippery mountain roads, and found car easy to handle



Tailless Jet For Carriers

Designed for catapult take-off from carriers and for fast climbing, the tailless XF4D is one of the first Navy jet fighters built specially for interception. The test model was flown for 30 minutes at a high altitude over Edwards Air Force Base, Muroc, Calif., but its dimensions and performance were not revealed. A slender nose extending from the swept wing houses the pilot.



Douglas Aircraft Co. photo

Radioactive Stitching

Less irritating to the patient because of its flexibility, a radioactive surgical thread is the latest aid for cancer treatment. The thread, devised by Dr. William J. Meyers of the Ohio State University Medical Center, is made by stretching warm nylon tubing to a small diameter and then inserting radioactive cobalt wire. It is fine enough to fit the eye of the surgeon's usual needles.

"Tape Measure" Rolls to Work

You can measure as you walk with a roller that has a two-foot rule recessed in its face. It measures in fraction of inches up to two feet and for longer distances an automatic counter clocks the measurement in feet. In addition, an audible click sounds for each two feet measured and a bell rings at 100 feet. The handle collapses to make the device compact enough to fit in the glove compartment of a car.

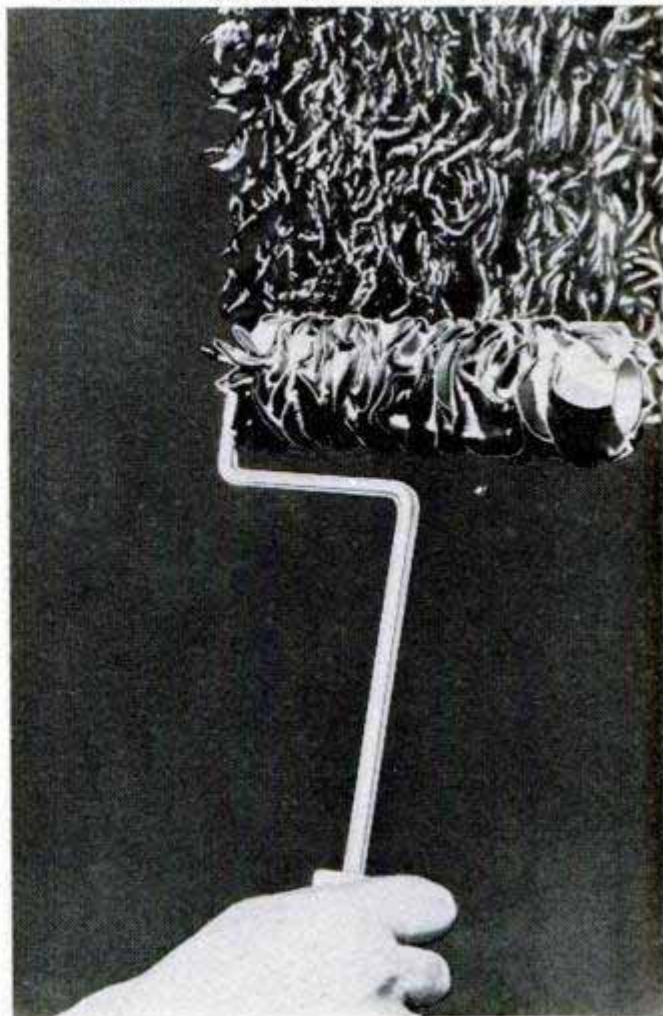


Rollstape, Inc.,
1415 14th St.,
Santa Monica, Calif.

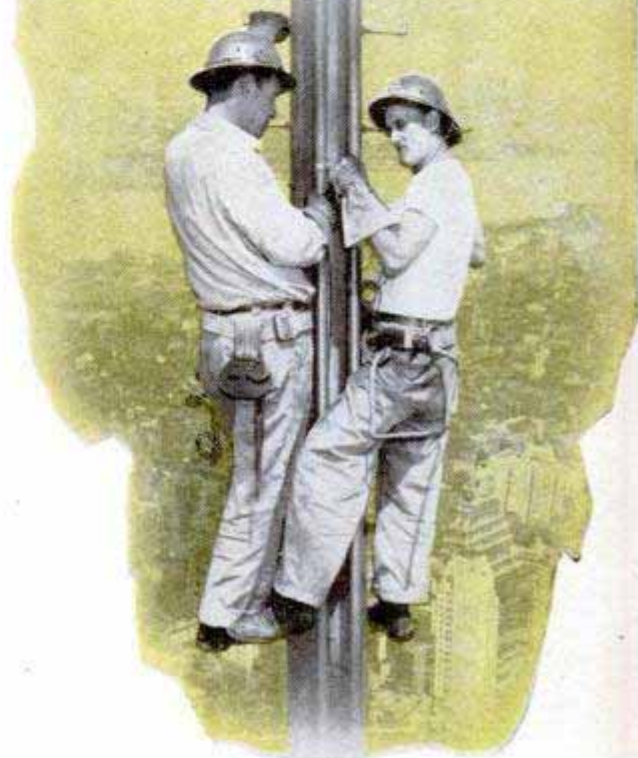
Textured Wall Roller

Textured walls are produced by a new paint roller that creates patterns from coarse to very fine. The background color is applied first. After it dries, a coat of a different color is applied. While the second coat is still wet the wall is rolled with the rough-surfaced roller. One pass with the roller creates a coarse pattern, and repeated passes produce a finer texture. An interchangeable roller is supplied for stippling.

American Products Co., 2287 Hollers Ave., New York City 66



TV's STEEPLEJACKS



Above, two workmen pause to talk it over on the Empire State mast, a mere 1250 feet high

By Arthur R. Railton

EVEN THE SLICKEST of city slickers has been gawking upward at the steeplejacks performing their workaday gymnastics on the new top of New York's topmost Empire State Building.

The 1250-foot tower of glass and steel has grown 222 feet taller in the last few months as the human flies wove a new television antenna to transmit for five stations. By centralizing most of the city's stations on this peak of Manhattan Island, the TV broadcasters hope to eliminate ghosts on Gotham screens and extend their effective range beyond 50 miles.

The Empire State's "spike," base of the new extension, was—as many have forgotten—designed as a

Left, climbing nimbly on a scaffolding that looks as delicate as a spider web, five men erect an antenna on Chicago's Lincoln Tower

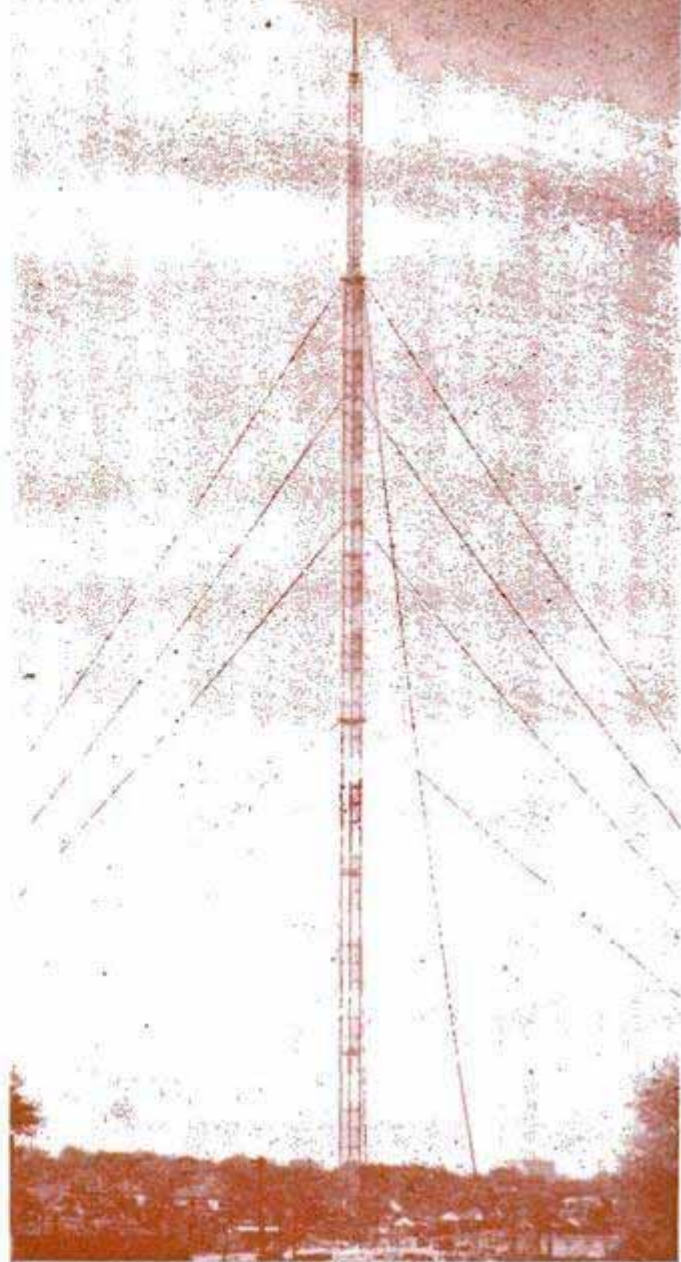
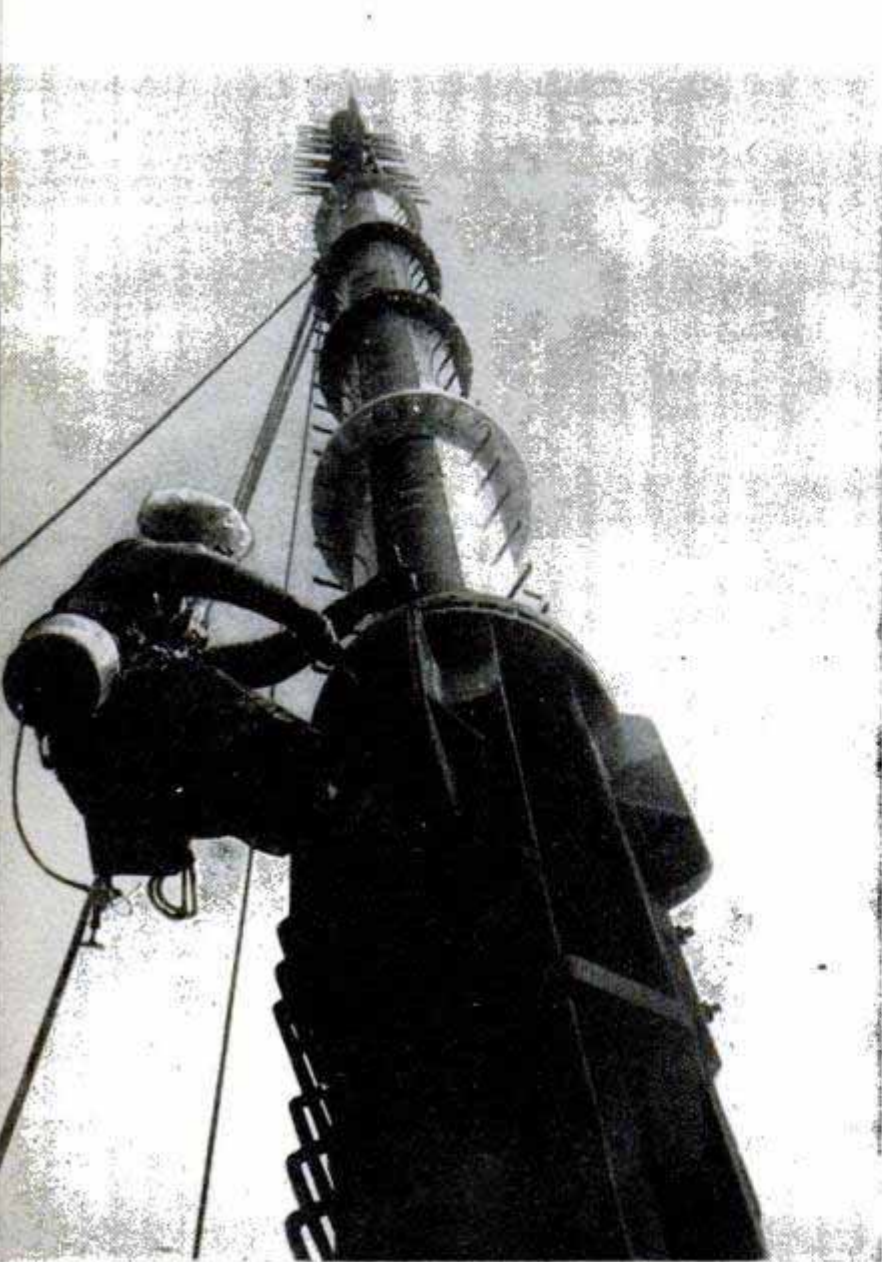
mooring mast for trans-Atlantic dirigibles. It turned out instead to be only an ornament, but fortunately it was built rugged enough to support the 70-ton antenna, largest in the nation.

New skyscraping TV and FM antennas are sprouting all over the country. Frequency-modulation and television waves are light-of-sight travelers. Their range is limited by the curvature of the earth and their clarity is affected by obstacles, such as buildings, that reflect the waves to create ghosts on your TV screen. The higher the antenna, the better the signal and the wider its reach. So the steeplejack is doing a land-office business.

What does it take to make a good steeplejack? The simplest formula is an iron worker with iron nerves. A. A. Belda, whose B.D.N. Steel Erection Co. has raised many of TV spiderwebs atop Chicago's Loop, says, "Some fellows can climb and some can't, that's all. Some of our men are old-timers who began when the tallest structures in town were church

Below, pass the wrench, please! And don't drop it because it's a long way down. Right, you can't see it here, but the ground is 613 feet below the men erecting WENR-TV's antenna on a Chicago building





Above, painting cloud-scraping antennas requires calm nerves. Below, old NBC antenna is removed from Empire State Building

Soaring 1057 feet above Atlanta, WSB's tower is the world's second tallest structure

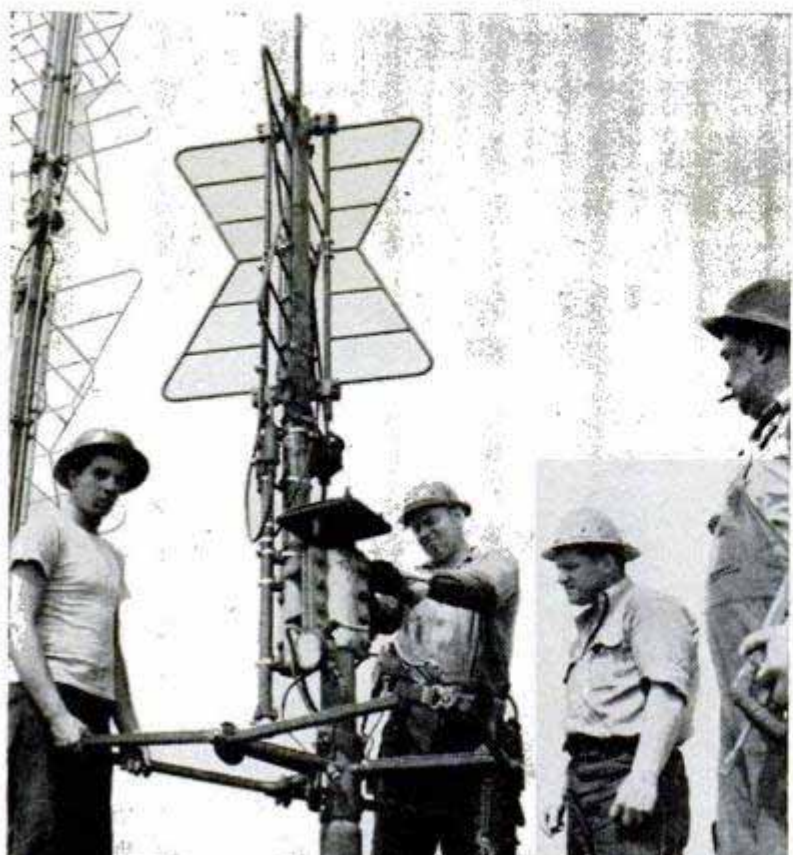
steeples. Others are just kids."

Accidents are infrequent. Every steeplejack knows he can make only one bad mistake. A clumsy or reckless worker is soon looking for another job. The others refuse to work with someone who risks their lives.

Belda's most spectacular job was the WFJL antenna atop the Lincoln Tower Building. Only 562 feet high, it is not in the Empire State Building class. However, it's just as fatal to fall 562 feet as 1500 feet! The biggest complication in this job was not height, but the building.

Virtually a needlepoint, the peak of Lincoln Tower is a smokestack. There is no room around the rim of the chimney for even one man to work. The only way to get up there is to crawl over the rim from below.

Belda's crew built a circular platform three feet wide around the chimney, which sent up gases that





Above, Old Glory flies on man's highest work: Empire State Building mast, 1472 feet high. Over-all view of mast, right, shows the first element for Channel 4 being installed at top

threatened to asphyxiate the men. Much of the time they wore masks. Above the platform, the crew erected a scaffolding of metal tubing. From street level, this tubing looks half as thick as a cat's whisker. Actually, it is only a couple of inches in diameter, but it is bolted and welded for stability. Inside this framework, the antenna was erected, section by section. As the wind blew off Lake Michigan, the scaffolding swayed dizzily, but to the workers that was no more disconcerting than the roll of a ship to a sailor.

Weather causes endless delays. Men refuse (with reason) to work in a high wind. They won't climb if it's icy or too wet. The necks they're risking are their own and when conditions are too dangerous, they stay down.

Sometimes, though, the weather changes suddenly and they have no choice. You can't leave a section of steel tubing hanging precariously up there. If a gale comes up suddenly, they stay on top until all is secure.

It's dangerous business but, as one worker philosophized, "It's not so bad—we don't have to worry about being hit by a car and, so far, nobody's been hit by a plane!"



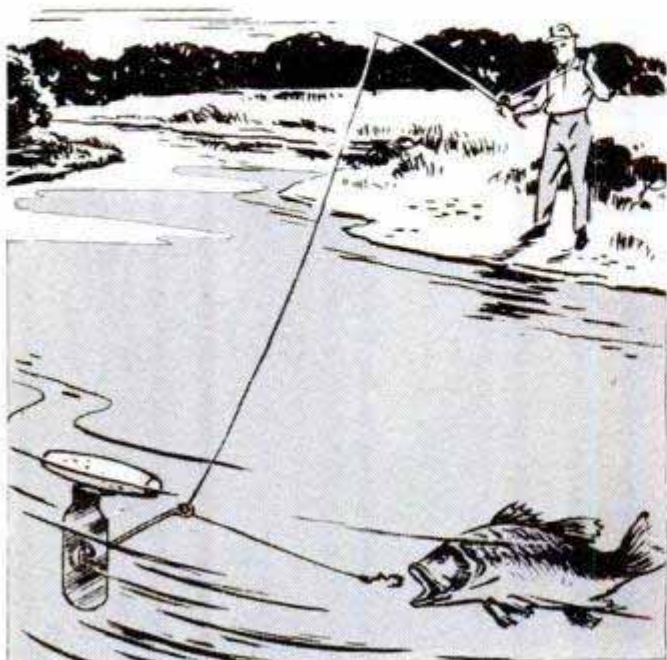


Charles A. Chayne, designer of experimental Buick, at wheel, shows car to Ivan L. Wiles, manager of Buick

Buick's Experimental 300-Hp. "Dream" Car

Custom-built from its big high-speed racing tires to the vertical side pillars on its corner-curved windshield, Buick's experimental "dream" convertible is powered by a 300-horsepower supercharged V-8 engine that delivers a speed of 150 miles per hour. The car was designed by Charles A. Chayne, former chief engineer at Buick and now vice-president of General Motors in charge of the engineering staff. He also handled mechanical features on *Le Sabre* (*Popular Mechanics*, February 1951, page 116), another GM experimental car. Chayne's car, called the XP-300, is a two-passenger single seater which hugs the ground and stands only 39.1 inches at the cowl. It is mounted on a 116-inch wheelbase and has an over-all length of 192.5 inches. Most distinctive styling feature is a side-louver arrangement that extends the length

of the car. The louvers on the front doors allow air to escape from the engine and those to the rear carry air from the driving compartment. The sloping hood, which affords excellent vision of the road even from the low seat, and front fenders are welded into a single unit. The hood is opened by a hydraulic lift controlled from the instrument panel, as are the side windows. The engine has a 10-to-1 compression ratio and uses only the highest octane fuels. During fast acceleration, methyl alcohol is injected in proper proportions to prevent knocking. The alcohol is carried in a separate fuel tank and is fed into the engine through a second carburetor. Power is transmitted to the rear wheels through a special Dynaflo unit at the rear of the car. Another feature is dual four-wheel brakes. The car was first shown at the Chicago Automobile Show.



The Kissich Co., Cedar Rapids, Iowa

Fish Float Carries Line To Any Spot in Stream

With a new fishing float the angler can maneuver his hook to virtually any spot in the stream. The action of the current upon a stainless-steel blade forces the float diagonally across the stream toward the opposite bank. Attached to the blade are a cork float and a wire stem. The line is tied to the stem. The float is guided to the desired spot by lowering or raising the tip of the pole and increasing or decreasing tension on the line.

☐ Visitors at the Exhibition of Industrial Power in Glasgow, Scotland, walk through a glass tunnel on which pound 20,000 tons of water a minute to provide a vivid demonstration of water power.



Rootes Motors Inc., 27-11 Bridge Plaza North, Long Island City, N.Y.

One man can handle suction pipe which is thrust into catch basin. Above, right, used as street sprinkler, the vehicle delivers 120 gallons per minute. Below, sidewalk-flushing hose unreels from front of truck

Catch-Basin Emptier

American municipal sanitation departments are showing interest in a British vehicle that quickly cleans catch basins and can also be used to sprinkle streets and sidewalks. A powerful pump sucks the material from the catch basin through a counterbalanced pipe that is easily handled by one man. Inside the tank, a hydraulic ram separates the sludge from the water which is then pumped back into the sewer. When used as a sprinkler truck, the vehicle delivers over 120 gallons of water a minute at 50 pounds' pressure.



Helicopter Charts and Sounds River Above Niagara Falls

Thanks to a hovering helicopter, a survey has at last been made of the river for a mile above the crest of Niagara Falls. A lead-weighted line was extended downward from the craft as it remained stationary at altitudes of 1000 feet or more and readings of the line were taken by surveying parties along the shore. Two-way radio

connected the air and ground groups. The survey will help determine the amount of water that can be diverted to provide electric power, equally to the United States and Canada, without affecting the beauty and grandeur of the falls. A total of 252 soundings were made and as many as 77 were made in a single day.

Experts Predict Twice as Many Prefab Homes This Year

More than 100,000 prefabricated houses will go up from coast to coast in 1951, according to predictions of leaders in the housing industry. That's almost double the number of prefabs turned out during

the past year. The predicted 100,000 for 1951 would account for about 12 percent of the 850,000 homes of all types which government experts estimate will be started during the current year.



Above, taking off from the final jump, these boats fight it out for the lead. "Lightning" won the race. The boats travel 75 feet in air before hitting water

Below, with an almost-perfect start, the zaniest of boat races began. Only three of the six finished. The winner's time for the 11 miles was 22½ minutes



Zaniest race on water is the show performed among the Florida cypress trees by the

HIGH-JUMPING OUTBOARDS

SOME FOLKS LIKE to drive speedboats. Others like to fly. But down at Cypress Gardens, Fla., there are a half dozen speed enthusiasts who like to do both—and at the same time! At that famed resort near Winter Haven, tiny racing hulls leap from the water like flying fish at 35 miles an hour.

Appealing to the daredevilry of these zany outboard enthusiasts, the Cypress Gardens organization put on a Steeplechase Race on Lake Eloise. It was more than a marine steeplechase, it was an obstacle course on land, water and in the air. The noisy waterbugs, forgetting momentarily that boats are supposed to stay in the water, zoomed up inclined ramps to take off like motorized ski jumpers. They slithered across weed-covered peninsulas. There was even a test under fire with the boats speeding through blazing gasoline that floated on the lake.

Naturally, some boats ended up as casualties. Three of the six starters did complete the hazardous course. Dick Pope, Jr., son of the man who thought up the zany pastime, was the winning racer and was treated by the losers to a victor's dunking in the lake.

To take the terrific punishment of the 11-mile course, specially designed and built boats were required. These hulls were

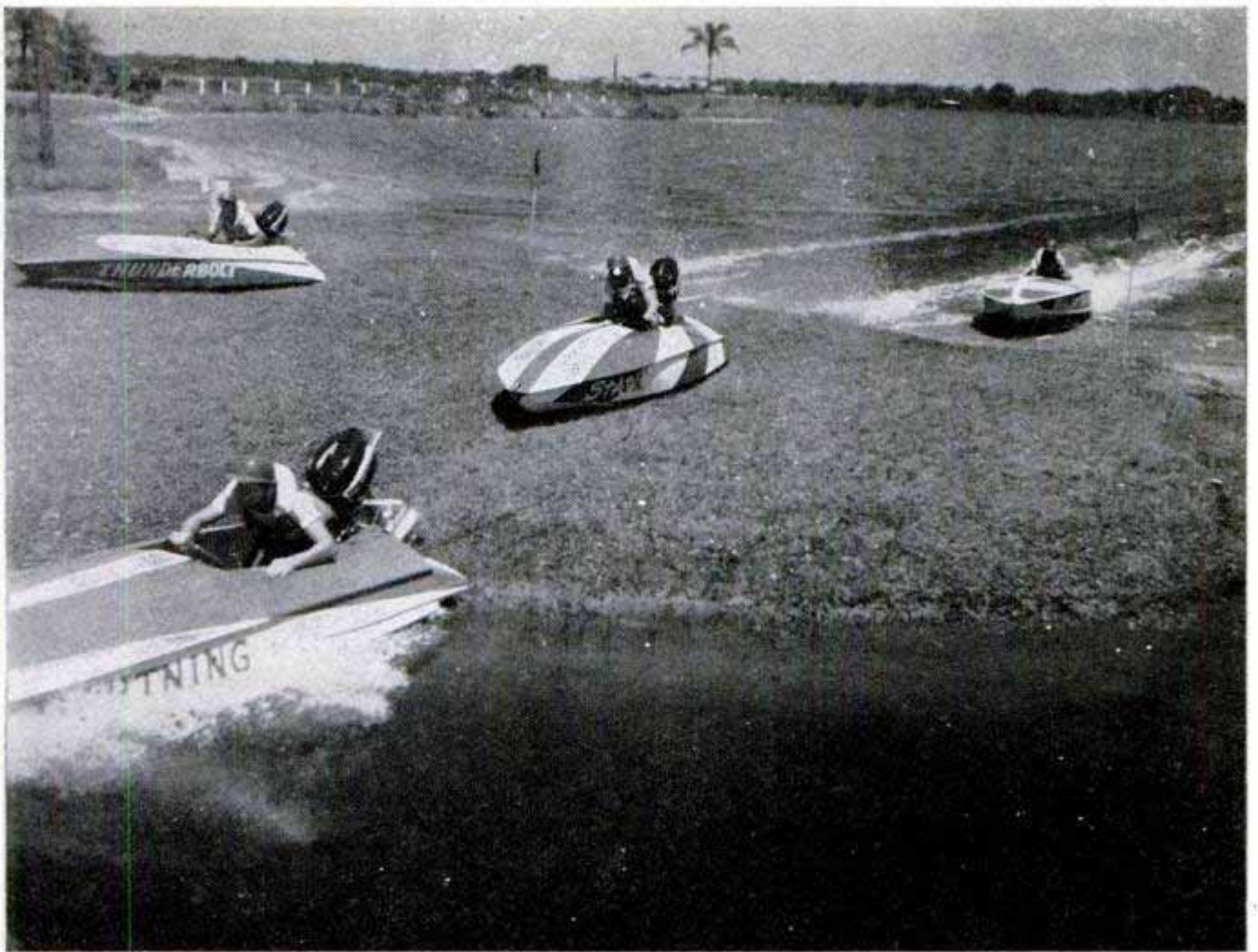
Heading skyward, a racer leaps from the water when it hits the wash of another fast outboard





Even with action like this, not one of the pilots was hurt. These boats are about 18 feet above the water. After this shot was made, the tree-climbing boat toppled into the lake. The pilot jumped out seconds before





Your eyes aren't fooling you! These boats are racing across land. It is all part of the craziest race ever

patterned after the 1931 Century Hurricane, but, to provide a smooth bottom for climbing ramps and sliding across land, the conventional hydroplane step was omitted. Three oak runners go all the way back to the transom for the hull to slide on. Transoms were reinforced with flat-iron knees to take the shock of the jumps. The motors, standard Mercury 10 Hurricanes, are hung on notched sponsons that project 10 inches aft of the transom. The boats themselves weigh about 200 pounds each.

The Mercury motors were completely stock with no alterations or souping up. No special fuels were used, regular gasoline pushing the boats through the water at about 35 miles an hour. Remote safety throttles were used to stop the motors should a pilot be tossed overboard.

The boats sail through the air as much as 75 feet after leaving some of the ramps. They hit the water with a tooth-rattling jar that tests the construction and seamanship of both pilot and craft. At the peak of the jump, the boats are as high as 20 feet above the water.

Made of one-inch lumber on two-by-four frames, the ramps are 20 feet long and six and eight feet wide, depending on the location. Most of them are eight feet wide. The boards are not waxed or treated.

The pilots prefer that the ramps not be too slick. If they were waxed or highly polished, the boat might slide sidewise should it hit the ramp at an angle. The one-inch lumber has a springiness that adds height to the jump.

To prove that this was the zaniest of all boat races (if more proof was needed), the boats had to race part of the way over land! The course was laid out to cross a narrow peninsula that juts into the lake. The land is covered with weeds and the smooth hulls slid across it, slowing down only slightly before entering the water again.

Winning time for the 11-mile course was a fraction over 22½ minutes, making the average about 30 miles an hour, on land, water and air.

Of the three boats that failed to finish, one became famous as the first boat to climb a tree. When its steering controls were ripped away on a jump, the boat swung around and headed for the cypress trees lining the shore. The pilot, Johnny Robertson, bailed out over the stern about 20 feet from land, but the runaway boat continued until it had climbed a fallen tree. There it lost its momentum and fell back into the lake. Robertson was unhurt.

The finish line was up on the grass, about 80 feet from the shore.



Dime-A-Wake Clock Corp., Las Vegas, Nev.

Coin-Operated Alarm Clock

Travelers who spend the night in one chain of motor courts in the Southwest are awakened at any time they want by a coin-operated alarm clock. The clock runs continuously, but the alarm operates only when a dime is dropped in the slot. Many motels or motor courts do not have 24-hour call service, and the coin-operated alarm provides such a service for the traveler.

"Radar" for the Blind

About the size of a large flashlight, an instrument for the blind utilizes bouncing sound waves to warn of obstacles ahead. The system is similar in effect to radar although sound waves are used instead of radio signals. The instrument sends out clicks barely audible to the blind person, who listens for the reflected clicks from objects in the way. It was developed in England.

Suitcase Stroller

All it takes is a twist of the wrist and a push on the handle to collapse a lightweight baby stroller so it can be carried under the arm or packed in a suitcase. The extensive use of aluminum in the frame keeps the weight down to about 10 pounds. The telescoping handle can be adjusted in length to suit the pusher. A twin model is available, the youngsters sitting in seats side by side. By adding a third seat between the handles, the twin stroller can be used for triplets.



A. E. Peterson Mfg. Co.,
700 Allen Ave., Glendale, Calif.

Steel Output Zooms

At the end of 1952, the total annual steel capacity of the United States will be 117,500,000 tons, according to the American Iron and Steel Institute. This will represent a 45-percent increase, amounting to nearly 36 million tons, since 1940. During the year 1950, capacity was increased nearly 5 million tons, bringing total capacity to more than 104 million tons.

ⓁDon't throw your back-issue magazines away. Our defense effort requires a vast number of products made from wastepaper.



Motorized PACKMOBILE

TWO HUNTERS, their equipment and bagged game are helped over mountainous terrain by a motorized one-wheel packmobile. It was built by Cash E. Giovannoni, a veteran hunter of Boulder City, Nev. His carrier is only 16 inches wide, 18 inches high and a little over 5 feet long—compact enough to be guided between close-growing trees and rock outcroppings. There are sets of handle bars at each end for easy control. A $\frac{5}{8}$ -horsepower washing-machine motor, through a gear-reduction box and a V-type belt, turns a small airplane wheel in the middle of the packmobile. Going uphill the rear operator is pulled along as he bears down on his handle bars to relieve all weight from the front man who is gently pushed forward. A ski turned up at both ends, to allow reverse travel, can be attached for use over snow or mud. The complete carrier weighs only 50 pounds.

With detachable skis, top, the packmobile travels easily over snow. Top speed of the one-wheeled vehicle is a little over three miles an hour. Upside down, the packmobile frame, below, makes a dining table. Cash E. Giovannoni, designer, is at right

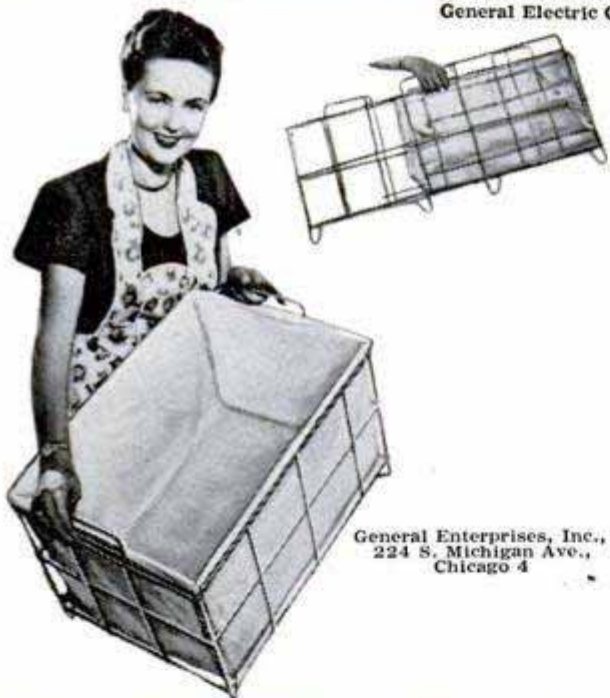




WHAT'S NEW *For Your Home*

KITCHEN CABINETS designed with a housewife's eye have doors that swing up, eliminating the danger of cracked skulls. The top cabinet is low enough for the little woman to reach easily. Beneath it, a smaller cabinet provides convenient but out-of-the-way storage

General Electric Co., Bridgeport, Conn.

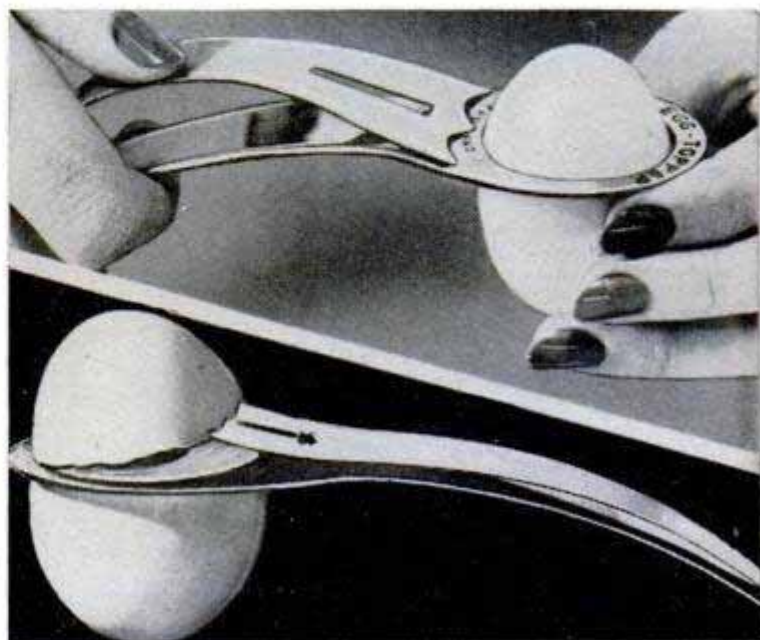
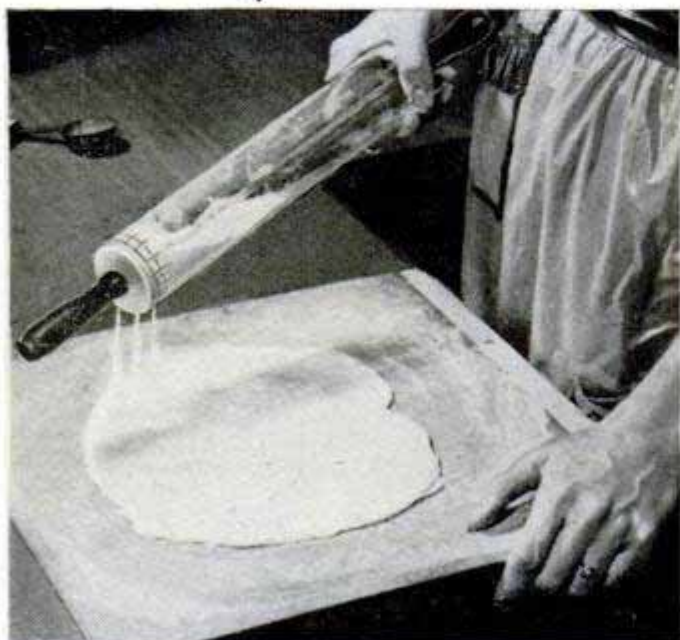


FOLDING BASKET is large enough to hold a full wash, yet, when not in use, collapses to store in a small space. The liner is made of an easily cleaned plastic material. Total weight is only four pounds

ROLLING PIN, below left, carries its own supply of flour to save the cook's time and energy. Made of clear plastic with brightly colored handles, it is easy to clean. You just rinse it and let it air-dry

General Enterprises, Inc.,
224 S. Michigan Ave.,
Chicago 4

EGG OPENER, below, snaps off the top of any egg without breaking the yolk. Nor are any tiny bits of shell pushed into the egg to spoil your meal. To use it, you insert the egg and press down on the blade



Kitchen Plastics, 111 N. La Cienega Blvd., Beverly Hills, Calif.

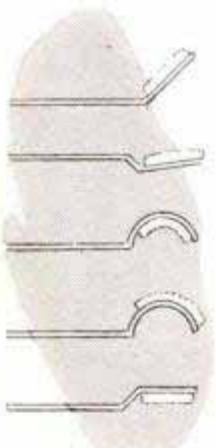
Jepeco, Box 94, Oakland 4, Calif.

DRYING LINE, 14 feet of it, is as handy as a window sill if you have this new all-metal rack. The rack slips over two screws which are left in the sill permanently. The seven rods are rustproof
Conn Sill Dryer,
New Castle, Ind.



Milwaukee Flush Valve Co., 301 East Reservoir Ave., Milwaukee 12, Wis.

SWING-DOWN SHOWER, above, does extra duty. Pulled all the way down, it serves as a regular tub-filling faucet. In the vertical position, it becomes a standard shower. It can be used in any position between these extremes for a child, for shampooing or, if you wish, for a sit-down spray



FLEXIBLE PAINTBRUSH, left, has a pad of lamb's wool for its bristles. The handle is a flexible metal strip that bends to any shape to enable you to paint around corners. It's a handy brush for windows and inside or behind radiators

J. W. Andrews Co., 166 W. Jackson Blvd., Chicago 4

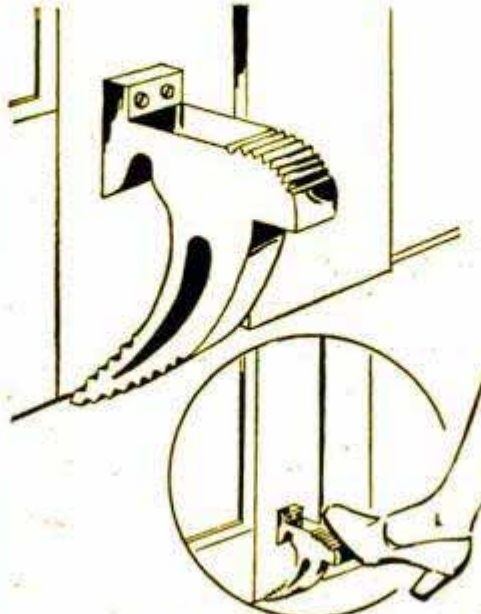
CANNED BATTER makes life easier for wives. Packed under pressure, it's ready for a griddle at the touch of your finger

RUBBER WEDGE springs up out of the way when not being used. If you want to keep the door from swinging, you just press wedge with your foot

VACUUM SHAMPOO is the new idea in hair care. Suction device also vibrates, massaging as it removes dandruff and grit from hair



Pan Waff, Inc., 525 N.W. Bank Bldg., Minneapolis 2, Minn.



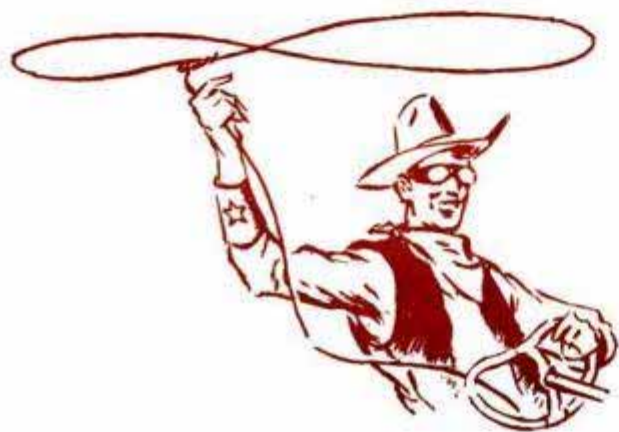
Bancroft & Partners, Ltd., 17 Victoria St., London, S.W. 1, England



Elron Products, 156 W. Chicago Ave., Chicago 10



Using map, game officials show Brady, right, where elk are reported

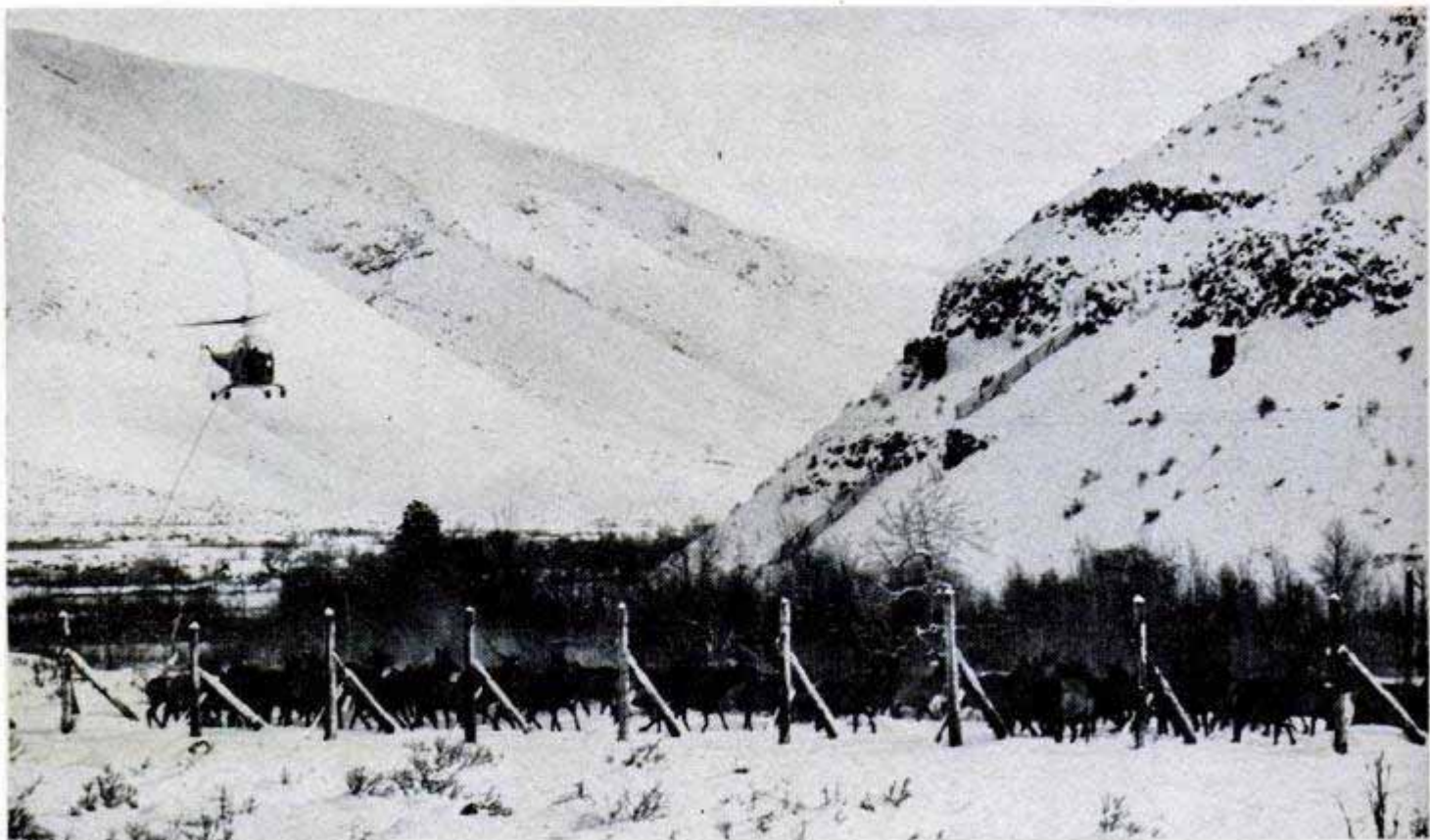


When herds of hungry elk start nibbling at your orchard, it's time to call the . . .

HELICOPTER COWBOY

By Parris Emery

Few elk are "lost" during roundups. Driving a herd of 230, the flying cowboy got to the refuge with 224





Their mountain feeding grounds buried under heavy snow, 3000 near-starved elk swarmed over farms and orchards during Washington state's bitter 1950-51 winter. There were an estimated 400 in herd shown above

WITH ROTOR BLADES whirling overhead, Carl Brady was leisurely scanning the Cascades through the window of his helicopter.

The apple orchards of the fertile Naches and Tieton farms were some 30 miles away. Directly ahead Brady spotted a small herd of elk. He shifted the controls and went down for a closer view.

The elk must have thought the helicopter was a demon from Mars, for they took off on a dead run. Brady followed, then decided to head them off. In doing so he learned that they turned easily, much like cattle. After practicing a little elk herding he went on to Yakima. Not knowing how the game department would regard his elk herding, he kept it a secret.

In the winter of 1949, starving elk driven by blinding snows and sub-zero weather were swarming from the mountains into the orchards of America's greatest apple country, near Yakima, Wash. Their natural browse covered by several feet of snow, they invaded farms, barns, and robbed haystacks. Thus started a famous "elk war."

The Washington game department, whose job it is to keep the elk on the Oak Creek refuge, was helpless. Fences meant nothing to the giant elk (weighing 250 to 600 pounds), who either leaped or knocked them down.

An almost useless effort was made by the game department to drive elk out of the farms and orchards back to the refuge. Fifty men worked on foot, horseback, and herded with Jeeps, but the invasion went on. An attempt was made to drive 200 elk seven miles from Windy to the Oak Creek

refuge. The men arrived with only 30 elk.

Their patience gone, the farmers started shooting. Nine elk were killed by one farmer, who told the game department to come and get 'em. He pleaded defense of his property. Eighty-nine were killed by angry farmers.

The game department finally herded 525 elk back to the refuge. But still the war went on, and dead elk were found every morning.

Just as the situation seemed hopeless, Brady, remembering his elk-herding episode, called the game department. He told them he thought he could drive the elk from the orchards with his helicopter. They listened, but were skeptical.

Finally, Fred Van Arsdol, district game supervisor, agreed to go for a helicopter ride with Brady. They spotted 15 elk and Brady zoomed down to the treetops. The elk took off. He turned them from the orchard down a steep cliff, picked up several more and drove the small herd through the gate on the Oak Creek refuge.

Van Arsdol was convinced. Fifty dollars was the price agreed upon for America's first helicopter herder.

Four days later Brady had every elk back on the refuge. The elk war was over.

Winters like that in 1949 don't happen often. The natives said it would be another 10 or 15 years before weather would drive the elk down again.

Old Man Winter must have heard their remarks, for this year he put on a repeat performance. This time it was a good show. Mercuries dropped to 17 below. The elk swarmed to the lowlands like locusts. Feed



Driven by the helicopter-mounted herdsman, stray animals were "pushed" through gates like the one above and into the safety of a game refuge



In full flight, above, the elk were a rampaging force. Weighing as much as 600 pounds, the big ones could jump over or knock down most fences. Brady operated most effectively flying at low level, below, where he was able to turn in quickly those that gave the slightest signs of straying



on the range had been poor all season. They were in bad shape.

Van Arsdol saw visions of another elk war. So Van Arsdol called on his star player, Brady, to defend the goal. Hay was rushed to the feeding grounds. If the elk could be held there, the battle would be won.

Some 3000 elk hit the line and, in spite of everything, hundreds got through. This time, however, farmers had confidence in Brady and the game department. When they found elk in their orchards, they merely called Van Arsdol's home and left word to send the helicopter. At daybreak Brady would take off and usually by 11 o'clock he had rounded up the 150 to 230 stray elk and returned them to the refuge.

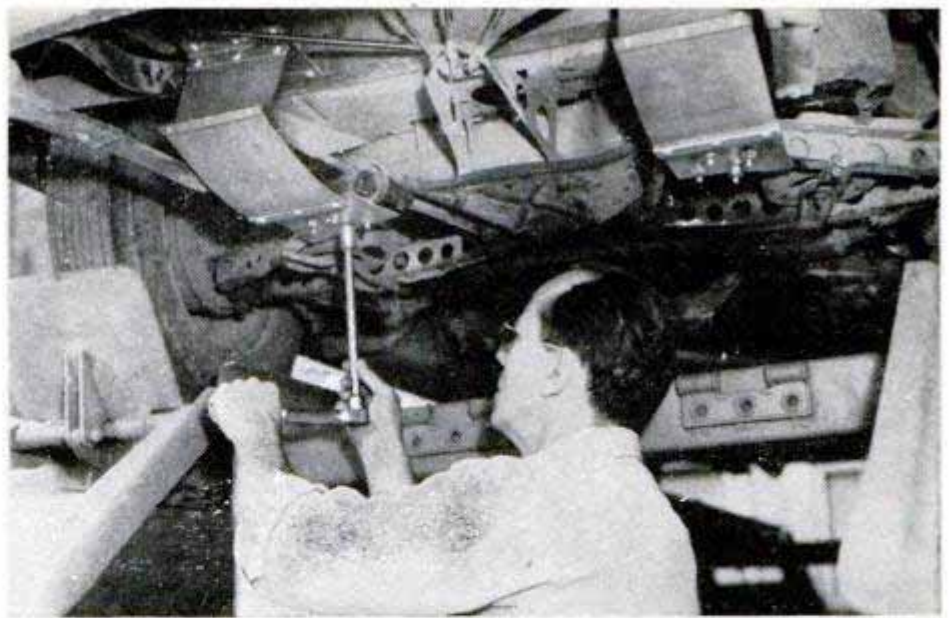
Brady loses few elk in his roundups. In a recent drive he started with 230 elk, arriving at the refuge with 224. Six just laid down and refused to move.

When Brady formed a crop-dusting company in Yakima with two partners, he called it the Economy Pest Control Company. Little did he dream that some of the "little pests" he would drive from the farms would weigh as much as 600 pounds.

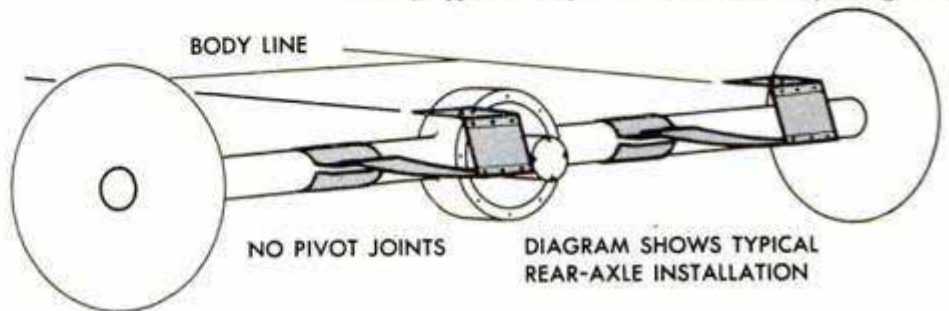
Automobile Stabilizers

Automobiles hold the road better on turns, and have no tendency to road-wander when equipped with spring-steel stabilizers. These stabilizers are rigidly connected to chassis and body to restrict sway and body shift without interfering with up and down movement. On turns, the stabilizers exert pressure on the axle in the opposite direction to that in which the car tends to skid. They also eliminate tire screech on sharp turns. After installation on the car, they require no maintenance.

Top, spring-steel stabilizers are rigidly bolted to chassis and body to restrict sway. Photo shows position of stabilizers



Welding Apparatus Co., 2750 W. Van Buren St., Chicago 12

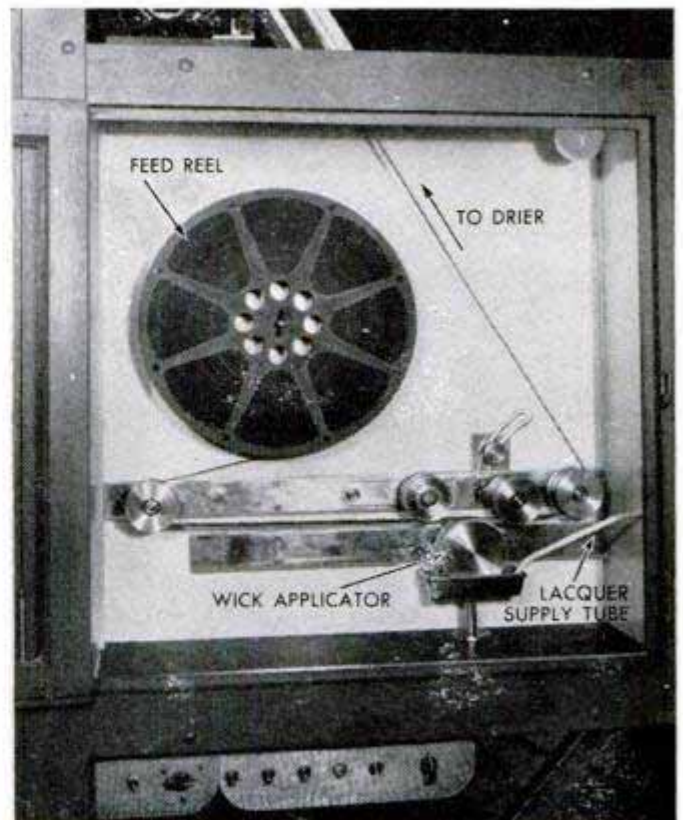
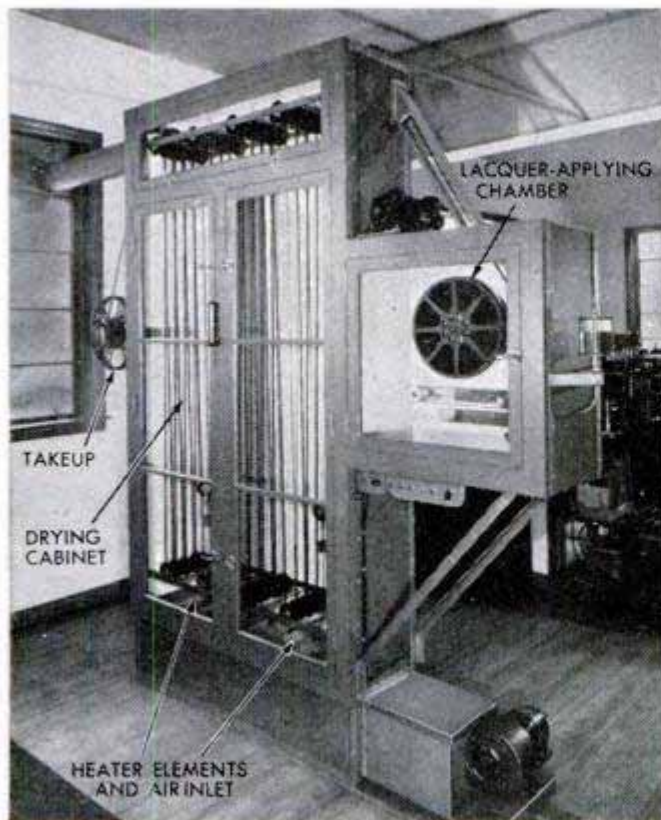


Coat of Lacquer Applied by Machine Protects Movie Film

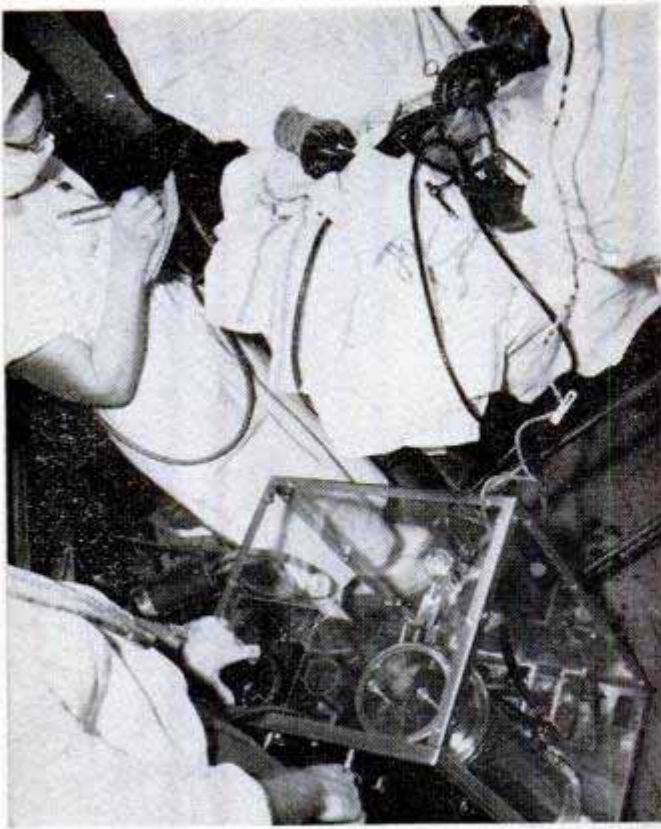
Valuable movie films are protected from damage by a coating of lacquer that is automatically applied by machine. The lacquer not only protects the film from scratches, but also seals in the normal moisture of the film, reducing to a minimum, breakage due to brittleness. It also tends to seal in

the dyes of natural-color film. The lacquer-coating machine rolls the film past a roller-wick applicator and into a drying chamber where the temperature is rigidly controlled. If the lacquer coating becomes scratched through repeated use, it can be removed quickly and a new coating applied.

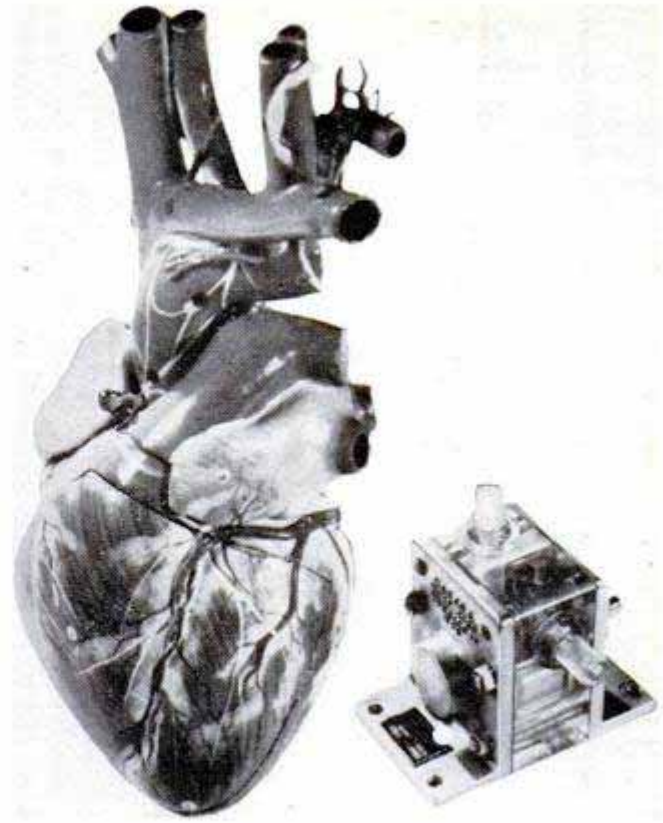
Film runs through lacquer chamber, drying cabinet, then to spool. Detail photo at right shows lacquer wick



Esocar Motion Picture Service, Inc., 7315 Carnegie Ave., Cleveland, Ohio



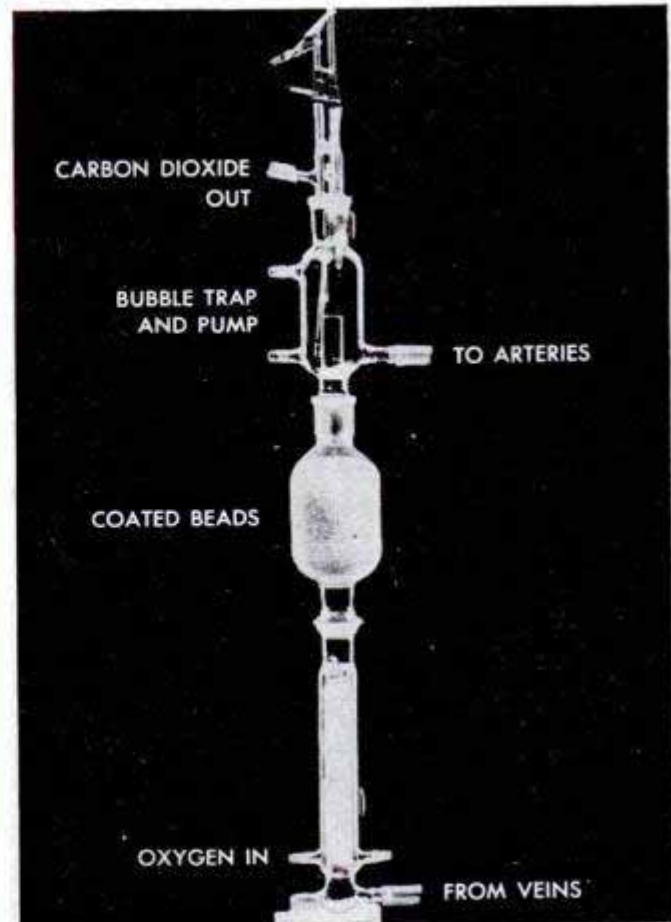
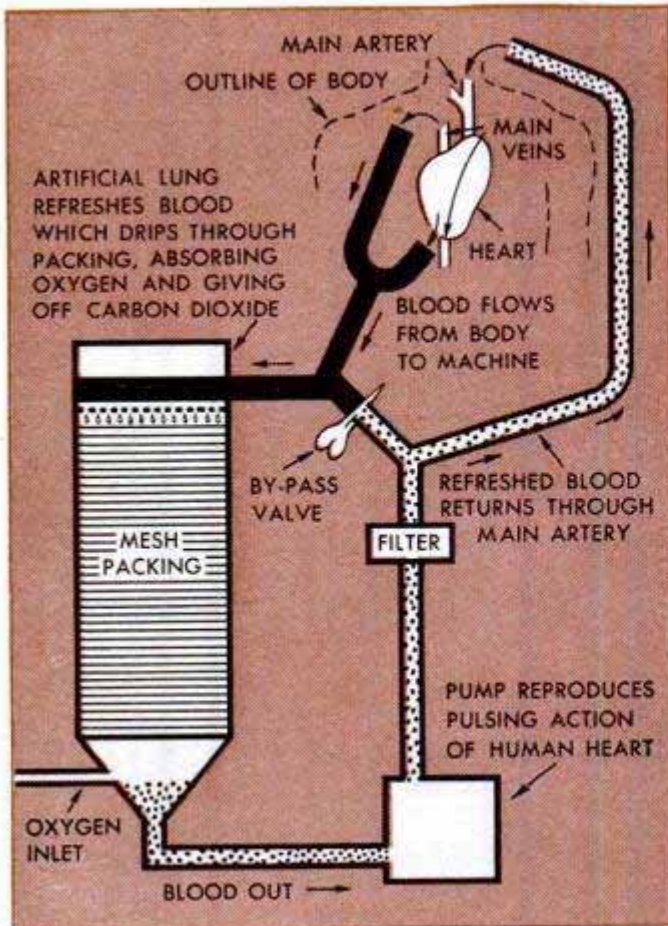
Above, a glass-enclosed, heart-lung machine keeps a dog alive during an operation. Right, a comparison of the human heart and the pump unit of the machine



FOR YEARS, chest surgeons have sought a machine to do the work of the heart and lungs. Two such machines are being used successfully on animals and may soon be used on humans. With them, surgeons would operate on a quiet, bloodless heart while the patient is kept alive mechanically. In heart disease, where rest is the best cure, the heart could be assisted by the machine, thus getting life-giving rest.

Heart-Lung Machines

Below, this is how the above heart-lung machine operates. Right, a smaller machine that has no moving parts yet has kept a large dog alive for two hours





Cree Trailer and Boat Co., Marcellus, Mich.

Interior is complete with dinette which will seat four. Note the bottled-gas cooking range. Above, right, at night the dinette is converted into a bed for two. Below, coach bolts to body of a pickup truck, can be removed at camp site if desired

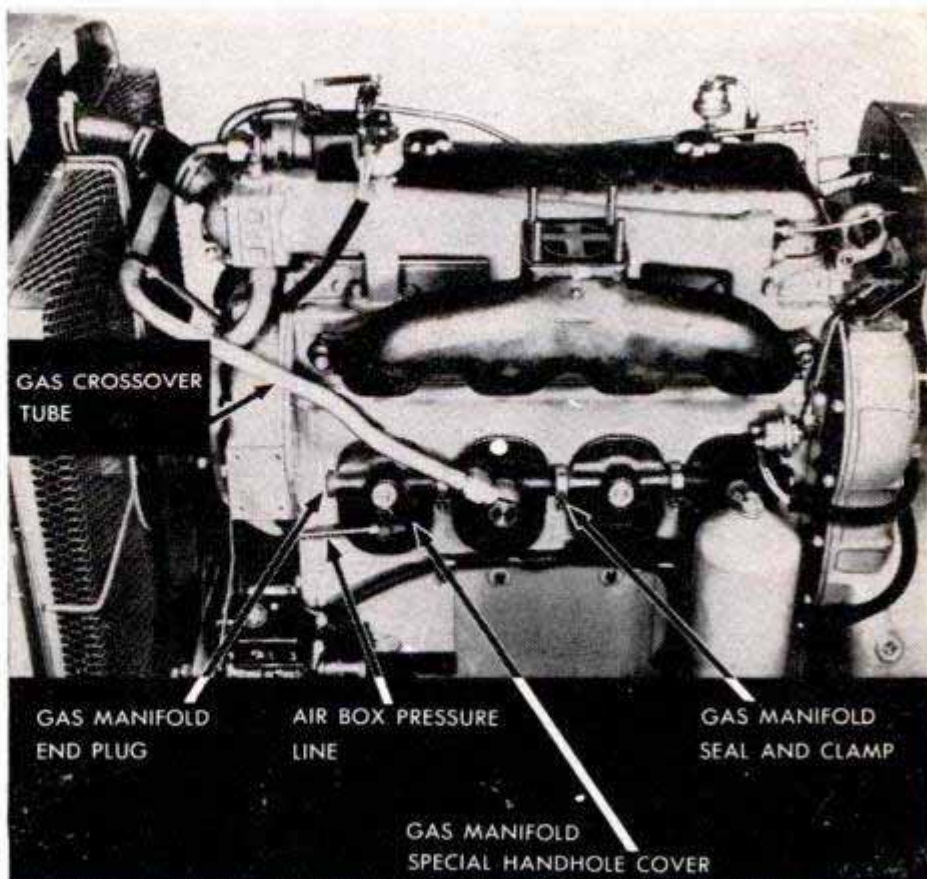


Pickup Home

Bolted to the body of a pickup truck, a compact home-for-three is complete with a gas stove, ice-box and sink. It takes only a few minutes to put the body on or off the truck. If you wish, it can be used off the truck as an overnight cabin or camp. The seats in the dinette form a double bed at night, and a canvas bunk can be set up above the bed for a third person. The exterior of the body is aluminum and the interior is varnished plywood. It is well insulated and has three windows and a door for ventilation and light.

Dual-Fuel Engines

Either natural gas or diesel fuel can be burned in a new diesel engine. Similar engines, already in use, can be converted to two-fuel operation with a change-over kit. The dual-fuel system was developed for engines which may be operating in several areas. Where it is available, natural gas can be used for more economical operation. Natural gas is delivered to the cylinder and fired by a small charge of diesel fuel. The engine automatically adjusts itself between the use of gas and diesel fuel in case the gas pressure falls off appreciably. Maintenance expenses usually are lower when natural gas is used.



Detroit Diesel Engine Div., General Motors Corp., 13400 West Outer Dr., Detroit 28, Mich.



Random Corp., 415 Lexington Ave., New York City 17

Binoculars Take Photographs

What you see through your binoculars you can preserve on photographic film with a combination binoculars-camera now on the market. The unit measuring $1\frac{1}{8}$ by $2\frac{3}{4}$ by $3\frac{3}{4}$ inches provides 2.5-power binoculars with adjustable focusing. Within the same body, a camera with 4.5 (40-mm. telephoto) lens can be used to take pictures at shutter speeds of $\frac{1}{25}$, $\frac{1}{50}$ and $\frac{1}{100}$ second and on bulb. The camera uses 16-mm. film that is loaded in a daylight magazine. After exposure, the film may be mailed in its carton for developing.

Lead-Calcium Storage Battery Gives Longer Life

Losing only four percent of its charge each month, a lead-calcium storage battery developed by Bell Telephone Laboratories requires much less maintenance than present batteries. This monthly loss percentage is only one fifth the amount considered normal for standard storage batteries. The



Times Facsimile Corp., 229 West 43rd Street, New York City 18

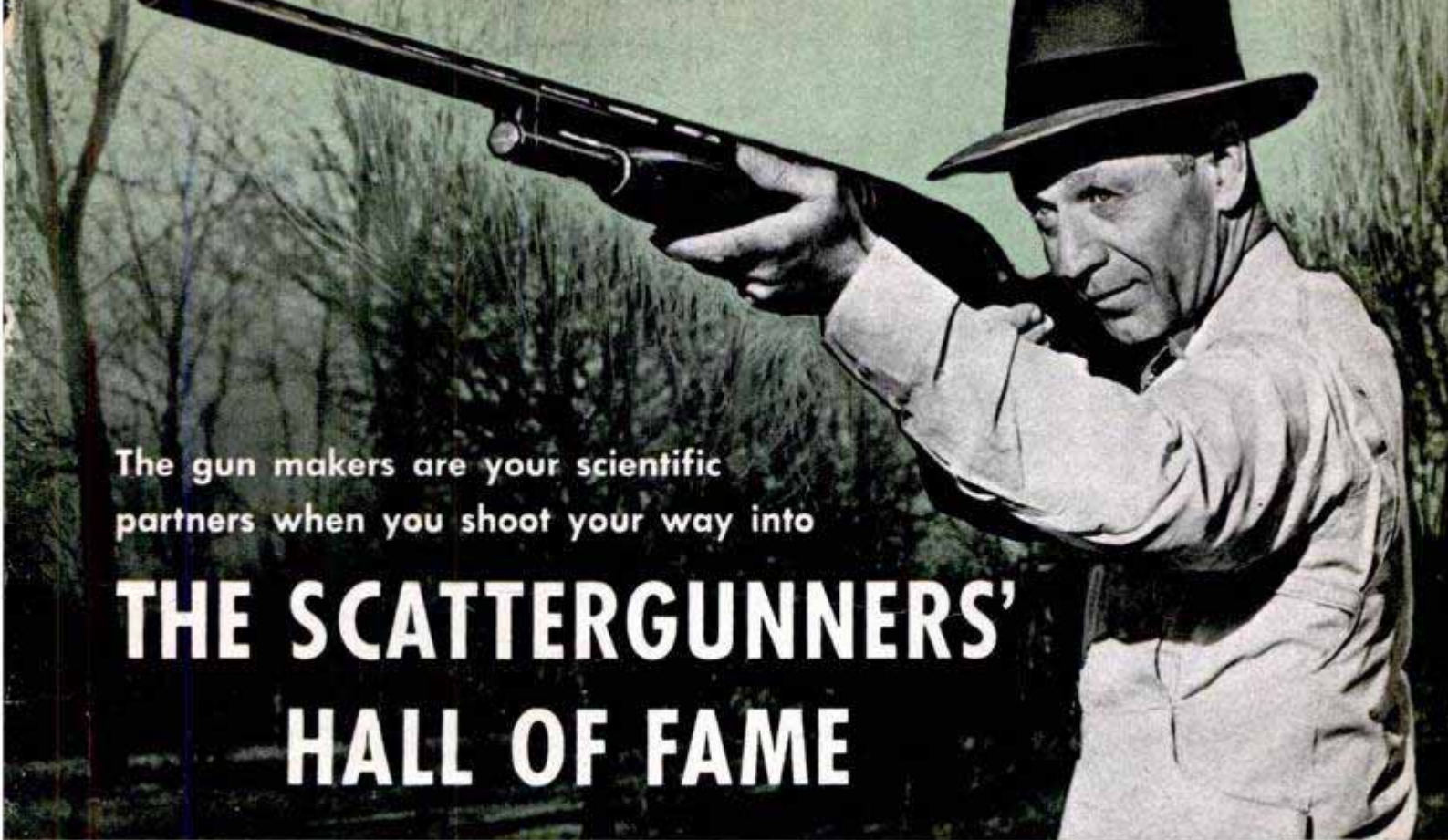
Electronic Scanner Cuts Mimeograph Stencil

From an electronically cut stencil you can make more than 10,000 mimeograph copies of printed or typewritten material, drawings or halftones. The material to be reproduced is wrapped around one of two cylindrical drums revolving on a single axis and a plastic stencil is put on the other. As the drums revolve at the same speed, an electric eye scans the copy and actuates a stylus when it perceives black space. The stylus punches holes in the plastic stencil in the same pattern as on the original copy.

new battery also serves for many months without the addition of water. A major feature is the use of calcium instead of antimony as a hardening agent for the lead alloy in the grids. Developed for the telephone company's stand-by service, the battery is not yet recommended for other uses.

If you do not find the information you need in the WHERE-TO-BUY-IT INDEX, starting on page 12, sources of further information are available to readers without charge and may be obtained by writing Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Illinois

☐ The Bureau of Mines has found that montan wax, previously imported from Germany as an important ingredient of shoe polish, ink, carbon paper, greases and electrical insulating materials, can be extracted from lignite deposits, notably in Arkansas and California.



The gun makers are your scientific partners when you shoot your way into

THE SCATTERGUNNERS' HALL OF FAME

By Clifford B. Hicks

IT WAS LATE afternoon when a little man named Oscar Scheske, Jr., stepped up to the firing line. The 51st Grand American Handicap—the “world series” of trapshooting—was almost over.

Thousands of gunnery fans roamed behind the line at Vandalia, Ohio, waiting for Scheske and a few other last-minute shooters to fire so the shoot-off could begin. Seven men had blasted 99 out of a possible 100 clay targets during the day. Now they stood nervously by to take aim at the \$10,000 cash prize.

Oscar Scheske, last year's Grand American winner, is sixth man to fire perfect 100 at the national match

Scheske, an unknown to the gallery, started his trip down the trap line. On the fourth bird he skinned his nose as the gunstock jarred back past his face. Fifty targets later he was running a perfect string; at 75 birds, a crowd began to gather behind him.

Calmly Scheske shot his way through the 80s and into the 90s. He hit 99 without faltering and stood there, a nerveless little man just one shot from trapshooting's most coveted title. Taking the 100th shell from his pocket, he kissed it, thrust it into the

At the Grand American Handicap last year, 1700 crack shooters scattered 500,000,000 pellets across countryside

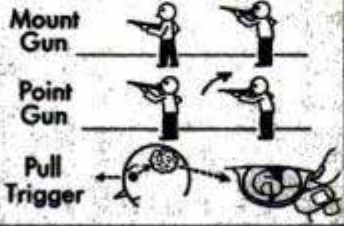


OF A SHOT

- ① HUMAN REACTION TIME
- ② MECHANICAL DELAY TIME
- ③ SHOT FLIGHT TIME

TARGET IS SIGHTED AND RECOGNIZED 1 SECOND

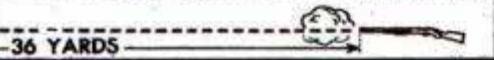
① HUMAN REACTION TIME 25 SECOND



② MECHANICAL DELAY TIME TRIGGER TO FIRING PIN .008 SECOND



③ SHOT FLIGHT TIME 123 SECOND



TOTAL TIME 484 SECOND

Western Cartridge Co. drawing

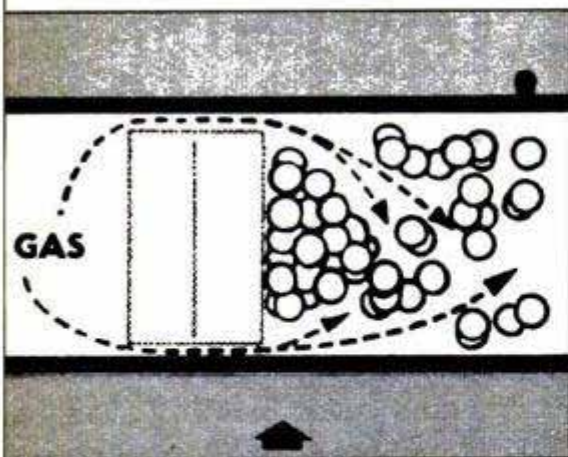
Split-second instrument has broken an average shot into bits. Shooter blasts target about a half second after spotting it

chamber and blasted the last soaring disk into bits.

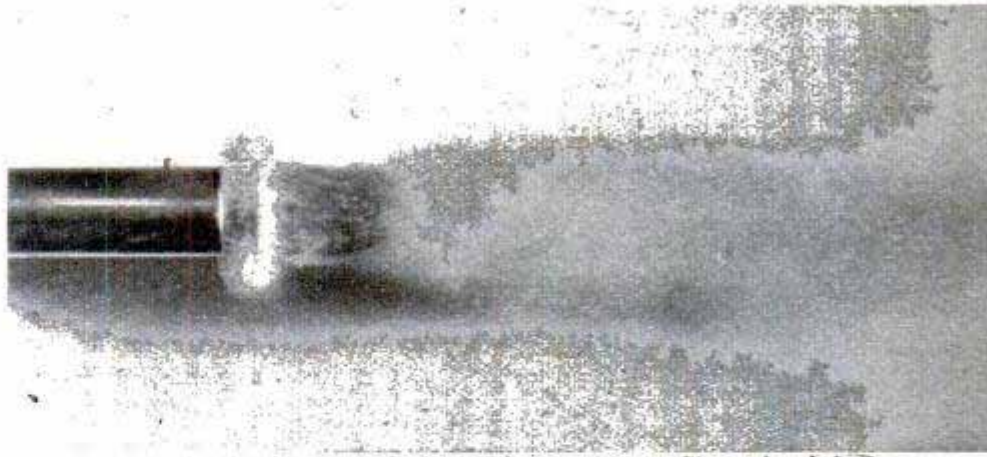
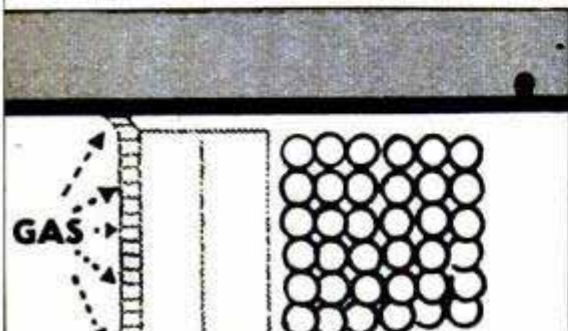
That 100th shot fired Scheske into trapshooting's hall of fame. He became the sixth man in 51 years to score a perfect 100 at the Grand American.

Scheske is just one of an estimated 200,000 clay-target devotees in the country. The best of the claymen gather for the Grand American and the National Skeet Shooting Tournament each year. At these two events you can see the cream of the shooting crop—men as diverse as their shooting stances. The Grand has been won by barbers and welders and business executives. It's the most elusive title in the sports world—no man ever has won it twice.

Scattergunners themselves admit they are a superstitious lot. Science, since the war, has succeeded in stopping shot pellets anywhere in the barrel or in flight, and has studied every phase of shotgun shooting; but the scattergunner invariably feels he can make his own improvements. It's no strange sight at the Grand to see a shooter whittling big chunks out of an expensive gunstock to "improve his grip," and the chips may be falling beneath a fantastically precise timing instrument which splits one second into 100,000 parts in order to measure the speed of human reaction.

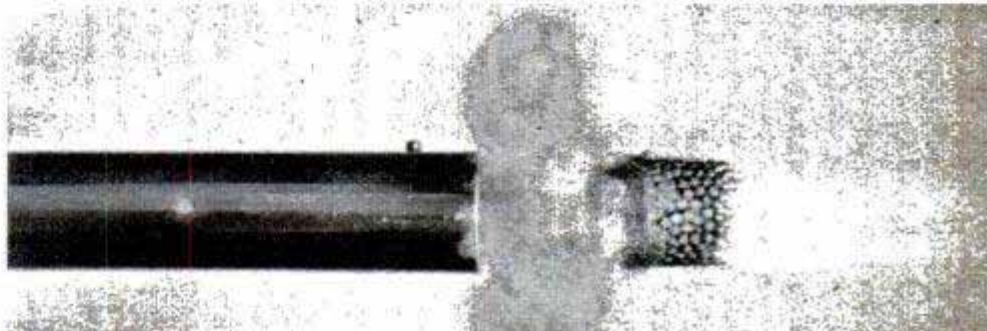


In old shell, gas leaked into shot. Below, new shell's wad seals off the gas



Western-Winchester photos

Result of gas leakage is shown above. Pellets emerge in spotty string. Below, with all the gas sealed from pellets, shot column emerges intact





Back-yard trapshoot has miniature trap, targets and ammunition, yet the shooter uses ordinary shotgun

The Grand American shooter who can't hit the targets always has an alibi. The weather was too hot or too cold, too windy or too still. The referee was blind as a bat, somebody put his safety on, or a sweat bee deflected his aim. But science has shot virtually all excuses out from under him. Through scientific research the old-fashioned blunderbuss has become a highly accurate modern shotgun, and the old-time lead pellets have evolved into the latest shot shells that scrub out the bore and deliver a controlled shot pattern about as



Top, .22 shot shell compared with large, standard shell. Above, barrel liner changes bore to .22-caliber

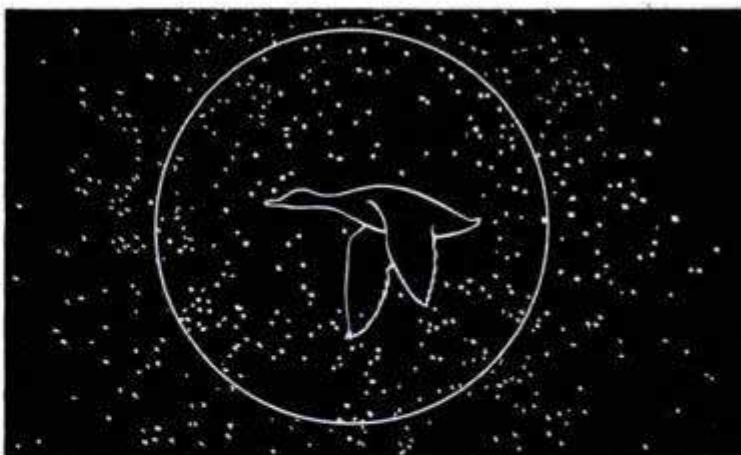
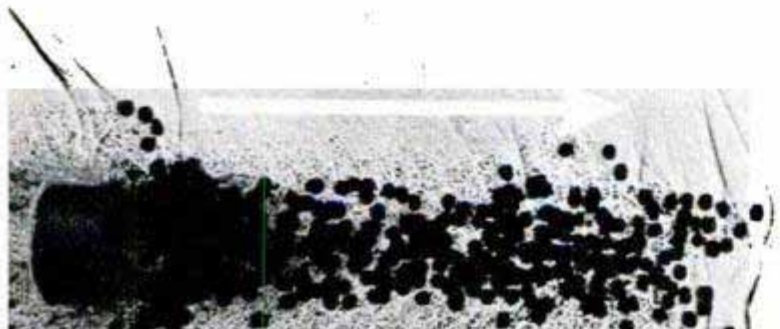
neatly spaced as the holes in a honeycomb. If Oscar Scheske aimed his gun on the button and pulled the trigger at the proper instant, it was virtually a foregone conclusion he'd ring up 100 perfect shots.

For the first time, in the past couple of years, science has successfully followed the flight of shot pellets from chamber to target. Ballisticians can watch the shell explode, see the pellets at any point in the barrel and examine them anywhere in flight. As tools, the research men are using 360,000-volt X rays, still photographs made



Remington photos

Old-type top wad could disarrange the shot. Below, new crimp-top shell has nothing in front of pellets



Gas leakage and wad produce spotty pattern. Bird can escape. Below, today's shell yields neat, even pattern



at millionths of a second and motion pictures produced at the dazzling rate of 3500 photos a second.

For some strange reason a good many shotgun shooters, as opposed to the riflemen, don't give a hoot about ballistics, trajectories, shot groups and the other fine points of shooting. Despite their indifference, research with unbelievably precise instruments is paying off on the firing line and in the field.

If you follow, through research, Scheske's last, \$10,000 shot from the time the trap was pulled, you can see how science has improved guns and their ammunition.

Split-second machines, which have put the brakes on time so that a second passes by with the leisure of a year, prove that from the time the target left the trap it took Scheske .1 second to see and recognize it. Then, assuming that his muscular reactions are about average in speed, it took him .25 second to aim the gun and pull the trigger.

This last figure is a measurement of human reaction only—there's no mechanical action involved. Western-Winchester has succeeded in measuring this sliver of a second with that incredible instrument, the counter chronograph, which chops a second into 100,000 bits and then counts the pieces. Thousands of shooters have been tested with the machine. The test shooter, armed with a gun, stands in front of a panel. On the board is a picture of a clay target, which can be illuminated by a light. An electrical switch connects the light with the

counter chronograph. As soon as the light flashes on, illuminating the target and starting the chronograph, the shooter, with his gun already mounted, aims and pulls the trigger. The trigger action stops the chronograph.

Some interesting facts have been uncovered with the chronograph: Skeet shooters between 13 and 19 years old are America's fastest scattergun shooters with an average human reaction time of .222 second; men are .0067 second faster than women; quail hunters are thousandths of a second faster than geese, duck, pheasant and rabbit hunters, who react in that order; vets of World War II are faster than vets of World War I.

After Scheske pulled the trigger on that prize-winning shot, timing mechanisms show it took the firing pin .008 second to lash forward and strike the primer of the shell.

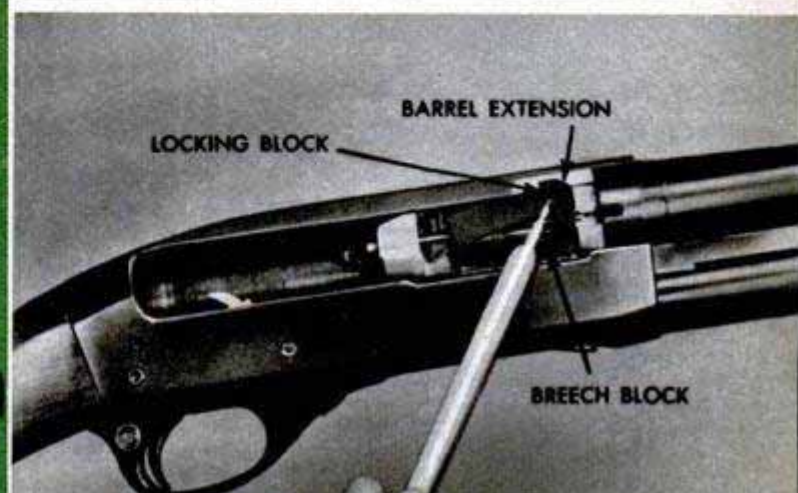
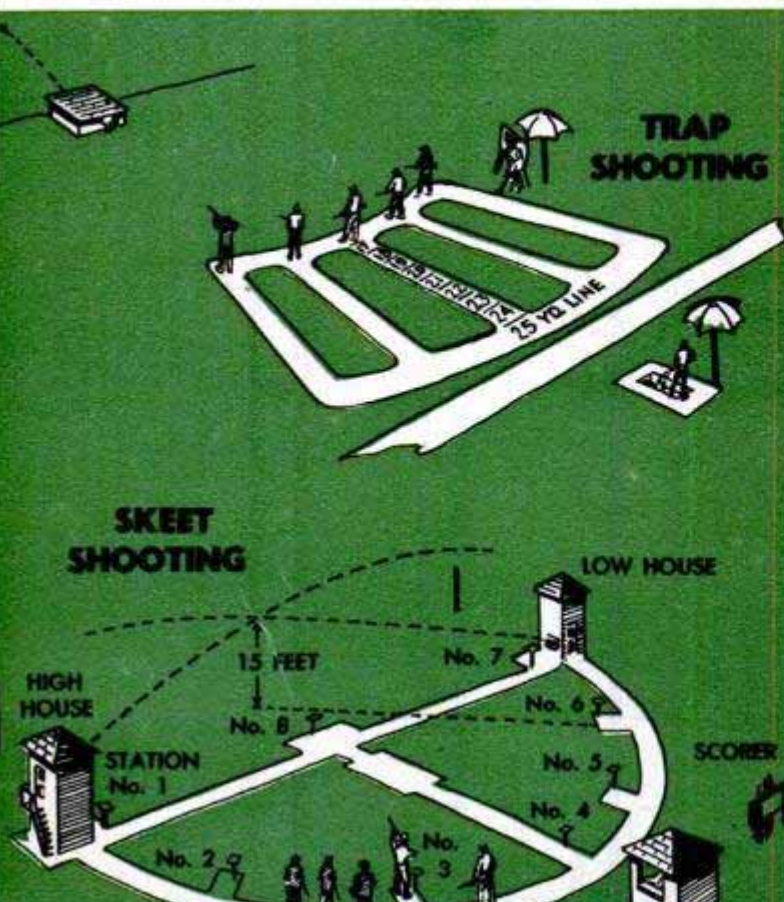
Now, through X-rays at 360,000 volts, watch what happens when the shell explodes. The primer burns so fast it raises the temperature inside the shell high enough to ignite the powder. This takes place in about .001 second.

Then with shattering force the powder burns into a gas which exerts thousands of pounds of pressure in all directions. There's only one exit for this gas—down the barrel, which is plugged by the lead pellets. So the forward end of the shell suddenly blows open and the pellets, pushed by the gas, start their trip toward the target.

All clay targets for trapshooters are thrown from one house in front of five-man squad. In skeet, the birds come from two houses at much more acute angles

New repeater has plugs of various weights which are used to change balance of gun. Bottom, breechblock of the shotgun locks into an extension of the barrel

Remington photos



The shell of yesteryear had a disk of cardboard across the top to hold in the pellets and seal out the moisture. Frequently, when the shell was fired this disk was overtaken by pellets, and it disarranged the shot column to produce spotty patterns. In theory (and probably in fact) a duck, partridge or clay target could be smack in the middle of the shot pattern and still escape a hit because of a hole in the pattern.

X-ray research and other ballistic studies of postwar shells have shown the big advantage of eliminating this cardboard top disk. The forward end of today's shell is folded over and crimped into a circular pattern that looks like a pie cut in pieces. When the shell opens up, the crimp unfolds in a split second. There's nothing traveling ahead of the pellets down the barrel.

High-speed X-ray photos also show that another factor can deflect the pellets—gas which leaks among them in the barrel. The gas is so hot it can deform the lead balls (making them corkscrew through the air) or fuse two or more of them together.

Old-type shotgun shells were made with a simple disk of cardboard or wad under the shot, which was supposed to prevent gas from reaching the pellets. But the hot gas frequently leaked around the disk.

Some new shells are made with a lubricated wad, others with a "cup" wad just below the shot. The cup wad resembles a soda-pop-bottle top. At the instant the gas explodes, the crimped edge expands, pressing tightly against the bore to form an airtight wall between the onrushing gas and the pellets. The crimp gives the cup wad enough flexibility so that it can shrink

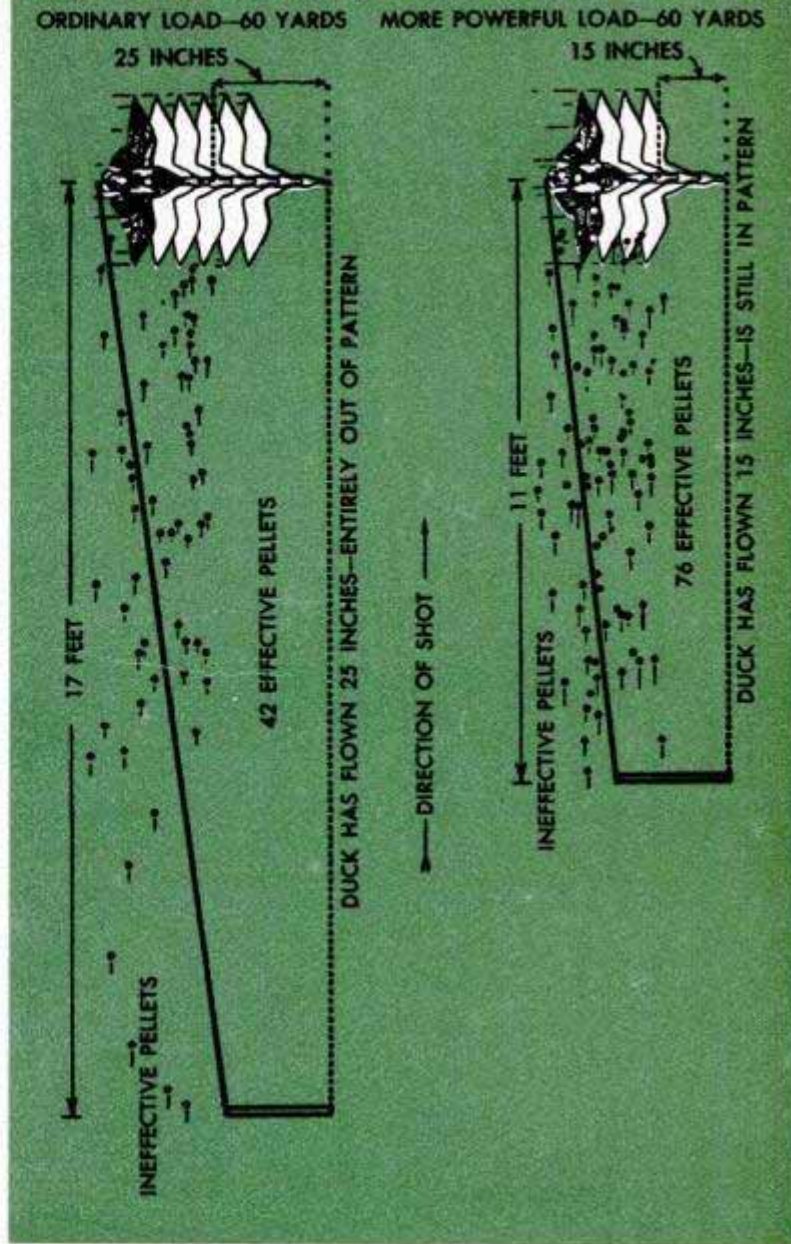


Diagram shows why short shot string is important. Speedy duck flies right out of the string at left

Ingenious gunsmith devised this curved stock for a gunner who lost the sight of his right eye. Stock enables him to sight with left eye while the shotgun is held firmly against his right shoulder

Two barrels are the feature of this two-in-one weapon. The top barrel fires a .22-caliber rifle bullet, the bottom shoots a .410 shotgun shell. There's one trigger but two separate extractors on the gun
Savage photo





Late-model Winchester has interchangeable barrels, slipped into place in a moment. The shooter can install the choke tailor-made for that day's hunting

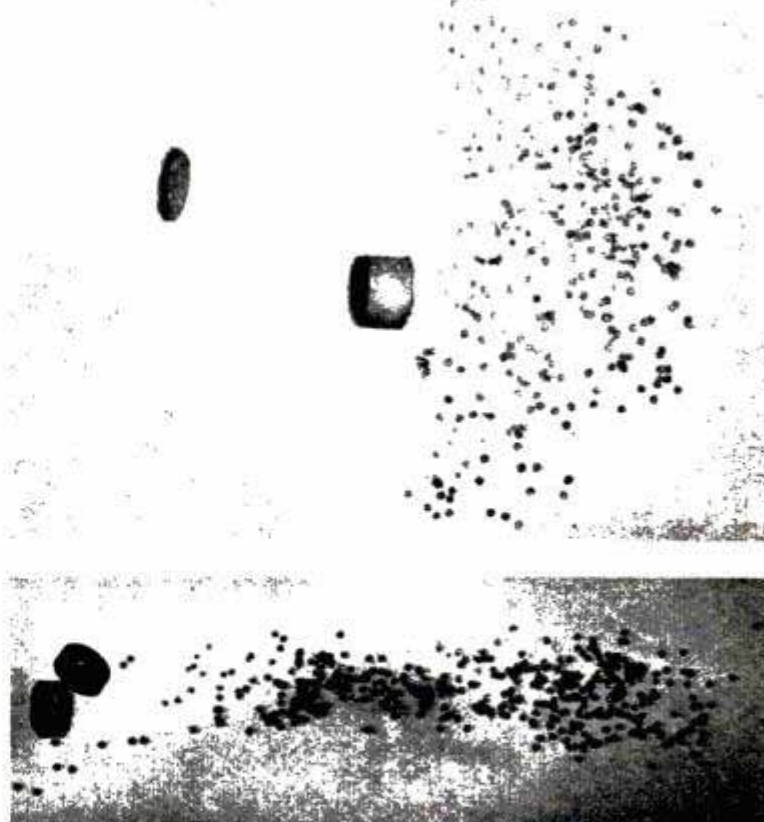
slightly as it strikes the constriction near the muzzle which determines the choke of a gun.

The choke works just like the nozzle of a hose—it forces the pellets into the size column desired. Choke boring was introduced into the United States about 70 years ago and shooters still are trying to solve the riddle of the best choke for their purpose and ability.

The scattergunner who really wants to scatter chooses a cylinder-bore gun which has no constriction. As a result the shot column opens out wide like the spray of a garden hose. The crack field shot hunting geese or pheasants probably wants a gun which will reach out at long range. He chooses a full-choke gun which squeezes the pellets into a narrow column, like the concentrated flow from a fire hose. It takes an expert to use a full choke.

Recently, for the first time, research men began photographing every pellet of a shot column at various distances from the muzzle, thus putting choke under precise examination. In the future this research with photos made at $36/1,000,000$ second may result in a fuller understanding of what choke can do for the individual shooter.

The shooter actually fires a three-dimensional column of many tiny shot pellets. One dimension, frequently forgotten by the shotgunner, is the length of the column—called the shot string. The length of the string is important because it determines how many pellets reach a moving target. For example, a duck traveling 60 miles



Photos made at $36/1,000,000$ second, 12 feet from muzzle, show effect of choke. Top shot, from cylinder-bore gun, spreads out. Full choke gives little spread

an hour may be directly in the center of the column when the first pellets arrive but may have flown out of the pattern before the last pellets reach that point if the pellets are strung out too far. To check this third dimension, engineers at Western-Winchester are employing a high-speed movie camera that whips through 3350 exposures a second.

Although a short shot string may not be particularly important to the short-range shooter or the man who fires at slow-moving targets, it is of vital interest to the shotgunner who hunts swift game at long range. But long-range shooting is more likely to cripple than to kill—unless the shooter is a hot-shot.

We've followed Oscar Scheske's prize-winning shot down the barrel, through the choke and out through the muzzle. About .003 second has elapsed since the firing pin struck the primer, according to experts conducting ballistic research.

If Scheske hits the target about 36 yards from the muzzle (his own handicap of 19 yards plus 17 yards from the trap) it takes the pellets .123 second to travel out and intersect the line of flight of the clay bird.

Adding it all up, about .484 second has elapsed since the target flew out of the pit. Hundreds of thousands of dollars have been spent in shaving this split-second down into bits and finding out precisely what happens during each bit. Not even the ballisticians are ready to say what further improvements to guns and ammunition can be made,

(Continued to page 256)



Jockey for Truck Trailers

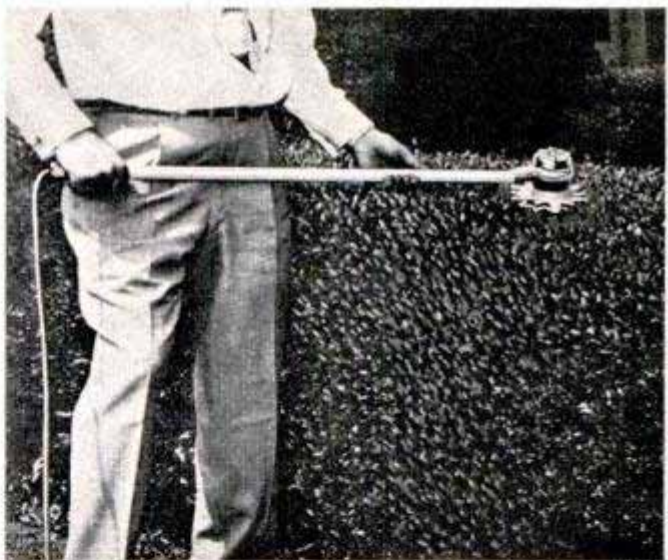
Semitrailers are quickly spotted and "switched" at truck-terminal docks by a yard "donkey" that can turn a trailer in its own length. The little tractor has a hydraulic fifth wheel controlled from the driver's seat. It raises the semitrailer high enough

so the "landing gear" need not be cranked up while the trailer is being moved. The landing gear holds the trailer in a level position when the road tractor is unhitched. From his seat on the donkey, which measures 13 feet 2 inches over-all, the driver also can connect or disconnect the air lines to the trailer's brakes.



Electric Clippers on a Stick

Tall shrubbery or short grass edgings are trimmed quickly and comfortably by a rotary cutter attached to a convenient no-stoop handle. Driven by a powerful electric



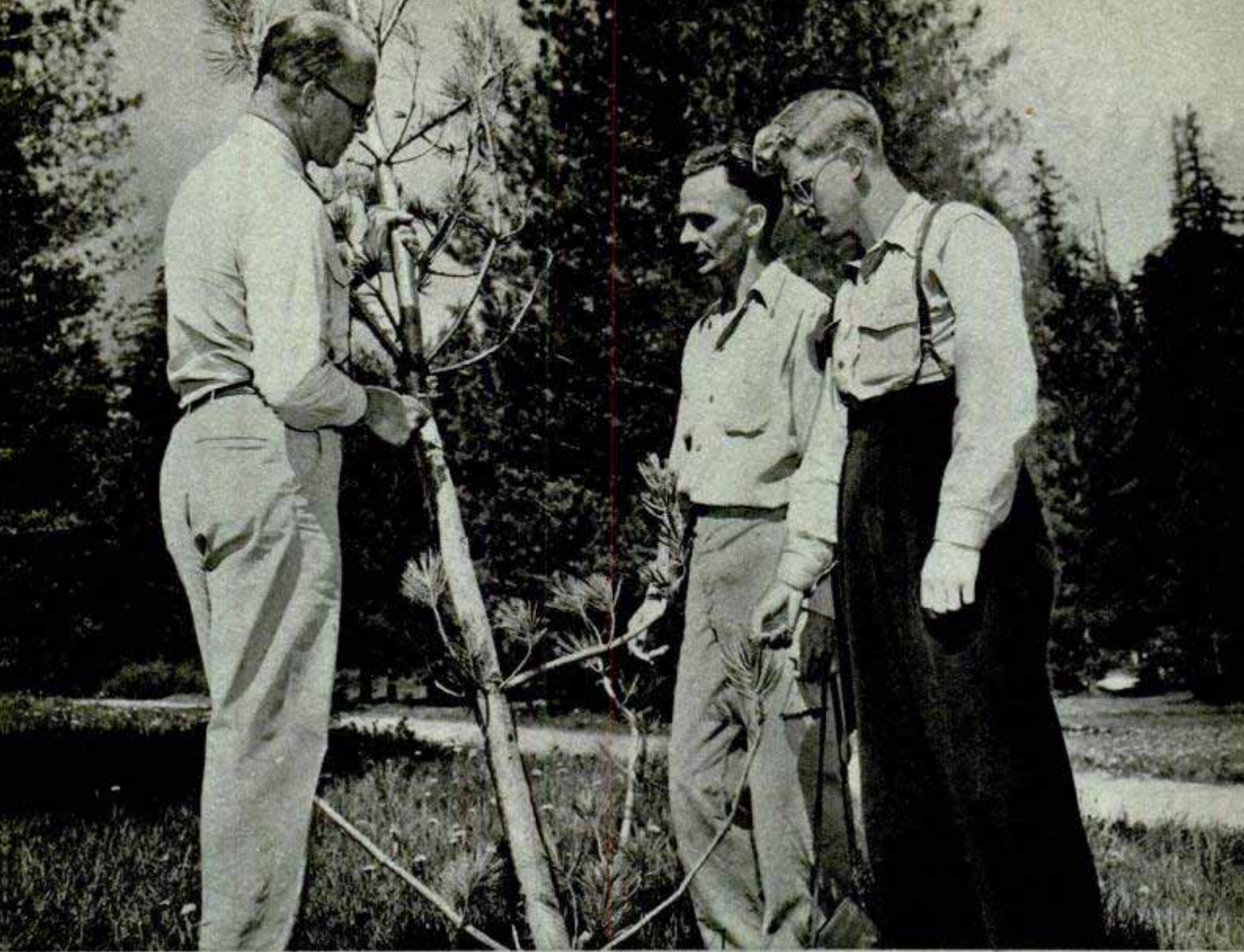
Apex Mfg. Laboratories, Box 283, South Pasadena, Calif.

motor, the circular cutting blade slices through hedges as easily as it does through grass. A lightweight model weighs only three pounds. A larger model, listed as a professional type, tips the scale at 5½ pounds.

Mountain Range Submerged in the Pacific Ocean

Scientists making a 27,000-mile trip over the central Pacific Ocean found a tremendous underwater mountain range, 1000 miles long, 100 miles wide and up to 14,000 feet high. The submerged range stretches all the way from Wake Island to Necker

Island near the Hawaiian group. Hydrographic charts had previously indicated isolated shoal points in this area. The joint University of California—U. S. Navy expedition discovered that these shoals were summits of a long mountain range.



Dr. Thomas E. Buchanan shows Idaho tree students a typical sickly stunted pine. Tree disease costs millions

Bark is peeled from a pine with mystery disease for grafting to a healthy tree

Ground-up needles taken from a sick white-pine tree are reduced to ashes in making one of the many recorded laboratory tests



PLAGUE *in the Big Pines*

By O. A. Fitzgerald

IN COUNTRY where you can still see scars made 90 years ago by greedy sourdoughs who sluiced out gold by the millions, a husky ex-Marine last fall pointed the nozzle of a high-pressure field pump at the base of a white-pine tree and began placering. There may have been gold in the muck that flowed from around the tree, but Dr. T. S. Buchanan, forest pathologist at the University of Idaho, didn't bother to look for any. He was after the tree's roots—all of them.

Not far off, a colleague jammed the needle of his hypodermic syringe under the bark of a healthy appearing tree and shoved down the plunger. Into its system, Dr. Ernest E. Hubert sent a charge of juice squeezed from another tree—a sick one. Moving on to another healthy tree, Doctor Hubert made half a dozen patch grafts, each with a piece of bark from a diseased tree.

Such strange goings-on in the white-pine forests of central Idaho are the result of another mystery disease going beserk. Buchanan, Hubert and many other tree doctors are shooting at stakes which could exceed all the millions in gold the early day miners took from the hills. Pay-off for them will be trees that go to the sawmill.

Foresters call the new disease "pole blight." It is one of the 25 new forest-tree diseases that have appeared in this country since the beginning of the century. Pole blight was first observed nearly 30 years ago. It has also been called "x" disease and the "unknown" disease, and has exploded over large white-pine stands during and since the war.

The present name, which may be only another temporary one, arises from the fact that the disease strikes what are known as pole-size trees—those in the 40 to 100-year, or middle-age, group. It is a mysterious something that seems to shut off their food supply. Slowly but surely the tree begins to die—from the top down.

Dollar loss to date isn't alarming but the mystery killer has struck white pine's most vulnerable spot. The nation's foremost white-pine belt has lots of young stands—the result of good forestry and a type of logging that assures ample natural reseeding on the logged-off hillsides.

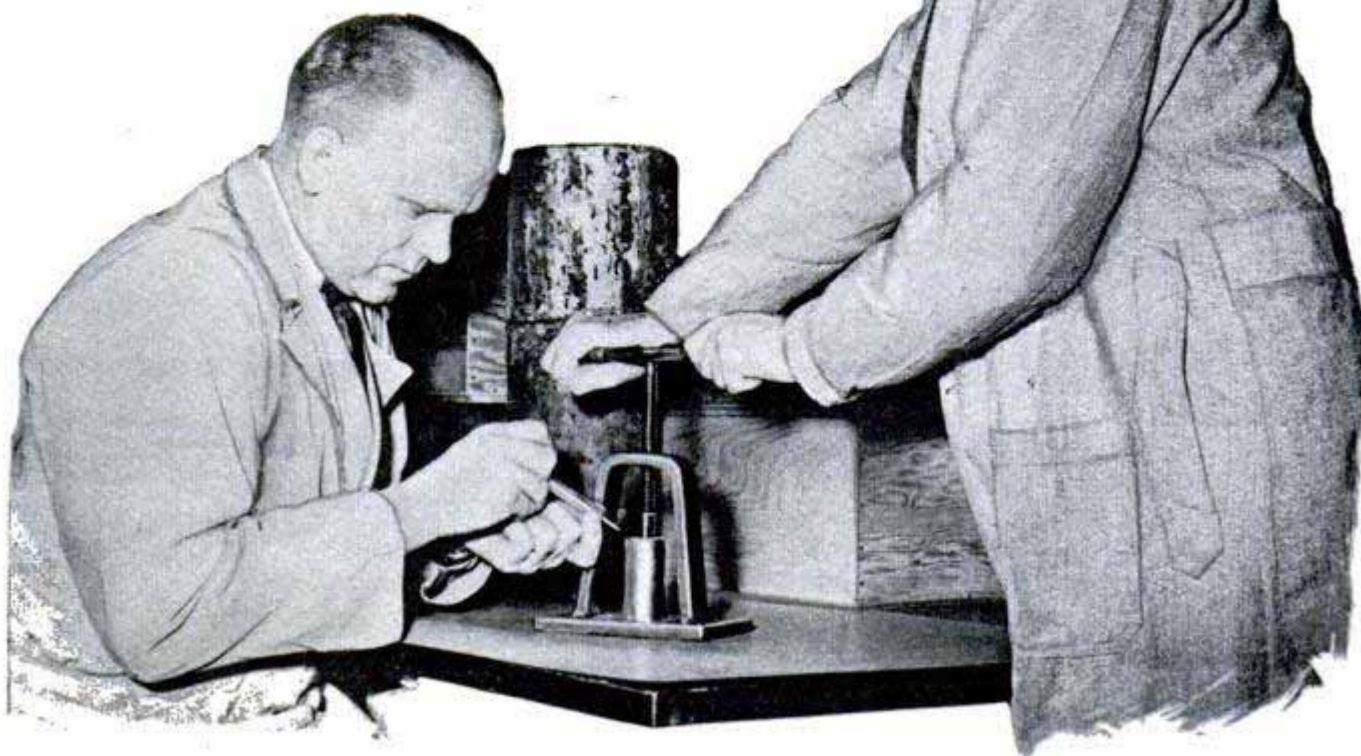
"We also have relatively extensive stands of old timber," adds C. A. Wellner of Spokane, in charge of the Inland Empire research center for the U. S. Forest Service.



Mystery disease is called pole blight because it attacks middle-aged pines known as pole-size. The tree dies from the top down. Below, test tubes hold fungus cultures collected from the diseased trees



Researchers extract juice from a section of a diseased tree with "pole blight juicer" designed by Dr. Ernest E. Hubert, standing. The juice is used to inoculate healthy trees



"But we are short on stands in the age group where this new disease has struck."

Tree doctors representing the U. S. Forest Service, the Northern Rocky Mountain Forest and Range Experiment Station, the Division of Forest Pathology, the Bureau of Entomology and Plant Quarantine, and the University of Idaho School of Forestry have teamed up to find out what causes pole blight. Only time can tell whether it will be a short-time project or another long, drawn-out affair similar to the little-leaf puzzle in the South.

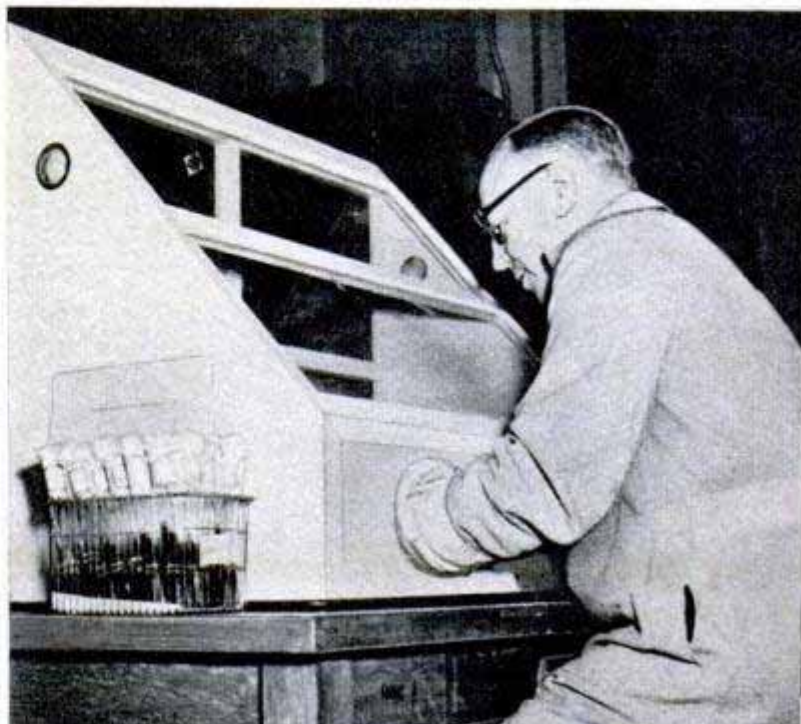
For a dozen years, forest pathologists have been trying to figure out what causes the little-leaf disease. Today, it is making heavy inroads on southern pines. Tree doctors feel they are nearing the answer but they aren't sure. Having worked on the little-leaf disease himself, Doctor Buchanan knows just how exasperating a mystery disease can be. Fact is, pole blight has several features that remind him of the unsolved Southern puzzle.

First step in the pole-blight campaign has been to define symptoms of the disease. University of Idaho men, under Buchanan's direction, have done that. Fifty-six trees were completely torn apart, fiber by fiber. From this dissecting they determined how the disease affects the sapwood, the bark, the limbs and the needles. External symptoms were catalogued by studying hun-

dreds of trees. These symptoms were found to be scanty needle growth at the top of the tree, yellow foliage, reduced growth, trunk lesions, flat faces on the trunk, long narrow areas of dead cambium on the main stem, and a heavy pitch flow. Out of this has come a set of standards by which the disease can be recognized and its severity on any tree or stand of trees accurately measured.

With the symptoms brought into sharp
(Continued to page 244)

Working in protector box, Doctor Hubert starts a fungus culture in extensive research on pole blight



*Subsidiary of Kelly
Washington 5, D.C.*



Cane stalks are cut close to earth by the blade, then are carried up the ramp by pickup rolls and dropped over the side in windrows. Below, biggest problem of harvesting cane has been the snarled stalks. The new machine moves through them easily

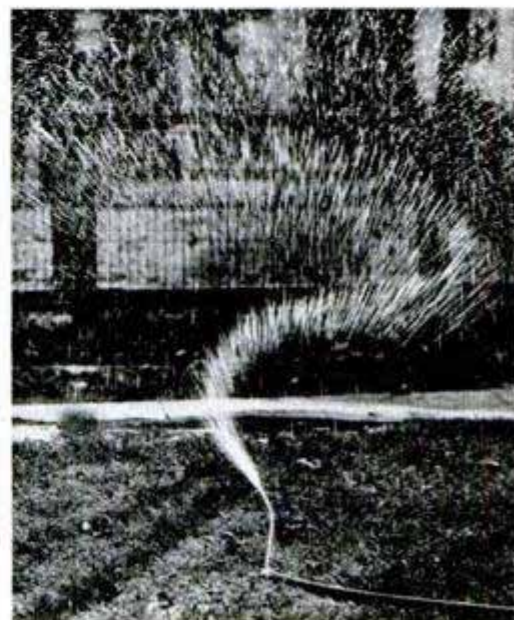


Sugar-Cane Harvester Cuts Snarled Stalks

Hawaiian planters recently have solved a knotty problem—how to harvest, mechanically, sugar cane which grows so tall it falls in snarled bunches. A new harvester cuts and piles 40 tons of cane an hour. It is a Caterpillar tractor equipped with a cutting blade and an inclined steel deck. The circular blade rips through the stalks close to the ground. Pickup rolls move up the steel deck to carry the tangled cane to the side of the machine, where it is windrowed and later picked up by crane. Only one of the machines has been built, but others will be turned out soon.

"Whip" Sprinkler Scatters Spray

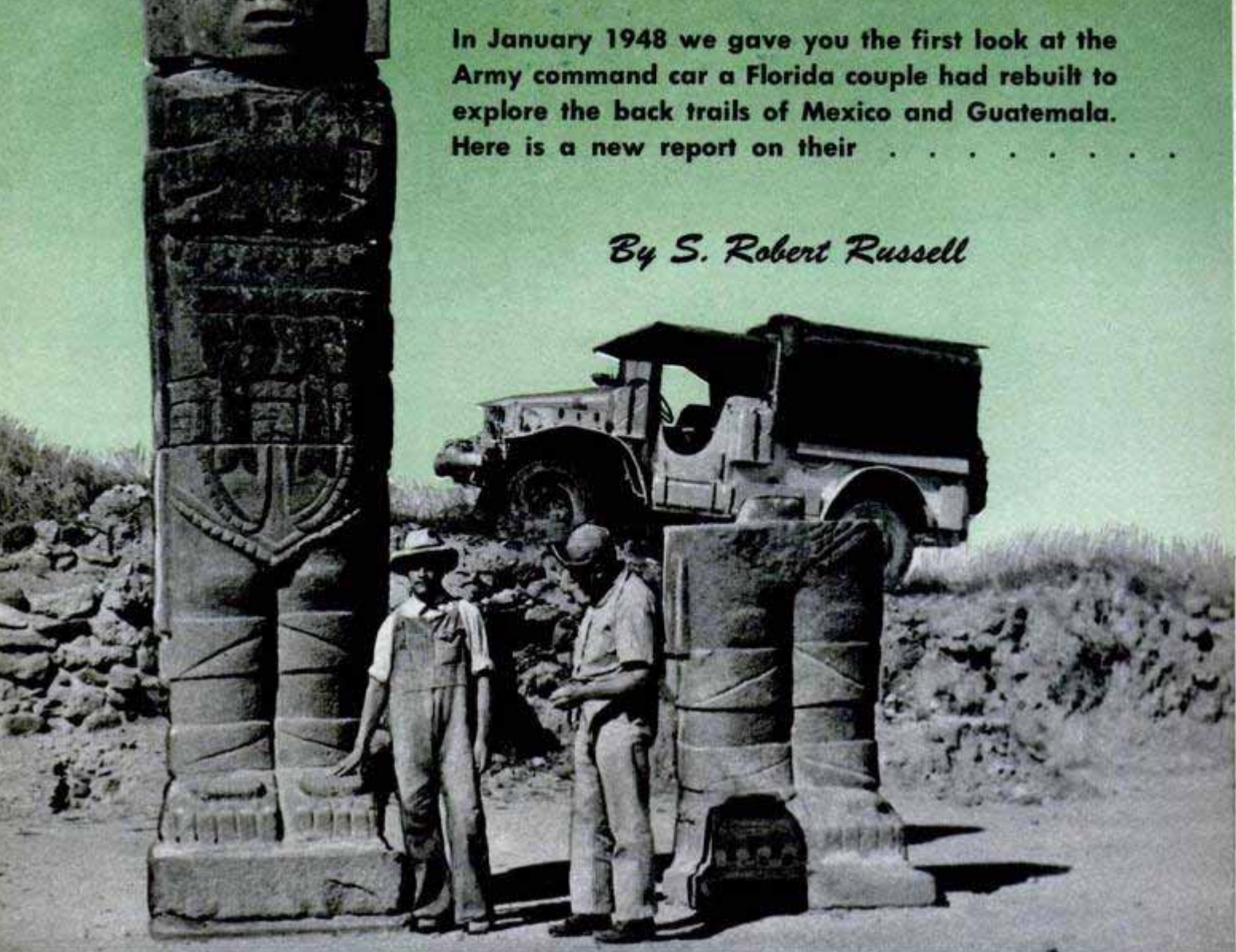
Water is spread as far as 20 feet in all directions by a sprinkler with no mechanical parts. It flows from a narrow rubber tube, much smaller than a garden hose, and pressure forces the tube into a whipping motion that distributes the water evenly. Medium water pressure is most effective. The tube is at the top of a spear-shaped aluminum base that is pushed into the ground.



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

In January 1948 we gave you the first look at the Army command car a Florida couple had rebuilt to explore the back trails of Mexico and Guatemala. Here is a new report on their

By S. Robert Russell



Hunting ancient treasures in remote parts of Central America is easier with the jungle car in background

WHEN YOU HAVE a hobby like mine—searching out ancient legends and archaeological secrets in remote places—you can't depend on busses, trains, airplanes, helicopters or even the ordinary family car to get you there. What you need is a jungle home on wheels like the one in which Mrs. Russell and I made our first expedition into Mexico and Guatemala.

Our research takes us to towns and ancient ruins that have never before felt rubber tires. Most of these places can be reached only by following tortuous trails or, at best, over deeply rutted ox-cart routes. We forced our unique (at least we think so) jungle home through solid thicket, forded streams, moved huge boulders, climbed impossible grades and once practically dug our way across a vast marshy plain where we averaged an exhausting seven miles a day. Throughout the trip we avoided tourist trails.

Despite our car's phenomenal climbing ability there were many promising spots it could not reach. This necessitated going afoot or on horses or burros.

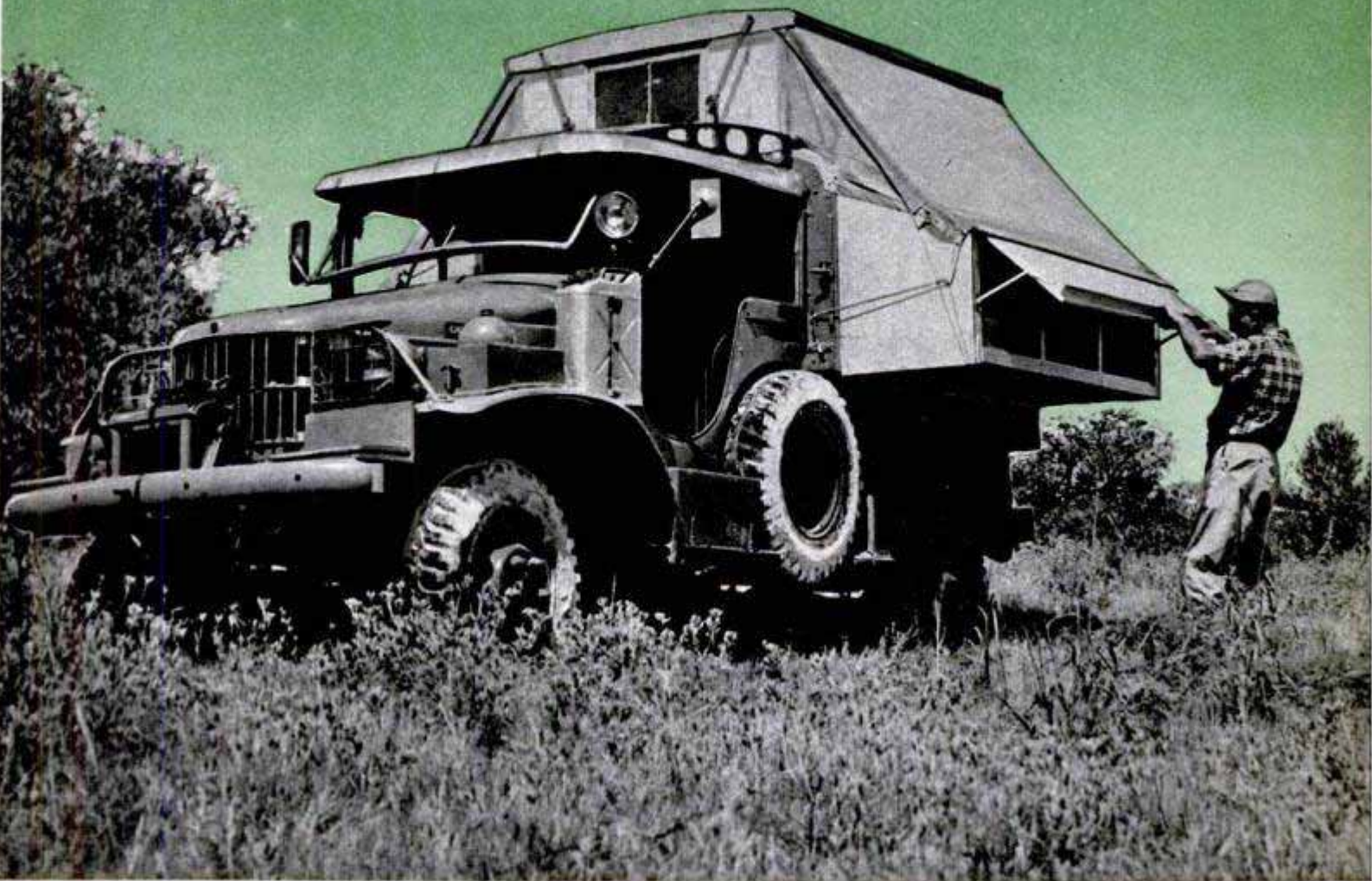
Readers of our first article in *Popular*

Mechanics (Jan. 1948) which told how we bought an old Army command car and added a folding body with trimmings such as sleeping bunks, icebox, dining-room table, typewriter and stand, will be interested to learn that we did not have a single mechanical failure on our first major trip. We learned a lot, though, about our jungle home and what could be done to improve its living quarters and increase the car's over-all efficiency.

Now we are back in Key West, Fla., taking a breather and doing some rebuilding on the car. The job is almost finished and when you read this we will be skimming along some highway on our way into Mexico.

On that first trip our electric winch was the major disappointment. It was selected to give us motive power even if the engine drowned out while fording a stream. It proved too slow and too hard on the car's batteries—something we had not foreseen. We discarded the electric motor and depended on a hand crank. It got us through many tough spots but at too great a cost in blisters and aching muscles.

JUNGLE HOME ON WHEELS



Truck unfolds for added living space; plywood bunk awnings are raised in hot weather, also upper windows

We now have a new winch which is larger and driven by a conventional power take-off. It can also be hand cranked and, as a convenience, it can be reversed by an electric self-starter motor.

Our heavy load plus the terrific grades we encountered when off the paved highways wore out brake linings too rapidly. While the car had husky rear brakes, the front ones were only about half their size. Securing new rear-wheel backing plates, drums and shoes and fitting them to the front wheels gave a substantial increase in braking area. All brakes are now interchangeable, reducing the weight of the spare-parts stock.

Getting in motion after stopping part way up an unusually steep grade always brought unpleasant pictures of burning out a clutch disk while deep in the wilderness. A lower low-gear ratio was indicated. This was obtained by replacing the original one-speed transfer case with a much better two-speed job taken from a GI armored truck. This gave us five forward speeds in place of the original four and two in reverse. When in low-low, and with the en-

gine idling, the car's movement is almost imperceptible.

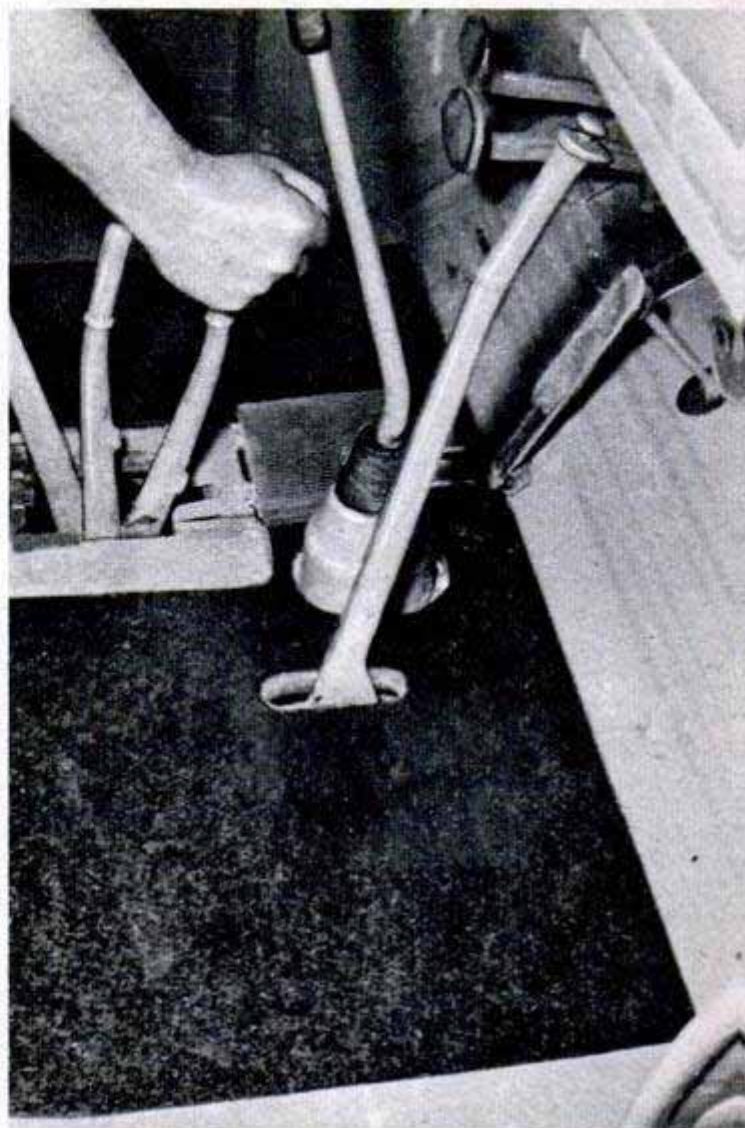
Shift levers for the new transfer case and winch were installed at the right-hand corner of the driver's seat. This left the front-wheel-drive lever in its original position, way over to the right of the emergency-brake lever, a long unhandy reach for even a tall man. It was moved over with the other two. Now, all three levers are directly under the driver's right hand. An Army sergeant who examined the jungle home said, "I wish the quartermaster engineers would put our six-by-six controls over there!"

A comparatively high-g geared steering worm made whipping the car around sharp bends and dodging trees in heavy woods pretty exhausting. A lower geared, more easily handled assembly taken from a late-model six-by-six has been installed.

An oil-cooling radiator, installed under the right fender during the original rebuilding has been relocated in front of the water radiator. There it delivers better oil cooling because of air sucked through it by the engine fan. In the low, jungle areas



New winch, driven by conventional power take-off, can also be hand cranked. It replaces an electric winch. Below, airplane rib on cab lifts tree limbs



Front-wheel-drive lever was moved over with other two levers so that all would be under the driver's right hand. Below, an oil-refining device was added



where it was necessary to grind along day after day, hardly ever getting out of low or second gear, this oil cooler worked wonders by doubling the time between oil changes. This oil cooler has now been supplemented by a device that re-refines the oil as it is used, replacing the conventional oil filter. I selected a large type designed for heavy trucks and busses.

Front springs have been replaced with heavier ones. The GI carburetor has been discarded in favor of a civilian model for which repair kits are available. Even the original spark coil went by the board. An oversize, oil-filled airplane type has taken its place.

Cab and folding quarters have been almost entirely rebuilt. The original cab top was of canvas. It has been replaced by one of steel, aluminum and marine plywood. Side curtains with plastic windows were junked. Removable, marine-plywood doors with sliding Plexiglas windows now give closed-car protection. We can install or remove and store them in their rack without leaving our seats.

Since it is sometimes a considerable distance between sources of safe drinking water we wanted an additional five gallons of storage capacity. With the car's old design there was just no place to put it. This was remedied during the rebuilding in an ingenious manner. By extending the cab roof forward so that it formed a sunshade we gained a space under the overhang. A tank shaped to fit inside this space holds only a trifle less than five gallons. An electric fuel pump keeps it filled automatically from the main, built-in tank. Water is piped from the new, overhead tank to a little faucet alongside the gasoline stove. When preparing a meal, this feature saves Mrs. Russell many steps between stove and the hand pump in the cab.

We contend that everything which grows

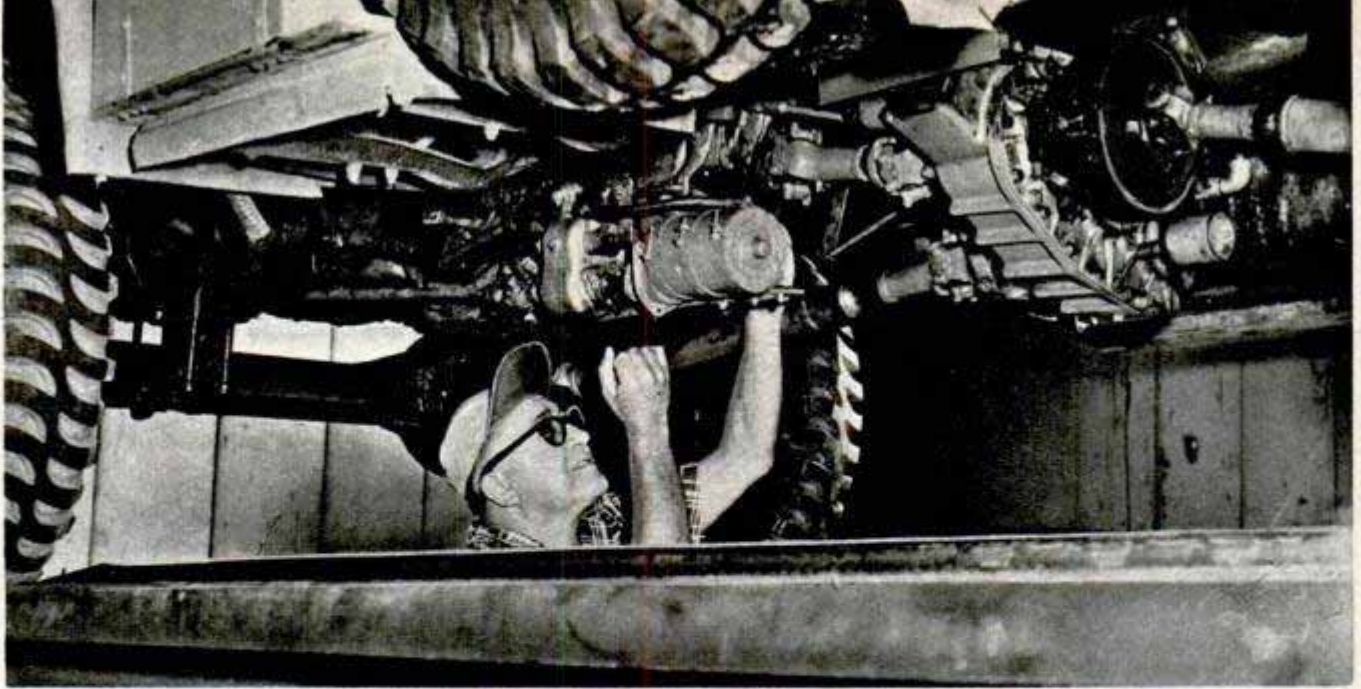


Huge prism binoculars mounted on truck save useless climb on heights barren of archaeological treasures

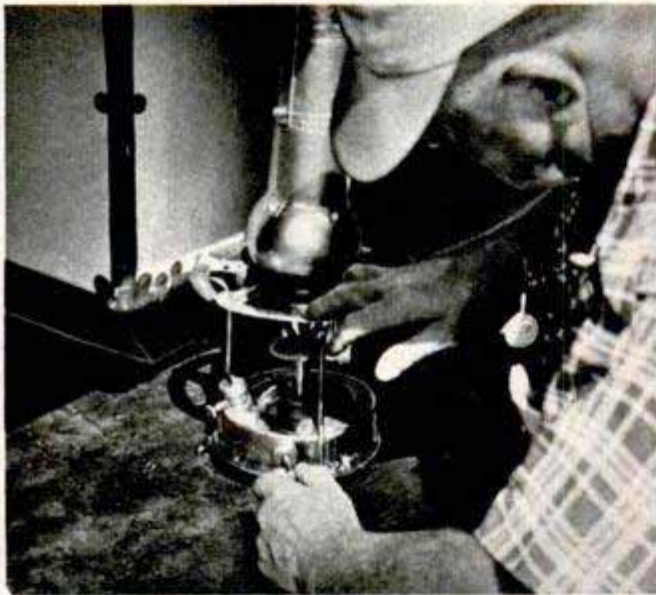


Side view with canvas rolled up shows new top. There is 75-inch headroom. Below, dual wheels plus chains and winch enabled Russells to reach isolated town

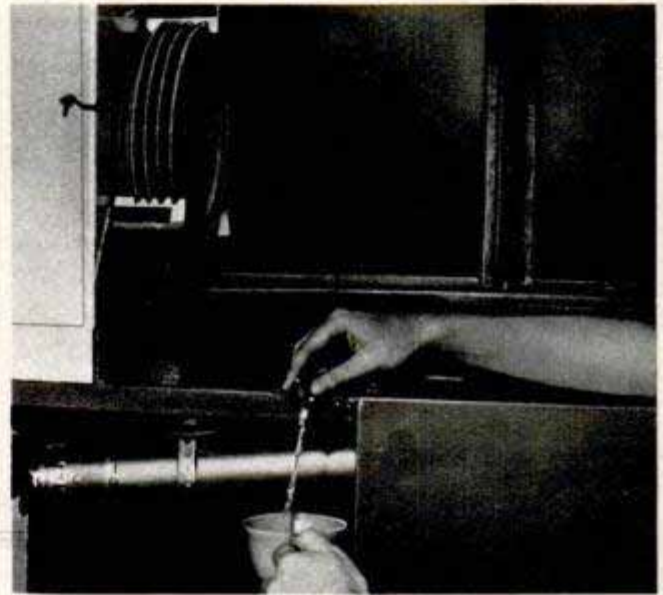




Sturdy two-speed transfer case from a GI armored truck replaces the original, lighter, single-speed job



Tiny heating plant is a welcome addition when the Russells travel through mountain country. Below, he holds a small brake drum replaced with oversize



Running water is piped from an overhead tank to a faucet alongside gasoline stove. The plates just above "sink" ride the bumps on a live-rubber rack



in Mexico's chaparral is equipped either with thorns, spurs or daggers. These were hard on the original canvas top of our living quarters. It has been replaced with one of marine plywood. The ends which support this top, when raised for camping (and fold in when the car is closed) are now linked to the top and rise into position automatically when the top is lifted from inside. Four pleasure-car, spring trunk lifters reduce the weight of the top until it all but goes up by itself.

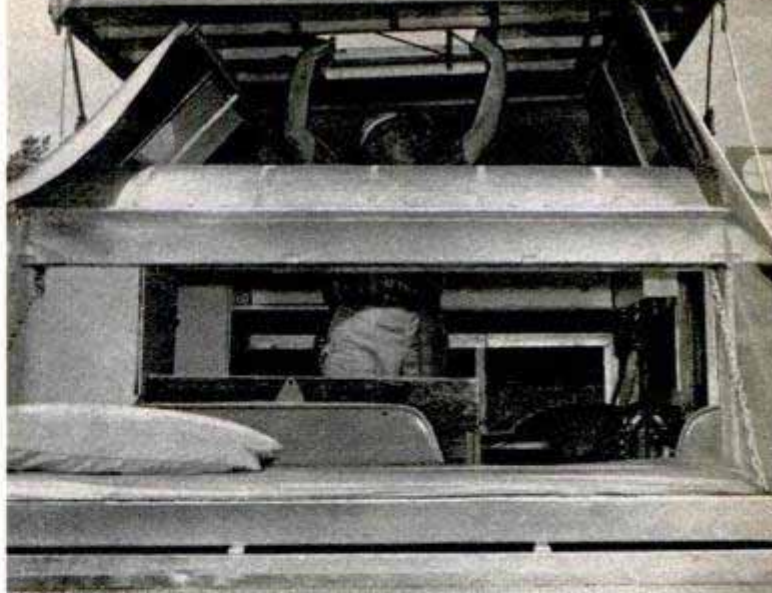
The living quarters now boast a central heating plant. It is a tiny, single-burner, wickless, kerosene stove. A vent pipe crosses the car, distributes the heat and carries dangerous fumes outside.

On the coming trip a pair of powerful field glasses will supplement our basic equipment of cameras, typewriter and notebooks. Once in Mexico we will head straight for the city of San Cristobal de Las Casas which lies in the mountains of Chiapas only 100 miles from Guatemala. Our only stops along the way will be to visit numerous Mexican friends. By following the recently completed Pan American highway we expect to make good time.

We selected San Cristobal because it is the center of the web of legends and mystery which covers the state. East of it lies a great area much of which is virtually unexplored. An ancient tomb, almost within the city limits, has been found to contain nine-foot skeletons.

A few miles distant lies the town of Zinacantan. Its people are direct descendants of Aztec warriors.

Our last act before leaving will be to paint "El Jeep Casita" on the front bumper. That is what an aged native woman christened our jungle home on wheels. It means, "little house on a Jeep."

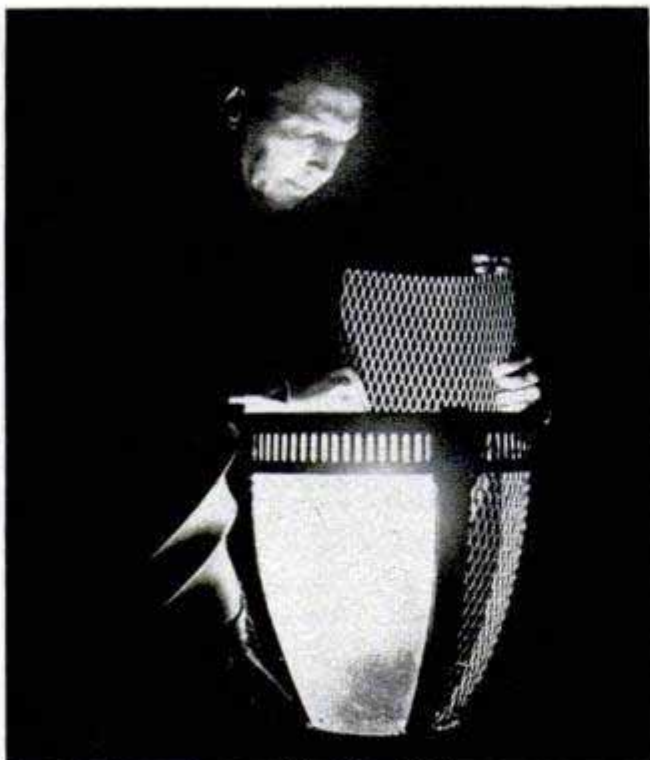


One canvas side is rolled up to show how a gentle lift raises top and the supporting endpieces, too



Everything in Mexico's brush country grows horns, spurs or daggers, say the Russells. Below, field tests. Metal case on fender holds small light plant

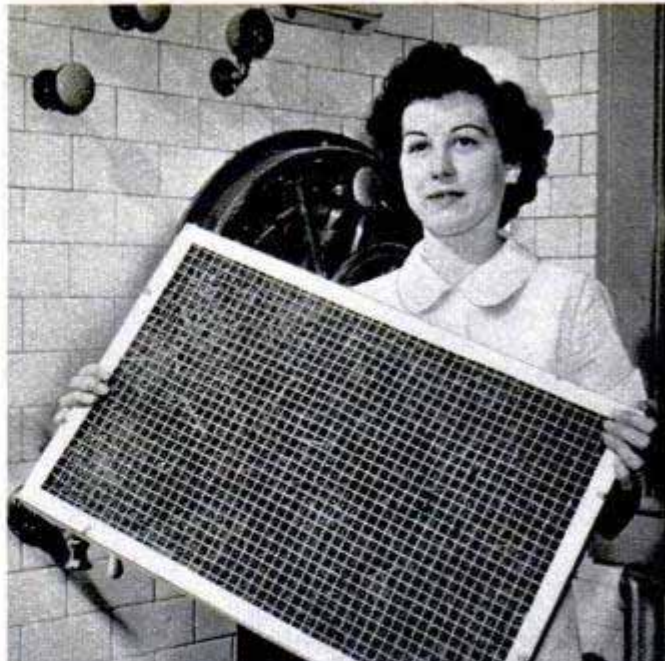




Wheeling Corrugating Co., Wheeling, W. Va.

Metal Lamp Guards

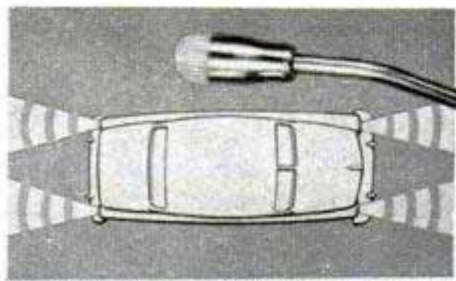
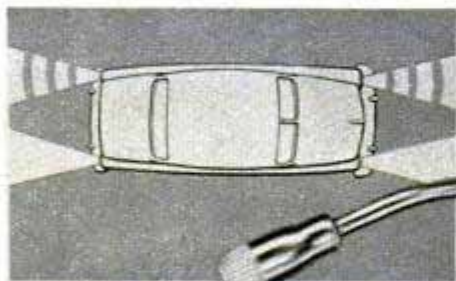
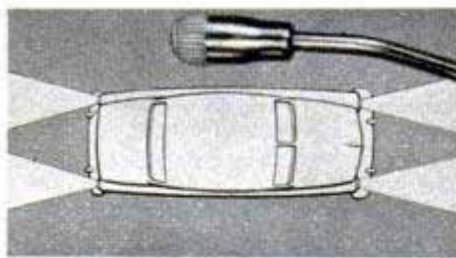
Lamp guards made of a metal construction material are being installed on New York City's street and park lights to foil stone-throwing vandals who, until recently, cost city taxpayers almost \$300,000 per year. The guards are made from expanded metal, fabricated by piercing and stretching solid steel sheet. They are replacing some plastic guards which were broken as frequently as once a week.



Goodyear Tire and Rubber Co., Akron, Ohio

Shredded Plastic Traps Dust

Dirt that escapes conventional air filters is trapped by a new type of filter that utilizes the dielectric properties of polyethylene and other plastics. When exposed in a current of air, the filtering material, thin film shredded into a porous mass, picks up an electrostatic charge that attracts and retains the finest of dust, soot or smoke particles. Developed for forced-draft, hot-air furnaces and air-conditioning systems, it is also being tested to remove pollen from the air in homes. It is washed by immersing in water containing a detergent.



NEUTRAL POSITION



FOR LEFT TURN
REVERSE FOR RIGHT



FOR DISABILITY PARKING

Flashing Lights Protect Motorist

With a flasher switch hooked into the circuit, motorists can use the directional lights on their cars to warn approaching traffic while changing tires or making emergency repairs along a highway. When the switch is in the emergency position, all directional lights, both front and rear, flash continuously, warning cars coming from either direction. The switch, which clamps to the steering column, also signals turns in the conventional manner. It can be used on cars already equipped with directional lights or, if the car is not so equipped, proper lights are easily added.

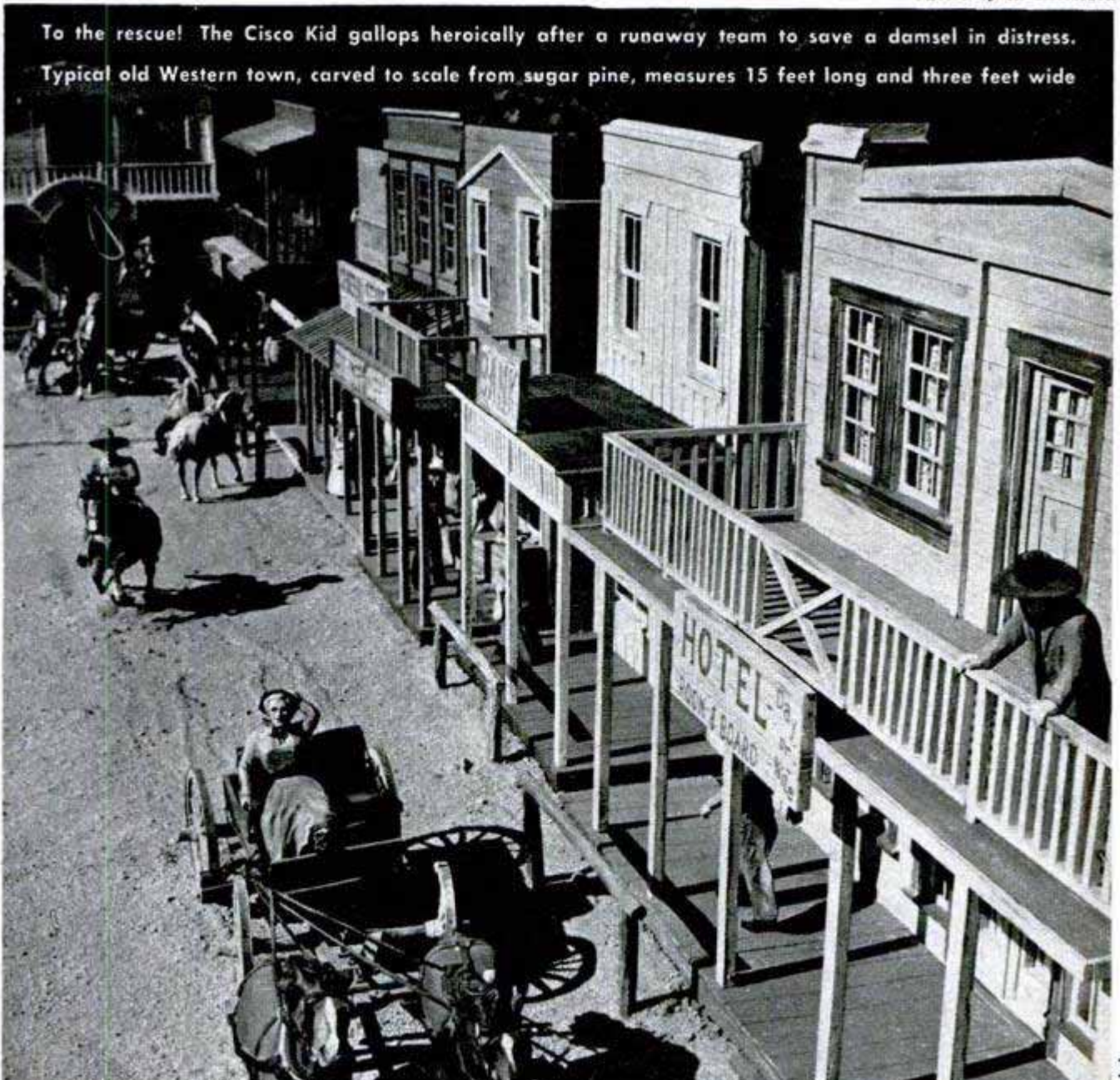


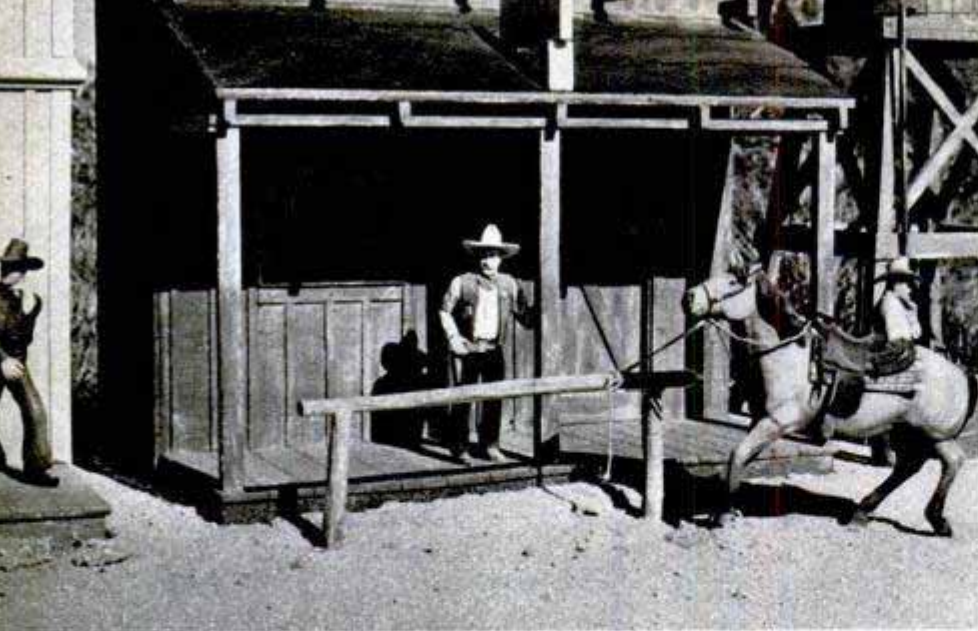
A WHITTLED'S COWBOY TOWN

GALLOPING COWBOYS, runaway horses and yelping dogs all give violent action to the complete Western town whittled to scale by Mrs. Mary Crouch. Reared in an atmosphere of cowboys and horses, Mrs. Crouch has used her background to create amazingly lifelike Western characters. She has been carving blocks of wood since she was 12 years old. Usually, she works on individual figures or small scenes, but decided to work out an entire town just to prove that she could do it. The craftswoman spent 14 months in completing the scene. She first sketches a figure on a

Photos by A. Halverson

To the rescue! The Cisco Kid gallops heroically after a runaway team to save a damsel in distress. Typical old Western town, carved to scale from sugar pine, measures 15 feet long and three feet wide



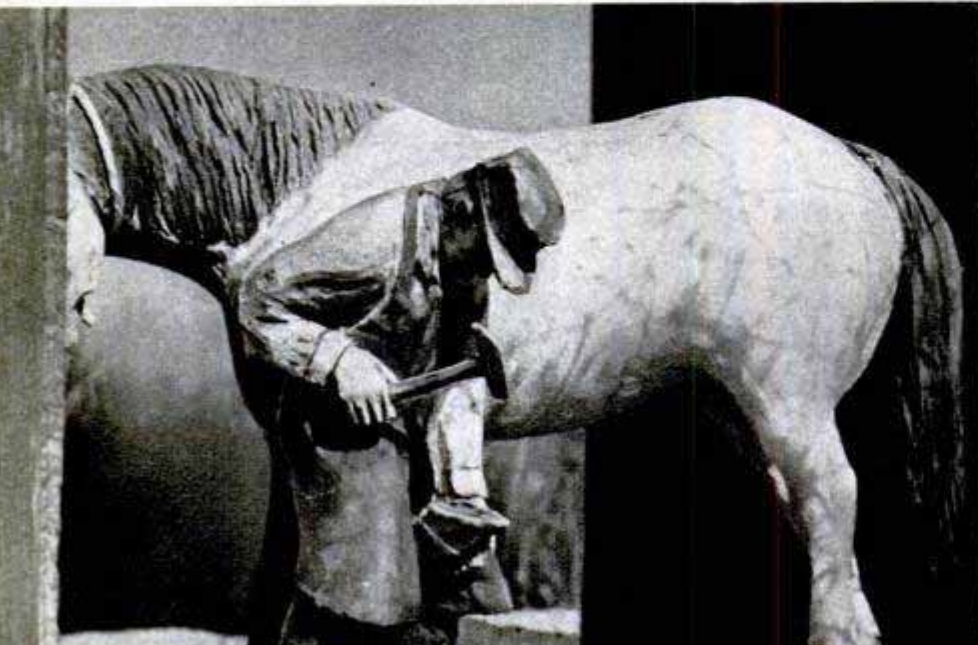


← Sheriff emerges from his office door to see what all the excitement is about while his trusty steed stands by, ready for a gallop up the street

Below, left, a sharp knife carves the final touches on the figure of an idle cowboy playing his harmonica



Mrs. Crouch, who has been whittling since she was only 12 years old, roughs out figure of a tired bronco



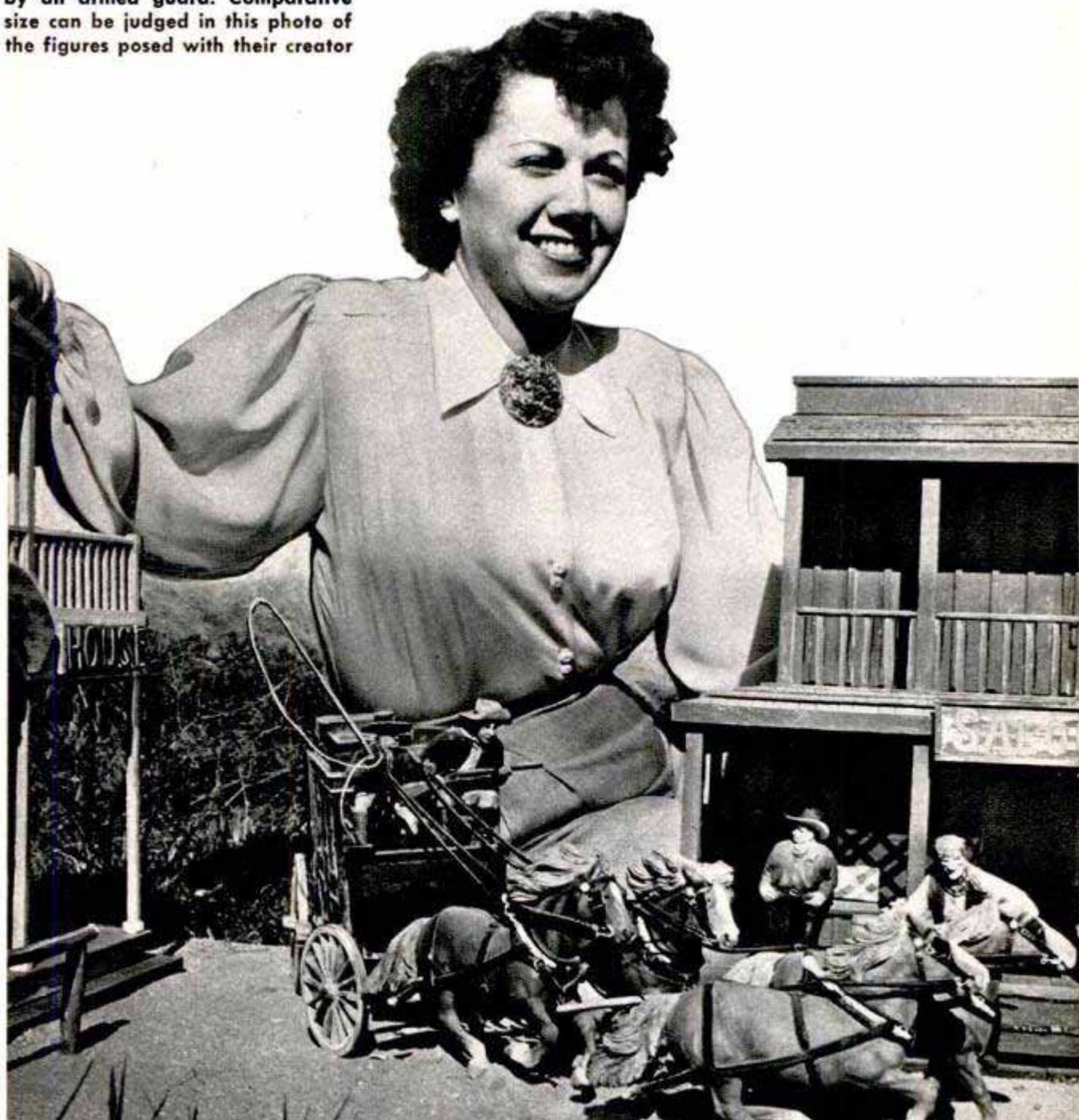
← Old village smithy carefully shoes a horse, oblivious to the excitement created on street by runaway team

sheet of paper, freehand, then transfers the sketch to a block of sugar pine. The rough form is cut out with a coping saw, and the fine finishing work is done with knives and small chisels. Finished figures are given a coat of linseed oil, then painted with oil colors. The entire village scene is 15 feet long, and the figures range from three to seven inches high. Central figures in the scene are Our Hero trying to rescue the hysterical and beautiful Heroine in Distress while the rest of the village looks on. At the other end of the village street a stagecoach, toting a shipment of gold, rolls into town accompanied by a guard, armed and ready for any forays by Western outlaws.



Slightly bowlegged cowboy leads two horses from the livery stable. Figure of the cowboy took about 16 hours to whittle

Stagecoach carrying a shipment of gold rolls into town, accompanied by an armed guard. Comparative size can be judged in this photo of the figures posed with their creator





Luxury in clothing. The fur tips of the chinchilla wrap the model is wearing are smoke gray, blending into a slate blue below. Her hat is also chinchilla



Breeder Earl Allen handles his tiny rodents by their six-inch tails. They thrive at moderate temperatures

CHINCHILLAS GO UNDERGROUND

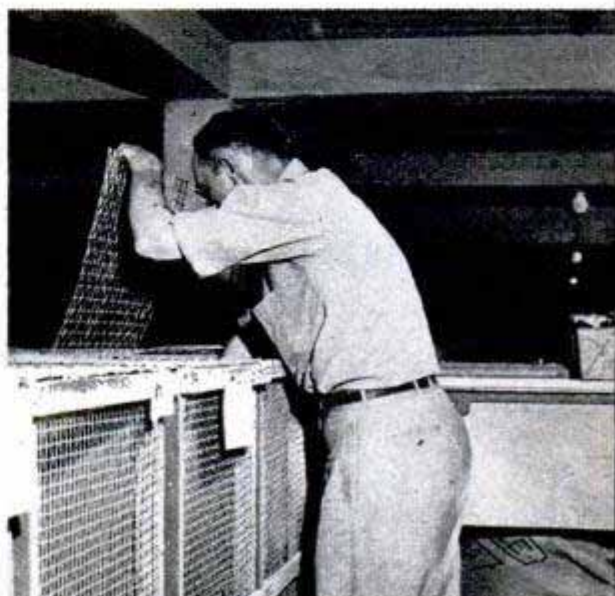
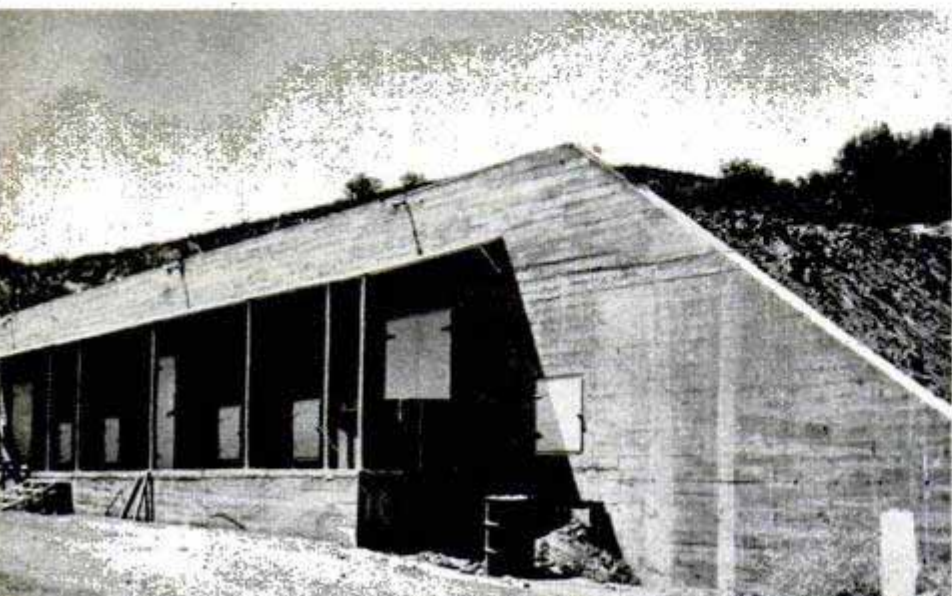
CHINCHILLAS have been housed in quarters ranging from bedroom closets to a Park Avenue penthouse. Some put their \$1,500-a-pair fur-bearing charges in the basement—a technique which has the blessing of Earl Allen, one of the country's largest commercial breeders.

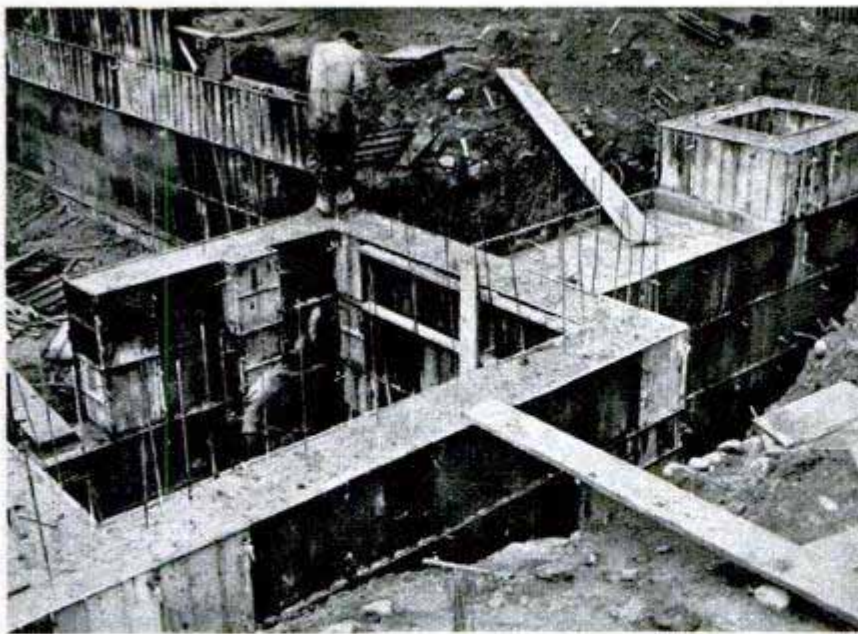
Breeders once considered plenty of sunlight and exercise space necessary. At the Allen ranch, inland from San Diego, Calif., the original animals were reared in a small dugout because space was at a premium.

They did so well that a 100 by 100-foot cave of reinforced concrete was constructed for a maximum of 2000 chinchillas. It has pens measuring only six square feet, elevated 15 inches from the floor to facilitate cleaning and handling.

These tiny natives of the Andes thrive at a temperature ranging from 55 to 65 degrees, and a few dollars worth of vegetables feeds them for a year.

Built when it was learned chinchillas don't require sunlight, concrete cave at left, below, will accommodate up to 2000 animals. Feed cart, right, carries cheap vegetables and pellets to the fur-bearing vegetarians



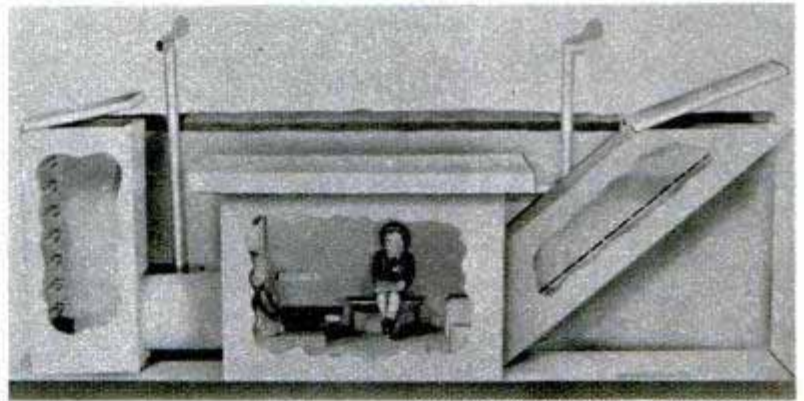


Seymour F. Maikin photos

Prefab A-Bomb Shelter Shipped to Site on Trailer

Atom-bomb shelters now are available in prefabricated form. The parts are shipped by flat-bed trailer, unloaded at the purchaser's home and lowered into a backyard excavation. The main section of the shelter has walls made of five-inch reinforced concrete. The roof is six inches thick. Another section of the shelter, similarly precast, has a steel lid, a slide down the center for fast entrance and stairs at the side. It fits into an opening cast in the main section. Still another section is a vertical escape hatch equipped with ladder rungs and a steel lid. It is connected to the shelter by standard sewer tile and may be installed at

Above, left, one model of bomb shelter is poured on the site. Others are shipped in precast sections. Above, escape hatch can be located anywhere. Below, cutaway model of prefab shelter



A-Bomb Shelter Corp., Teaneck, N. J.

any desired distance away. When the shelter is assembled, an additional slab of concrete is poured over the roof. The lawn then is backfilled to the level of the steel lids.



Martin Fireproofing Corp., 2200 Military Rd., Buffalo 17, N. Y.

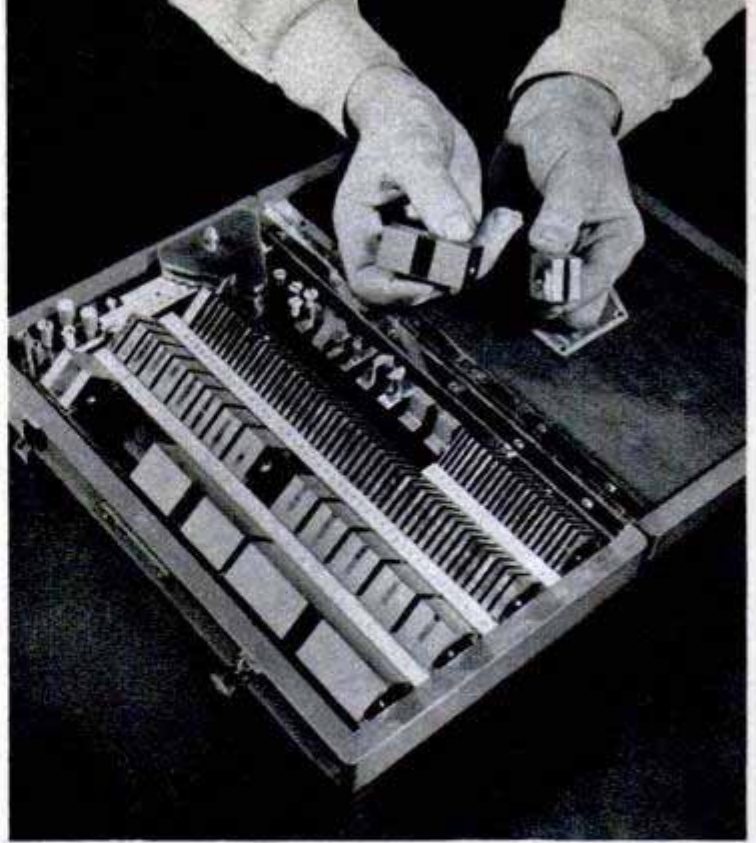
Concrete Saw

Precast concrete slabs can be cut to size and shape on the job by a new portable saw. It is operated by an electric motor and has guide rails to assure a straight cut. A hose attachment permits either wet or dry cutting.

If you do not find all the information you need in the WHERE-TO-BUY-IT INDEX, starting on page 12, sources of further information are available to readers without charge from the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11



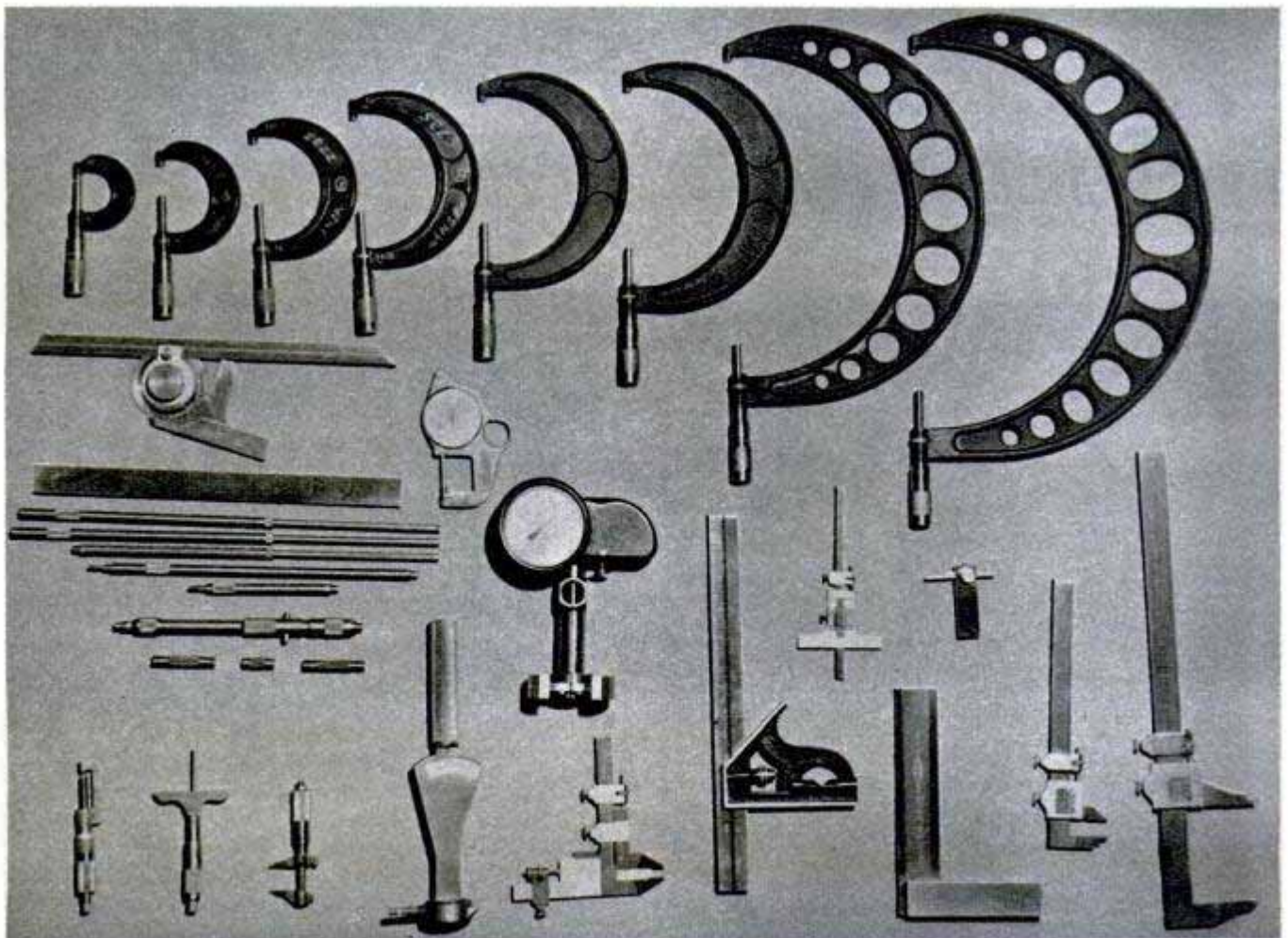
Double check: The gauges used to check the threads of bolts are themselves tested with supermicrometer



Only dry hands can handle these gauges. Even perspiration left by fingerprint can destroy their accuracy

HEADQUARTERS FOR PRECISION

Hand instruments, including calipers, squares and micrometers, check any dimensions less than 12 inches long





Kit of standard length bars determines whether instruments are accurate. Inaccurate gauges are rebuilt

THAT CELEBRATED dimension, the width of a split hair, is a huge measurement in a unique precision laboratory at Sharon, Pa. The laboratory is a miniature Bureau of Standards representing an investment of \$50,000.

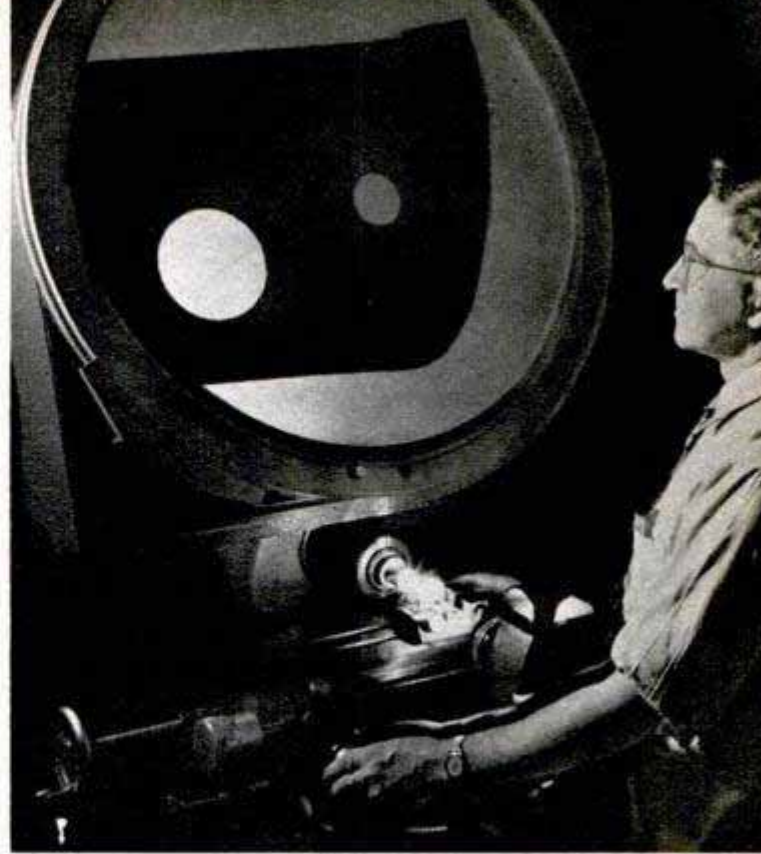
Maintained by Westinghouse, the laboratory not only keeps a hawk's eye on the accuracy of company instruments, but also maintains a constant check on the tools owned personally by shop workers.

Once, years ago, a number of sheets of steel in the plant had to be scrapped because they were too short. A quick check of every worker's six-foot rule exposed the culprit—a rule a fraction of an inch short.

Today, there are instruments in the lab for checking almost every measuring device, from six-foot rules to the smallest micrometers and patterns. One gauge is accurate to $5/100,000$ inch and can detect an error of $1/10,000$ inch.

A sort of a "screen test" is another type of measurement used by the hair-splitters. Tiny patterns and gauges too small to be measured conveniently by ordinary means are placed in an instrument that has a round screen resembling a giant television screen. A beam of light aimed at the tiny object casts a greatly enlarged shadow or silhouette on the ground glass. This shadow then can be measured easily. Every $1/1000$ inch on the object is faithfully reproduced on the screen as $1/16$ inch.

One of the most unusual measurement tools is a set of "Hoke" blocks so temperamental they can only be handled by certain



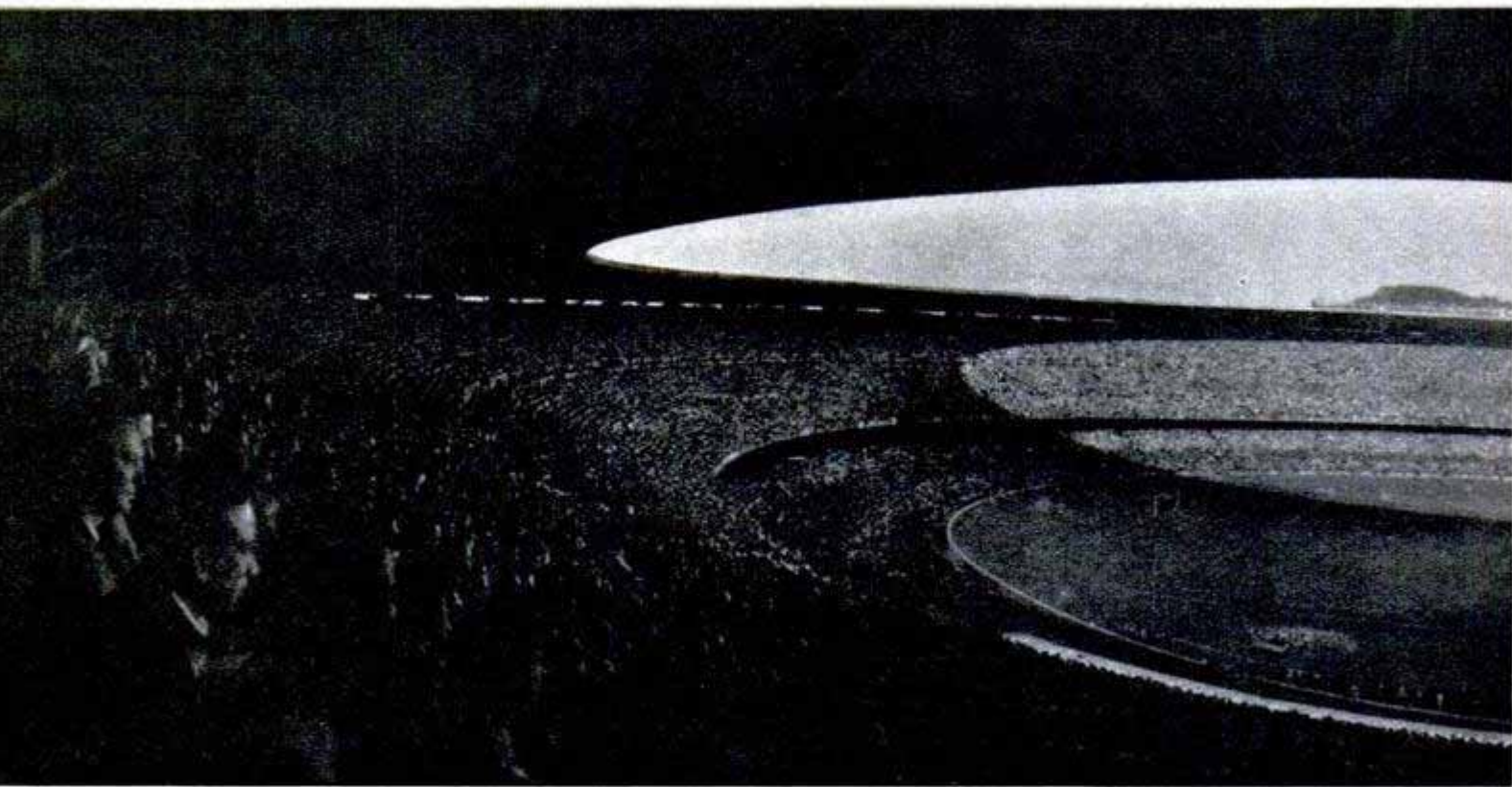
Silhouette of a tiny gauge is cast on a screen. Large outline is measured to check dimensions of the gauge

people. Made of high-grade steel, they are ground to an accuracy of $3/1,000,000$ inch. They are so highly polished that the perspiration left on them by a fingerprint can destroy their accuracy—which means that anyone whose hands tend to perspire excessively cannot use the blocks.

Still other instruments in the laboratory maintain a constant check on the temperature, pressure and humidity in each of the ovens, tanks and vacuum devices throughout the plant.

Even micrometers must be checked. This instrument can show up an inaccuracy of only $1/10,000$ inch





FROM Brazil comes a sweeping photograph of 200,000 people watching a soccer game. Reader Carlos Carneiro of Rio de Janeiro provided the photo after spotting the article on soccer, "The World's Favorite Sport," in the October, 1950, issue of *Popular Mechanics*. The "Colossus" of Maracana is the municipal stadium, especially

200,000 SPECTATORS—

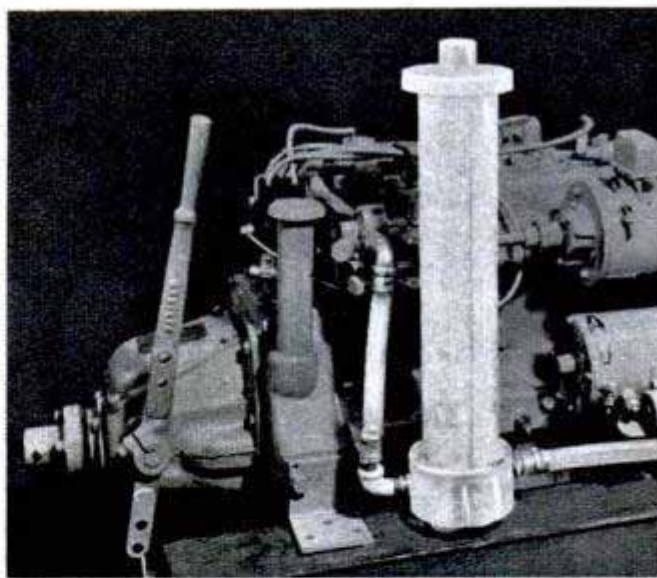
built for the world's cup match, according to Carneiro. He adds that during the last match, when the photo was taken, Uruguay edged out Brazil 2 to 1, "the only thing we couldn't imagine." Carneiro hazards the guess that there's no other stadium as large



Walker Manufacturing Co., Racine, Wis.

High Lift for a Car

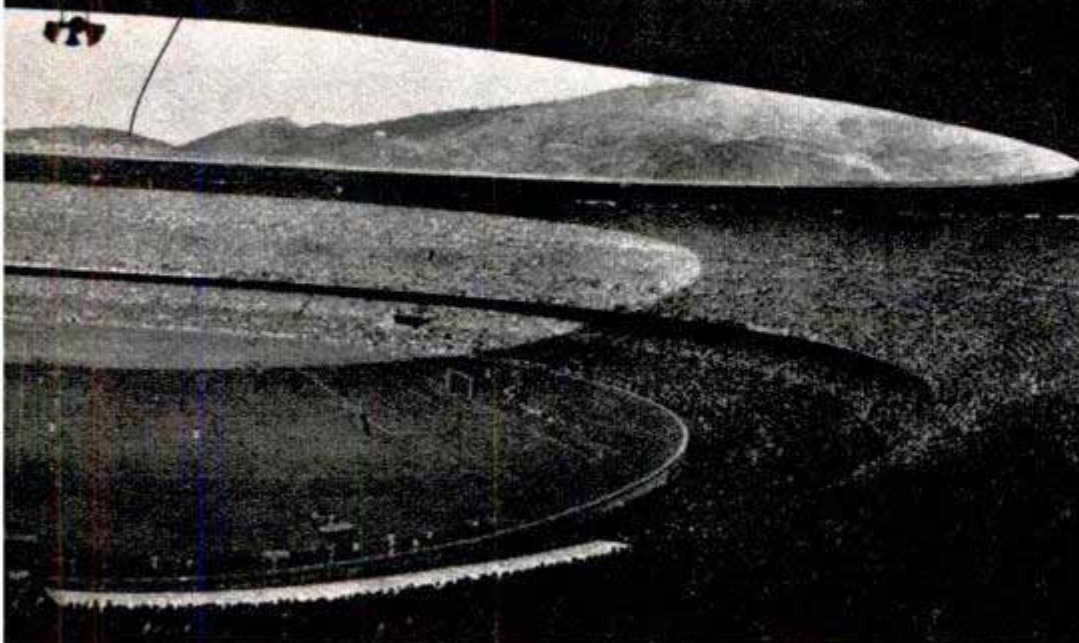
One end of an automobile can be raised as high as 46½ inches off the ground by a new hydraulic lift designed for garages and service stations. The jack handles vehicles weighing up to 4300 pounds. Four wide wheels distribute the weight over a large floor area. The jack weighs 375 pounds and has seven positive holding positions in the safety mechanism.



Sudbury Laboratory, South Sudbury, Mass.

Crystals Stop Rust In Engines

Cooling systems on marine engines are protected from corrosion by a thin film that coats all metal and is carried into the engine by the cooling water. Especially designed to stop damage to salt-water-cooled engines, the film is produced by crystals which slowly dissolve. The crystals are stored in a plastic cylinder through which the cooling-system water passes.



ONE SOCCER GAME

as this one in the world. Soccer, according to this reader, is the principal recreation in Brazil, and even in the sparsely settled areas the traveler can always find two things—a church and a soccer field. He says Brazilians play soccer in a special way of

their own, and describes the famous “bicycle” shot in which the player “jumps, feet upwards, and with a sudden movement of legs that reminds you of someone riding a bicycle, he shoots the ball to a place to which he has his back turned. We play soccer in a very special way of our own—you can’t find in books what our boys do.”



Garbage Truck

When the garbage collector on Kahuku plantation, Hawaii, makes his rounds, he doesn't have to handle the refuse because he hauls the loaded container to the disposal area. Steel bins are placed around the village in places convenient for the residents. An old straddle truck is the garbage vehicle. Extension arms on the front of the truck pick up the large containers as they are hauled to the dump. There, the bottom of the bin opens and the refuse falls out.

Tortillas the Easy Way—Just Add Water and Bake

Mexican housewives can now make their own tortillas right “out of a box” simply by adding water to a prepared mix. Used like American biscuit mixes, the tortilla flour is also suitable for atoles, tamales and other basic items in the Mexican diet. Tortilla

dough is perishable and, prior to the introduction of the new preparation, had to be mixed from freshly ground wet corn shortly before baking. The mix, which can be stored for long periods, will eliminate hand grinding and waste.



Photos courtesy California Division of Fish and Game

Drinking Fountain Saves the Quail

By **Claude M. Kreider**

A CASUAL OBSERVER would be puzzled to see three men put a heavily loaded truck over brush and rocks to reach a point high in a basin of California's arid hills. The actions of the three would be even more mystifying. One serious fellow, the leader, studies the terrain, with special attention to the slope and drainage area. Another starts with pick and shovel to dig a square hole. The third finds faint tracks of birds in the dry wash and exclaims with satisfaction. Their errand promises to avert a tragedy which countless times has threatened the existence of the beautiful California valley quail. A quail "guzzler" will be installed, for collection of rainwater, to carry the birds through another hot, dry summer.

Quail, like chickens and all members of the Gallinae family, require a small amount of water daily. The effective device to supply quail with water is the invention of Ben Glading, assistant chief of game conservation of the State Bureau of Fish and Game.

Quail, once found in thousands throughout the valleys, foothills and adjoining brushlands, have had to give way to encroaching civilization and hunting pressure. Pushed higher into the hills, these hardy little natives are living where springs



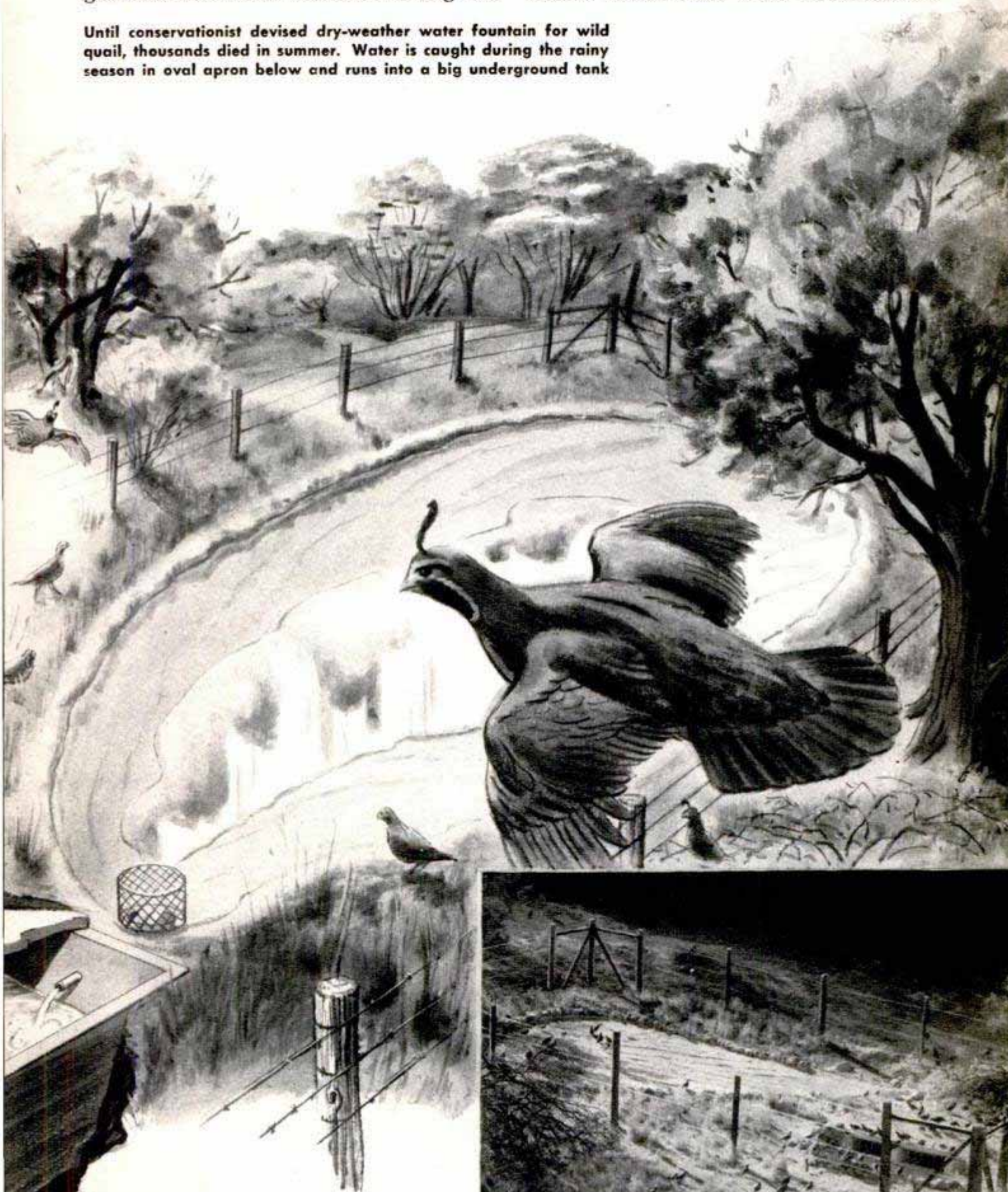
and water holes soon dry up after the meager winter rains. It is sheer tragedy when the fluffy little baby chicks, no larger than a walnut, hatching as many as 15 to a nest, die of thirst during the nesting season.

Biologists of the Division of Fish and Game estimate that this mortality in dry seasons is perhaps greater than all other causes combined. Thus, more than 800 guzzlers have been installed during the

past few years, and already their worth has been proved of inestimable value.

The modern guzzler is being constructed largely of plastic-treated Fiberglas sheets. This material is impervious to seepage, wears well in all kinds of weather and is comparatively easy to install. The rain-collecting apron is laid to slope sharply into the buried tank, and is planned to have an area to fill the tank when it catches half

Until conservationist devised dry-weather water fountain for wild quail, thousands died in summer. Water is caught during the rainy season in oval apron below and runs into a big underground tank





Field worker digs hole for quail "guzzler" tank. An apron for catching rain will be spread on slope above. Protective brush is left around the fountain



Top of water tank is leveled before sealing and installation of drain. Below, glass mat apron is laid on slope above tank with low dirt border around it. Three inches of rainfall will fill 400-gallon tank



the minimum annual rainfall in the area.

In the dry foothills and semidesert regions, having a rainfall of six inches per year, a 400-gallon tank will be filled by three inches of rain falling on an apron of 215 square feet, shaped roughly oval, about 18 feet across. This amount of water, about enough to supply a family of humans for a day or two, will maintain possibly 500 quail, as well as other birds, through the long, hot summer.

Without this constant supply the birds would perish, for they do not seem to have the instinct to enable them to find a new supply. The birds using a guzzler will seldom be found more than a mile from it, so dependent are they on the water supply. For this reason, the devices are usually well hidden, since hunters know this and seek the quail near the watering spots.

The storage tanks are built of concrete and Fiberglas with a heavy tight top, and are buried in the ground. A strainer is built in at the apron outlet. To prevent drowning, as has often been the case when quail water at sheer-sided cattle troughs, a narrow ramp enables them to follow the water down as the supply drops.

Steel rods keep out large animals and a cover of 2 by 4-inch redwood is bolted above the ramp. In other instances, the concrete top projects over the entrance. A strong cattle fence is built around the entire installation to keep stock and game animals from trampling the apron.

The ideal location for a guzzler requires first a good drainage area, then scattered brush to give the birds a feeling of security as they approach. The scant shade also provides a place to rest, dust and preen, just as the barnyard chicken does after a drink.

More than 800 quail have been counted using a single guzzler. Counts made at guzzlers in use three years showed an average use of 185 quail for each. Doves, rabbits and songbirds were also found to be drinking there.

Other states and territories have followed California's lead, and guzzlers have been installed in Oregon, Washington, Utah, Arizona, Nevada, New Mexico, Hawaii and Puerto Rico.

Thus, this comparatively simple and inexpensive device promises to go a long way in game conservation. It is saving the valley quail, the official California "state bird."

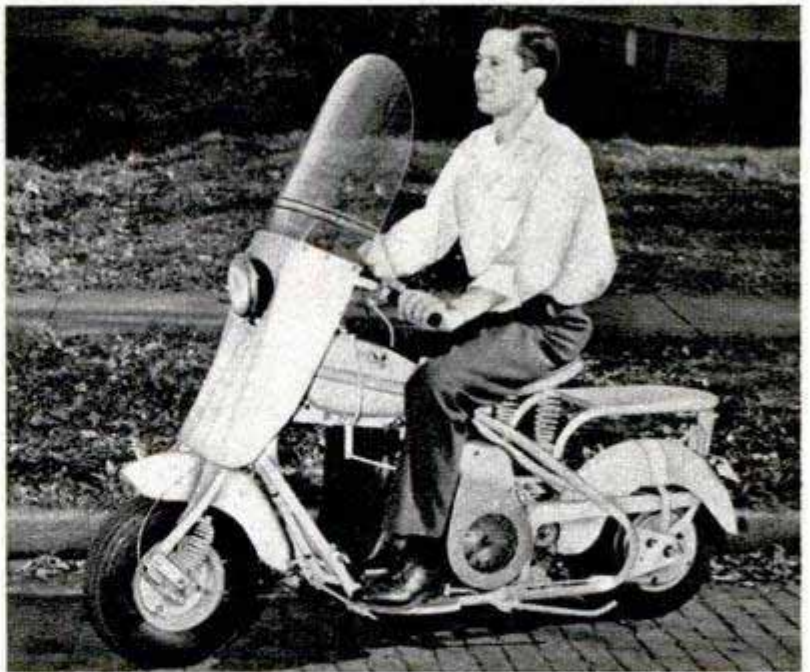
Everyone loves and respects this little citizen, with his gay, nodding plume, twinkling feet and beautifully speckled "vest." The foresight and planning of the bureau officials, aided by sportsmen's groups, in many instances, have insured that the valley quail will not go the way of the passenger pigeon.

50-M.P.H. Scooter

Extra riding comfort has been built into the new Cushman motor scooter which features super balloon tires and oversize coil springs on the seat and front wheel. The new model, called the "Eagle," is powered by the Cushman four-cycle, five-horsepower engine that travels as many as 75 miles on a gallon of gas and has a top speed of 50 miles an hour.

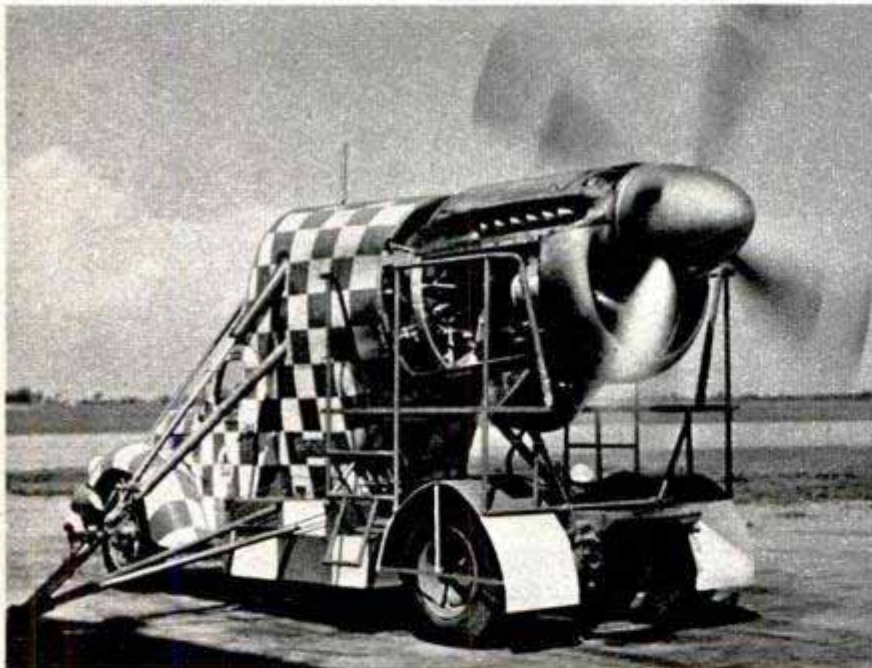
Old Sol's Getting Hotter

During the past 20 years, the heat of the sun, as it reaches the earth, has increased a fourth of one percent, according to findings of the Smithsonian Institution. This statistic is the result of an analysis of more than 16,000 measurements at the Smithsonian's observatory on the summit of Mount Montezuma, Chile. While this increase may seem insignificantly small, it



Cushman Motors, Lincoln 1, Neb.

means enough extra heat has reached the earth to have affected climate. This fact, no doubt, has bearing on the tendency toward milder winters in most of the world.

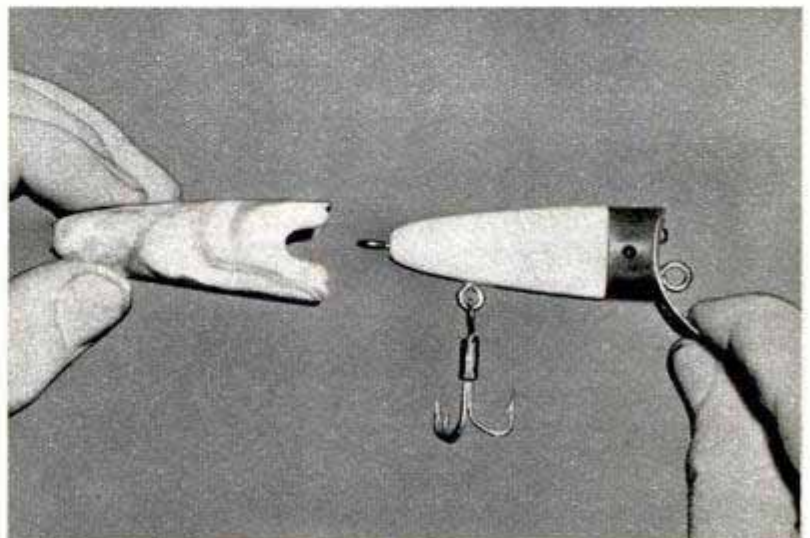


Air-Powered Groundling

Nicknamed "Pluck"—half plane and half truck—a mobile engine run-up stand eliminates a noise nuisance from the main part of Montreal's Dorval Airport. Power plants for Trans Canada Air Lines planes are put in a steel frame at the back of the truck and driven to an isolated part of the field for test run-ups. In addition to being chained down to counteract the engine's 5000-pound pull, "legs" salvaged from a derelict Lancaster are extended down from one side of the truck to give further stability. Inside the cab, dials usually found in a cockpit register every detail of the engine's performance.

Colored Jackets on Plugs Lure Hard-to-Get Fish

Fishermen who aim to please will be interested in the "Strip Teaser." It is a black and white plug that comes with black and green, gray and pink, and yellow and green jackets. If one color doesn't attract fish, the angler can slip on another jacket without removing the plug from the line. An adjustable bib makes the plug travel on the surface or deep down for the big ones. It can also be adjusted to obtain lazy, medium or fast action.

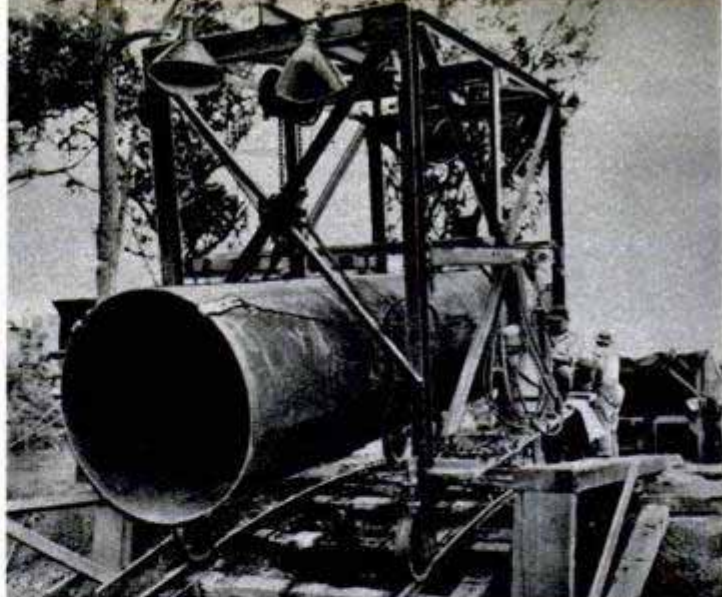


H. & H. Plug Co., 228 Randolph St., Waterloo, Iowa.



This may look like a mammoth roller coaster, but it's a pipe line that will siphon water to the mill of an Hawaiian sugar plantation

Right, the car starts down the sharp incline with its load. Notice the restraining cable that is operated by a gasoline-driven winch



Two men can move the bulky sections of 54-inch pipe down a steep mountainside with this straddle-loading "trolley"

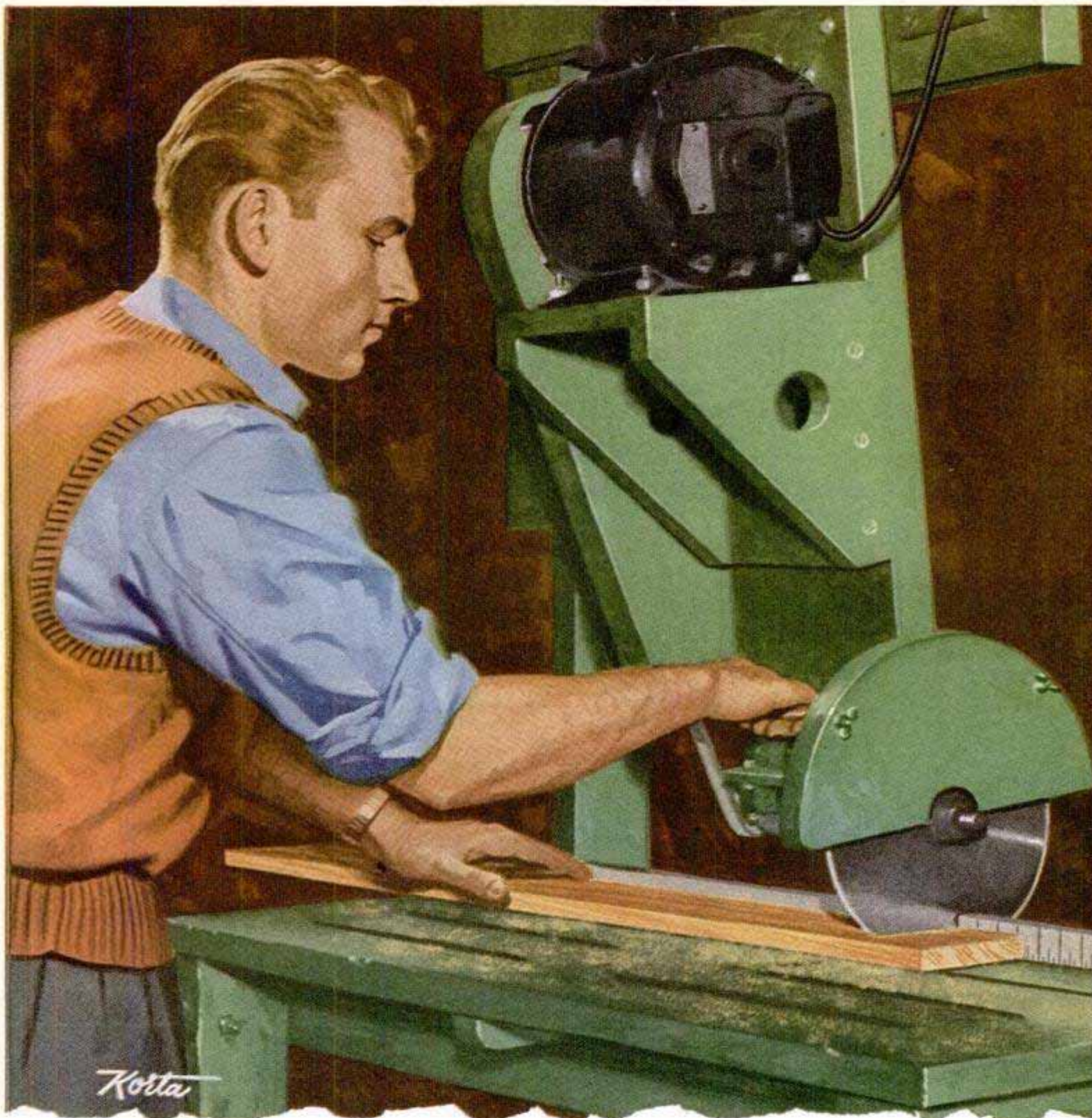
CABLE-DRAWN "TROLLEY" LAYS MOUNTAIN PIPE LINE

LOOKING like a stripped-down Toonerville Trolley, a cable-drawn car is actually a mountain-climbing stevedore in the construction of an Hawaiian pipe line. At the Waialua plantation on the island of Oahu, engineers laying a 54-inch water pipe line over extremely hilly terrain were faced with a transport problem. How could they lower the bulky pipe sections down precipitous slopes, almost too steep for men to work on? Lowering the pipe by hand was slow and dangerous.

Their answer is a cable car that straddles the pipe and carries it down the steepest slope on tracks, holding it securely while the weld is made. A gasoline engine drives a winch to provide the tension needed on the cable to lower the car slowly with its load and to pull it back empty for another pipe section. The pipe line is assembled right on the tracks. Rails and ties are left in place to support the heavy pipe, which serves as a giant siphon, carrying water to the plantation's sugar mill.



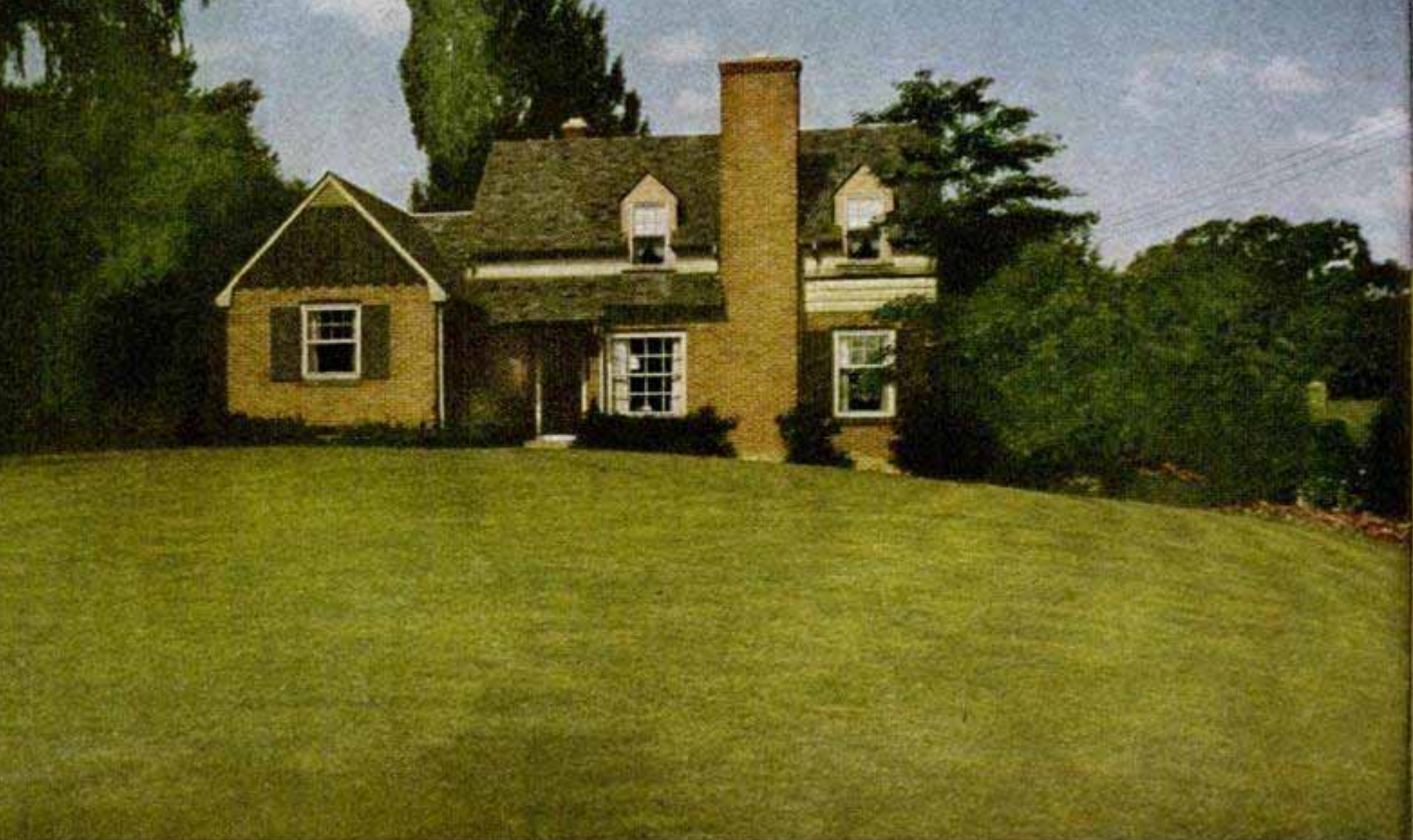
the **POPULAR MECHANICS** **CRAFTSMAN**



▲ For fast random cutting, there's nothing like a swing cutoff saw to rough out stock in a hurry. Ideal for small cabinet shop. See page 212

Table fountains that spout water realistically make unusual centerpieces. Page 194





Be proud of your **LAWN**

Photos and story courtesy O. M. Scott & Sons Co.

IT PROBABLY IS safe to say that 75 percent of all the time, effort and money spent on lawns is wasted by the average homeowner. And, yet, this costly waste actually is unnecessary because establishing and maintaining a well-groomed and healthy looking lawn amounts to little more than following a few do's, don'ts and whens.

Many new lawns turn out disappointing-

Like any living thing, your lawn needs a certain amount of sun. Keep any large tree on the lot trimmed to let sunlight come through as much as possible

ly because they were planted at the wrong season. In most localities, the best planting times are late summer and early fall when shorter days and cooler evenings aid root development of the tiny seedlings. Germination and seedling growth are better when the soil is warm, the sun not quite so hot and moisture more abundant. However, in spite of the fact that the best time may be autumn, most grass seed is planted in the

Avoid giving your lawn a "crew" cut. In cool weather, set the mower for a 1-in. cut or more and raise it to 1½ to 2 in. when the weather is hot and dry





Does your lawn produce a harvest of dandelions like this one? Dandelion control is now so simple that you can rid your lawn of them practically overnight. Fill a spreader with 4-XD and simply wheel it over your lawn

spring. Although good lawns can be developed from early spring plantings, they will require more attention than autumn sowings. Thorough preparation of the seedbed, an abundance of available plant food, and proper watering and mowing are the fundamental requirements for success with a spring seeding.

You already have most of the tools: Except for possibly a fertilizer spreader, the average homeowner possesses the few tools needed to maintain a fine lawn, namely an iron garden rake, a spade and a mower. While the rake will do to pulverize any crusted bare spots so that new seed will

Rolling a lawn is somewhat out of fashion now. Harm can be done by compacting heavy soil. Roll only to press new seeding or in cases where roots are heaved

have good lodging, a half-moon turf edger will be found more convenient in loosening and breaking up the soil of such areas.

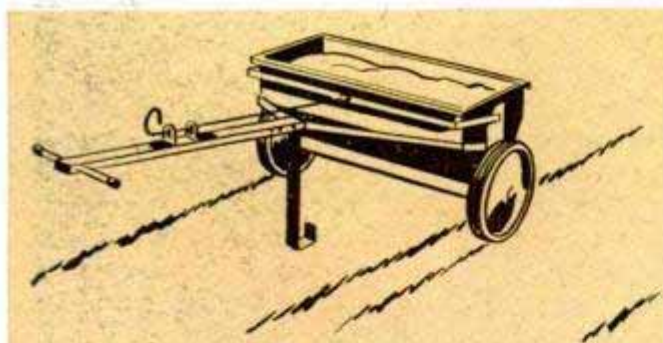
Many homeowners make a point of getting out the lawn roller on the first balmy day. Rolling of lawns, however, is considered by some to do possibly more harm than good, especially in the case of heavier soils. Good loam soils seldom need rolling. In any event, heavy rolling always should be avoided. About the only reasons for rolling are to firm heaved roots back into the soil or to press soil around new seedings. Here, only a lightweight roller should be used, the hollow water-ballast type

Several spray compounds and one dry-powder type are available for stamping out obnoxious crab grass. The powder compound is applied by using a spreader

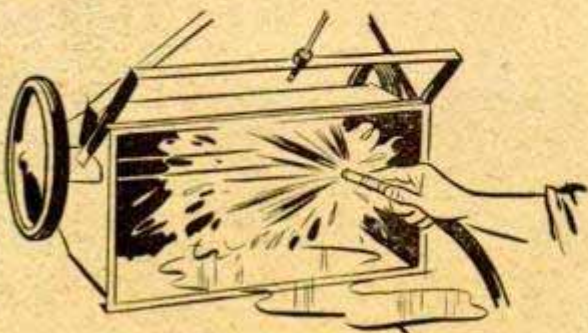




The most efficient and economical method of applying both fertilizer and seed is with a mechanical spreader. Uniform coverage is insured and there's far less waste of material as compared to broadcasting by hand



The spreader is used in much the same manner as a lawn mower, overlapping each strip slightly to make sure the area is completely covered



After using it to apply fertilizer, wash out the spreader with a hose before sowing seed. Wipe and push spreader to air-dry agitator

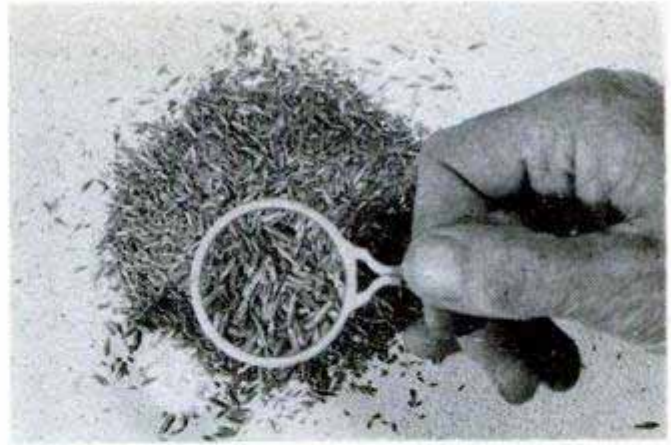
probably being the best when filled with only enough water to accomplish the job. In addition to standard reel-type power mowers, horizontal or rotary-scythe mowers recently have come into wide use.

Many lawns need lime: Not so many years ago it was a common procedure to give a lawn an annual "whitewash" or light dusting of lime, that was as much a spring ritual as sulphur and molasses for the whole family. Later it was found that overuse of lime actually encouraged the growth of weeds. As a result, many made the mistake of not using lime at all. Except in localities having limestone soils or where the sprinkling water contains considerable lime, lawn soils may need "sweetening" with fairly generous applications of lime every two or three years, especially in cases where the soil is quite acid or where there is a deficiency of calcium and magnesium. This is particularly true of the country in and to the east of the Allegheny Mountains. In case of doubt, it is a good idea to arrange for a pH test of the soil, pH designating a unit of measure which chemists use in determining the intensity of alkalinity present. Some of the larger seed companies provide a testing service, as do county agriculture agents and state experimental stations. Do not use quick or slaked lime. Instead, use either hydrated or raw-ground agricultural lime. A typical dose is 25 to

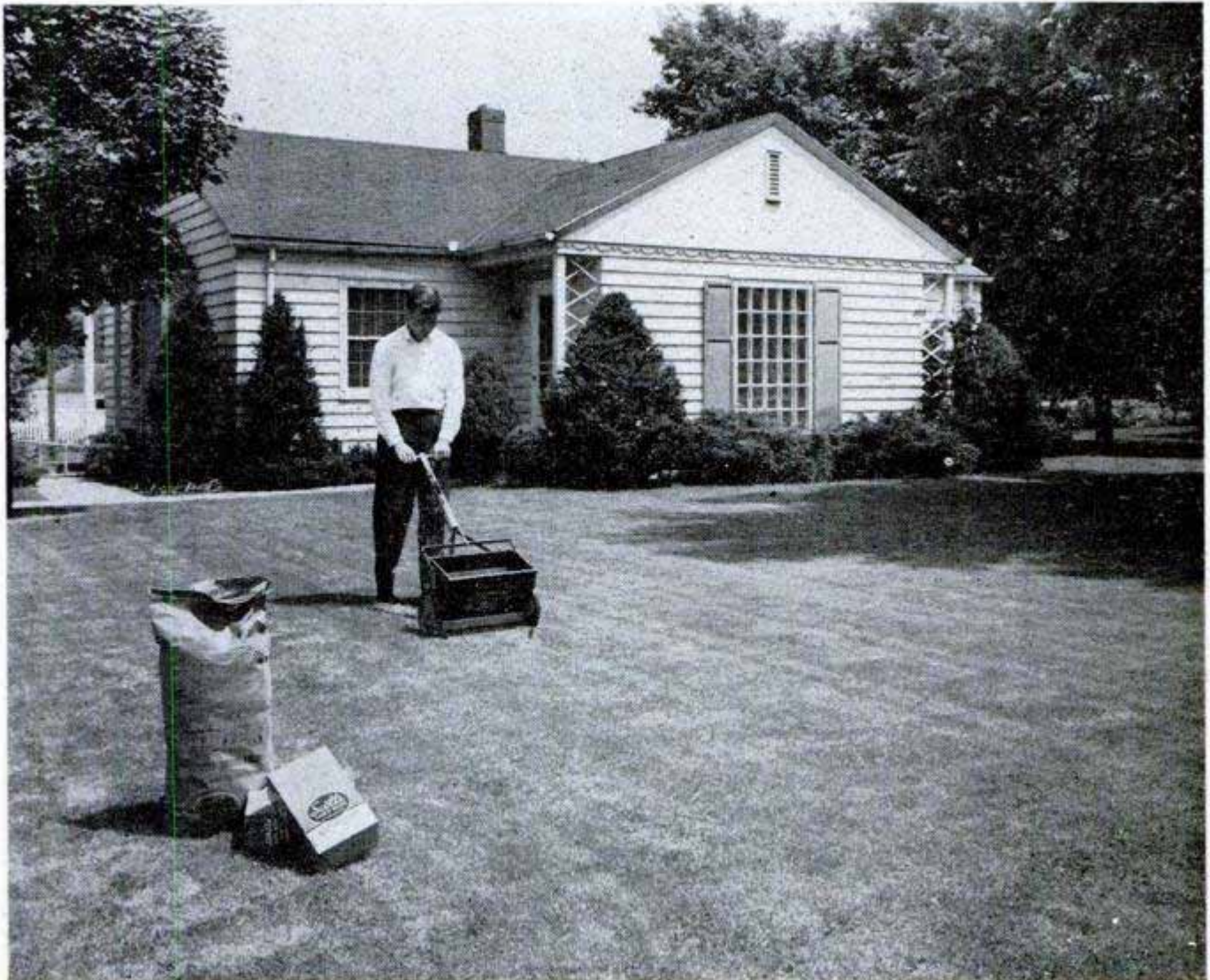
50 lbs. per 1000 sq. ft. Lime may be used almost any time provided it is applied a couple of weeks before sowing seed or adding fertilizer.

The spring program: Applications of special grass foods (fertilizer) are advisable as early in the spring as possible. Frequent feeding is quite important—three or four times a year until the lawn is well established and then at least twice a year. The selection of lawn food is important. Manure in sufficient quantities would provide the nutrients needed but, even if at hand, would introduce too many weeds. The one advantage of manures—slow availability—also is found in those lawn foods composed in substantial part of organic materials. Thus, for a quick pickup for grass, a complete fertilizer, or turf builder, is the ideal material. Uniform application at the proper rate is important and is best accomplished by using a mechanical spreader. Hand broadcasting is bound to be uneven with some spots receiving entirely too much and others none. Uneven color and spotty growth result. Spreaders having a rotary agitator have been found superior to the shaker,

With a spreader, effective crab-grass killer in powder form can be applied to an infected lawn with as little effort and time as it takes to walk the lawn



These two photos show graphically that there are more than three times as many seeds in a pound of the best grass seed than in a pound of cheap seed

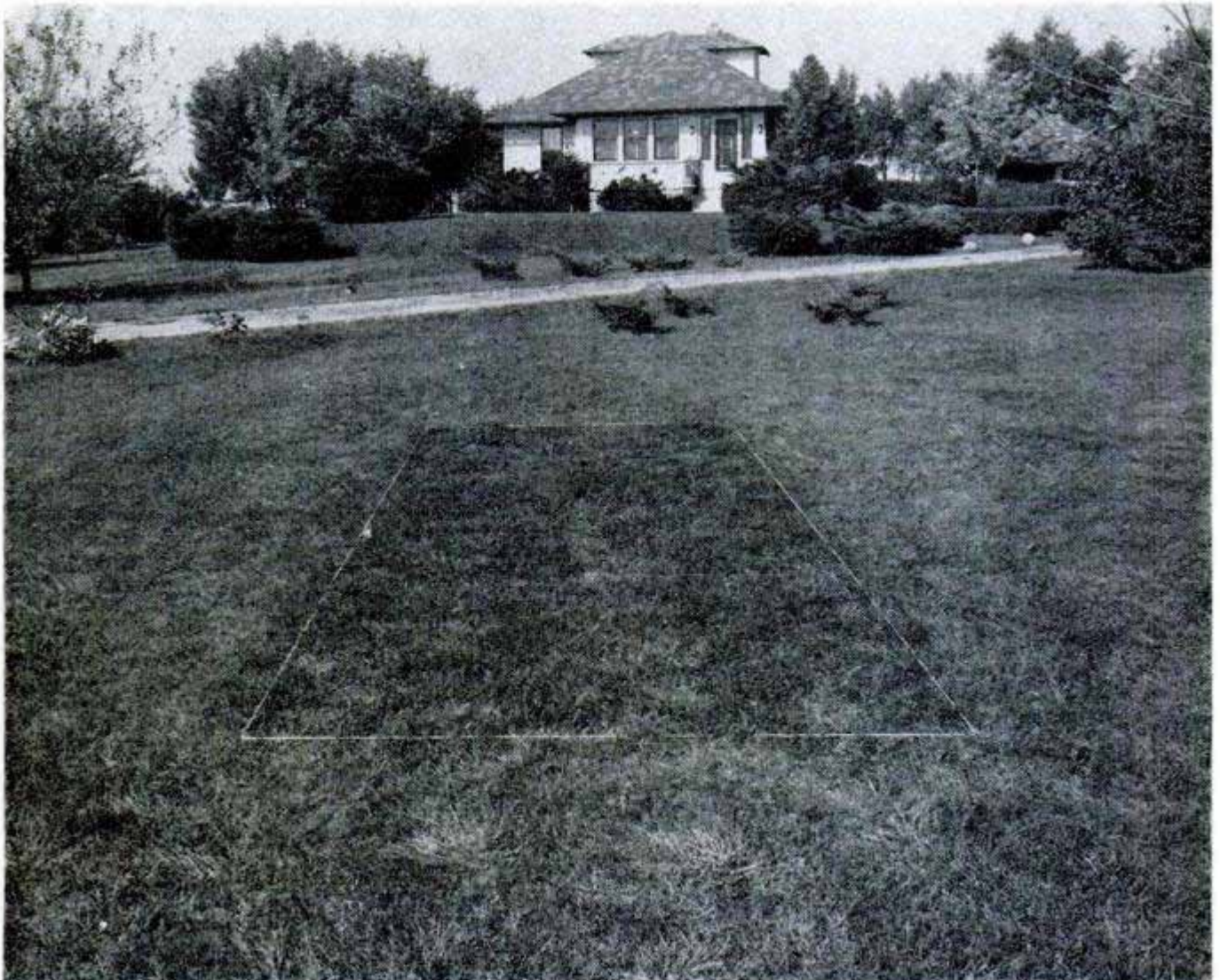




Here, a test plot of a lawn badly infested with crab grass is being treated to show the effectiveness of a powder-type weed killer. Bottom photo shows the test plot completely cleared of crab grass. The test-plot idea also can be used to determine whether or not your lawn needs lime. Treat an area, and then observe if grass becomes greener than that of untreated area

or vibrator, type in delivering an even flow of material. This is important to prevent dumping in ridges, or applying the material in a washboard pattern. Hoppers designed with closely spaced slots in the bottom insure even distribution across the width of the spreader, and actually broadcast the material instead of depositing it in rows.

Seeding and feeding: In cold weather, it is all right to sow seed immediately *after* applying fertilizer. In warm weather, it is best to follow manufacturers' directions. With some materials, it may be advisable to wait a week or so. Freezing or even zero weather will not harm good seed. If lawn food has been applied and the date is such that late-winter or early spring temperatures of 25 deg. or lower are expected, it is all right to sow seed on established lawns without any soil preparation. Alternate freezing and thawing will open small cracks and crevices in which the seed will lodge and where it will find protection and



moisture as the ground warms sufficiently for germination. If seeding is delayed until later in the spring, it is advisable to cultivate the bare or thin spots. In some seasons the weather is such that established grass will have grown considerably before the new seeding germinates. In that event, the mower should be set to cut the lawn closely.

The quantity and kind of seed selected have the utmost bearing on the results. The best may cost as much as \$1.50 a lb. but it is worth it, considering that there are as many as 3,000,000 seeds per pound in first-rate mixtures as compared with less than a million in the cheaper grades. As each seed will potentially produce a single plant, the advantage from the numerical standpoint is quite obvious. Then, too, the better the quality, the more sure you can be that it is free of weed seed. When sowing grass seed that contains even small quantities of weed seed, the homeowner is planting a costly headache for the future. Most persons waste seed because they broadcast it by hand and often have the mistaken idea that by sowing seed "good and heavy" they overcome the handicap of poor soil or growing conditions and careless preparation of the soil.

Determining the rate or amount of seed to sow with a spreader is dependent upon the selection of seed (whether it is of high or low count), the relative stand of grass on the lawn and, of course, the budget. It is usually better to sow one pound of good seed than two or three pounds of ordinary run-of-the-mill mixtures.

Weed control: Lawn weeds fall into two main classifications — grass-type weeds, that is, the monocotyledons, and the so-called broad-leaved weeds, the dicotyledons. Until scientists working with and in the U. S. Department of Agriculture discovered the miracle of 2,4-D, the appearance of dandelion, plantain and the like meant laborious hand removal.

In a new product recently put on the market, a way has been found to impregnate alkanolamine salts (of the ethanol and isopropanol series)

of 2,4-dichlorophenoxy-acetic acid in a special grade of vermiculite. The resulting product, called 4-XD, is easily applied with the spreader over any turf areas and is a most effective control for broad-leaved weeds. As 4-XD does not contain fertilizer, it is

less expensive than the weed-and-feed combination. Furthermore, it is more adaptable for repeat applications which are required to eliminate resistant low-growing, vining-type weeds such as chickweed, speedwell and ground ivy. For home-lawn use, 4-XD is relatively foolproof. It is safely applied in cool or warm weather, to either wet or dry vegetation. The product is almost completely free from dust, thus practically eliminating drift which is quite a problem where sprays or finely ground, dry materials are used.

In the past, crab grass has been hand-plucked, burned and cursed without appreciable result. Now, thanks again to a merger of horticultural ingenuity with chemistry, the problem is licked. A number of spray compounds and one dry powder are now available for controlling crab grass. When scattered over crab-grass areas either by hand or with the same mechanical spreader recommended for seed and fertilizer, the powder-type compound is caught on the broad crab-grass blades.

When nightfall brings the dew, the particles absorb moisture, a process that fastens them to the blades like barnacles on the sides of a ship. Firmly anchored, the powder feeds its chemicals (chiefly phenyl mercuric acetate) to the crab grass, causing it to wither and die. Two or even three applications of the powder at intervals of five to seven days may be necessary. Crab grass can be treated from late June to mid-September, the best time being while the grass is growing vigorously before seeds form.

Because crab grass is an annual, it is advisable that it be killed off before it goes to seed. Otherwise, hundreds of seeds will be dropped each year to germinate in the lawn the following spring. Unless this cycle is interrupted short of its seeding time, the crab-grass problem will be more vexatious the following year. In fact, even if all active crab grass is destroyed before it seeds, there will be some crab grass in ensuing years, but in much less degree. The seed

of this weed is highly irregular in germination, some of it lying dormant in the soil for several years before sprouting. These stragglers will offer no great problem of extermination and the lawn can be kept free of crab grass, providing any new invasions are quickly curbed.

LAWN AND GARDEN BOOK

If you have read this story, you are interested in beautifying the grounds around your home, and should own *Popular Mechanics* book **HOW TO GROW THE BEST LAWN AND GARDEN IN YOUR NEIGHBORHOOD**. It contains 176 pages of information on landscaping and lawn maintenance as well as how to plant trees and shrubs, and grow flowers and vegetables—the finest in your neighborhood.

In addition, the book contains plans and instructions for making outdoor fireplaces, garden pools, trellises, ornaments and arbors—all of which are presented in *Popular Mechanics* easy-to-understand style. Send \$2.50 for this book and get your beautifying program started this spring. Mail your order to *Popular Mechanics* Book Dept., 202 East Ontario Street., Chicago 11, Illinois.

Cut-Down Card Table Provides Stand for Portable Indoor Sandbox

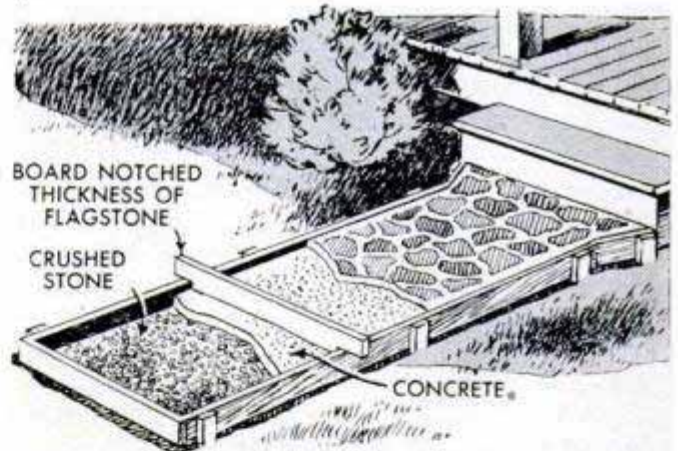


Rainy days won't spoil the youngsters' fun if this indoor sandbox is set up in the basement or playroom. An old card table serves as a stand for the sandbox and, when the sand is poured into a bag, the unit can be folded for compact storage. The legs of the table are cut off about 5 in. from the ends to lower the box to a convenient height for the children. A simple box, or tray, is made by nailing four lengths of 1 x 6 to a 30-in.-square bottom of plywood or hardboard. The bottom of the box is then screwed to the card-table top, all wooden surfaces are sanded smooth and the entire unit is given a coat of bright-colored enamel. When the enamel has dried, the surface is sanded lightly and covered with a coat of clear lacquer. Colorful decals can be applied to the sides if desired. The box is filled with clean sand to about 2 in. from the top. Of course, there is going to be a certain amount of sand spilled on the floor. However, this can be minimized by nailing strips of lattice stock along the top edges of the box sides so they overhang the side members toward the center of the box.

Victor H. Lamoy, Upper Jay, N. Y.

Flagstone Walk Made by Laying Scrap Stone on Concrete

By setting a layer of thin, scrap flagstones in a concrete foundation, I was able to build a picturesque walk at considerably less cost than if I had used standard flagstone. To lay this type of walk, start by digging a bed about 8 in. deep. Then build a form from scrap lumber and stake it into position, remembering that the top of the form will determine the surface of the walk. Spread a layer of crushed stone about 5 in. deep at the bottom of the bed and pour a layer of concrete over it, leaving a clearance at the top which is approximately equal to the thickness of the flagstones you will use. Level this coat of concrete with a notched board, as shown, and place the stones in position. Then fill the joints between the stones with a fairly dry cement



mixture and clean the excess from the faces of the stones, being careful not to remove any of the fill from the joints.

David Lowder, Albemarle, N. C.

Tiny Alnico Magnet in Fountain-Pen Case Cleans Tight Spots of Metal Chips

Readily accessible in your shirt pocket, this little magnet makes it possible to fish particles of metal from almost any small



opening. The tool is made by removing the ink cartridge from an ordinary ball-point pen and inserting a short length of alnico magnet in its place. Usually, a magnet $\frac{3}{16}$ in. in diameter will fit the pen snugly but, if the opening is too small, drill or ream it to the proper size. The projecting end of the magnet is ground to taper.

Andrew Brennan, Philadelphia, Pa.

☛ Tape on the head of a hammer will prevent marring the finish of upholstery tacks.

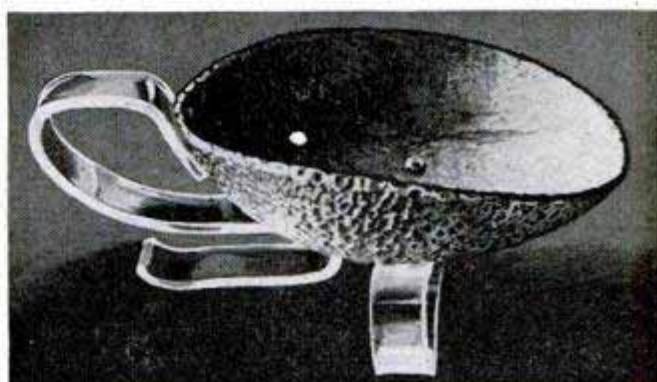


COCONUT *Candy* DISHES

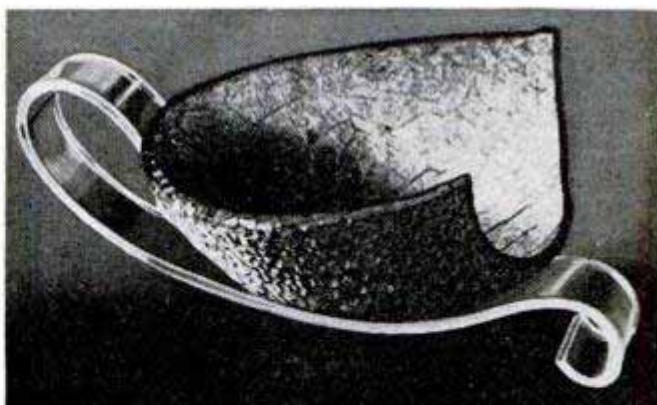
By William J. Erickson

ATTRACTIVE novelties such as candy dishes, servers, planters and nut bowls can be made from parts of coconut shells combined with scrolled handles or hangers of clear plastic. The hard, dense structure of a coconut shell permits sanding and polishing the outer surface to a high luster. It also takes relief carving exceptionally well and a newer finish resembling hammered metal is achieved by cutting an irregular pattern into the surface of the shell with a rotary file driven by a hand grinder. Novel candy dishes and matching planters are easy to make by cutting a large shell in half, crosswise at the center, and then forming a scalloped rim on each of the halves by scrollsawing around the edges. If desired, the outer surface of the shell can be sanded smooth and buffed to a high polish, or the natural ribbed pattern can be brought into somewhat bolder relief by lightly brushing with a wire wheel and then buffing a high polish on the tops of the ribs. This results in a very attractive finish. Working the surface into a relieved pattern with a rotary file and hand grinder is done freehand as pictured on the following page. Care must be taken in this operation to prevent the rotary file from cutting through the shell. After the surface has been completely worked with the rotary file, it is buffed lightly, the buffer being permitted to touch only the tops of the ridges. No other finishing materials, such as varnish, lacquer or wax, are used. The result is the novel and attractive finish on the three pieces pictured above and at the right.

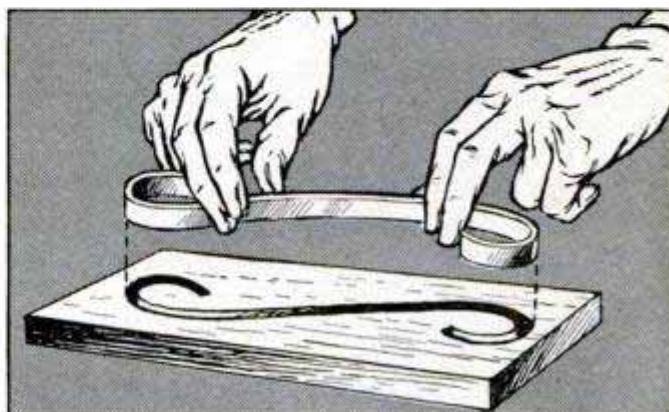
Cutting coconut shells is simple to do if you use a fine-toothed saw. A coping saw

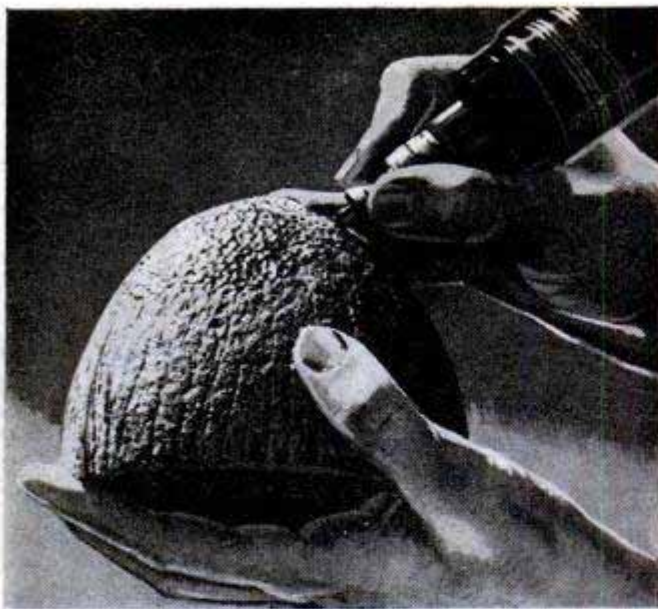


Sawing shell lengthwise gives shallow dish an attractive contour. Reverse bend of handle makes foot

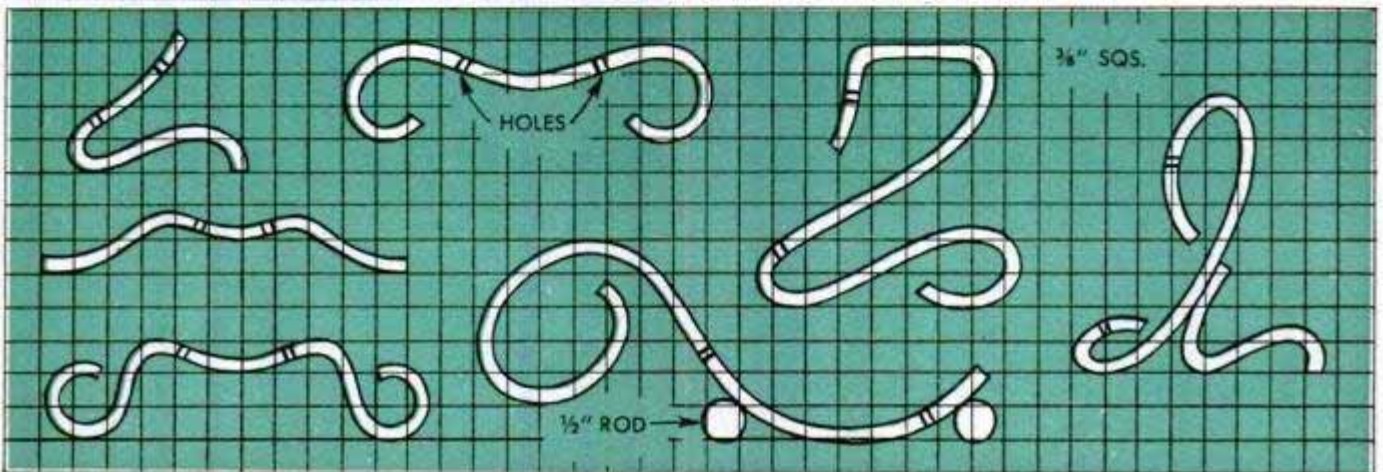


Above, novel server made by cutting away shell rim. Below, heated plastic strip is shaped in wooden form





generally is best. Allow the shell to become thoroughly dry before working it with sandpaper, buffer or rotary file. Scrolled plastic handles and feet as well as hanging bails are easily made by cutting clear plastic into strips of suitable size, heating in the oven until pliable and bending quickly to the approximate shape before pressing the strip into a wooden form as in the lower right-hand illustration on the preceding page. Other shapes are shown in the squared detail below. Attach the formed strips to the shells with small bolts inserted through holes drilled in the plastic and shell. Align the holes and drill them at the correct angle, as otherwise the small bolts will not seat properly.



Helpful Hints to Make Hunting and Camping Trips More Enjoyable

Here are a few tips designed to help the sportsman avoid some of the discomforts which plague his outdoor life. Itching and chafing, caused by woolen clothing, can be prevented by dusting the skin with cornstarch before putting on the garment. A zipper won't stick if it is coated with a little gun oil. Olive oil, rubbed on the hands and face, will protect them from windburn and the cold, while a little vinegar, rubbed on the hands, will keep them from chapping. When washing wool shirts or socks, hang

them up to dry without wringing the rinse water from them and they won't shrink. The socks will wear a lot longer if the heels and toes are rubbed with paraffin after each washing. Wool shirts can be waterproofed by rubbing them lightly with a cloth dipped in lanolin. If castor oil has been applied to the outside of boots, the water-soaked leather will not become stiff when it dries. A strip of emery cloth, glued to the inside of a waterproof hunting coat, will provide a dry place to strike matches.

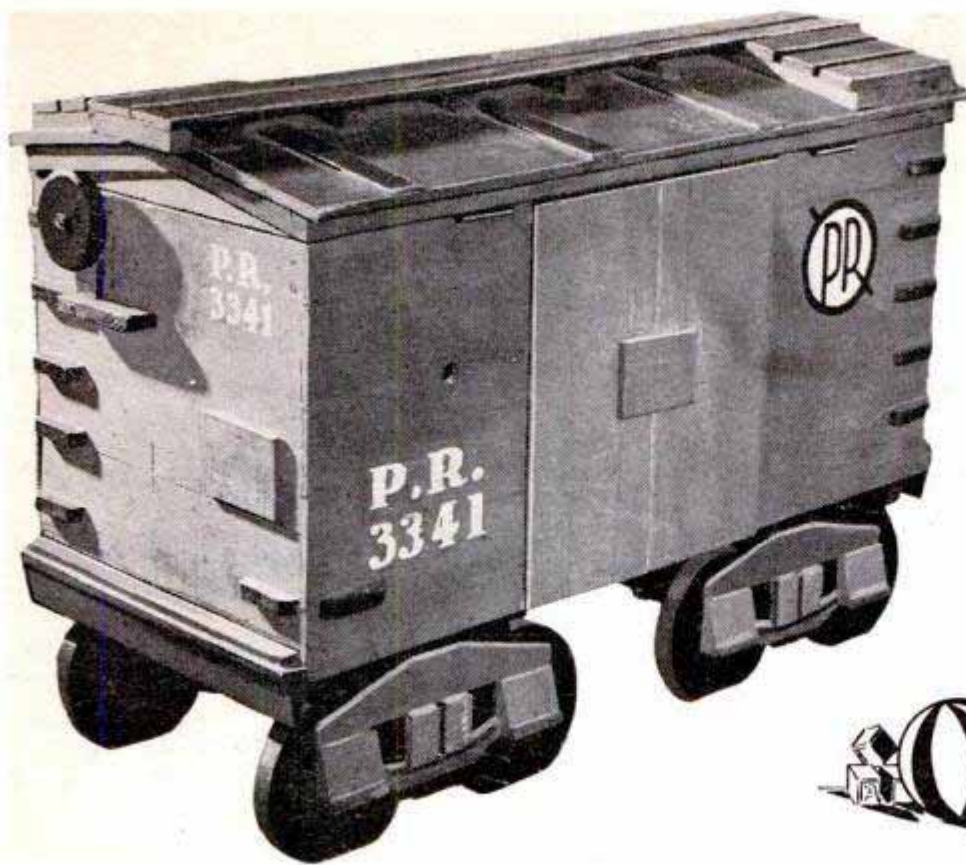
Bed Lamp Provides Extra Illumination for Cash-Register Keys

In places of business where the light is subdued, it is often desirable to have an extra light on the cash register to aid in making change and otherwise handling cash. An ordinary clamp-on bed lamp, having a small fluorescent bulb, will readily suit this purpose. Simply bend the clamp to a shape that allows it to fit over the top of the cash register as in the photograph.

Tom Griberg, Moline, Ill.



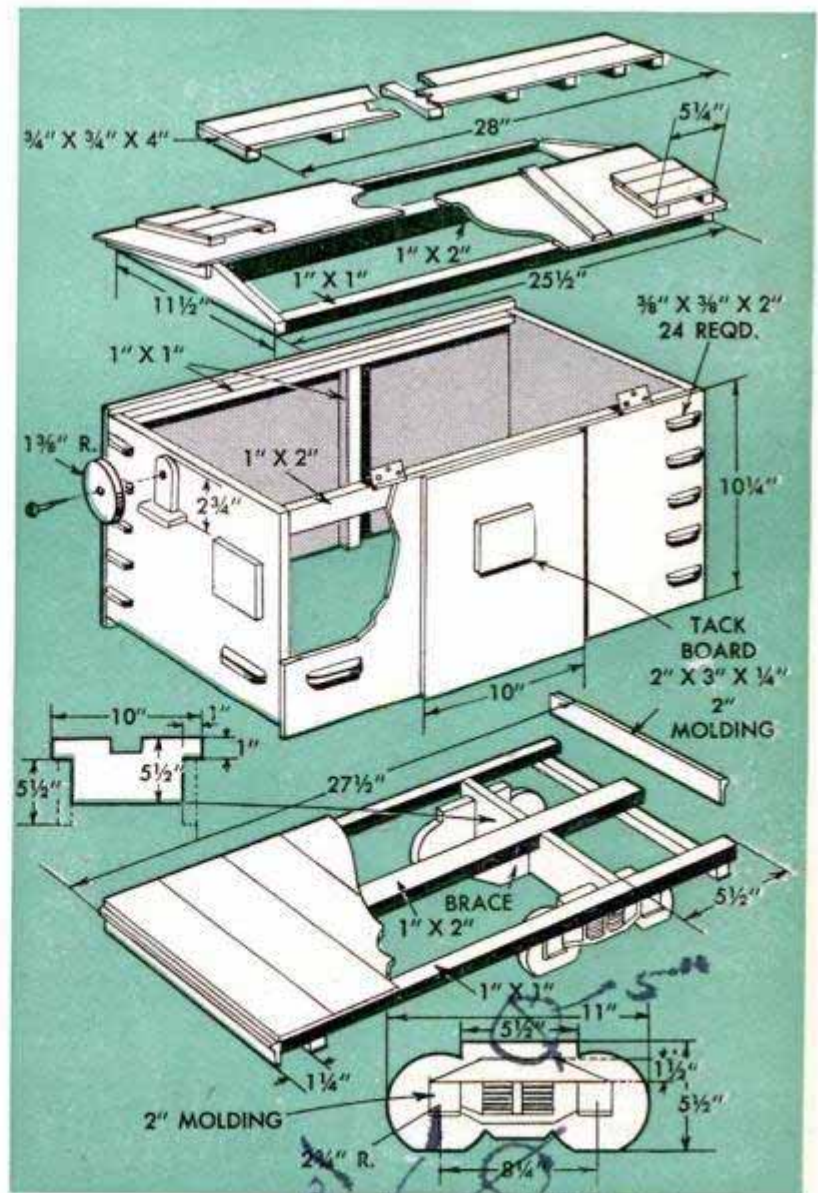
☞ Coating wooden fishing rods and plugs with automobile wax will keep their finish from checking and cracking.



TOY BOX

By F. L. Hendren

YOUNGSTERS will remember this freight-car toy box long after they've outgrown it. Large enough to provide storage for most of the toys in the playroom, the box is made of materials salvaged from orange crates, 1 x 2-in. strips and several wooden Venetian-blind slats or lengths of lattice stock. Endpieces from an orange crate form the boxcar ends. The sides are of 1/4-in. stock tacked to 1 x 1-in. strips, which are nailed to the endpieces as in the detail at the right. The 3/4-in. stock from the crate also is utilized in making the car trucks, and wooden overlays simulate truck frames, bearing boxes and springs. The boxcar top, which serves as a lid, is hinged as shown, and other details on both the top and sides, such as the catwalk, icing doors, brake wheels and grab irons, are made from strips cut from the Venetian-blind slats and fastened with brads and glue. Wheels, car frame, grab irons and brake wheels are painted black, and the rest bright red with the lettering in white.



Solving HOME



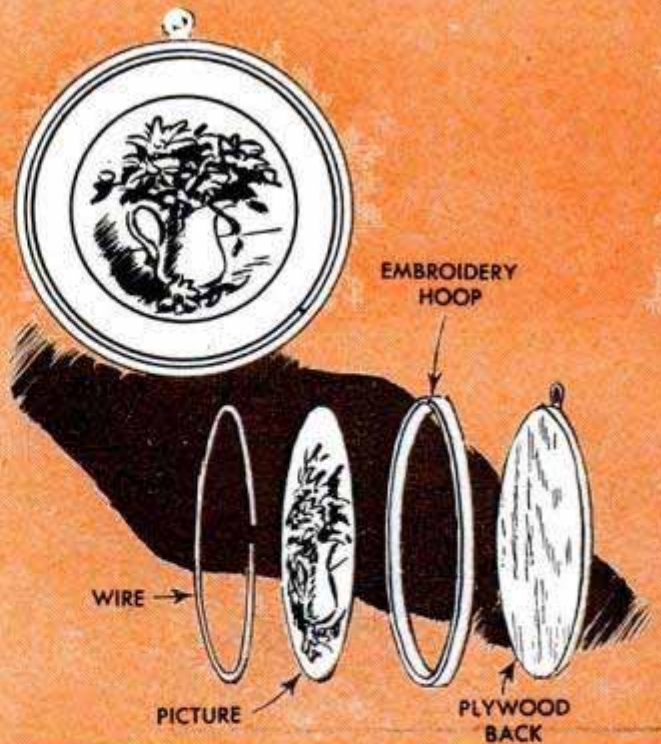
HOLDER FOR BALL OF TWINE is had by mounting a plastic measuring cup on wall or cabinet door. After screwing cup to wall, place the twine in the cup and pass end of twine through hole in handle



CURLED WALL CALENDARS can be flattened by applying water to the back with a cloth or sponge and rolling paper once in the opposite direction. When unrolled, the calendar will hang almost straight

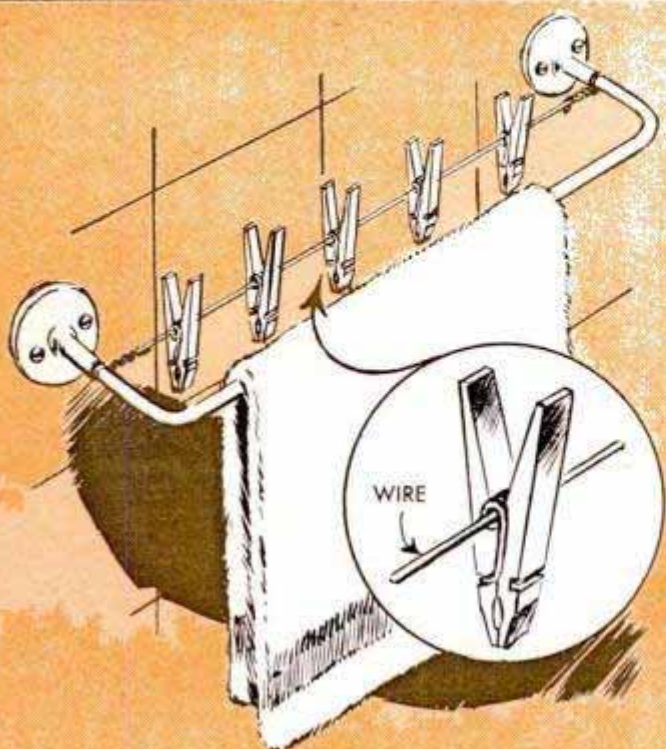


IRONING ASPHALT TILE is a good stunt to remember when laying a new floor. Not only will the heat soften the brittle tile and permit pressing down any curled edges but it makes a better adhesive bond. Set the electric iron for medium heat



QUICKIE PICTURE FRAME can be improvised from an embroidery hoop, plywood disk and wire ring. The hoop is glued to the edge of the disk to provide a molding and the picture is held in place with a spring-wire ring. Regular hanger is attached to back

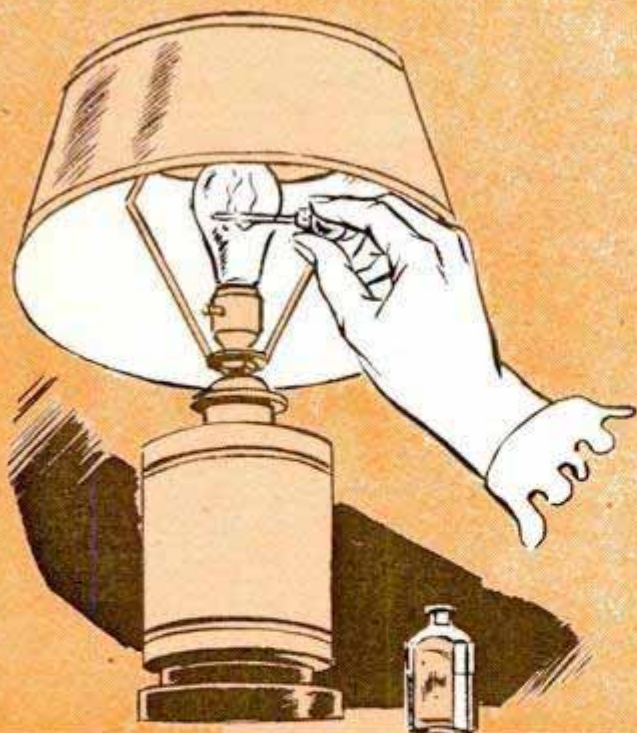
PROBLEMS



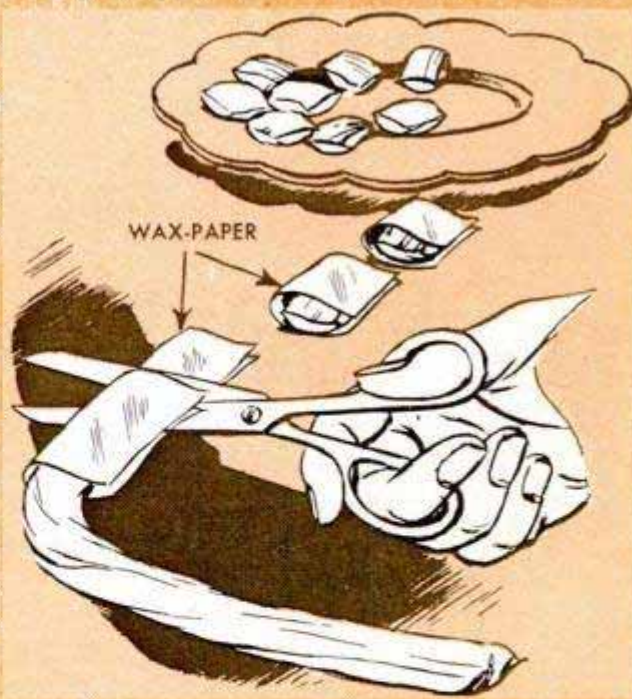
DRYING A FEW CLOTHES in the bathroom is done inconspicuously if the wash is neatly hidden behind a bath towel. Spring-type clothespins are threaded on a length of wire tied between the towel-bar arms



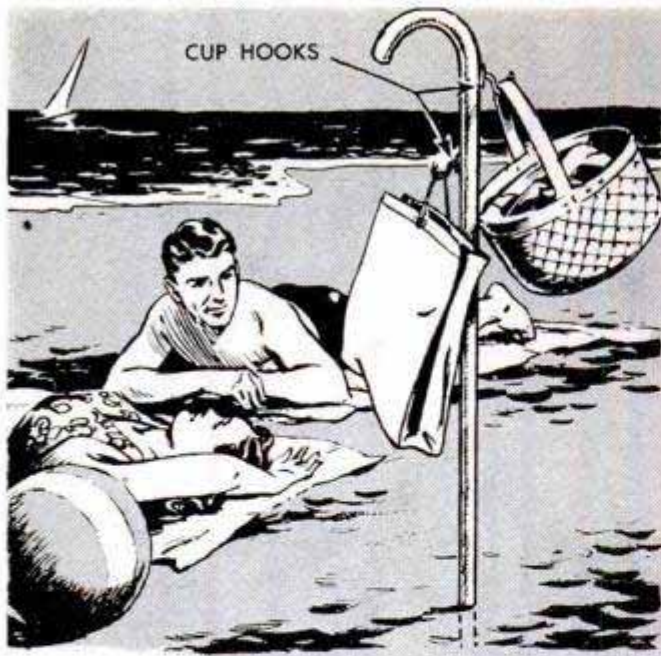
FLOWERPOT SHIELD to protect stems of African violets from rotting is made from a paper plate. Rim of the plate is placed around plant and the cut edges are joined with a strip of cellulose tape



TO REMOVE COOKING ODORS from a room when a deodorizer is not at hand, try placing a little perfume or cologne on the light bulbs of your table lamps. By the time your guests arrive, heat from the bulbs will give off a pleasant aroma to counteract the odor



CUTTING HOMEMADE TAFFY into bite-size pieces is a simple task when you use wax paper and scissors. The sticky taffy is merely wrapped in the paper as shown and snipped off in the sizes desired. The waxed paper keeps the taffy from sticking



"Hall Tree" for Use at Beach Made From Walking Stick

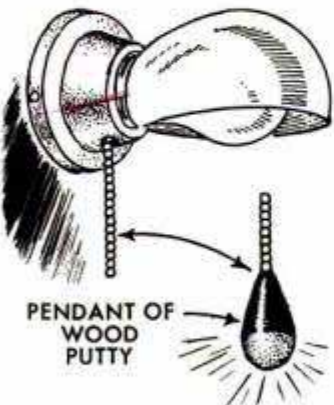
Here is a novel arrangement for those who find it annoying to discover sand in all their belongings after spending a day at the beach. Take an ordinary walking stick or cane and screw cup hooks or L-hooks into opposite sides as shown in the illustration. On arriving at the beach, push the cane into the sand so it will stand by itself and hang your bathing cap, beach bag, and other odds and ends from the hooks.

Norbert Engels, South Bend, Ind.

Fireproofing Fabrics

Draperies, curtains, ironing-board covers, etc., can be fireproofed by dipping them in a solution consisting of borax, 7 oz., boric acid, 3 oz., and water, 2 qts. Soak the fabric thoroughly, wring out and hang it up to dry. It can be ironed when almost dry.

Substitute Pull-Chain Pendant Molded With Wood Putty



If the metal pendant on the pull chain of a wall or ceiling lamp socket breaks off, a new one can be molded quickly from wood putty right on the end of the original chain. Form the putty to a convenient size over the last few beads of

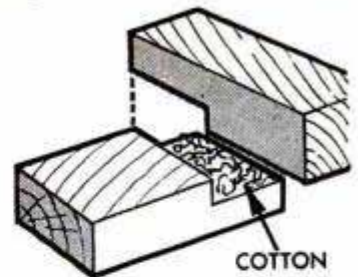
the chain and, after it hardens, paint to suit. If desired, the lower end of the pendant may be dipped in luminous paint.

Scoop Coates, New Brighton, Pa.

Cotton Adds Strength to Glue Joints

When gluing half-lapped joints together, greater strength is added to the joint if a thin layer of absorbent cotton is inserted between the pieces. The cotton serves as a binder between the two glued surfaces of wood. Fine steel wool also can be used for this purpose.

Benj. Nielsen, Aurora, Neb.



Natural Insect Repellents

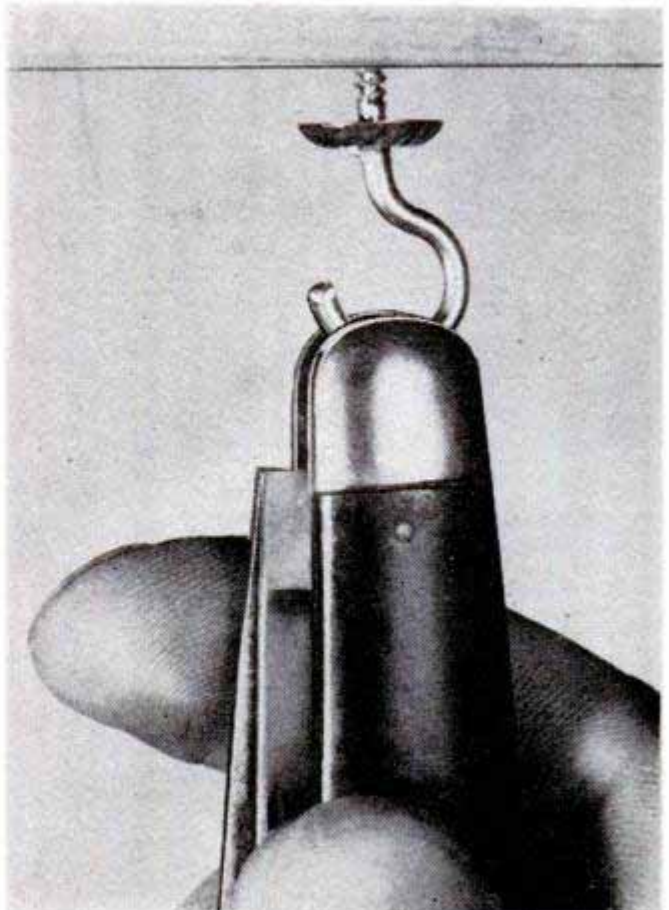
Creating a smudge by burning green fern fronds or damp, rotten cedarwood will keep mosquitoes away. Wild-spearmint leaves, crushed and rubbed on the legs, will guard against chigger bites. Applied to the neck, face and hands, it will ward off black flies, gnats and other flying insects.

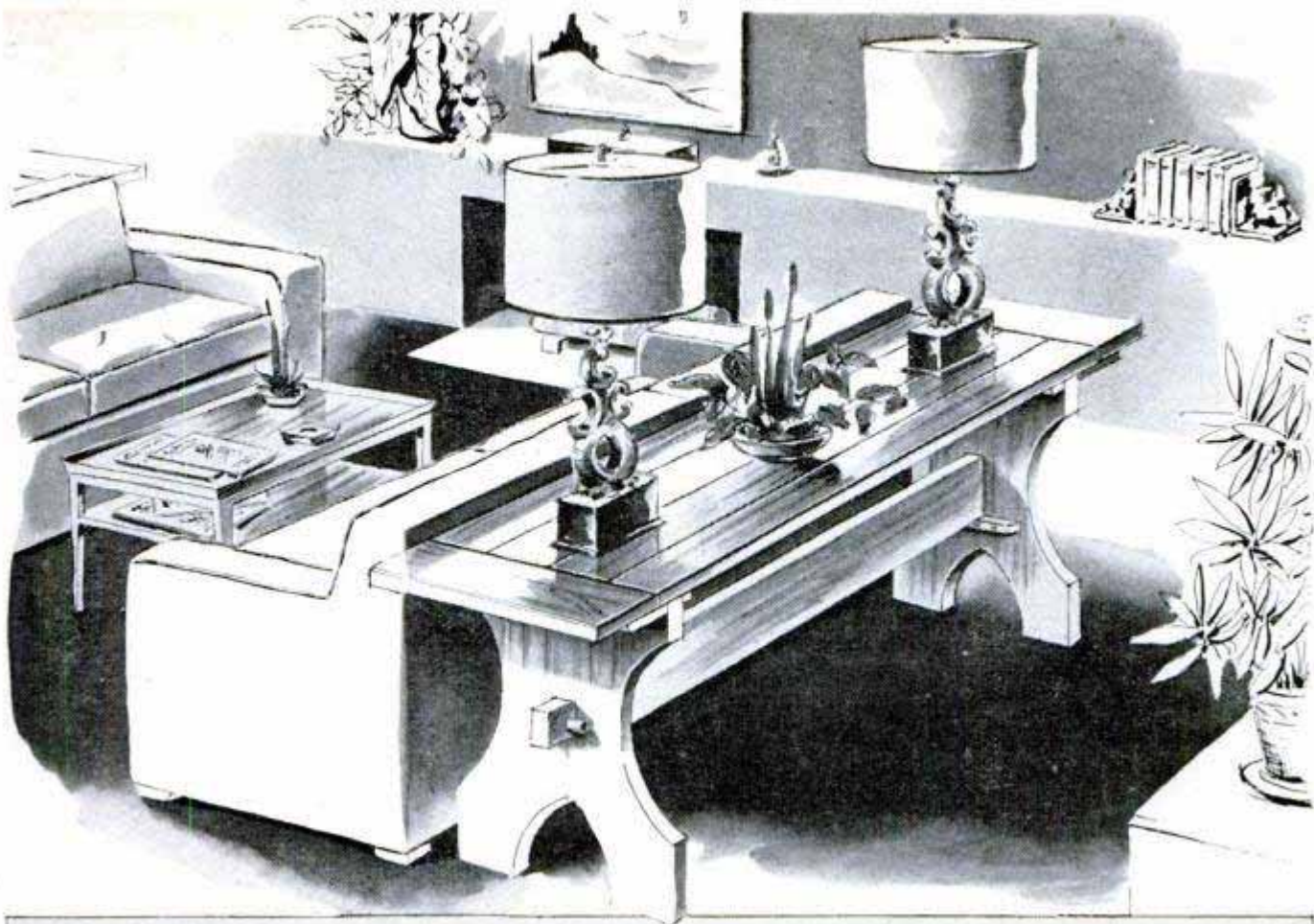
R. A. Jenkins, Los Angeles, Calif.

Knife Handle Drives Screw Hooks

Cup hooks, screw hooks and screw eyes can be driven quickly by engaging the hook in the slotted end of a pocketknife handle and then turning the hook with the closed knife. To avoid unnecessary strain on the knife handle, drill holes for the screws before driving them.

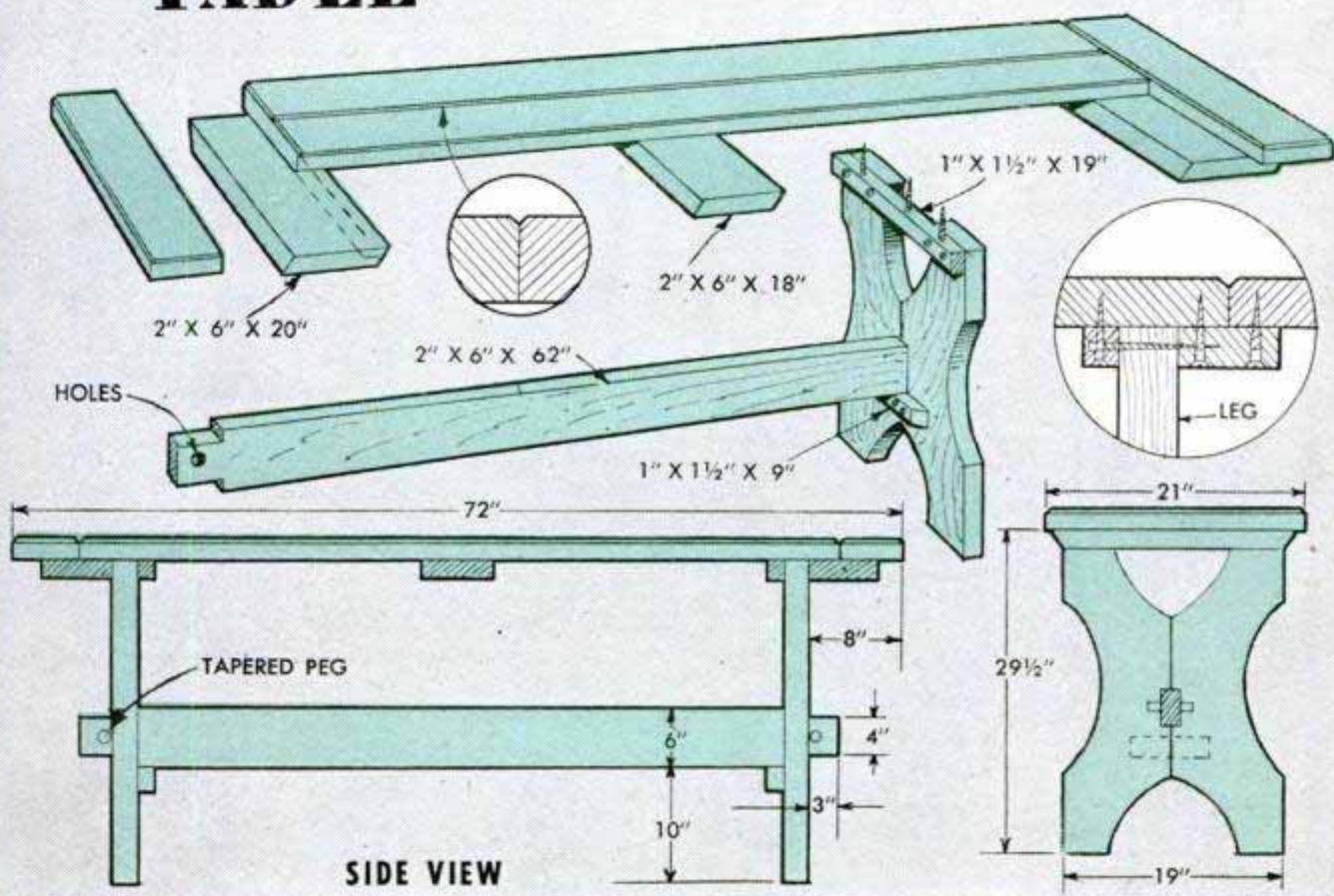
William Swallow, Brooklyn, N. Y.





SOFA TABLE

Where room furnishings include facing sofas, a matching pair of narrow sofa tables stand by ready to relieve the dining problem at large family gatherings. Used alone, side by side or placed one at each end of the regular dining table, they provide a quick-change setup that is ideal for cramped living quarters. The drawings below detail the simple, rugged construction, pine or fir being used and then stained



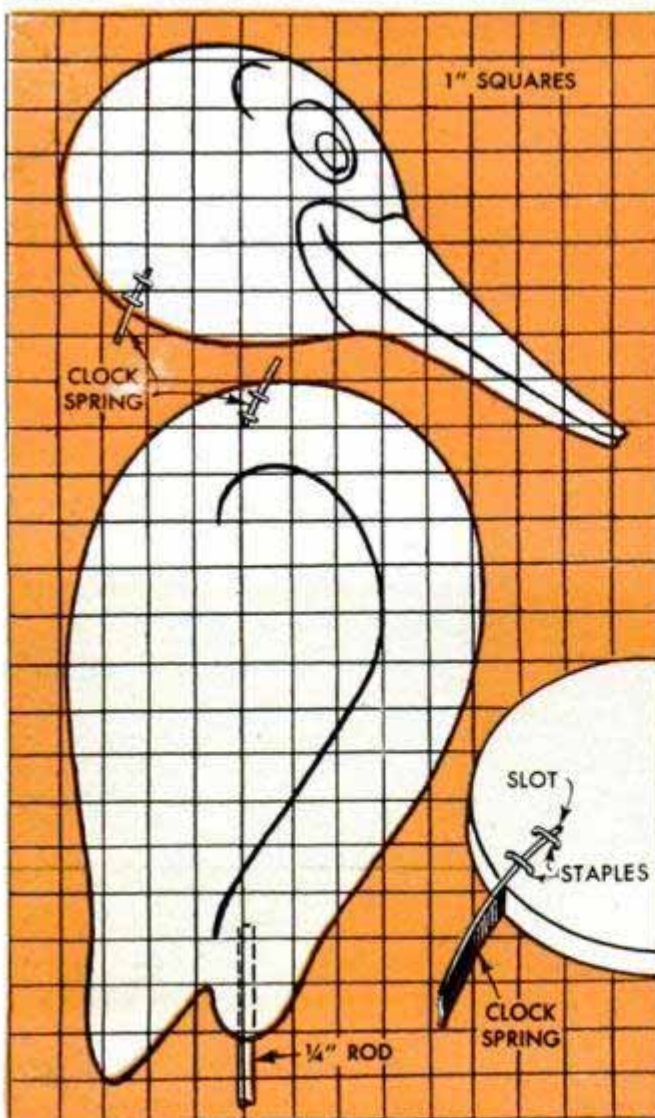
1 EVENING PROJECTS

IF YOU like simple yet practical projects that can be completed in an evening or two, or like an occasional easy one to break the monotony of working on large projects, look over these five "quickies." They lend themselves to the use of hand tools as well as power tools.

CHRISTOPHER, THE CRANE

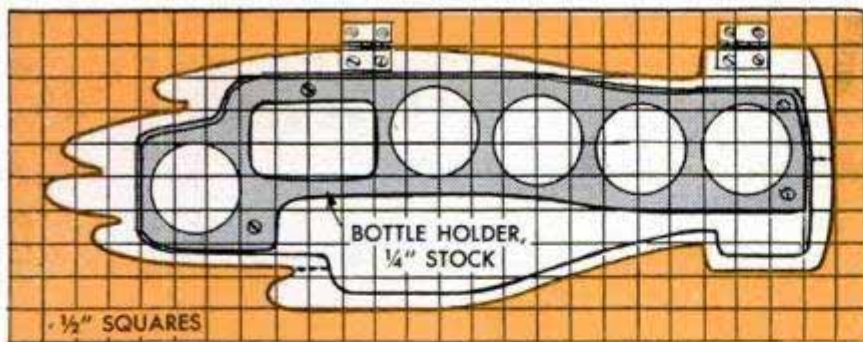
The gangling fellow pictured at the left bobs his head with every gust of wind and feels right at home in a large lily pond or in the small pool of a rock garden. The head and body of the crane are jigsawed from $\frac{3}{4}$ -in. stock and his single leg is a length of $\frac{1}{4}$ -in. rod. Ordinary curtain rod painted orange will do. A piece of spring steel about $\frac{1}{2}$ in. wide and 12 in. long, such as heavy clock spring, forms Christopher's neck. The ends of the spring are inserted in slots cut in the head and body, the spring being wedged in place with nails driven through the edges of the wood and against the metal. Staples driven over the edges of the spring, as in the detail, keep it from slipping sideways. Head, neck and body of the crane are painted white, while the bill is finished in orange. The mouth, eyes and wing outlines are added with black paint.

Christopher, the Crane

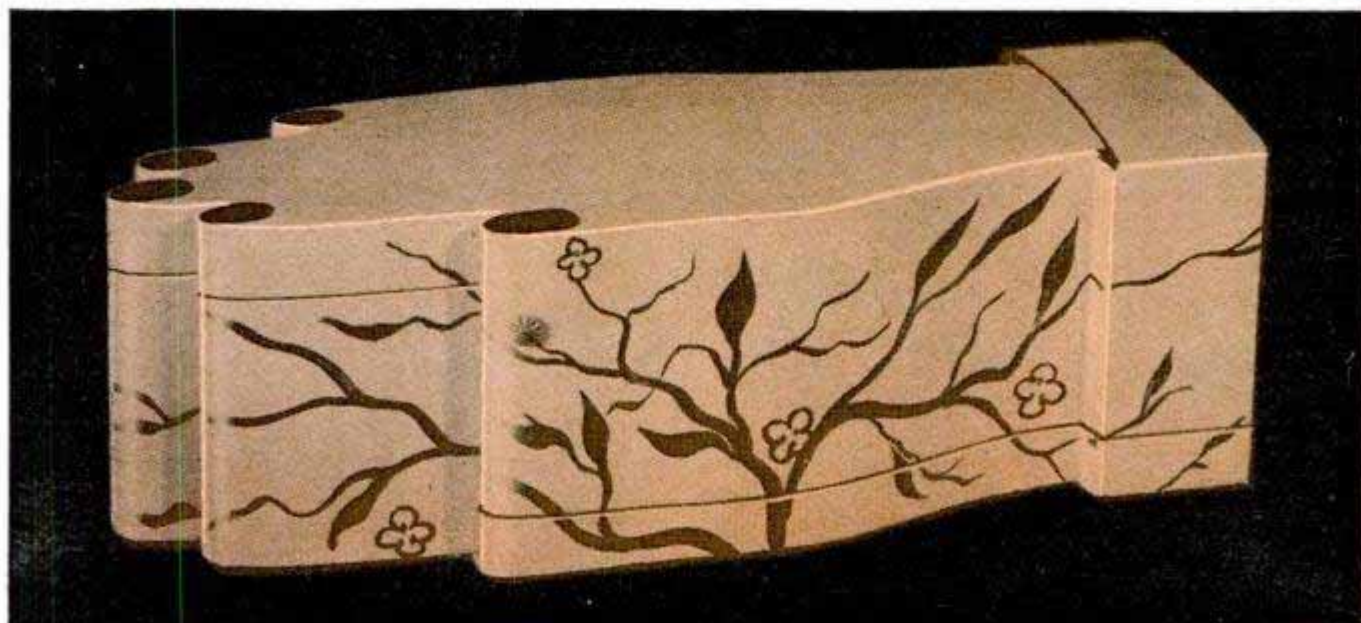
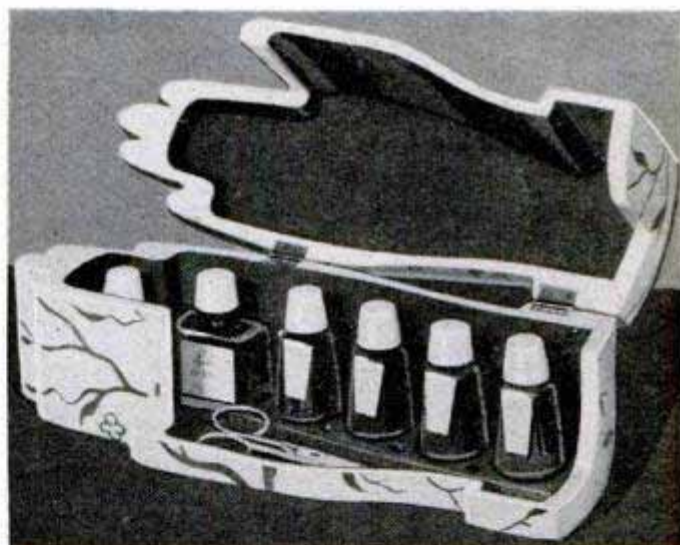
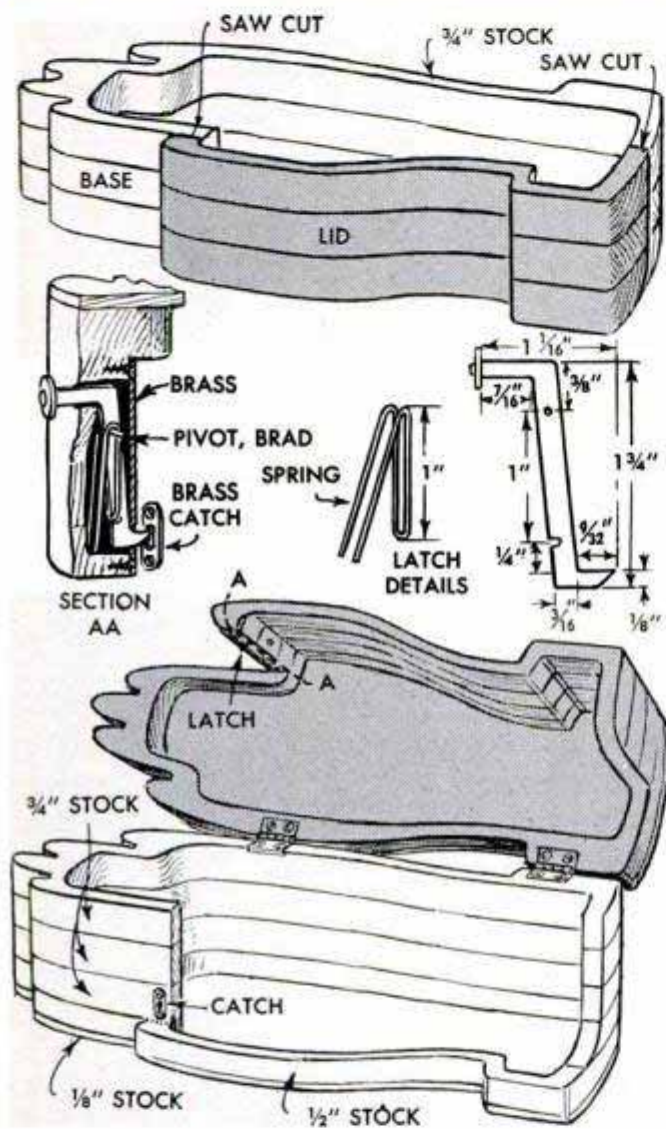


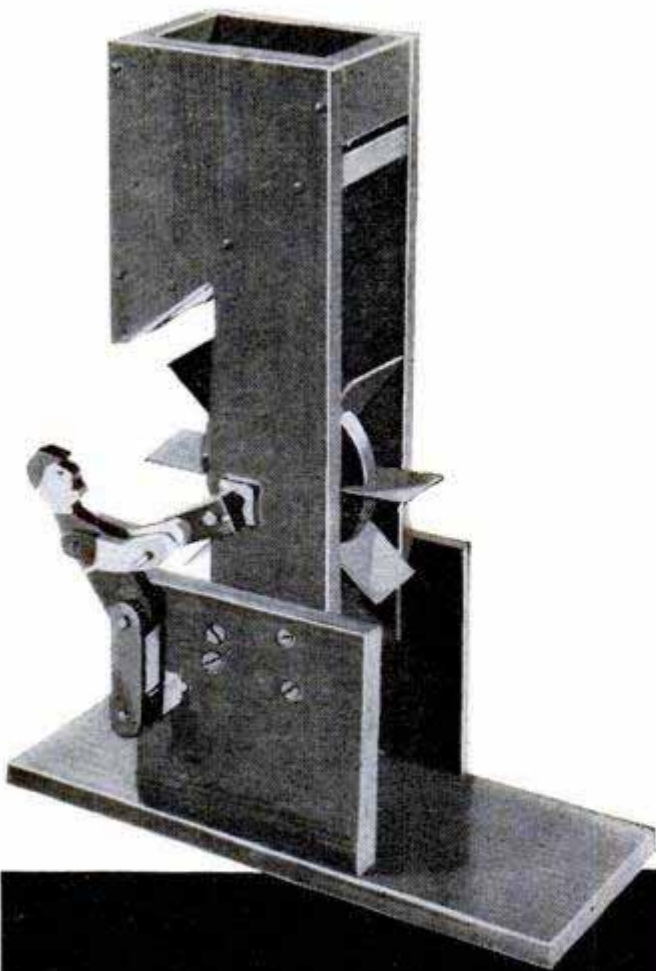
NAIL-POLISH BOX

Outfitted with fingernail polish, file, scissors and similar needs, this unique box forms a useful and attractive manicure kit for the top of a vanity. To make the box, enlarge the squared pattern to provide a template for jigsawing four pieces of $\frac{3}{4}$ -in. stock, one piece of $\frac{1}{2}$ -in. stock and two pieces of $\frac{1}{8}$ -in. stock to the shape of a hand. Cut out the center portion from all the pieces except those of $\frac{1}{8}$ -in. stock, which are used to form the bottom of the box and the top of the lid. After gluing three of the $\frac{3}{4}$ -in. layers together cut off the portion indicated by the gray tint, and glue this section to the fourth $\frac{3}{4}$ -in. piece to form the box lid. Assemble the box as in the lower detail and screw the $\frac{1}{4}$ -in.-thick bottle holder to the bottom of the box. Be sure that the holes cut in the bottle holder are of the correct size and shape for the particular style of nail-polish bottle to be used. The spring latch is optional, and can be made as shown in the center details.

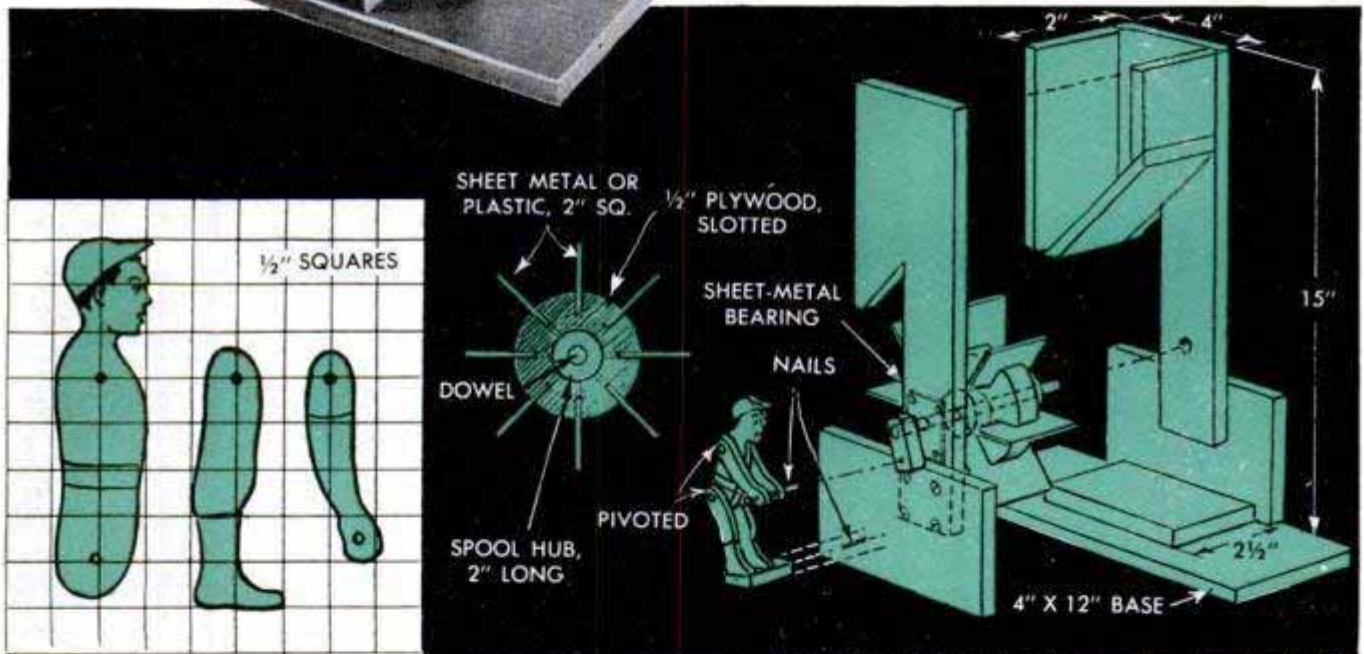


Nail-Polish Box

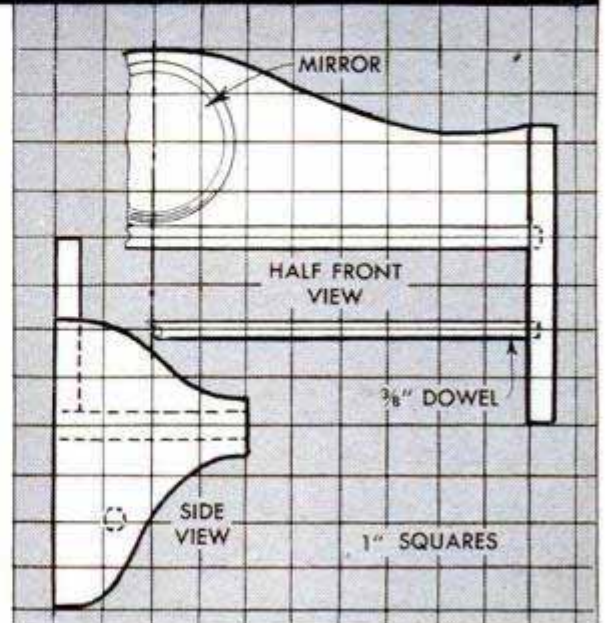




Sand Toy



Towel Bar and Shelf



The latch is cut from a piece of $\frac{1}{32}$ -in. brass and, after it is installed in the mortise, a brass disk is soldered over the tenon on the outer end to serve as a push button. The brad on which the latch pivots is driven from the inside of the lid into the offset formed by the thumb tip. Note that the mortise is covered with a strip of brass.

SAND TOY

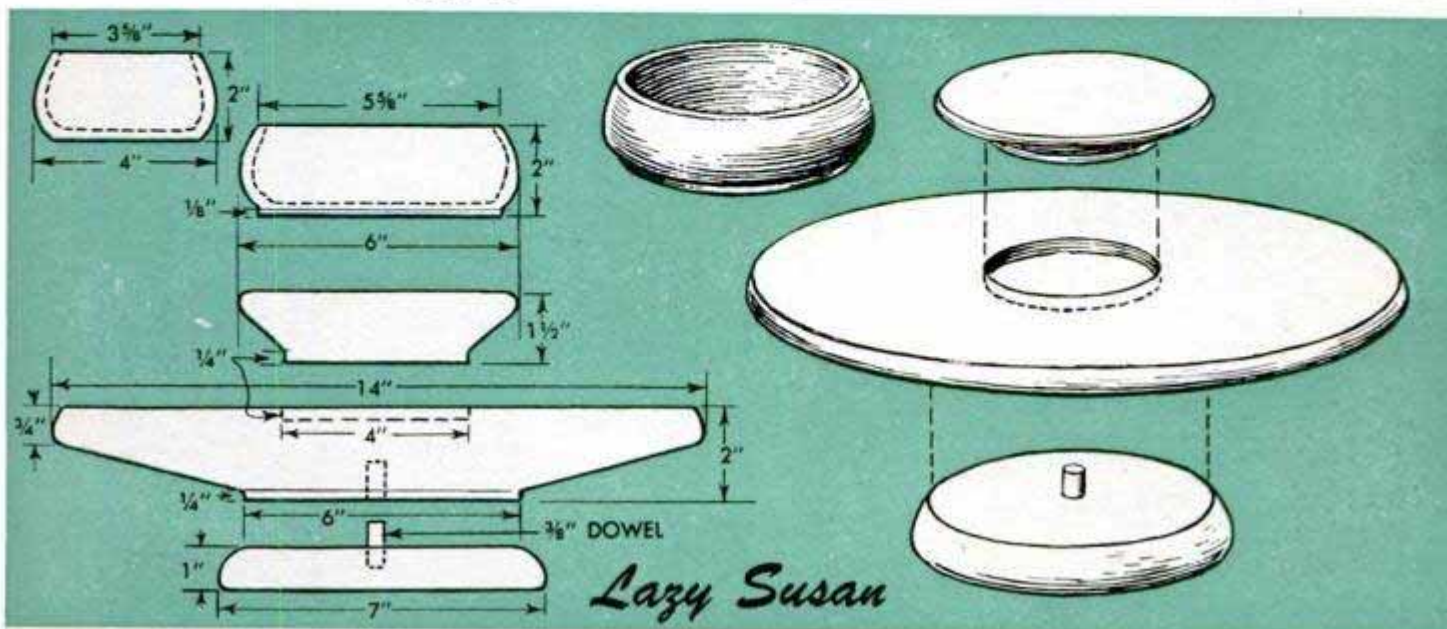
Youngsters will spend many an hour pouring sand into the toy hopper just to see the little man busily crank the paddle wheel. Made entirely from scrap wood plus a few squares of sheet metal or plastic for the paddle-wheel blades, the toy can be cut out and assembled in an hour or two.

TOWEL BAR AND SHELF

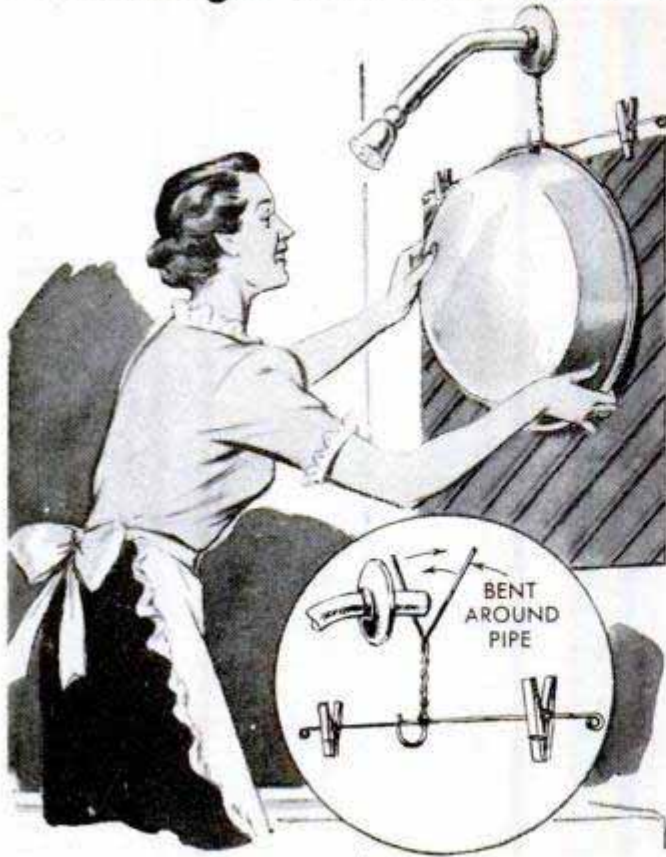
Hanging this dual-purpose shelf on the bathroom wall affords an extra towel bar in addition to increasing the storage space for cosmetics, hairbrushes, etc. A small mirror glued to the shelf back increases its utility. When fitted with a mirror and mounted at just the right height for a small child, the shelf forms a personalized "vanity" that is considerable help in teaching the youngster to comb his hair and wash his hands and face. The shelf, which is assembled with glue and brads, can be stained or enameled to suit.

LAZY SUSAN

A lathe project having a pleasingly simple design, this Lazy Susan can be used with or without the individual bowls. The large tray rotates on a dowel which is glued to the base, and a removable tray is fitted in a mortise cut in the center of the large tray. So that each of the small bowls will be turned to exactly the same size and shape, it is best to use cardboard templates to check both the inside and outside surfaces of the work as turning progresses.



Coat-Hanger Wire Forms Holder for Basins and Rubber Bath Mat

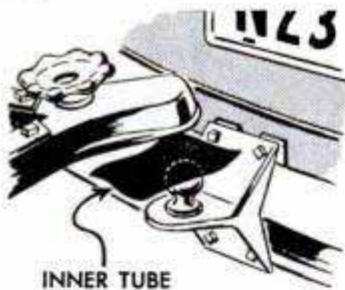


In small apartments and cottages where storing bathroom utensils becomes a problem, a rubber bath mat and several basins can be kept out of the way by hanging them from the shower arm. This is done by making a combination holder from a wire coat hanger as shown in the detail. The hooked portion of the hanger is cut off to leave two arms, 3 or 4 in. long. These are bent around the shower arm and concealed by the wall flange. To hold the bath mat, two spring-type clothespins are threaded on a wire crosspiece which also is cut from the coat hanger. The wire is passed through an opening made by separating the twisted wires of the hook and is bent over at both ends to keep the clothespins from slipping off. If the bathroom wall is tiled, the basins and bath mat can be hung up wet.

G. Jaffin, Silver Spring, Md.

Trailer-Hitch Shock Absorber

To overcome the usual jerk and chatter of a ball-and-socket trailer hitch, place a square of inner-tube rubber over the ball



before lowering the socket connection. This also will help to keep the hitch from loosening as a result of vibration. — G. E. Hendrickson, Argyle, Wis.

Yard Umbrella of Sheet Aluminum

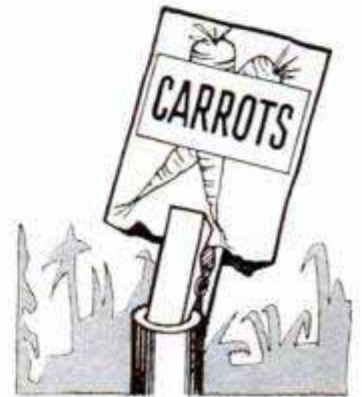
Waterproof and rustproof, this aluminum yard umbrella can be left up the year 'round without deterioration from the elements. Sheet-aluminum sections are riveted or welded to bowed stays which also are of aluminum. The umbrella assembly is supported by a wooden upright or one of aluminum or stainless-steel tubing. An application of outdoor paint will improve the appearance of the umbrella, and a novel effect can be attained by applying a different pastel shade to each sheet-metal section, painting the upright a neutral color.

Dog Hair Kept From Clogging Drain

Next time you wash your dog in the bathtub try placing a wad of steel wool in the drain opening. The steel wool strains out the dog hair which might otherwise clog the drain.—Linda Larsen, Ludington, Mich.

Garden Row Marker

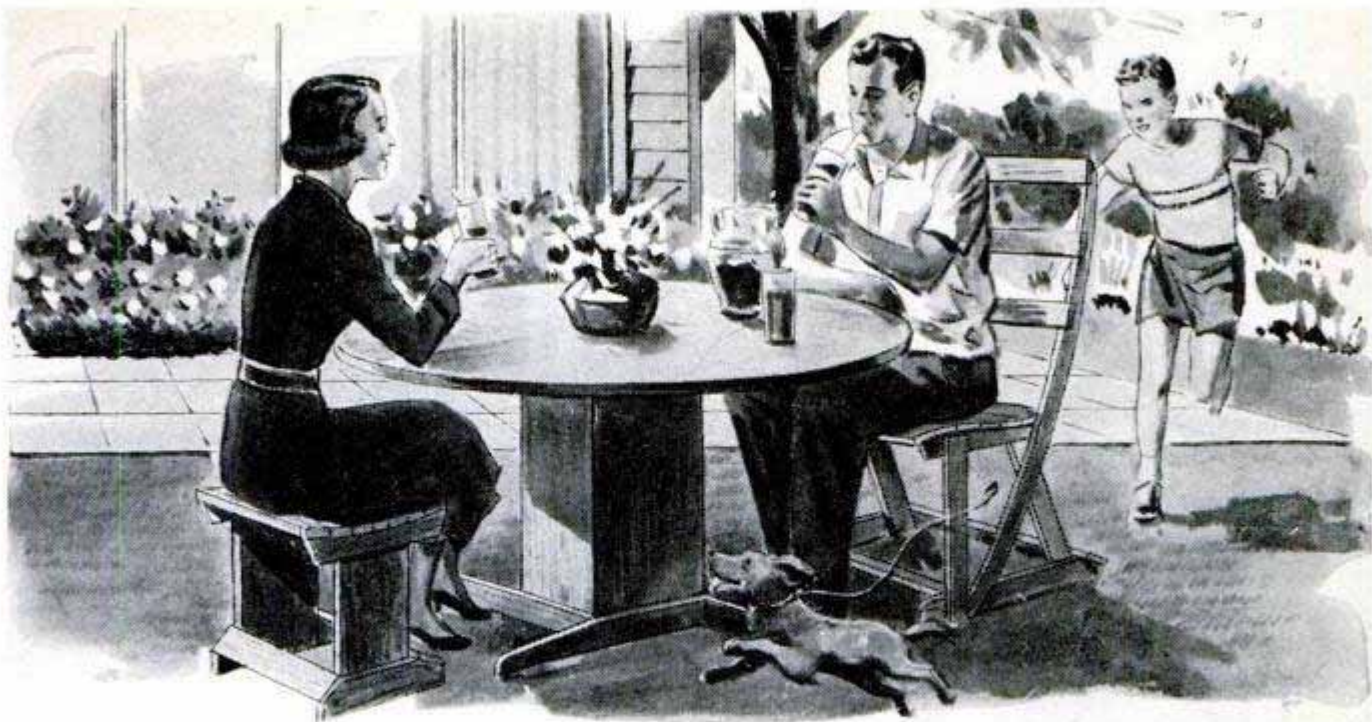
Durable row markers for the garden can be made from short lengths of water pipe and spring-type clothespins. Drive the pipe into the ground and insert one leg of the clothespin in the end of the pipe.



Then catch an empty seed package in the jaws of the clothespin to mark the crop. An alternative is to fasten the clothespin to the top of a wooden stake with a screw or nail.

Withstands Inclement Weather





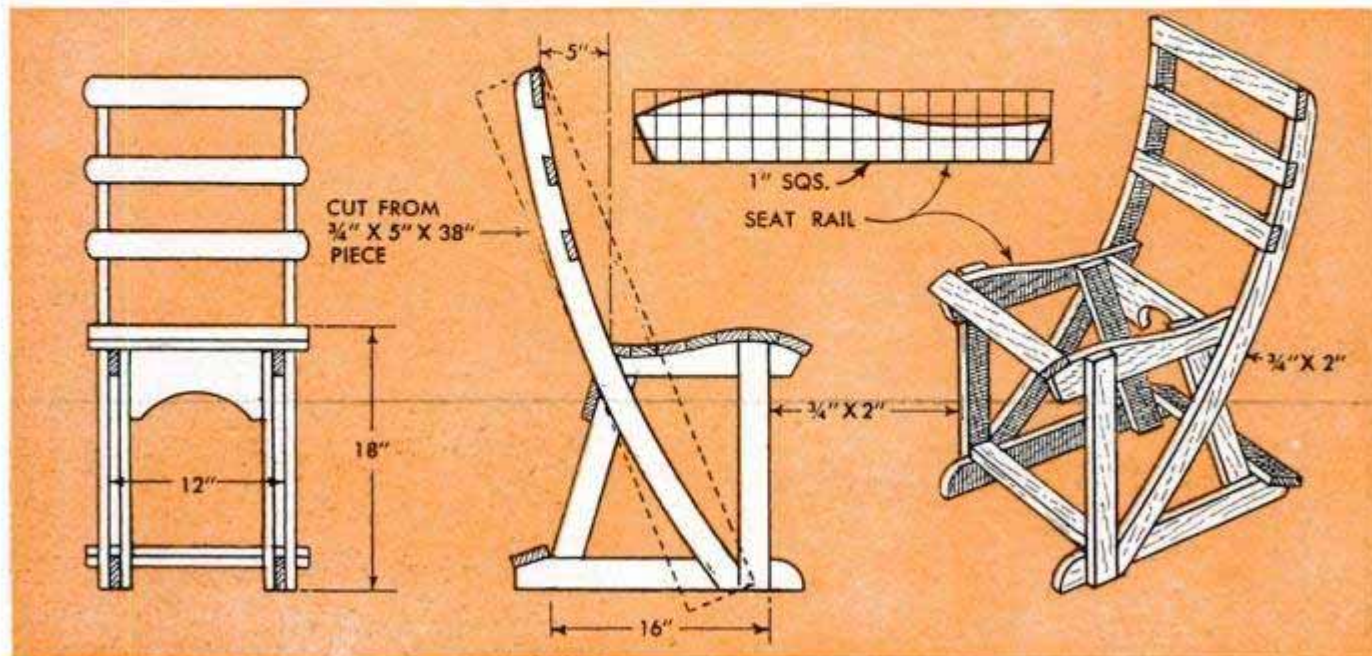
WEATHERPROOF GARDEN SET

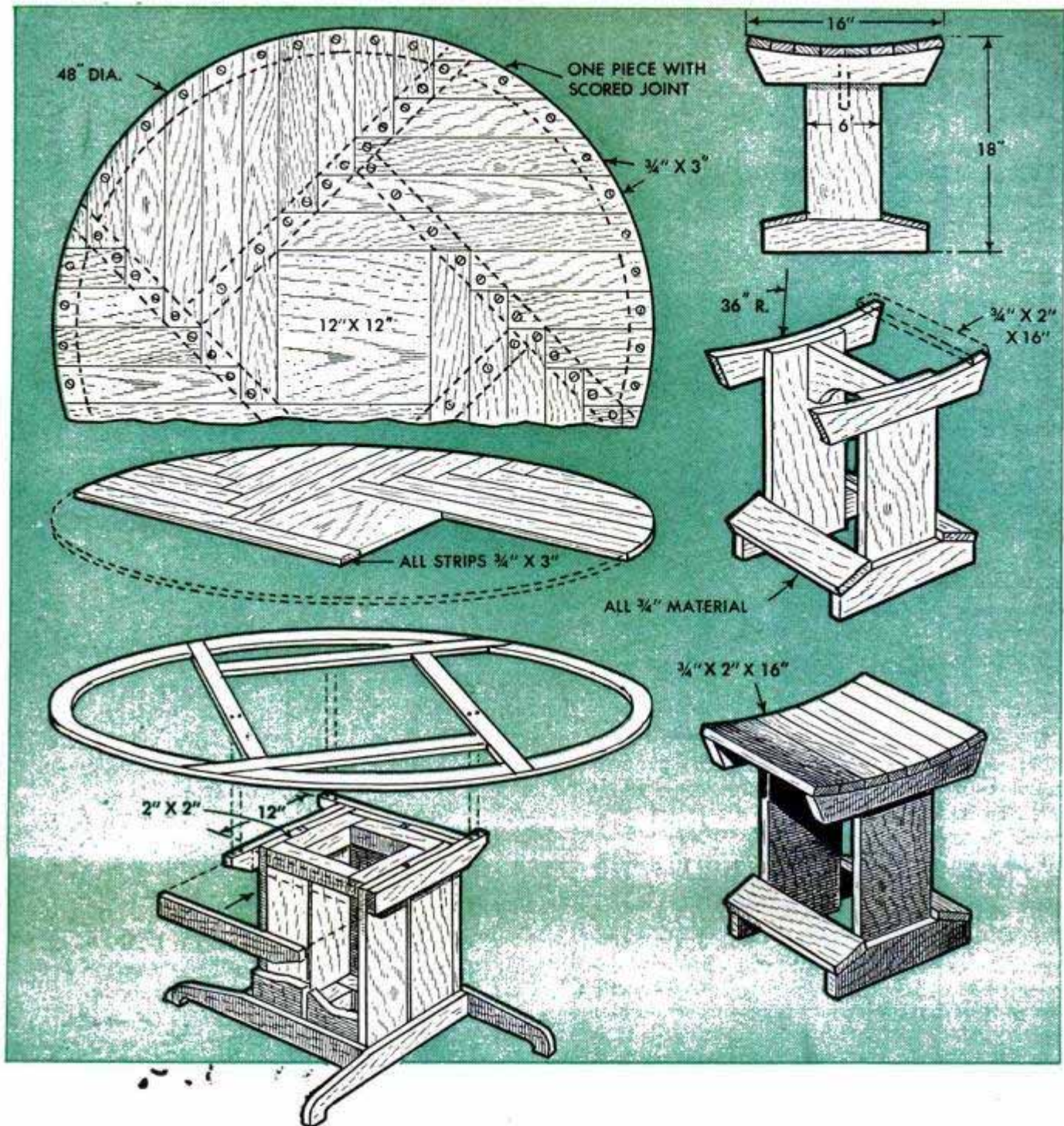
INCLUDING a sturdy round table for dining or playing games, plus as many chairs and stools as may be needed, this attractive set of garden furniture can be left outdoors regardless of the weather. The set is unpainted, which allows the elements to supply a mellow, weathered patina to the pieces. Cypress and redwood are excellent for this purpose, but, of course, the set can be made of pine or fir and painted. In this case, however, it is best to store the furniture indoors through the winter months. The pieces are assembled with waterproof glue and galvanized screws, the latter being countersunk and the holes plugged.

The chair detailed below features a com-

fortably curved back, the rails of which are bandsawed from $\frac{3}{4}$ x 5-in. stock. The seat rails are cut to the squared pattern, and both back and seat slats are of $\frac{3}{4}$ x 2-in. material. If desired, the ends of the back slats may be rounded as indicated in the left-hand detail.

The table consists of a novel planked top screwed to a single pedestal. The pedestal is made as shown in the lower left-hand detail on the following page. Each of the four arms at the top extends 3 in. beyond the side of the pedestal to support the table-top frame, the latter being fastened to the arm extensions with countersunk screws before the top boards are assembled. Four 24-in. legs provide a sturdy





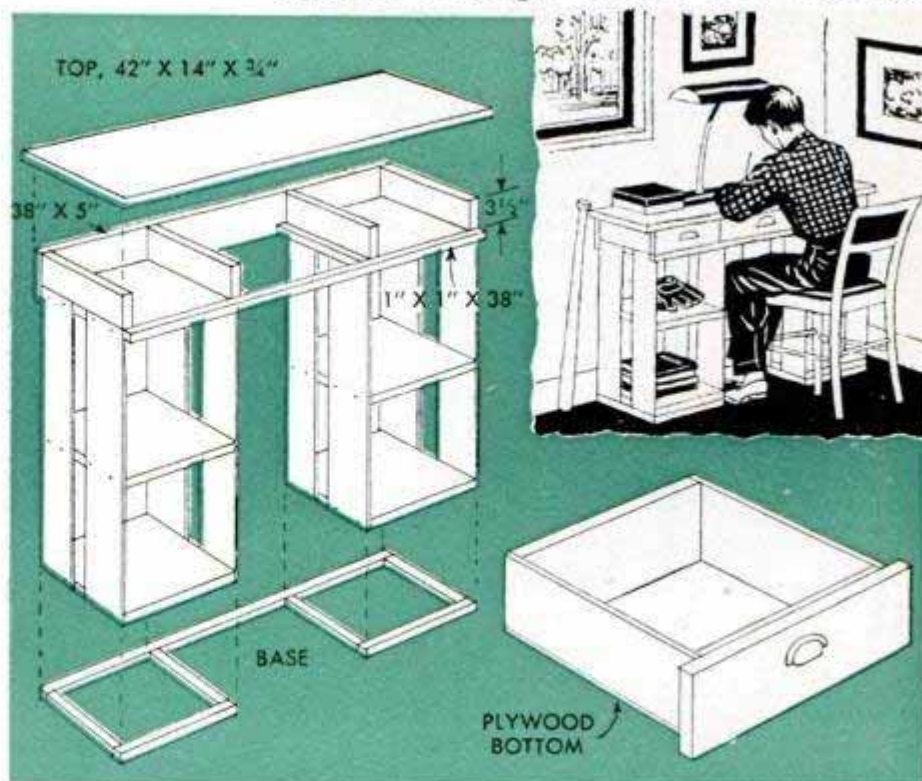
base for the pedestal which stands 29 in. high with the legs in place.

The table-top frame consists of a large wooden ring having four cross braces. To save material when bandsawing the segments of the ring, it is a good idea to glue short lengths of stock together to approximate the desired radius and then bandsaw the segments from the glued pieces. The width of the bandsawed segments should be at least 2 in., and they can be assembled to the four cross braces in either of two ways. They can be glued together to form the complete 48-in. ring and notched to permit half-lapping the ends of the braces. Or, each segment can be cut to length and then doweled and edge-glued to the cross braces. After the frame has been mounted on the top of the pedestal, the 12 x 12-in. center panel and the 3-in.-wide boards are

fastened in place with screws and edge-glued together. The center panel should be blocked up so that its surface is flush with the rest of the table top. The boards which are used to plank the table top are cut to approximate length before assembly, and after the top has been completely covered, the projecting ends of the boards are cut off and planed flush with the outside edge of the circular frame. Note that the pieces used to cover the frame at the cross-brace joints are wider than 3 in. and are scored to give the appearance of two pieces instead of one. This is done to eliminate the use of four small sections of board which could be fastened only to the outer ring of the frame. Several matching stools provide comfortable seating facilities around the table. These are of simple construction, as shown in the details above.

This handsome little desk is especially suitable for the children's room and will provide them with a place of their own for doing homework or other writing. It can be built quickly and at a minimum cost since much of the material is provided by two orange crates which, left intact, are used as the pedestals. Start the job by checking the corners of the crates to see that they are square. Tighten any loose boards, adding nails if necessary, and sand all surfaces which will not be covered in the construction. Cut the drawer dividers, from $\frac{3}{4}$ -in. stock, to fit exactly across the top of the crates. Attach them with nails, driven from the underside of the tops, being careful to keep the parts parallel so that the drawers will slide evenly between them. The back rail, also $\frac{3}{4}$ -in. stock, fits flush with the top edges of the dividers, but extends $1\frac{1}{2}$ in. below the crate tops so it can be nailed to the backs. Next, cut the 1×1 -in. pieces to size. In attaching the base pieces to the pedestals, $1\frac{1}{2}$ -in. wood screws should be used, countersinking them to avoid scratching floor surfaces. The front rail and the center drawer runners may be nailed in position. Now cut the drawer pieces. The fronts are 1-in. stock, the sides and endpieces are $\frac{1}{2}$ -in. stock and the bottom is $\frac{1}{4}$ -in. plywood or hardboard.

Attractive Desk for Children's Room Utilizes Orange Crates as Pedestals



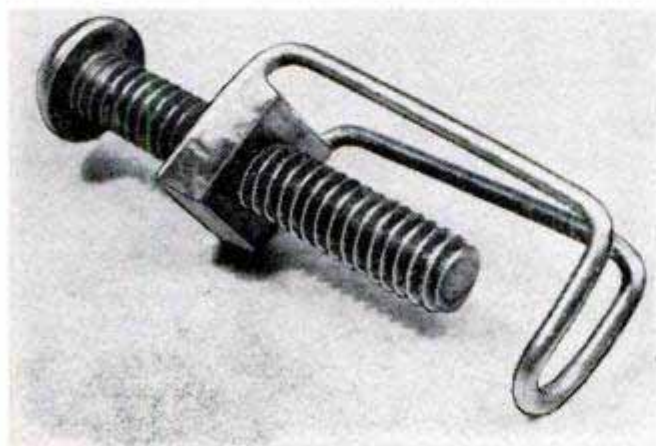
Assemble as indicated, leaving a $\frac{1}{8}$ -in. clearance at the sides and tops of the drawer openings. The bottom pieces are attached to the drawer frames with $\frac{1}{2}$ -in. countersunk screws. Sand the bottom corners lightly and attach the assemblies to the drawer fronts with 1-in. screws. After the drawers are fitted to slide smoothly, attach the desk top with $1\frac{1}{2}$ -in. screws. Countersink the heads about $\frac{1}{8}$ in. below the surface and fill the holes with wood putty. Finish by sanding all surfaces of the desk and applying two coats of paint, or stain, seal and apply shellac or lacquer.

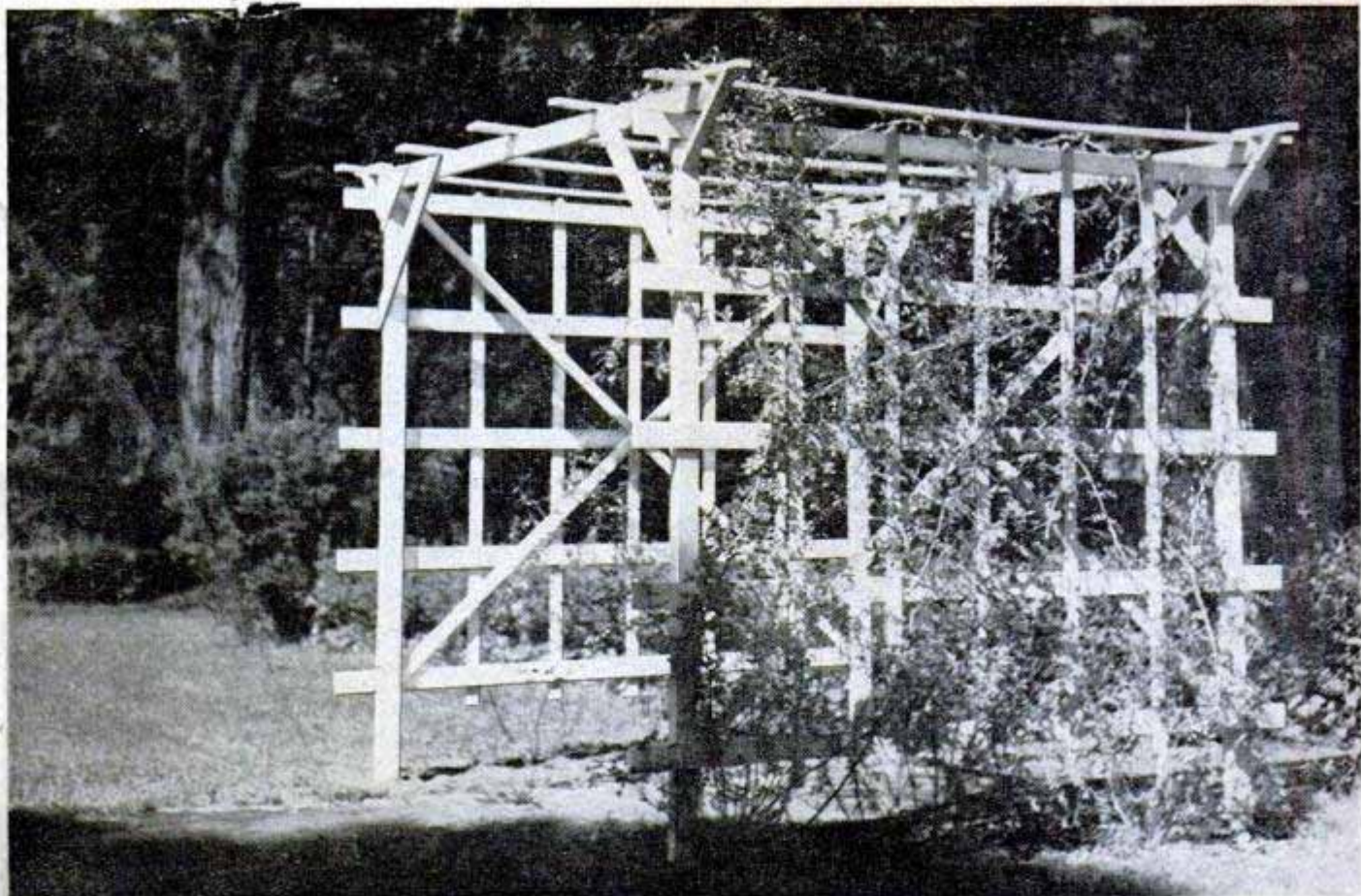
Frances E. Bate, South Berwick, Me.

Modelmakers' Small C-Clamps Made From Bolt and Stiff Wire

Lightweight C-clamps, which often come in handy when building models, can be improvised from stove bolts and stiff wire at a cost of only a few cents each. After the wire is cut to the desired length and

folded double, the ends are soldered to opposite sides of the nut. Then the wire is bent to a U-shape and the bolt turned into the nut to form the clamp screw. The size of the clamp opening is determined by the length of the bolt. A metal shim inserted between the work and the end of the bolt will protect the work surface. The clamp can be fitted with a thumbscrew grip by soldering a metal washer in the bolt slot, and a swivel head for the clamp screw may be fashioned from a second nut. To do this, several of the threads are filed from the end of the bolt to form a tenon, and the nut is slipped over the tenon. Then the end of the tenon is peened over to lock the nut in place. The edges of the hole in the nut should be chamfered so the peened portion of the tenon can be filed flush with the face of the nut.—Ed Packer, Chicago.





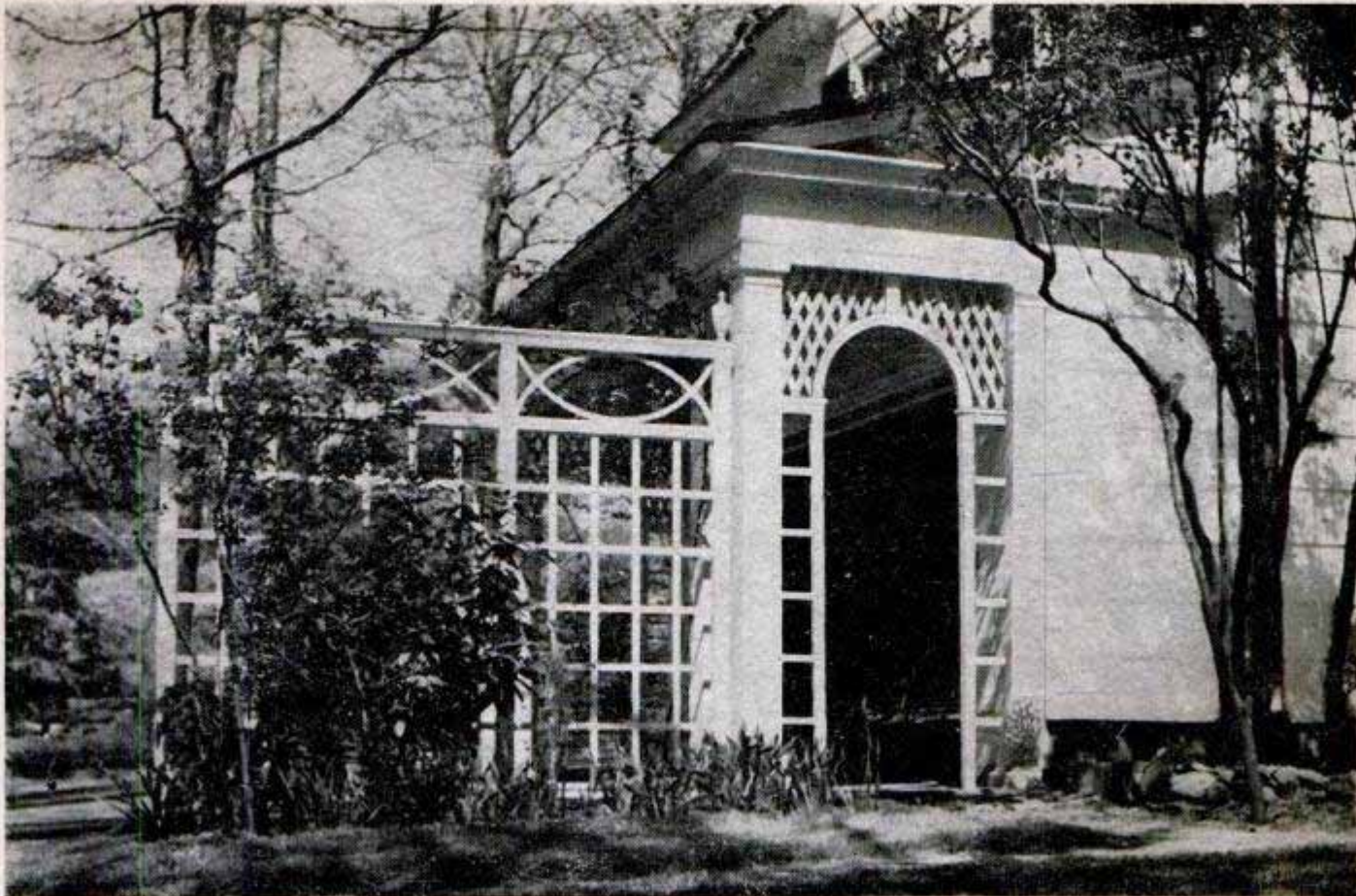
ARBORS and TRELLISES

By Max Alth

CAREFULLY planned placement of ornamental trellises can make a house appear wider, higher or lower, and the simple formality of an arbor lends interest and completeness to any garden. Trellises also are used to screen unsightly corners, conceal the garbage can, serve as a wind-break for delicate plantings, and to provide a patterned backdrop for a formal garden. The design of a trellis can be almost anything that suits your fancy or purpose, but the design and size of an arbor are less flexible because of the vertical and horizontal arrangement of the structural members. The architectural lines of even the simplest arbor make it necessary to plan the design of the structure and its location beforehand. If the arbor is to provide support and guidance for climbing vines or shrubs, then it is well to avoid fine structural detail and use only an open, slat-type construction. The arbor pictured above is a good example of the more practical design. This is just about the simplest saw, hammer and nail job possible, yet the secret of its attractiveness is in the pattern of squares which has been carried out in the construction of the side panels. Note that the supporting corner posts are placed the same

distance apart each way, and that the height equals the length of the sides. The X-braces add both rigidity and an interesting structural detail.

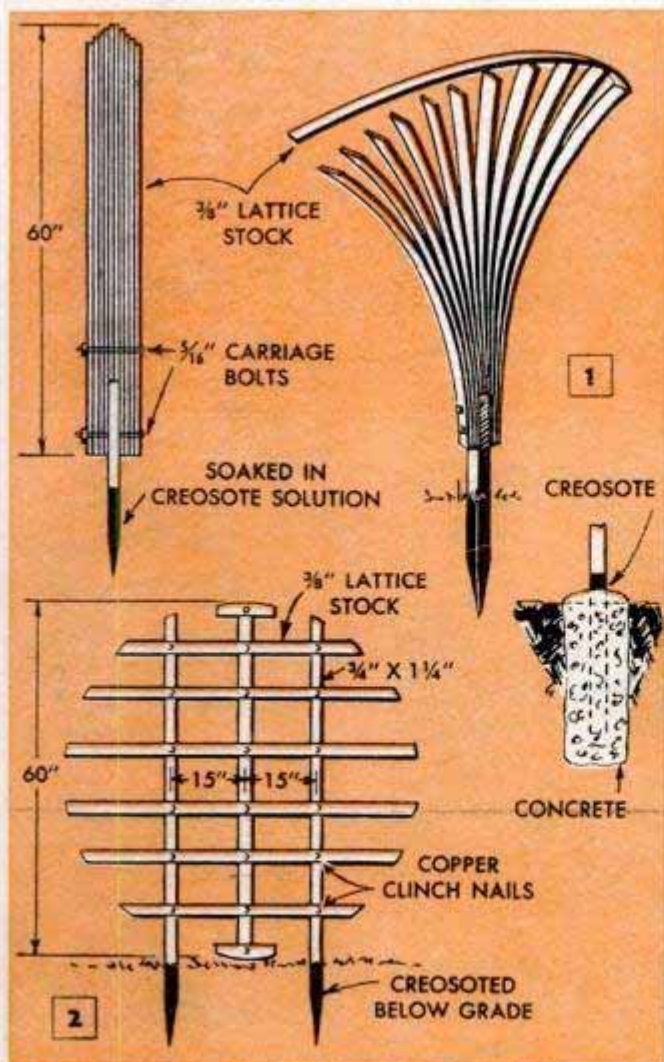
A trellis of more formal design is pictured at the top of the opposite page. The architectural detail has been worked out with the purpose of extending the horizontal lines of the house, and the crisscross, or diamond pattern, above and at each side of the arch is obviously for the purpose of lowering the height of the opening in relation to its width. The gate arbor, or perhaps more properly, arch, shown at the lower right on the opposite page brings up another point in connection with arbor and trellis design. When building such structures, especially an arched gateway in a hedge, it's a good idea to stick to simple design. A heavy, ponderous structure decorated with detailed cornices or elaborate curved work appears rather out of place in the hedgerow. This one, you will note, is simple and effective as a decorative feature of the home grounds and, at the same time, serves the twofold practical purpose of providing rigid, permanent gateposts and a guide, or support, for training the hedge.

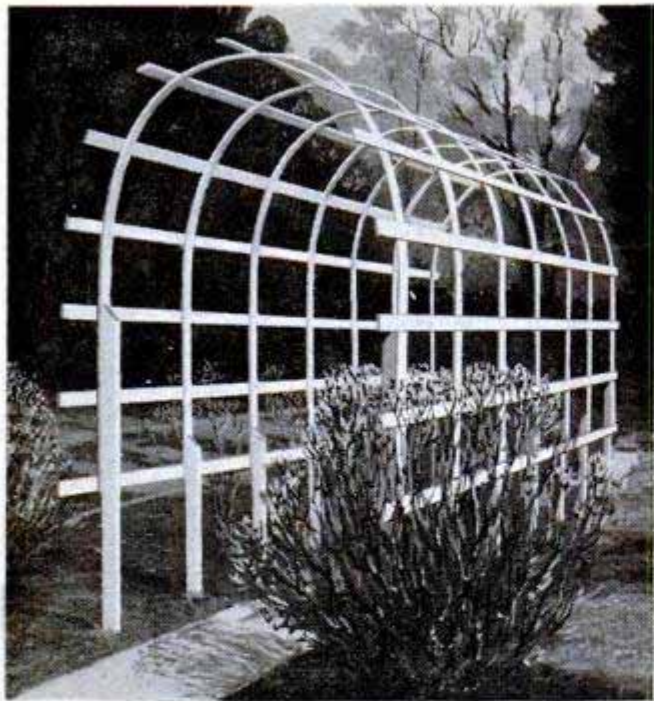


The formal trellis often is used to lower height of an opening or to make the house appear longer or wider

Small trellises, such as the fan type shown below, are easy to build. Bow is nailed to ends of fan slats

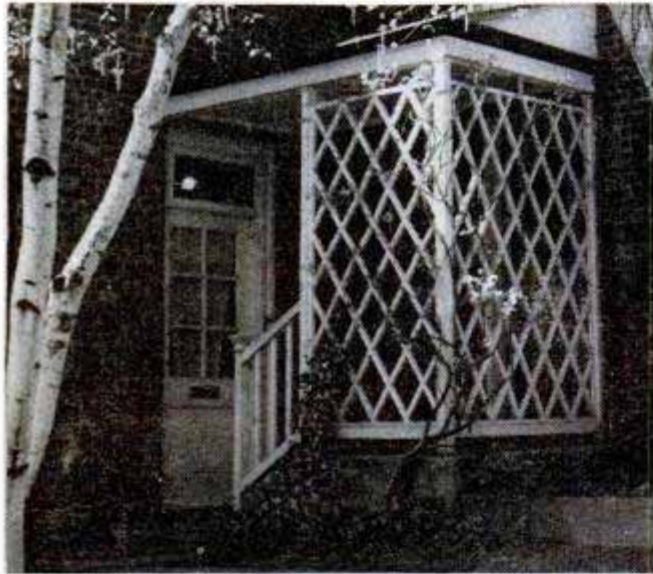
Stick to plain design when building a gate arbor in a hedgerow. This type is easy to build and maintain



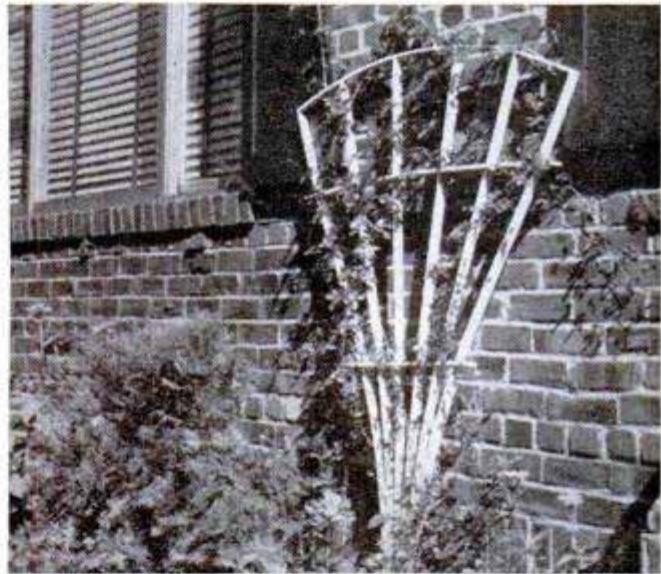


Simple construction of bow-type arbor will appeal to homeowners having natural, or informal, gardens

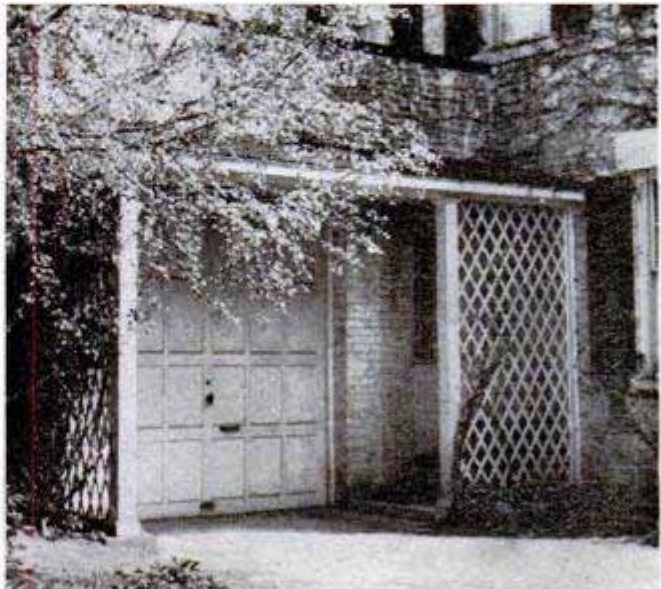
Two popular types of simple trellises are detailed in Figs. 1 and 2. The fan trellis, shown in the upper detail, is pictured below in the right-hand photo. Here, two horizontal crosspieces have been added in addition to the bow top. The round trellis is made by nailing slats (lattice stock) to two spaced uprights of heavier material. The ends of the slats are cut off on a radius and are arranged in such a way that the structure appears circular in form when assembled. Addition of the center member with end blocks cut on a radius finishes the job. The trellises, arbors and gateways pictured on this and the opposite page are typical, and the various applications pictured are suggestive of the many uses to which these structures are adapted. The curved arbor shown at the left is detailed in Fig. 3. The dimensions given are merely indicative of the average over-all size. It can be built in any length up to 20 ft. and the arched members, or bows, can be installed in any number and spacing desired.



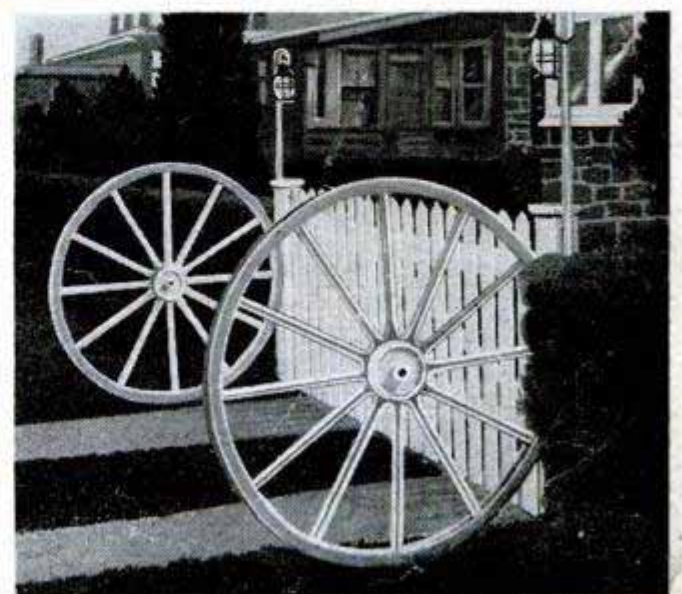
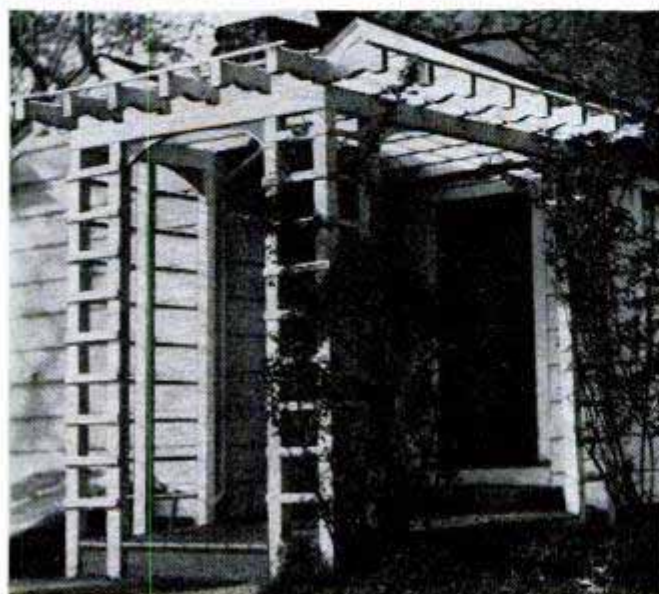
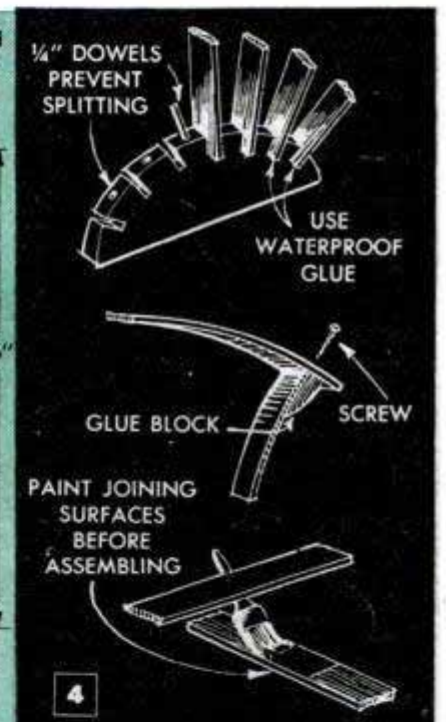
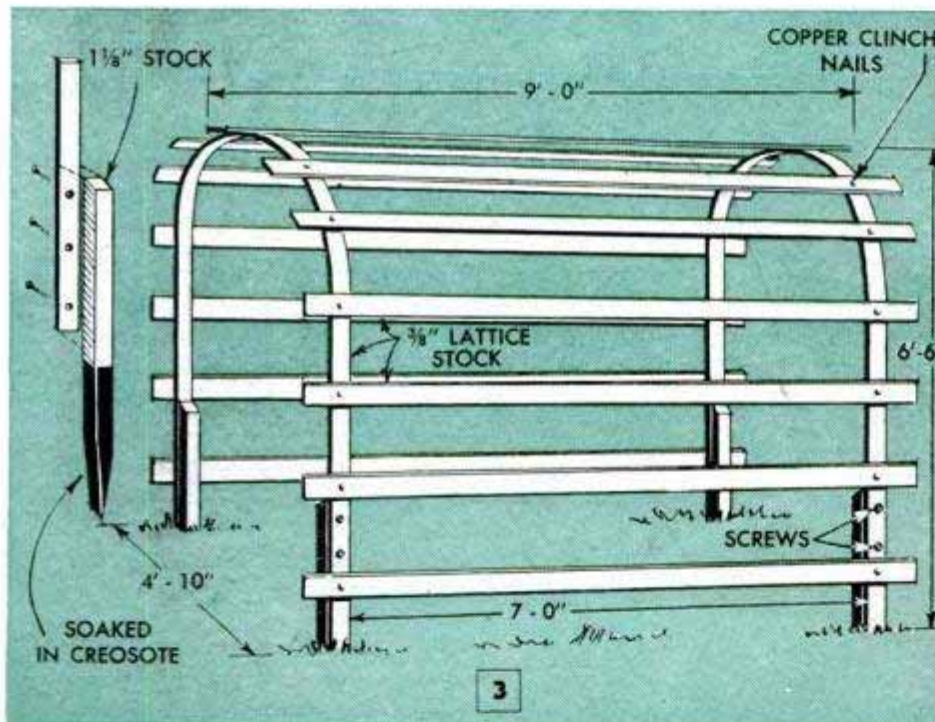
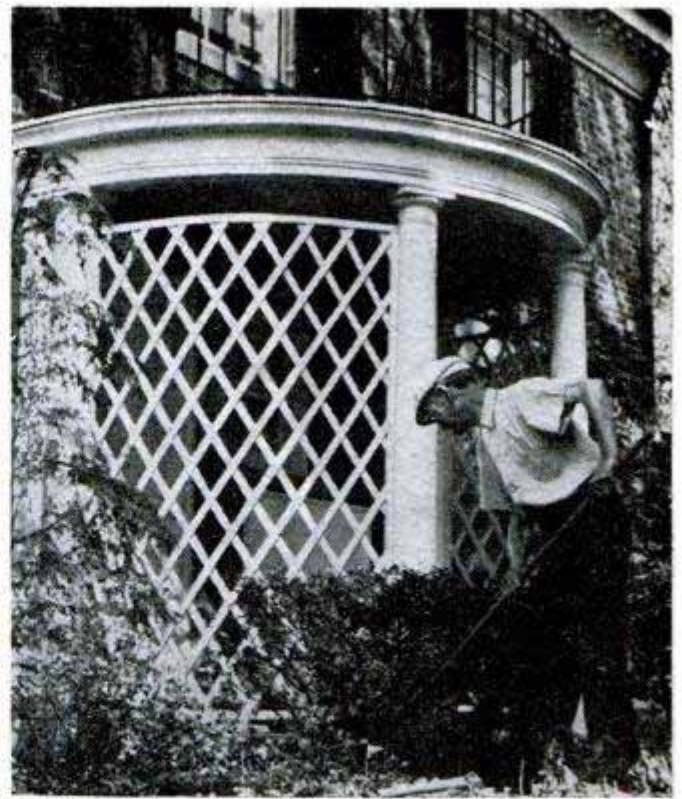
Above and below are two applications of trellises used to partially enclose open porches. Diamond pattern of one above screens a doorway effectively while squared design below lowers height of opening



Above, a typical application of the fan-type trellis placed against a red-brick wall to support a rambler rose. Below, diamond-pattern panels enclose hooded garage entryway and screen service door to kitchen



Three quite important construction details of various types are shown in Fig. 4. Another way of making the base for a large fan-type trellis is shown in the upper detail, and the method of anchoring the ends of the bow to the outside slats is covered in the center detail. When making flat, clinch-nailed joints such as are common in trellis and arbor construction, it's important to paint the joining surfaces with a prime coat before assembling. A still better procedure is to prime and paint all parts before joining. Parts driven into the ground or set in concrete below ground level should always be soaked in a creosote solution, Figs. 1, 2 and 3. Place the solution in a container and allow the lower ends of the stakes or posts to soak 48 hrs. or longer. A creosote solution is frequently used as a finish for the entire structure as it stains the wood a weathered brown and at the same time acts as a preservative. However, it should be remembered that oil paints cannot be applied over creosote.



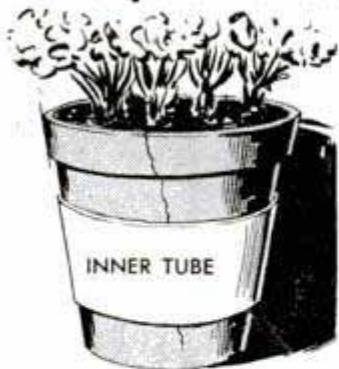
Wooden Bar Adjusts Tension Of Multiple Clotheslines



Sagging of indoor clotheslines or outdoor lines strung parallel and fairly close together can be corrected quickly if they are fitted at each end with a movable wooden crossbar. The bar is simply pushed toward the wall or posts to draw the lines taut, and moved outward to increase the amount of sag if the lines are too high. Two lines are strung from each hook, as shown in the illustration, and the crossbar, which is a length of 1 x 2, is drilled for the clotheslines. In addition to permitting the tension adjustment, the crossbar also serves as a spreader to keep the lines evenly spaced at all times.

Harris A. Palmer, Fairfield, Iowa.

Flowerpots Mended With Inner Tube



Instead of throwing away your broken flowerpots, you can make them usable again by holding them together with a wide band of rubber cut from an old inner tube. Simply stretch the section of tube

over the base of each broken pot. If you like, the rubber can be painted to match the color of the flowerpot.

Ervin L. Strayhorn, Beebe, Ark.

Grease Pencil Transfers Designs

Repeat designs are transferred quickly and accurately with a grease pencil and tracing paper, provided it does not matter

if the design is reversed. After placing the paper over the original and tracing the design with the grease pencil, lay the tracing upside down on the work. Rub the back of the paper with the thumbnail or the tip of a teaspoon to transfer the design. The grease pencil will print about ten duplications.—Francis J. Kafka, New York City.

Chain Helps Screen Damp Sand

To speed the process of screening sand which is lumpy or difficult to sift because it is damp, place a length of chain, such as a tire chain, in the screen before

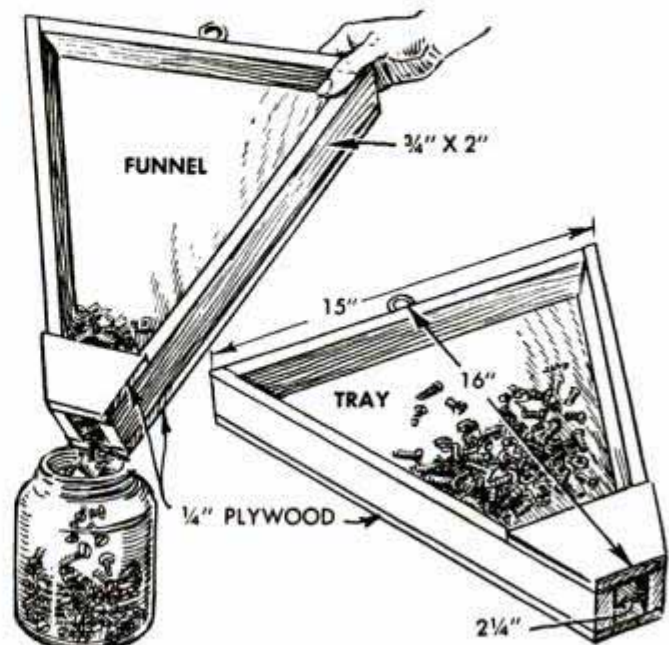


pouring in the load of sand. The weight of the chain will serve to break the lumps and force the sand through the screen.

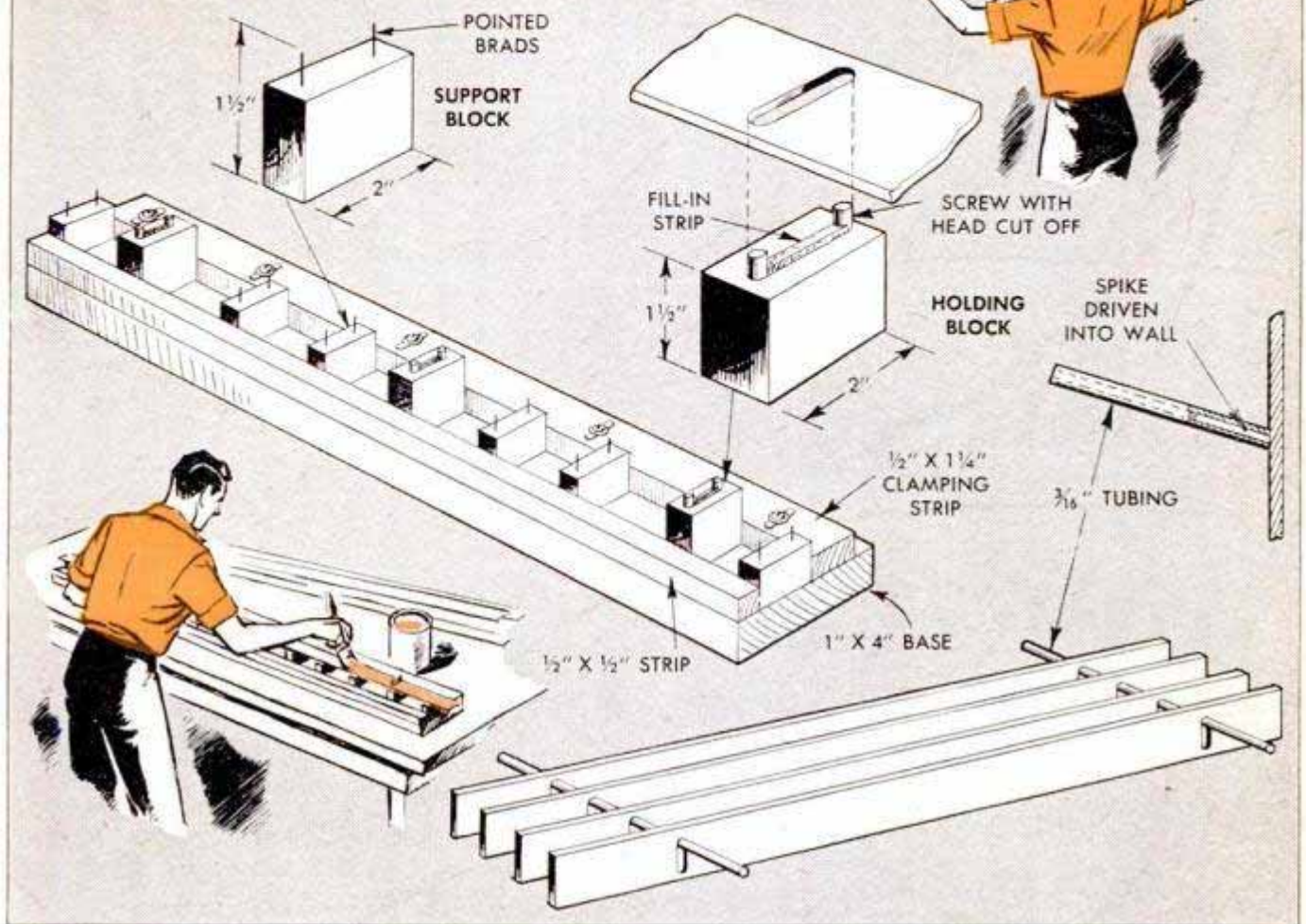
Sorting Tray for Small Parts Has Built-In Funnel

Home craftsmen who keep a wide variety of nails, screws and other small parts in cans or jars will find this sorting tray invaluable for selecting just the right bolt or screw from the collection. After the contents of a jar are emptied onto the tray and the needed parts picked out, the rest of the items are simply poured back into the jar through the funnel-shaped end of the tray. The tray is made as detailed, using plywood or hardboard for the bottom. Note that a screw eye is driven in the end of the tray opposite the funnel spout. This permits hanging the tray from a wall or the side of the workbench where it is out of the way.

Charles C. Thomas, Cambridge, Mass.



Refinishing VENETIAN BLINDS



WHEN REFINISHING Venetian blinds, a great deal of time can be saved by building two racks, one for holding the slats while they are being painted, and another for drying them. To build the painting rack, first cut the base piece, the back strip and the clamping strip to a length which will accommodate the longest slats to be painted. Nail the back strip flush with one edge of the base and cut $\frac{3}{16}$ x $\frac{3}{4}$ -in. slots in the clamping piece at intervals of about six inches. Then cut two or three holding blocks, 1 x $1\frac{1}{2}$ x 2 in., one for each cord opening, in the longest slat. Center the opening of a slat over the top of each holding block and, using a sharp pencil, trace a pattern of the opening onto the blocks. These patterns will serve as guides for driving screws which, when the heads are cut off, engage the cord openings of the slats. The screws, of a diameter slightly less than the width of the patterns, are driven just inside the ends of the patterns and extend about $\frac{1}{4}$ in. above the tops of the blocks. After cutting the heads off all screws, place the holding blocks on the base piece, one at each end and one in the center, with their edges against the back

strip. Place the clamping strip in front of the blocks, holding them securely against the back strip as shown. With the clamping strip in this position, drive a round-headed screw through the center of each slot and into the base, seating the head of each screw on a metal washer. Note that the clamping strip can be moved back and the blocks can be adjusted simply by backing off these screws. Now lay a slat in position on the fixture, and fill the space between the headless screws on each holding block with wood putty. Allow the putty to dry before removing the slat. The support blocks are made by driving two brads into the top of each block and cutting them off so that the height from the bottom of the block to the top of the brad is $1\frac{1}{2}$ in. Support blocks are spaced 10 inches apart in the fixture. Provide a drying rack for the painted slats by driving two spikes into the wall, spacing them the same distance apart as the outer cord openings of the slats. Cut the heads from the spikes and press a 12-in. length of $\frac{3}{16}$ -in. tubing over each one. Hang the slats in the wall rack as in the lower right-hand detail, spacing them so they do not touch each other.

A

Fountain

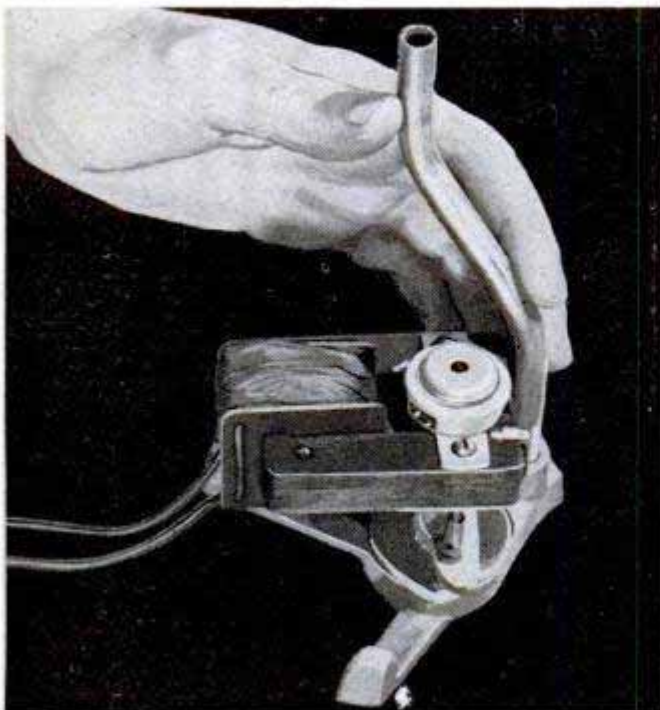
ON YOUR TABLE

By Allan Carpenter



This attractive fountain utilizes a ceramic bowl for the pool and a ceramic flowerpot for the pump housing. Note miniature birdbath cemented to housing

HIGHLY DECORATIVE table fountains, which up to now have been considered a luxury item, can be fashioned at home for only a few dollars. You can make a simple though effective fountain in a half hour or so, or you can spend several days building a miniature table-top rock garden similar to the one pictured in full color on page 165. A recirculating pump like that shown in the lower left-hand photo is the first requirement, and this can be purchased in kit form or completely assembled. In addition to the pump, the fountains are composed of plastic or ceramic dishes, bowls or flowerpots, plus a plastic clothes sprinkler which serves as the fountain spray. The design of the fountain is limited only by your own good taste and imagination. A myriad of novelties, such



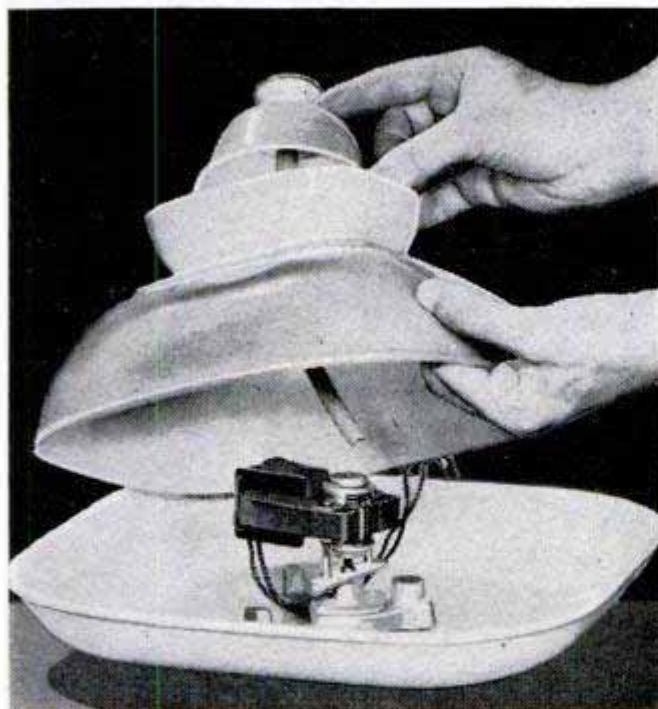
Recirculating pump draws water from bottom of pool and forces it out fountain spray where it cascades back into pool. Only water loss is from evaporation



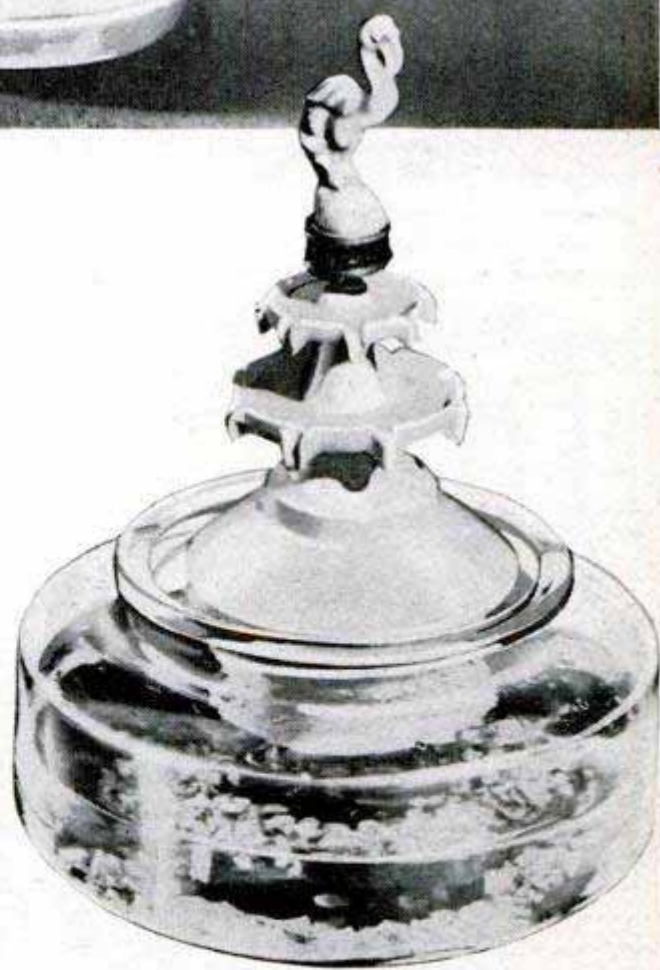
Rock-garden pump is concealed in deep bowl. Water from plastic dish set on bowl rim drains through holes near sides so motor and wiring are kept dry



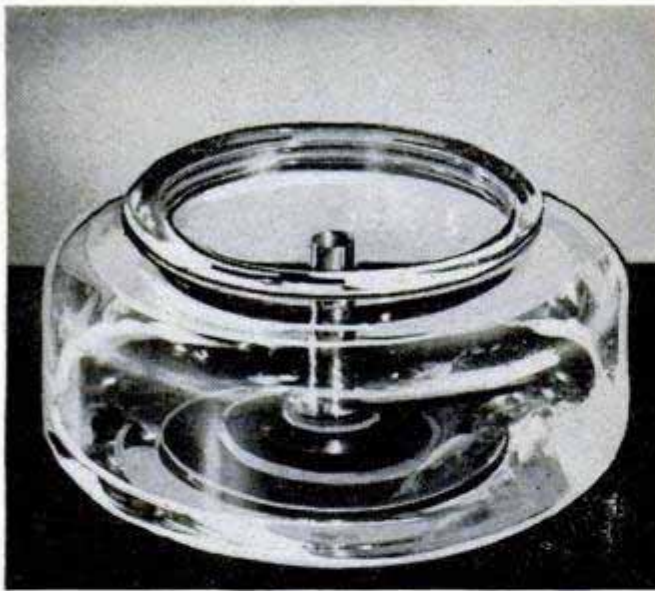
Water cascading from birdbath plus a spray of flowers in season form attractive table fountain. Ordinary frog in bottom of pool holds the cut flowers



Simplest type of fountain is made from plastic bowls. Rubber tubing replaces pump-outlet tube and waterproof wiring is used to run line over side of pool



This aquarium fountain uses special fish bowl shown on next page. Extension screws raise recirculating pump off bottom of bowl so the motor is above water



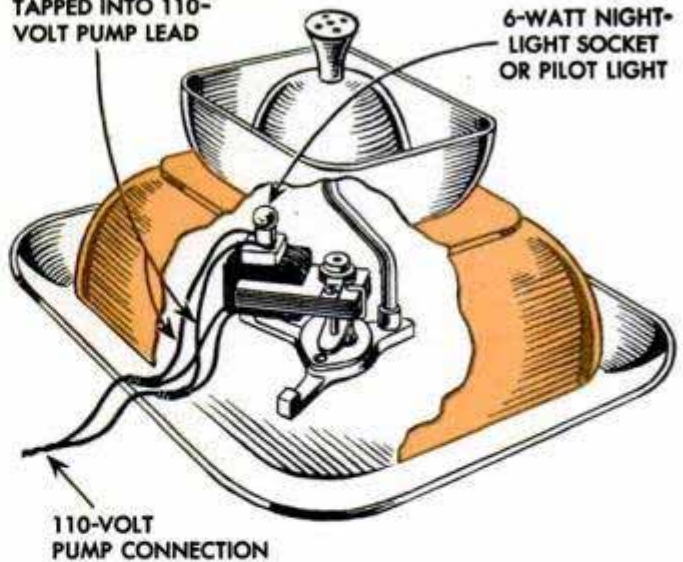
Ready-made fish bowl for use with recirculating pump is fitted with tube to carry wires for motor. Rubber gaskets seal joint between tubing and hole in glass

as simulated water lilies, figurines and toy birdbaths and lawn furniture are available.

In the basic fountain the pump is set in the bottom of a shallow container, which forms the "pool" and is covered with an inverted bowl or flowerpot to protect it. A smaller bowl is set on top of the pump housing and the plastic clothes spray is connected to the pump-outlet tube with a length of rubber tubing. In use, water overflows the small, upper bowl and cascades back into the pool where the pump recirculates it through the fountain. Both the pump housing and the top bowl must be drilled for the rubber tubing. The plastic can be drilled in the same way as wood and the hole enlarged by carving with a knife blade if necessary. A hole can be made in the bottom of a ceramic bowl either by drilling it like glass or by chipping carefully with a sharp, pointed tool, such as a small chisel, an awl or an ice pick.

For the sake of clarity, the leads to the motor are pictured as if they were brought over the edge of the pool and through the water. This may be done in actual use only if waterproof wiring is used, as otherwise

SOCKET CONNECTIONS
TAPPED INTO 110-
VOLT PUMP LEAD



Night light wired in parallel to pump leads is used to illuminate fountain from inside. Even though waterproof wiring is used, connections must be out of water

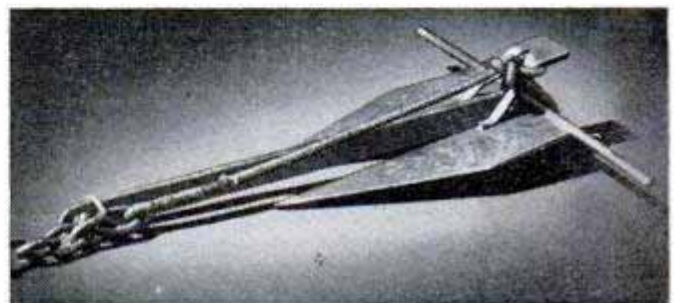
the 110-volt line will charge the water, making the fountain extremely dangerous. A safer way to bring the line to the motor, and one that adds neatness to the fountain as well, is to insert a threaded copper nipple through the bottom of the pool and run the line under the pool and up through the nipple to the motor. The nipple is held in place with two nuts and rubber washers tightened against both sides of the pool bottom. The rubber washers insure a waterproof seal. Be sure your wiring job is electrically safe as water is a good conductor of electricity, and any short to the water or at a damp connection could cause a severe shock when you touch the fountain. The pool must be raised slightly to allow clearance on the underside for the nut and washer as well as the wires. This can be done by cementing plastic or rubber feet to the underside of the bowl.

The fountain can be given a pleasing illuminated effect by wiring a clear or colored night light to the 110-volt leads. The light is connected in parallel, as shown above, so its burning out will not open the circuit and stop the pump motor.

Small Anchor Fouled in Rock Is Released by Cable Secured to Crown

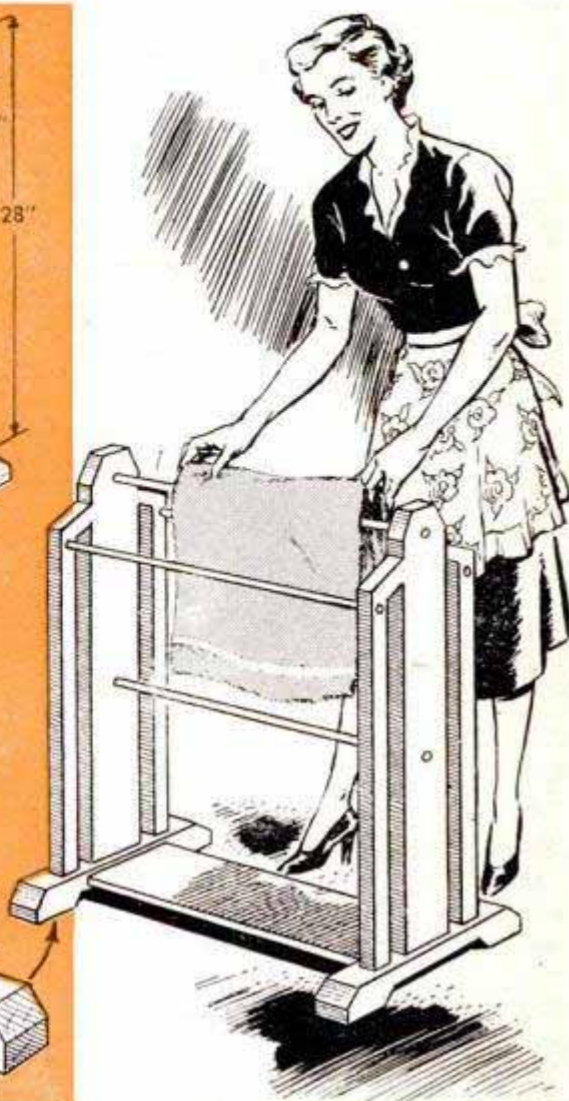
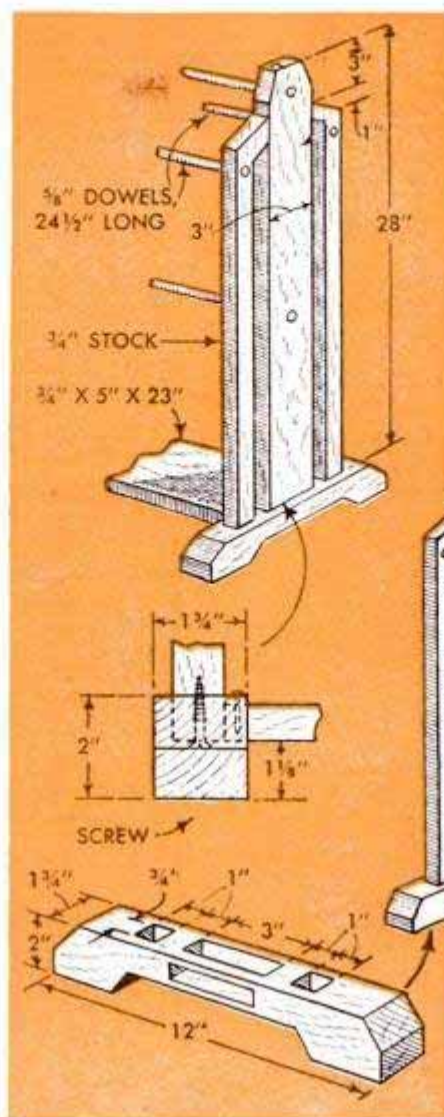
A small-boat anchor which has become fouled in the rocky bed of a stream or lake usually can be recovered if the anchor cable has been secured to the crown as shown in the photograph. The cable is not attached directly to the eye of the anchor, but is simply lashed to the shank at the eye with a short length of strong cord. The cord is tested to see that it is strong enough to lift the anchor under ordinary conditions, but can be broken by a sharp tug. When the anchor becomes fouled, the boat is moved above the anchor and the cable is jerked

free of the eye. Then the anchor is dislodged by hauling the crown end upward.
Clinton R. Hull, Costa Mesa, Calif.



Portable Drying Rack for Towels and Clothes

Easily carried from bathroom to kitchen or set in front of a radiator, this handy rack will hold several towels or washcloths and is just the thing for drying a few articles of clothing overnight. To build the rack, cut each upright endpiece from solid stock, or make in three parts assembled with dowels and glue. Drill both uprights for the $\frac{5}{8}$ -in. dowels which provide the towel bars, drilling the parts simultaneously to assure alignment of the holes. Next cut out and mortise the base pieces, as in the lower detail, to receive the uprights and the bottom panel. Note that the mortise for the 5-in. bottom panel is made only 3 in. long and that 3-in. tenons must be cut on both ends of the panel before assembly. After sanding all the parts smooth, join the uprights to the base pieces with glue and screws. Then complete the assembly by gluing all the parts together and pinning the ends of the dowels in the uprights with brads. To afford maximum protection from moisture,



it is a good idea to apply two coats of clear lacquer to the rack. Then, if desired, an additional coat or two of enamel may be applied over the lacquer.

Plastic Protects Stair-Well Wall From Children's Finger Marks

Toddlers who are just learning to creep or walk up the inside stairs are likely to leave finger marks and smudges on the wall



surfaces along the stairway. To protect the wall from becoming soiled, sheets of cellophane or thin, transparent plastic can be tacked to the wall so they completely cover the area which the child will probably use for support. Smudges left on the protective surface can be wiped clean and the plastic shield is easily taken down when no longer needed.—R. M. Woodbury, Haverhill, Mass.

Lemon Rind Removes Mineral Stain

Instead of throwing away the skin after squeezing a lemon, use it with the adhering pulp to loosen mineral deposits from the insides of teapots or other kettles. Simply fill the utensil to be cleaned with lukewarm water, cut up and add the skin of one lemon to each pint of water and allow to soak for four or five hours. Then rinse the kettle with hot water.

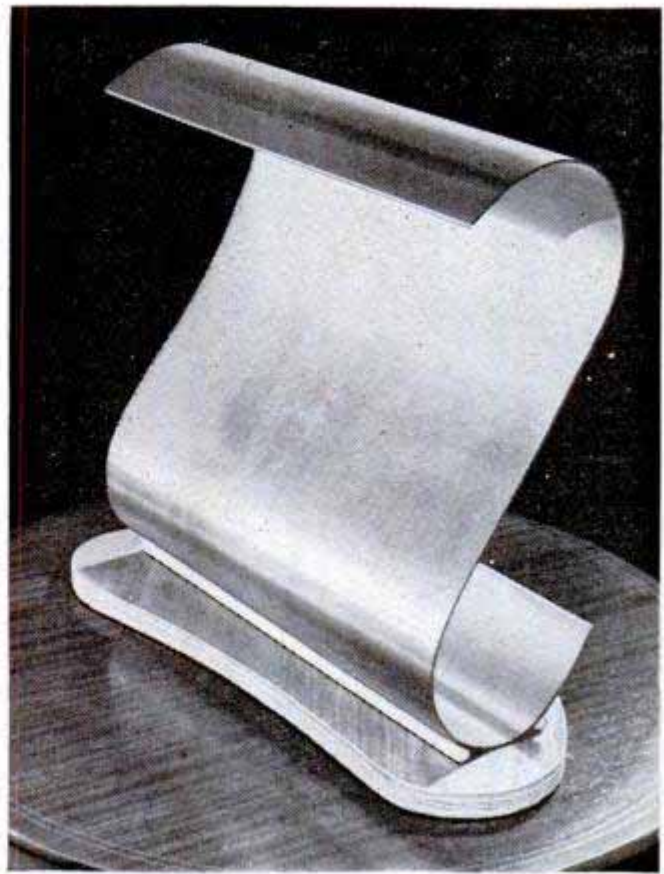


Table LAMPS

By George Daniels



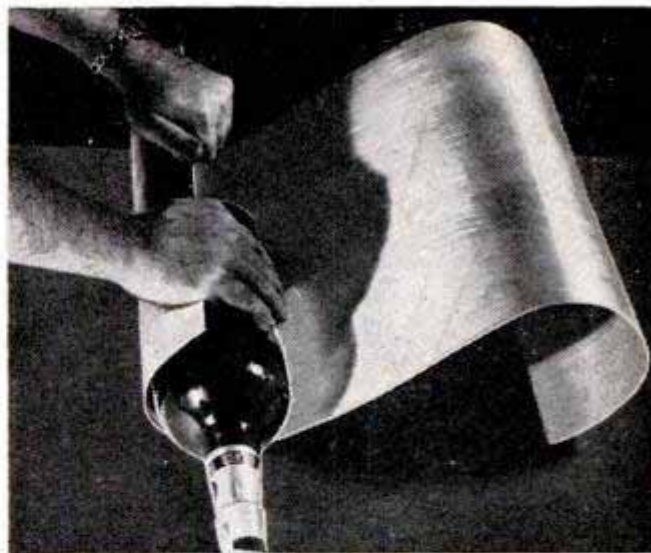
After inserting end of metal roll through baking tin, slit the metal with tin snips and hammer the ends over

TABLE LAMPS like these are available only from your own basement workshop. Although just one of the designs is shown as a planter lamp, both can be readily adapted to this decorative purpose. The reflectors, which are especially styled to go with modern furnishings, should be made from polished aluminum, copper or red brass. In the novel jack-in-the-pulpit design, upper left, the "pulpit" is made from polished copper, a sheet 9 in. wide and 32 in. long being required. "Jack" is a tubular-type filament lamp bulb turned into a keyless socket which is anchored in a plywood base. The latter is cemented to a baking tin of the type used for baking small cakes and for molding salads. The baking tin forms the planter. The first step is to roll the end of the copper sheet in from both edges so that it will slide through the upper end of the conical riser in the center of the tin. Force the rolled end through the riser un-

til it projects about 1 in. from the bottom and then make several cuts with tin snips so that the metal can be bent over and hammered flat, as in the photo at the lower left on the preceding page. The other end of the copper sheet is trimmed to a long, tapering point to simulate the single wide leaf of the jack-in-the-pulpit plant. Bend the point over and down as shown in the photo. Next, cut a circular base from $\frac{1}{4}$ -in. plywood to a diameter slightly less than the diameter of the tin. Drill a hole at the center to take a $\frac{3}{4}$ -in. fixture bushing with slotted nut. Turn the nut on the lower end, insert the bushing in the hole and screw the socket onto the upper end. Wire the socket with standard lamp cord and provide a cord switch for turning the lamp off and on. Drive three rubber-headed tacks, equally spaced, into the underside of the plywood base. Now, turn the lamp bulb into the socket and coat the top side of the base with mastic cement as in the lower photo at the right. Insert the lamp bulb through the neck, or riser, at the center of the tin and press the base tightly against the bottom of the pan, being careful to center the bulb. Wipe off excess cement and weight the tin until the cement sets. Coat the tin and the plywood base with a flat-black enamel.

The novel S-shaped reflector, or shade, on the table lamp shown in the upper right-hand photo on the preceding page is made from a single sheet of copper 16 in. wide and 24 in. long. While you can roll the metal around a bottle as in the top photo at the right, you'll get a better job if you have your tinsmith do this on his slip roll. The lamp and socket are housed in the upper curve of the S, which forms the reflector. Although in the original the socket was simply wrapped with a layer of rubber tape and two layers of friction tape and held in place with a twisted wire, a better installation is to rivet a metal angle bracket in the top curve near one end. Drill the bracket to take a brass fixture bushing, insert the bushing through the hole, turn a nut on one end and screw the keyless socket onto the other end. Bring the lamp cord to the socket through a hole drilled in the back of the reflector. Fit a rubber or fiber grommet in the hole to protect the cord and provide a cord switch for controlling the tubular-type filament lamp bulb. Although the base of the original lamp was made from birch plywood, colored plastic also can be used. In either case, the reflector is attached to the base with three screws and supports are placed at each side of the lower curve. These can be polished birch dowel rods or clear plastic rods cemented in place.

Polish the metal reflectors of both lamps on a buffing wheel and apply a clear metal lacquer to prevent tarnishing.



Reflector can be shaped with aid of bottle, but for a better job take it to your tinsmith for forming



Although socket can be wired in place, it is better to support it in an angle bracket and fixture bushing



After fitting socket and lamp bulb, coat the plywood base with cement and attach to bottom of the planter

Records Kept From Slipping With Fingernail Polish



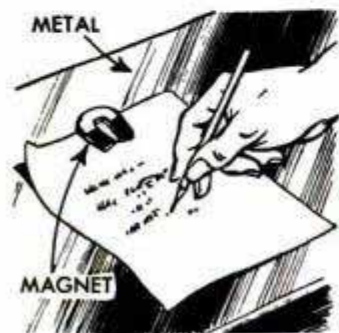
Especially in the case of long-playing phonograph records, any slippage of the records stacked on the changer turntable will result in annoying tone distortion. Although there are many ways in which slipping can be prevented, applying fingernail polish to both sides of each record is an easy method that results in a positive nonslip action. Two or three dabs of fingernail polish are applied near the outer edges of each label, keeping the distance from the center hole the same on all the records. The hardened polish produces slight bosses which interlock when one record is dropped on top of another.

H. G. Frommer, Milwaukee, Wis.

Length of Rod Substitutes for Funnel

In the absence of a funnel, liquids can be poured from a wide-mouthed container into one having a narrow neck by use of a length of rod or tubing. After placing one end of the rod in the container to be filled, pour the liquid so that it flows along the rod and into the small container.

Small Magnet Holds Paper to Metal



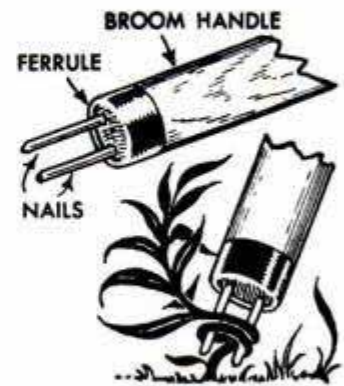
Making notes or sketches when working on an automobile or other piece of machinery is often bothersome, especially if you have only one hand free to hold the sheet of paper

and also do the writing. By means of a small magnet, the paper can be placed against any flat, steel surface of the machine and held securely enough to permit writing even on a vertical surface.

W. F. Schaphorst, Newark, N. J.

Nails Driven in Broom Handle Provide Handy Weed Puller

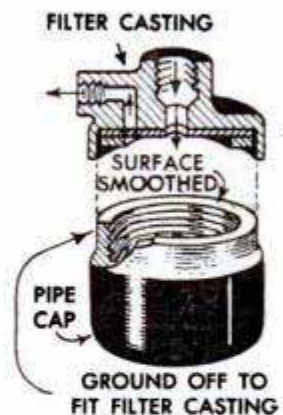
Supplying its user with an abundance of leverage, this unique weed puller is especially effective in pulling large weeds and devil grass. It is made by fitting a metal ferrule, which can be taken off an old window-shade roller, to a section of broom handle. Drive two 10d nails into the end of the handle, cut off the heads and sharpen the projecting ends. To use the weed puller, stab the center of the weed and turn the handle until the weed starts to wrap around the nails. Then lower the angle of the handle enough so that the weed won't slip off the prongs, and raise the pronged end to pull out the weed.



A. A. Stafford, Corona del Mar, Calif.

Pipe Cap Serves as Filter Bowl On Gasoline Engine

Should the glass filter bowl on a gasoline engine break, it often can be replaced by a pipe cap having nearly the same diameter. The pipe cap will serve the purpose until a new bowl can be obtained. For instance, one man found he was able to replace the broken filter bowl of his power-mower engine with a 1/2-in. pipe cap, simply by grinding the sides of the cap to remove the projections and also decrease the outside diameter slightly, so that the cap would fit the filter casting. The threaded end of the cap was filed smooth to provide a tight seal with the filter gasket.



□ An extra mirror, attached to the back of the medicine-cabinet door, is handy when using cosmetics, antiseptics, etc., which are kept in the medicine cabinet. The need to close the door to use the standard mirror mounted on the front of it is avoided.

TUCK POINTING

It's important to keep mortar joints between bricks water-tight to avoid costly repairs

By E. R. Haan

WHETHER your home is of brick or of frame construction with only a brick chimney, you no doubt realize the necessity for tuck pointing; that is, renewing the loose and crumbling mortar in the joints between the bricks. This is one phase of home-repair work in which you can save a sizable amount of money by doing the job yourself, and it does not require any special skill or know-how.

The primary cause of the loosening of the mortar is the entrance of water into hair-line cracks where the bricks have pulled away from the mortar. Constant wetting, especially during the spring and fall, weakens the mortar and, during the winter, the freezing of water in the cracks causes the mortar to crumble. The result, of course, is further deterioration and, if not corrected, results in a dangerous weakening of the structure. All brick surfaces are subject to mortar erosion, but the problem is most likely to be encountered in the chimney brickwork, Fig. 1, and on the walls under parapet copings, leaky eaves troughs and large windows, as well as at any point where brickwork comes in contact with moist earth. Stopping water leakage at its source may require only calking of the

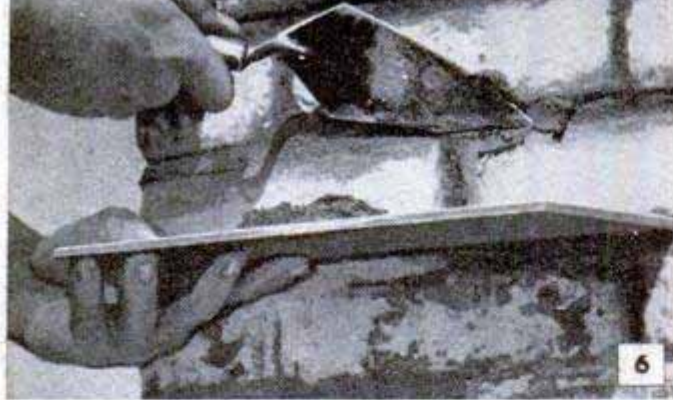


Chimneys frequently need tuck pointing as their location subjects them to all damaging weather elements



Above, before chimney is tuck pointed, the cap is examined and all cracks are sealed to keep out water. Below, remove all loose and crumbling mortar, brush away the dirt and saturate the brickwork thoroughly





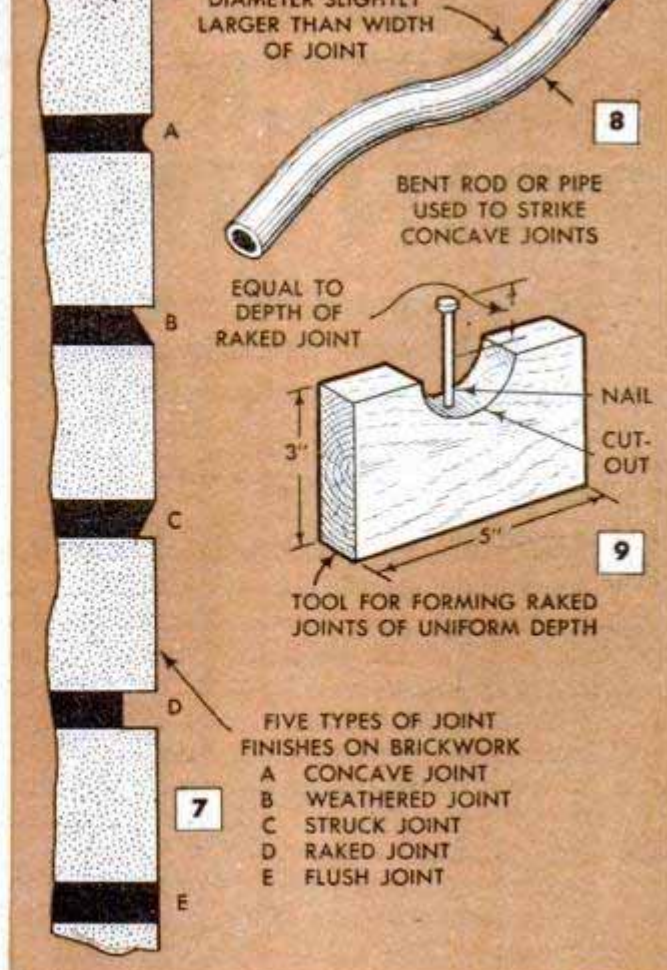
Edge of pointing trowel is pressed over mortar to "strike" the joints, making them compact and smooth

crack through which it is entering. Sometimes this can be done with an application of roofing cement as in Fig. 2. However, occasionally it is necessary to replace a flashing, repair a cracked chimney cap or renew a wall coping.

Danger sign: A white frostlike deposit on the outside of the brickwork is an obvious indication that water is penetrating the mortar joints. The deposit, called efflorescence, is caused by soluble salts being washed out of the bricks and mortar, and can be removed by scrubbing the affected surfaces with a solution of muriatic acid, 1 part, and water, 10 parts, using a fiber brush to apply the solution. All traces of the acid should be rinsed from the brickwork with a garden hose. *Caution: Avoid getting the acid solution on the skin or the clothing. Wear rubber gloves while working.*

Cleaning and soaking: Before tuck pointing, remove all loose mortar with a cold chisel or with a screwdriver and hammer, Fig. 3. Avoid chipping out solid mortar but remove that which can be pried out by hand or with only light tapping. Then brush the dirt and dust away as in Fig. 4. Dry bricks quickly absorb moisture from fresh mortar, causing the mortar to congeal and preventing proper adhesion. To avoid this, thoroughly wet the brickwork before the mortar is applied, Fig. 5.

The mortar mix: Bags of prepared mortar can be obtained from most building-supply stores. Dry-mix the entire bag to be sure that the ingredients are uniformly distributed. Then put a small amount (as much as you will use in about an hour) in an old metal pail and, adding water a little at a time, mix thoroughly until the consistency is quite stiff. If you prefer, you can make your own mortar by mixing portland cement, 1 part, hydrated lime, 1 part, and clean, sharp sand, 6 parts—all measured by volume. For extra-strong mortar, use 3 parts of sand instead of 6 parts. Use the mixed mortar as soon as possible, as it



FIVE TYPES OF JOINT FINISHES ON BRICKWORK
 A CONCAVE JOINT
 B WEATHERED JOINT
 C STRUCK JOINT
 D RAKED JOINT
 E FLUSH JOINT

quickly becomes too stiff to work and will lose some of its strength each time it becomes necessary to add water. If you use a wooden mixing board, soak the board with water so it will not absorb moisture.

Applying the mortar: The only tools needed for filling the joints with mortar are a pointing trowel and a 6 x 12-in. hawk for holding the mortar, the latter being cut from sheet metal or hardboard. With the hawk, hold a small amount of mortar alongside a horizontal joint and work it in place with the trowel, Fig. 6. Try to avoid smearing the face of the bricks. After a few of the joints have been filled and before the mortar sets, finish them by pressing the trowel or other tool against the joints and drawing it across the surface of the mortar. This is called "striking" and is done vertically first, then horizontally.

Kinds of joint finishes: Fig. 7 shows a number of joint finishes commonly used. Concave joints, detail A, are usually considered the best since the mortar in them is packed tightly against both sides of the joint. They are easily made with a rounded tool like the one pictured in Fig. 8. If the raked joint, detail D, is the one you must match, use a tool such as the one shown in Fig. 9. After recessing the joint with the raking tool, compact the mortar with a flat tool.

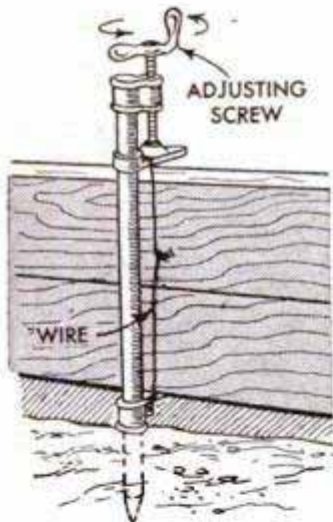
Movable Back-Yard Incinerator Is Easily Wheeled Out of View

If an incinerator must be set up where it spoils the appearance of your back yard, you can get rid of the eyesore by using this portable incinerator. Keep it tucked away alongside the garage or behind some concealing shrubbery and just wheel it out whenever it is needed. The unit is made by bolting or welding a section of oil drum on a pair of old hand-truck wheels. The latter or a satisfactory substitute often can be obtained at the local junk yard. A grate is installed in the drum about 6 in. from the bottom and a hole is cut in the side below the grate to provide sufficient draft. The hole also permits access beneath the grate for removing ashes. Pipe or flat-iron handles are bolted to the sides of the drum and, if desired, a lid can be fashioned from wire mesh or sheet metal.

Hallie H. Holt, Springfield, Ill.

W. T. M. Concrete Bar Clamps Level Concrete Forms

Setting up and leveling heavy panels for concrete forms can be done by only one man with the aid of a pair of long bar clamps. Working with one side of the form at a time, drive a clamp about 5 in. into the ground at points a few feet from each end. Rest the form boards on the lower jaws of the clamps and then estimate the approximate level, and run in the top jaw as far as the adjusting screw will permit. Loop



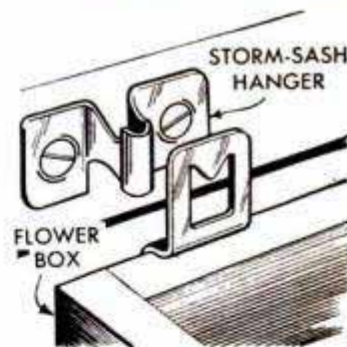
a heavy wire over the two jaws. Then, when the top jaw is backed off, the lower jaw will raise and bring the form panels level.

W. G. Waggoner, Sacramento, Calif.



Window Boxes Hung Neatly With Storm-Sash Hangers

Ordinary storm-sash hangers are excellent for hanging window boxes, as they simplify the job of mounting and removing the boxes and also eliminate rust streaks caused by conventional metal brackets. Two or three hangers are fastened to the back of the box and to corresponding positions on the window sill as shown. To keep



the box from tilting outward, nail a cleat to the back of the box near the lower edge.

William T. Burke, Mineola, N. Y.

Spreading Roots Over Soil Cone When Transplanting Aids Healthy Growth

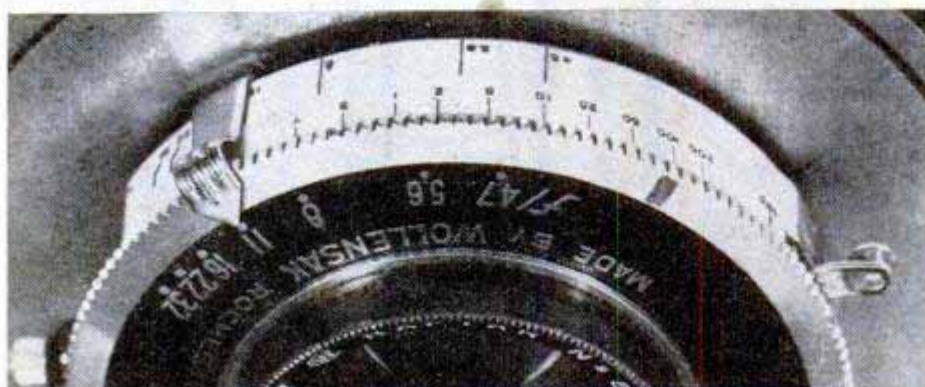
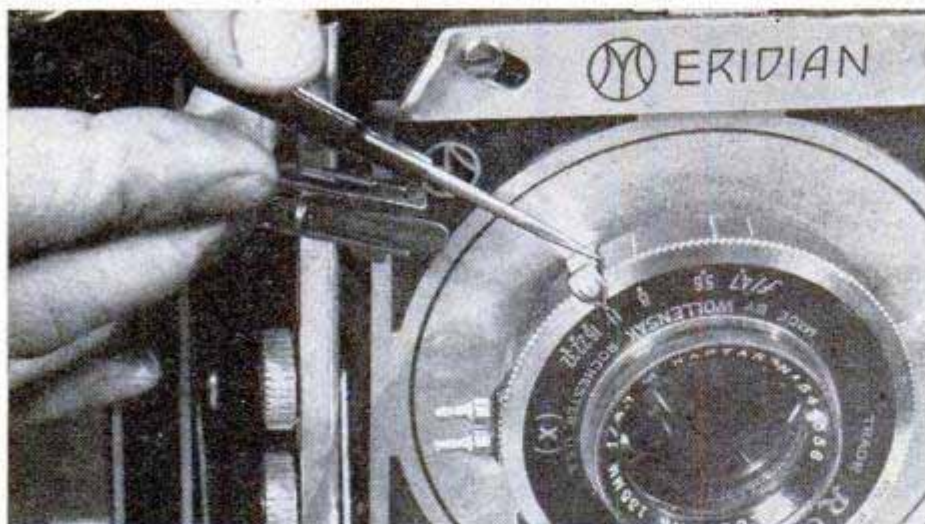
Much of the loss occasioned in transplanting small bushes, such as rose and berry bushes, results from incorrect placement of the roots. Often the roots are wadded so that soil cannot be worked down



around them. This leaves air holes around the roots which kill them. To avoid this condition, form a cone of rich earth in the bottom of the hole where the plant is to be placed. Then separate the roots and place them firmly down over the cone of soil as shown in the drawing. When filling the remainder of the hole, work the soil carefully and firmly around the roots. This will help prevent air pockets and assure the bushes a good start in their new location.

John Krill, North Lima, Ohio.

Combination Shutter and Diaphragm Scale Simplifies Making Setting Adjustments

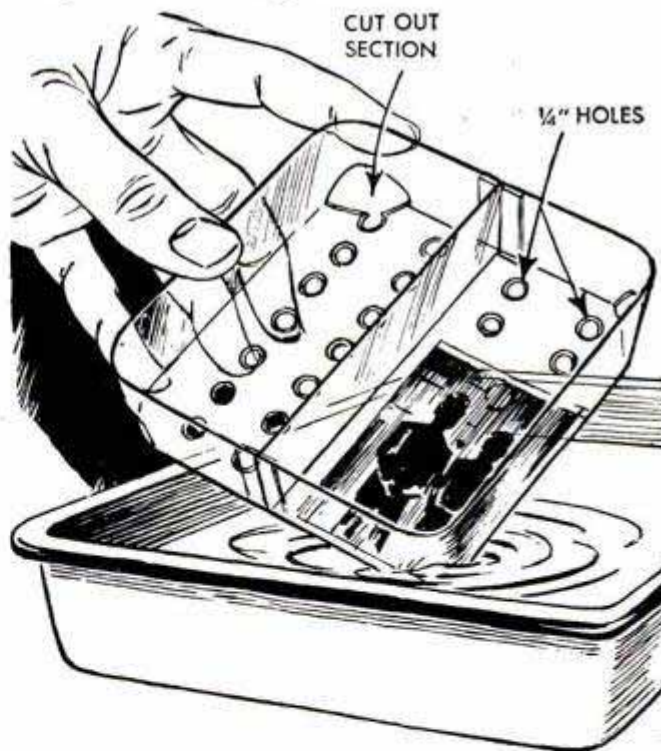


Shutter and diaphragm settings on cameras having between-the-lens shutters can be read from the top of the lens housing if the latter is mounted upside down and a combination scale is taped to the housing. First, tape a strip of overexposed film to the top of the inverted lens housing and scribe a mark alongside the diaphragm lever at each setting, upper photo. Next stick a piece of tape to the face of the shutter ring, lower photo, and use this as an index mark in scribing the shutter speeds on the film strip. Make an enlarged tracing of the marks on white paper, adding the proper numerals, and copy the tracing down to the exact size of the original strip. Then tape a contact print of the strip to the lens housing.—Alfred Coda, Englewood, N. J.

Processing Rack Cut From Plastic Box Helps Guard Against Film Scratches

To keep scratches on cut film to a minimum, I use a rack made from a plastic sandwich box that makes it unnecessary to touch the film while developing, fixing and washing. During processing, the rack is simply set in the trays of solution. The bottom of the box is drilled with numerous $\frac{1}{4}$ -in. holes and sections are cut from the corners to permit thorough immersion of the film. A strip of plastic, cut from the cover of the box, is used to divide the rack into two compartments. The strip fits in channels formed by cementing rectangular pieces of plastic to opposite sides of the rack. With the separator installed, each compartment of the rack holds two sheets of $2\frac{1}{4} \times 3\frac{1}{4}$ film, placed back to back. With the strip removed, the rack holds two $3\frac{1}{4} \times 4\frac{1}{4}$ sheets. All holes are countersunk and all edges are filed smooth so there will be no danger of scratching the emulsion.

Oliver C. Grant, Springfield, Mass.



Machine Screw in Cable-Release Hole Keeps Out Dust Particles

Many cameras which are equipped with cable releases are subject to defective shutters caused by dust and dirt particles that enter the shutter through the cable-release hole. To keep this opening sealed when the cable is not being used, one photographer

simply turns a small machine screw into the hole. The local hardware dealer should be able to supply a screw of the proper size, as the threads in the cable-release opening usually are standard.

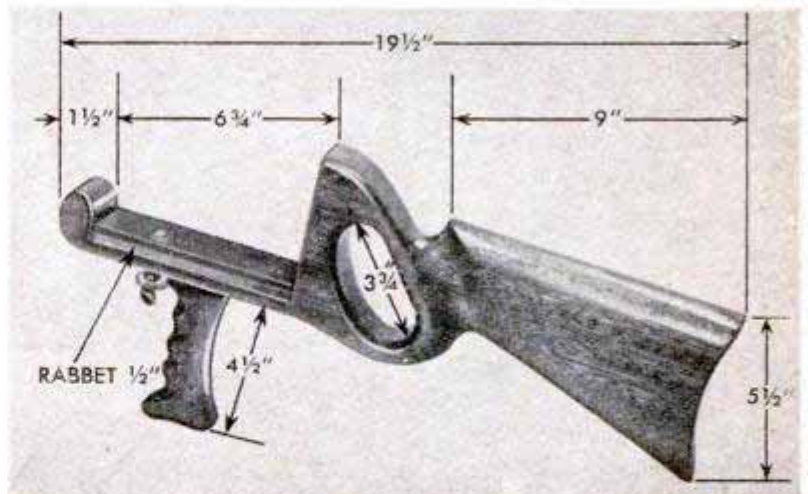
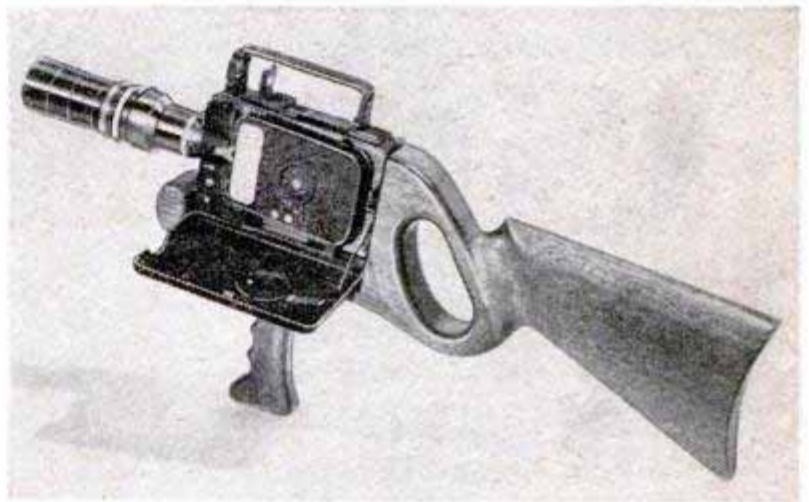
George J. Berkowitz, New York City.



Mount for MOVIE CAMERA

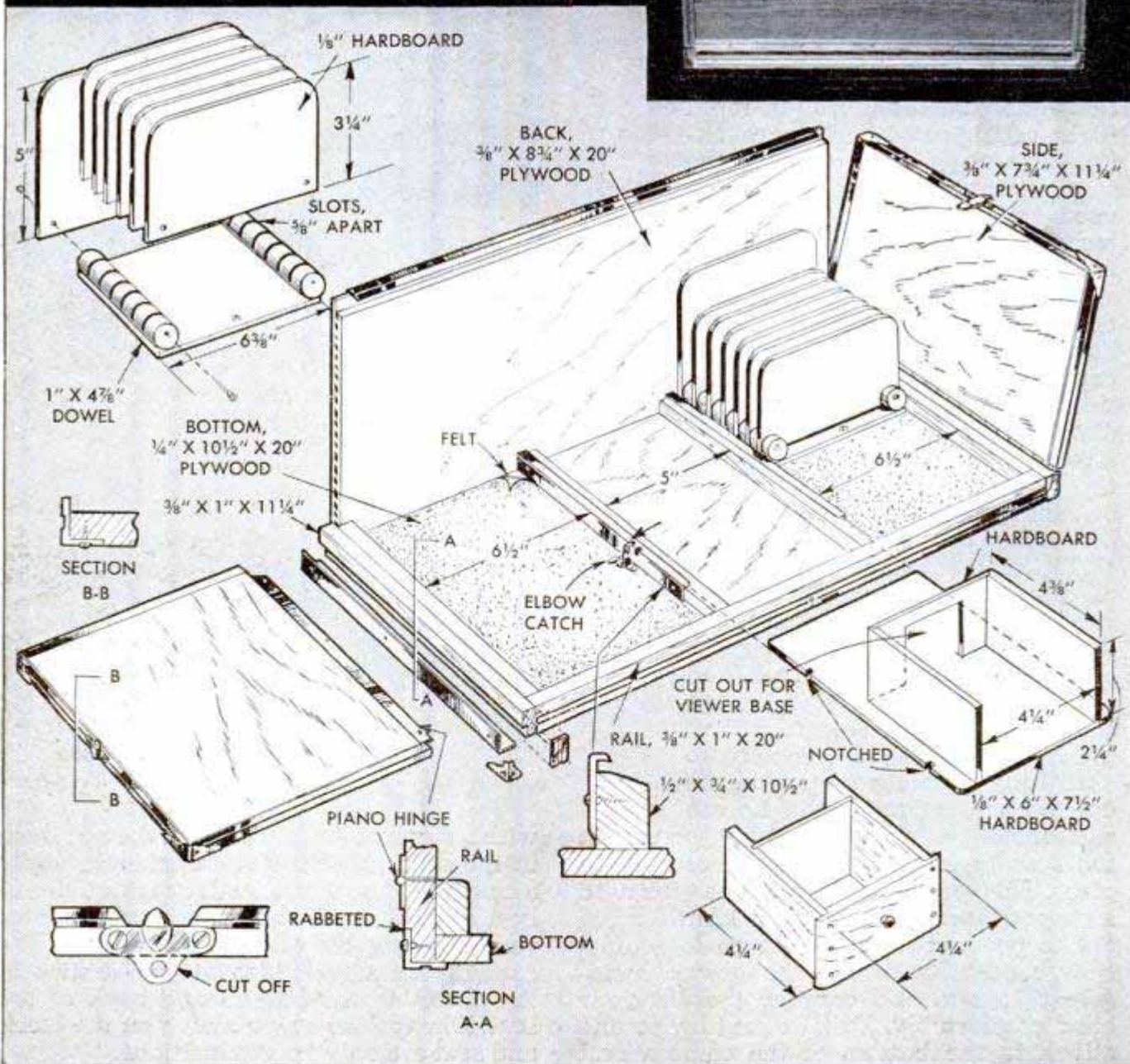
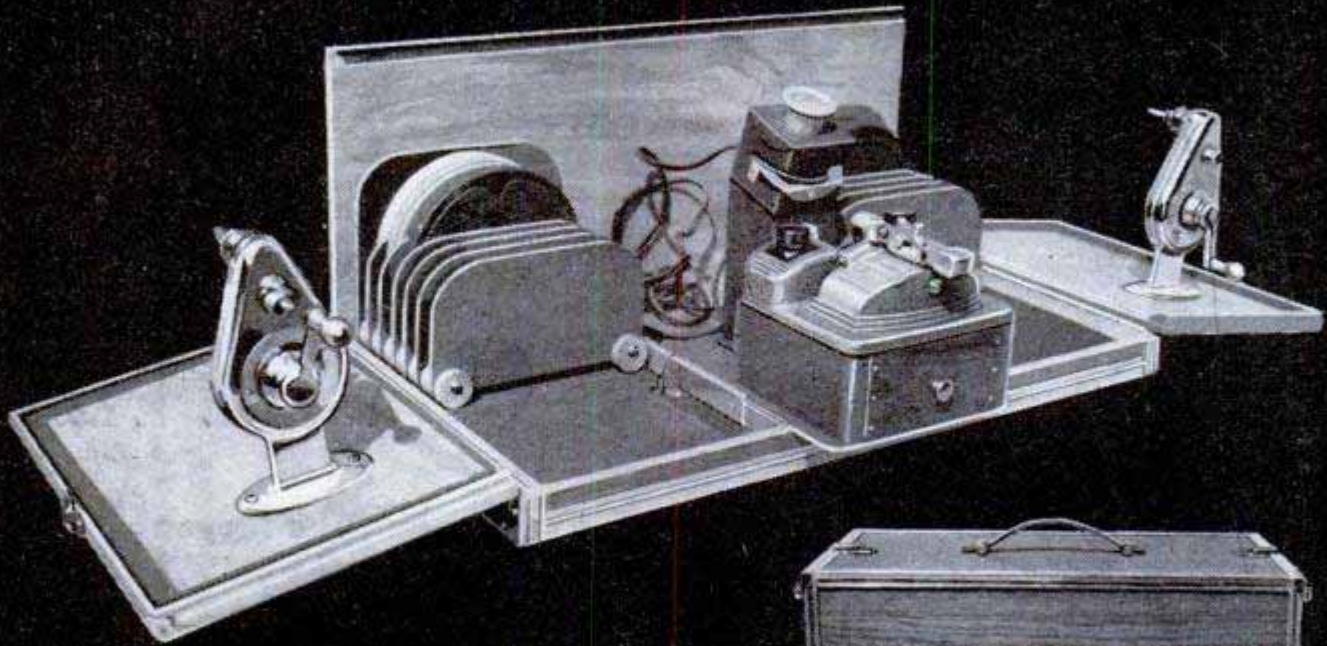
By John Moyer

USING a movie camera to shoot fast action, such as birds in rapid flight, racing autos, and planes taking off and landing, calls for the same point-and-swing technique used by shotgunners on moving targets. Small movie cameras are not shaped for rock-steady holding with both hands, and a tripod cannot be used for this special work. So amateurs and professionals who regularly shoot fast action with a small movie camera use a gunstock aimer like the one pictured. First, measure your camera to determine the height and length of the body, or box. Then lay out and pencil the outline of the aimer on a piece of $1\frac{3}{4}$ -in. mahogany to the overall dimensions given on the lower right-hand photo. Bandsaw to the layout lines and shape the parts to contour with a spokeshave and sandpaper. Cut a rabbet in the left side of the camera seat to permit the hinged side of the camera to open fully for reloading, as in the upper photo at the right. Locate and install a camera-locking screw in the seat to hold the camera securely in place. This screw should be of the type used in tripod heads which has a knurled jam nut to prevent the screw from loosening. Now, bandsaw and shape the forward hand-grip to a size and contour that fit your hand comfortably. Drill it lengthwise and attach to the bottom of the camera seat



with a stove bolt. Countersink the nut flush in the seat. Sand the wood smooth, apply a colored filler, then a sealer coat and finally a coat of water-white lacquer. To prevent marring the leather covering of the camera, it's a good idea to glue a strip of $\frac{1}{16}$ -in. felt to the bottom and back of the seat. Dimensions given above on the stock and seat are only approximations.

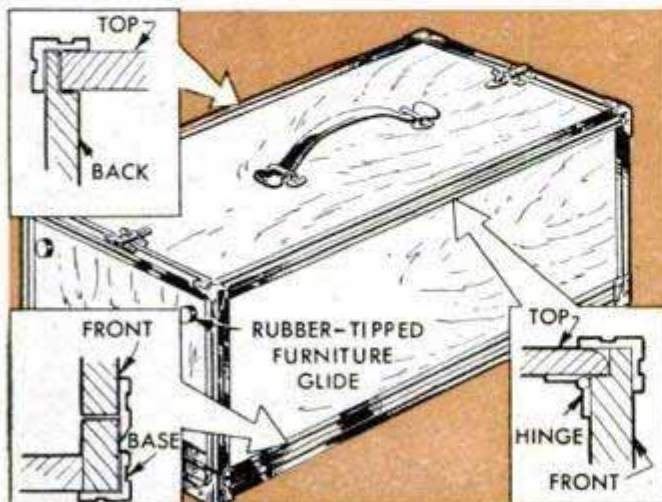
HOME - MOVIE EDITING



CABINET

By R. C. Grote

EDITING movie film becomes a real pleasure when you have all the necessary equipment grouped conveniently at your fingertips in this attractive cabinet. It closes dust-tight for protection of film and accessories, and is equipped with latches and a handle for carrying like a suitcase. When opened, it provides a sliding base for lining up the viewer-splicer unit, racks for storing film containers and a rigid support for the film winders. All construction details are shown on the opposite page except the hinged front and top which are detailed below. These parts are separate and are removed entirely when the cabinet is in use. Note in the details how metal edgings and corner angles are used to provide slides and reinforcing members for various parts of the cabinet. One leg of the corner angle is fitted in a rabbet cut in the end rail as shown in section A-A. Note also how the same type angle is fitted at the top of the endpiece, section B-B. The sides, end panels and top of the original cabinet were cut from $\frac{3}{8}$ -in. oak-faced plywood, which takes a very attractive natural finish. It's a good idea to finish the wooden parts before assembling. Then, after the assembly is complete, it will only be necessary to polish with wax to remove finger marks. After finishing and assembling the parts in a trial fit, attach the luggage latches which hold the cabinet closed. These latches are of the two-piece type, the striker being attached to the top of the hinged endpiece, as in the lower left-hand detail on the opposite page. The latches are shown in position in the detail below. The top and front are hinged to fold flat and the back edge of the top fits into a channel formed by a rabbet in the top edge of the back and a length of corner angle.



APRIL 1951



Tabs of Tape Aligned Diagonally Keep Photo Slides in Order

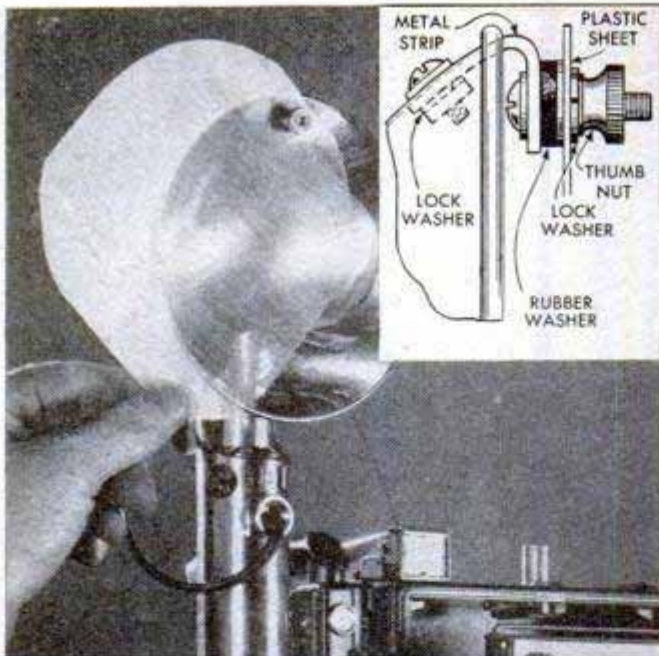
With the aid of a diagonal line of tape across the edges of a box of photo slides, you can tell at a glance if any are out of place. Before establishing the line, make certain that each slide is in its place. Then stretch a strip of tape from one of the lower corners of the row to the opposite upper corner and press it to the top edges of the slides. Cut the tape midway between the slides and press the severed ends down over the sides. By using a different color of tape for each row of slides, it becomes easy to avoid mixing them.

Evan Wright, Topeka, Kans.

Strap Bracket Holds Cable Release

Many photographers find it easier to steady a hand-held camera if they snap the picture with a cable release anchored to the camera case instead of using the manual release on the shutter. The ferrule at the plunger end of the cable is pressed into the channel which is formed by the carrying-strap bracket at the upper corner of the camera, as shown in the photo. If the cable ferrule is tapered, it can be pressed into the channel without prying the metal apart and is removed easily when the free cable release is used with the camera mounted on a tripod.





Diffusion Screen for Flash Gun Provided by Plastic Mask

When using a flash gun as a fill-in light, the flash can be diffused to give a softer effect by covering the reflector with a sheet of transparent plastic. The sheet is cut somewhat larger over all than the diameter of the reflector and the plastic surfaces are made translucent by rubbing lightly with very fine emery cloth. A metal bracket bolted to the top of the reflector holds the plastic in place. The mask, which is drilled or slotted to fit over a bolt, is sandwiched between a rubber and a metal washer, the rubber washer allowing the sheet to be swung out of the way in order to change bulbs. A thumb nut facilitates attaching and removing the plastic sheet.

Frank P. Fritz, Chicago.

Discarded Auto Ammeter Mounted on Plywood Checks Output of Dry Cells

If the flash attachment to your camera is used only on rare occasions, it will pay to have this simple tester on hand to check the condition of the battery before an important shot is to be made. The tester consists of an old auto ammeter which is merely mounted on a piece of plywood that is raised with cleats to provide clearance for the ammeter terminals and wire leads. The leads are passed through holes cut in the base and the ends of the leads are dipped in solder to assure good contact

with the cell. A rack for the cell is formed by tacking two small cleats to the plywood. To indicate that a cell is in good condition, the ammeter should read

between 5 and 10 amps., depending on the type of gun used and the number of flash bulbs to be fired simultaneously.



Popular Mechanics Book Shop

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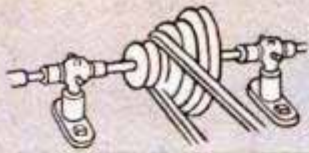
make you a graduate veterinary, but it will enable you to diagnose and treat many common ailments of animals. Written in easy-to-understand terms, the book is divided into various sections covering different animals. It is a must for anyone having an animal for a pet, or anyone who produces animals for sale.

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If you are looking for plans or suggestions of things to make in your home workshop, this series of 12 books will be a gold mine of information. Each book contains an average of 300 things to make. The complete set of books includes almost anything you can think of, from the simplest projects to the more com-

plicated ones that would require a construction time of many weeks. There are projects in leather, wood, metal and glass as well as toys of all kinds. There are also projects for your lawn and garden as well as your home workshop. Each book is priced at \$1.75 per copy, or all 12 books may be had for \$18.00.

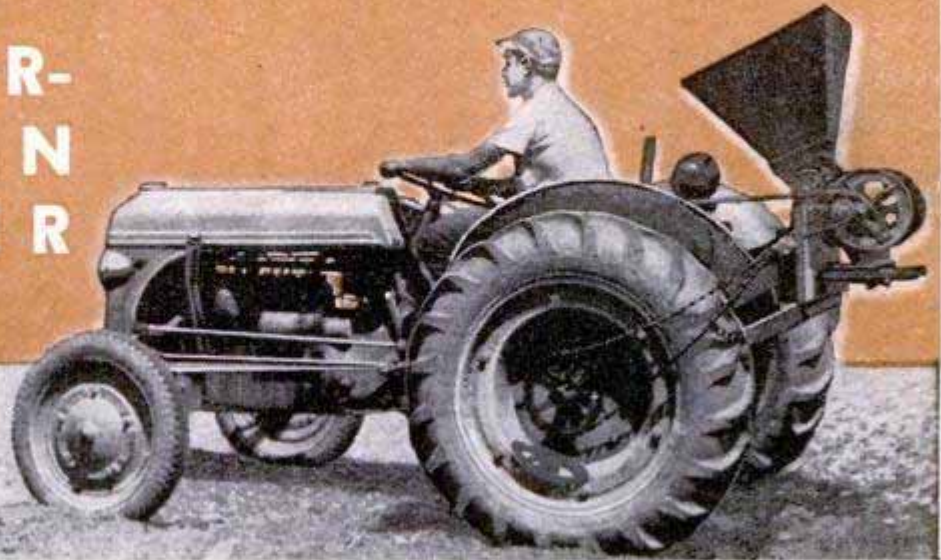
All books are available from Popular Mechanics Book Dept., 202 E. Ontario St., Chicago 11



Shop Notes

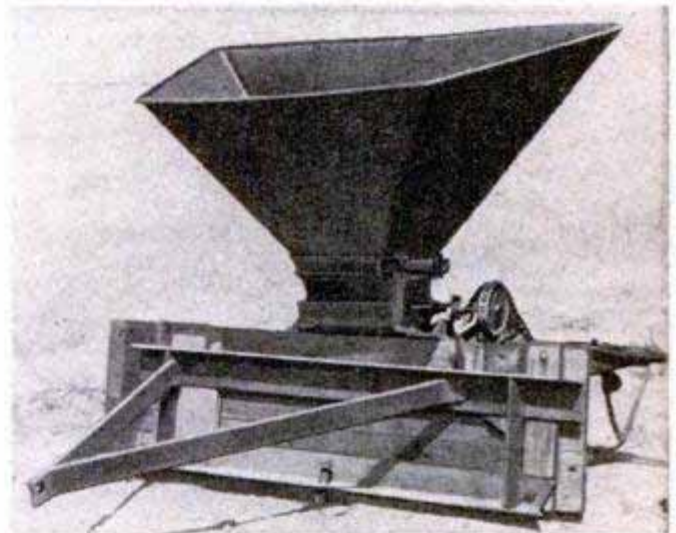


TRACTOR-DRIVEN SEEDER



By Hi Sibley

FOR BROADCAST seeding of pastures, cover crops, small grains, and for re-seeding of established meadows, this tractor-mounted seeder saves hours of valuable time and assures uniformity of seeding rate at higher speeds. Designed by Clarence Walker of Nuevo, California, it's simply an ordinary endgate seeder mounted on a special angle-iron frame and adapted for use with the Ford tractor. Of course, a similar mounting can be designed with only a few alterations to fit other makes of tractors having hydraulic implement lifts. The top photo shows the seeder in operation, the center photo pictures the mounting, and the lower one shows how the sprocket drive must be mounted on the drive wheel of the Ford tractor. The seeder is regularly supplied with an endgate suited to a wagon or trailer box of standard dimensions. Note from the center photo at the right and the details on the following page that the seeder is offset slightly on the angle-iron frame to which the endgate is bolted. This is necessary in order to align the sprockets correctly when the seeding unit is in operating position. To permit raising and lowering with the tractor lift, the drive chain must run slack. On some types of endgate seeders this will require a spring-mounted idler, which can be either a curved chain slide or a flanged roller. Usually a suitable idler can be picked up at a farm-service shop or junk yard. On the Ford tractor, which has no shaft extension beyond the hub of the drive wheel, it is necessary to

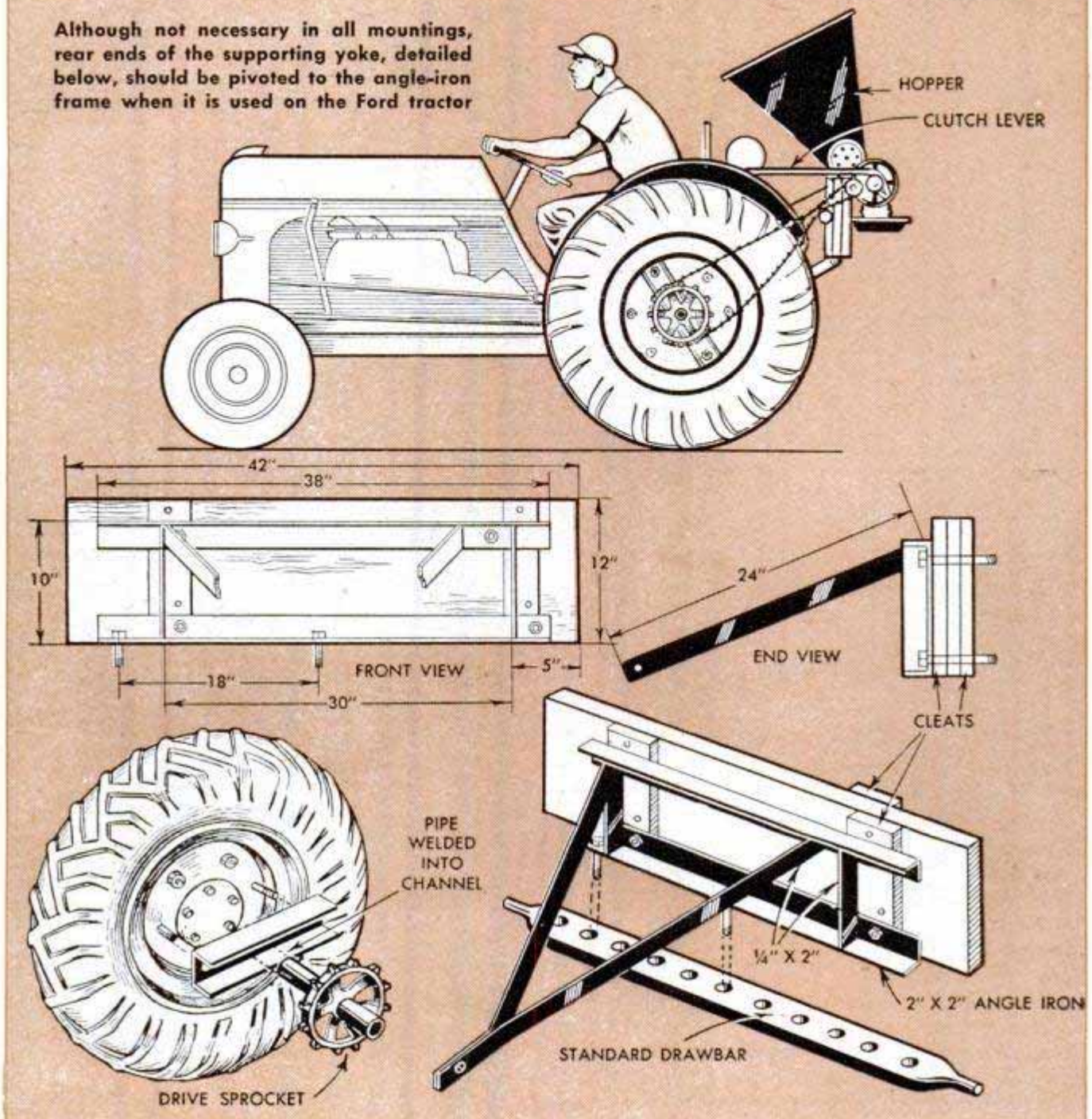


Endgate seeder is mounted on a special angle-iron frame for use with Ford tractor. Seeder usually comes equipped with wooden endgate of standard width



Drive sprocket is mounted on stub shaft welded to a steel channel which is cut long enough to span the hub bolts. Use a skip-tooth sprocket for the drive

Although not necessary in all mountings, rear ends of the supporting yoke, detailed below, should be pivoted to the angle-iron frame when it is used on the Ford tractor



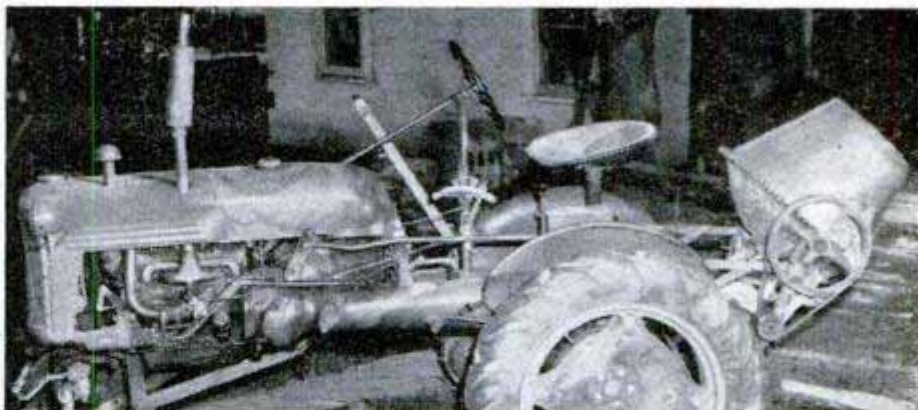
mount the drive sprocket on a bracket consisting of a piece of steel channel to which a stub shaft or a length of pipe is welded at the center to take the sprocket wheel. The channel should be long enough to span the wheel-hub studs. In some cases, when using a flat sprocket wheel, it would be possible to use a longer piece of channel and drill holes near the ends to fit over opposite rim bolts. On tractors having splined shaft extensions, it generally is possible to mount the sprocket on the shaft by reboring the hub and fitting a setscrew. On some tractor wheels it is possible to mount the ring sprocket which is ordinarily supplied with the seeder. In any case, use a skip-tooth sprocket to avoid breakage caused by the slack chain riding up on the tips of the sprocket teeth.

One thing to watch in the construction

is the length of the Y-shaped yoke which replaces the tension bar on the lift mechanism of the Ford tractor. The rear ends of the yoke are attached to the angle-iron frame supporting the seeder with bolts so the parts can pivot as the seeder is raised and lowered. The length of the yoke must be carefully calculated beforehand so that, when the seeder is raised to operating position, it will be level, or nearly so. One arm of the yoke is attached to the frame with an angle bracket because of its offset position. As will be seen in the detail, the supporting frame is bolted to the tractor drawbar which can be raised and lowered by the lift mechanism of the Ford tractor. In most instances it will be necessary to provide a lever for engaging and disengaging the jaw clutch on the seeder shaft from the tractor seat.

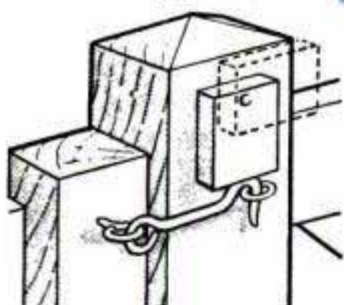
Cement Mixer Mounted on Rear of Tractor

By mounting a small cement mixer on the rear of his tractor, one man was able to pour his own ready-mixed concrete directly into the forms when constructing a new driveway. Thus, he was able to save the work of mixing the cement by hand and transporting it manually. By driving the mixer from the power take-off of the tractor, the batch of concrete is thoroughly mixed while being hauled to the place where it is to be used. The position of the dumping lever on the mixer allows the driver to pour the concrete without leaving the tractor. As the mixer is bolted to the tractor, it is easily removed. — Elmer L. Weaver, Chicago.



4830 Washington Blvd.

Hook-Type Gate Fastening Locked by Small Pivoted Block



Gates and doors held closed by hook-and-eye fastenings are quite easily opened by livestock and, often, movement caused by the wind will disen-

gage the hook. This can be prevented by nailing a small block of hardwood to the post, or casing, just above the hook. A slightly oversize hole is first drilled through the block near one end so that it will pivot freely on the nail. In attaching the block, care must be taken to locate it so that it will clear the hook when turned.

R. W. Kainulainen, Spokane, Wash.

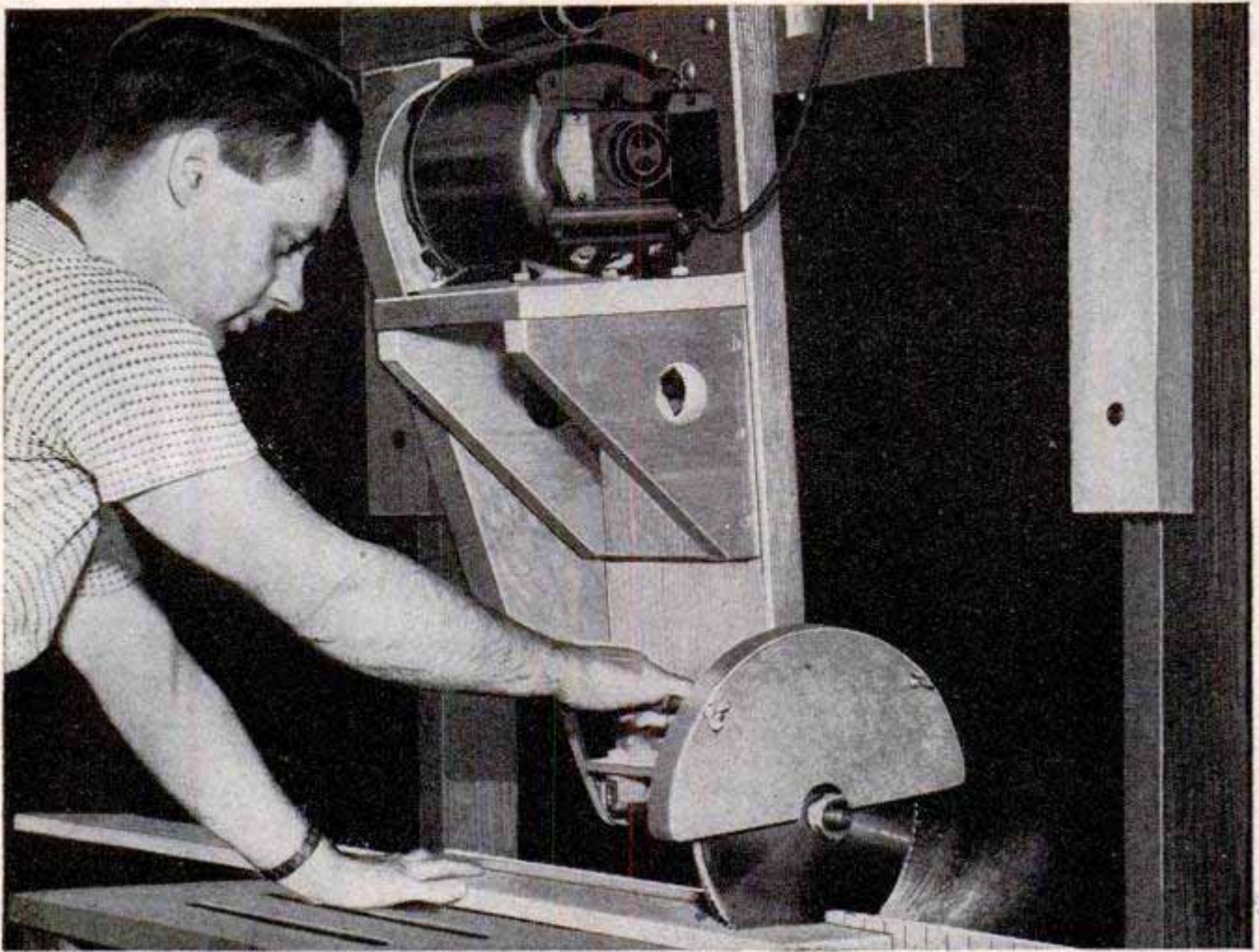
Welder's Trestles Constructed From Pipe Lengths Are Portable and Rigid

Although these trestles, or horses, were designed and built expressly for use in a welding shop, carpenters and builders will like them because they are portable,

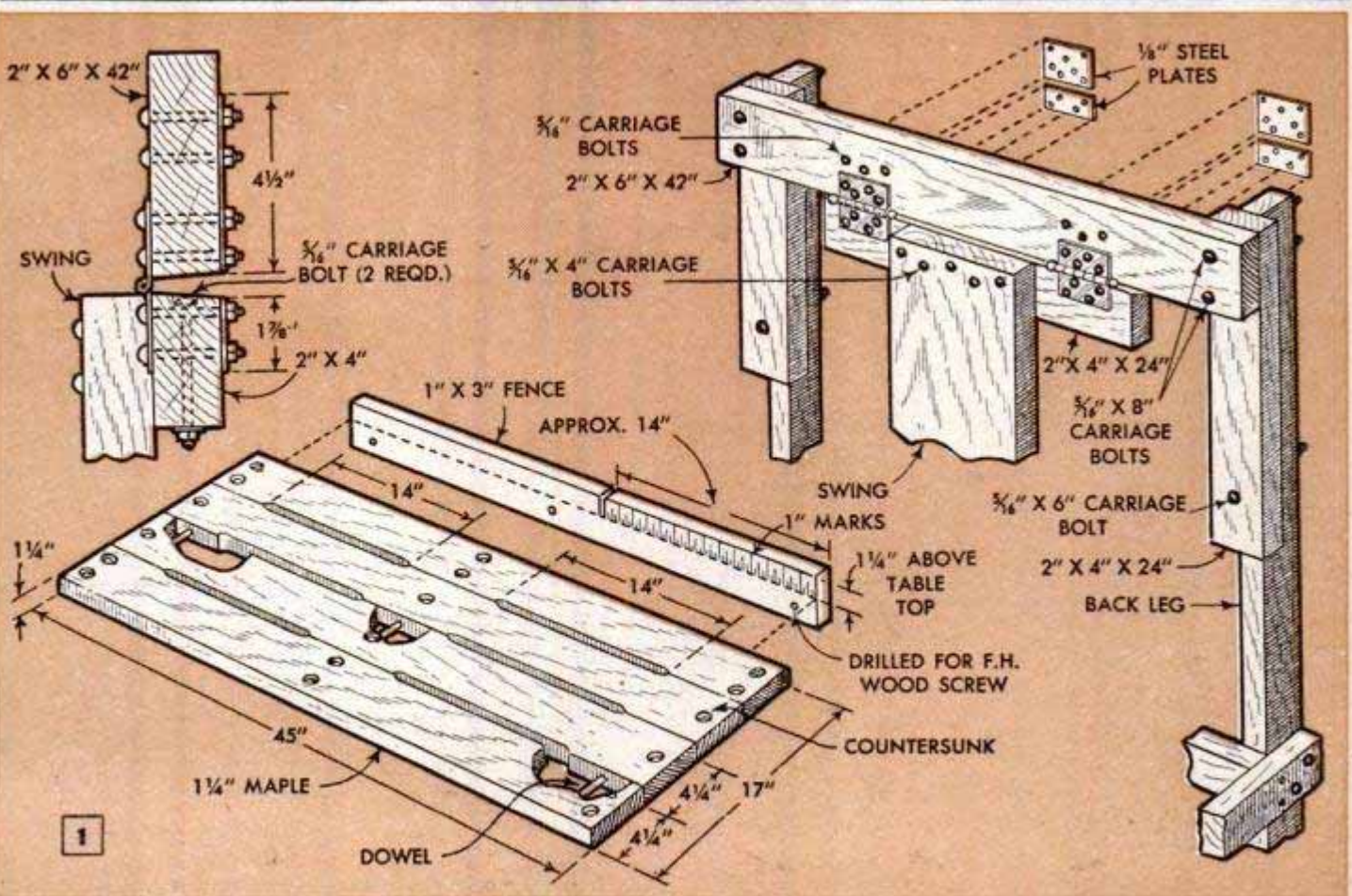


weatherproof and extra strong. All parts except the leg braces are of $\frac{3}{4}$ -in. black pipe. The braces are of $\frac{1}{2}$ -in. pipe and are welded to each pair of legs close to the lower ends. The outstanding feature of the design is the construction of the trestle beams, or rails. These are made up as units and consist of two identical lengths of $\frac{3}{4}$ -in. pipe welded to spacers. This construction gives the trestles their unusual lightness and rigidity. The trestles can be made to the conventional sawhorse height, or the legs can be made any length up to 60 in. so that the units will serve as sturdy, lightweight trestles for low scaffolds.

Lengths of small rubber hose can be connected easily by using short sections of glass tubing to link them together. Round the sharp edges of the tubing before slipping the ends of the hose over it.



SWING SAW



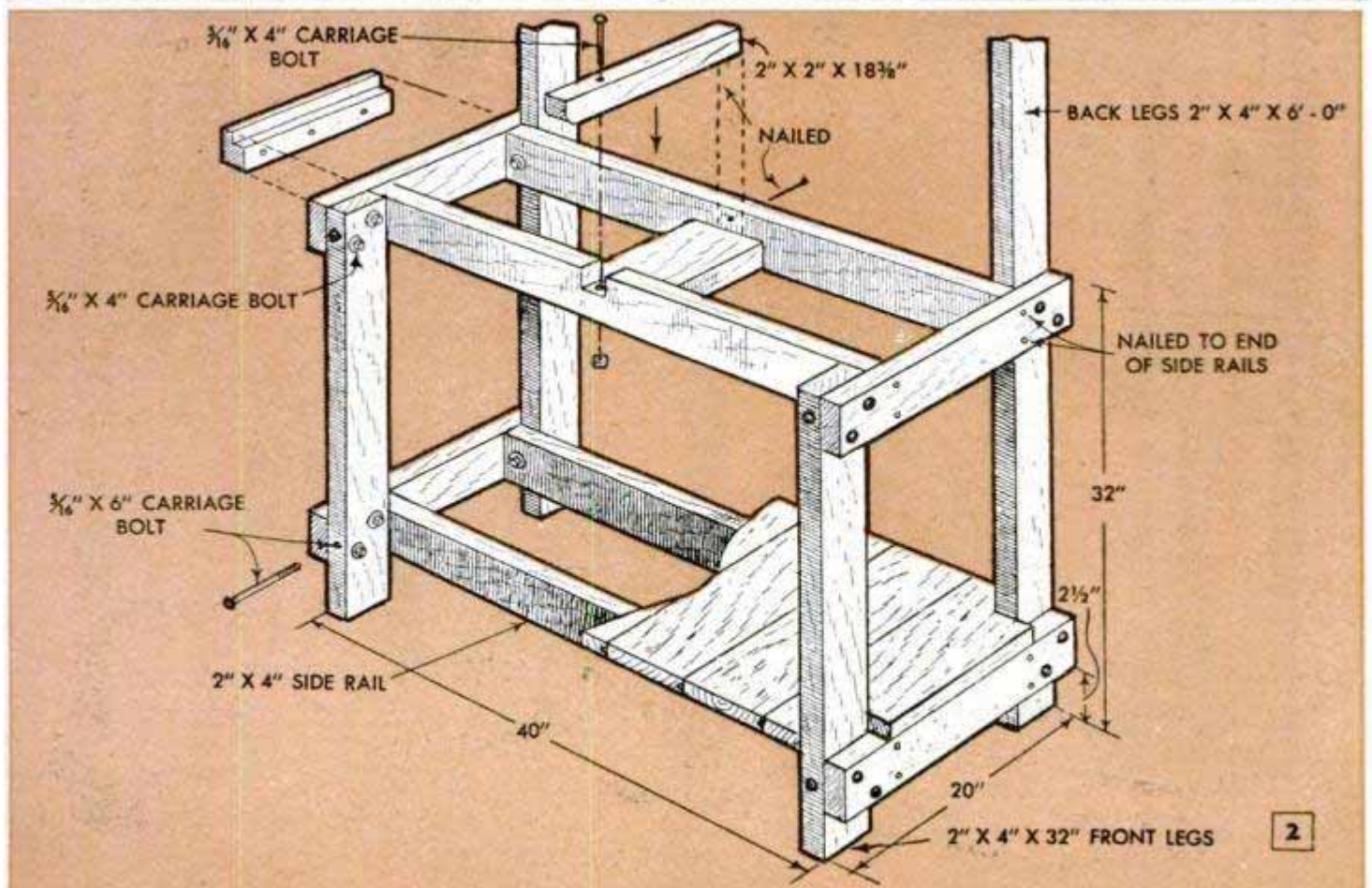
FOR CROSSCUTTING long boards and framing lumber to precise lengths, you can't beat a swing saw for speed and accuracy. That's why experienced home craftsmen, cabinetmakers and carpenters usually build one for use in the shop. The principal units and parts you'll need for the job are a ½-hp. motor, a ball-bearing saw arbor of the type having a housing cast with bolt lugs, suitable pulleys and belt, a pair of heavy butt hinges and a few straight 2 x 4s and 2 x 6s with which to build the table frame and the back support. Figs. 1 and 2 detail the saw table and frame. Before cutting the stock, note that the table height will be 32 in. plus 1¼ in., the thickness of the table top, or, a total height of 33¼ in. Some craftsmen prefer a table height of 36 in. on a swing saw. Check beforehand to make sure which table height you desire. Note also that the table-top length is 45 in. and that the saw blade is on the operator's right. Many craftsmen prefer the blade on the left, as it is somewhat easier to see the dimension marks when cutting to pencil lines rather than using the scale on the table fence. This will require a saw arbor with a left-hand thread.

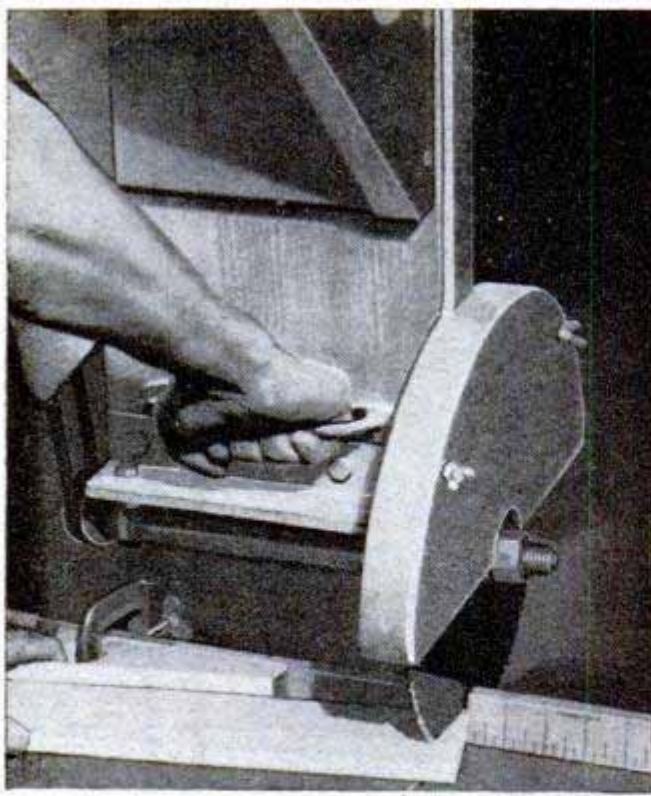
The back legs of the table extend to 6 ft. in height as in Fig. 2. First, cut the legs and the end and side rails, or stretchers. Be sure that all parts are cut square at the ends and to the lengths specified. Assemble the end members with glue and bolts as in Fig. 2 and check both assemblies for squareness before the glue dries. Then set up the frame with the side rails in place and place bar clamps across the top and bottom end rails, using one clamp at each corner so that the frame can be drawn together tightly before drilling the holes for the 6-in. carriage bolts. Use waterproof glue in the joints and, when the frame has been glued, clamped and bolted, check for squareness.

The table top, Fig. 1, is a simple edge-gluing job with the joints doweled. To form the slots, bandsaw both edges of each of the inner pieces, and one edge of each of the outer pieces to a depth of ½ in., each cut being 14 in. long. Start the cuts in on a ½-in. radius, run straight for 13 in., then out to the edge on a ½-in. radius. When the table strips are assembled, the cuts will form 1-in.-wide slots with rounded ends, permitting sawdust and chips to fall through to the floor. Although the table length is given

By Edward R. Lucas

for Your Home Workshop

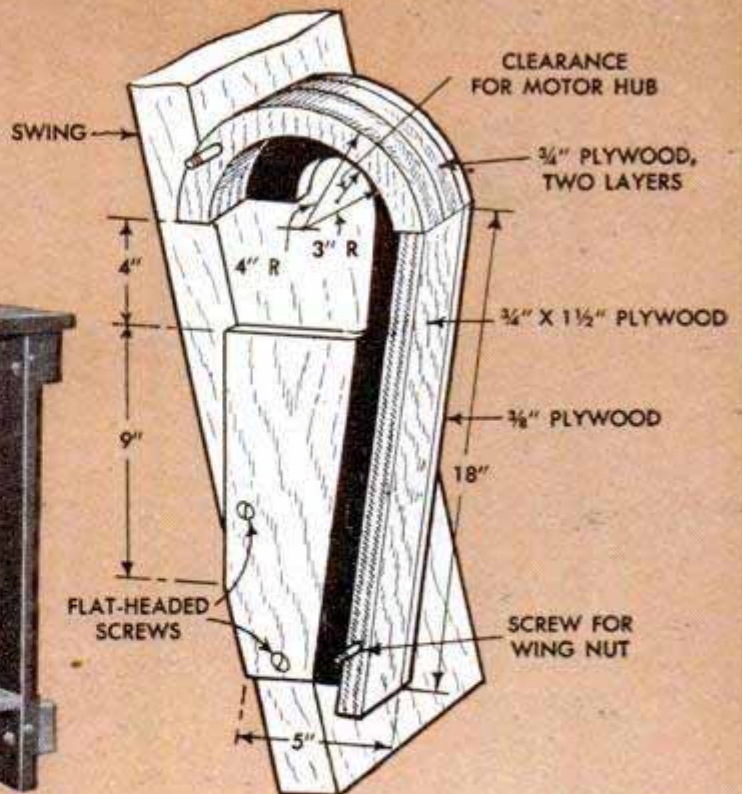




By using angle blocks clamped against the fence, you can make angle cuts up to 45 deg. on narrow stock

here as 45 in., it can be made any convenient length up to 6 ft. by using the same general construction and thickness of material. The table top is attached to the frame with spaced wood screws driven in countersunk holes. If desired, the holes can be filled with wooden plugs after driving the screws. Note in Fig. 2 that the table top is supported at the center by a 2 x 2-in. cross member bearing on a 2 x 6-in. spreader glued between the rails. The cross member is notched through the front rail as shown. Sand the table top smooth and apply a thin coat of orange shellac. Finish with wax. The lower shelf, Fig. 2, can be omitted if desired.

The swinging column, motor shelf, guard and arbor mounting are detailed and pictured in Figs. 3 and 4. The top of the swinging column is attached to a cross member, and this is hinged to the horizontal support which is bolted to the top ends of the back table legs as in Fig. 1. Before attaching the hinges, cut out and drill backing plates from $\frac{1}{8}$ -in. flat steel so that the hinges can be attached with bolts as in the sectional view, Fig. 1. Lay the hinges on an anvil and indent the hinge eyes with a prick punch so that the pins will be a tight press fit when the hinges are assembled with the parts in place. This will prevent any play in the swinging arm and also will prevent the pins from working out while the saw is in operation. Note in Fig. 4, right-hand detail, that the motor shelf rides on a key, or guide, fitting in a groove cut on the back face and that the bolt



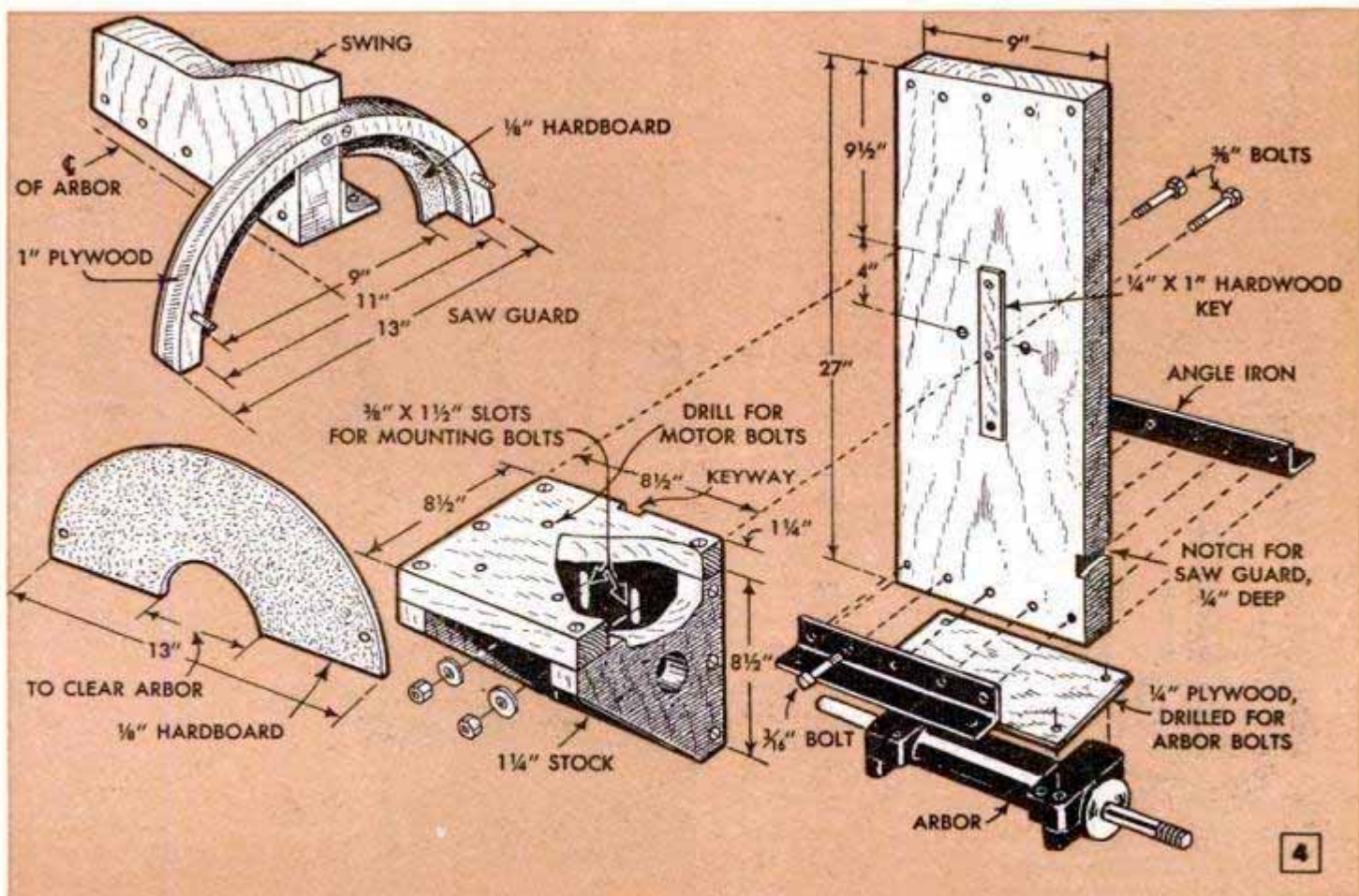
3

holes are elongated so that the motor may be adjusted to give the correct belt tension. Two pieces of angle iron are bolted to opposite sides of the column at the lower end to form a mounting pad for the saw arbor. Because of slight irregularities of the cast arbor housing, it's a good idea to insert a piece of 1/4-in. plywood between the arbor and the angle-iron pad as in the right-hand detail, Fig. 4. It is essential that the saw arbor and motor shaft be as nearly parallel as it is possible to make them. As dimensioned, the parts accommodate an 8-in. blade. After mounting the motor and arbor, make the belt and blade guard, following the details in Figs. 3 and 4. Now, mount the swing unit in the frame and locate at the proper height in relation to the table top by adjusting the supporting cross member of the frame slightly up or down. When properly adjusted for height the blade will cut a groove in the table top about 1/8 in. deep. Screw the fence in place and make this first cut through the fence and across the table top. Then remove the fence and mark it in 1/8 or 1/16-in. graduations to the right of the saw cut. Note in the right-hand detail in Fig. 1 that the swing support is blocked out from the uprights. These blocks are not necessary for cutting stock up to 10 in. wide, but for full capacity of about 13 in. they will move the unit forward just the right distance. For correct blade speed with a 1725-r.p.m. motor, use a 5-in. pulley on the motor and a 2-in. pulley on the arbor.

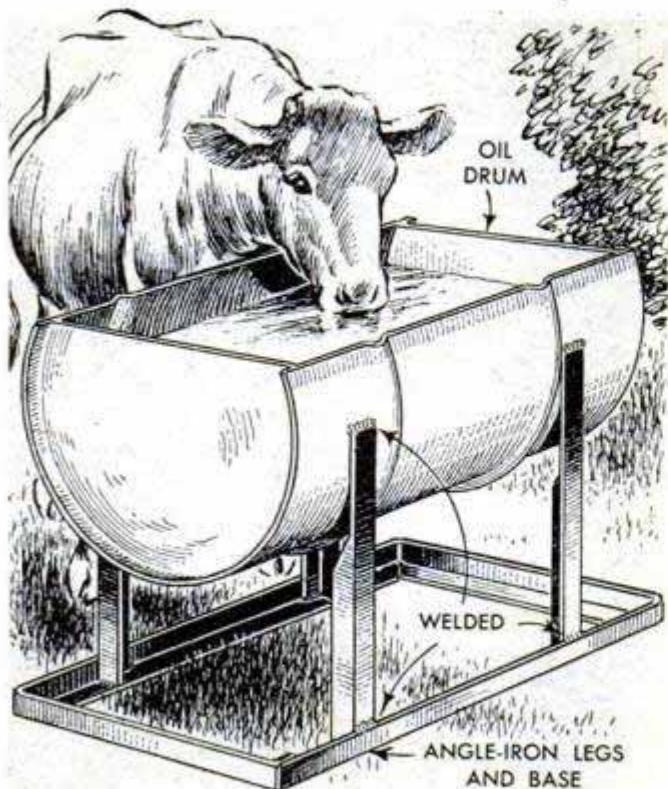


Belt guard is built up as a unit before attaching to swinging column. Note relative size of pulleys

Details below show the construction of column and angle-iron pad on which the saw arbor is mounted



Watering Tank for Feed Lot Is Made From Steel Drum



Made from a 55-gal. steel drum, this portable watering tank is designed especially for use in small pastures and feed lots where there is no permanent water supply. The upper one third of the drum is cut away and the edges smoothed with a file. (Caution: It's a good idea to steam-clean the drum before cutting with a torch, as there is some danger of an explosion being caused by flammable residues unless the inside of the drum is thoroughly cleaned.) The tank is supported on four angle-iron legs welded to the sides of the tank and also to a rectangular frame of welded angle iron. The frame, or base, is made larger than the over-all size of the tank so that the tank will be supported without tipping or settling on soft ground.

Kenneth R. Imig, Watseka, Ill.

Horseproof Gate Latch



The farm saddle pony who habitually nuzzles open the gate or barn door and roams over the lawn or garden patch will be completely baffled by this simple latch. The moving part is a long link made by bending and welding $\frac{3}{8}$ -in. steel rod, the radius at the ends being about $1\frac{1}{2}$ in. The handle and the catch, which is attached to the gatepost, are bent from $\frac{1}{4}$ x

$1\frac{1}{4}$ -in. flat steel. Before bolting the handle to the gate, slip one end through the link. The secret of the effectiveness of this latch is that when in the locked position the link drops below the offset bend in the catch and can be raised only by pulling the link outward and upward simultaneously.

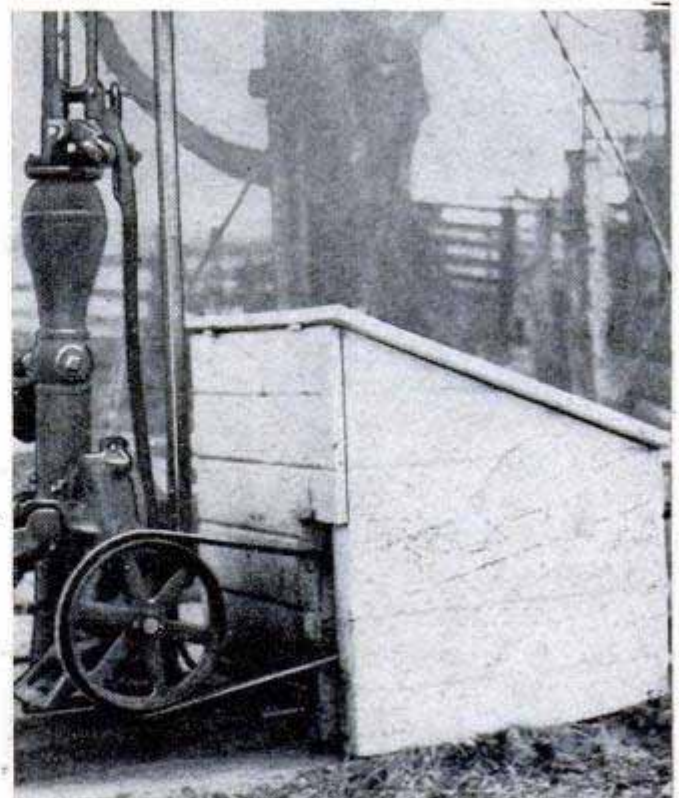
Sections of Worn Push-Broom Heads Are Used as Bench Dusters

In time, a push broom becomes worn to the point where it is no longer useful for the purpose for which it is designed. However, by cutting the broom into two or three sections and rounding the cut ends by sanding, the parts still can be utilized as bench dusters. Just attach a short handle to each of the sections and trim the worn bristles to a uniform length.



Portable Shed Gives Protection To Electric Well-Pump Motor

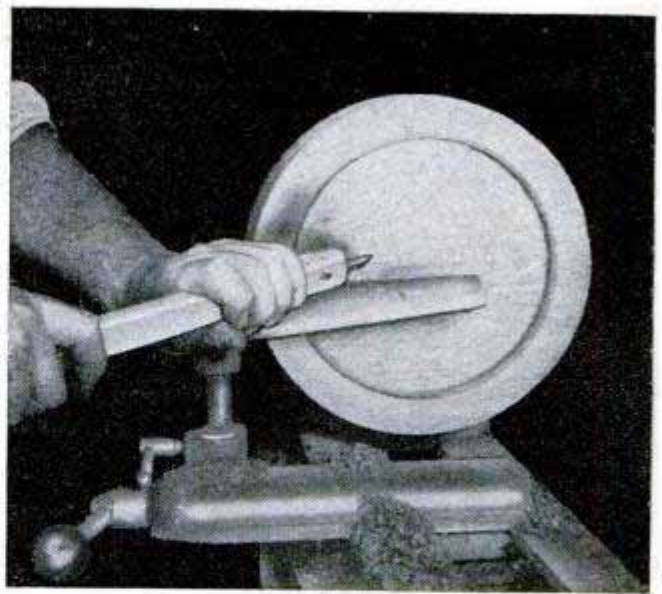
This easily built miniature shed provides complete weather protection for an electric pump motor. The roof is hinged for easy access to the power plant, and the switch is conveniently mounted outside. The shed, being heavy enough to resist ordinary winds, is not fastened down so that it can be readily removed when necessary to service the motor.



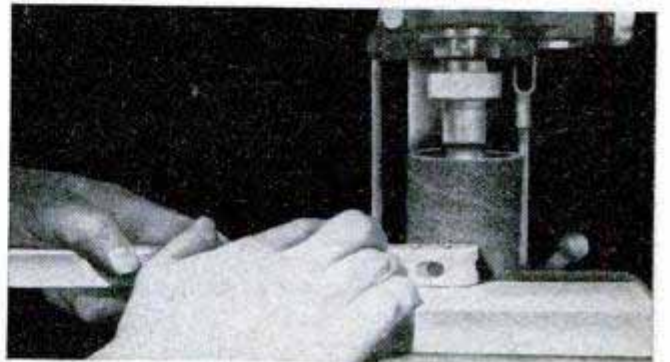
CARBIDE-TIPPED TURNING 'CHISELS'

By Harrison Neustadt

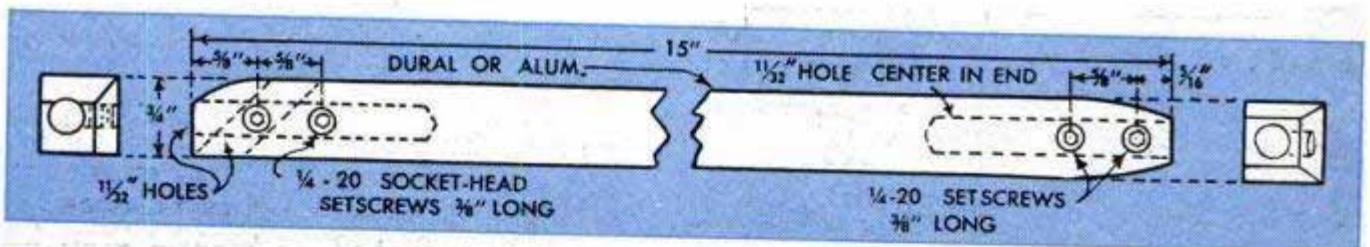
Made from a square bar of aluminum, this two-ended handle permits carbide-tipped tools to be used as wood-turning chisels. The carbide tips require less frequent sharpening than the steel of ordinary lathe chisels and can be used for turning other materials such as plastic and soft metals. Holes drilled in the shaped ends of the handle take $\frac{1}{4}$ -in.-square bits of the type used in metal-turning lathes. Note that one end of the handle is shaped with two, short, slightly rounded bevels, and that the other is provided with three long bevels. Holes are drilled longitudinally in each end and transverse holes are drilled and tapped for set-screws. A third hole is drilled at 45 deg. near one end to provide an angle setting for one turning chisel. These special features enable the lathe operator to work in deep recesses, undercut square shoulders, and bore large-diameter holes in hardwoods and plastics at cutting speeds not possible with ordinary turning tools. After shaping, drilling and tapping of the handle have been finished, round the corners of the aluminum bar near the center to provide a comfortable handhold but be sure to leave the faces of the bar square near the ends to provide a firm bearing on the tool rest.



Shaped ends of this chisel handle enable the operator to work in deep recesses and narrow undercuts

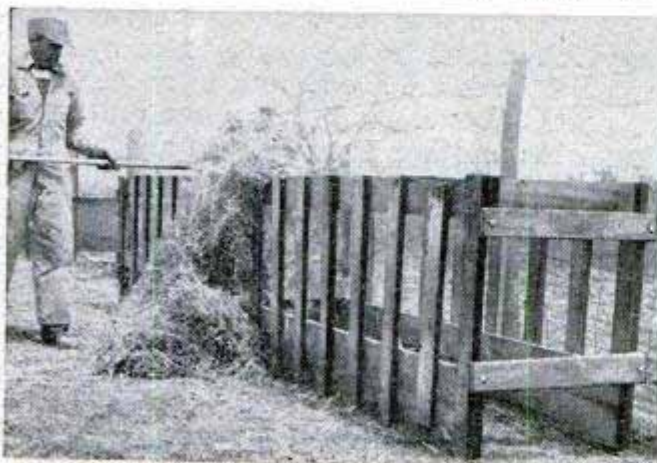


Ends of the handle are ground to shape on the drill press by attaching aluminum-oxide sleeve to drum



Stanchion-Type Rack Prevents Waste When Feeding Flock of Sheep

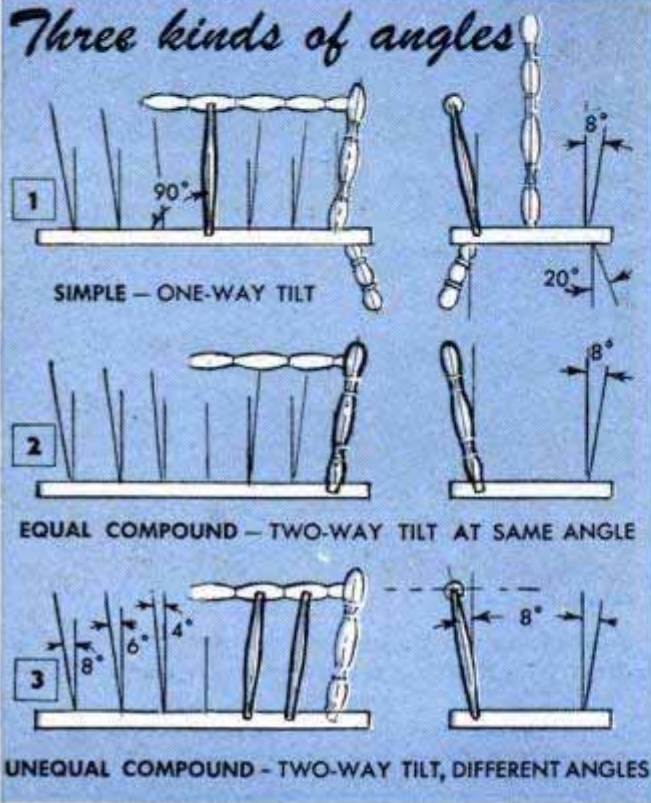
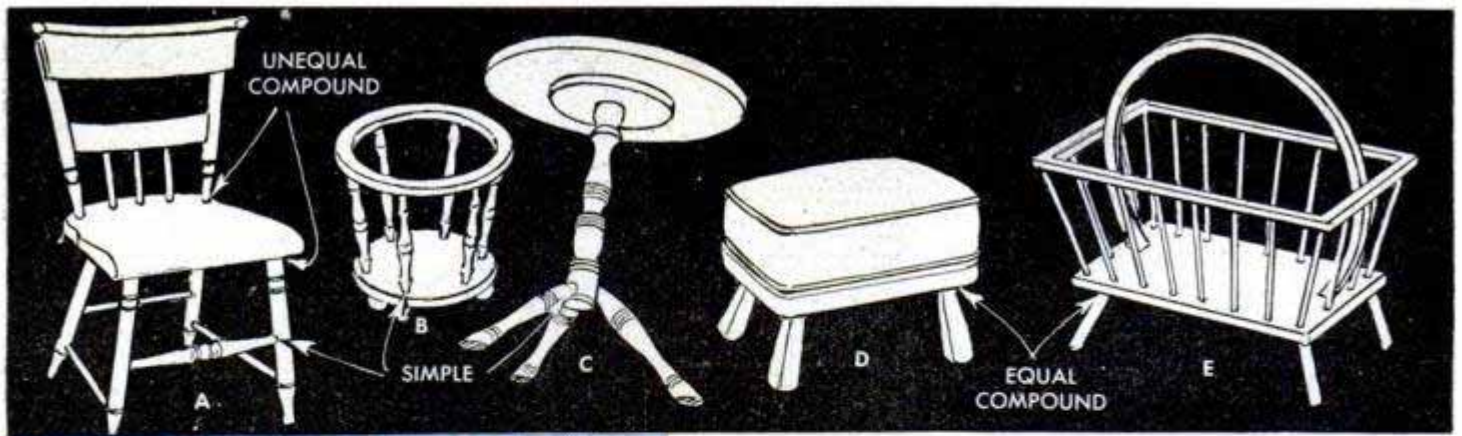
The problem of preventing waste when feeding hay and other roughage to a large flock of sheep led one farmer to design this rack especially for the purpose. It is 16 ft. long, 24 in. wide and 36 in. high. The



spaced uprights, which are cut from 1 x 6-in. cypress fence boards, are nailed to a 2 x 12-in. plank at the bottom and a 2 x 6-in. plank at the top. The vertical end members, and also the two cross members at each end are oak 2 x 4s. These are joined together with $\frac{3}{8}$ -in. bolts. This assembly makes the rack easy to take down and store in a narrow space when not in use. When set up, the rack can be anchored with wire to four steel fence posts driven into the ground near the ends.

Loosening Truck Tire From Wheel

Failing to pound the bead of a truck tire from the wheel rim, one mechanic used the hydraulic hoist to force the tire loose. He placed the wheel on the garage floor and carefully lowered the hoist onto the tire.



How to do ANGULAR DRILLING

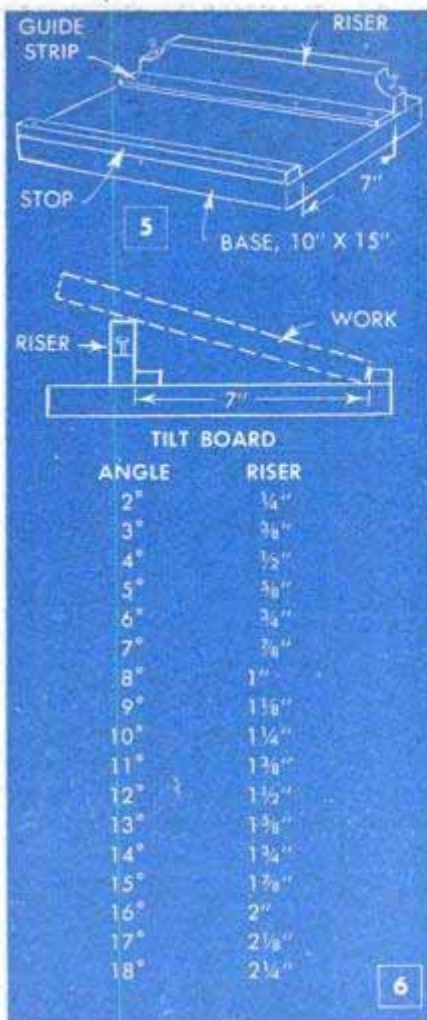
By Sam Brown

IF YOU PLAN to build furniture, likely you will run into a job where holes must be drilled at an angle. Although angular drilling may seem complicated, it actually is quite simple.

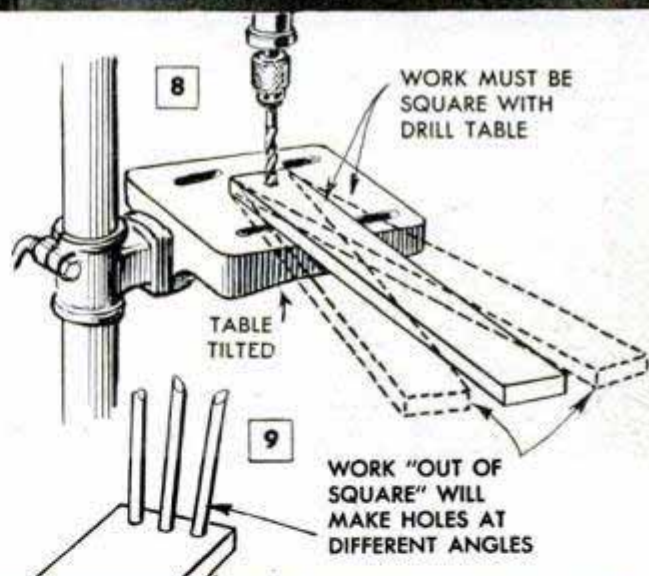
Kinds of angles: There are three main kinds of angles as shown in Figs. 1, 2 and 3. All three types are required in construction of the magazine rack pictured in Fig. 4. The simple angle involves a one-way tilt only. Most used is the equal compound angle, Fig. 2, which involves a tilt of the same magnitude as viewed from the front and end of the work. The unequal compound angle, Fig. 3, is likewise a two-way tilt, but with one angle greater than the other.

The simple angle: A basic rule in drilling at a simple angle is that the work must be square with the table, Fig. 8. It will be apparent that if the work is off to one side, the hole will show a similar error as in Fig. 9. However, positioning of the work is not too critical at low angles so that placement of the work by eye alone usually is sufficiently accurate. Examples of the simple angle are shown in sketches A, B, and C above. Note that when one turning joins another turning, the angle is always a simple angle—a one-way tilt. Radial work, sketch B, is always a one-way tilt and requires only that a radial line from the center of the work to the drilled hole must be square with the drill table.

Work requiring a simple angle usually is specified at so many degrees of tilt. The simplest way to set the tilt is to use a circular-saw miter gauge set at the needed



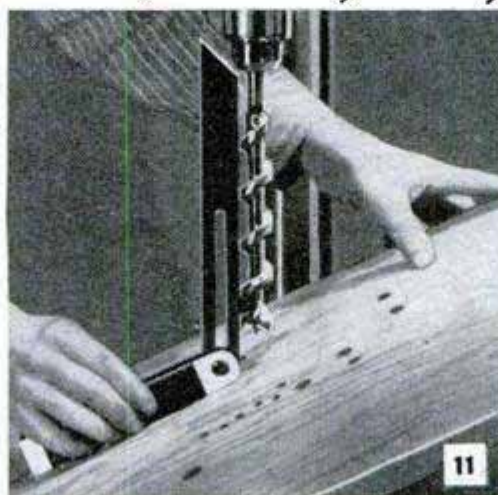
angle, and sight the bar to the drill column while adjusting the table as in Fig. 10. Use of a T-bevel, as shown in Fig. 11, is obvious. Also, instead of tilting the drill table, you can leave the table level and make the tilt with a tilt board as indicated in Figs. 7 and 12. If the tilt board is made exactly 7 in. between stop and riser, Figs. 5 and 6, height of the riser needed for any specified angle up to 20 deg. will be 1/8 in. per degree. This is tabulated in handy form in Fig. 6. Over 20 deg., the progression of 1/8 in. per degree will show a constantly increasing



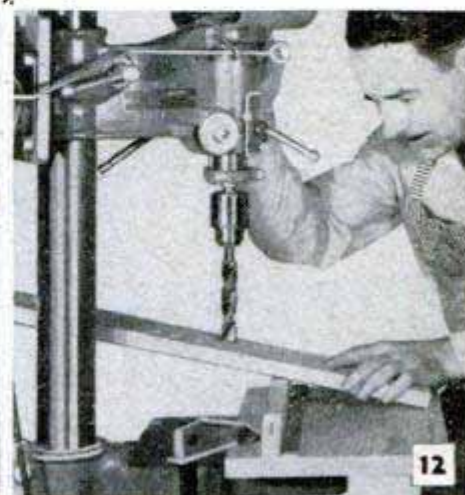
Setting the simple angle



... BY SIGHTING WITH MITER GAUGE



... WITH SET BEVEL



... WITH TILT BOARD

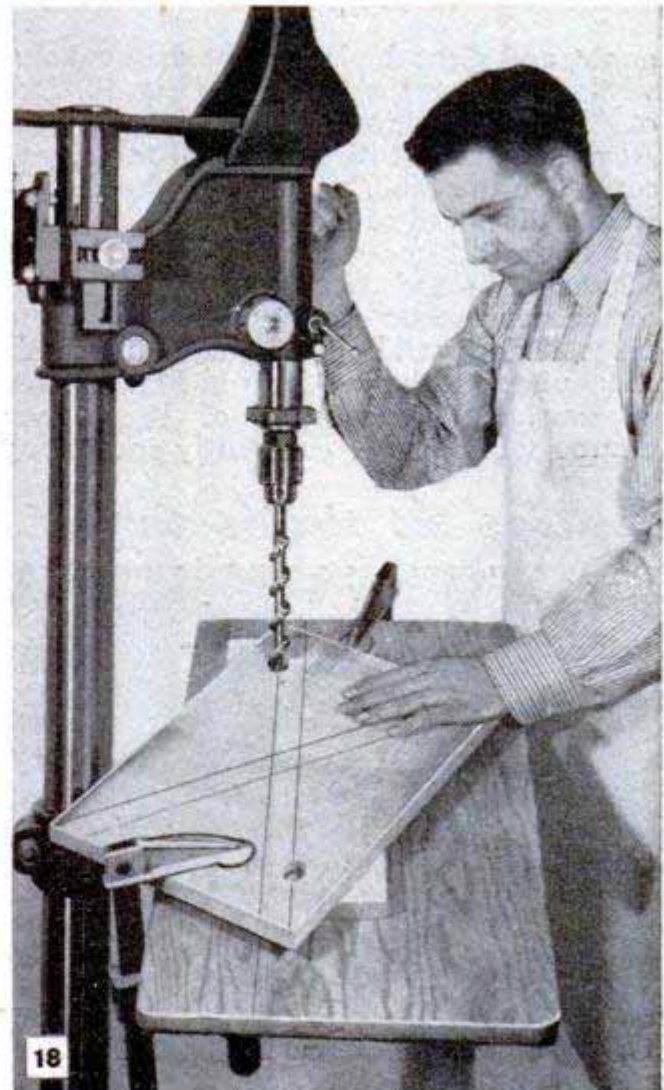
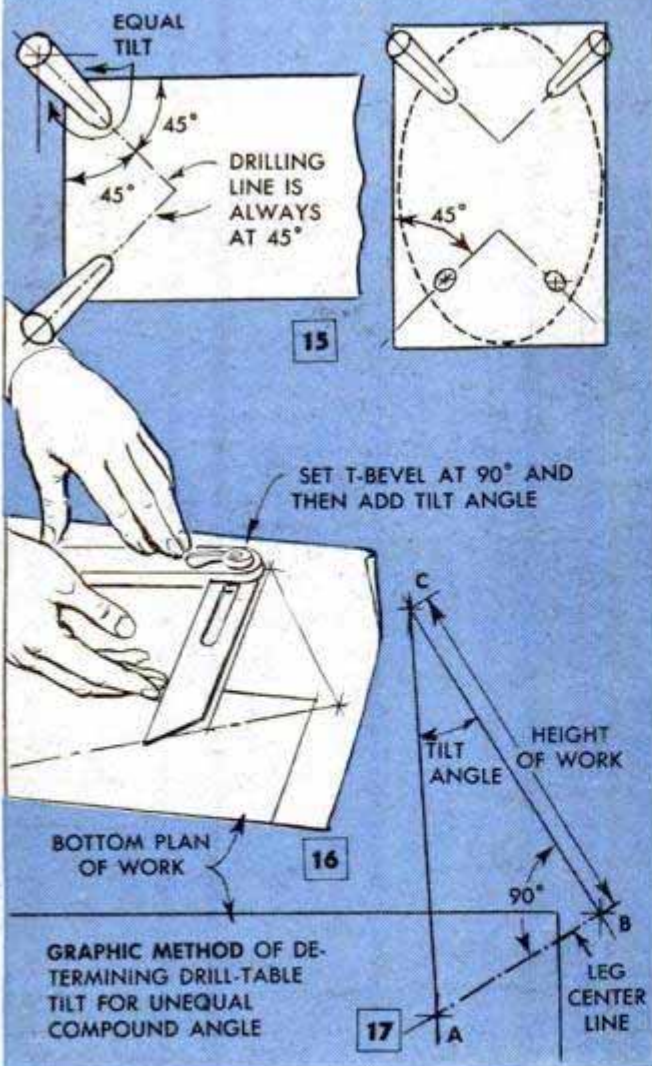


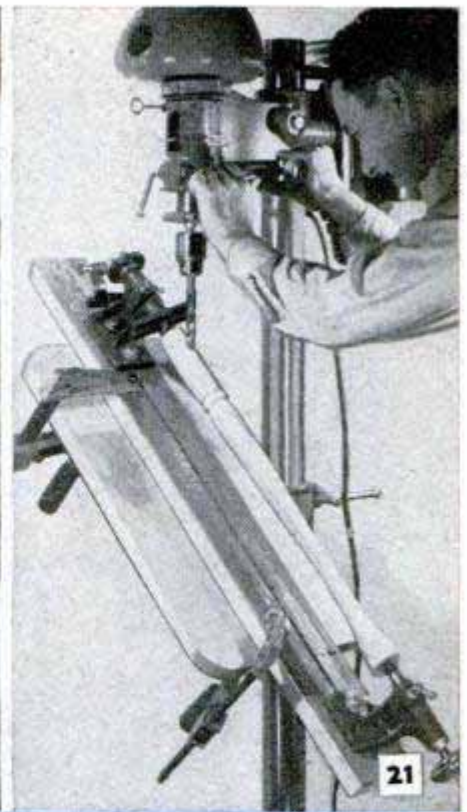
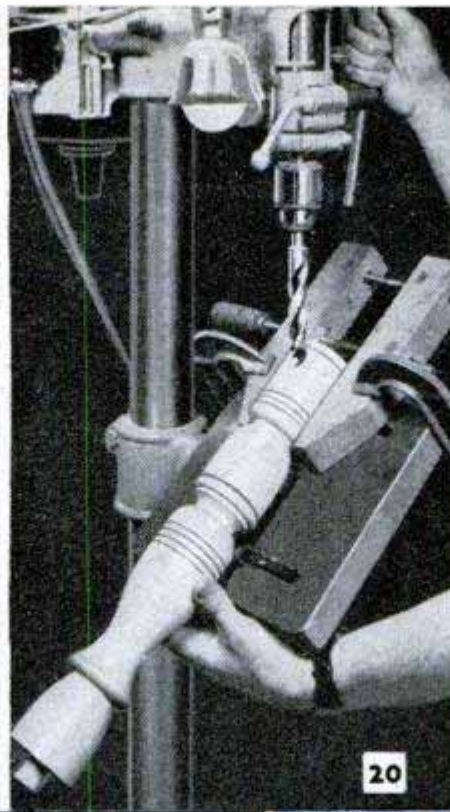
14
EQUAL COMPOUND ANGLES CAN BE CONVERTED TO SIMPLE ANGLES BY USING THE TABLE SHOWN AT THE TOP OF THE PAGE. NOTE THAT THE DRILLING LINE IS ALWAYS 45° TO THE EDGES OF THE WORK SURFACE

EQUAL COMPOUND ANGLES			
WORK ANGLE	TABLE TILT	WORK ANGLE	TABLE TILT
2°	2¾°	12°	16¾°
3°	4¼°	13°	18¼°
4°	5½°	14°	19½°
5°	7°	15°	21°
6°	8¼°	17½°	24¼°
7°	9½°	20°	27°
8°	11°	22½°	30¼°
9°	12½°	25°	33°
10°	13¾°	27½°	36°
11°	15¼°	30°	39°

error, but within the limits of the table given is reasonably accurate.

The equal compound angle: On a drilling job like the one in Fig. 2, where the corner spindles tilt 8 deg. as viewed from the front, and 8 deg. when viewed from the end, you have an equal compound angle. Since the tilt is equal both ways, the drilling line is always at 45 deg. to the work, as in Fig. 15. Placement of the work is done easily by using a V-block. If the lower edge of the V-block is placed square with the table, the work and the drill will be in correct alignment. Tilt of the drill table itself, Fig. 14, is simplified by consulting the table in Fig. 13, which converts the equal compound angle to a simple angle. Thus, in the



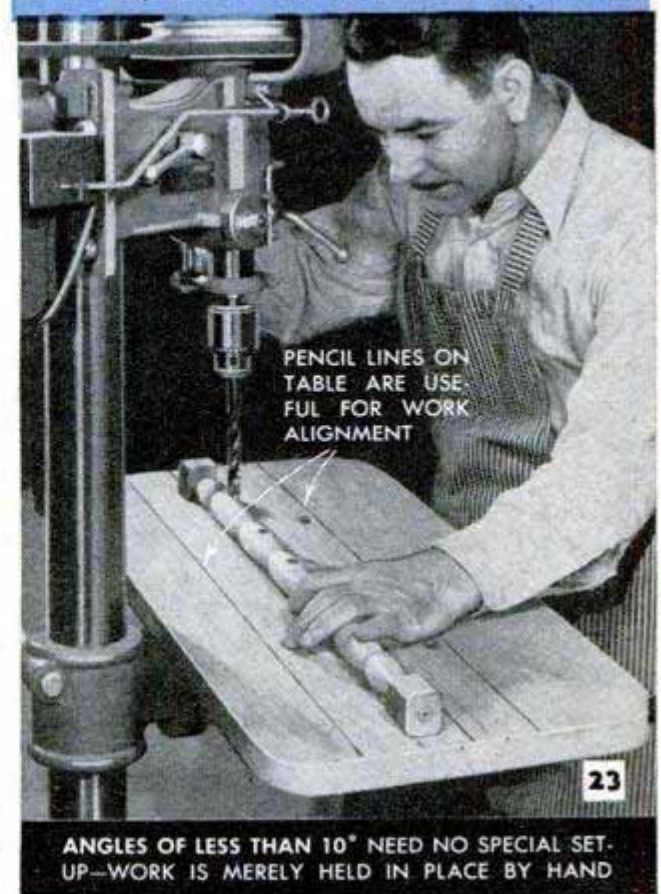
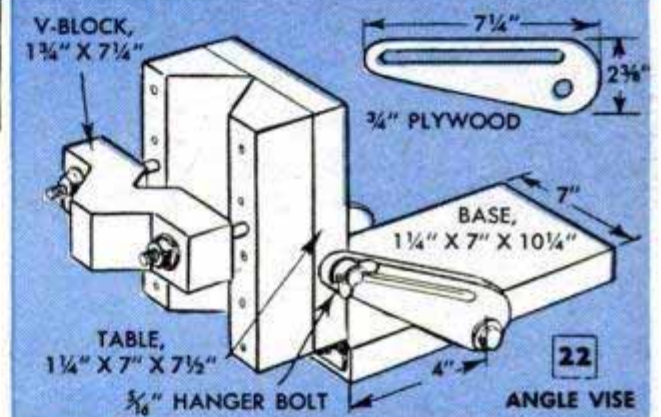


MOUNTING THE WORK CAN BE DONE BY ANY OF THE THREE METHODS SHOWN ABOVE. THE ANGLE VISE DETAILED AT THE RIGHT AND SHOWN IN USE IN THE LEFT-HAND PHOTO ABOVE, IS USEFUL FOR A VARIETY OF DIFFERENT JOBS

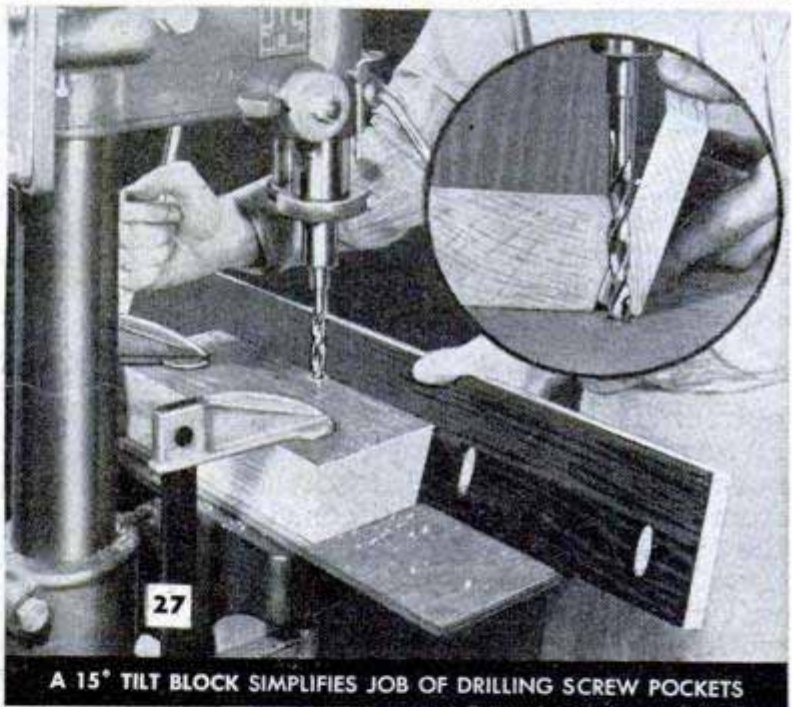
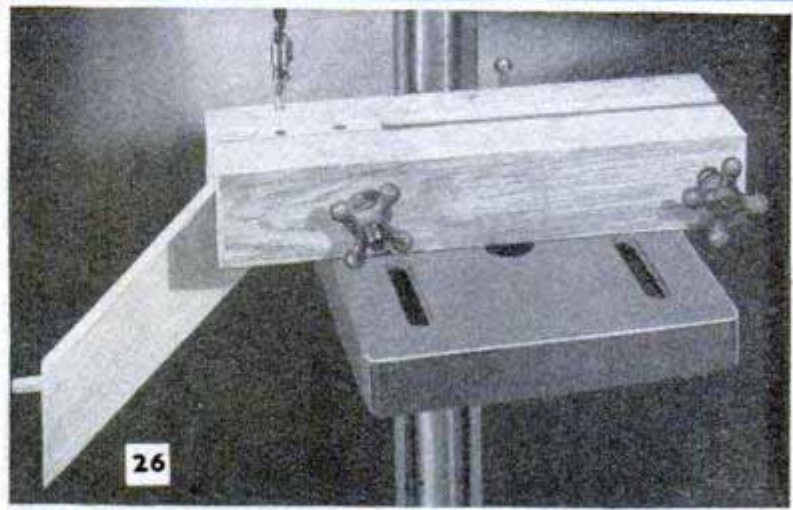
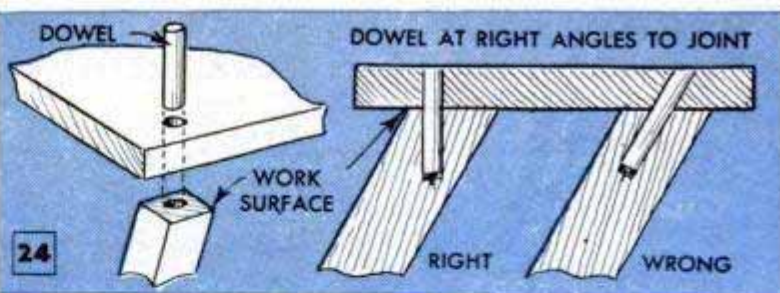
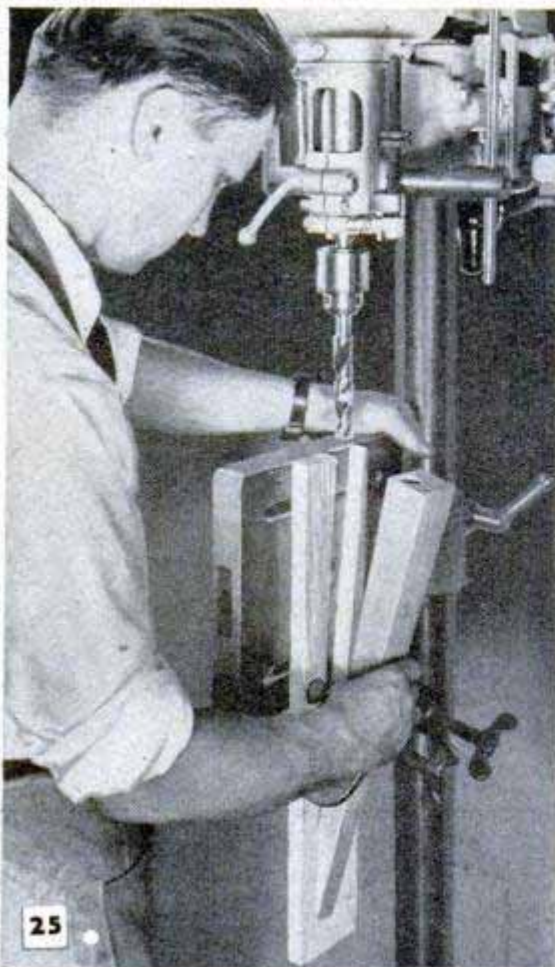
example previously mentioned, Fig. 2, a two-way tilt of 8 deg. is a one-way tilt of 11 deg., keeping the 45-deg. drilling line square with the table. Sketches D and E also picture the use of the equal compound angle.

The unequal compound angle: This is best worked by actually making the two tilts required. The example in Fig. 3 shows that all turnings for the side of the magazine rack have a uniform tilt of 8 deg. when viewed from the end, but vary in tilt as viewed from the front. Set the 8-deg. tilt needed with the use of the tilt board. As shown in Fig. 6, this will require a 1-in. riser. Then, with the work placed on the tilt board, Fig. 7, the center spindle hole can be drilled as a simple angle. The two spindles on either side of center require a tilt of 4 deg. In the same way, set the 6-deg. tilt, and then, since you have the setup made, the equal compound angle required for corner spindles is made similarly, with 8 deg. on the tilt board and 8 deg. on the drill table. The work has to be square with the drill table for both tilts.

A drawing-board method of determining the drilling line and tilt for an unequal compound angle is shown in Fig. 17. From drawings of the project it is easy to make a bottom plan view, locating on this the leg center line, as shown by line AB. From B erect a perpendicular, making it as long as the height of the project. Join C to A. The angle at C will be the required tilt of the drill table. To take off the angle, set a T-bevel at 90 deg. as in Fig. 16, and then add the angle.



ANGLES OF LESS THAN 10° NEED NO SPECIAL SET-UP—WORK IS MERELY HELD IN PLACE BY HAND



A 15° TILT BLOCK SIMPLIFIES JOB OF DRILLING SCREW POCKETS

DOWEL HOLES OFTEN REQUIRE ANGULAR POSITIONING OF WORK BUT THE HOLE ITSELF IS ALWAYS AT RIGHT ANGLES TO SURFACE OF JOINT

Use the T-bevel, set in this way, to set the drill table, as shown in Fig. 11. Fig. 18 shows the job being drilled.

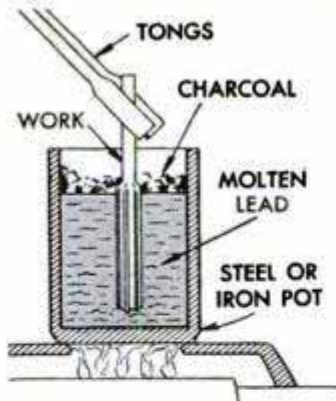
Mounting the work: Besides knowing how to set the angle, there is the job of mounting the work. A useful gadget for spindle work is the angle vise, shown in Figs. 19 and 22. Fig. 20 shows a simple handscrew mounting. The fluting jig, Fig. 21, is a good mounting for spindles, especially if spacing around the circumference is required. If the tilt angle is not over 10 deg., then simple placement of the work on the drill table as in Fig. 23, will do the trick. Note the pencil lines drawn on the table to help align the work. Note also how square sections are left uncut on turning. In order to keep the square sections on the table when drilling various holes along the turning, the drill table can be swung right or left as desired. This does not affect the drilling angle.

Curved work: When angular or straight holes must be drilled in curved work like the handle in example E, saw a jig block to fit the curve, keeping the opposite end of the jig block true and square. With the curved member held in the jig, you will

have the equivalent of a square piece of work, and the tilt and positioning of work can be made accordingly.

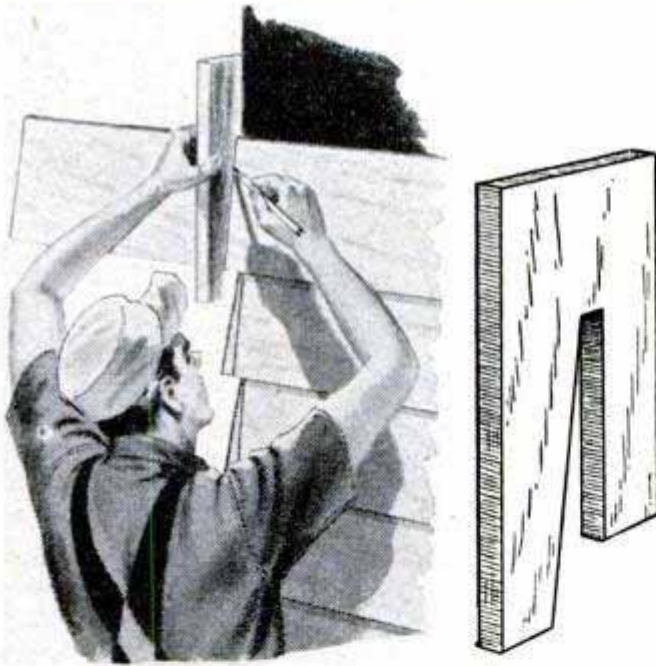
Dowel holes: Angular drilling frequently is required in drilling dowel holes, but with the important difference that here you have a working surface. In Fig. 25, for example, a jig is made to hold the table leg in the required angular position, but the hole itself is no puzzle—it must be square with the work surface, Fig. 24. A similar case is the doweled miter joint, Fig. 26. Angular drilling for screw-pocket holes requires no calculation. A guide board with one edge cut at a 15-deg. bevel, Fig. 27, is clamped to the table so that the drill makes a hole at the extreme edge of the bevel.

Lead Bath Heats Small Tools To Minimize Distortion



Heating small shop-made taps, reamers and other similar tools in a lead bath preparatory to hardening prevents the formation of scale and pits and minimizes the possibility of distortion of parts having small sectional

area. After the lead has been heated to the melting point—about 620 deg. F.—the tools to be hardened are preheated slightly before immersing in the lead bath. During the heating period, keep the bath covered with a layer of charcoal pellets to prevent oxidation of the lead. To guard against warpage be sure that the tool does not rest on the bottom of the lead pot. Also make sure that the work is clean before immersing, as otherwise the lead may stick to it and interfere with proper quenching.



Siding Quickly Marked for Cutting With Aid of Wooden Jig

To speed cutting off siding at the corners of a house, one carpenter made this wooden jig which permits marking the siding in one simple operation. It is merely placed over the top edge of the siding and the cutting line is marked on the face of the board, thus eliminating transferring the line from the underside.

☐ When shopping for fish, leakage of water and odors from the packages can be prevented by placing them in a plastic bag.



Single Tank Waters Livestock In Four Separate Lots

A large water tank, placed at the intersection of two fences, will accommodate livestock in four separate lots. Note the positions of the four fence posts. These hold the tank securely and, at the same time, provide support for the wires which continue across the top of the tank.

Improved Farrowing-Pen Creep Allows Young Pigs More Freedom

In the permanent farrowing house, growing pigs may be allowed the run of the wide alley simply by fitting a 2 x 4 across the opening to the alley from each individual pen. This arrangement confines the sows to the pens but allows the young



pigs access to special feeds and minerals placed in small feeders and troughs located along the sides of the alley. The 2 x 4 bars are held in place by flat-steel brackets bolted to the inside face of the sliding-door frame. In this way the bars may be inserted or removed without detaching any part, or interfering with the operation of the doors.

Bulbs on Lift Illuminate Car

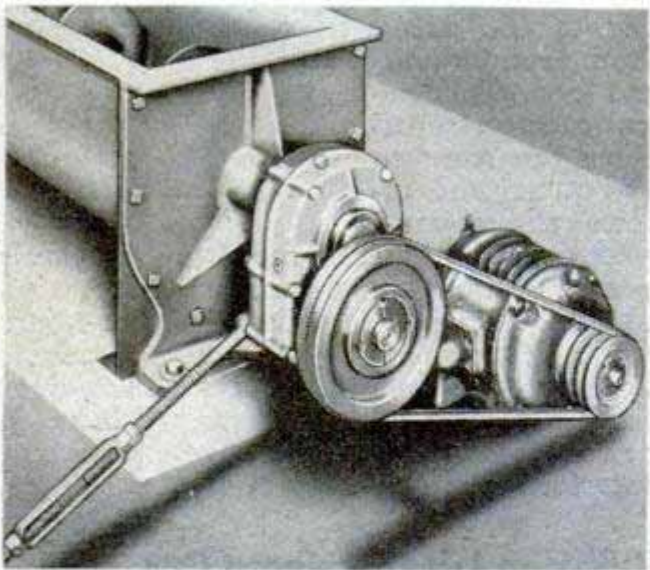
One garage owner provided plenty of light to aid the lubrication man by installing sixteen 60-watt light bulbs on the hydraulic lift. Eight of the bulbs were mounted on the inside of each channel and spaced to extend the full length of the lift.

L. H. Houck, Jefferson City, Mo.

SHOPPING



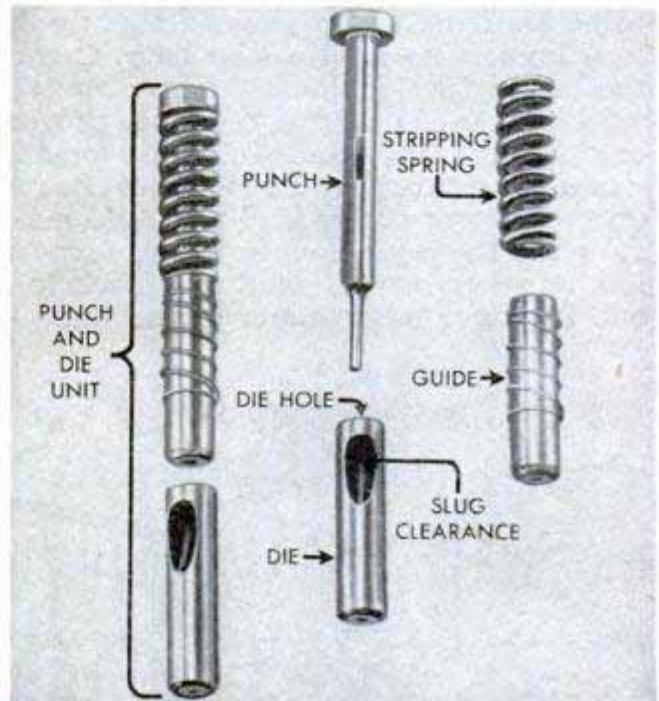
Wales-Strippit Corp., North Tonawanda, N.Y.
MULTIPLE HOLE-PUNCHING SYSTEM in which the die units are self-contained and interchangeable permits the same units to be used in a variety of setups. Arranged in a box-type unit, the dies are inserted in holes drilled with a master template. In box-type assemblies, holes can be punched in almost any pattern over a working area 21 in. wide and 23 in. long. Twin-plate assemblies are used for larger work



Dodge Mfg. Corp., Mishawaka, Ind.
TORQUE-ARM REDUCER for output speeds from 115 to 330 r.p.m. is new item in the field of power-transmitting equipment. It is said to be the first shaft-mounted speed reducer designed for this speed range. The unit is attached to the shaft to be driven by means of two locking collars, one being placed on each side of the housing which is anchored to floor by a torque arm



John I. Paulding, Inc., New Bedford, Mass.
DUPLEX SURFACE OUTLET is designed for easy surface mounting and has extra knockout for use when wiring in series. Double-spring phosphor-bronze clips assure positive electrical contact when plug is inserted



SINGLE DIE UNIT of the multiple hole-punching system is pictured above disassembled to show various parts. These are available to users as individual units for assembling setups to suit their own requirements. Dies are inserted in holes drilled in the plates

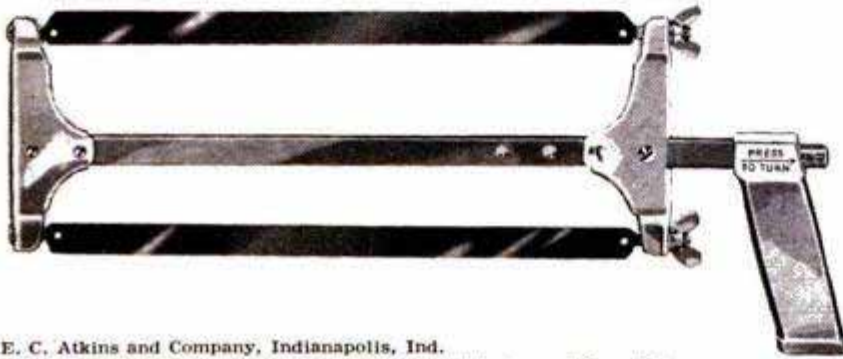
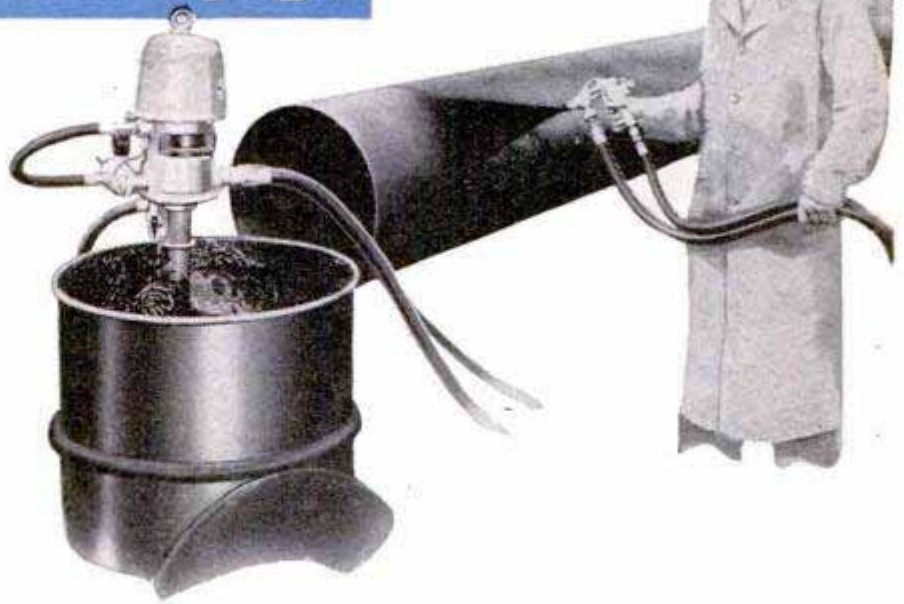


Federal Products Corp., Providence, R.I.
PORTABLE THICKNESS GAUGE assures precise check on thicknesses of sheet stock used for stamping and forming. Full-jeweled dial indicator, of either the direct or continuous-reading type, is graduated to .001 in. Movable and fixed anvils, or jaws, grip stock and hold gauge perpendicular to the surface. Hardened contact points transfer measurement to dial hand

FOR TOOLS

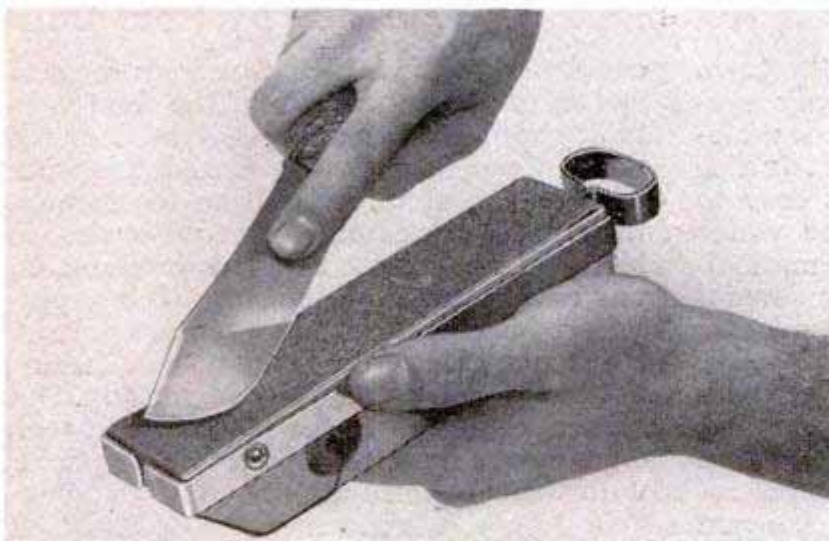
Gray Company, Inc., Minneapolis, Minn.

MOGUL-TYPE PUMP is designed to handle heavy spray materials without spurting. It's air driven and operates within a broad pressure range from 20 to 175 pounds per square inch. Handles such heavy sprayable materials as corrosion and rust preventives, calking compounds, adhesives, sound deadeners and also mastics of certain types. The power head, or housing, which encloses air motor, is of aluminum. This reduces unit weight to 35 lbs.



E. C. Atkins and Company, Indianapolis, Ind.

DUAL-PURPOSE HACKSAW FRAME holds two 10 or 12-in. blades of same length but of different tooth points. The frame is rotated to bring either blade into any one of four cutting positions by a release button in handle



W. E. Fleming, 1721 B Avenue N.E., Cedar Rapids, Iowa

KNIFE SHARPENER is designed primarily for the purpose of putting a keen cutting edge on all types of knives, but serves equally well as a hand-sanding block. Principal feature of the unit is the unique device for locking the sandpaper or emery cloth under sufficient tension to prevent folding under sanding or grinding pressure. When the pivoted locking lever is in the closed position, exposed portion of the sandpaper is held rigidly at each end of the block



Kedman Co., Salt Lake City, Utah

THIS PRACTICAL SCREWDRIVER has a two-piece blade designed to hold the screw, start it and drive it in restricted spaces. Screw is held by two hollow-ground blades that expand by means of a sliding sleeve to grip the sides of the screw slot flush from top to bottom. When half-round blades are locked in place by sliding sleeve they cannot slip. Has shockproof handle and is made in small, medium and large sizes and in a range of blade lengths to fit screws with flat and round heads



Oil Drums and Welded Framework Provide Combination Feeder

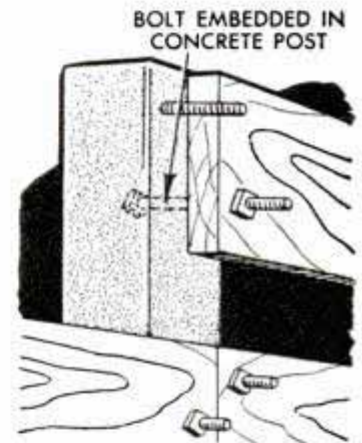
Permanence, exceptional strength and neat appearance are special features of this portable all-metal feed rack which provides a rack for roughage and a round-bottom trough, or bunk, for ground feeds on each side of the welded frame. The bunks are made by cutting steel oil drums in half lengthwise, cutting out one end of each drum and then welding the halves together endwise. *Caution:* Before cutting the drums with a torch be sure to steam-clean them thoroughly, inside and out. The frame members are of 1½ or 2-in. pipe assembled with all joints welded. The sloping sides and the ends of the rack are spaced steel rods, ⅜ or ½ in. in diameter, and are welded into holes drilled in the frame members and the corner posts. Two lengths of 3-in. pipe welded to the ends of the corner posts form skids for easy portability.

Planks Bolted to Concrete Posts Make Rugged Barnyard Fence

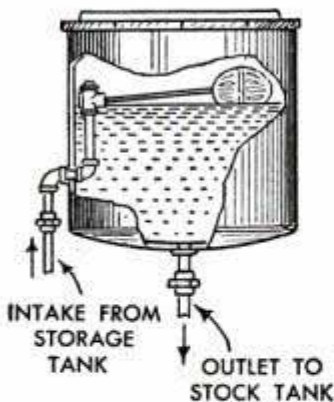
W.T.M. Concrete

After wasting considerable time in temporary repair of barnyard fencing, one farmer took time to build this permanent fence. He cast special concrete posts in a wooden form designed so that the heads of bolts could be accurately embedded in the concrete mix. The bolts were located in pairs spaced at regular intervals along the length of that portion of the post which was to be aboveground. Then the posts were set to a uniform depth of 36 in. below ground level with the bolt ends facing one way. To finish the job, 2 x 6-in. planks were bolted

to the posts and painted white. In order to turn hogs and sheep, it is advisable to space the three lower planks closer together than those above, and the bolts must be located accordingly. — A. M. Wettach, Mt. Pleasant, Iowa.



Water Level in Livestock Tanks Automatically Controlled by Float Valve



Where the farm water-supply system includes elevated storage tanks, it's easy to control the water level automatically in one or several livestock tanks by fitting a float valve in the supply pipe at any convenient point between the storage and stock tanks. Cut the pipe, remove a short section, and fit elbows and risers onto the two ends. The upper ends of the risers are connected to a float-valve tank made by cutting off the top of an old hot-water tank about 18 in. from the end. This unit is then turned upside down, a suitable cover is fitted, and the inlet and outlet connections are made as in the detail. An ordinary toilet-tank float valve is

connected to the intake pipe from the storage tank. When installing, the float-valve tank should be carefully adjusted so that when the float valve is closed the water level in the chamber will be the same as that in the stock tank. Then, when the water level in the stock tank is lowered, the valve will open, replenishing the supply. Where location of the supply lines permits, the float-valve unit can be placed inside a building for protection from freezing. Outside units can be protected by a temporary enclosure made from boards and packed with straw for insulation.

Ridding Granary of Rats

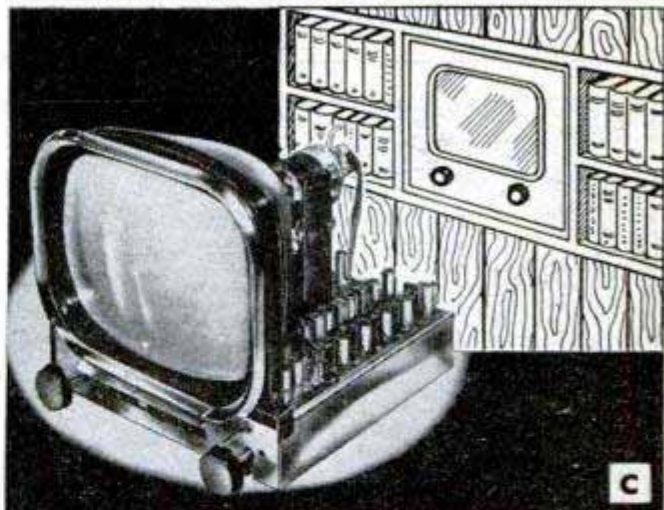
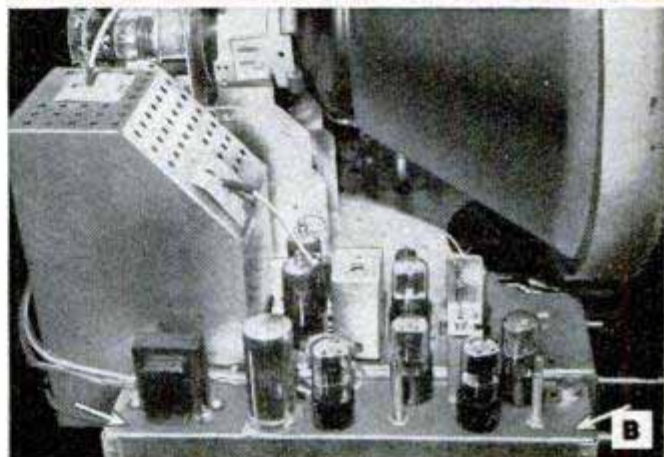
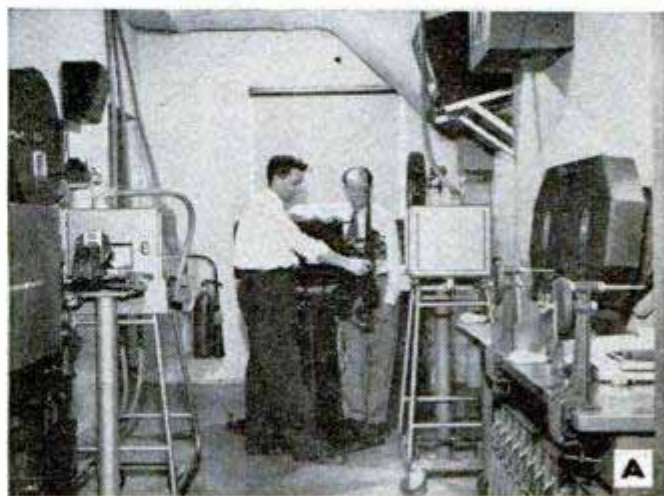
To keep rats out of his granary, one farmer fastened a small bell around a rat which had been caught in a trap. The rat was turned loose in the granary and the sound of the bell frightened other rats, keeping them out of the granary.

Radio Television Electronics

TELEVISION TODAY

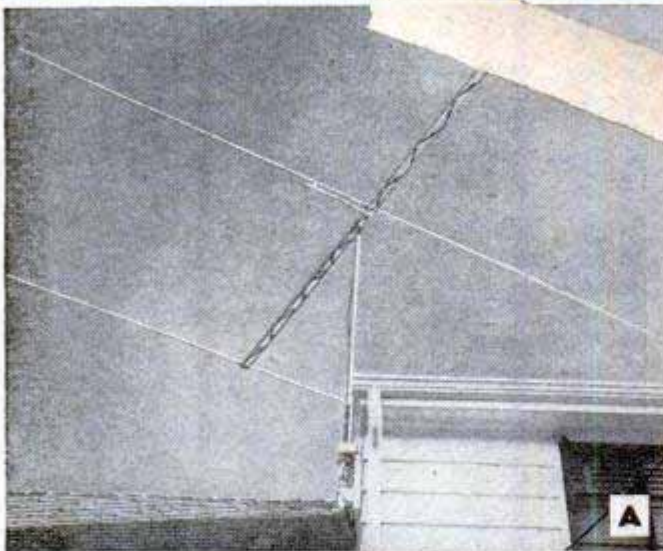
PHONEVISION has been available to 300 typical Chicago families for 90 days. The test, authorized by the Federal Communications Commission, was conducted by the Zenith Radio Corporation from their special transmitter (photo A) atop the Field building. The families selected to take part in the test to determine public opinion were named by the National Opinion Research Center of the University of Chicago, and the result will be submitted to the FCC. Phonevision is a "scrambled" combination of television and telephone transmission of a movie or other special entertainment in such a way that the viewer must pay a fee to view a desired program. The necessary decoder unit, indicated by the arrows in photo B, is installed in each home set.

Photo C shows a big-picture TV tuner designed for quality custom-built installations. It features simplified tuning with a double-shadow "magic eye" tuning indicator and can be used with the latest 16, 17 or 19-in. picture tubes. The young lady in photo D is demonstrating a compact 2-tube "finger tip" TV front-end tuner of improved design, which is housed in a chassis 2 $\frac{5}{8}$ in. wide, 2 $\frac{7}{8}$ in. high and 4 $\frac{3}{4}$ in. long. These front-end tuning units select the desired TV channel. Photo E shows a tiny "magnetron" tube developed for use in new ultra-high-frequency television receivers.



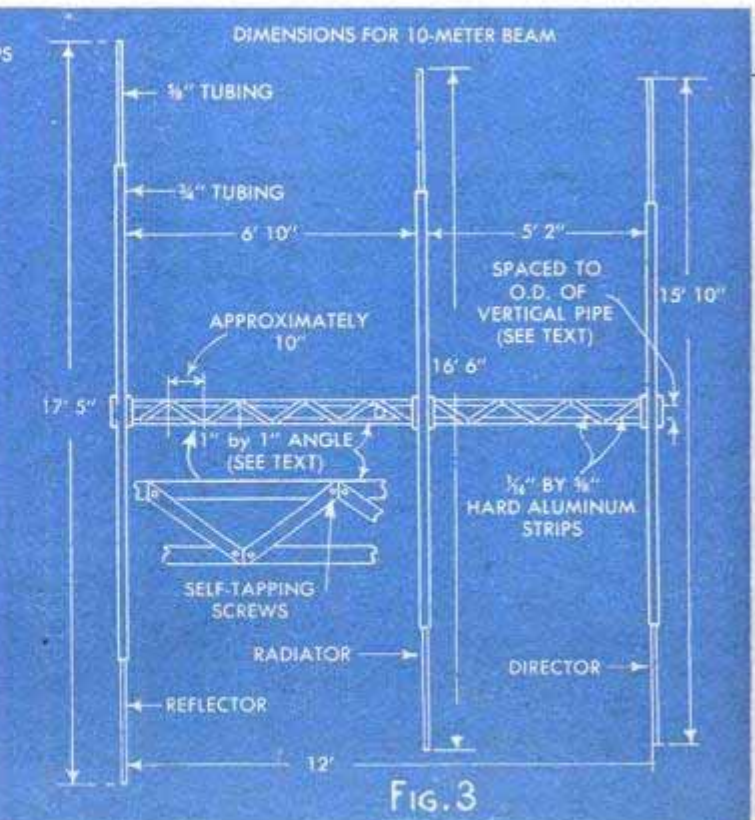
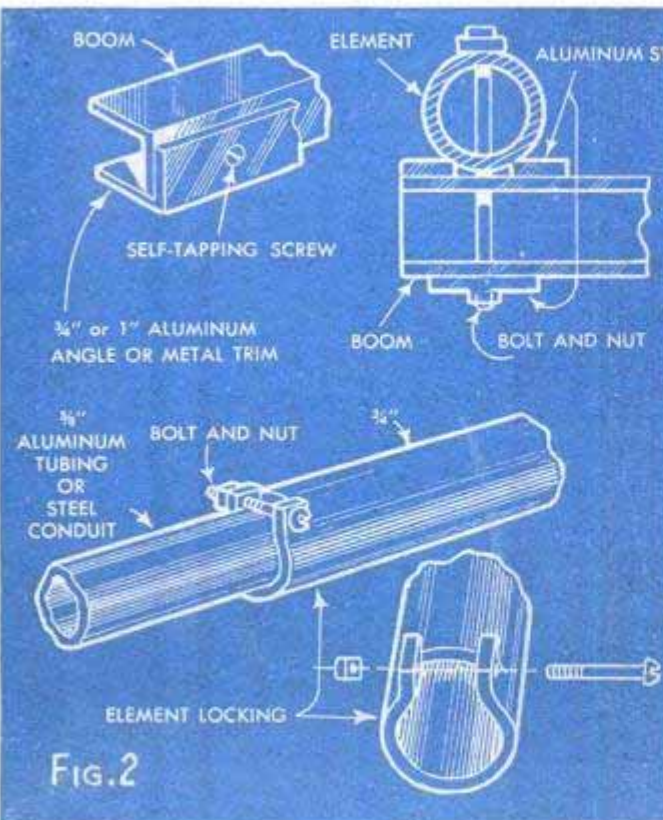
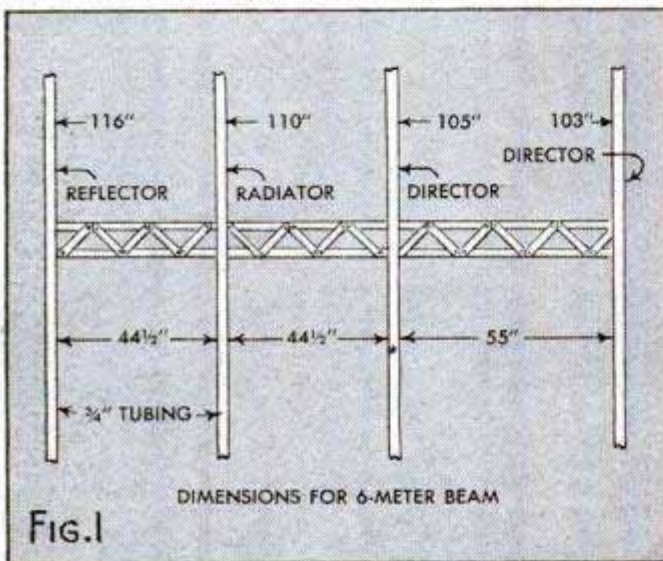
"YAGI" BEAM ANTENNA

By S. A. Johnson WØLBV



PERHAPS the most popular, and certainly one of the most effective, single-beam-antenna arrays employed by amateur radio operators and recently for certain channels by TV-antenna manufacturers, is the "Yagi" multiple parasitic-element array. This is commonly known to hams as the "plumber's delight" owing to its all-metal type of construction. The usual method of home construction involves mounting the elements through a boom made of large tubing, a difficult job which is not very strong mechanically.

The antenna shown in photos A and C was designed for the 10-meter band and the boom construction was simplified and strengthened by making it of 1-in. hard aluminum angle; or $\frac{3}{4}$ -inch aluminum or steel angle "trim" may be used with some sacrifice in rigidity. The same boom can be used for the 6-meter band, the dimensions for which are given in Fig. 1. Self-tapping screws are used to fasten the angle together to form a "U." When these are completed, they are spaced the proper distance apart to carry the 1-in. vertical pipe which supports the antenna. The boom is then built up into the form of a girder, as indicated in Fig. 3. When completed, small strips are placed across the top, as shown in Fig. 2, to provide "beds" for the elements. These are bolted to the boom as



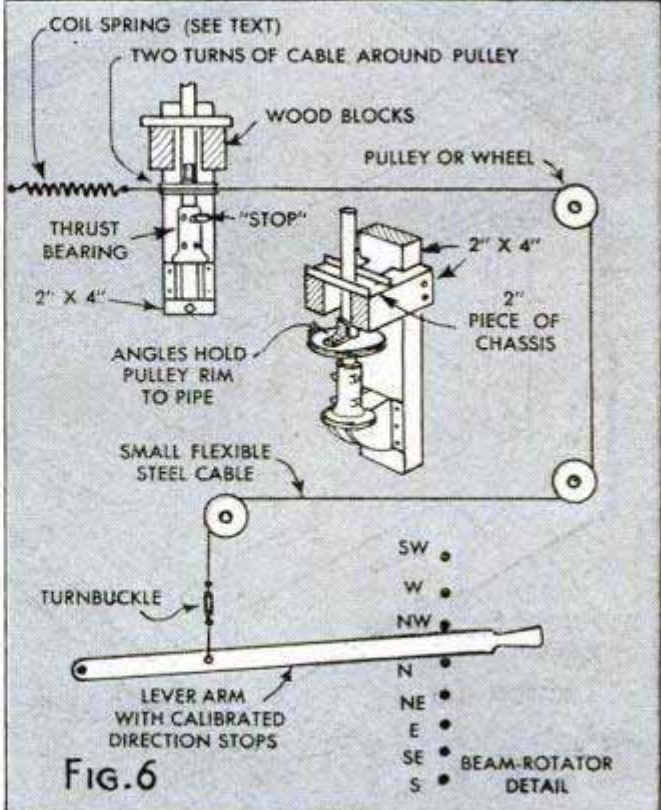
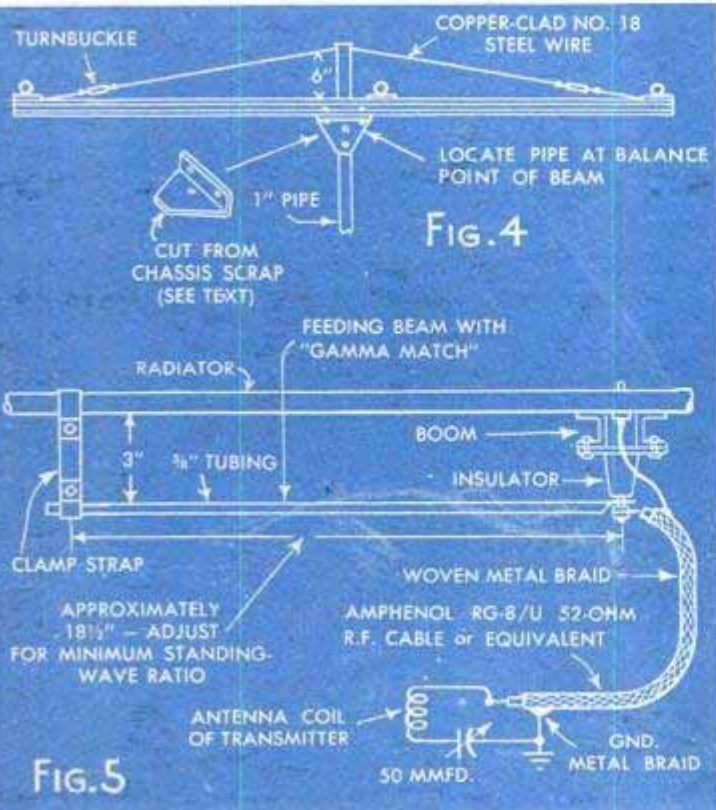
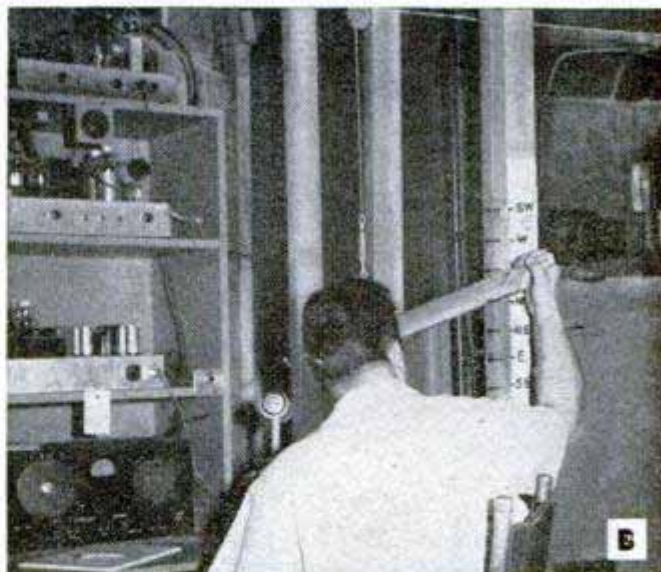
with LOW-COST ROTATOR

indicated in the sectional diagram. Either hard aluminum tubing or ordinary steel conduit may be used for the elements.

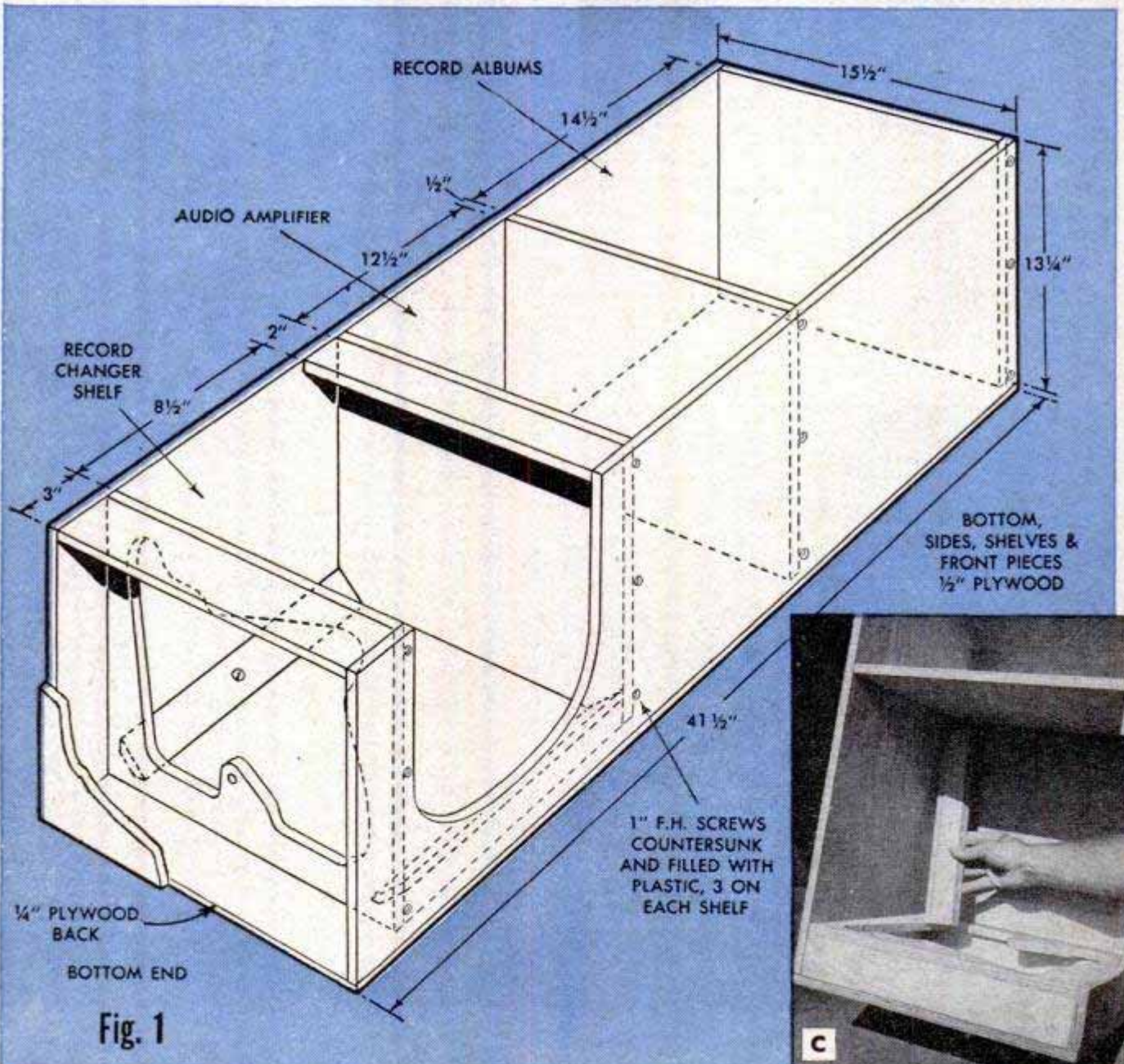
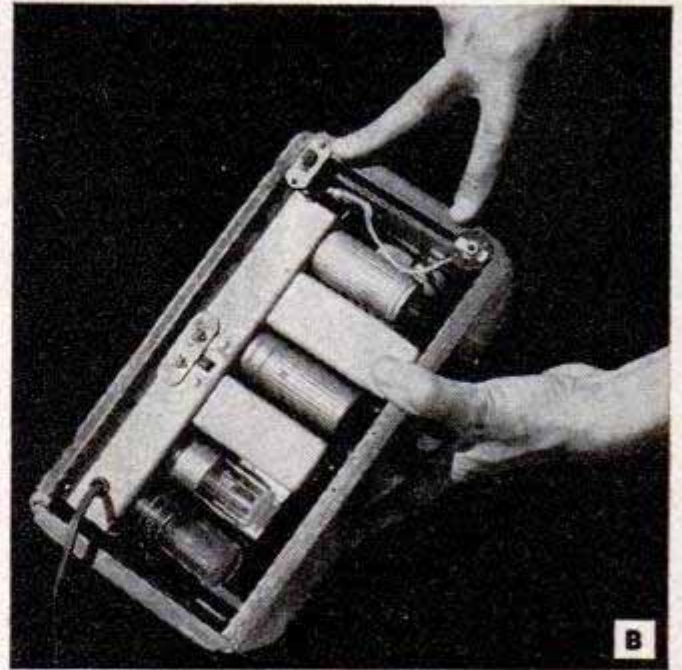
The telescoping elements can be locked in position in the manner shown in Fig. 2, or the builder can use ordinary hose clamps of the proper diameter. The beam is bolted to the pipe by means of two brackets as detailed in Fig. 4. Top guying adds further strength to the assembly.

The inexpensive, homemade rotator consists of a simple device that can also be employed to rotate any type of television-antenna array. The rotator, detailed in Fig. 6, utilizes a television-antenna thrust bearing costing about \$3. This carries the load, and the antenna pipe is held vertical by means of the simple bearing made of a piece of chassis and the 2 x 4-in. wood blocks. The pipe, or mast, is fitted with a 4-in. V-pulley rim of the Gates type sold by many hardware stores.

Rotation is obtained by a rather unique principle: The antenna is "loaded" with a coil spring and rotated by simply pulling against this spring. The flexible steel cable is passed through large pulleys and run into the basement or other convenient spot for turning the antenna about 355 degrees. The lever arm is calibrated with nail stops for direction, Fig. 6 and photo B. The beam illustrated was fed with the popular "gamma match" shown in Fig. 5, the matching section being adjusted with the clamp strap.



CORNER CABINET for



your RECORD PLAYER and SOUND SYSTEM...

By Peter Gowland

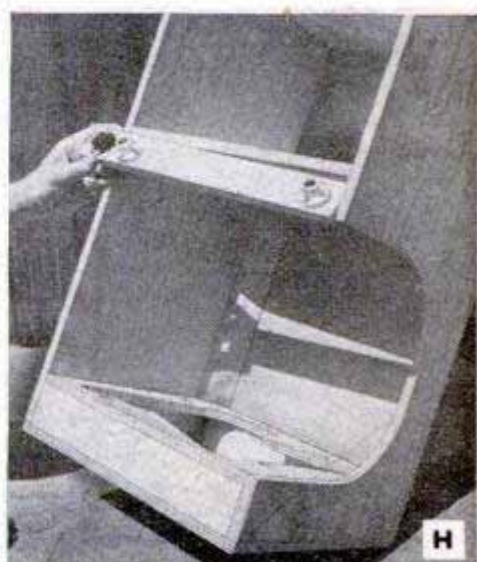
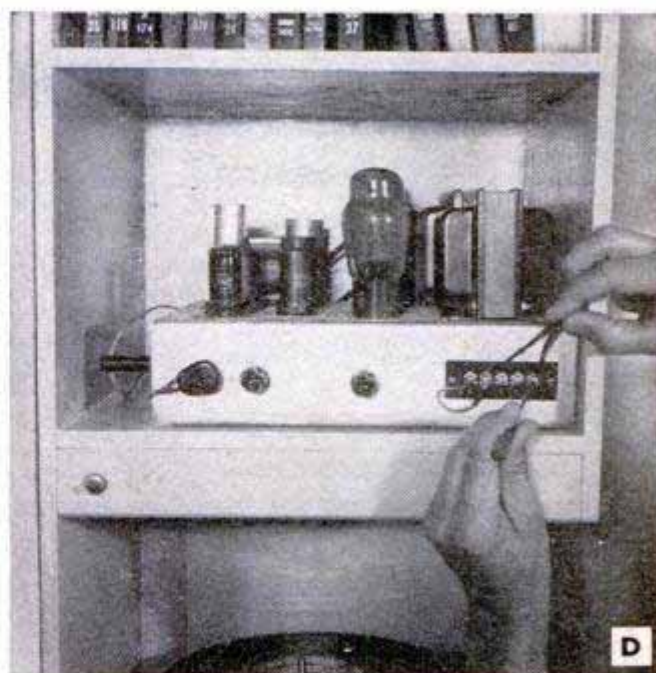
HAVE YOU ever wished that your home was equipped with a super sound system that would enable you to play quality records or radio in almost every room? A radio experimenter friend told me that there was really nothing to installing such a system in a simple space-saving wall or closet cabinet that I could build, and the cost would depend on what I would like to spend for equipment. Separate amplifier, record changer, radio tuner and speaker units are available from radio parts houses. Any serviceman can arrange a simple control panel like the one shown in photo E so that either the records or radio can be played through speakers located in various rooms.

The simple plywood wall cabinet shown in photo A was the end result of this conversation. All dimensions and construction details are given in Fig. 1 and Photos C, F and H.

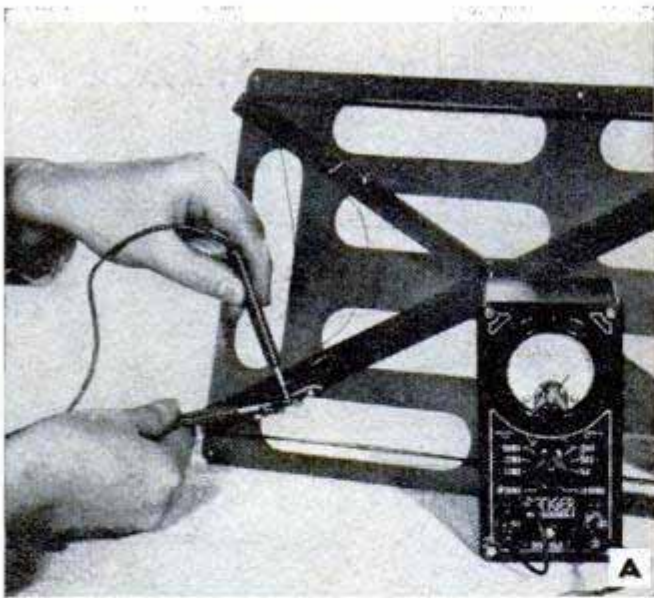
Two strips of $\frac{1}{2}$ -in. plywood are fitted in the corners where the wires are to run up from the changer to the amplifier D and control panel E. The builder can use any available record player or a tape-disk type of recorder and playback unit such as the one illustrated in photo E on page 232. In this case, however, the cabinet would have to be wider as this unit measures $12\frac{1}{4} \times 17\frac{1}{2}$ in.

Illumination for the record changer is provided by two small 7-watt lamps mounted on the 2-in. strip as in photo H. Instead of a radio tuner, my radio serviceman installed a plug and switch on a small radio set as shown in photo B, and ran a shielded wire from the set to a plug and jack on the amplifier control panel.

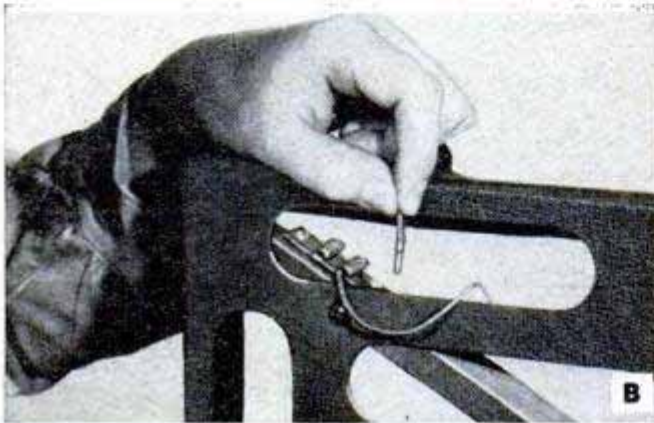
Remote speakers can be located in suitable wall cabinets as shown in photo G.



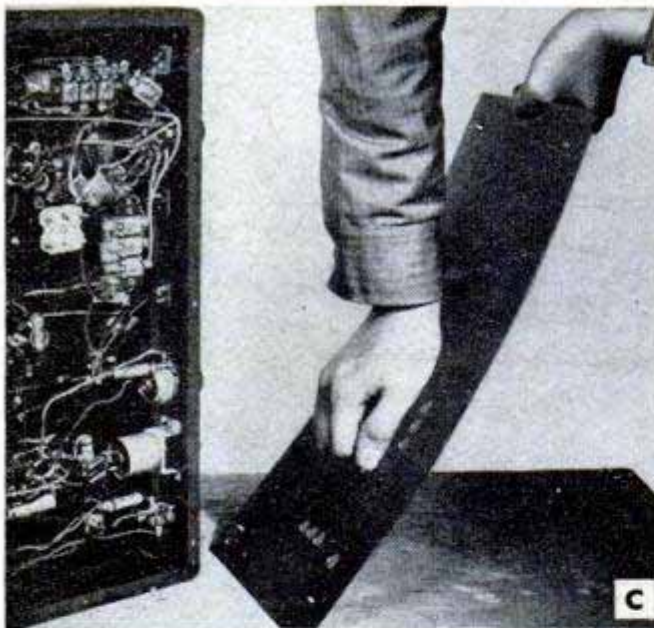
HINTS FOR RADIO OWNERS AND EXPERIMENTERS



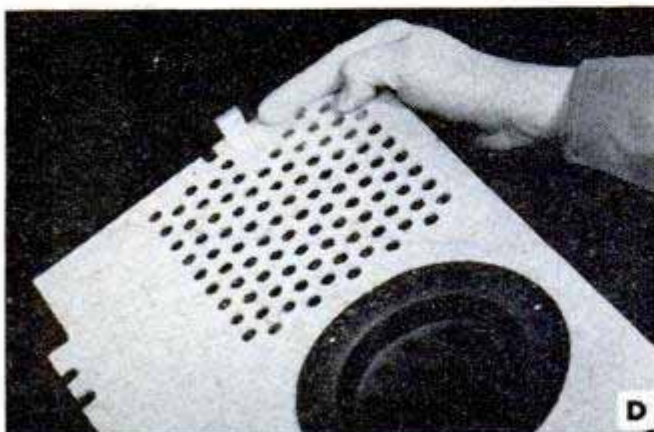
A—A low-reading voltmeter may be used as illustrated to check loop antennas for open circuit or shorts. Remove loop from the set before checking.



B—Small table-model receivers employing loop antennas with plug-in connectors will sometimes give whistling noises when tuned. Try reversing the loop plug connectors as they may have been reversed when the loop was removed for test.



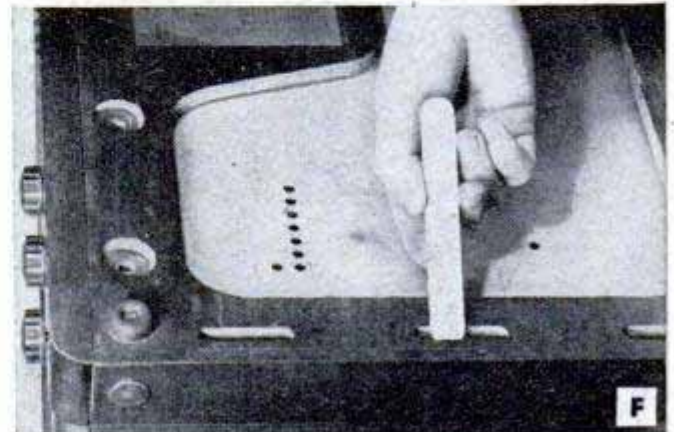
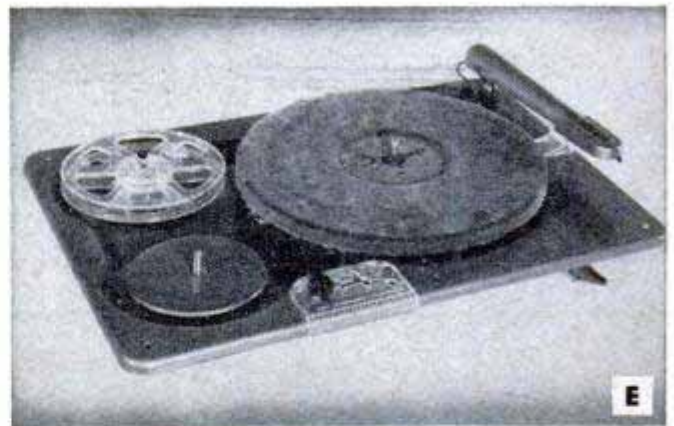
C—In large receivers, the metal bottom plate may become bent inward and possibly short to some "live" part. The simple remedy is illustrated.

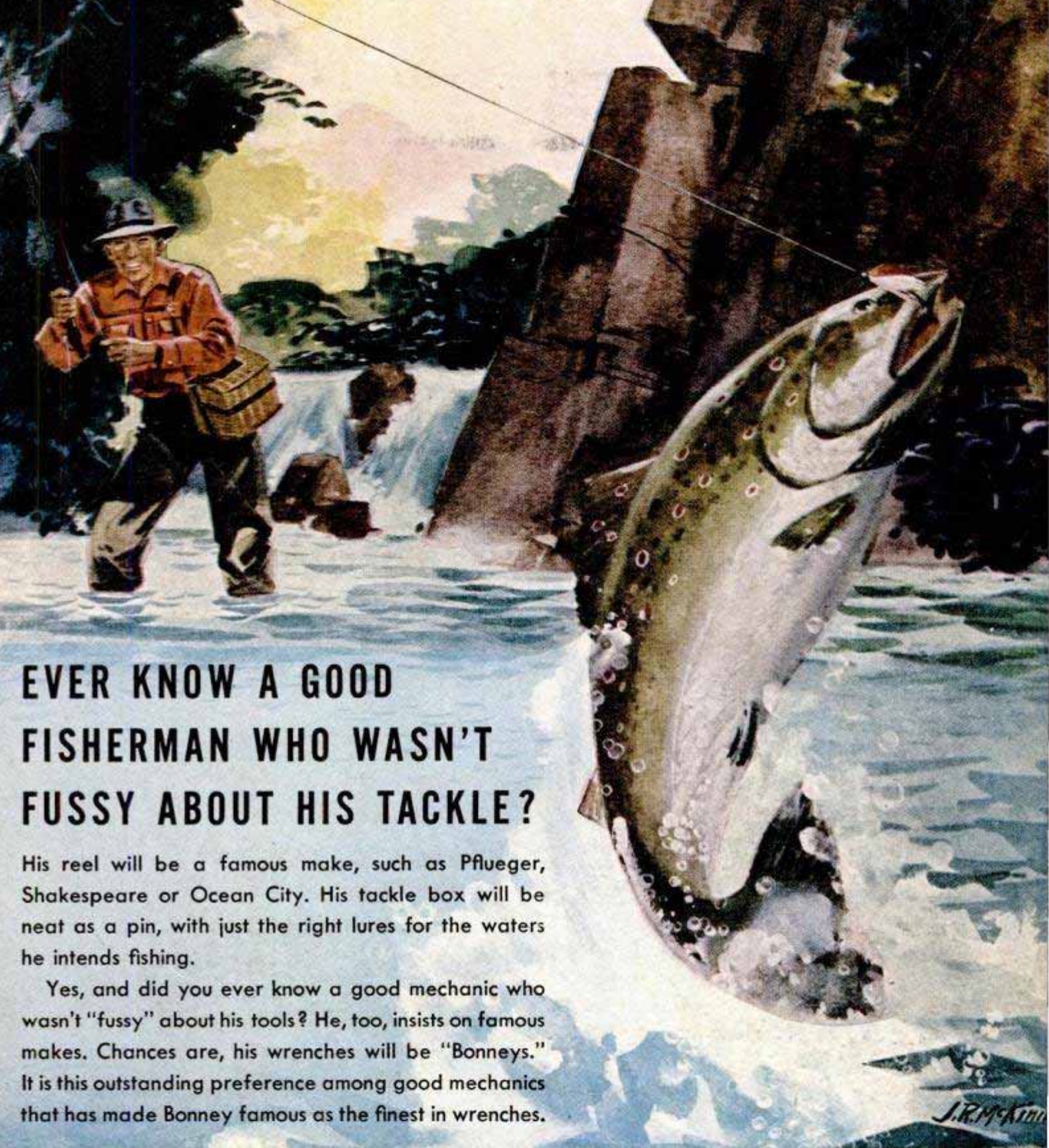


D—It is important in TV receivers that the interlock catch, or plug, on the back cover makes good contact. These are sometimes damaged in service. Always disconnect the set line plug before checking.

E—Experimenters and builders of custom installations in the home can employ the versatile combination General Industries tape-disk recording and playback assembly unit to solve unusual space and recording problems. It records on disks from tape, on tape from records or on either from microphone or radio, and then plays them back. It also plays 78-r.p.m. records.

F—TV sets operated in shops or other dusty locations should be frequently checked to see that all ventilating holes in the cabinet are open.





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His reel will be a famous make, such as Pflueger, Shakespeare or Ocean City. His tackle box will be neat as a pin, with just the right lures for the waters he intends fishing.

Yes, and did you ever know a good mechanic who wasn't "fussy" about his tools? He, too, insists on famous makes. Chances are, his wrenches will be "Bonneys." It is this outstanding preference among good mechanics that has made Bonney famous as the finest in wrenches.

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DU PONT Cooling System CLEANSER



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The "ALL-GLASS" headlamp gives most light when new
... most light throughout life



"ALL-GLASS"
sealed beam
HEADLAMPS



General Electric headlamps are

ALL-GLASS...they do not grow dim!

Road and laboratory tests prove the average G-E Sealed Beam headlamp gives 99% of original light output right up to the end of lamp life. They do not grow dim, because:

1 "All-Glass" seal makes possible the one-piece construction that

keeps out dirt and moisture.

2 Rugged filament supports—filaments won't shake loose.

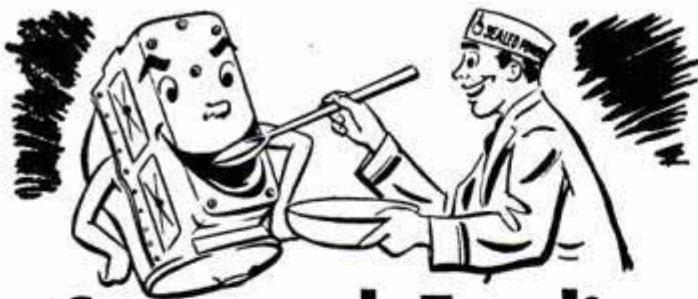
3 Reflector *stays* mirror-bright.

4 Hard-glass lens gives accurate beam pattern.

Check your lights ... and replace burnouts with General Electric "All-Glass" headlamps!

You can put your confidence in—

GENERAL  **ELECTRIC**

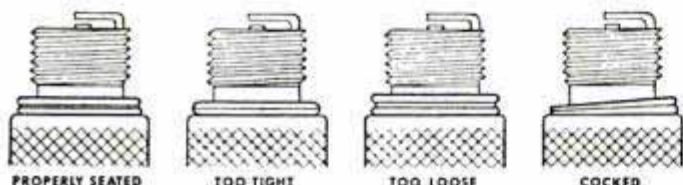


Care and Feeding of Engines

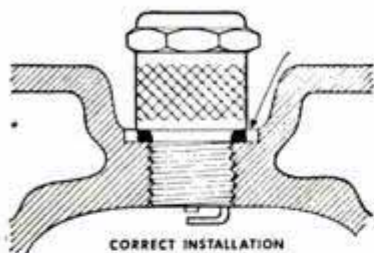
BY S. P. CORP

CHECK PLUGS FOR MORE SPARK!

To remove a spark plug that has been in use for some time, blow dirt out of spark plug well, then remove wire and unscrew plug one turn to remove carbon formed around threads. Now tighten plug again and connect wire. Idle engine fast, to get rid of carbon deposits that dropped off bottom of plug when you loosened it. If engine misses, idle until miss is gone. Then remove all plugs and inspect gaskets.



If gasket crease is closed tight, plug was installed too tight, causing a compression leak around porcelain. If gasket is not compressed at all, plug was installed too loosely, permitting leakage around base of plug. If gasket is cocked when installed, results will be the same as with a loose plug. Spark gap will be too high in combustion chamber, causing delayed action, incomplete combustion, and poor gas mileage.

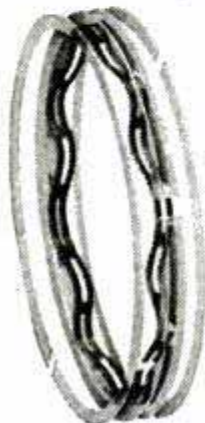


TO INSTALL:

1. Set gap according to your car manual.
2. Always use new gaskets.
3. Clean threads in cylinder head by screwing in old plug without any gasket.
4. Clean spark plug seat in cylinder head.
5. Screw plug in by hand until seated on gasket.
6. After seating, tighten $\frac{3}{4}$ of a turn with wrench.
7. Connect wires and idle engine. Correct idle speed shows charge on ammeter. Do not idle too slowly.

SPRINGTIME IS RING TIME

If you need a re-ring job, be sure to use Sealed Power Rings—the best rings built! Sealed Power MD-50 Steel Oil Ring is the only ring with the Full-Flow Spring—best for oil control even in badly tapered and out-of-round bores. There is a Sealed Power Ring Set specifically engineered to do the best possible job in your engine! For free booklet, "7 Ways to Save Oil," write Sealed Power, Muskegon, Mich., Dept. G-4.



Lightning Strikes Your Dinner

(Continued from page 102)

"Want to see how she works?" asks the doctor. You are escorted through a concrete, lead-lined chamber, into which the bottom of the big vacuum tube projects from the ceiling. Under it is a circular target table, with remote-controlled motors that can revolve, raise or lower it, so that successive bursts can hit the target from every possible angle. Your destination is the lead-lined closet in the corner, with a slit window of heavy glass.

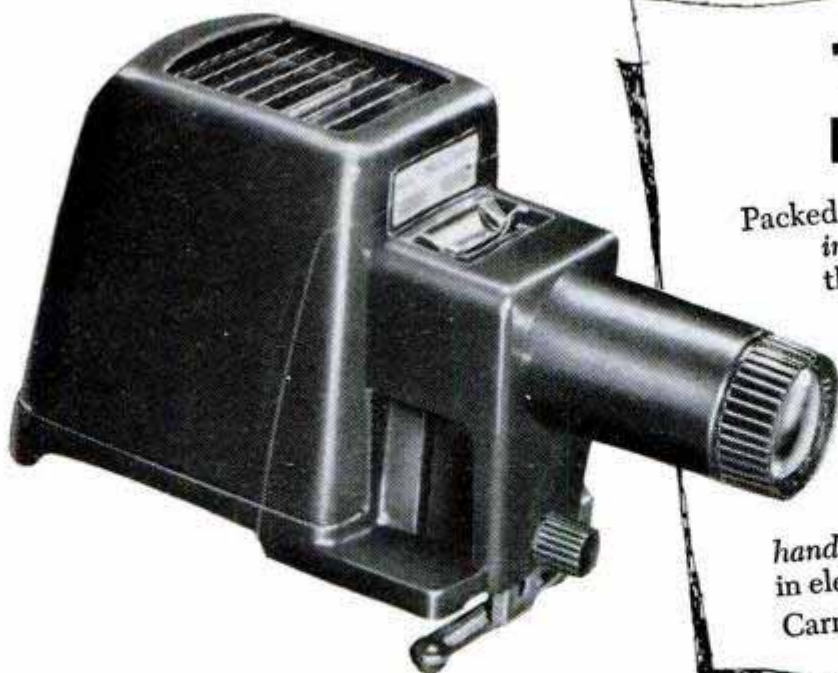
A white-coated assistant puts a calcite crystal on the table and goes out. The lead safety door locks behind him. The evacuating pump for the vacuum tube throbs dully. Outside, a horn beeps, announcing all clear in the radiation chamber. A gong clangs to signal circuit readiness. It is followed almost instantly by an ear-stabbing crack, as powerful sparks leap gaps on the tower, and three million volts of blue haze jab down from the aluminum window under the tube. With a blinding flash it stabs the gloom of the chamber, striking dazzling fire in the crystal, which now glows like semi-molten glass. The air is loaded with the smell of ozone. "Here, examine it," says the doctor handing you the crystal. It looks as though it would burn right through your hands, but it's cool as a mountain brook.

Other objects go on the table—tiny crystals in a closed box, a tray of salt, a china plate with metal templates fastened to it with cellulose tape. They all prove something. Again the sound effects, the lightning flash, and what has happened? The tin box looks the same, but inside it those crystals are alive with fluorescent glow, proving that electrons will penetrate cans of vegetables or meat and still do their job. The salt has turned a dark brown, and the plate tinted. But under the heavy metal templates, the china is white—and a design has been forever emblazoned on the dish. Turn it over, and you'll see that the pattern goes all the way through. "Just another commercial adaptation," says Brasch, "but we'll never get a chance to develop it. Too many more important things."

Brasch and Huber still are solving a number of problems. Odd things have happened to some items under the electron blast.

Milk, for instance, can be sterilized easily. "But," says Doctor Huber, "it acquired an awful taste at first. We don't know why." However, by experimenting, the scientists found that "irradiated taste" could be minimized in many items by "shooting" them in vacuum containers.

(Continued to page 240)



The Kodaslide Merit Projector

Packed full of features. For easier slide insertion—you feed 2 x 2-inch slides through recess in top, remain seated at right of projector—no jarring or moving of instrument. For even illumination—Lumenized Kodak Projection Ektanon Lens, 5-inch f/3.5-powerful 150-watt lamp. For slide protection—large, cool lamp house keeps slides flat. For handy elevation—built-in elevating mechanism. Carrying case, \$9.50.

only \$24⁵⁰

SMART COLOR TEAM

Kodak Pony 828 Camera

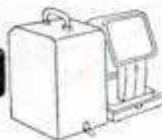
Makes superb color slides on Kodachrome Film; sharp black-and-white negatives. Kodak Anaston f/4.5 Lumenized Lens; Kodak Flash 200 Shutter with built-in "synch"; body shutter release; simplified exposure settings marked in red. Takes 8-exposure rolls. Field case, \$6.50.

only \$29⁹⁵



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Putty Hardens

Q—After purchasing a pound or two of putty to repair a window sash, I wrapped the remainder in two thicknesses of oiled paper for storage. Sometime later when I opened the package I found the putty had hardened over the whole outside surface, making it unfit for use. I tried to cut away the hardened material without success. Isn't there some way to prevent this?
O.F., Superior, Wis.

A—One way is to pack the putty in a glass jar having a tight-fitting screw top. After packing the putty tightly in the jar so that it is fairly level across the top of the mass, pour a small quantity of water over it and tighten the lid of the jar. Stored in this way, small amounts of putty will keep in good condition for long periods of time. When the putty is removed from the jar, it should be thoroughly worked before using, as it may be somewhat soft and sticky. Another fairly reliable method of preserving putty for short periods of time is to wrap small amounts in two thicknesses of cellophane and seal the folds with cellulose tape to exclude air.

Polishing Silverware

Q—I have some rather choice solid-silver tableware, some of it quite old, which seems to have been dulled by continued polishing. At any rate, it tarnishes rapidly to a dark color and it appears impossible to restore it to a high luster with any of the ordinary silver polishes. I've tried a number of these polishes with about the same result. How can I clean this tableware and polish it?
G.S., Memphis, Tenn.

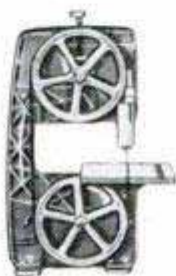
A—We do not believe that any of the silver polishes you have used are the cause of your trouble. We think it more likely that your old silverware has become blackened by silver sulphide. One method of removing this coating is to dip the items, one by one, for just an instant in hydrochloric acid and then rinse immediately and thoroughly in running water. However, we cannot recommend this as a household procedure because of the hazards involved in the use of powerful acids. A safer method is to mix (dry) cream of tartar, 2 parts, levigated chalk (not precipitated), 2

(Continued to page 238)

It's **CRAFTSMAN** . . . America's most famous and dependable, low-cost 12-in. Band Saw!

The ONLY Band Saw at ANY price . . . with ALL these Features!

Only CRAFTSMAN has this superior ONE-PIECE frame and back cover, with bridge-girder type, ribbed reinforcement . . . a scientifically engineered development that permits a much more rigid, stronger, more accurate saw!



SAFE! All operating parts except actual cutting edge of blade completely enclosed for maximum operator protection!

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Saw guides above and below table, have oil-impregnated bronze blocks and ball bearing thrust wheels for true cutting!

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See this accurate, economical CRAFTSMAN Band Saw NOW! It's outstanding for pattern shop, furniture, boatbuilding!

This superb CRAFTSMAN Band Saw belongs in your shop because it will give you better performance . . . longer service . . . and cost you far less money! Handles all kinds of straight and contour sawing . . . in wood, plastics, rubber felt, paper . . . even thin sheet metal work. Cuts to center of 24-in. circle, in wood up to 6-in. thick. Dynamically balanced, cast iron saw wheels, with rubber tires ground true, for smoother operation. Table tilts 45°. See it at (or call) your nearest Sears Retail Store TODAY! Or write Dept. 609, Sears, Roebuck and Co., Chicago 7, Illinois.

**COMPARE ITS QUALITY!
COMPARE ITS PRICE!**

\$71⁵⁰*
Cash

Without motor or bench

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Upson Panels saw like wood. Take screws, nails, fixtures, drilling! Pebbled, tile embossed or smooth surfaces! Hundreds of uses! Most lumber dealers carry Upson Panels in a variety of lengths, widths and thicknesses. All panels trademarked for specific uses. Heavy duty Strong-Bilt for new construction, Kuver-Krak for re-covering cracked ceilings. 3/4" Upson Panels for lighter uses. Use only as directed.

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I enclose 10c for 32 page Idea Booklet. Include Instruction Sheet for applying Upson Ceilings and working drawings for Storage Wall FREE.

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Upson Floating Fastener



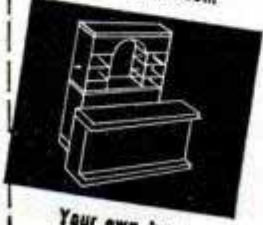
Closet under stairs



Beautify your fireplace



Extra closet in bedroom



Your own bar

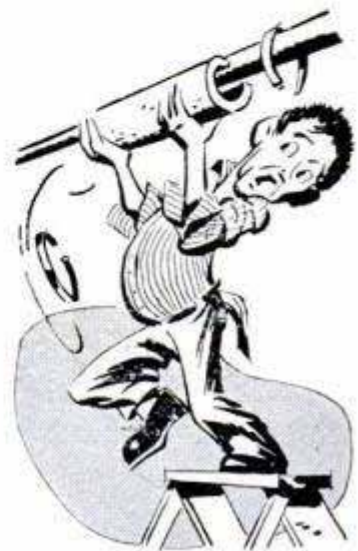
(Continued from page 236)

parts, and alum, 1 part. Store the unused portion of the mixture in a tightly corked bottle. Wet whatever amount is to be used with sufficient water to form a fairly heavy paste, and rub the silverware lightly with a linen cloth charged with the mixture. This treatment usually removes the black coating with very little rubbing. Thereafter you can clean your solid silverware quite easily by a simple process. Place a sheet of aluminum in a shallow aluminum pan filled with soft water, and add 3 to 5 tablespoons of ordinary salt, depending on the size of the pan and the amount of water. Immerse the silverware in the solution and boil 3 to 5 minutes, or until the light tarnish disappears. Then remove the silverware, rinse in running water and rub dry with a soft cloth. Of course, this process should not be used on silverware having handles of any other material, such as real or artificial pearl, etc.

Pipe Insulation

Q—The hot-water pipe from my heater to the bathroom is about 25 ft. long and in cold weather it is necessary to let the faucet run for some time before getting even warm water. I tried wrapping the pipe with newspapers, which seemed to help some, but was not very satisfactory from the standpoint of appearance and durability. Isn't there some simple way of preventing this loss of heat and at the same time making the job more attractive?

F.R., Buffalo, N.Y.



A—If the pipe runs from the heater to the bathroom are fairly straight and clear the floor joists by 2 in. or so, then perhaps the most practical remedy is to cover the pipe with a cellular insulating material of the type used for covering the hot-water and steam lines of heating systems. This is readily available in various sizes and usually is furnished in 3-ft. lengths. It is easily cut into shorter lengths if required. To apply it, simply cut the muslin covering along one side, open it and place over the pipe. The material is held in place with special metal fasteners which are supplied.

Staining Bricks

Q—My red-brick fireplace has what appears to be a smoke stain directly above the opening and extending nearly up to the mantel. It covers almost all the bricks above the opening. How can I remove this stain? Also, is there any way of renewing the color of the bricks, other than painting? They seem to be rather faded, because of embedded dust, I suppose.

K.T., Paducah, Ky.



A—If the discoloration is on the surface of the bricks and is not coming through from the flue, it usually can be removed quite easily by scrubbing the bricks with a medium solution of trisodium phosphate. Ordinary household ammonia sometimes proves quite effective. **Caution:** When using any ammonia, or ammonia solution, indoors, provide ventilation, as under some conditions the concentrated fumes are toxic. To brighten the bricks after a cleaning, make a stain by mixing equal parts of linseed oil and turpentine and adding enough Venetian-red oil color to give the bricks the shade and depth of color desired.

performance

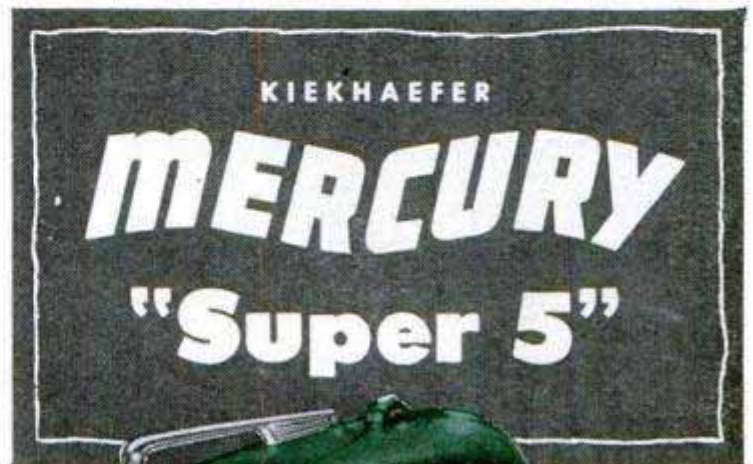
above all!

DESIGNED by Kiekhaefer engineers who recognize that **PERFORMANCE** is important to the fisherman, **PERFORMANCE** in your Mercury "Super 5" means hours on end of the slowest, sweetest trolling any fisherman could ask for.

PERFORMANCE means easier starting and reliable operation in fair weather or foul, because of the waterproofed ignition system. **PERFORMANCE** means reliable operation in shallow, stumpy bays or thick weed beds, because of the clog proof rubber rotex pump, low level water inlet, multiple disc propeller clutch and truly weedless position, dual purpose drive.

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 **SPRED SATIN**

THE WONDER PAINT

Here's the ideal paint for "do it yourself" redecorating. Goes on faster than any paint you've ever used. Apply with brush or roller. Start or stop any time, any place—no laps or brushmarks will show. Dries in 20 minutes to a gorgeous satin finish.

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- ★ Beautiful pastel and deep-tone colors—ready to use.

The secret of this amazing paint is its exclusive *synthetic rubber emulsion* formula. The rubber forms a tight, durable surface that dirt can't penetrate. See your dealer today!

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And because of its cold energy, the electron burst is ideal for producing powdered milk. Butter gets a "taste" too, and so does cream cheese, but in the latter it disappears a couple of months after storage. Lettuce collapses completely, gets soggy, flat tasting and bleaches out almost white. So do strawberries, whereas cherries, grapes, blueberries and apples come out fine. So do fruit juices. Irradiated heavy fruit-juice concentrates can be effectively preserved at room temperatures.

"One of the funniest things," says Huber, "is castor oil. It comes out sterile and clean and just like castor oil—except for one thing. It smells like daisies."

In early tests, some meats like beef, while they were perfectly good, acquired an ugly purplish-brown color. "That was corrected by refrigerating the meat before bombarding it," explains Brasch.

In spite of the failures, the scales are balanced well on the positive side for the capacitron. From its target table has come raw beef that is still fresh after being kept at room temperature for more than four years. There are well-aged fillets of flounder, bacon, chicken a la king, eggs, corn on the cob, still fresh and firm. Lima beans and cabbage, four years old, show no signs of collapsing. Diced cauliflower, stowed on a shelf in 1947, is as crisp as the day it was put away. Camembert cheese quit "ripening" the instant it was shot, but is perfectly preserved after four years in a warm room.

Cut roses and carnations, snipped from their stalks in 1948 are still fresh and crisp in their plastic envelopes, while "control" flowers that weren't irradiated have rotted away to black blobs.

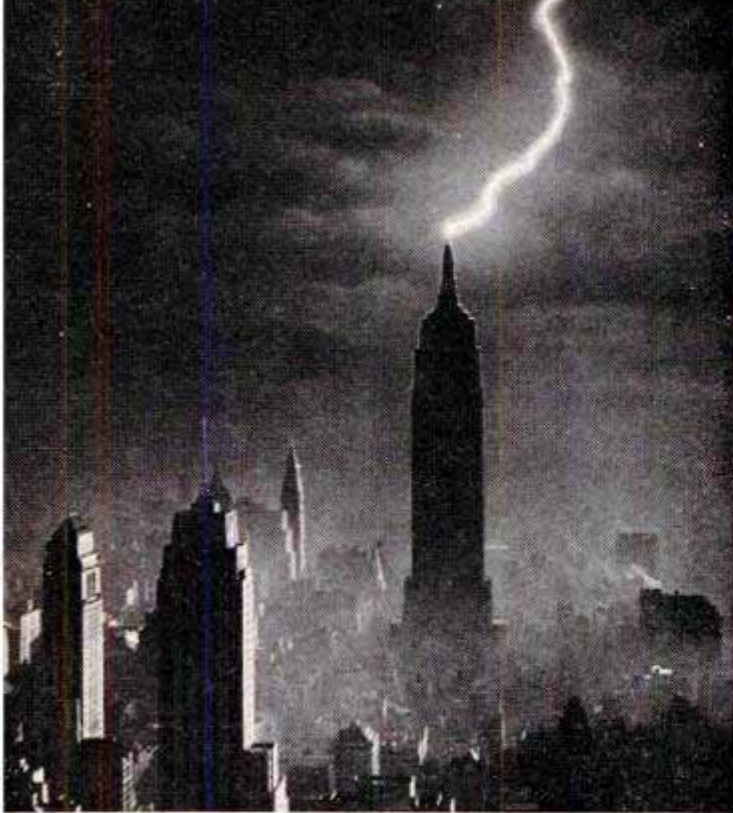
In the field of medicine, vitamins can be thoroughly sterilized with a single burst of energy, without losing their potency. In one swoop, biologicals like serums can be made sterile, eliminating the long, involved process now necessary. Bacteria and viruses can be killed with electrons so that they still keep the substance that lets them fight subsequent infection by disease germs. This opens the door to preparation of a whole new series of vaccines. Antibiotics, like penicillin and streptomycin, can be given a tremendous jolt, which stabilizes them without interfering with the substance that works against infection.

Work is being done, too, on whole blood, which must now be kept cold and used within two weeks. The capacitron's lighting should increase its life by many times, and obviate the need for refrigeration.

Both men have tremendous faith in the eventual use of electrons to destroy cancer cells. "No other beam," says Brasch, "has

(Continued to page 242)

Scientists Create "TAILORED LIGHTNING" For Better Motoring



ELECTRICITY LEAPS from storm clouds to top of Empire State Building as shown in this dramatic night photograph. Engineers harness electrical energy like this to "fire" gasoline in your engine.

In the great engineering laboratories of The Electric Auto-Lite Company in Toledo, Ohio, a group of Auto-Lite Ignition Engineers have been probing inside engine cylinder walls, peering at "blow-by-blow" spark performances, charting the behavior characteristics of man-made "lightning" across the spark plug gap. From endless tests they've determined what your engine's ignition system needs most, and then set about producing spark plugs to fill the bill. Net result: Ignition Engineered Auto-Lite Spark Plugs . . . the spark plugs that are world famous for quality and performance.



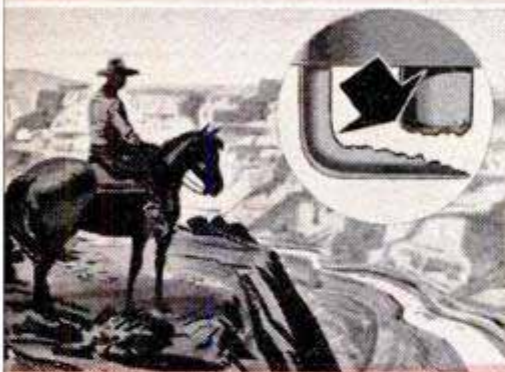
FRANKLIN'S KITE experiment was first demonstration of electrical nature of spark discharges between clouds. Date: 1752.



"FIRING PIN" of the car engine. Your spark plugs fire as many as 15,000 fuel charges per minute with tailored precision.



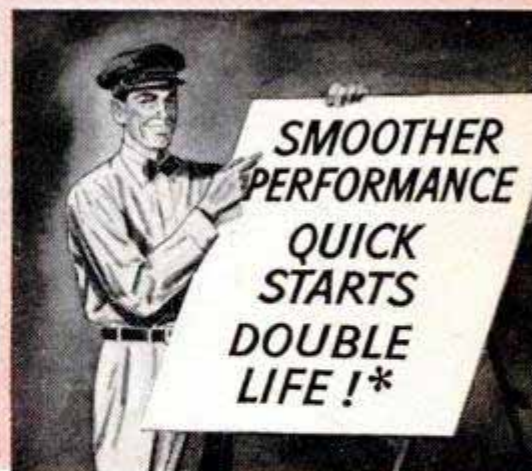
RELIABLE STARTING is one important benefit resulting from Auto-Lite research to assure correct materials, dimensions and design.



RIVER CUTTING CANYON resembles way surging of electricity wears away electrodes. For solution see next picture.



TINY UNIT called a "Resistor" permits wider initial gap setting, makes possible these advantages of Resistor Spark Plugs:



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DOUBLE
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rocking chair pistons
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the killing power of these atomic bullets—in combination with the exquisite control we can achieve."

The beam does other impressive things. Without harming grain, like barley, wheat, soybeans and corn, it will knock dead every weevil, moth or bug it touches. These insects destroy as much as \$600,000,000 worth of grain each year. "By loading grain into storage elevators via a conveyor belt passing beneath a capacitron tube," says Brasch, "all that grain would be saved."

Doctor Huber points out that the capacitron will not make refrigeration a thing of the past by a long shot. "Rather, the two will work together," he says. Many items—like beef—preserve best if cooled before treatment. Others keep their flavor, color and texture best if kept in a cool place. But instead of being down below freezing, much less refrigeration will be necessary."

The incredible beam even has the unique property of solidifying some liquid plastics to a point where they have some of the properties of steel.

The real story will come once that new capacitron goes to work this year. Unlike its forebear, it will make no racket, ring no bells or toot no horns. All its 17 banks of condensers are sunk in an insulating fluid. Sparks leap through special gaps from post to post and make no more noise than the tick of a big clock. But out of the huge vacuum tube in a completely safe, lead-enclosed treatment area at the far end, five million volts of lightning will begin to prove themselves, while the conveyor belt on the floor below carries tons of new merchandise to waiting delivery trucks.

Meanwhile, in the Brooklyn icehouse, the rebuilt pilot-model capacitron will preserve many different items for special wholesale customers—cut flowers, foods, drugs—and experiments will continue.

I'm Building the Popular Mechanics Plywood Ranch House

(Continued from page 89)

A multitude of various paneling methods can be used in the different rooms. Here in our Ranch House the bedrooms have plywood walls that can be painted, papered or given any other finish desired. The kitchen, utility room and bathrooms will be enameled. The living room will have its walnut paneling, large windows and brick walls. The dining-area walls will be stained. There are many little tricks to use on these walls, such as metal linoleum edging for the ceiling-wall joint.

Every room in the Ranch House has

(Continued to page 244)



STEVENS MODEL 124*

—12 ga., 3 shot repeating shotgun. Fast cross bolt action. Has the lines and balance and comparable performance of repeaters and auto-loaders, costing up to *twice* as much. Checkering . . . paneling and fluting of durable plastic stock give added eye appeal and value.

STEVENS MODEL 59

— .410 ga., 6 shot, tubular magazine, repeating shotgun. Chambered for 3" or 2 1/4" shells, take-down. Self-cocking bolt action . . . convenient thumb operated safety. Handles and shoots like a "22". Model 58 — same specifications, except fitted with 3-shot detachable clip magazine.

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* Both Models 124 and 258 double as deer guns, when loaded with rifled slugs or buckshot.



First in the Field



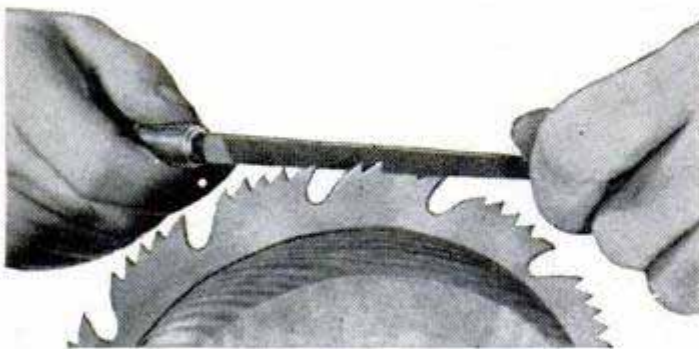
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Fine tools have a way of reflecting themselves in the quality of the work they turn out. You'll find that true whenever you use Nicholson or Black Diamond files. Mill files for sharpening and smoothing. Flat files for general purpose filing. X.F. Swiss Pattern files for precision work. Keep a good assortment of these famous files handy at all times. No home workshop is complete without them.

* For larger combination circular saws, the Nicholson or Black Diamond 10" Cantsaw File is recommended. And for filing the teeth of large circular rip saws, the Mill Bastard file with one round edge is often used. Your hardware dealer has all these files, or can get them for you.

HOW TO SHARPEN CIRCULAR SAWS, handsaws, auger bits, shop tools, etc., is all covered in the Nicholson 48-page booklet, "FILE PHILOSOPHY." It's free. Send for your copy today.



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modern and practical features you will like. My wife can hardly wait for me to complete the dining room. You can furnish it with standard furniture, but my completed dining room will both save you money and give a better room.

It has been carefully planned so that it can be a dual-purpose dining and living area—most of us today do not use a formal dining room enough to devote the floor space to that use exclusively. You make the dining table yourself from a flush hardwood door, the simplified "boomerang" table designed especially by John Whelan for the Ranch House. It is a huge, low coffee table that ingeniously lifts up to become a generous dining table for six to eight people. Behind the table, against the dining-room windows are two low buffet cabinets that you can buy or build and between these cabinets four modern dining chairs fit together to form a sofa or davenport. Thus your dining room is a lounging or reading area of the living room, yet in two minutes it becomes a dining area that will accommodate even that big Thanksgiving dinner.

There are many other features of the house and its furnishings that I would like to tell you about now, but that will have to await future issues. I will say only that it has been fun building the Ranch House, that you needn't have any fear of attempting it and that you accomplish more than just savings in completing your home with your own hands. Don't miss the story of this amateur-built home as it begins in next month's issue with drawings and photographs in full color.

Plague in the Big Pines

(Continued from page 142)

focus, pole-blight recognition schools were held last summer. These were to teach foresters and lumber-company fieldmen how to recognize a sick tree. First part of the school comprised lectures around a dozen pole-blighted trees. Lastly came the "exam." The questions concerned another dozen trees of different disease severity.

Out of the recognition schools has come a survey to determine just how much white pine already has been hit. Current guess is that it will be 100,000 acres or more. Pole-blight devastation so far has been mainly in the Cabinet and Kootenai national forests in Montana and in the Coeur d'Alene and St. Joe in Idaho. Extensive airplane checking will be done this summer by the Division of Forest Pathology in areas which have not yet reported any trouble from the mystery disease.

(Continued to page 246)

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Because the most easily recognized symptoms are at the very tops of the trees, aerial spotting is expected to serve for the preliminary survey. When the aerial spotters report suspicious stands, ground crews will move into the territory to make close-up investigations.

The big target in pole-blight research, however, is to find out what causes the disease. Seeking the cause, scientists are exploring every possibility, below ground as well as above. Eight complete root systems, mostly of diseased trees, already have been plucked out for complete analysis.

"White-pine tree roots are shallow, seldom going down more than four feet," explains Doctor Buchanan. "But they certainly do spread out. We washed soil out 35 feet from the trunks of some trees to get all the running roots."

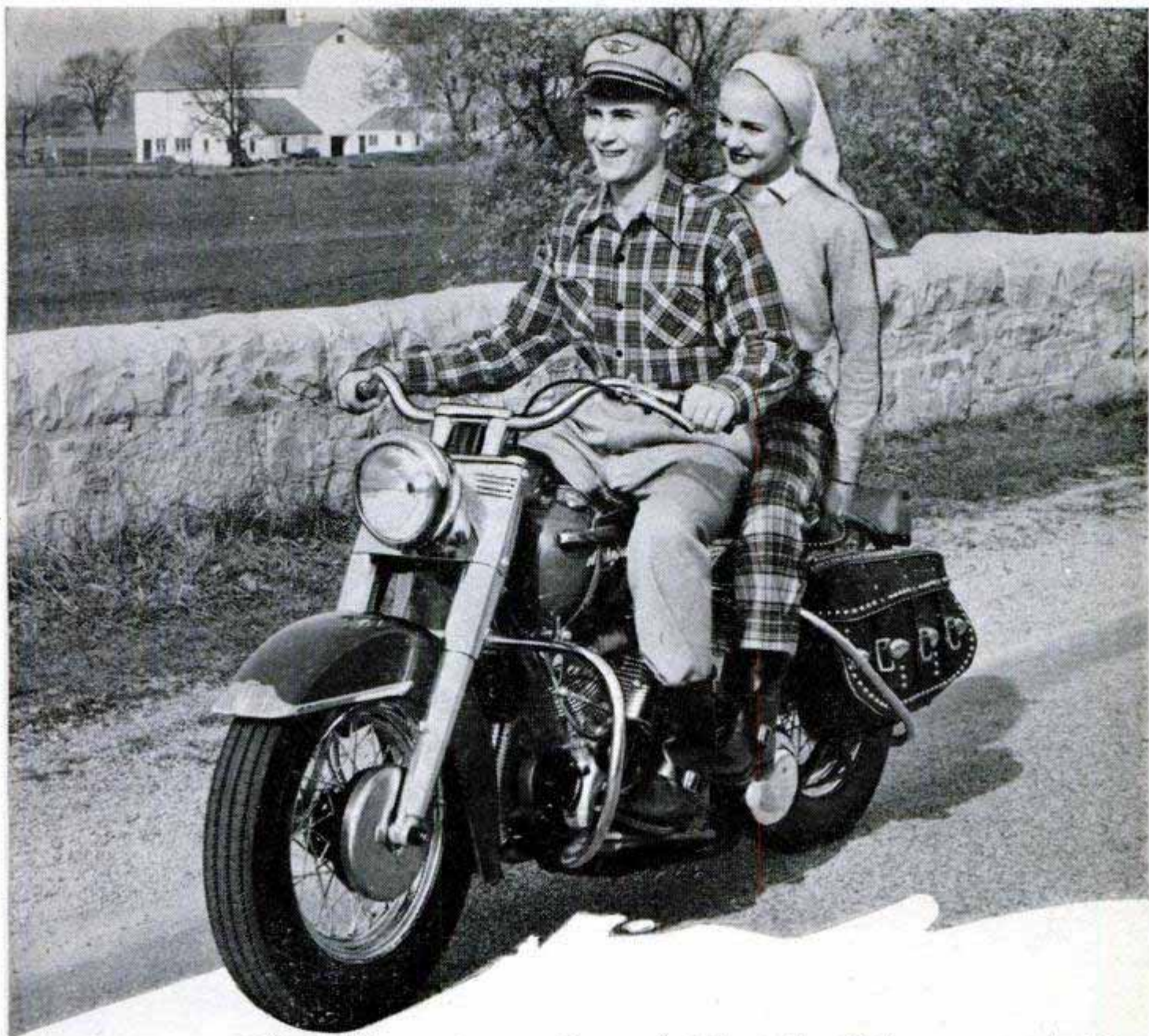
Soil around the trees has been completely analyzed. Idaho's Dr. William K. Ferrell is checking the tree soils for chemical content, acidity, nitrogen content, origin and texture, depth, slope, drainage and organic-matter content. Every angle is being explored for a possible lead.

All kinds of "juice" squeezed from the bark and wood of sick trees has been shot into healthy ones. Dr. Lake S. Gill of the Division of Forest Pathology collected 120 different fungi off sick trees. Each gets a laboratory test. Doctor Hubert has punched his hypodermic needle into more than 50 trees, giving each a shot of juice from a diseased tree. In addition, he has made nearly 500 patch grafts. Pieces of bark from diseased trees are grafted onto healthy ones. In cold storage in his laboratory, Doctor Hubert has hundreds of test tubes containing fungus cultures from sick trees. Entomologists are exploring the possibility that some forest bug may be the culprit spreading the disease.

Masses of data from the many-sided field studies being carried on in some two dozen field plots in six national forests in Montana, Idaho and Washington, go into what one worker jokingly described as a "mathematical grinding machine." Even high-speed computers have a place in modern research.

Right now the white-pine tree doctors are agreed on but one thing. They have a first-class killer on their hands. There is no evidence to indicate that any tree, once it gets pole blight, ever gets well.

Standing on the sidelines watching the forest pathologists, the entomologists, the soil scientists, the ecologists and other specialists interested in the general health and welfare of our forest trees pooling their resources, one is convinced the patient is in competent hands.



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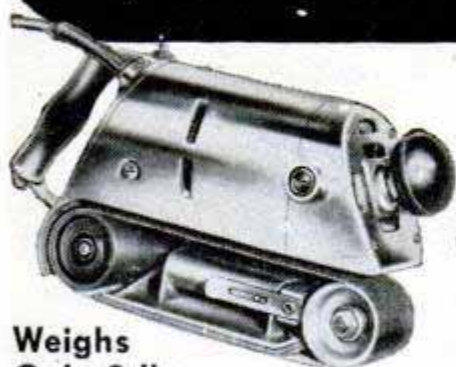
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(Continued from page 85)

by high sulphur content. When the sulphur is removed, the gas has no odor at all, so it is given an artificial odor at the distribution end of the pipe line. This enables almost anyone to detect leaking gas.

Natural gas is pumped into a long-distance pipe line at pressures up to 800 pounds per square inch, and it flows through the line at an average speed of around 30 miles per hour. After a distance it slows down because of friction with the pipe, and is then repressured at compressor stations spaced about 125 miles apart. The 20 compressor stations of the new line to New



X-ray film is wrapped around weld. Radium salt inside pipe will expose film through any weak spot

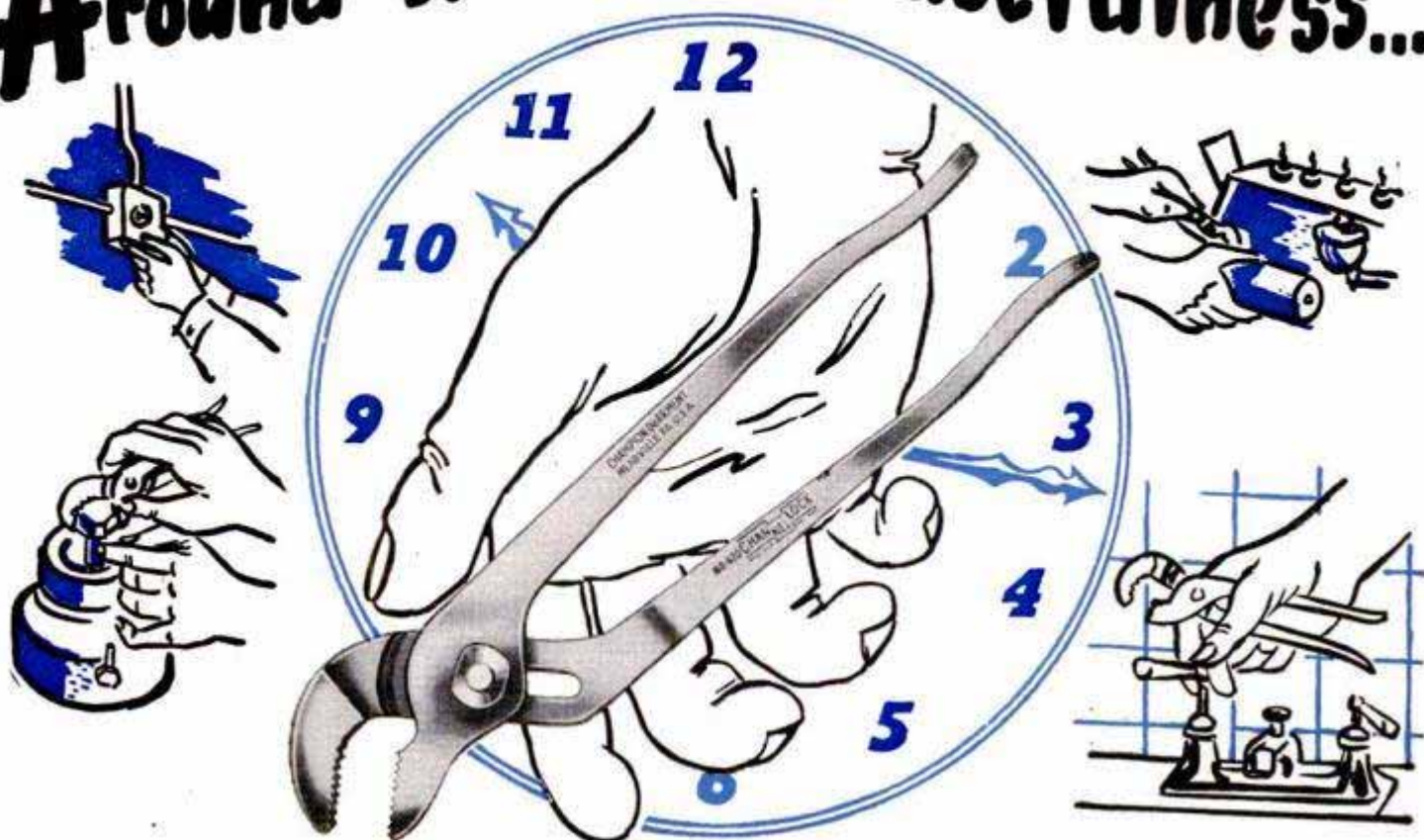
York have a capacity of 209,120 horsepower, and each station takes gas out of the pipe line to use as fuel.

All the oncoming gas is "scrubbed" as it enters a compressor station by being bubbled through an oil bath. This removes the dust, rust and metal particles that it has picked up along the line and that could injure the compressors.

One of the biggest problems the gas industry faces is a way to meet the fluctuating seasonal demands for its fuel. Due to the increased use of gas for heating in cold weather the load factor may be seven times greater in January than it is in August. A

(Continued to page 250)

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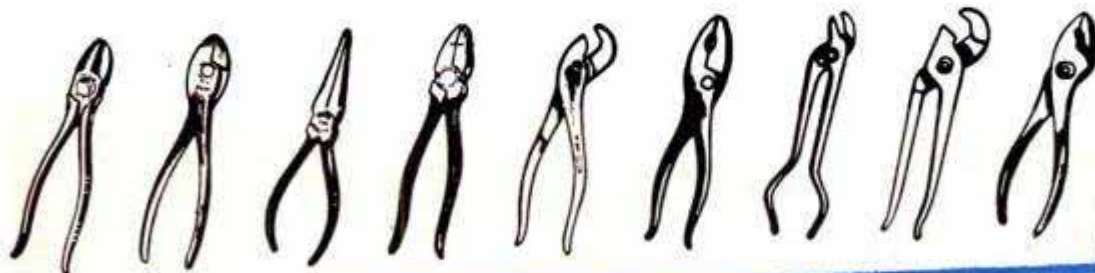
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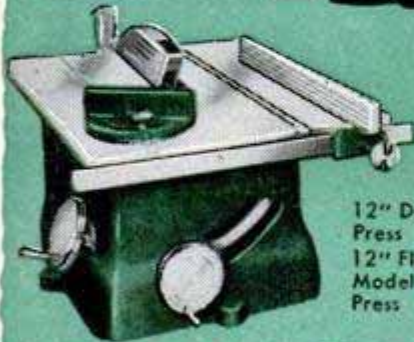
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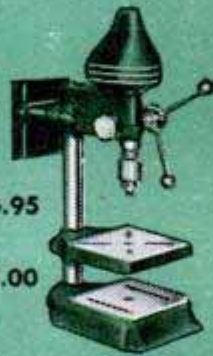
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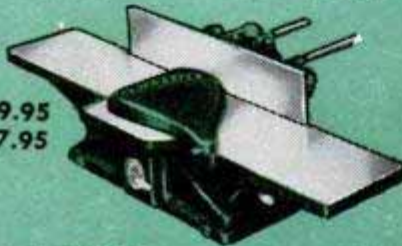
8" Tilting Table bench Saw . . . \$51.50

10" Tilting Arbor Bench Saw . \$86.95

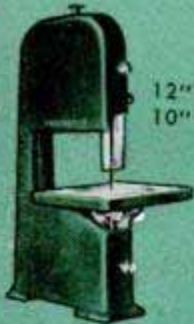
10" Floor Model Tilting Arbor Saw . . . \$105.00

6" Jointer-Planer . \$79.95

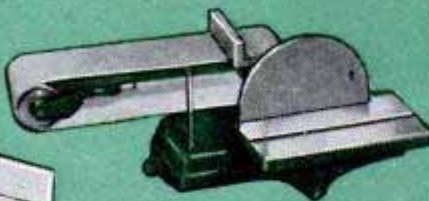
4" Jointer-Planer . \$47.95



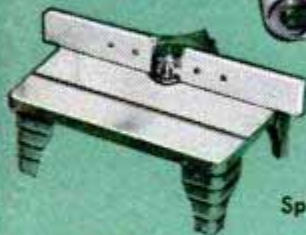
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pipe line can be "packed" with higher than normal pressure in anticipation of a cold snap but this is of only slight help.

What is needed is enormous storage facilities adjacent to the market areas. In a few instances where a partly depleted oil or gas field lies close to a marketing terminal, it's normal practice to pump gas into the structure all summer long. It's drawn back out again and into the distribution system in the winter. Last year about 250 billion cubic feet were stored underground. An old gas field near Austin, Mich., is being filled with Texas gas for winter withdrawals, and similar underground storage facilities are being developed in old oil fields in Pennsylvania.

On the West Coast the Southern California Gas Company and its affiliates have developed the largest underground storage facility of all, the depleted La Goleta field near Santa Barbara. This subterranean reservoir is a mile below the surface and lies in part under the Pacific Ocean.

Engineers estimate that the tightly sealed structure has a capacity equal to a gas tank covering 300 city blocks and 28 stories tall. It can hold 50 billion cubic feet of gas under a pressure of 2000 pounds per square inch. Compressors at the tops of nine wells that pierce the formation inject natural gas into the reservoir all summer long. During the winter months Los Angeles and other cities can draw as much as 365 million cubic feet of gas per day from this natural storage tank.

From this and other sources, southern California consumers can be provided daily with natural gas equal in heat energy to 753,000 tons of coal or equal to the electrical output of 24 Hoover dams. The region won't run short this year or next, but engineers expect that by 1953 they will require another pipe line extending to Texas or even to Canada, plus additional storage facilities equal in capacity to two more Goleta reservoirs.

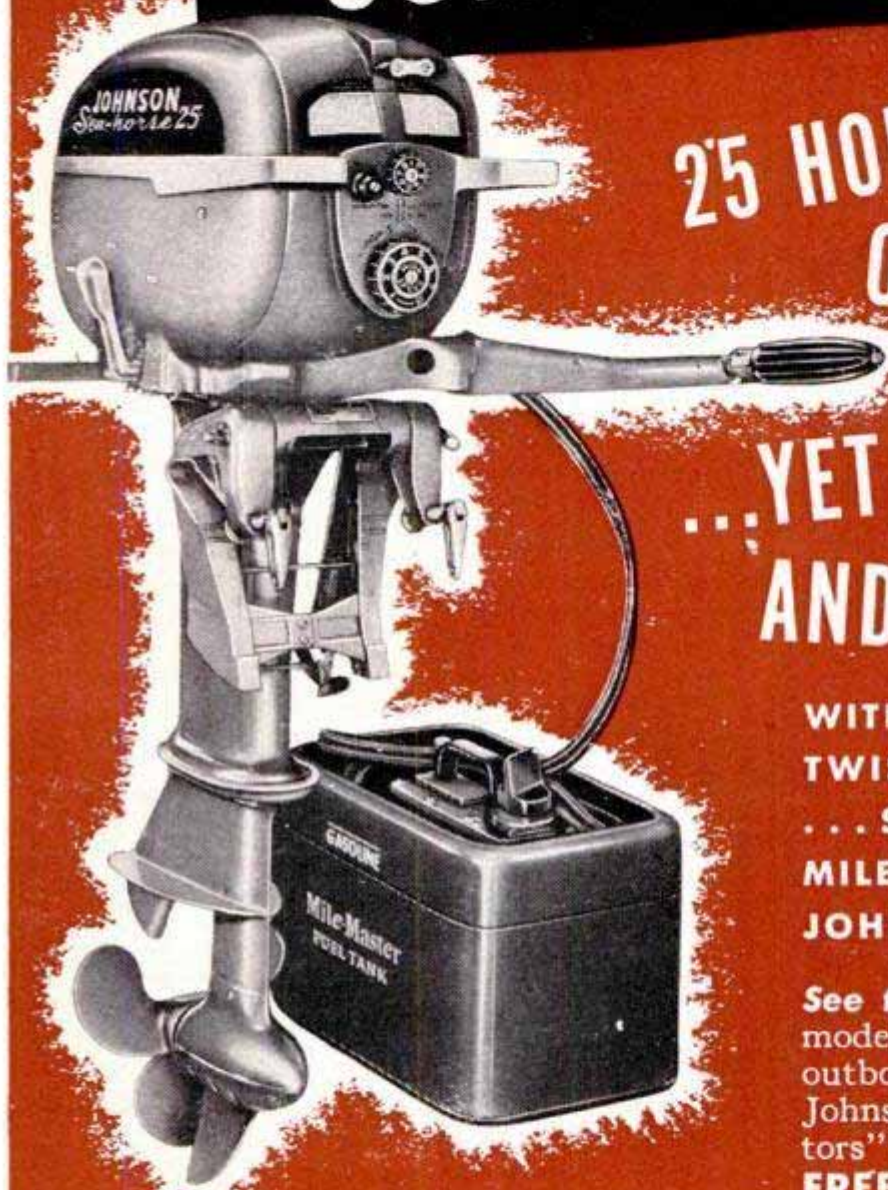
Another method of terminal storage that may be tried on a smaller scale in other areas would be to condense natural gas into a liquid and flow it into pressure containers filled with a solid absorbent material prepared from fuller's earth. Six hundred cubic feet of gas can be stored in two cubic feet of space in this way.

Still another possibility that has been tested is to ship liquid propane and other condensed gases by rail from a producing to a marketing area. There the liquid is vaporized, mixed with air and pumped into the low-pressure distribution system to boost the supply.

The era of pipe-line building is by no

(Continued to page 254)

THE NEW JOHNSON *Sea-Horse* 25



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OVER 30 M.P.H.!**

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Please send—free—Kentucky Club Catalog.

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Owners Report on the '51 Ford

(Continued from page 110)

mileage could be improved." Another man says: "I have found low-pressure tires do not give as many miles per gallon by one or two miles."

A woman in Massachusetts says: "I get 22 or 23 miles per gallon with regular transmission. Car handles fine, well balanced. Assembly could be better."

A Pittsburg, Kans., owner says he especially likes "the quiet, smooth performance, the heavy solid feel of front end and steering, styling, quick and sure-fire start in cold weather, door latches, easy front seat, dash design, smooth ride without pitch." He objects to "water running down inside of closed window, sharp-edged bumpers, transmission and drive shaft up too high on the floor." He concludes: "I've owned three Fords and my next will be a Ford."

1951 FORD SPECIFICATIONS

ENGINE—(6 or 8-cyl.)

8-cyl. L-head, V-type. 3-3/16-in. bore, 3 3/4-in. stroke. Piston displacement—239.4 cu. in. Brake hp.—100. Compression ratio—6.8:1.

6-cyl. L-head, in-line. 3.3-in. bore. 4.4-in. stroke. Piston displacement—225.9 cu. in. Brake hp.—95. Compression ratio—6.8:1.

Transmission options: (1) Conventional 3-speed, (2) Conventional with overdrive, (3) Fordomatic Drive automatic transmission.

GENERAL

Weight (4-door Sedan)—V-8: 3224 lbs., 6-cyl.: 3180 lbs. Wheelbase—114 in. Tread—front 56 in., rear 56 in. Height—64.7 in. Over-all width—72.8 in. Length—196.7 in. Tires—6.00 x 16 standard or 6.70 x 15 super-balloon. Recommended pressure—28 lbs. front, 25 lbs. rear; super-balloons—24 lbs. front and rear. Road clearance—7.9 in. Turning radius—20 ft. 6 in. Steering wheel, lock-to-lock—4 turns. Steering ratio—17.7:1.

CAPACITIES

Oil—5 qts. Water—(V-8) 21 qts., (6-cyl.) 16 qts. Gasoline—16 gal.

A Mondamin, Iowa, farmer says: "I'm a long-time Ford owner and I like the improved heating system, fast pickup and ease of handling."

A North Bend, Ore., owner likes the "parts and service facilities available anywhere, and the good resale value."

Many were loud in their praise with such remarks as: "Easy to handle, has that safe feeling . . . front-seat adjustment is wonderful for a short person . . . I like the new electrical equipment and fuel pump is outstanding . . . new door-locking system is fine, as keys cannot be locked in car . . ."

(Continued to page 262)

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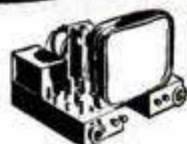
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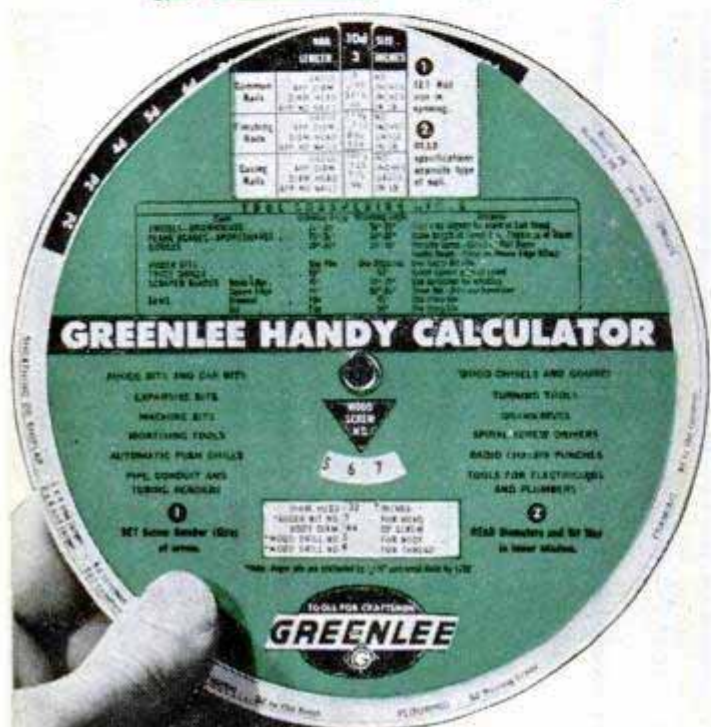
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Here's the improved GREENLEE Calculator with more information on lumber, nails, concrete mixes, painting materials, etc. Convenient... simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of wood. 6" diameter, heavily varnished card-board, printed in three colors.

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means over. Areas that are already served are asking for more gas and the industry expects that it will spend 2½ billion dollars on new transmission lines as soon as steel is available and long-term contracts can be written.

Construction men have developed special methods for building the lines, an example being Pacific Gas and Electric Company's new "Super Inch" that serves San Francisco. More than a million dollars' worth of extraordinary equipment, much of it designed especially for the job, was required for its construction. Mightiest units were a pair of trenching machines, 50 feet long and weighing 32½ tons. One of these can dig more than a mile of trench per day, 5½ feet deep and 44 inches wide. One of the smallest pieces of equipment is a tiny bulldozer, 42 inches wide, that is driven along the bottom of the trench to level the earth.

Pipe is delivered along the right-of-way in 32-foot lengths. These are welded into units 4000 to 6000 feet long. Each weld is photographed with X-ray film that reveals any weak spots. An ingenious self-propelled machine coats the pipe with asphalt and double-wraps it with felt and kraft paper as a protection against corrosion and electrolysis.

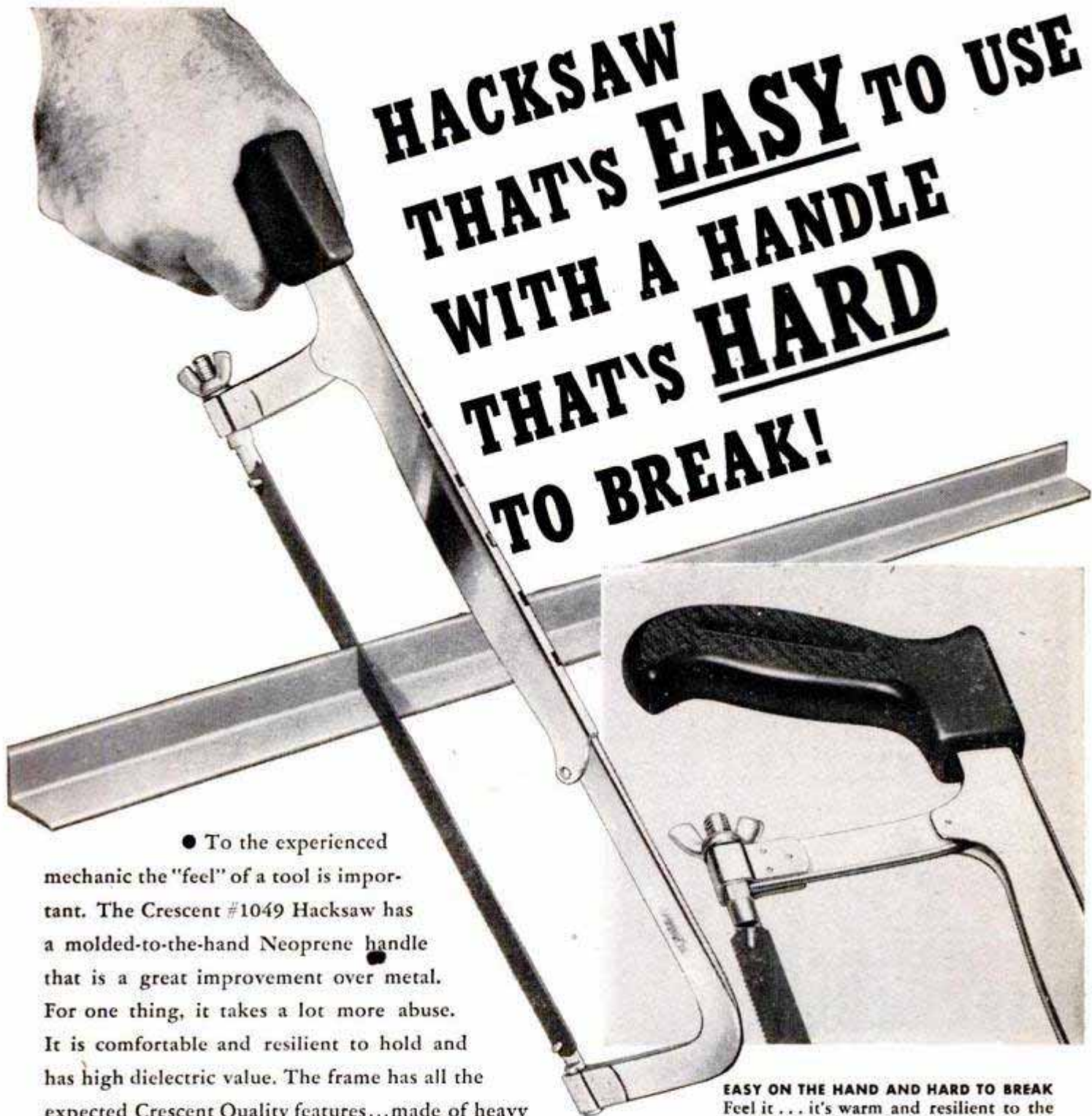
Each 33-mile length of pipe is purged by admitting gas into the line, building up the pressure to 600 pounds per square inch, and opening a gate at the end of the pipe. Dust, gravel and extraneous material in the pipe are swept away by the rushing gas. After the line is buried, the right-of-way is seeded with grass by low-flying aircraft to prevent future erosion.

Natural gas is a versatile raw material that can be converted into various products. It is the basis of almost all the carbon black that is manufactured for the printing trades and for use in automotive tires. Ammonium-nitrate fertilizer is made from it, and it can be transformed into gasoline and a wide range of hydrocarbon liquids. Probably it never will become an important source for these synthetic products, however. It makes such an ideal fuel in its original state that every cubic foot of it may be needed for creating heat and power.

Longer-Wearing Tires

Use of a new carbon black is expected to increase the wear of "cold" rubber tires as much as 50 percent. Carbon black constitutes about one third the weight of both natural and synthetic-rubber tires. Developed by the Phillips Petroleum Company, the new black could aid in rubber conservation. Thinner-tread tires that wear as long as present-day tires may be possible.

HACKSAW THAT'S EASY TO USE WITH A HANDLE THAT'S HARD TO BREAK!



● To the experienced mechanic the "feel" of a tool is important. The Crescent #1049 Hacksaw has a molded-to-the-hand Neoprene handle that is a great improvement over metal. For one thing, it takes a lot more abuse. It is comfortable and resilient to hold and has high dielectric value. The frame has all the expected Crescent Quality features...made of heavy gauge steel...nickel-plated for corrosion resistance...beautifully balanced. You'll find all the features that make a good hacksaw in this Crescent model.

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

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Feel it . . . it's warm and resilient to the touch. Drop it . . . it won't break. Use it . . . it is impervious to oil and acids. Temperatures 100 degrees below to 200 above will not affect it. Has high insulating value under all conditions.

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Most battery cable trouble starts at the terminal because of corrosion or bad fit. Bowes "Seal Fast" battery cable terminals positively will not corrode. They are specially engineered, tailored to fit the posts snugly, assuring longer cable life and full power from your battery. Stop battery cable trouble before it begins. For sure, positive starts insist on Bowes "Corrodeless Terminal" Battery Cables—then you'll get all the power your battery is designed to give you.



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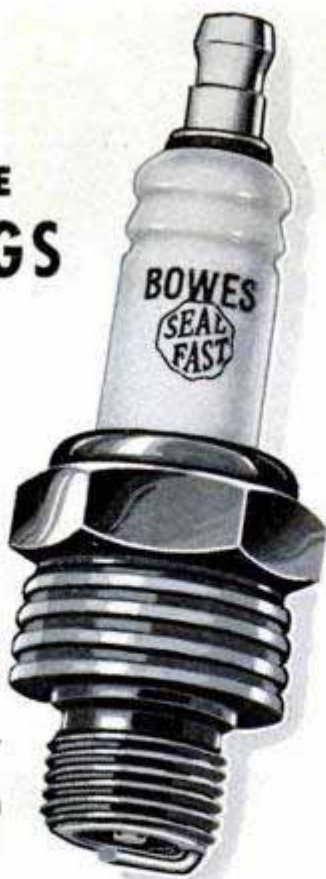
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INDIANAPOLIS 7, INDIANA

The Scattergunners' Hall of Fame

(Continued from page 138)

but it's a safe bet that tomorrow's alterations will be based on this type of basic study.

While this precise research is underway in ballistics laboratories, applied research is



Blind in right eye, right-hand shooter aims with left eye down special sight parallel to the barrel. Below, rifled-slug shot shells, before and after firing



resulting in better arms, ammunition and new products for the scattergun shooter right now.

Take the new Remington Wingmaster. For the first time in any pump-action shotgun, the breechblock locks up into an extension on the barrel, closing the action against the head of the shell. The result is more constant "head space," the old bugaboo of almost any type of firearm. The Wingmaster also is equipped with plugs of various weights made of wood and steel. By leaving the weights out entirely or inserting them in various combinations, the gunner can change the balance, weight and shot capacity of the gun.

An old idea with a new twist is the neat Savage over-and-under rifle and shotgun. The top barrel fires .22 rifle shells, while

(Continued to page 258)

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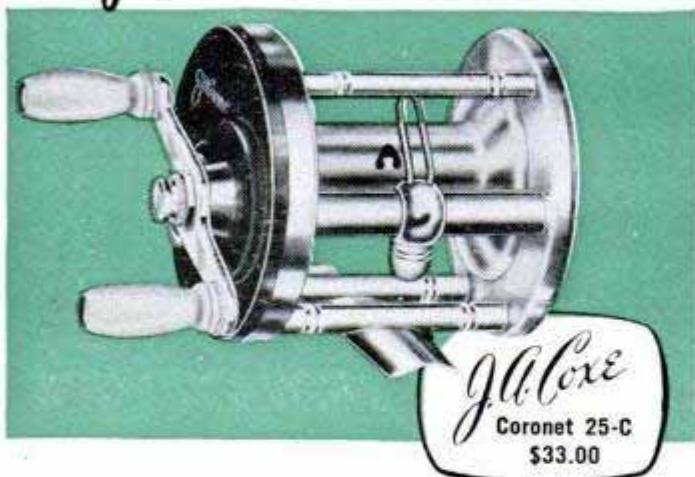
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Got a new glass rod? Get the new **COXE** reel!

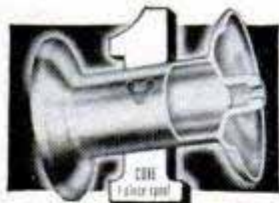


● Here's the reel we designed especially for the new glass rods—the J. A. Coxe *Coronet 25-C* with the new one-piece spool!

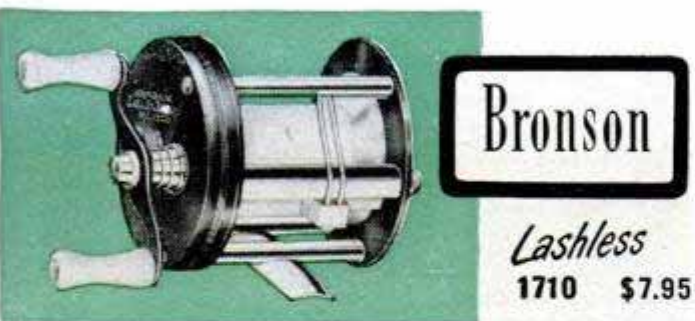
This is the reel you've known for years as the world's only automatic free spool reel. You get the same Coxe craftsmanship, the same basic features—cross-bolt construction, 10-second takedown, perfect spool alignment.

But now it's completely re-designed—with the weight cut in half!

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BRONSON REEL CO. • BRONSON, MICH.
Division of Higbie Manufacturing Company

the bottom one shoots .410 shotgun shells. There's a single trigger, but a separate extractor for each barrel.

The shotgunner who wants to use the scattergun as a rifle can do so, in effect, with the rifled-slug shot shell. In the old days the only such ammunition available was the "pumpkin" ball—a round, single-ball load, somewhat erratic in flight and



Wounded during war, Nolan E. Wilcutts can't raise arm above waist. Swiveled extension which he developed helps him shoot a high score at Grand American

short in range—and buckshot. With the rifled slug the shotgun approaches a rifle in accuracy. Spiral lands on the slug expand against the bore to spin the bullet slightly as it moves down the barrel.

For the hard-pressed shotgunner who likes to indulge in skeet or trapshooting but feels he can't afford it, there's a new miniature clay-target setup on the market. It permits him to use .22-caliber *shot* shells in his own shotgun *regardless of the bore*. An adapter—virtually a bore liner—slips into the barrel to reduce the gauge to .22-caliber. There's a built-in ejector. The smaller shells cut down the punishing jolt to the shoulder and the even more punishing jolt to the pocketbook. Miniature clay disks, scaled to the .22 shot, and small traps are available.

Some gunners are making their own alterations and improvements, although in most cases these adaptations are to adjust the gun to a physical handicap. Horace Aldritt, of Excelsior, Minn., showed up at the last Grand American with a weird-looking sight. Aldritt, a right-hand shooter, has a blind right eye. He designed a

(Continued to page 260)

MODERN LAWN MOWER SHARPENER

FOR LAWN MOWER SHOPS
FIX-IT SHOPS

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101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang • 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed. All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist blades.



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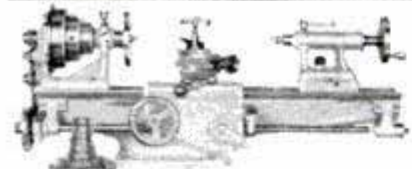
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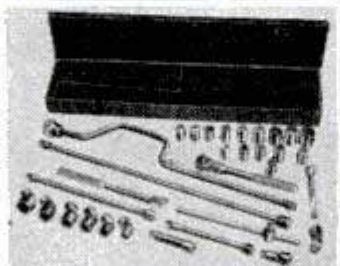
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Catalogue with complete construction drawings of this 8 inch lathe with milling, grinding and hand shaper attachments, 25 cents postpaid, or send one dollar for drawings of three lathes, two milling machines and six inch crank shaper—refund on castings order.

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Enclosed (check or M.O.) \$4.95 for one set of NEW Warren Washers. My arbor size is 1/2" 3/8" 3/4" 1". Send free booklet. (PLEASE PRINT)

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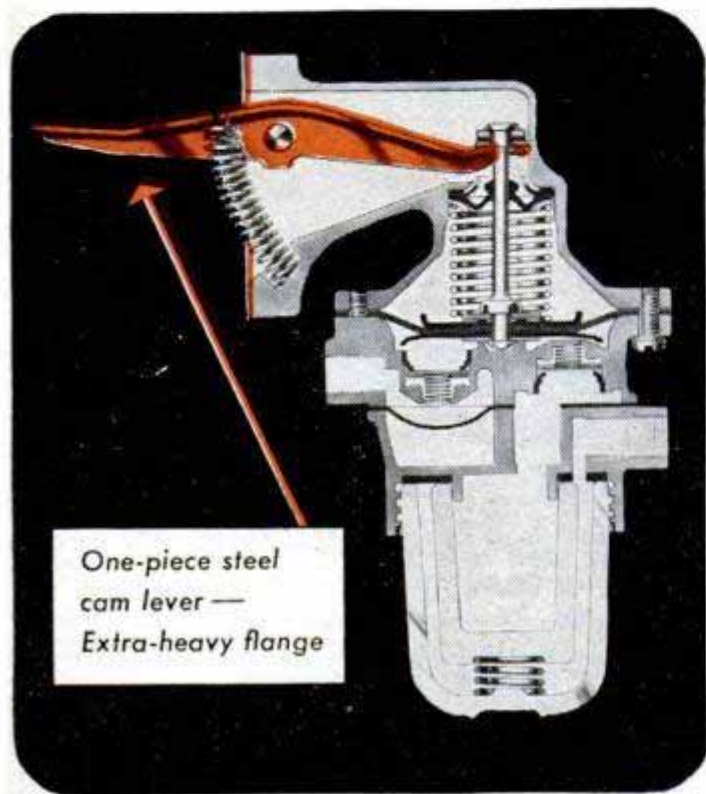
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Extra-heavy flange

Have strength and durability

at **Vital Points** to
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FUEL PUMP

The extra-heavy flange that bolts to the engine is designed to prevent warpage and oil leakage. The one-piece steel cam lever has an extra-wide cam bearing surface hardened for longer wear.

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precise, offset sight which protrudes two inches to the left of the barrel and is $\frac{7}{8}$ inch higher than the barrel to compensate for the tilt of his head as he aims. The sight enables him to aim with his left eye and fire right-handed.

An old-time New York gunner had exactly the same problem—he lost the sight of his right eye—but a skillful gunsmith solved it in a different way. The gunsmith made a curved stock for the shooter's favorite gun. Now the man is able to plant the odd-looking firearm against his right shoulder and line up the sights with his left eye.

Nolan E. Wilcutts, a Grand American shooter from Felton, Del., was wounded in the right arm during the war, and is unable to raise his right hand above his waist. A left-hand shooter, Wilcutts devised a swiveled extension which pivots down from the forearm of his shotgun. By grasping the lower end of this handle below his waist, he can hold the gun as steady as he did before the war.

Millions of men were exposed to firearms for the first time during the past war. As a result the number of shotgun shooters has soared higher than a wily mallard on the second day of the duck season. There are around 10,000,000 shotgun owners in the country today.

Shooters at the Grand American and the other events at Vandalia last August numbered 2000 odd. In six days' time along a $\frac{1}{2}$ -mile trap line they fired 1,205,300 shotgun shells and scattered 500,000,000 pellets across the green countryside. They littered the field with 84,748 pounds of lead, a good many cubic feet of shell casings and the shattered dreams of some 1700 men who hoped—this once—to shoot a perfect 100 at the Grand.

Now they are dreaming of the next national match; and science, through ballistic research, is improving their chances of hitting that elusive 100.

No Skidding for Air Force Bombers

Detectors which "sense" a skid—and stop it—are now on all of the Air Force's B-47 and B-51 airplanes. One of the detectors, six inches in diameter, is placed on the outside of each airplane wheel and it has an energy wheel that rotates directly with the airplane wheel. When a skid develops, the energy wheel over-travels, causing a valve to interrupt the brake pressure. Another device similar in principle, uses a skid detector to energize a solenoid valve that releases the brake pressure. Both re-establish brake pressure automatically when the skidding stops.



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Be permanently
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No. 8-A Ace Tool Set for 9" and 10" Swing Lathes—fits shank size 3/8" x 3/4". Includes Turning, Cutting-off, Boring, Knurling and Threading Tools with high speed cutters, blades and wrenches. 8 complete tools in fitted steel case—nothing else to buy. See your local dealer or order direct.

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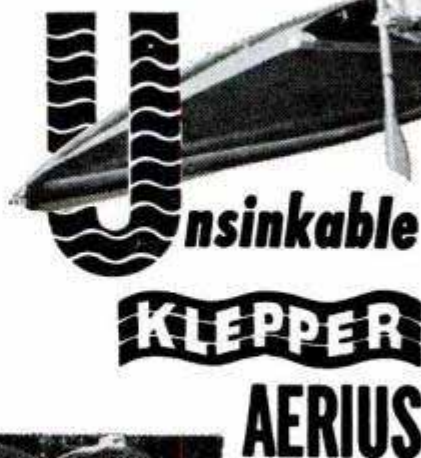
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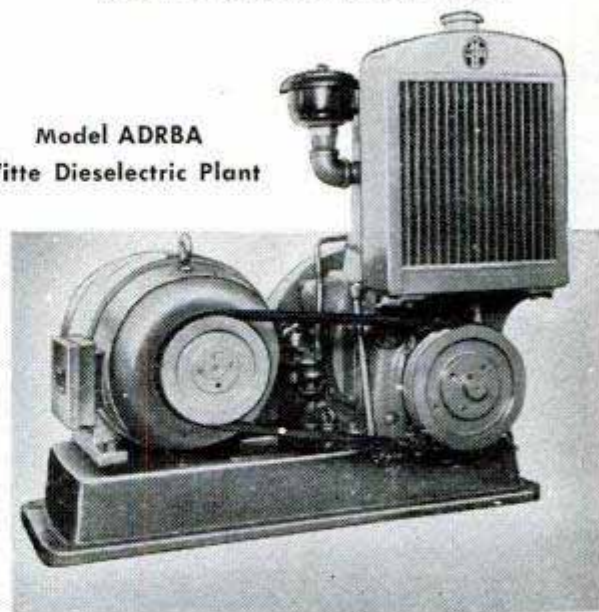
FREE! "Wandering by Water". . . Color Story of Foldboating. Write to
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Shoot rapids, fish, hunt, wherever you want to go, with sail, paddle, or out-board, the rugged, fast, new KLEPPER AERIUS will prove up to the game. And air-tubes built into the hull at the gunwales make it UNSINKABLE too . . . your **safest** bet for a real man's boat!

4,000 WATTS

from this compact, low-cost
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UNITED STATES STEEL

SAY YOU SAW IT IN POPULAR MECHANICS



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NO WASH!

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Now you can "strip off" any finish safely, easily, without mess.

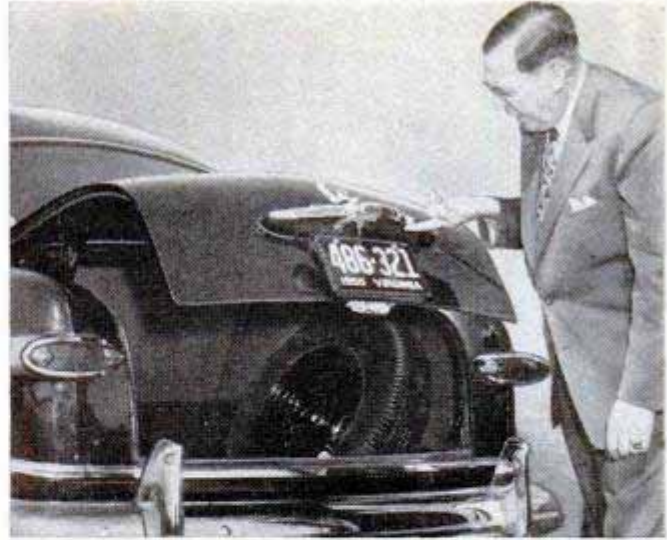
Old-fashioned, inflammable solvents work by "dissolving," leaving a sticky, waxy surface that must be carefully washed, or "neutralized." But Klean-Strip penetrates all layers of old paint and actually "breaks" the bond between the bottom layer and the surface to be stripped.

Klean-Strip changes any finish into a wrinkled film that is easily peeled off with brush or putty knife. Leaves surface smooth, clean and dry.

Buy Klean-Strip whenever you buy paint. At better paint, hardware and department stores.

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One finger easily lifts the counterbalanced trunk lid. Most owners were pleased with the body styling

balanced trunk lid is fine, car rides much better than I expected."

On the other side of the ledger, a Colorado owner writes that he is skeptical about the small fan belt. A Dedham, Mass., owner thinks more attention should be given to the car's performance on ice and snow because his traction was poor even with snow-tread tires. Another owner says: "The speedometer hand is very hard to read and poorly lighted at night." Another complains: "I dislike the starter-switch location and there should be a crank for vent windows."

Another man turned over his questionnaire to write on the back: "Beautiful interior, wonderful car, but the top of the custom-model horn rim is directly in line of eye to speedometer vision; it partially obscures the high-beam warning indicator; the speedometer dial is poorly lighted and hard to see quickly. The old pointed needle indicator with closer graduations on the speedometer dial was better." (I agree.)

Several owners opined that lightness of the Ford rear end gives poor traction on snow, ice and mud. (I agree, but most modern cars have engine and weight so far forward that this is a common complaint.)

If there ever has been any doubt about the loyalty of Ford owners, this survey should end it for all time. There were many kicks, as reported above, but in almost every case, between the lines was this sentiment: "Even my best friend has a fault or two and I forgive him."

Now for my own impressions of the car:

I put 4000 miles on a 1951 custom Ford V-8 with Fordomatic, in three weeks . . . and they were hard, tough miles from the Ford plant at Dearborn through snow to Kansas City, then on icy roads in bitter-cold weather to Denver. I drove over the high

(Continued to page 264)

Be Your Own Boss



There's a great feeling to being in something for yourself, where all the profits go into your own pocket. American floor sanders make it possible for you to realize this ambition without special schooling or a big investment. Begin small and work up to as large an enterprise as you desire . . . It all depends on your ambition to get ahead.

Ask for "tell-all" booklet entitled "Opportunities in Floor Surfacing". Use coupon and enclose 25 cents in coin or stamps to cover handling.

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Original "Type P" Pump has 2400 GPH capacity. 360 GPH 75' high, or 1500 GPH from 25' well. Use any 1/8 to 1/2 HP motor. **DOES NOT CLOG.**

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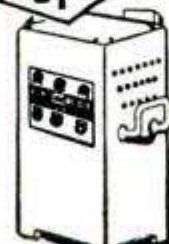
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Tops in comfort—tops in wear—they're made of tough, wear-defying pigskin tanned buckskin-soft by the famous Wolverine triple-tanning process. No other work gloves like 'em!

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While supply lasts we'll send you one **FREE** and name of your nearest Wolverine dealer. Address

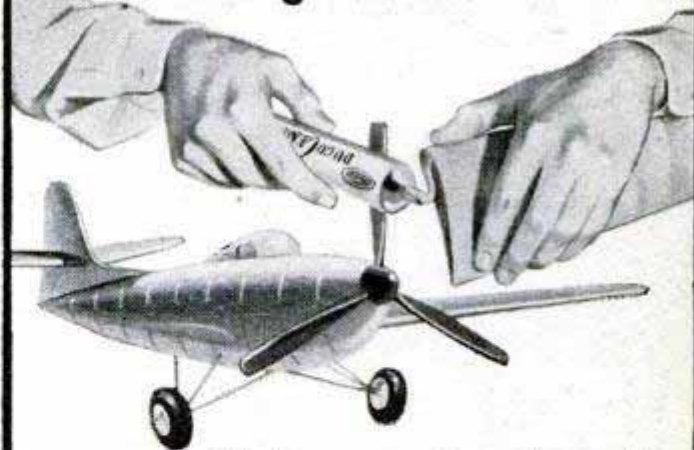
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Stronger Models



It's transparent, waterproof, flexible and durable. Get a tube today.



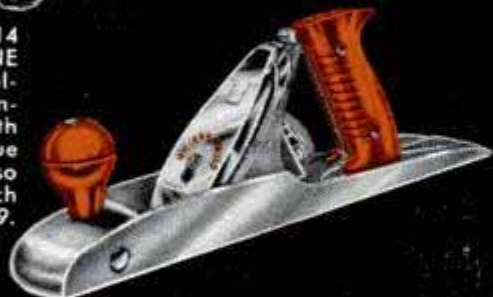
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many unique
features. Also
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If you want the very best, ask your hardware dealer to show you these beautiful new Millers Falls tools. See, too, the many other Millers Falls hand and portable electric tools he is now displaying. They're the finest line in Millers Falls 83 years of quality toolmaking. Millers Falls Company, Greenfield, Mass.

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NEW NO. 525 KEY-
HOLE SAW. Cuts
most anything—most
anywhere. Inter-
changeable blades
— rotatable handle.

passes of the Rocky Mountains, across the plains and desert and through still more mountains to Los Angeles, and then more miles were added in California.

After the car was broken in I did my best to uncover any weakness in performance. In a bad snowstorm we climbed to the 10,850-foot Wolf Creek Pass in Colorado. The highway was slick with snow and ice.

The car handled well on winding mountain roads. Skids could be well controlled due to the excellent stability of the car, and super-cushion tires helped some in the snow. Like most modern cars, a little more weight on the rear end would provide better traction on snow and ice.

For about 70 miles between Gallup, N. Mex., and Holbrook, Ariz., we ran into a real blizzard. The highway was so slick that several cars had slid off the road. It became difficult to see the road as we crept along in a line of cars at 10 to 20 miles per hour in the blinding, fast-falling snow. Out of Holbrook, the morning after the storm, we hit the open, straight stretches. On long, level straightaways, about 95 was top speedometer reading, but we cruised nicely at 80 to 85.

Brakes proved smooth in every instance. Perhaps a little more brake-pedal pressure is needed than in previous Ford models where only light and very sensitive pedal pressure was required. The hand brake has close ratchet graduations, which make for ease of operation.

Of great interest is Ford's new automatic transmission. Fordomatic combines a three-speed torque-converter transmission with a 3.31-to-1 rear-axle ratio (as against 3.73-to-1 ratio with regular transmission). The gearbox is the planetary type, permitting shifting between all ratios without torque interruption. Gear ratios are 2.44 in low, 1.48 in second, 1.00 in high, and 2.00 in reverse. Before the engine can be started, the shift lever must be in neutral position.

Starting in drive range with moderate throttle, all gear changing takes place smoothly and almost effortlessly between 17 and 65 miles per hour, depending on throttle opening. It shifts to high gear at 65 miles per hour with a slight forward surge, but only when the throttle is held wide open. In ordinary driving, it shifts to high between 25 and 30 miles per hour when the throttle is held in one position or foot pressure is taken off the throttle. Acceleration is good, using the drive range only, but can be increased somewhat by starting in low, allowing the engine to "rev" up to about 30 miles per hour, then pushing the selector lever quickly to drive position while the throttle is wide open.

(Continued to page 266)

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ALL BRAND NEW FULLY GUARANTEED

LOGAN HEAVY DUTY HYDRAULIC PUMP

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 10 GPM at 1200 RPM at 1000 P.S.I. using 6 HP. Has a 3/4" inlet, 3/8" outlet, 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value FOR ONLY.....



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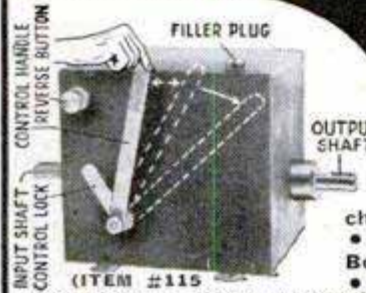
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This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't. acq. cost \$145.00

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
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10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

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- USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of 3/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7 1/2" x 7 1/2" x 1 1/2". Gov't. acquisition cost, \$428.00. Shipping weight 26 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago

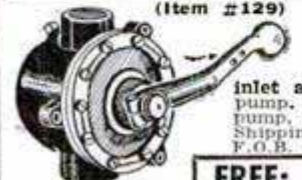
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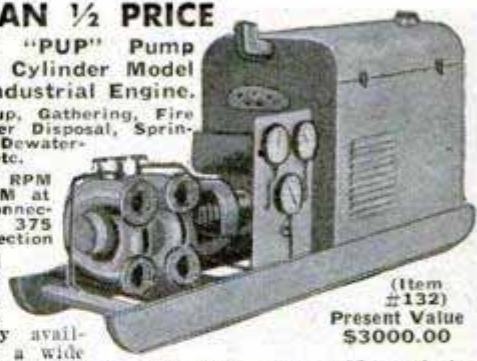
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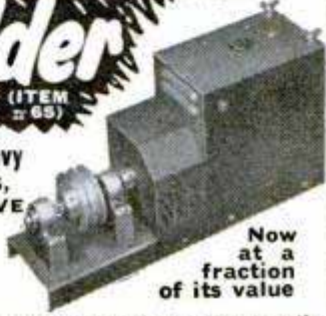
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Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

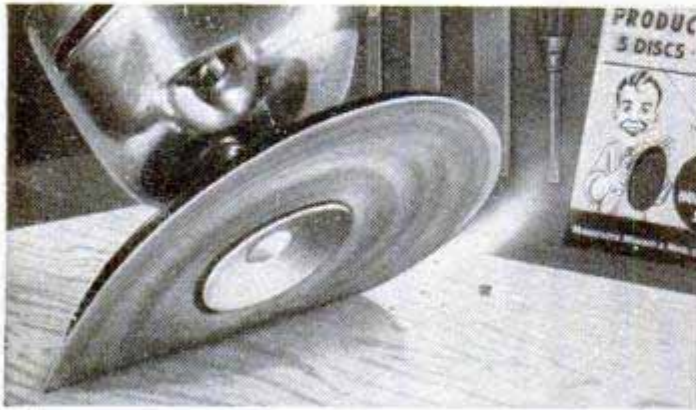
- ITEM #70—Purolator hydraulic oil filter. Permanent element type. 3/8" female pipe thread ports. Capacity 16 gallons per minute. A \$13.00 value. Now postpaid..... **4.95**
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- ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft. 3/8" tubing thread ports. Overall length closed 28". Shipg. wt. 11 lbs. F.O.B. Chicago. **21.50**
- ITEM #31C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/8" piston rod. Clevis mounting at base and shaft. 19 1/2" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses 3/4" tubing fittings. Value \$102.00. Shipg. wt. 11 lbs. F.O.B. Chicago. **22.50**
- ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1 1/8" stainless steel shaft. Gov't. acq. cost \$176.00. Shipg. wt. 26 lbs. F.O.B. Chicago. **28.00**
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Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn., also makers of "Scotch" Brand pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives. General Export: Durex Abrasives Corp., New Rochelle, N.Y. In Canada: Canadian Durex Abrasives Ltd., Brantford, Ont.



Even with full or light throttle, Fordomatic shifts down to intermediate gear below 20 miles per hour when in drive position. Down shifting is smooth and at speeds below 40 miles per hour and regardless of throttle opening, the shift to low range places the transmission in its lowest ratio (2.44 to 1). This immediately aids braking in descending grades or for fast stops. Below 57 miles per hour intermediate ratio is brought into use by pressing the throttle quickly to the floorboard; at speeds below 20 miles per hour down shift to intermediate occurs at less than full throttle. Under closed-throttle conditions, the automatic down shift occurs between 5 and 8 miles per hour.

I found when coasting downhill or pushing or towing the Fordomatic, that the engine can be started by moving the lever quickly from "N" position to low at 15 miles per hour or faster. The car can be rocked in mud and snow by quickly moving the lever between reverse and drive or low positions. Ford has practically eliminated the "jackrabbit" start in the automatic. Incidentally, engaging reverse is easy, without going through a forward range. The car has a slight tendency to creep while standing in drive or low with the throttle closed. "P" position on the quadrant is for parking; it locks the transmission with or without the engine running. This is a fine feature as the car will not roll in either direction. I tested this feature on a 30-percent grade and the car did not move an inch when in "P" position, without hand or foot brake being used.

Fordomatic is very flexible in operation. There seems to be very little slippage or effort in getting under way. There is a slight hum while accelerating, which diminishes as speed increases.

The new automatic ride control is good. Front springing is not unduly flexible and is a little stiffer than in previous Fords when you hit the bumps hard, and that's good. It seems to steer a little tighter than previous models and, combined with the stiffer and better-controlled springing, this makes for better cornering stability and road-holding — not as much front-end "floating."

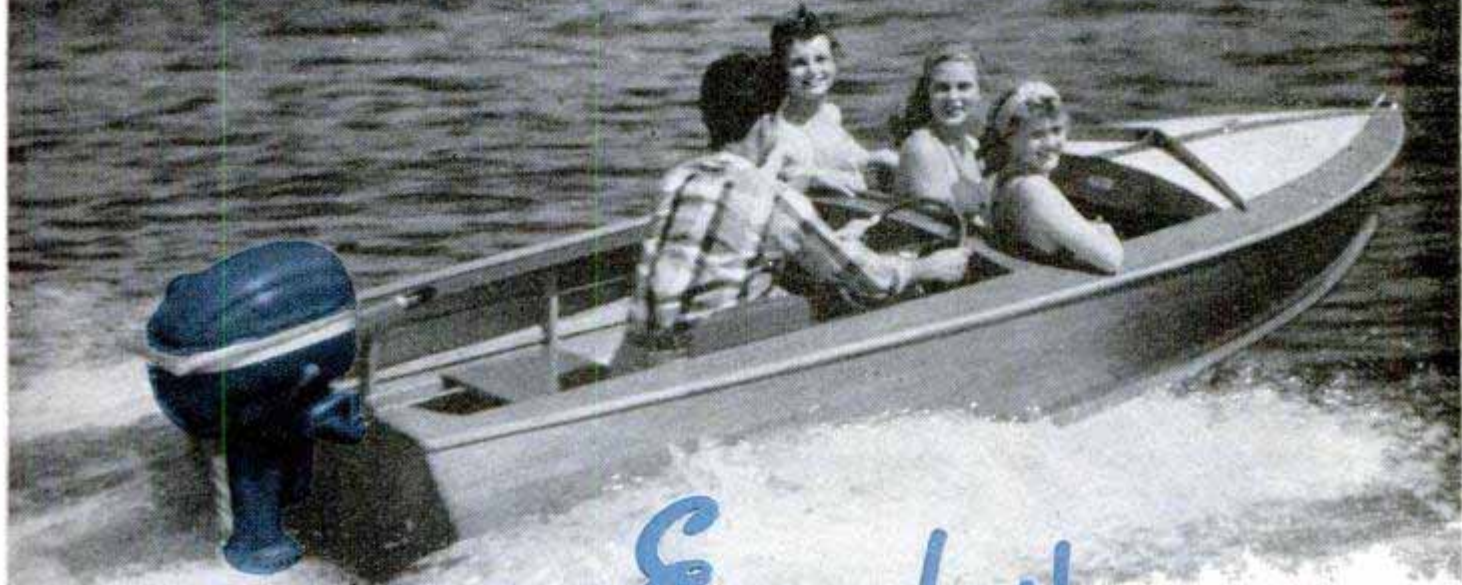
The new instrument panel is the most attractive Ford has ever offered. I'm not too happy with the new speedometer needle; that ring attached to the end is hard for the eye to follow; also, night illumination of the instruments could be better — and they are not too easy to read in daylight. The top of the horn ring obstructed some of my speedometer vision (and high-beam indicator at night) . . . a lower, half

(Continued to page 268)



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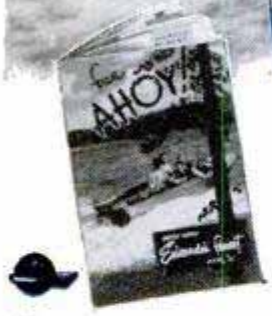
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January and February
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| <input type="checkbox"/> Bleached Fiddleback | <input type="checkbox"/> Walnut Angle Grain (45°) |
| <input type="checkbox"/> Gray Harewood | <input type="checkbox"/> Basketweave (Walnut) |
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| <input type="checkbox"/> Lined Oak Gray | <input type="checkbox"/> Mottled Pearl—Maroon |
| <input type="checkbox"/> Striped Mahogany | <input type="checkbox"/> Mottled Pearl—Blue |
| <input type="checkbox"/> Fiddleback Mahogany | <input type="checkbox"/> Red-White Gingham |
| <input type="checkbox"/> Mahogany Crotch | <input type="checkbox"/> Blue-White Gingham |
| <input type="checkbox"/> Mahogany Stump | <input type="checkbox"/> Black and Gold Marble |
| <input type="checkbox"/> Walnut Crotch | <input type="checkbox"/> Breche Rose Marble |
| <input type="checkbox"/> French Walnut | <input type="checkbox"/> Jaune Benou Marble |
| <input type="checkbox"/> Quartered Walnut | <input type="checkbox"/> Brazilian Onyx |
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horn ring would be better. I like Ford's manually operated choke.

I had a pleasant surprise in the hours of rain or snow . . . not a drop of water leaked in the windshield, trunk or windows. The heating system is excellent . . . I've never had a more comfortable winter ride across country. The ventilating system is also good. Doors are tight, fit nicely, open easily and few rattles or squeaks developed in 4000 hard test miles. Vision is good, although corner posts might be narrower. The hood is some lower at front than heretofore, which helps forward vision.

Gas mileage of the 1951 Ford V-8 engine is about the same as in other years, but the motoring public will have to get used to fewer miles per gallon with any make of automatic transmission; my tests show that one to three fewer miles per gallon is the penalty one must pay for the smooth, "lazy man's" shift of any automatic transmission. I found little difference in performance between regular and premium gasolines. All in all, I'd say the 1951 Ford is definitely a good car and better than previous models. I consider either the "6" or V-8 an excellent buy.



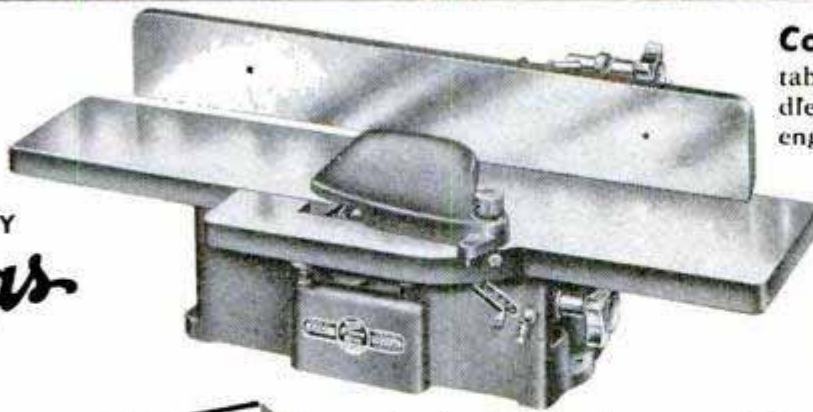
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BUILT BY
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The rugged 25" table you'll appreciate at a glance—the fence will surprise you. Try it. Notice how it stays put. It's solid. Operate the controls — you'll be amazed how easy it is to position, how smoothly it tilts for bevel cuts. Then remove

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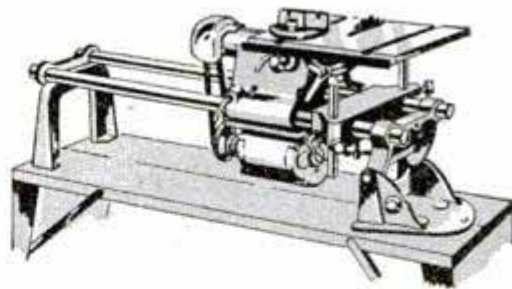


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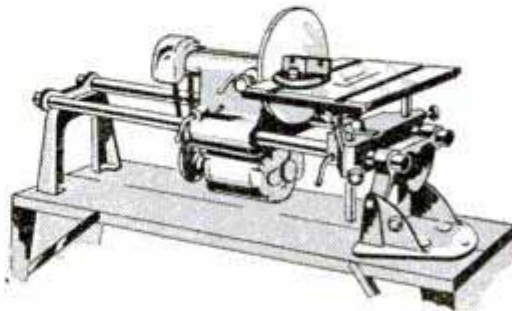
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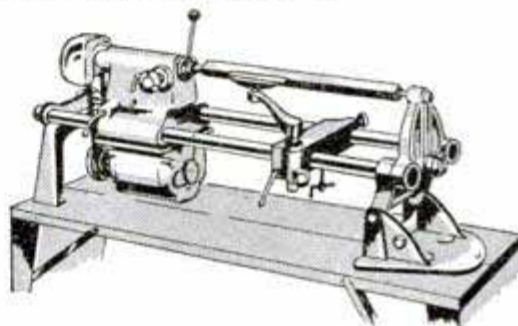
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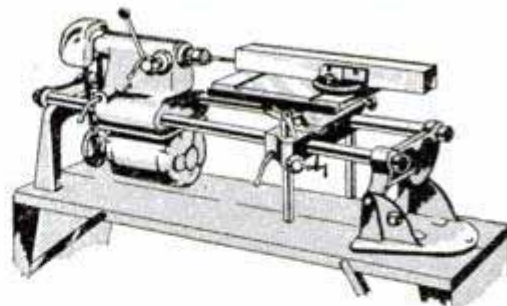
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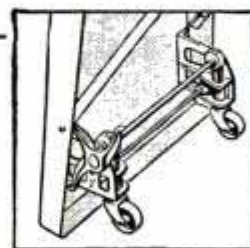
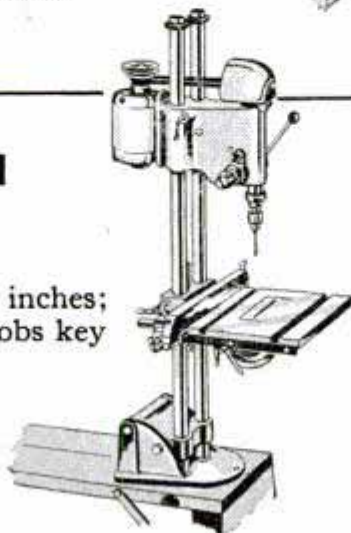
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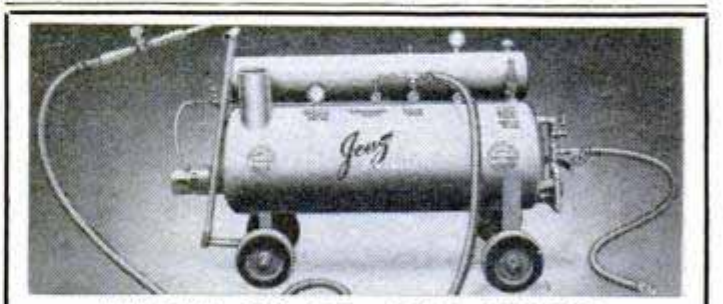
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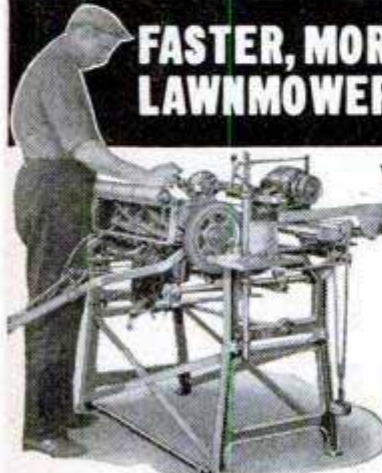
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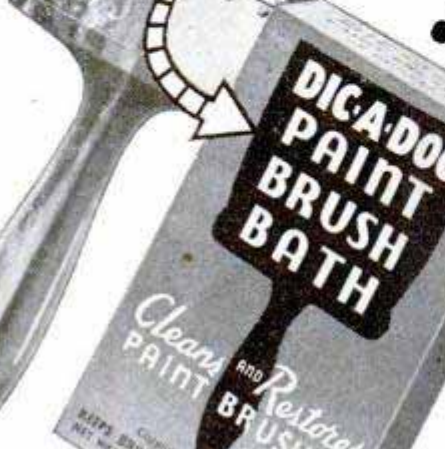
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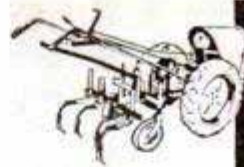
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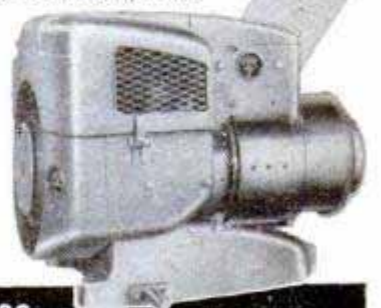
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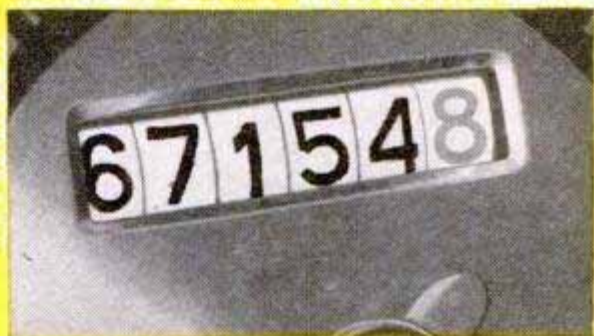
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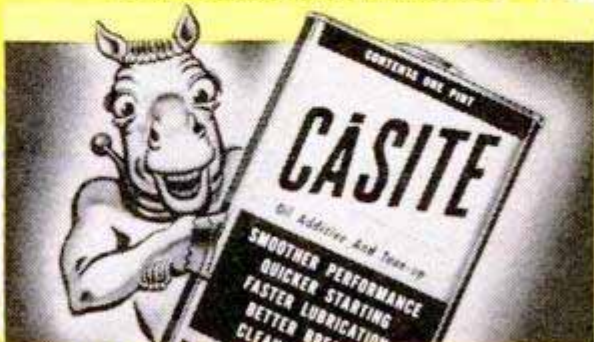
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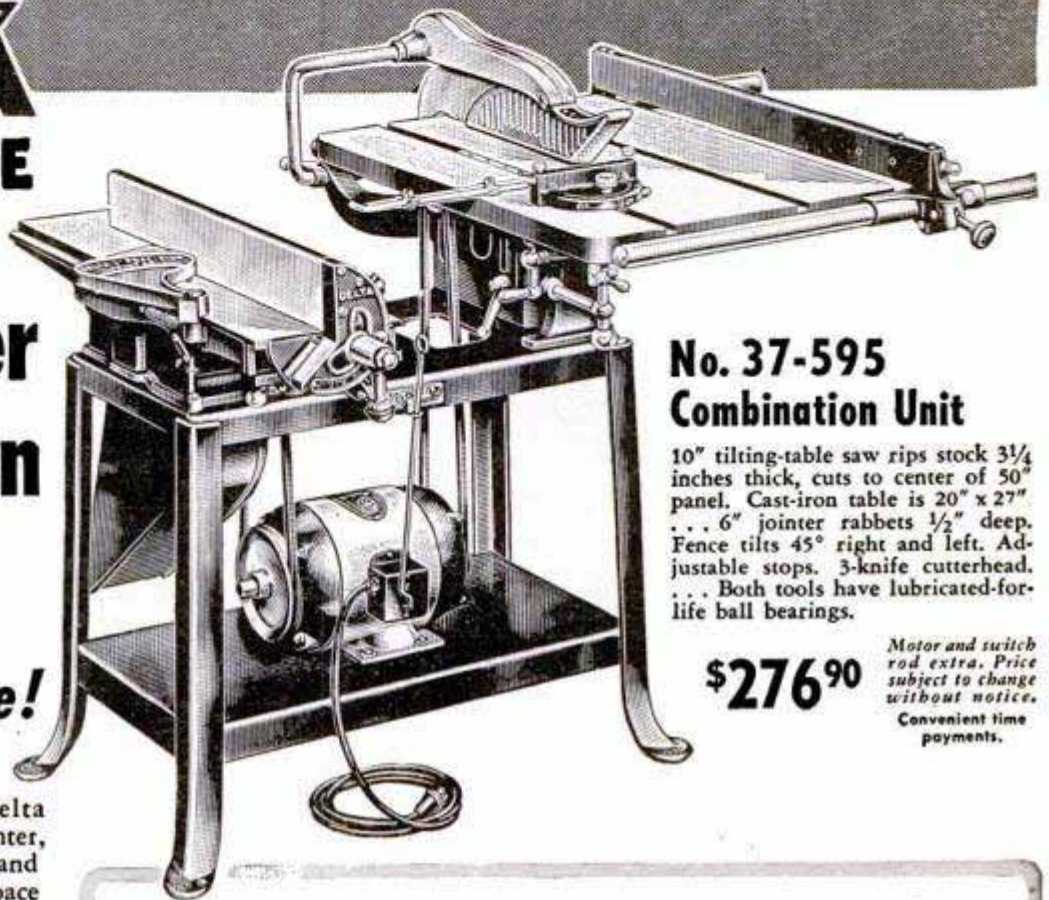
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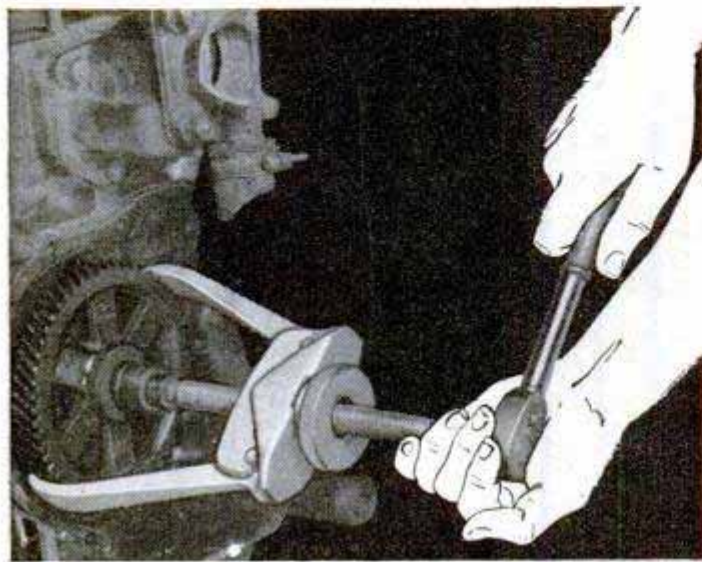
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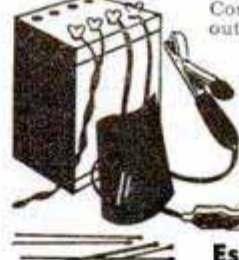


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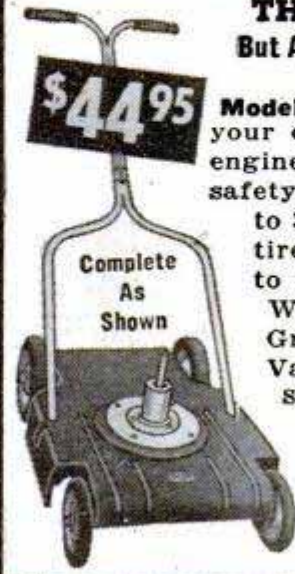
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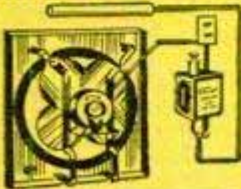
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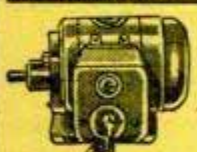
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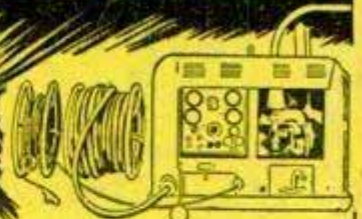
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LIGHT PLANT BUYERS, in emergency telephone collect—unit shipped same day!

300 WATT, 110-220 volt AC, 60 cycle light plant powered by 1 HP gas engine, direct drive. Mounted base, weight 40 lbs., just right for bomb shelter or P. A. system. New Stock #409 \$99.00

750 WATT, AC 110 volt, 60 cycle, direct drive, air cooled, Briggs & Stratton gas engine, Model AP, Pioneer generator, radio filter, self exciter, rope start, 190 lbs., 20" long, 17" wide, 18 1/2" deep with carrying handle. New. Stock #573 \$232.00

2500 WATT, AC 115 volt, 60 cycle, single phase. ENGINE: Briggs & Stratton, air cooled. 8 1/2 HP. GENERATOR: Kurtz & Root or Leland, belt drive. Complete with \$30.00 worth of spare tools, instructions and fully GUARANTEED. Was formerly priced at approximately \$710.00. Now priced for you NEW. War surplus, at only \$345.00. Reconditioned \$295.00. Plants built in 1951 \$426.00. To make plant 110-220 add \$48.00 for transformer.

3000 WATT CONTRACTOR'S PORTABLE, Briggs & Stratton 5 to 7 HP gas engine with Delco generator and rubber tired wheels. Rope start, weight 275 lbs. Used like new at \$220.00. NEW \$279.00

5000 WATT, 120 volt, 60 cycle AC. HERCULES 4 cycle gas engine. Generator mfr'd

by Hobart Bros. Unit includes remote control cable, 150' 2-wire #8 and 150' 3-wire #18, exhaust pipe, power cable plug, KVA at 80% power factor, radio and television filtered. Unit is completely automatic. List price today \$1910.00. Now priced for you at \$675.00 used. NEW \$895.00. To make plant 110-220 add \$72.00 for transformer.

7500 WATT, 110 volt AC, 60 cycle, powered by a VE 4 Waukesha 4 cyl. gas engine, Continental or Hollinsworth generator. Remote control starting. Complete with switch board. NEW \$995.00. To make plant 220 volt, 3 phase, add \$76.00 for transformer.

10,000 WATT, 110-220 volt AC, 60 cycle. Remote control. Powered by a Jeep 4 cyl. gas engine. Used but like new \$1195.00. NEW \$1495.00.

25,000 WATT, 220 volt AC, 3 phase, or 110-220 volt single phase. Used but like new and GUARANTEED \$1995.00. NEW \$2495.00.

35,000 WATT, 110-220 volt, Diesel. Rebuilt, \$2995.00.

50,000 WATT, Cummins Diesel generator, 240 volt, 3 phase, 60 cycle, AC, 1200 RPM, 150 amps. Rating 50% continuous exciter. NEW. GUARANTEED \$5900.00.

SPECIAL! HOT ROD SUPERCHARGER



Here's a hot rod supercharger at a price you can't afford to miss. SEE HOW SIMILAR SUPERCHARGER IS USED IN PICTURE and ARTICLE on Page 67 AUG. Issue of POPULAR MECHANICS. Mfg. by Borg & Warner. SPECIFICATIONS: 7 1/2" wide, 5" deep, 7" high. Weight 17 lbs. Compact and sturdy, 4 base mounting holes. 3/4" outlet, 5/8" shaft. Includes female Lovejoy coupling. Priced today at \$85. OUR SPECIAL SALE PRICE ONLY \$31.00

HEAVY ELECTRIC CABLE

Electric rubber cable, 16 cond., No. 18, solid. 100 feet or more, per foot \$.16
Electric rubber cable, 10 cond., No. 18 solid. 100 feet or more, per foot \$.10
Electric rubber cable, 4 cond., stranded, No. 18, water and oil resistant; run in parallel No. 16; 100 ft., \$6.25; 250 ft., \$12.50; 500 ft., \$25.00; 1320 ft. reel \$56.00
Electric rubber cable, 2 wire, No. 14; 50 ft., \$11.00; 100 ft. \$21.00; 250 ft. \$50.00
Electric rubber cable, 3 wire, stranded, No. 10; 65 ft. with lugs, Val. \$46.00 \$28.00
Electric rubber cable, 3 wire, stranded, No. 10, submarine cable, underwater, underground, overhead—50 ft., \$20; 100 ft. \$40; 250 ft. \$100; 500 ft. \$200.00
Electric rubber cable, 3 wire, stranded, No. 6—150 ft. reel, with 1 male connector; 2 female, crouse hinds connectors \$125.00
Electric rubber cable, 2 wire, No. 4—75 ft. lengths, male & female connectors \$75.00

BALL BEARING ARBORS



Grinding and saw arbor, has 1/2" double end shaft, 1 1/2" long with 2" center pulley. New Departure double roll ball bearings. Right and left hand thread. Self aligning Dodge pillow block, 10,000 RPM. Bearings alone list at \$10. Complete arbor new. Stock #305 only \$6.95

STAINLESS STEEL TUBE

HALF PRICE — 6' to 10' Lengths

SIZE	O.D.	WALL	MILL PRICE	OUR PRICE
1/4	3/16	01506	51c FL.	FL. 25c
3/8	11/32	01301	63c FL.	FL. 32c
7/16	13/32	01508	70c FL.	FL. 35c
1/2	15/32	01205	72c FL.	FL. 36c
3/4	11/16	05001	91c FL.	FL. 46c
7/8	1-3/16	03125	1.01 FL.	FL. 50c

New "MALL" Portable Flexible Shaft Grinder



1/2 HP, 3450 RPM 110 or 220 volt dustproof motor mounted on universal swinging trunion. Heavy base has a convenient tool tray and large, easy rolling casters. Flexible shaft is equipped with both full speed, angle spindle and straight spindle. List price \$172.00. Your price with all attachments \$99.00.

AIR COMPRESSORS

Gas or electric. Awarded from government.

1/2 HP	12 gal. tank	\$ 99.00
1 HP	50 gal. tank	\$239.00
1 1/2 HP	50 gal. tank	\$265.00
2 HP	50 gal. tank	\$295.00
3 HP	60 gal. tank	\$410.00
5 HP	60 gal. tank	\$485.00
7 1/2 HP	80 gal. tank	\$675.00
10 HP	80 gal. tank	\$775.00

and other bargain items

BLOWER and MOTOR. Enclosed squirrel cage type for cooling, heating, suction or blowing. Ball-bearing Redmond Motor, 1550 RPM. Discharge 3"x3". Intake 5". Weight 9 lbs. \$11.95

WELDING ROD. Not less than 50 lbs.—50 lb. box \$4.00

HAND WINCH. Ideal for boats, trailers, etc. Ratchet operated \$8.95

BRIGGS & STRATTON Marine Model AP Gas Engine, 2 1/2 HP, NEW; Regularly priced at \$115.00. Your price \$69.00

ALL ITEMS GUARANTEED AS REPRESENTED C & H ELECTRIC Co. 434 W. JUNEAU AVE. MILWAUKEE 3, WISCONSIN

All prices F.O.B. Milwaukee. 25% deposit required on all C.O.D. orders. No C.O.D.'s under \$10.00. Use stock number when ordering. Many other bargain items not listed—write for our free circulars.

We Dare Anybody — ANYBODY — to Beat These Marlin .22s!



We're asking for it! Asking you to compare the Marlin 88-C against any—ANY—other .22 automatic. For we know the more you

compare, the more you'll realize this amazing Marlin is first in its field.

Visit your Marlin dealer. He's showing this Marlin 88-C and other Marlin .22's—the greatest in Marlin's 81 years—bolt-action, lever-action, automatic. From \$25.80*

SENSATIONAL NEW .22 AUTOMATIC

Marlin 88-C. No-jam action. Fires as fast as you can trip the trigger. Ammunition "funnels" into buttplate (15 rounds). Fires standard caliber .22 long-rifle ammunition only. Regular or high-velocity. Sear lock safety. Side ejection for low central 'scope mounting. Easy take-down.

*Prices subject to change without notice. Slightly higher west of the Rockies. Marlin guns—also single-edge and sensational new magnetized double-edge Marlin Razor Blades are available in U.S.A. and Canada.

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VALUABLE COUPON—MAIL TODAY!

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New Haven, Conn.

Please send me your catalogue with full information and photo-illustrations of Marlin Guns. I understand you will also send me a pack of (please specify) . . . single or . . . new magnetized double-edge Marlin Blades. I enclose 10¢ for postage.

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P&C Hot Forged Tools

Stay on the Job longer

Really tough jobs—in industry or at home—prove that special analysis alloy steel and scientific heat treating make P&C tools last longer. More than 300 P&C tools are easier and faster in everyday use or on special jobs. Your hardware dealer recommends P&C hot forged tools; ask him for the P&C tools you need.

Write for the new folder on P&C tools—"the BEST tools money can buy".

P&C **P&C HAND FORGED TOOL COMPANY**
PORTLAND 22, OREGON



Check or \$5 Deposit

F & F SALES

Box 446, Highland Station, Springfield, Mass., Phone 2-3313

Power Products Late Production \$60 Model #1000

GASOLINE ENGINES

- 1 H.P. "Flyweight" 18 lbs. 2-cycle Air Cooled
- NEW DEPARTURE BALL BEARINGS ON CRANKSHAFT
- WICO MAGNETO
- TILLOTSON FLOAT
- FEED CARBURETOR
- ALUMINUM CONSTRUCTION

COMPLETE

Reconditioned \$19

NEW \$29.50

F.O.B. Springfield

Make Your Own POWER LAWN MOWER
with this DRIVE CUTTER ASSEMBLY

Constructed for those who desire to build their own mower or to replace your old cutter assembly. Complete with 18" blade and double ball bearing drive, only.....

\$12.95

Add 50c to cover handling & shipping. No COD's

ATLAS EQUIPMENT CO., Dept. PM4
229 SW BLVD. KANSAS CITY, MO.

Genuine MAHOGANY Wood

Large Batch \$1.00 Postpaid. Other Usable Scrap Bargains Postpaid
Sample 25c — Price List 3c

S. R. MARKS CO., Inc., Dept. C, Montgomery 5, Ala.

SAY YOU SAW IT IN POPULAR MECHANICS

CASH IN YOUR SPARE TIME

BIG MONEY IN OWN BUSINESS
YOU CAN MAKE UP TO \$40 A DAY sharpening and setting circular saws for factories, builders, lumber yards—with NEW BELSAW COMPLETE CIRCULAR SAW SHOP. LOW COST, Sharpens 4 to 5 saws per hour, no experience needed, complete instructions. Send today for FREE Catalog.

BELSAW MACHINERY CO
3703 Field Bldg. Kansas City 2, Mo.

BUY DIRECT-BRAND NEW-UP TO 85% DISCOUNT

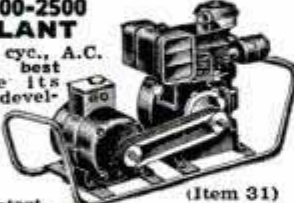


Portable LIGHT PLANT

PUSH BUTTON START
500-700 watts 110-120 v. - 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1 3/4 hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for most oil burners, emergency lights, freezer, radio, incubator, etc. Ideal for trailers or camping. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines.
Reg. \$275.00 value. **\$143.50**

GIANT 2000-2500 WATT PLANT

110-120 V. 60 cyc., A.C. Absolutely the best made because its heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or Wisconsin 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 and instructions included. Wt. 220 lbs. Reg. \$585.00. Special at. **\$299.50**
GENERATOR ONLY and control box. \$169.50
Drive it with your engine or tractor



(Item 31)

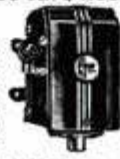
EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2 1/2 lbs. Usually \$4.50—Special 40 ft. **\$1.99** Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **\$4.95**



PRESSURE SWITCH

(Item 30) Penn Electric Model 110 BPO2, best made. For pumps and air compressors. Heavy duty. Will handle up to 250 lbs. press. and up to 5 h. p. Autom. unloader valve, for easy starting. 110-220 v. A.C. or D.C. 2 pole. Wt. 5 lbs. Reg. list \$17.50. Our Spec. **\$9.45.**



HOT WATER HEATER

(Item 26) Immersion type, heavy duty, 115v. A.C. 300w. Does not require watching. Thermostat shuts off at 165°. Keeps water hot for shaving, washing dishes, etc. Also good for keeping water from freezing in big troughs or tanks. Made by Cities Service. Wt. 4 lbs. Worth \$9.50. Our Spec. **\$4.50.**



CLIP BOARD

(Item 17) Heavy Masonite, with self-adjusting spring hinge to hold up to 100 sheets of 8 1/2 x 11 paper. Push back cover for instant release. Flip cover shut and notes or drawings are protected. Perfect for pilots, engineers, students, artists, truck drivers. Wt. 2 1/2 lbs. Usually \$2.95. Spec. **\$1.10, 2 for \$2.00.**



GAS ENGINE

(Item 25) Air-cooled. 1 1/2-2 h.p. Complete with gas filter, air cleaner, governor, fuel tank. Ready to run. Speed range 2000-3600 r.p.m. 5/8" shaft. Rope start. Ideal for pumps, air compressors, power tools, generators, etc. Factory warranty and instructions incl. One of the best made. Wt. 40 lbs. Worth \$72.50. Special. **\$46.50**



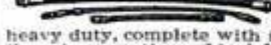
GAUGE TESTER

(Item 27) Precision made of solid bronze by Star Brass Co. Calibrated weights (incl.) act in g against hydraulic piston, provides quick accurate testing of all pressure gauges up to 3000 lbs. per sq. in. Brand new in hardwood cases. Wt. 100 lbs. Reg. \$435.00. Our Spec. **\$135.00**



HYDRAULIC HOSE

High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum \$1 per lgh. **INSIDE DIAMETER, 1/4" 50c per ft. 3/8" 60c, 1/2" 80c, 5/8" 90c.**



ELECTRIC HAND SAW

(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6 1/4" comb. blade, ripping guide and 10 ft. hv. duty cord. Built-in sawdust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2 1/8". 1 year written guar. Wt. 12 lbs. Drastically reduced. **\$39.95**



ANGLE DRILL

(Item 23) Fits into chuck of any electric or pneumatic drill or flex. shaft. Operates at any angle in a full 360° arc. Makes possible drilling, grinding, carving, routing, etc. in close cramped quarters. Makes impossible jobs easy. Made by Kett Tool Co. Complete with built-in chuck (1/4" capacity) and adjusting key. Hardened alloy gears. Precision built for heavy duty. Lists at \$39.95—while they last. **\$9.95**



CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, pres. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 13 lbs. Worth \$20.00. Our price. **\$8.95**



SPRAY OUTFIT

(Item 37) Twin cylinder, piston type compressor direct-connected to powerful 110-120 v. AC-DC motor. Built-in air tank eliminates pulsation and provides steady flow of air at 25-30 lbs. Sprays lacquers, enamels, insecticides, etc. Does beautiful work on autos, furniture, farm equip. 1 qt. spray gun, relief valve and 10 ft. air hose incl. Full instructions and 1 year guar. Wt. 11 lbs. Easily worth \$50. Spec. **\$29.95.**



PARTS WASHER

(Item 20) Store gas or carbon tet. in 5 gal. safety can. Valve releases just the right amount into washing compartment. Parts are washed and drained on a "dunking" screen—no fishing for parts. Eliminates fire-danger, waste, spillage, evaporation. Wt. 14 lbs. Reg. \$19.50—Special. **\$5.95**



FIRE EXTINGUISHER

(Item 39) Fully charged (at 1000 lbs. P.S.I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. \$19.50 value. Special. **\$6.95**



5 GAL. STRAINER FUNNEL

(Item 28) Made of heavy galv. steel. Fine brass strainer built into neck. Perfect for straining milk, gas, diesel fuel, spray mixes, etc. Wt. 7 lbs. Worth \$5.95. Our Spec. **\$2.25, 2 for \$3.95.**



RUBBER HOSE

New genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%.
(Inside Diam.) 1 1/4" 1 1/2" 1 3/4"
Length 25 ft. 40 ft. 30 ft.
Price 9.25 14.75 14.75
If specified we will send special hose for gas or oil at same prices.



TERRIFIC VALUES!

AIR HOSE

(Item 11) 1/4" Diam. heavy duty, double braid, suitable for gas stations, spray painting, air tools, etc. 20 ft. with standard swivel couplings. Wt. 4 lbs. Reg. \$6.50 val.—only **\$2.95.** Five 20 ft. lghs. (100 ft.). Wt. 20 lbs. Only **\$13.75.**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **\$6.35;** 9" Fan, wt. 6 lbs. **\$7.45;** 10" Fan, wt. 7 lb. **\$8.45;** 12" Fan, wt. 8 lbs. **\$9.45.**



1/2" DRILL

(Item 33) Deluxe model—powerful, smooth running, precision built. Handles toughest jobs. Cutler-Hammer switch, Jacobs key chuck. 110-120 v. AC-DC 300-450 rpm. Alum. alloy case for high strength and easy handling. Built-in blower assures cool operation. Cap. 1/2" in steel. 1 year written guar. Wt. 11 lbs. Should be \$65. Special. **\$34.50**



1/4" DRILL

(Item 34) Hi-power, long-life, smooth running. Alloy steel gears; built-in blower. Cutler-Hammer switch. Jacobs hammer chuck. 110-120 v. AC-DC 1000-1600 rpm. Cap. 1/4" in steel. 1 year guar. Wt. 4 lbs. Terrific value at **\$12.95.**



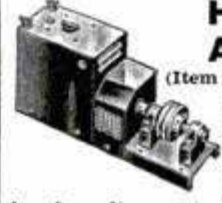
38 Pc. DRILL KIT

(Item 35) Includes above illus. guar. drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer burrs. Complete in heavy steel case. Wt. 13 lbs. 38 pcs., all highest quality. Complete kit worth \$38.50. Our **\$19.85** Spec. only.



HEAVY DUTY ARC WELDER

(Item 38) Use as portable or shop welder. 250 amps. D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to 1/2" plate using 1/4" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs. **\$99.75**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at. **\$8.50**



FRAM OIL FILTER

(Item 12). Model F21, Big 73 cu. in. size. Ample capacity for all cars, trucks, tractors. Universal bracket, standard openings. Fram filters are tops. Easy to install. Wt. 8 lbs. Usually \$7.95—now **\$3.75**



MANUFACTURERS SPECIALS

RHEOSTATS (Item 40) variable load, 480 v., AC or DC, arranged in 80 steps of 8 kw each to provide instant selection of any power output desired. Controlled by magnetic contactors; remote control possible. Ideal for testing setup, group starting, frequency control, variable speed, etc. Made by Cutler Hammer. Brand new. Worth \$4000. Only 2. each **\$1100**

MUD CHAINS (Item 43). Extra heavy for dual truck tires, 7.50x20, triple side links, made by Intl. Chain. Reg. list \$57.50—our spec. **\$19.50**

DUCT FANS (Item 42) Amor. Blower Co.; powerful 24" 3-bladed fan mtd. in circ. steel duct which tapers from 25" to 30" diam., 16" hi. Duct flanged for easy installation. Fan powered by 1 hp. 115 v. DC motor, 1150 rpm. Tremendous output. A \$20 Cutler Hammer starter control incl.; also big steel tool box, spare armature, bearings, brushes, etc. Easily worth \$195; a terrific value at. **\$39.50**

READY POWER GAS-ELECTRIC PLATFORM TRUCKS (Item 41) 5 ton capacity; wide, 17" hi. Platform 90" long, 40" wide. Equipped with coupler for trailers; very maneuverable; used but in exc. operating condition. Will ship on approval to well-rated firm. New price \$4000—our special. **\$1350**

MANUFACTURERS AND JOBBERS—Write us about your surplus items

All items brand new. Prices f.o.b. Chicago area. 10 day Money back guarantee. Send check or M. O. **MASTER MECHANIC MFG. CO., Dept. 40, Burlington, Wis.**

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for the speedy
**HOME-UTILITY
SANDER-POLISHER**



ONLY
\$32.95

Use it to **POLISH YOUR CAR** ▲



Use it to **SAND
DOWN FURNITURE!**



Use it to
DRILL LEAD HOLES!



Use it for
WOOD BORING!



Use it to
SHARPEN CUTLERY!



Use it to
REMOVE RUST!

**This husky, versatile tool
drives many attachments
to save you time, money
and muscle!**

You haven't handled a really versatile tool until you've tried the Home-Utility Sander-Polisher! It comes complete with sanding discs, lambswool bonnet, 1/4" drill chuck, cans of auto polish and wax. It drives many other attachments for grinding, sharpening, buffing, burnishing and cleaning. And it weighs only 3 1/2 lbs., so it's easy for the whole family to use!

QUALITY-BUILT BY WORLD-FAMOUS BLACK & DECKER, this Sander-Polisher is a real tool, not a mere toy! It has an extra-powerful motor for high-speed work from AC or DC outlets. Its housing is strong, light die-cast aluminum. It has an instant-release trigger switch. Its balanced design means comfortable handling. Try it today at your hardware, electrical or implement dealer's or department store.

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**ELECTRIC
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TOOLS**

1/4"-1/2" DRILLS • SANDER-POLISHERS
LECTRO-SAWS • BENCH GRINDERS



The Right Tool for
a Right Job
**IN YOUR WORKSHOP
EMPIRE LEVELS**



Get more value
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Your Choice an Empire Level

No. 151 Aluminum Level. Extremely accurate with adjustable-interchangeable vials. Has 2 levels, 2 plumbs, and a choice of 2 45° vials or 2 additional plumbs. Beautifully finished, easy to work with. A tool you can be proud to own.

18" ... \$6.40 24" ... \$6.80 28" ... \$7.80

Order EMPIRE Levels from your local dealer,
or write for complete information.



**EMPIRE LEVEL
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ALL NEW 1951 KING MIDGET AUTO

World's Lowest Priced 2 Passenger Car

Drive it for 75c per week. Amazing performance. Surprising comfort. All steel construction. Full accessories, top and heater. Ready to run or assemble it with our bolt together parts. Rider agents wanted, earn your car free. Send 25c for detailed literature or \$1 (refunded first order) for actual assembly book and service manual filled with photos, drawings, specifications, etc.



**MIDGET MOTORS MFG. CO.,
ATHENS 1, OHIO**

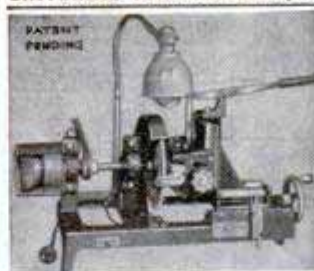


DUST-O-VAC FOR ALL MACHINES

For Home Workshops & Industry. DUST-O-VAC collects & bags wood & plastic chips, wood & metal dust, wood shavings. Free Bag. Attaches to circular saw, planer, band saw, grinder, belt or disc sander, shaper, drill press with shaper or sander attachment, spindle shaper, wood lathe, jig saw. 110 A.C., D.C. Send for mounting instr. for all machines.

**\$19.95
F.O.B.
Yonkers**

HEAVY CAST ALUMINUM BLOWER — ONLY \$11.25
For workshop, lab., kitchen, cellar, app. 100 CFM. Send for circular.
UNIVERSAL YONKERS CORP., 137 Alexander St., M-4, Yonkers 2, N. Y.



Start a NEW BUSINESS!

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Repair Business

SHARPEN DULL PIPE WRENCHES

**PIPE TAPS & DIES
"GUM" CIRCULAR SAWS**

Write for Information

**J. C. MOORE INDUSTRIES
BOX M 276 FREDONIA, PA.**

ASSEMBLE YOUR OWN MOWER

**\$79.95
F.O.B. WICHITA**

SAVE 40%
INCLUDES NEW 1 1/2-2 HP
VERTICAL ENGINE AND ALL PARTS

CAST ALUMINUM BASE

This is a modernized streamlined and nicely finished product. Two-tone baked enamel. Full 20" cut, hardened steel, one-piece cutting blade with safety clutch. Ball bearing, large size rubber-tired wheels.

CUTS TALL GRASS

will mow to carpet smoothness tall coarse grass, cuts close to fence.

OVER 12,000 SATISFIED USERS

Price Complete Satisfaction
\$79.95 Guaranteed

Cash With Order or Money Refunded
**NEFF EQUIPMENT CO.
510 PETROLEUM BLDG., WICHITA, KAN.**



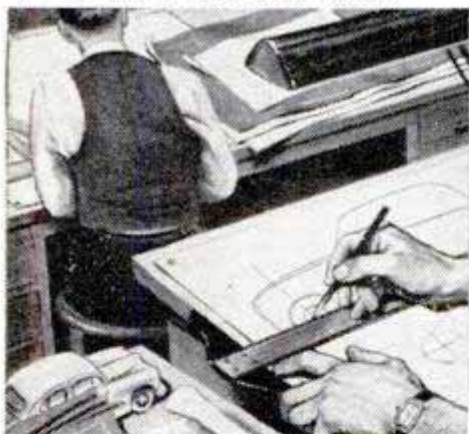
**"MISTER,
YOU SAVED
MY DAY!"**



"MY SCHEDULE'S TIGHTER THAN EVER THESE DAYS," I TOLD THE MECHANIC, "AND THANKS TO YOU, I'M KEEPING RIGHT ON TIME."

"DON'T THANK ME," HE SAID. "THANK THE GENUINE FORD PARTS I USED IN YOUR FORD. THEY'RE THE REAL TIME SAVER."

"YOU SEE, GENUINE FORD PARTS ARE RIGHT FOR FORDS — MADE RIGHT TO FIT RIGHT TO LAST LONGER. THEY KEEP YOUR FORD ALL FORD."



"THEY'RE DESIGNED BY MEN WHO DESIGNED YOUR FORD, TO SAVE YOU TIME, MONEY AND ASSURE REAL SATISFACTION."

**"THAT'S WHY YOU'RE SMART TO
LOOK FOR THIS SIGN (AT FORD
DEALERS' AND SELECTED
INDEPENDENT GARAGES)
AND ALWAYS SPECIFY
GENUINE
FORD PARTS"**

AVAILABLE WHEREVER YOU SEE THIS SIGN AT ALL FORD DEALERS AND SELECTED INDEPENDENT GARAGES



**THEY KEEP
YOUR FORD
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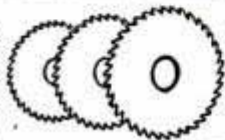
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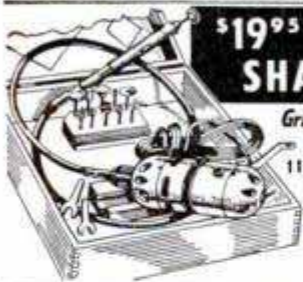
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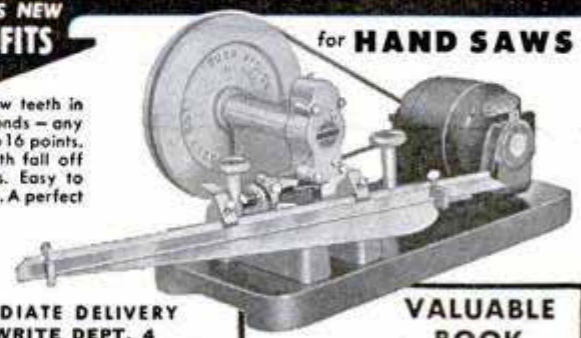
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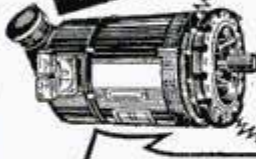
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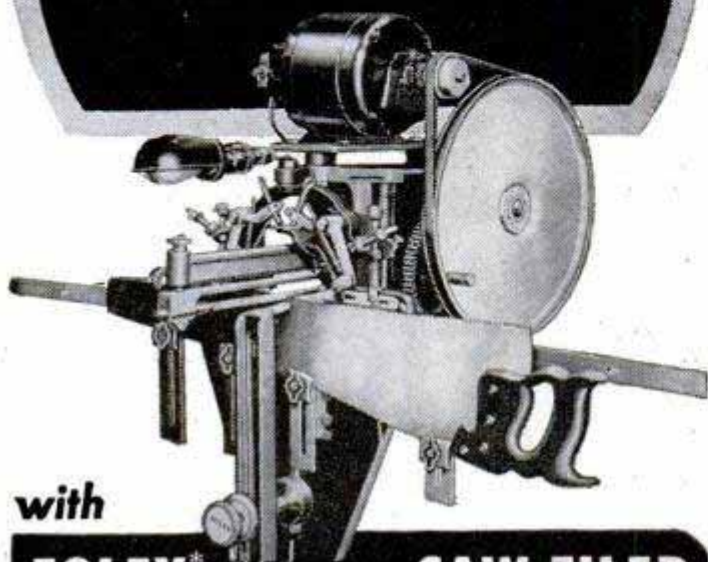
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FACE FORWARD
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Sands, Cleans, Smooths, Polishes Electrically

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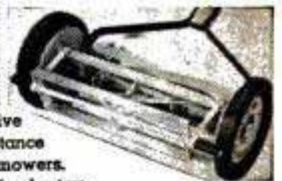


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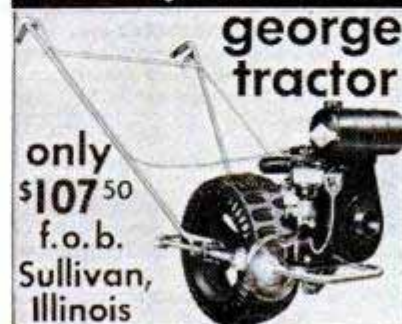
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**NEW '51
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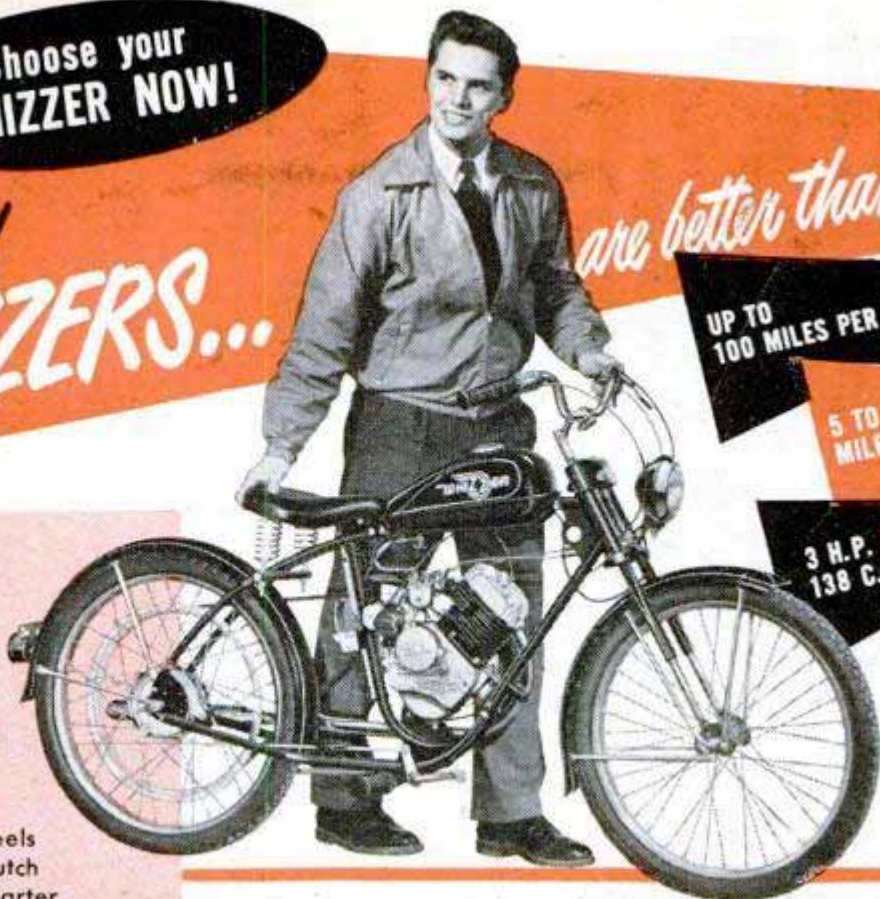
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- TILT/ARBOR SAW**
- 27x28 in. table stays level. Blade tilts full 45 degrees. • 10 in. blade cuts 3 1/4 in. deep, jack-screw depth adjustment. • Floor model, 34 in. table height. • New Departure ball bearing arbor, 3/4 in. precision shaft, ready to run, 5/8 in. bore blades. • Quick positioning, self-aligning rip fence guide. • Sturdy wood, steel and aluminum construction. • No machining—build easily with hand tools only. • Capacity and performance of floor saws selling for \$150.00 and up!
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SAVE \$50 OR MORE

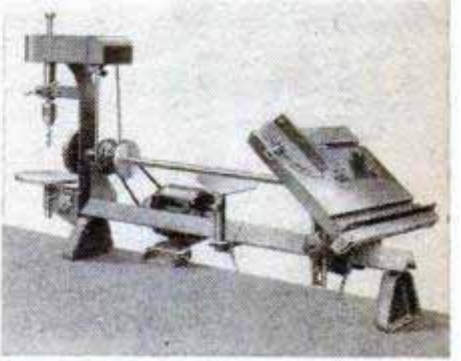
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- 21 sq. in. sanding surface • weighs only 5 lbs.
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**MODEL 2000
SANDER • POLISHER**



14,400
SANDING
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with steel carrying case, 25 asstd. sheets abrasive paper, and a sheepskin polishing pad.

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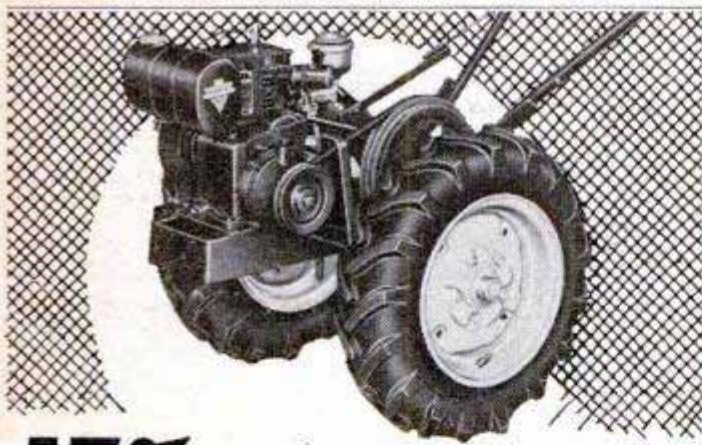
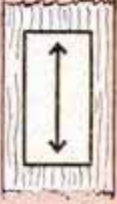
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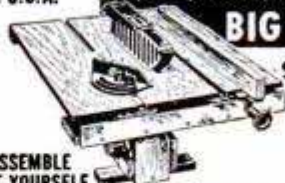


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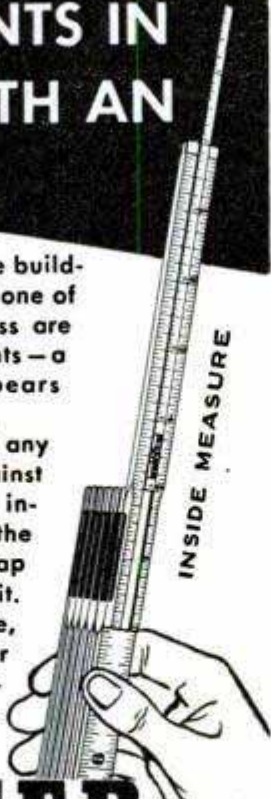
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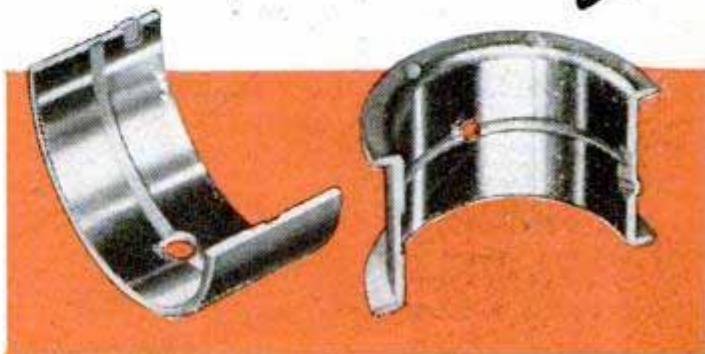
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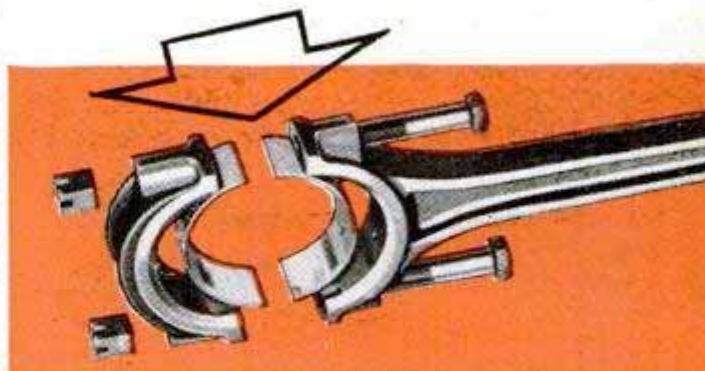
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can
FREEZE
the crankshaft



HARD TO BELIEVE? Not when you consider the two purposes of engine oil—to lubricate, and to *cool*. Badly worn main bearings oil-starve the connecting rod bearings they are supposed to feed. "Shorting" the bearings of necessary oil leads to heat and friction. In the worst cases, bearings overheat and fail—they "freeze" or seize on the crankshaft, causing costly damage.

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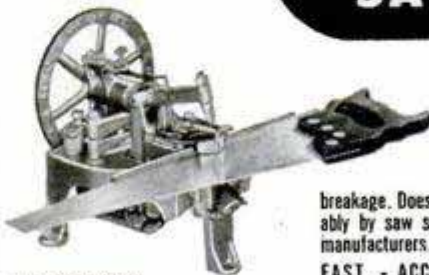
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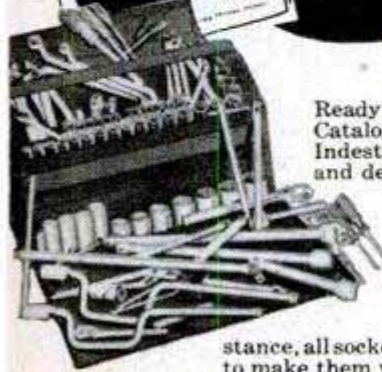
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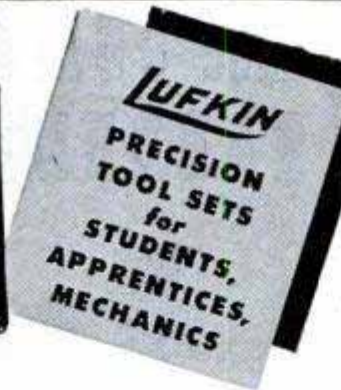
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"Scrum" endangers your car and your pocket book three ways: a clogged radiator means an expensive repair job; "Scrum" deposits act as insulation, causing overheating which cuts operating efficiency or causes serious damage; "Scrum" accumulations at vital points cause hidden hot spots that lead to big repair bills.

Just draining anti-freeze and flushing with water is not enough. A chemical cleaning is necessary to dissolve the binder that holds rust and scale in place.

Be sure the thermostat is functioning properly, also. If the valve fails to open within 10 to 15 degrees of the rated temperature, it should be cleaned if gummy or replaced. A faulty thermostat causes engine overheating.

It pays to check water hose and fan belt, too. Loose rubber particles from rotted hose can clog the radiator and tubing that is too soft may collapse from suction. Be sure fan belt play is $\frac{3}{4}$ " when belt is depressed between pulleys. A slipping belt causes overheating, a tight belt causes excessive bearing wear.

When you clean out cooling system "Scrum," use WARNER RADIATOR CLEANER—the finest and safest product of its kind on the market. After flushing, add a can of WARNER COOLING SYSTEM PROTECTOR to stop rust and scale all summer long. To repair leaks, use WARNER LIQUID SOLDER.

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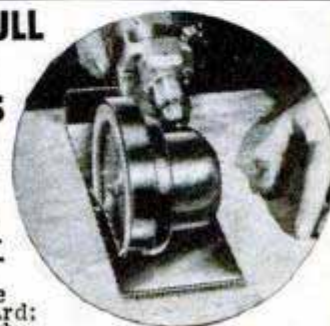


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OO-OO-OOH!

...that awful stuff in my car?

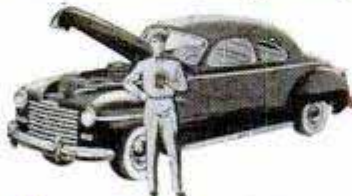
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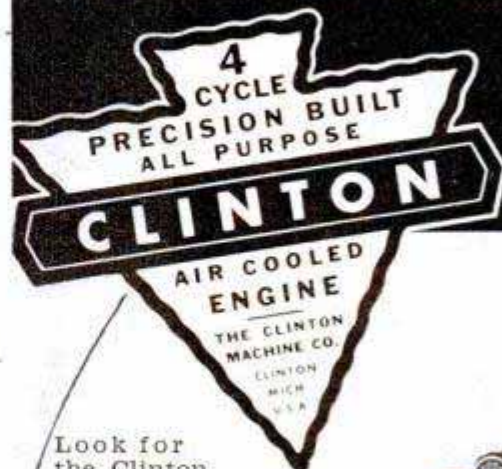
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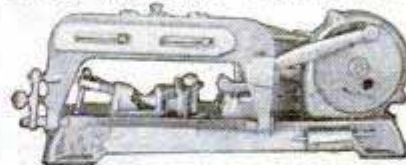
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 and CUT →

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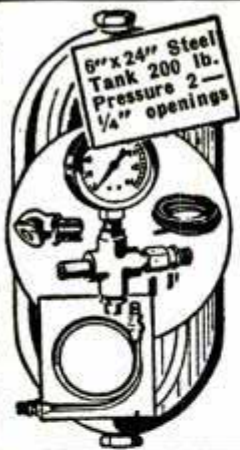
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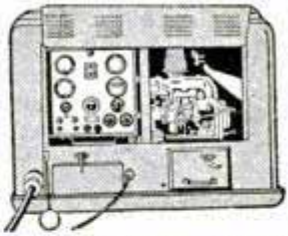
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War Surplus
Signal Corps Power Unit PE 197

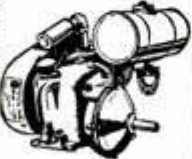


115 volt 60 cycle A.C. single phase 5 K.W. Hobart water cooled, 14 h.p. 4 cylinder Hercules engine. Remote Control, complete panel board with instruments. 150 ft. automatic remote control cable with reel; 150 feet #6 heavy duty wire with reel; housed in metal case with replacement parts and tools. Cable with reels alone worth \$400. Regular price of unit \$1900. Shipping **\$895.00**
wt. 1250 lbs. Our price, complete. f.o.b. Chicago

Same unit, slightly used. Reconditioned, less cable. Fully guaranteed **\$595.00**

RED SEAL CONTINENTAL GAS ENGINE

BRAND NEW. 1 1/2 HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price \$79.50. Shipping weight 54 lbs.
SPECIAL PRICE \$47.50
Same engine furnished at 2600 RPM.....



\$46.50

AUTOMATIC PRESSURE SWITCH



For Air or Water 20 to 40 lbs.

\$6.50
125 to 150 lbs. with unloader **\$13.75**
1/4" check valve **\$3.25**
1/2" check valve **\$4.75**



Chicago Pneumatic CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price \$73.00
Brand New..... **\$32.50**
Used, like new, guar..... **\$17.50**

WELLWORTH V-BELT CLUTCH



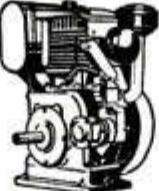
Takes starting load off engines or motors. When speed is reached, a flip of handle shifts clutch from idling to driving position. Handles "A" belts, 2.35" pitch diameter, 3/4" bore. Ideal for use with lawn mowers, garden tractors, home workshop motors, etc. 3 1/4" long. Safe, easy to mount, sealed bronze bearings. positive action. Shpr. wt. 3 lbs.
\$7.50
BUSHING FOR 1/2" SHAFT, 15c

BRAND NEW SAME CLUTCH FURNISHED WITH 3/4" BORE **\$8.50**

WISCONSIN GAS ENGINES

at a big saving!

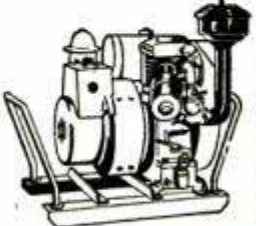
Model A.B., 1.7 to 3 H.P. Wt. 60 lbs. List Price, **\$76.00**
\$90.00. Special Price.....
Model A.K., 3 to 4.1 H.P. Wt. 70 lbs. List Price, **\$86.50**
\$106.50. Special Price.....



LIGHT PLANT

Brand New 1 Year Guarantee
Portable Light Weight

1500 watts, 110-120 volt, 1 phase 60 cycle, A.C. 12 Volt starting and charging 30 watts, 2 receptacles for plug in, Rheostat for voltage control. Voltmeter. Complete with Briggs & Stratton or Wisconsin Air Cooled engine. Shipping wt. 220 lbs.
SPECIAL PRICE. \$325.00



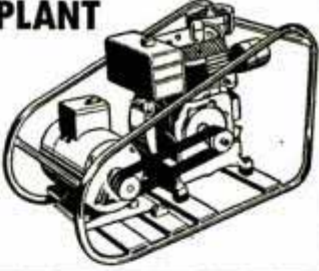
GENERATORS . . . Big Values



500 to 750 watt, A.C., 110-120 volt, 60 cycle, 1 phase output. Also 100 watt D. C. battery charging output. May be used at the same time. Voltmeter, 2 outlet boxes. Price..... **\$99.50**
Wt. 55 lbs.
Furnished with 1 1/2 HP Engine with drive..... **\$149.50**
2000 Watt, 110-120 volt, 60 cycle, A.C. 1 phase, 35 amperes, Starting, overload capacity up to 51 amps. Voltmeter, 2 plug-in receptacles. Wt. 75 lbs. Complete instructions furnished. Special Price..... **\$169.50**
Furnished with 4 1/2 H.P. Wis. AK Engine and drive..... **\$275.00**

2000 WATT LIGHT PLANT

2000-Watt Generator with Floating Base for Automatic Belt Adjusting, 2-Groove Engine Pulleys, V-Belts, Bolts, etc. 4 1/2 HP Engine, Briggs & Stratton Model 14 Engine, Voltmeter. 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim: L 34 1/2" x W 17" x H 20". Wt. 180 lbs.
\$365.00



AIR REGULATOR and EXTRACTOR

1/4" Air Regulator, Gauge and filter. Wt. 5 lbs. New **\$8.95**
Regulator and Gauge only..... **\$5.95**
Air Filter only..... **\$3.25**



AIR TANK & ACCESSORIES

Air receiver, stainless steel. Brand New. 6"x24", 400 lb. test. Ideal for carrying on trucks, autos and wherever compressed air is needed. Equipped with 500 lb. combination air gauge and inflation valve with core for retaining pressure in tank; tire chuck, 3 ft. high test air hose.

COMPLETE OUTFIT \$7.95
No. K21 SHIPPING WT. 12 LBS.

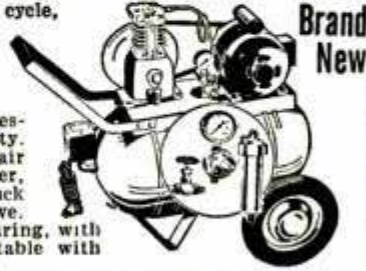
TANK ONLY \$6.25
Shipping wt. 7 lbs.

"Wellworth" BLOWER BARGAIN



Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13 1/8" x 11 3/8"; inlet 8 3/4". Height 19". Width 18". Depth 16 1/2". C.F.M., 1/4" S.P. 1600; outlet vel. 1575; wt. 45 lbs.

BLOWER LESS MOTOR AND DRIVE \$27.50
with belt and variable speed pulleys \$2.50 extra. (Motor required, 1/4 h.p.)



AUTOMATIC COMPRESSOR UNIT

Requires 1/2 H.P. heavy duty capacitor motor. AC 110/220 volt, 60 cycle, 2x1 1/4 inch piston type compressor, splash feed lubrication. 12x24 inch tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" pneumatic tires. Portable with handle. Shipping wt. 90 lbs.
Price **\$79.50** Furnished with 1 1/2 H.P. gas engine..... **\$124.50**
Less Motor ..

Prices f. o. b. Chicago. Money back guarantee. Send check or money order today. Prompt shipment.

NEW CATALOG

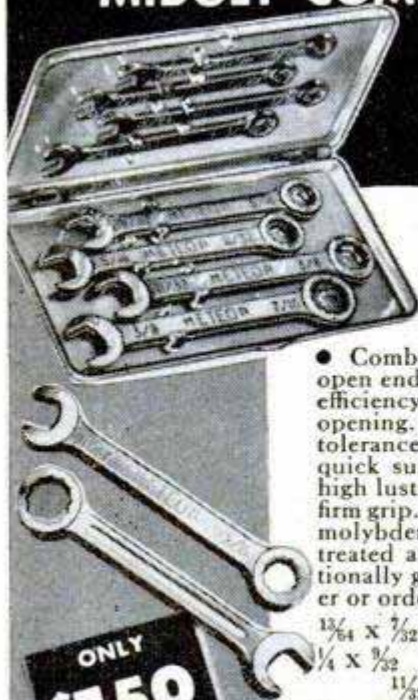
Motor guide, air compressors, home and factory workshop tools, light plants, luggage bargains. Send 10c for postage.

WELLWORTH TRADING CO.

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MIDGET COMBINATION**

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WRENCH
SET**



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• Combination wrenches with open end angled at 15° for better efficiency, box end has 12 point opening. Broached to accurate tolerance in graduated sizes for quick sure fit. Heads plated to high lustre, handles panelled for firm grip. In strong, tough chrome molybdenum alloy steel, heat treated and hardened. Unconditionally guaranteed. At your dealer or order direct from factory.

1/4 x 3/32 7/32 x 15/64 15/64 x 1/4
1/4 x 9/32 9/32 x 5/16 5/16 x 11/32
11/32 x 3/8 3/8 x 7/16

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DRILL SAW**

Fits any
1/4" drill

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You'll never use a handsaw again after you try this light-weight, fast-cutting beauty. Careful design, rugged, precision manufacture and a better blade make this an outstanding buy. Quick-acting, worm-drive, patented clamp gets it on and off your drill in seconds. Combination blade is chrome nickel alloy steel, precision ground, correctly heat treated, balanced and fitted. Cuts grooves, dados, crosscut, rip, hour after hour without sharpening. Depth of cut fully adjustable from 1/8" to 1 1/2". cuts plywood, shelving, wallboard, 2x4's to 2x10's in two cuts, one from each side. Special sighting notch enables you to follow line. Lifetime Oilite bearings, finest quality hardened steel gears, shafts. One or two hand operation with hand-fitting knob. Use coupon to order at once for immediate delivery. Try it for 10 days, full refund if not completely satisfied.

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Send me _____ Saw-Rite #600 Saw Attachment(s) @ \$10.95; _____ Additional blades @ \$2.00; _____ metal cutting blades @ \$3.00; _____ FREE literature.
(Write name and address on margin)
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FLEXIBLE MOLDS**

Mold, Brush, Trowel, Spray It! MOLD novelties, Statuary, Art Goods in Flexible Plastic Molds; 5c material makes \$1 seller. Make Marbleized floors, Tile Walls. Colorful, glossy, amazing! Easily learned; start in garage or basement. Particulars free.

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28 Lawn Ornament Patterns, 25¢. Other Patterns; 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 10¢ each. 25 Novelty Patterns, 30¢. All 62 Full Size Patterns, \$1.00 Postpaid.
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Top quality rubber. Has pebble tread bottom. Adj. heel strap. Re-inforced for strength. Vented for air & drainage. For diving and swimming.



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Soft rubber mask fits over eyes. . . Has heavy duty glass eyepiece . . . Adj. head-band.



4 1/2" 299 Miss 5" 219 W. 5 1/2" 345

FISHING SPEAR

Corrosion resistant . . . for spear fishing. 11" long with barbed end. Dia. of socket 1".



39¢

NAVY WADING SUIT

Makes Surf & Deep Stream Fishing A Pleasure! Ideal for ranchers, oil fields or anywhere where it is necessary to protect body or clothes from moisture, silt, muck, etc. Made of rubberized canvas. Has vulcanized seams & built-in, rubber gloves and boots. Cost Gov't \$60.00 Small - Medium & Large



AAF CASE

Genuine top grade leather. Multi-compartment. Lock and Straps. Ideal for Artists, Students, Salesmen, etc. Used, good condition.



695

AIR CORPS BRIEF CASE

This is a genuine piece of AAF equipment . . . Made of best grade leather in a handsome pebble finish with a light canvas liner. Has two full length map or paper compartments and three smaller pockets. An ideal case for students, salesmen, artists, etc. Full heavy duty zipper closure. 12" x 16" . . . ONLY



295

CHEMISTRY SET

Made for Chemical Warfare Division for testing water, etc. A handy addition to the chemistry lab or an exciting experiment for the amateur. Set includes test tubes, complete instructions, 15 different items. Packed in attractive lucite box with cover and dividers . . .



695

GOOSENECK LAMP

Consists of 24 volt control box with dimmer switch, 18" flexible extension & frosted glass shade. Can be used on 110 volt current.



272

NAVIGATORS LAMP

A handy light for desk, work bench, chart table, engine room, etc. Can be used on 6-12-24-110 volt by changing bulb. 3 ft. shaft has 4 joints to adjust position . . .



329

Sealed Beam LAMP

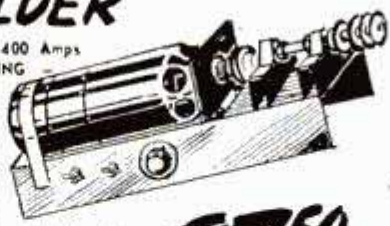
U.S. Navy Portable Pistol Grip light. Has sealed beam and aiming sight. Ideal for search spot or emergency light on auto, boat, farm, etc. 12 Volt light, 4" lens . . . 329 24 Volt, 5" lens & carry case . . . 379 Set of 3 filters, red, grn. amber. (specify type lamp) . . . 994



269

NEW! STATIONARY or PORTABLE D.C. ARC WELDER

300 Amps Continuous. 350 - 400 Amps Intermittent. For ALL WELDING LIGHT or HEAVY!



This rugged air-cooled precision built electric ARC WELDER - designed to weld for hours comes complete with pulley reactor, output controls, Hi-Lo switches, rheostat. The heart of this unit is the famous H-1 generator, specially developed for B-29 Bombers, and with features no other generator has. Heavy steel frame, easily adapted to mounting on Jeep, Tractor or other power supply (10 H.P. gas or electric). Never before offered at this low price.

97.50

NEW WATCHES

NEW WATCH . . . Here's a real shock absorbing watch. Has jewel movement, sweep second hand, luminous dial, chrome case. Guaranteed for one year. Ideal for young and old. **695**

WALTHAM NAVIGATION WATCH. (Type A-8) An ideal timer for following of horse racing, boating or any other sports event where split-second timing counts. Large dial with sweep second hand counts the seconds in 1/10ths. Small dial records up to 5 minutes. Originally designed for aircraft navigation. THIS IS A TREMENDOUS BUY!! **22.50** Plus 10% FED. TAX

17 JEWEL CHRONOGRAPH One of the finest made anywhere. Cased in Switzerland. Sweep second hand, stop and re-set button. Measures distance, airspeed, groundspeed, races. Ideal for the sportsman. **26.95**

17 JEWEL AUTOMATIC WRIST WATCH . . . Swiss made men's wrist watch. A real self-winding watch. . . winds itself while you wear it. Incabloc (shock protected). Silver white or black face. Waterproof nickel chrome case, stainless steel back. Hours marked in numerals. Genuine leather strap. Red second hand with arrow tip. Guaranteed **26.95** Plus 10% FED. TAX



WHEELS For Wagons, Dailys, Handtrucks, Wheelbarrows, etc.

10" dia., with 1/2" center hole. (can be drilled out to take 5/8" axle) Wheel is 1/8" steel with 10 x 1.75 heavy duty, semi-pneumatic cushioned rubber tire. . . . **\$1.95**

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Mildew & Flame Resistant. Cheap outside storage! They are really moving at these prices.

5' x 7' . . . \$4.29
15' x 16' . . . \$28.80
16' x 32' . . . \$63.50
Rubberized Nylon Tarp 7' x 11' **6.95**

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Telephone type - Highly Sensitive with excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the radio 'ham' and professional recording studio, broadcasting, home recording, public address, etc. A Sensational Buy! Complete with cord and plug. . . . ONLY **2.69**



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Overall length 21" - Width at widest point 11" - at base 4" depth 6". For decorative fish or flower bowls or for cab roof - lights **1.89**



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Moulded, pre-shaped. Can be cut to fit your chair, boat, truck, auto or trailer seats. Ideal for all sports events.

4" x 18" x 23" x 22" . . . \$5.70
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3" Cored Stock . . . No. 2 1/2 compression. Ideal for cot, bed, bunk, couch or chair.

3" x 44" x 80" \$59.50 | 3" x 44" x 49" \$33.50
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2 1/2" x 44" x 40" \$31.00
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Genuine LEATHERETTE

to cover Chairs, Patio Furniture, Nooks, Auto Seats, etc. - 10 COLORS - at a BARGAIN PRICE

36" tile, red, brn, black . . . \$1.19
36" tile, grn, dk. grn, blue . . . \$1.65
54" (approx.) red, brn, lt. blue, ivory and yellow \$1.95



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1000's of uses around farm, shop & factory for storage, pressure, paint & insecticide spraying, etc.

F-2 - 6" x 45" - (1000 cu. in. capacity) - Stainless Steel **4.95**
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Dural with welded seams, 2" filler with cap, two standard pipe ports for hook-up. Visible liquid level gauge on side. For gas, oil, water or "spare" on auto tractor, truck or boat. Sturdy, light. Capacity - 6 gal. . . . **14.95**



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Fine grade leather . . . Chamois lined with chin cup on strap. Intermediate weight . . . Ideal for summer wear. NEW ONLY . . . **1.59**



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Rubber or chamois covered frame. Clear or Green GROUND LENSES are inter-changeable. Adjustable nose bar. Ideal for flying, motor cycling, etc. . . . **1.69**

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NEW! U.S. Navy - Has soft sponge rubber frame. 4 Polaroid lenses. 2 green, 1 red, 1 clear. Perfect for racing, cycling, etc. **89¢**



RUBBER BOOTS

A sturdy boot of the finest pliable rubber. Completely waterproof with adjustable strap. Can be worn with or without shoes. A REAL BUY **3.95**



SHOE PACS

Assures complete foot and shoe protection in the coldest weather. Specially designed to keep the feet warm & comfortable & the shoes dry. Has 14" leather boot top, rubber shoe & sole - felt inner sole. **3.95**



Plexiglass & Macrolite clear plastic shts.

MACROLITE - Full sheets app. 1/8" x 37 1/2" x 49 1/2", app. 10 1/2 lbs. each **\$14.25**

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Fabricators write in for our special quantity prices, all above are new & masked. Also inquire about other large stocks of Plastics

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with knobs and rubber pads for non-slipage on each section. A must for navigators, mechanics, draftsmen and engineers. You've never seen 'em at . . . **97¢ ea.**



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Lightweight but sturdy. Navy type. Full 50mm objective lenses that insure maximum brightness and sharp definition. Finely balanced for easy handling extra wide field of vision, individual eye-focusing. With genuine leather case . . . **33.95**



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Strong - Lightweight - 2 ply NYLON FISHING LINE. ROT PROOF and WATERPROOF . . . Especially treated for strength and long life. ON SPOOLS.

1500 ft. 25 lb. test - wht. **\$1.86**
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750 ft. 50 lb. test - brn. **\$3.18**
400 ft. 50 lb. test - brn **\$1.31**
750 ft. 45 lb. test - grn. & brn. . . . **\$2.96**
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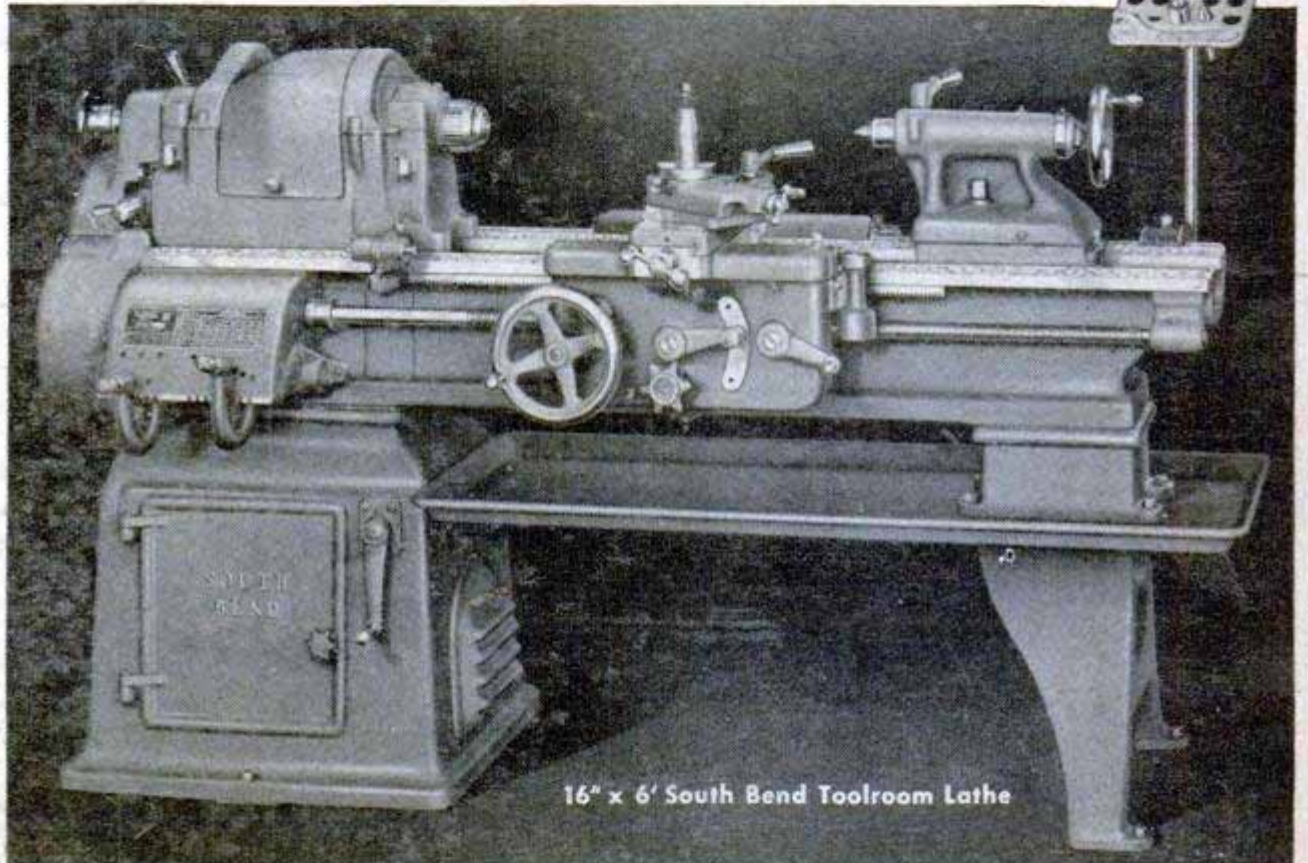
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SOUTH BEND LATHE
SOUTH BEND, INDIANA



16" x 6' South Bend Toolroom Lathe

SPECIFICATIONS OF SOUTH BEND 16" LATHES

Swing: 16 $\frac{1}{4}$ " over bed, 9 $\frac{5}{8}$ " over cross slide.
 Bed Lengths 6 to 12 feet
 Center Distance 33 $\frac{1}{2}$ " to 105 $\frac{1}{2}$ "
 Cross Slide Travel 10 $\frac{1}{2}$ "
 Spindle Speeds:
 8-Speed Drive 25 to 770 r.p.m.
 12-Speed Drive 20 to 945 r.p.m.

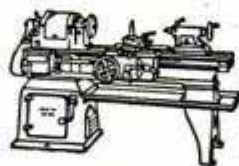
Collet Capacity 1"
 Spindle Bore 1 $\frac{1}{8}$ "
 Power Feeds:
 Longitudinal: 48 R.H. or L.H., .0015" to .0841"
 Cross Feeds: 480006" to .0312"
 Thread Cutting: 48 R.H. or L.H. pitches 4 to 224 per inch

Send Information Checked:

- 16" TOOLROOM LATHES
- 16" QUICK CHANGE GEAR LATHES
- LATHE ATTACHMENTS



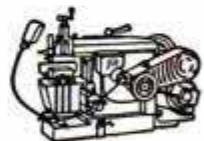
- 9" and 10" BENCH LATHES



- 10" TO 16-24" FLOOR LATHES



- 14" DRILL PRESSES



- 7" BENCH SHAPERS

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- TURRET LATHES
1/2" and 1" Collet



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SAVE GAS .. Up to 1 Gallon in Every 4



install a

MILE-O-METER

(Reg. U.S. Pat. Off. International Copyrights & Patents Secured)

(measures miles per gallon)
and motor tune-up gauge

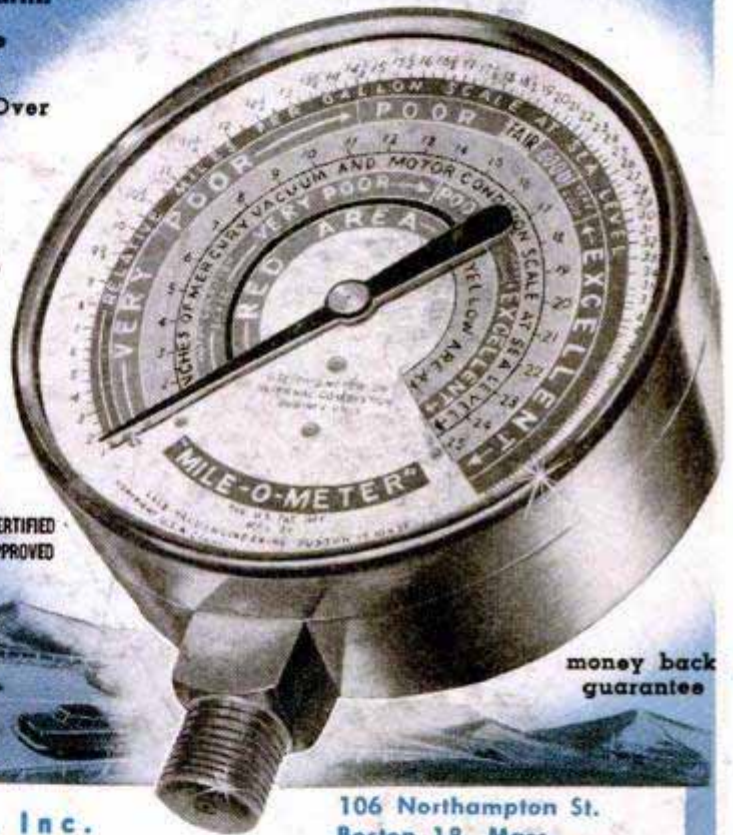
Up to 35 Miles Per Gallon

Mile-O-Meter is a gasoline mileage gauge as well as a motor tune-up indicator, very important in running your car economically.

Fits all cars. Permanently mounted. Checks Spark Plugs, Carburetor and 31 other Motor adjustments. Shows how to increase miles per gallon at every speed. 1 to 5 minute installation — 4 color Easy-To-Read Dial. No holes to drill. Mounting bracket fits dash or windshield frame. No experience needed. Complete instructions and 16-page mileage book included. Tested and proved by leading Automotive Associations and manufacturers. Makes a perfect gift. (Beautifully gift wrapped at no charge.) Over 1,000,000 in use today.

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AT ALL SPEEDS

Send for yours, today — Mile-O-Meter shipped prepaid — money back guarantee
Deluxe Chrome Model 3 3/8 Dia. . . . \$14.95 Ppd.
Standard Model 2 3/4 Dia. . . . \$9.75 Ppd.
Fed. Tax Incl.



money back guarantee



Mile-O-Meter will tell you how to correct the engine condition

Certified Test Performance Certificate **1950** CERTIFIED APPROVED



order from **GALE HALL ENG., Inc.**

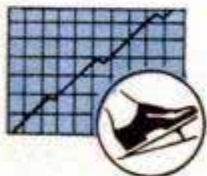
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1. **TEACHES** you how to drive economically — eliminates the Jack Rabbit starts and passing on hills — that's where you really drink up fuel.



3. **YOU** can check your engine condition at all times, and if it is not operating efficiently, Mile-O-Meter will tell you how to correct the condition.



2. **PERFORMANCE** charts and suggestions are enclosed with every meter, enabling you to determine how many miles per gallon you are getting, and what adjustments to make to increase your mileage.



4. **SIMPLY** mount meter on windshield frame or on dashboard area to suit your convenience with the aid of mounting brackets that can be bent into practically any position.

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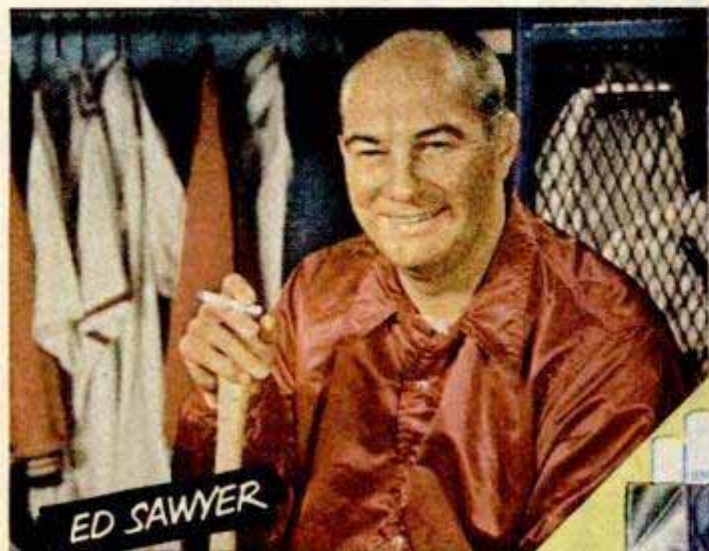
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"Manager of the Year" in 1950, Ed masterminded the Phils into the pennant. "My own 30-Day Camel Mildness Test proved how mild a cigarette can be!"



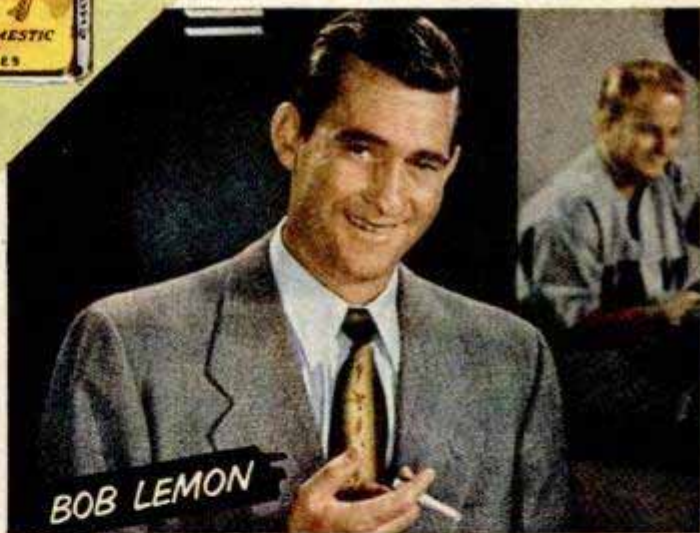
JIM KONSTANTY

Most Valuable Player of 1950 in National League, Jim Konstanty says: "Camels give me the kind of flavor and mildness I find in no other brand."



VIC RASCHI

Top Pitcher of the World Champions, Vic Raschi, of the New York Yankees. "Camels are my choice for mildness. Camels never tire my taste," says Vic, opening game winner in the World Series.



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Leading Right Hand Pitcher of 1950, Cleveland's Bob Lemon, only hurler to win 20 games or more in each of the past 3 years, says: "I'm glad I made my own 30-Day Test. Camels hit the spot!"

Make the sensible cigarette test. Change to mild, flavorful Camels for 30 days. You'll know why...

MORE PEOPLE SMOKE CAMELS than any other cigarette!



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