

ANC



POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN DO IT

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Dave Mink

WINTER AHEAD

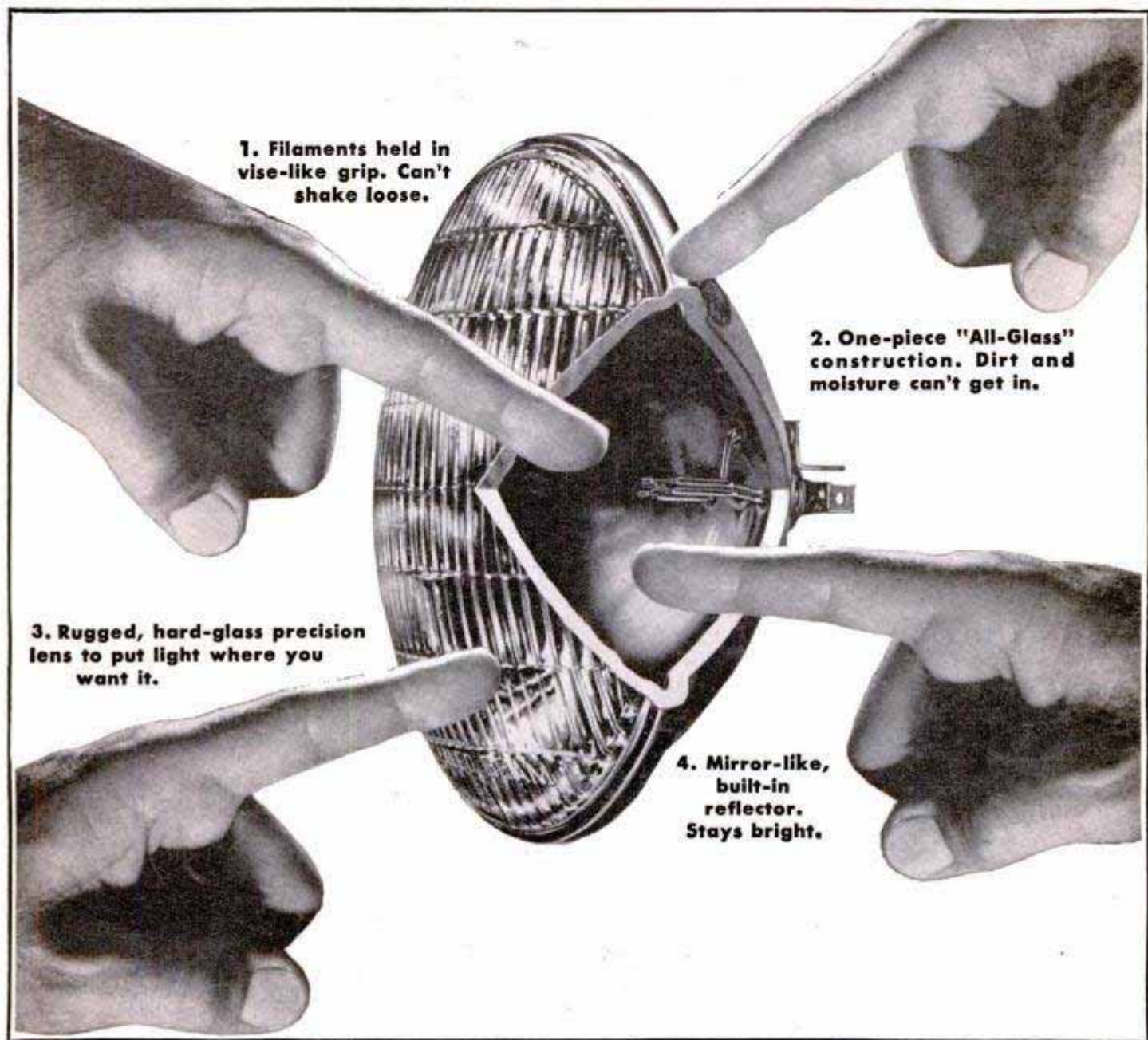


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NOVEMBER 1950

This One





How a whiff of stibine led toward lower telephone costs

At the New York Telephone Company's Triangle exchange in Brooklyn, emergency batteries stand ready to deliver 3000 amperes for several hours.

In the Bell System there are a million lead storage battery cells connected to telephone circuits in the central offices. Current seldom flows in or out of these cells beyond the trickle which keeps them charged. In the rare event of power failure, however, they stand ready to supply the current for your telephone service.

Even in this stand-by service, cells require water to make up for electrolysis. And they consume power and eventually wear out. But Bell Laboratories chemists discovered how to make a battery which lasts many more years and requires less attention — by changing a single ingredient, the clue to which came unexpectedly from another line of their research.

The clue was a minute trace of stibine gas in battery rooms — detected by electrochemists looking into atmospheric causes of relay contact corrosion. In small traces the gas was harmless but it gave chemists a useful hint.

For stibine is a compound of antimony — and antimony is used to harden the lead grids which serve as mechanical supports for a battery's active materials. Tracing the stibine, the chemists discovered that antimony is leached out of the positive grid and enters into chemical reactions which hasten self-discharge and shorten battery life.

Meanwhile, in the field of cable sheath research Bell metallurgists had discovered that calcium could be used instead of antimony to harden lead. And theory showed that calcium would not react destructively in a battery. The result is the new long-life calcium-lead battery which cuts battery replacement costs, goes for months without additional water, and needs but $\frac{1}{5}$ the trickle current to keep its charge.

It demonstrates again how diverse lines of research come together at Bell Telephone Laboratories to keep down the cost of telephone service.

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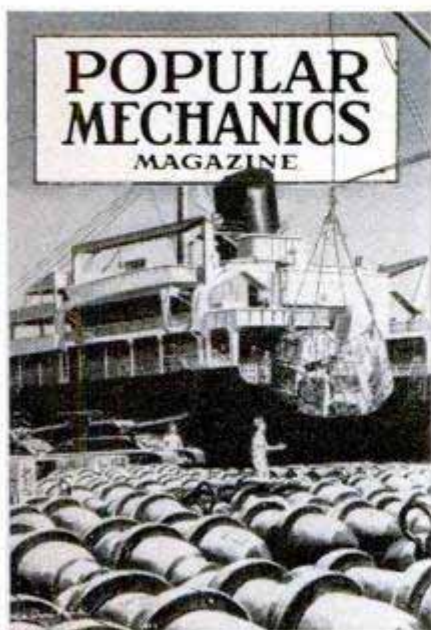


Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



this month's cover

MIGHTY SUPPLY LINES of the U. S. Department of Defense are humming with activity in the Pacific. Dave Mink, noted cover artist, has caught the spirit of this tremendous mechanical operation with his painting of a cargo ship taking on a load of 500-pound bombs, tanks, guns and other vital materiel being rushed to the Korean war front. Mink is shown below in his Chicago studio working on one of the sketches from which the final painting was made



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Maybe you don't need expensive anti-freeze

Results of Du Pont tests show most motorists can get complete winter protection from \$1.25-a-gallon "ZERONE"

This may surprise you—but here's what exhaustive winter road and laboratory tests made by Du Pont now prove about anti-freeze performance.

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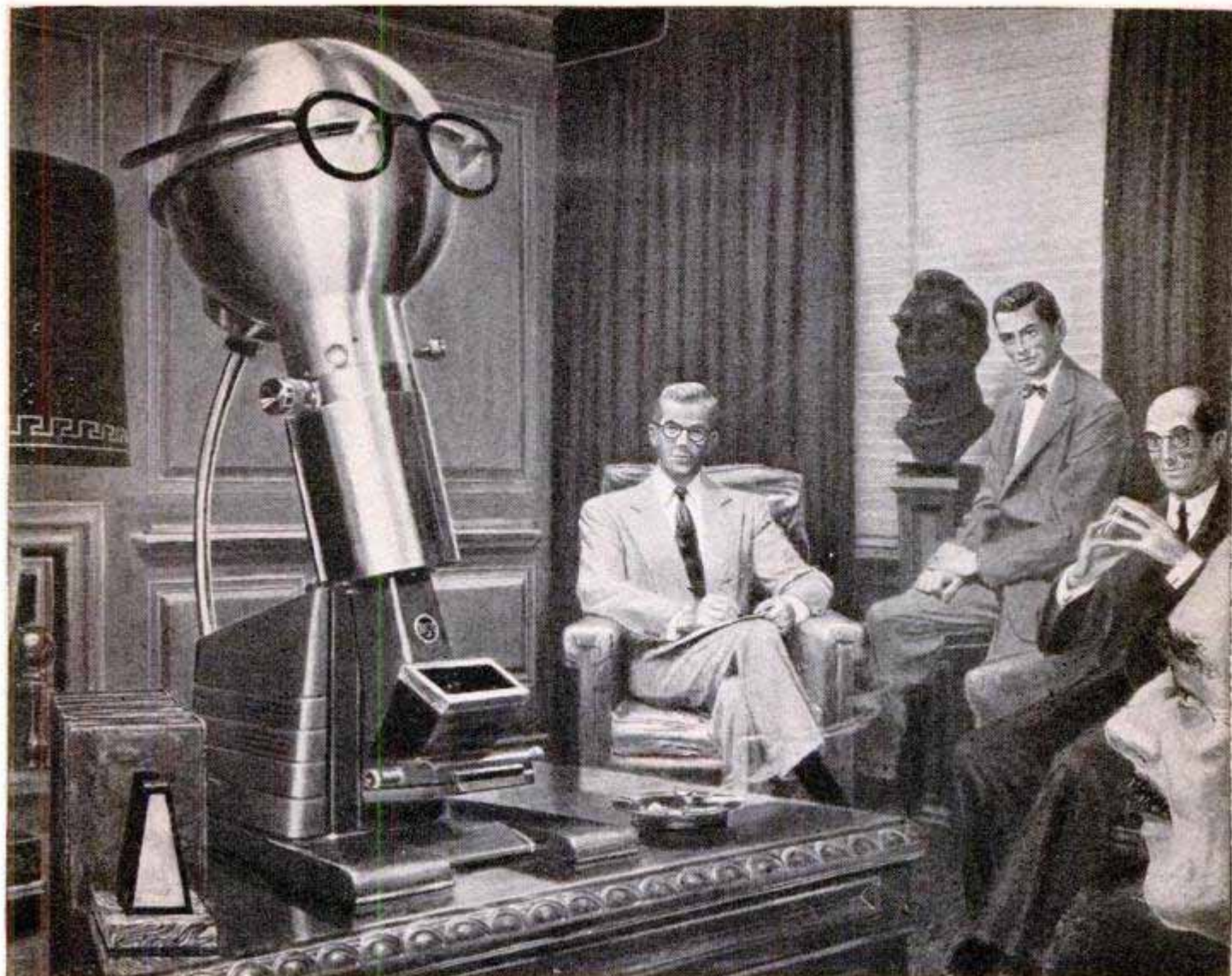
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Portable electron microscope, developed by RCA, widens research in universities, industries, hospitals.

The new instructor gets a hearty welcome

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Through basic principles uncovered at RCA Laboratories, RCA engineers have developed a compact "table model" electron microscope, at a price which makes it practical for use in an increased number of universities, industries, hospitals, clinics. So

simplified is the new instrument that a high school student or unskilled laboratory technician can quickly learn to use it!

Magnifications of 6000 times can be obtained directly in RCA's portable electron microscope—four times that of ordinary light microscopes—and photography lifts this to 30,000! A new "instructor," yes—and one that gets a very hearty welcome.

* * *

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THE EDITORS



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Buena Suerte, Amigo Jack

When a man is young enough to play a fast and steady game of tennis every Sunday from the first spring thaw until they lock the courts up for the winter at Evanston, Ill., he seems too young to retire from business.

But at 70 a man is entitled to relax a while and turn his vocation into a hobby. So Jack Atkin walked out of the darkroom the other day and said goodbye to us and to you. For, if the artist had signed all his work, you would have seen the name John Drew Atkin under thousands of photographs in *Popular Mechanics Magazine* in the last 31 years.

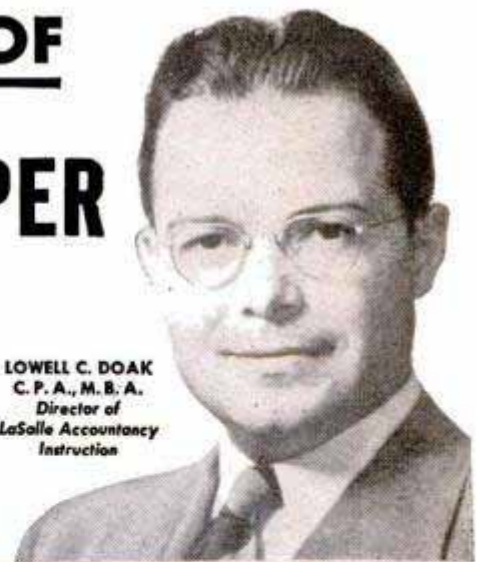
Jack is an artist with a camera. He needed little direction from the editors who accompanied him on a story hunt that might take him from coast to coast. He knew how to take pictures that tell a story.

Born in Ireland, Jack was already a veteran photographer when H. H. Windsor, Sr., founder of the magazine, brought him to *Popular Mechanics* July 24, 1919, from the pioneer Essanay Motion Picture studios in Chicago, where he had been a movie

(Continued to page 8)

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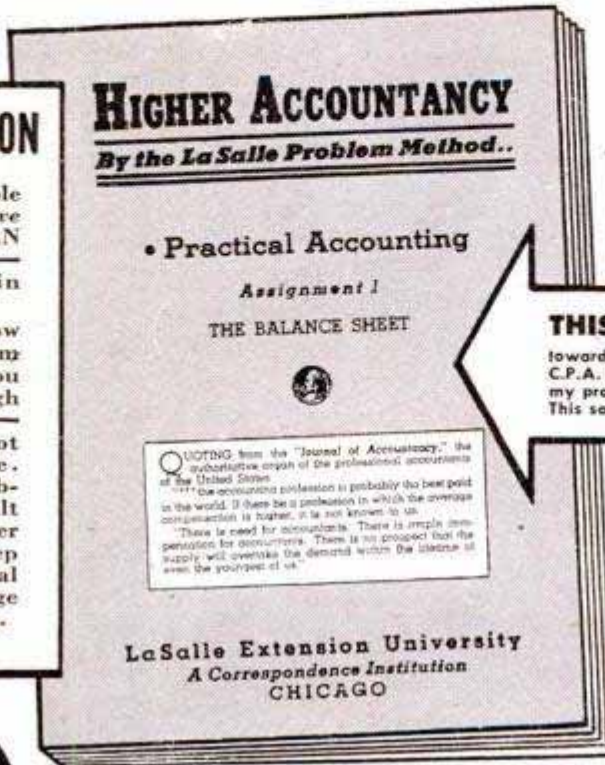
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TRAIN IN MIAMI-- AIR CAPITAL OF THE WORLD

(Continued from page 6)

cameraman almost from the industry's beginning. For the first few years he was The *Popular Mechanics* photographer. When he said goodbye to H. H. Windsor, Jr., now Editor and Publisher, the magazine's operations had grown so great that Jack had three assistants.

His experiences in chasing down photographic stories for the magazine would fill a fascinating book. In the early days of flying he hung out of windows of pioneer crates to make aerial pictures. He rode the cab of the first streamline trains. He was always looking for the best angle for his pictures; the managing editor likes to remind Jack of the time he took him to a locomotive yard to get the story of the turn-around servicing of a big Burlington steam engine. Jack had to get an overhead shot as the locomotive pulled up to a coal tower to fill its tender. He climbed the iron ladder to the top of the tower, and just as he was ready to trip the shutter, tons of coal poured down the chute and a cloud of coal dust billowed high alongside the tower, completely enveloping him. He came down unrecognizable, but for his grinning white teeth. He got the picture.

If this reads like Jack Atkin's farewell to photography, it is nothing of the sort. A few weeks ago he boarded a plane for Mexico, accompanied by Mrs. Atkin and their daughter, Jaqui. There he will make his home—and there, we are certain, he will also make some more good tennis shots and a lot of beautiful photographs of that beautiful land south of the border.



"My Kingdom for Some Horsepower!"

At the moment this photograph was taken, Thomas E. Riley of Portland, Ore., was just about ready to trade in his spade on a

(Continued to page 18)

THOUSANDS OF SKILLED AIRCRAFT WORKERS ARE NEEDED NOW!

REMEMBER those wartime jobs in the nation's aircraft plants? It was not uncommon for unskilled workers to draw \$75-\$100 a week. *Trained men virtually wrote their own tickets.*

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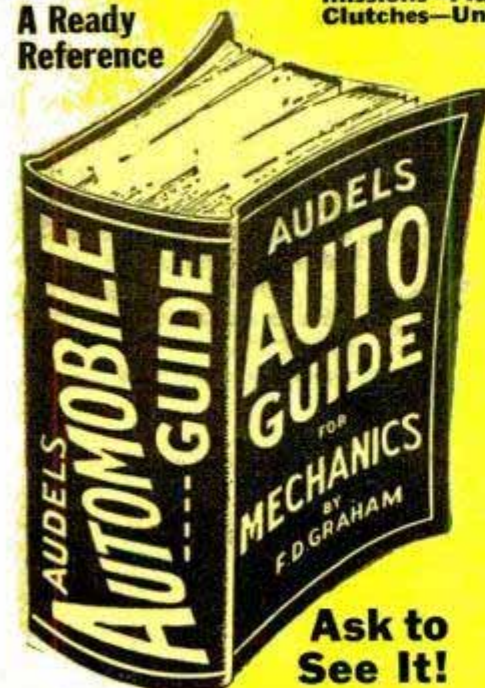
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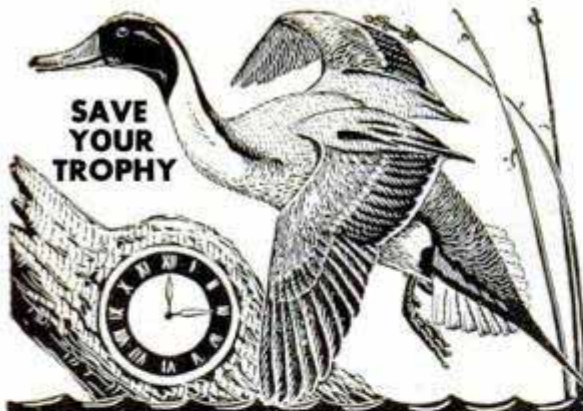
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Radio-Television, Electronics

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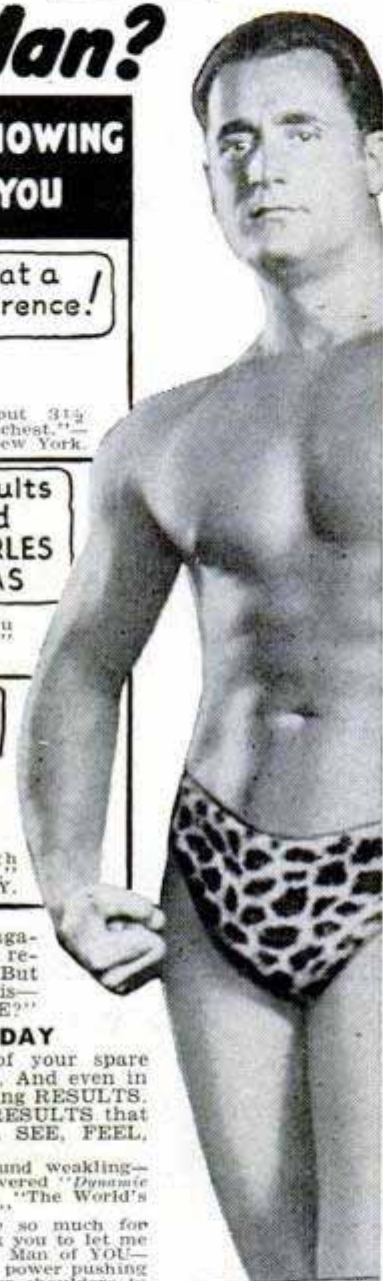
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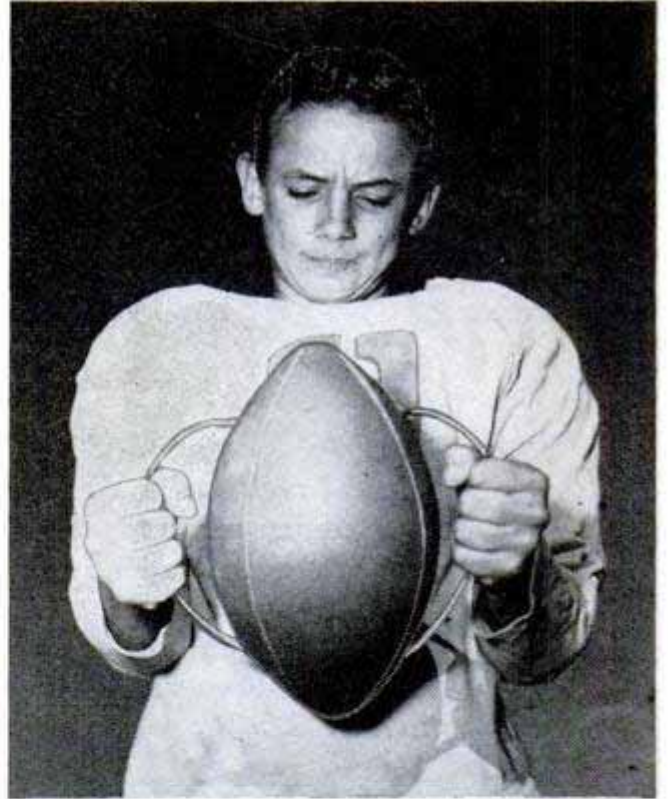
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(Continued from page 8)

couple of trenchers and excavators. But a short time later on his beautiful hillside plot the new *Popular Mechanics* Build-It-Yourself Home was beginning to take shape.

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The preview of Tom Riley's project begins on page 88 in this issue. Progress reports will continue each month until the full story and detailed how-to-build instructions begin in the Craftsman Section early in 1951. This will be followed by a complete book of plans and instructions, to be published by our Book Department. We are confident that this ranch-type home will be as popular with our readers as the two earlier houses described in two preceding books, of which many thousands have been sold: "Your Home and How to Build It Yourself" (the Cape Cod cottage) and "Popular Mechanics Concrete-Block House."



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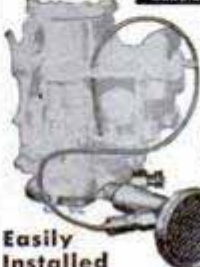
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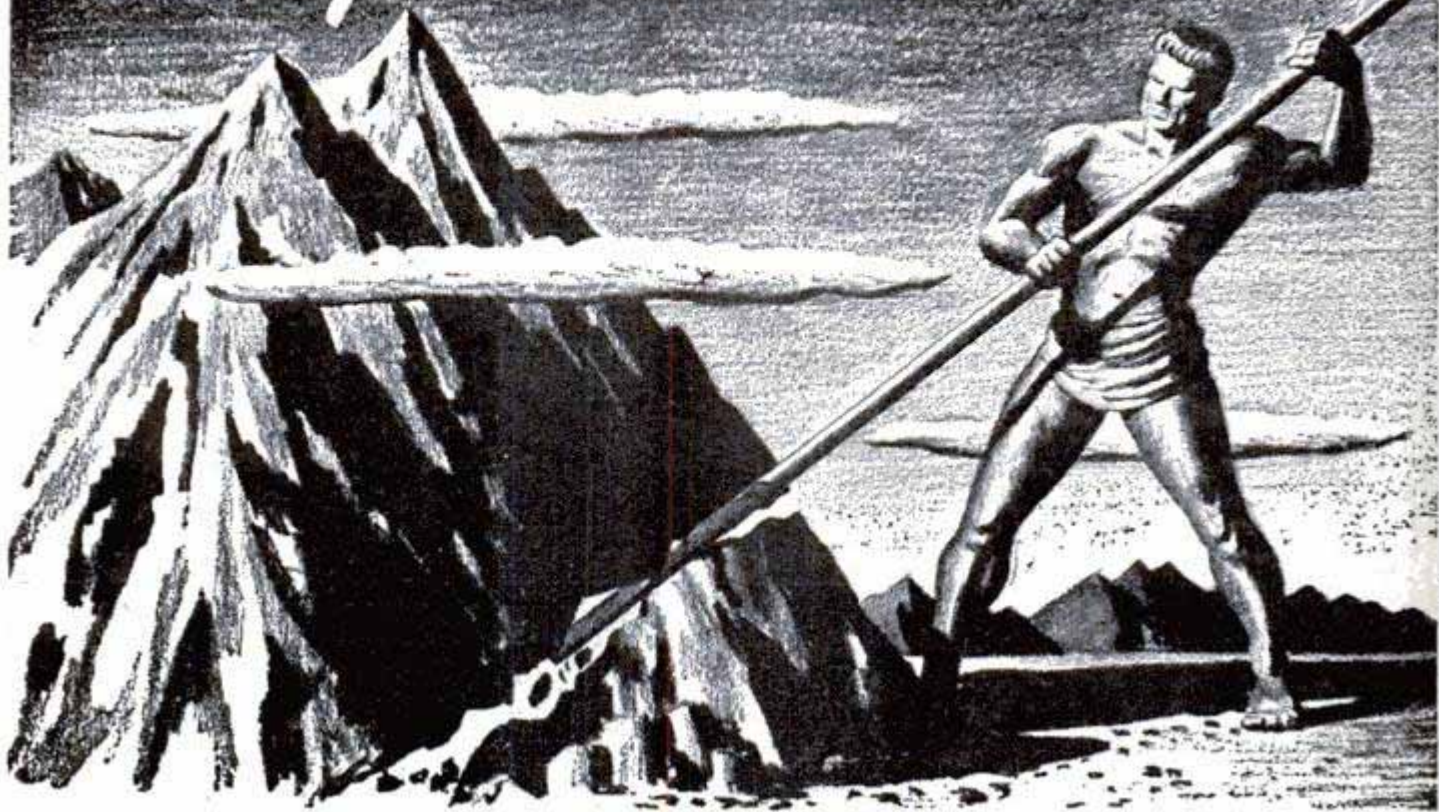
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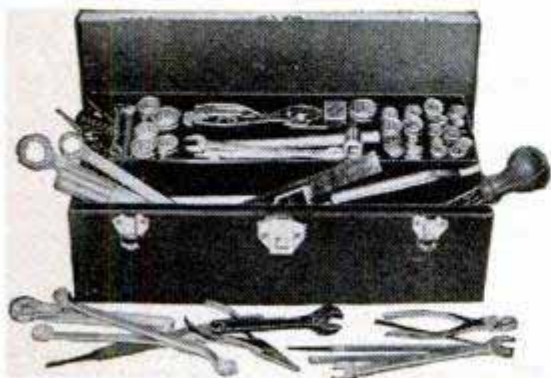
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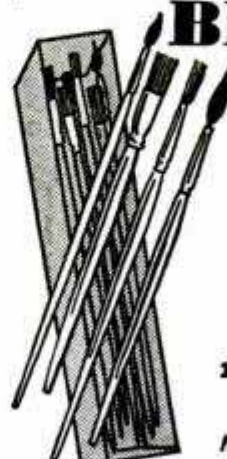
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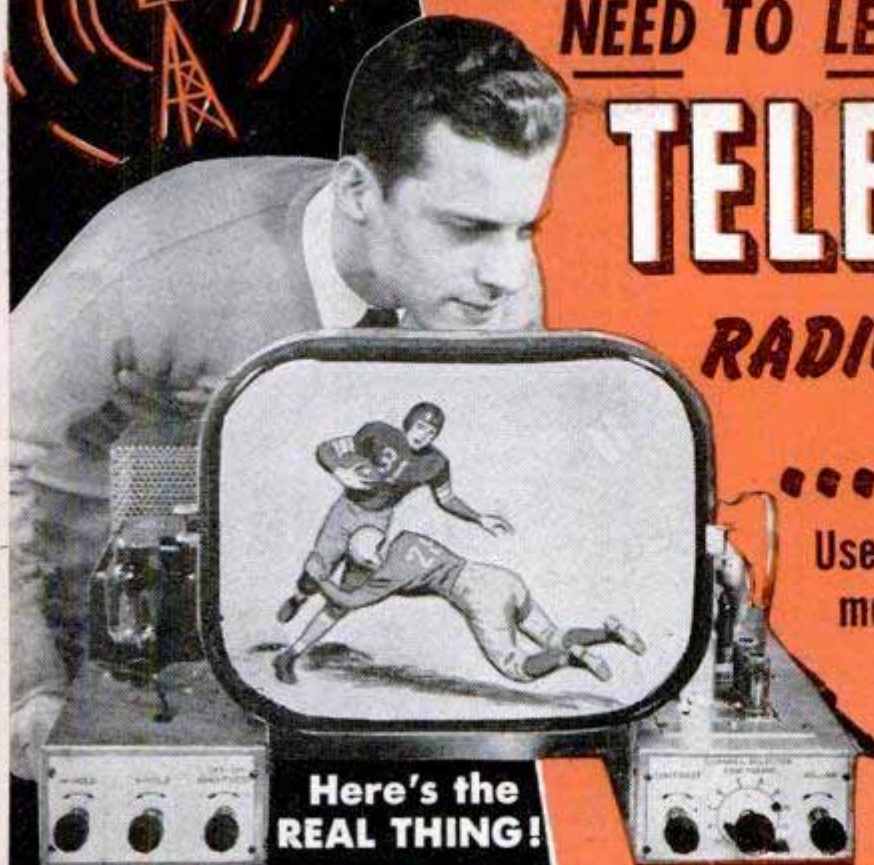


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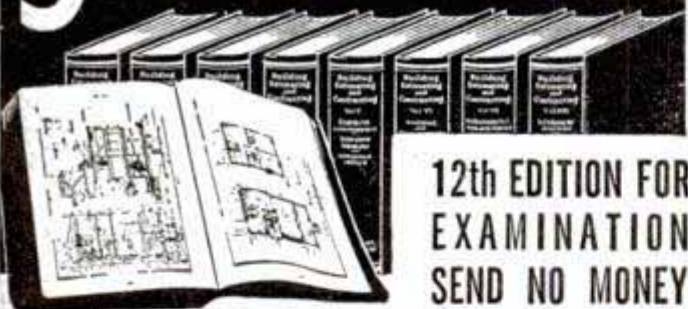
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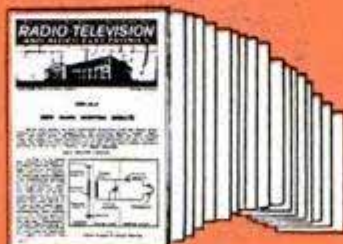
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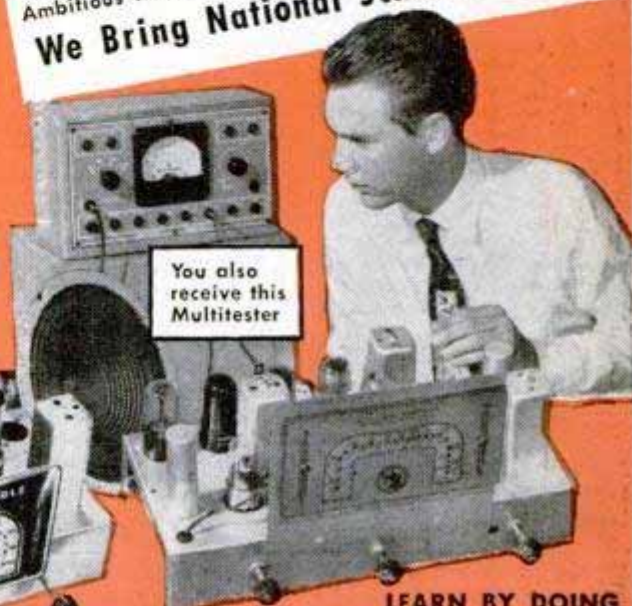
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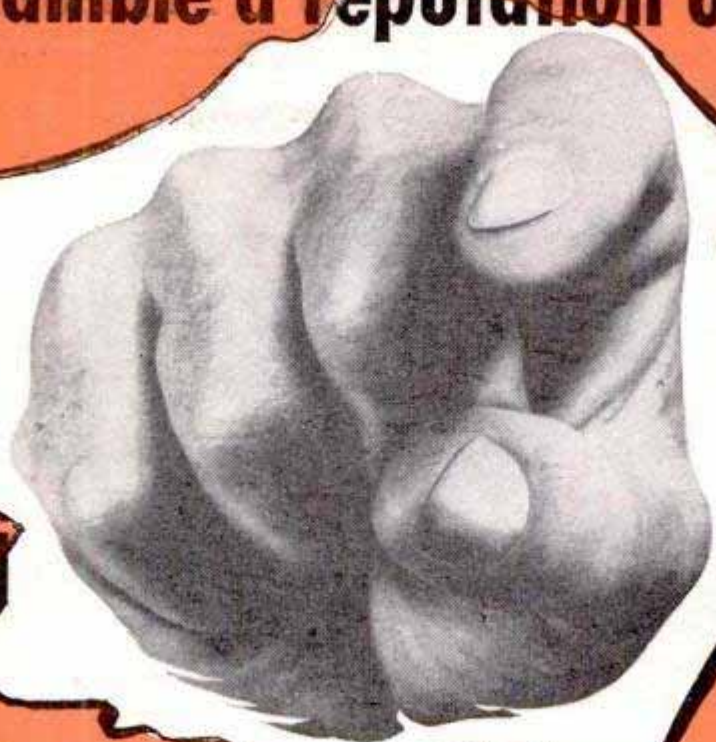
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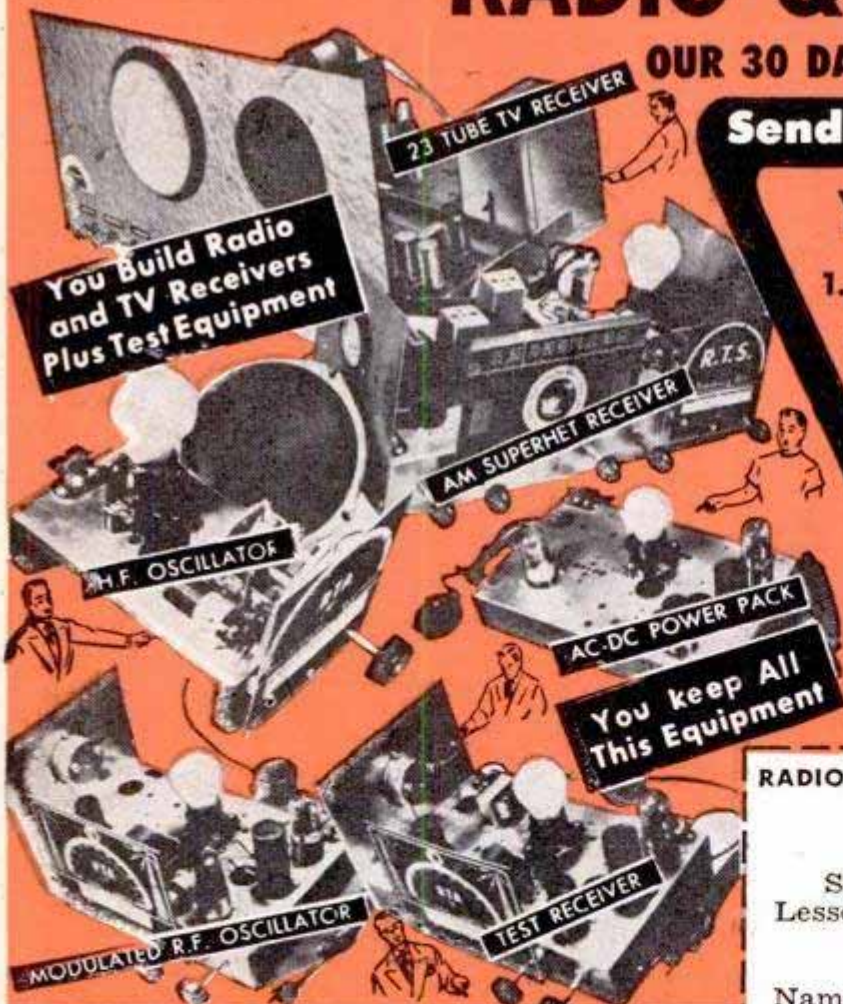
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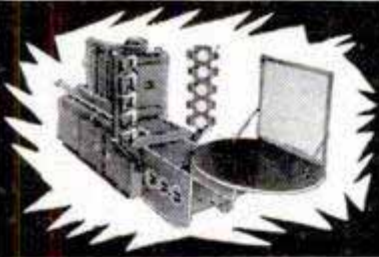
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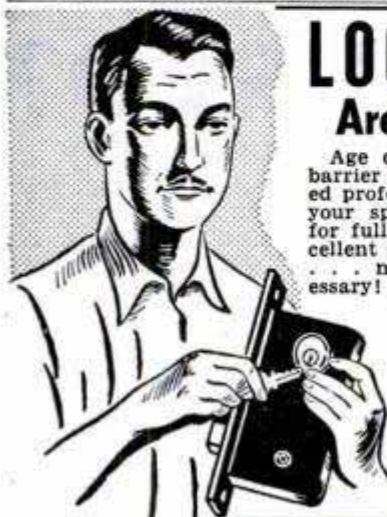


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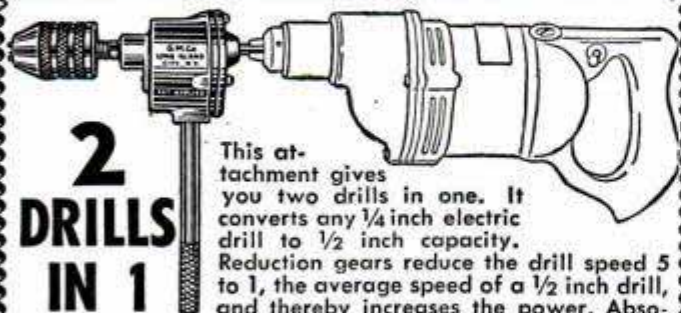
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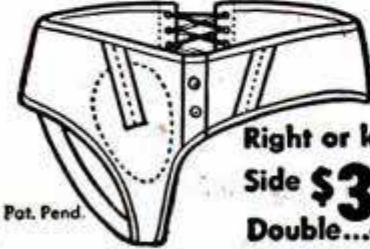
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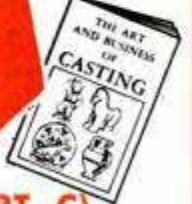
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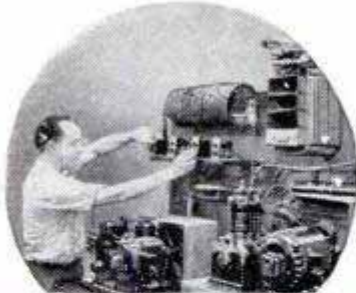
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BARGAINS! Save up to 50%. Hosiery, lingerie, toys, school supplies, blades, novelties, carded goods, drygoods, cosmetics, stationery, jewelry, notions, perfume, soaps, etc. Send 10c for illustrated 1000 bargain catalog. Valuable surprise gift free with first order. Reliable Jobbers, 311-B North Desplaines, Chicago 6.

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

EASY Money, wonderful work. Mix water with our concentrates. Make flavors, lotions, perfumes, shampoos, cleaners, polishes, 125 products. Free catalog. Qualco E20030 Russell, Detroit 3.

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

CASH In on tremendous demand for new low priced burglar alarm for cars, homes and farm building. Nothing like it. Everybody wants one. 286% profit. Unique sample offer. Northwest Electric Co., Dept. K-10, Pukwana, S. Dak.

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

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples \$1.00 postpaid. Lowy, 812 Broadway, Dept. 571, New York City 3.

TO \$35.00 Weekly. Spare time, home operated, mail order business. Successful small "beginner's" plan. Everything supplied. Lynn, 5710-M Bankfield, Culver City, California.

NYLONS Direct from mill. Sample free. Guaranteed against runs. No experience or money needed. Also nylon slips, briefs. Earn big money spare or full time. Become manager, appoint agents. We pay you 40c for every \$1 your agents earn. Sell 14K neckchains "Flat-Curb" \$6, cost \$2.50. Ergim Co., 992 Columbus Ave., New York.

\$1.00 STARTS You in business. Sell men's neckwear full or part time. Low investment big profits. Send \$1.00 receive sample tie, free color catalogue, selling plan, wholesale price list. Radio City Neckwear, Dept. M7, 112 W. 50th, New York City 19.

BALL Point pens. Dozen two dollars. Samples twenty-five cents. L. S. Distributing, White Bear Lake, Minn.

STRANGE "Dry" window cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 158, Akron, Ohio.

NEW Plastic mending tape. Just press on! Repairs clothing instantly. Lightning seller. Samples sent on trial. Kristee 159, Akron, Ohio.

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

NEW, Novel plastic "slideon" pricing sets sell fast to stores, manufacturers, others. Exclusive features. Take easy orders—collect big profits. Free starting outfit. Mastercraft, 223 Tyler, Dept. PM-1, Trenton, N. J.

OWN A big moneymaking used clothing business. Men's used suits \$2, pants 35c, topcoats \$1.25, jackets 60c, shoes 20c. No experience necessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7, Ill.

AGENTS Make big money! Sell new invention needed in every home, hotel, institution. Does double job at fraction of old cost! Top quality! Quick repeater! Your profits huge, almost 100%! Rush name for free money-making details. Universal, 29 Hall Avenue, Tuckahoe 7, N. Y.

ALL-Purpose power mowers. 10" wheels. Gas-electric. Rotacut, R-2011, Excelsior Springs, Missouri.

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 83, N. Y.

WALKER'S Tooth powder, user's favorite, can multiply your profits. Write J. Walker, 633 Plymouth Ct., Dept. 1, Chicago 5.

PERFUME—Sideline to independence. Learn all—free. International, 6347 Parnell-AM-11, Chicago 21, Illinois.

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-11, 6 N. Michigan, Chicago 2, Ill.

MAKE Products yourself right at home. Windshield cleaner, rug cleaner, vanilla, spot remover, moth killer, auto polish, radiator cleaner, glass cleaner, soapless shampoo. Use just one ingredient formulas. No mixing. Amazing profits. Complete set \$1.00. Ideal Formula Service, Park Ridge, Ill.

SELL NuSilver Plating Polish, cloth applied products. Contain genuine silver. Silverplates copper, brass, silver. Nu-Silver, 508-PM11 N. Y. Street, Aurora, Ill.

SCHOOL Seniors! A postal will bring you our wonder, Kwick-Sell Cardalog of popular graduation name cards. Biggest profits! Only firm giving free Golden Memory Book and Souvenir Chest. Don't miss out. Hurry that postal! Craftcards, Box 235 (L), Pittsburgh 30, Penna.

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.

FAST Profits—No investment. Send for big, free catalog. Plastic aprons, tablecloths, etc. 150 sure-fire items. We guarantee sales. Write The Halliday Co., Dept. M-9, 15-19 Pennington, Passaic, N. J.

SALESMEN, Distributors. Fast selling jewelry items. National Distributing Company, Calumet Building, Miami, Florida.

SELL Watches, silverware, cookware, appliances, etc. Lowest prices. Top profits. Write: Kriston, Pemberville, Ohio.

EARN Big profits! Every home needs new Tapaline Multiplug that makes 8 appliances available from one outlet. Sample \$1.50. 16 page catalog of household items free. Sunshine Sales, Dept. WP5, Loudonville, Ohio.

MEXICAN Feather pictures. Christmas novelty \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 762, Mexico City.

BIG Week's pay every day. Demonstrating new light weight Zip-Kwik All-Purpose Folding Chairs for quantity sales to homes, churches, clubs, schools, resorts, hotels, restaurants and so forth. Profits and prospects unlimited. Wire or write, Valley Steel Products Co., 126 Sidney Street, St. Louis 4, Mo.

NEW Plastic rayon towels selling rapidly everywhere with spectacular demonstration. Large profits. Sample package \$1.00. Sunbeam Products, 634 4th St., South, St. Petersburg, Florida.

THERE'S Big money taking orders: Personal initialed buckles with belts, tie holders, choice of over 3,000 emblems, cap and breast badges for every purpose. Uniforms, work clothes, embroidered with company name, trademark, sales message, etc. Prospects everywhere. Latest styles, finest fabrics. Write for selling kit. Hook-Fast Co., Box 480PM, Roanoke, Virginia.

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

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

SELL Direct finest quality, fastest sellers in \$1.00 and \$1.50 neckwear. Hosiery. Lowest prices, top profits. Write: Wolfmark, 931-P West Roosevelt, Chicago, Ill.

MAKE \$20 A day! Sell Staybright brass name plates for front doors. Write Hubstamp, 357-E Congress, Boston, Mass.

TIES Christmas boxed free. New patented tie and regular ties. Sensational Christmas gift line. Perma-Knot Tie Company, Dept. 101, Williamsville 21, New York.

\$184.00 CONTINUOUS Profit from every \$8.00 investment. Shampoo powders in bulk. Bottle yourself or sell powders. Request convincing facts. Morael Manufacturing Company, 505-R Fifth Ave., New York City 17.

BE A money maker. Represent magazines year around. Wonderful home work. Big Christmas profits now. Liberal commissions. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

CASH in on plastics! Big profits with our 350 new plastic home needs. Perfect for party demonstrators, canvassers, stores. Lowest prices—highest quality. Write for free details. Durever, 2781-G Atlantic Ave., Brooklyn 7, N. Y.

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

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.

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

1950 XMAS Card catalog ready! Earn more money as a wholesale jobber! Large selection of dollar box assortments, imprints, religious, personalized Christmas cards! Three dollar sample boxes \$1, postpaid! Write for free holiday bulletin. Elfko, 438 North Wells, Chicago 10.

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

WRITE for free booklet and catalog telling how to earn substantial profits in your spare time by forwarding new and renewal subscriptions to all magazines for your friends and neighbors. Oldest U. S. agency. Established 1869. Moore-Cottrell, North Cohocton, New York.

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

NEWEST Money making sensation. Sell personal initialed belts, buckles, cap and breast badges, tie holders, etc. Choice 2000 emblems. Write special outfit offer today. Hook-Fast, Box 1425PM, Providence, R. I.

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

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

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

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.

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.

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.

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

AGENT Or exclusive distributor for cigarette lighter manufacturer. MacGregor, Tahoe Valley 16, Calif.

HIGH-GRADE SALESMEN

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 5311, Rochester, Ind.

POSITIVELY New—Over 100% profit. Two sided reversible neckties. Free details. Farrell Company, Dept. P-16, 1377 Van Zandt, Cincinnati 31, Ohio.

SALESMEN—Sell America's finest, biggest line of advertising specialties. Sensational sellers to all types of business. Big commissions advanced. Sensational sales plan nets you top earnings. Free outfit. Charms & Cain, 407-MPM South Dearborn, Chicago 5.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-1150, 7530 Greenwood, Chicago.

BUILD Your own business—Sell nationally known cushioned sole Charles Chester Shoes direct from our factory established 1876. Complete line for entire family. Full time or side line. Advance commission up to \$2.50 per pair plus generous monthly cash bonus. Samples and equipment free to producers. Chas. Chester Shoe Co., 150 Foundry St., Brockton, Mass.

CALENDARS And advertising novelties. All sizes, styles and prices, including household, religious, 12 sheet, girls, pencils, rulers, key chains, thermometers, etc. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Ill.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Big spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-11, Chicago 32, Illinois.

SHINER-Hook; New sensational seller. Fishermen, dealers. Sample 10c. Catalog free. Nelson Company, St. Paul 2, Minn.

WANTED: Man who needs to earn at least \$75 weekly. Work full or part time. Permanent. National organization. Free outfit. Write Red Comet, Inc., Dept. 775, Littleton, Colorado.

SALESMEN—Would you like a seagoing yacht for one dollar? The writer has one, and after 45 years of successful selling, tangibles and intangibles, has condensed a few priceless and proven secrets of his successes into one small pocket book you can carry with you. This booklet is unlike anything you have read and satisfaction is guaranteed no matter what you are selling. For example the writer sold and placed 34 ordinary life insurance policies in a single day. (Not industrial or group.) A world's record. See "The Insurance Salesman," Oct., 1934. Mail one single dollar for "P.M.S." to Stroud and Sowle, 195 26th Ave., #5, San Francisco 21, Calif. (Crew and Sales Managers, 6 for \$5.00).

BE A master salesman. Powerful secret key in new book, "How to Sell Faster." Send \$2.00. Free literature. Helpful Press, 2212 Cuming, Omaha, Nebraska.

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.

SELL The fastest money maker out! Handy Hannah automatic wax dispenser pays you over 100%. Every housewife wants it. Saves time, labor, stooping, mess, waste. Press button and wax is released. Sample and details write Everett Young Co., Whitman, Mass.

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

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

EDUCATIONAL AND INSTRUCTION

MEDICAL Laboratory Technicians in great demand. We train you in your own home. Catalogue free. Imperial Technical Institute. Box 973-J, Austin 65, Texas.

ACHIEVE Business and financial success in your own collection-credit agency business. Home or office. Quickly learned. Free folder. Write Cole & Associates, Syracuse 2, N. Y.

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

USED Correspondence courses and educational books bought, sold, rented. Catalogue free. Educational Exchange, Summerville, Georgia.

USED Correspondence courses. Educational books. Bought, sold, rented. Free list. (Satisfaction guaranteed.) Home Study, 150, Salem, Indiana.

LEATHER Carving. Fascinating, highly-paid art; age-old secrets now taught for first time in home study course. For hobby, profession or profitable business, write: Baird School of Leather Carving, Box 1367-M, Dept. 11B, Manitou Springs, Colo.

"HOW To Break and Train Horses"—A book every farmer and horseman should have. It is free; no obligation. Simply address Beery School of Horsemanship, Dept. 11011, Pleasant Hill, Ohio.

MAKE Up to \$35-\$45 week as a trained practical nurse! Learn quickly at home. Booklet free. Chicago School of Nursing, Dept. M-11, Chicago.

BE A real estate broker through home study or classroom instruction. Write for free book. Approved for veterans. Weaver School of Real Estate, 15 E. Pershing Rd., Box CP-11, Kansas City 8, Missouri.

3800 LATEST Used correspondence courses. Cat. 50c. EG, Elmsford, N. Y.

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

VOICE Secrets! Information free! Studio, 14356B South Jersey, Norwalk, Calif.

READ With speed! New amazing method! Save hundreds of hours yearly. Free test. Speed-Reading, 9111-g Hoyne, Chicago 20.

"CONCRETE Block Homes." 32 page booklet on how to build. \$1.00. H. C. Lightfoot, Civil Engineer, Richboro 1, Pennsylvania.

INVESTIGATOR Courses. Free literature. Allied Academy, 14 No. East, Indianapolis.

LEARN To play Scrimmage by correspondence. New football game sensation. Big demand for instructors. Write to-day. Fred Welna, 2220 North 33rd Avenue, Omaha 10, Nebraska.

IT'S Fun learning a language by Linguaphone. At home, in leisure time, quickly, easily, correctly master Spanish, French, Italian—any one of 29 languages through proved Linguaphone conversational method. Send for free book. Linguaphone Institute, 83-P Radio City, New York City.

U.S. Gov't. jobs. Men, women qualify now. Study course, service helps you. Complete \$10. Wellwood Agency, Box 363, Oak Park, Ill.

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

USED Correspondence courses and books sold and rented. Money back guarantee. Catalogue free. (Courses bought.) Lee Mountain, Pisgah, Alabama.

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

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

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

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

PIANO Tuning pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school—52nd year. G.I. approved. Write for booklet. Niles Bryant School, 78 Bryant Bldg., Washington 16, D. C.

PLAYS, STORIES, MANUSCRIPTS

MUSICAL Comedy plays. Dorby Publications, P.O. Box 738, Morristown, New Jersey.

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

INFORMATION

WHERE To buy most anything. We furnish supply sources. Single item, 50c. 3 for \$1.00. Service Bureau, Box 5053, Chicago 80, Ill.

WHERE To sell more than 500 items. List \$1.00. D. L. Crawford, 61 Werden, Vallejo, Calif.

BUSINESS SERVICE

INCORPORATE Your business. Delaware laws. Free details. Tax Research Bureau, Inc., Box 710, Wilmington, Del.

SPECIAL SERVICES

TANGIER Postmark! Letters reairmailed 3 for dollar bill. Idap, 26, Hollande, Tangier, Morocco.

YOUR Letter remailed in San Francisco, 25c. Prompt, confidential. Sherman, 1600-12th Avenue, San Francisco 22, California.

ALASKA Postmark! Letters remailed 25c each. P. H. Williams, Box 1164, Anchorage, Alaska.

DRAWINGS To order, labels, trademarks, monograms, etc. \$15. c.o.d. Co-Op Art, Box 384, Madison, Wis.

MEXICAN Mailing address, 25c each, \$3.00 monthly. Businesses, personal. Mexican matters reliably handled, confidential. Acuña, Box 25612, Mexico, 12, DF.

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

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

DRAW Beautiful human figures, 20 lessons, 147 illustrations, \$1.00 complete. Aldcroft Studios, Bendix Building, Los Angeles 15, California.

PROFESSIONAL Pen cartoon from your photo \$2.00. EG, Elmsford, N. Y.

"HOW To Write Cartoon Gags" \$2.00. "How to Earn \$100.00 Weekly Cartooning" \$2.00. "How to Sell Your Cartoons" \$2.00. Literature 25c. Free details. Lew Card, 16-13, La Habra, California.

TRACING Folios—Twelve alphabets, ten numerals, \$1.10. Three different \$3.00. Demonstrators, 639-P Paulina Street, Chicago, 12.

9 ALPHABET 3 Numeral pattern sets and catalog. \$1.00. Sign Letter Distributors, P.O. Box 101, Mineola, N. Y.

ART—Learn to draw in spare time. Commercial art, designing, cartooning all in one course. Write for free book "Art for Pleasure & Profit." Studio C129, Washington School of Art, 1115-15th St., Washington 5, D.C.

TALENT Test—Information. Give age. Art. Box 8066, Dallas 5, Texas.

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

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

ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

LET Me mail your circulars to "live" clients. 25c per hundred. "Keyed" circulars welcomed. Sherman, 933 Judah Street, San Francisco 22, California.

FRESH Names, compiled weekly: men, women mailorder buyers, opportunity seekers, etc. 1,000, \$4.00; trial 300, \$1.00. Wright Publications, Memphis 8, Tenn.

SPECIAL. 1000 Opportunity seekers names, \$1.00. Wilbur Errickson, English-town, New Jersey.

MAILING Lists for all purposes. Purchasing salesmen, agents, home owners, etc. \$1.00. A. Reeves, College Station, Box 271, New York City.

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

MAILING Lists executives and engineers. Write Columbia Graphs, Columbia, Connecticut.

MAILORDER Advertisement, 2,000,000 nationwide circulation, \$32.90 inch. 24-word classified, 20 Sunday newspapers, \$25.00. Instructive Ad-Guide—ratebook magazines, newspapers, mailing-lists—10c. Ideas developed. Ads prepared free. Chicago Advertising Agency, (Established 1900), Chicago 4.

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

FREE! 1950 Advertisers Rate and Data Directory. 52 pages! E. H. Brown Advertising Agency, 20 N. Wacker, Chicago 6.

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

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

ADVERTISERS! Reach nearly 18,000,000 readers. 25 Sunday national key newspapers, 18 words, \$51.50. "Terrific pullers." 20 popular newspapers, \$10.00. "Free booklet." Special—One inch display 2-821,198 circulation. \$48.30. Newmark's Advertising Agency, (Established 1893), 217-7th Ave., New York 11.

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

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

PRINTOMATIC Selffeeding post card printing duplicator \$13.50. Envelope addressing machines \$24.50. Pittsburgh Typewriter Company, 336-R Fourth Avenue, Pittsburgh 22, Penna.

TYPEWRITERS \$19.50, Duplicators \$9.95, adders \$12.50, addressers \$9.95. Meiers, 118 N. Spruce, Wichita, Kansas.

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

RUBBER STAMPS AND OFFICE SUPPLIES

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

RUBBER Stamps, 3 or 4 line, \$1.00 postpaid. Dealer proposition. Smallwood Printery, 2715 Vine, Cincinnati 19, Ohio.

DELUXE Cushioned, indexed, knob handle; 3 lines 50c, 4-60c. Inked pads 40c. Free literature. 500 two color gummed stickers 3/4 x 2" \$1.00. Quick service. Warner Stationery, Havre de Grace, Maryland.

READY Made stamps, free list. Criterion, Box 2326, Denver 27, Colo.

LINE 20c; 2-35c; 3-50c. Stamp Works, Auburn, Nebraska.

PRINTING OUTFITS AND SUPPLIES

CAPABLE Home-built press, details free. Roberts, Box 184, Walpole, Massachusetts.

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

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

PHOTOCOPY Anything—Papers, books. No darkroom. 8 1/2" x 11" complete \$6.95. Fotoflex, 3751 St. John's Terrace, Cincinnati 36, Ohio.

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.

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

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

**PRINTING, MULTIGRAPHING,
MIMEOGRAPHING
GUMMED LABELS**

BUSINESS Printing. Samples, prices free. Howprint, 723M Eunice, Webster Groves 19, Missouri.

500 3/4x2 1/4 **FOUR** Line gummed stickers 50c. Red border \$1.00. Moritz Printery, Saginaw, Mich.

HAMMERMILL Paper, office supplies, lithographed letterheads, YCP, Box 31, Hammondsville, Ohio.

LETTERHEAD — Form letter combination, printed one operation. Inexpensive. Any quantity. Robbins, 415 20th, Baltimore 18.

PRINTING: Get our prices first. Crane, Box 7625-D, Kansas City, Missouri.

500 **LETTERHEADS** or envelopes \$3.25 postpaid. Advocate, 437 Harvey, Greenville, Miss.

1000 6 3/4 **WHITE** Wove envelopes \$5.00; # 10 \$6.50. Ideal Printing Company, Hudson 7, New York.

NEED Printing? Get my samples, prices. Gooch, 202PM, Hernando, Miss.

1000 **EMBOSS** Business cards \$3.50. Samples. Ziegler, 694 Rockaway, Brooklyn, N. Y.

100 8 1/2x11 **HAMMERMILL** Letterheads and 100 envelopes, \$1.75. Don Johnson, 410 East Okla. Place, Tulsa 6, Oklahoma.

1000 **EMBOSS** Business cards \$2.95. Samples. Gaffney, Printer, 110B Ashburton, Yonkers 2, New York.

100 **LETTERHEADS**, 100 Envelopes, Hammermill, \$2.00 postpaid. Boyle, Clinton, New York.

125 **LETTERHEADS**, 8 1/2x11 Hammermill, \$1.00 postpaid. Envelopes, business cards, same. Race Printers, Hudson 4, New York.

MONOGRAM Stationery, paneled cards, excellent quality. Samples, prices on request. Mrs. B. Pokorny, P.O. Box 402, Grants Pass, Oregon.

1000 **EMBOSS** Business cards postpaid \$3.00. Fast service. Free samples. Shatford, Palmdale, California.

YOUR Name, address 300 letterheads, \$2.00. Roy Press, Box 96, Brookline, Mass.

100 **ENVELOPES**, Printed 2-colors \$1.25. Samples. Box 523, Rochester 2, N. Y.

MIMEOGRAPHING, Vari-typing. Free price list. Loyal Brush, 3712 Walnut, Kansas City 2, Missouri.

\$3.00 **PRINTING** Specials. Samples free. Travelonian Press, 55 South Tuxedo, Indianapolis 1, Indiana.

1000 **BUSINESS** Cards \$2.50. Printery, 1485 Cota, Long Beach 13, Calif.

MIMEOGRAPHING — Free informative price list, samples. Anything legibly reproduced. Corley, F285 Carlton, E. Rutherford, New Jersey.

MIMEOGRAPHING — Reasonable. Any copy. Mailers Service, Box 606-S, Chicago 90, Ill.

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

MIMEOGRAPHING, Multigraphing. Like personal typing. Down low prices. Free samples. Packer, Box 1674, New Haven 7, Conn.

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

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

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

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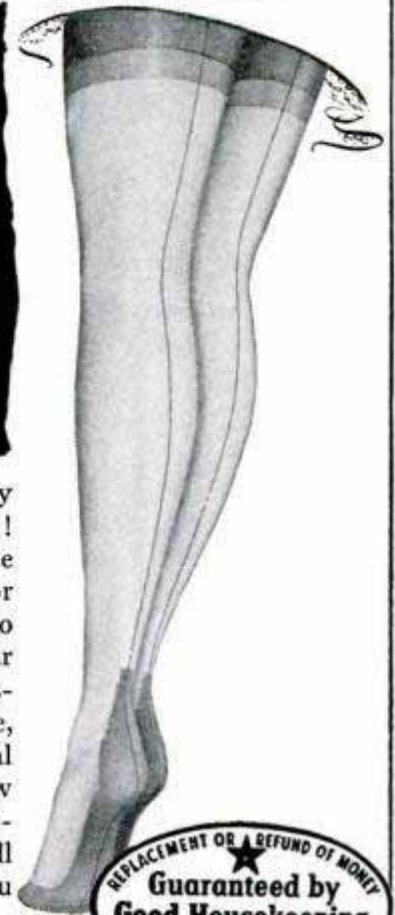
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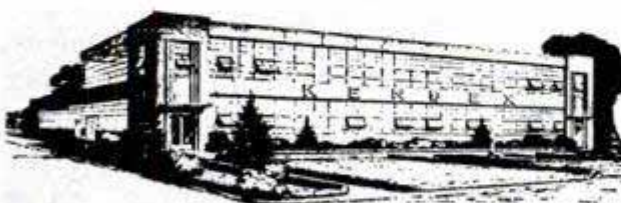
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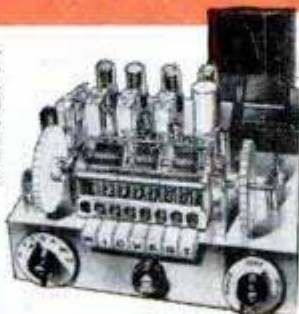
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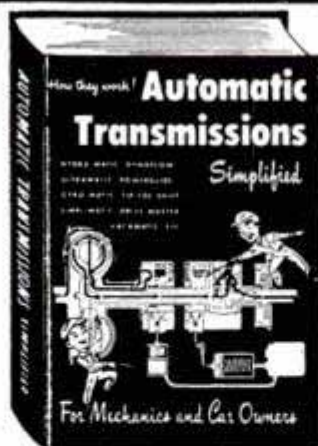
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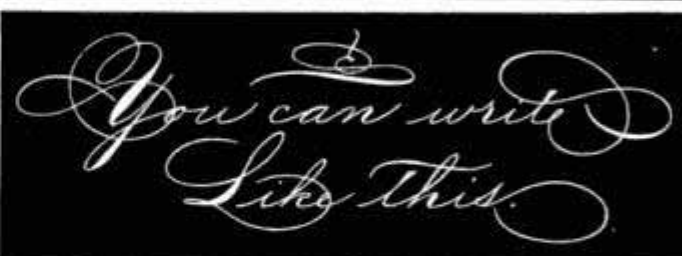


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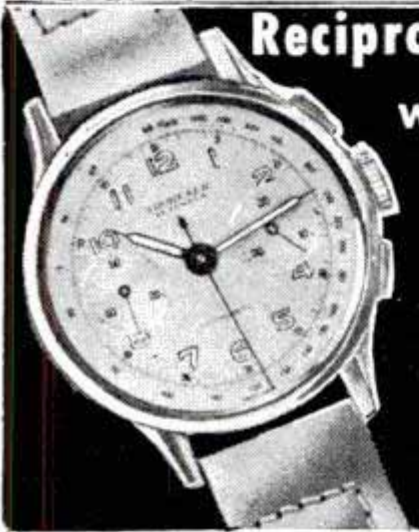
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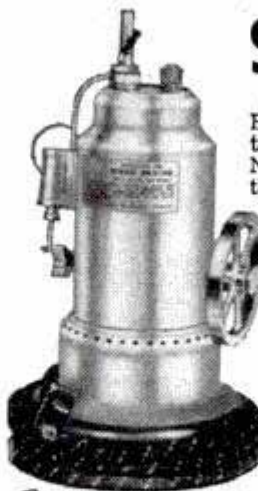
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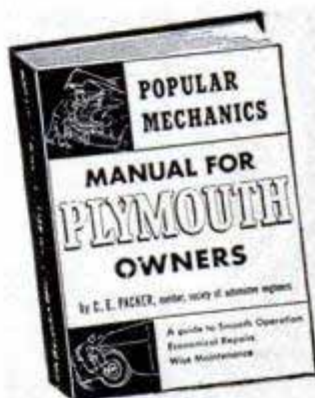
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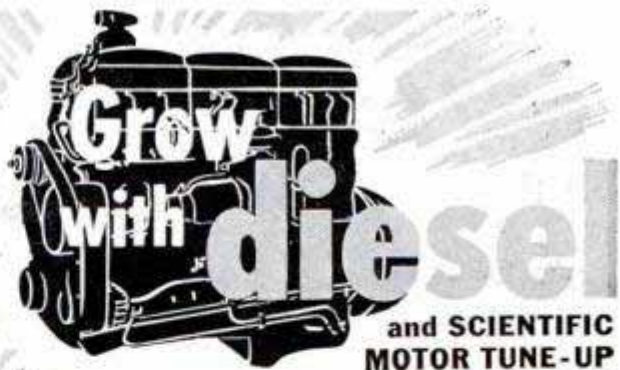
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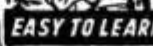
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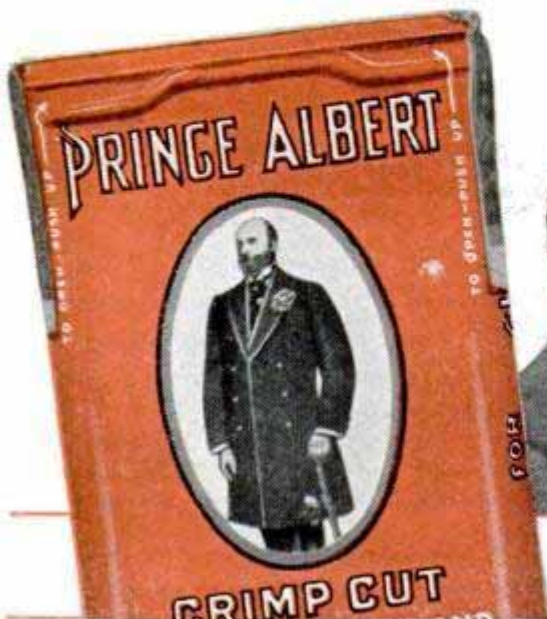
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The National Joy Smoke

TV's LITTLE BROTHER

By Creighton Peet

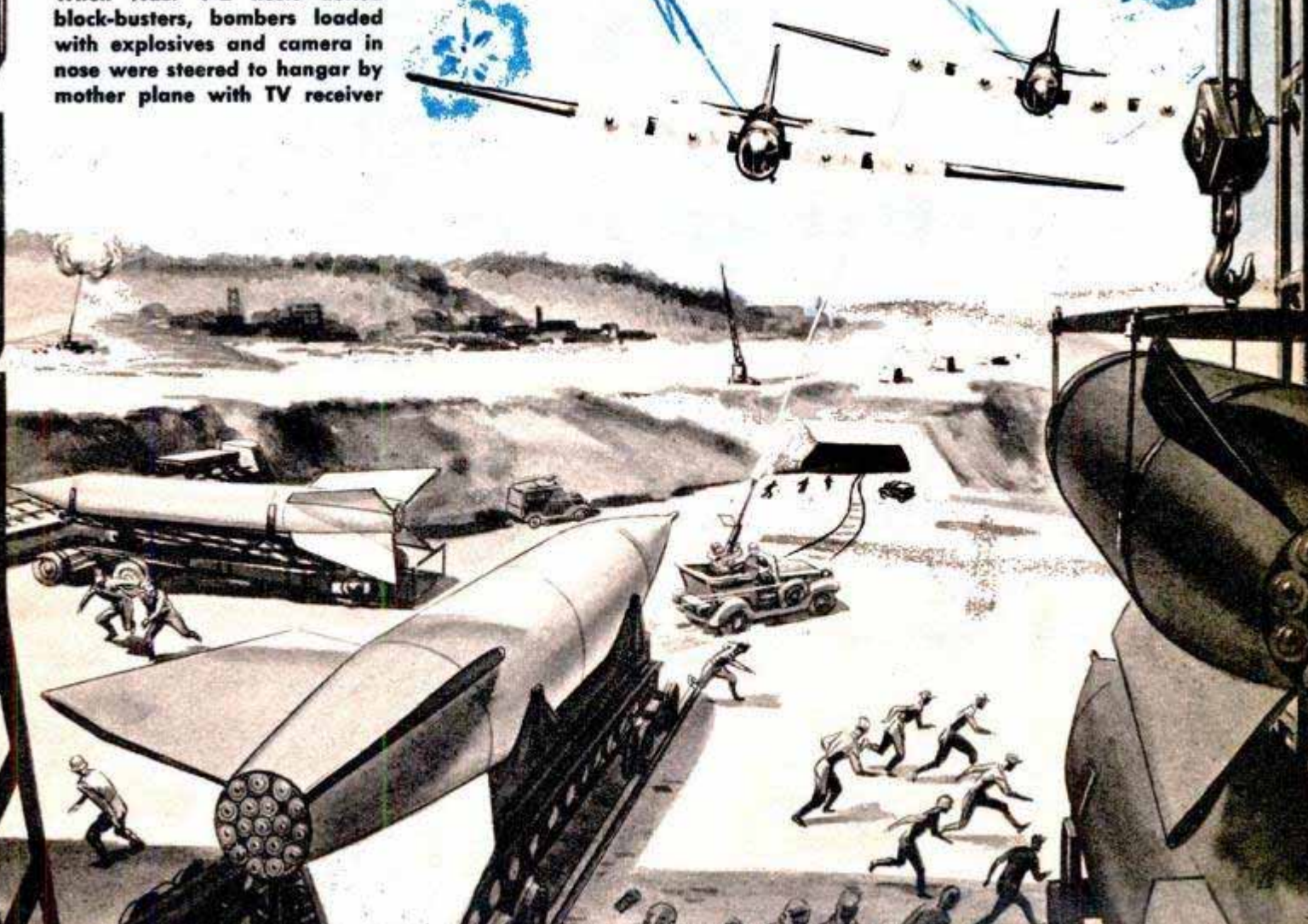
YOU CAN use it for anything—absolutely anything. It will show you what's going on around corners, through walls, underwater, in the dark, at the bottom of an oil well—or inside the human stomach.

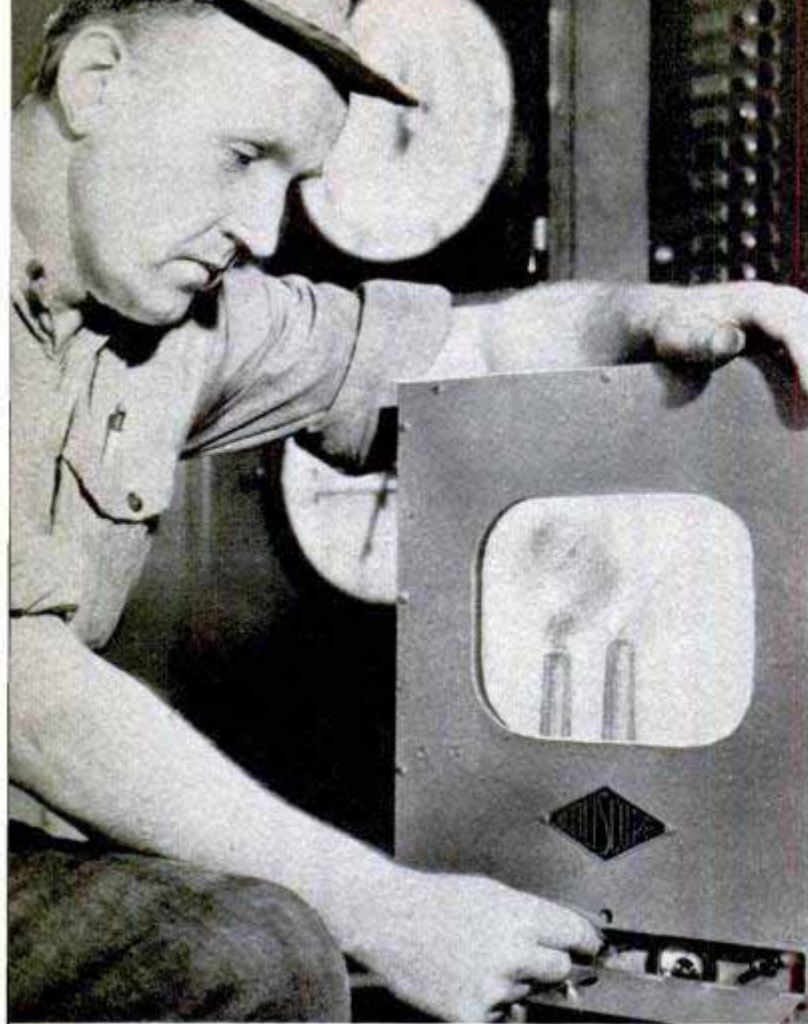
It's TV's little brother, a small and comparatively inexpensive wired television setup designed for industrial uses. Already three such devices are on the market. Diamond Power Specialty, a subsidiary of I. T. & T. has the Utiliscope; Remington Rand has developed its Vericon, and RCA the Vidicon. In one model the orthicon tube is the size and shape of a small flashlight, and its housing looks like a 16-mm. home movie camera.

Among the hundreds of uses to which such tubes have been, or could be, put, a few are: watching a machine in a factory, a flame under a boiler and a water gauge at the top of a giant boiler.

They also guard prison corridors, or keep an eye on a jewelry counter in a store. They can be used to check progress along an assembly line, or the density of traffic at critical intersections. One operator, one

When Nazi V-2 nests defied block-busters, bombers loaded with explosives and camera in nose were steered to hangar by mother plane with TV receiver





In a sub-basement boiler room, engineer watches TV screen to inspect smoke coming from three chimneys. Medical students at the University of Kansas, below, follow an operation taking place in the next room



guard, or one production manager can perform the work of a dozen or more men.

This junior TV has so many possibilities and implications that even its manufacturers are a little skittish about it. Compact and easily transported, it can be plugged into any standard 110-volt household electric outlet. Planted indoors or out to watch and trap suspects, it becomes an extra eye in police work. As such, it makes the much-debated wire-tapping seem as innocent as "drop the handkerchief."

Its relationship to labor will be even more complicated to resolve. How many pairs of human eyes these tiny TV tubes can replace, nobody has even tried to estimate—but coupled with the incredibly skillful automatic devices already speeding production in American industry—they are something to reckon with.

One use for this wired TV will meet with no opposition from anybody. In perfect safety, operators can now watch remote-control manipulations in areas filled with radioactivity. They also can observe critical blending of unstable chemicals and get a good close-up of the blast from an experimental jet or rocket. Sealed in a container with a suitable light source, it can report on the underwater damage to a ship's hull, or help in salvage operations.

In some situations camera units are expendable, and in years to come this device is destined to save many lives. A good number are already at work in atomic-energy plants, and other defense projects shrouded under security regulations.

Probably the "oldest" installations in continuous service are those of the four Utiliscopes which the New York Edison Company uses to check on the water level in some of its five-story steam boilers. For four years now, two or more of these little TV eyes have been at work 24 hours a day watching the gauges which indicate the water level in drums at the top of the boilers. This information is relayed to the main control panels on the ground floor.

A pressure of 1400 pounds to the square inch, and a temperature of 900 degrees require special mica-coated glass one inch thick—and even this blows out from time to time—so that watching these gauges can be dangerous.

Another early application of the Utiliscope was in strip coal mining. It was discovered that in operating a power shovel capable of picking up 40 tons in one load, the operator had no direct view of the scoop. Frequently, he came up with half loads, which resulted in a loss, as the shovel was very costly to operate.

A TV camera installed on the upper rim of the shovel, with the receiver in the operator's cab, gave him a clear picture of

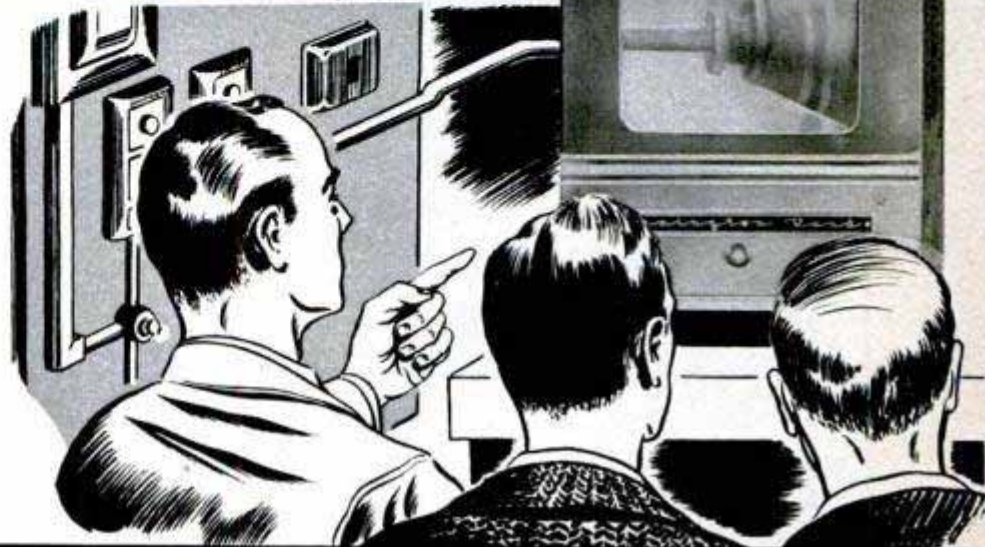
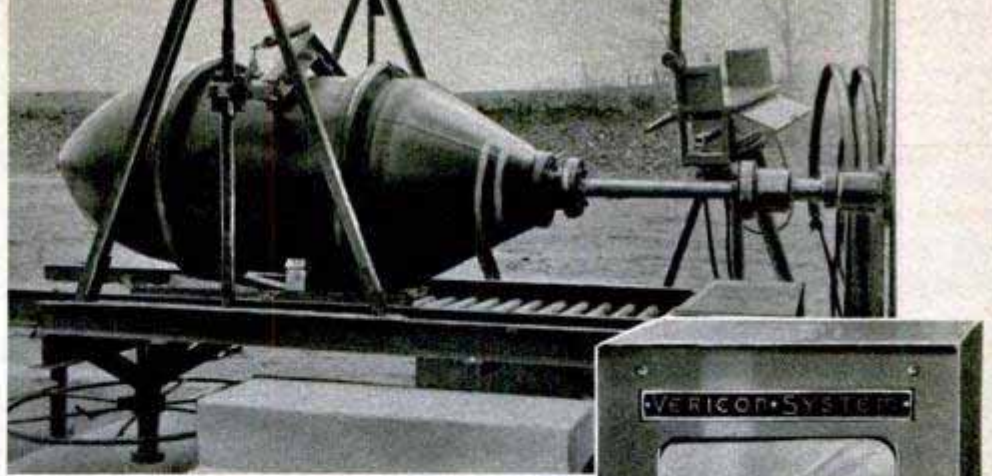
exactly how much material he had picked up.

Still another use of the Utiliscope is in the steel industry, in the B & W Tube Works, of Beaver Falls, Pa. Here a camera equipped with a telephoto lens is used to watch the surface of molten metal in a continuous casting process. This eliminates the need of a man standing close to the casting pipe.

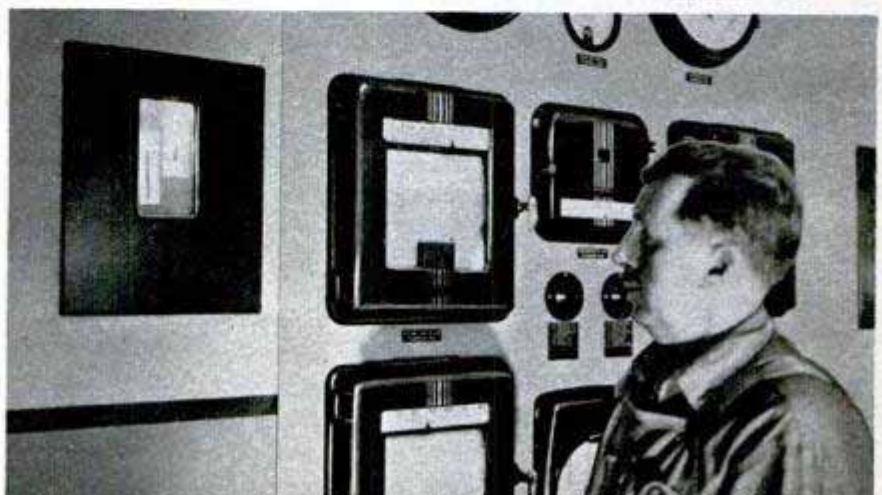
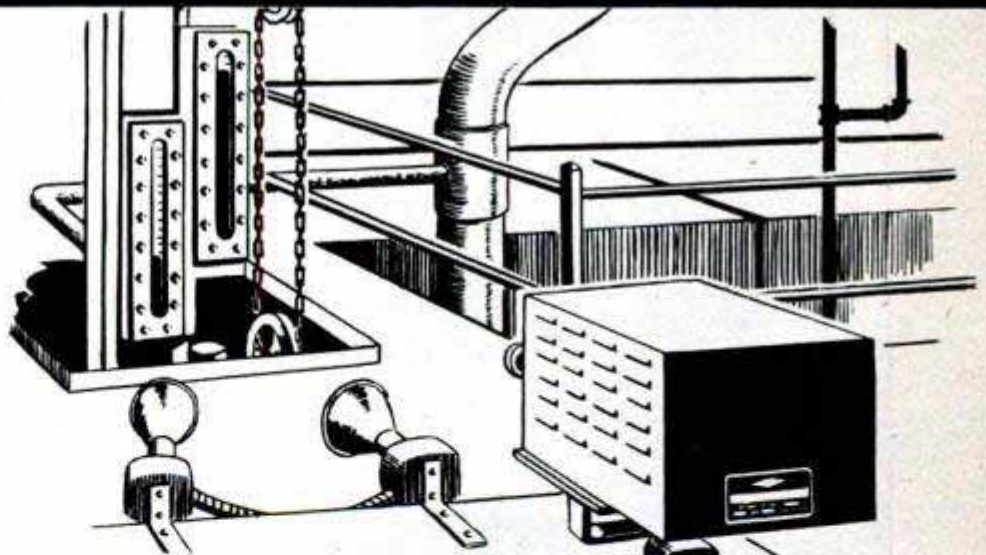
While standard broadcast television has about 525 scanning lines, the Utiliscope picture has but 220 lines. The resulting picture is not quite as clear as that on your home set, but is entirely adequate for the vast majority of industrial applications, and cameras and viewers can be connected with ordinary cables instead of coaxials. The picture will carry about 500 feet without booster equipment, farther with it, and as many as 10 viewers can be connected with one camera. The total cost of one complete Utiliscope installation is between \$3000 and \$3500.

Remington Rand's Vericon, developed under William L. Norvell, chief of the Guided Missiles Branch in Air Communications as a lieutenant colonel during the war, has found its chief uses so far in military and defense plants, and the observing of surgical operations. The Vericon uses a standard 525-scanning-line picture and a coaxial cable. A complete unit runs to about \$8500.

More than a score of Army ordnance depots around the country are also equipped with these little TV eyes to make the defusing and disassembling of various types of ammunition safer. Personnel located in a concrete bunker half a mile away can defuse a bomb



Defusing of a bomb, top, is about to begin under observation of camera while, safely within a concrete shelter, technicians watch the operation. Below, gauge on drum of steam boiler builds up to 1400 pounds' pressure under the watchful eye of an engineer who is safe in remote office



Other uses for the new television

- quick signature verification
- reducing production costs
- saving money on protection
- protecting safes, showcases
- increasing sales



When illuminated by infrared light at night, safes and showcases are apparently in total darkness, yet every detail is visible on viewing camera. A single guard in another room can observe many such scenes

Speed and accuracy in verifying signatures on checks and inspecting documents are vital to banks and other businesses. With a viewer convenient to verifier in vault or file room, comparison can be made quickly



by means of a power-operated wrench, watching the progress of the work in their viewer.

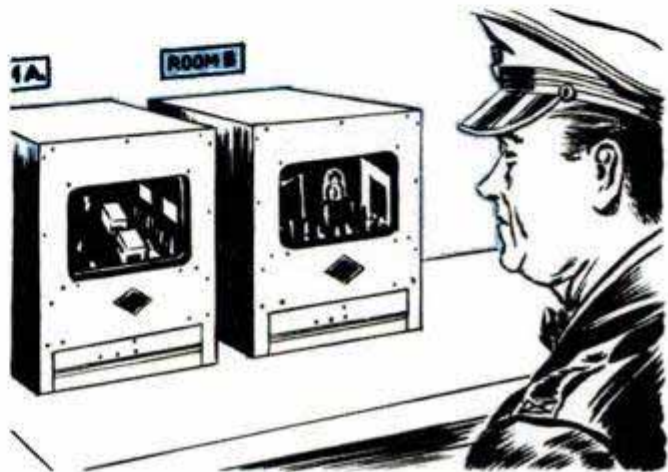
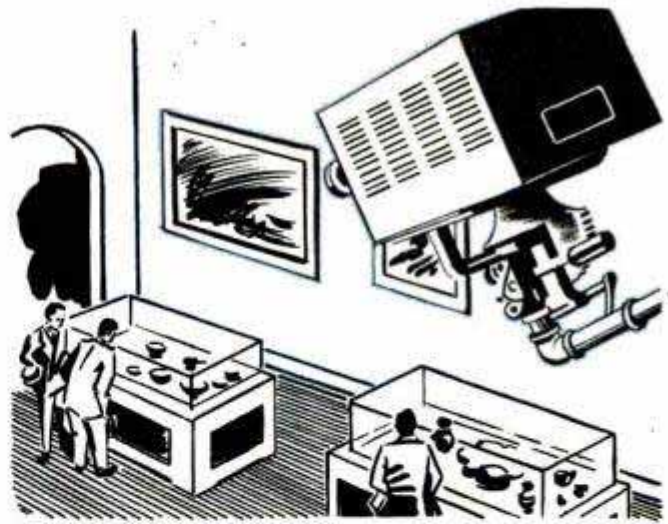
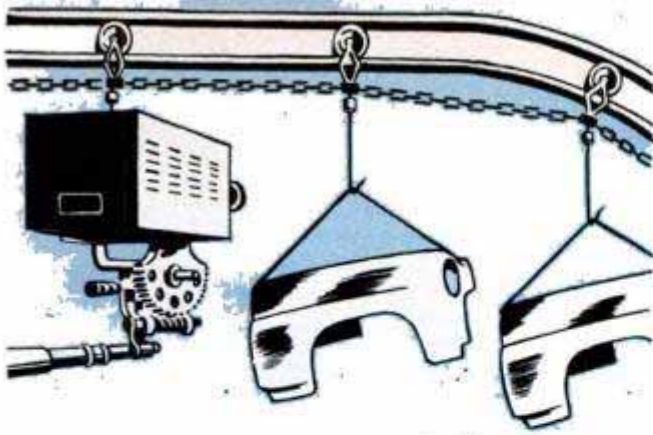
RCA's Vidicon, also using a 525-scanning-line picture and a coaxial, is just out of the laboratory and has had few installations as yet. The tube is but one inch in diameter, and its housing measures only 3½ by 5 by 10 inches, making it unusually compact.

It is expected that this device will find many jobs in industry in the inspection of small or inaccessible spaces, such as cylinder or cannon bores, the interior of factory chimneys, grain elevators, or the joints in oil-well casings.

Obviously, all of these devices can be adapted to almost any use, but here are a few additional applications which are either in use or being considered:

A bank in Texas is installing equipment so that checks and other documents presented at windows in its main banking floor can be inspected on screens in upstairs offices.

Department stores could install screens



In large plants where economical scheduling and pacing of assembly are important, supervisors can be watching a series of key locations on screens at same time. Shortages can be caught before they are serious

Constant safeguards against thievery are necessary in museums where valuable objects are on display. From a central station, one watchman at viewing screen can keep a series of exhibition rooms under close scrutiny

in street windows or booths on the first floor, so that passers-by could see a fashion show or some other special event, such as Santa Claus, on an upper floor.

One watchman with an eye on a central control board, could cover 20 or more check points in a factory, or in a series of buildings. Automatic panning devices, similar to those which swing electric fans in wide arcs, could enable each camera to cover two or more corridors.

The Utiliscope, which is sensitive to infrared illumination, could spot intruders even though they were apparently operating in total darkness. Undoubtedly, the FBI and other detection agencies will make great use of this device in the near future.

In psychiatry, too, it has been suggested, students in one room could watch the reactions of a patient being treated in another room, without his being disturbed by their presence.

Traffic-control officers and highway, bridge and tunnel officials could get a clear picture of traffic jams in the process of forming by watching the flow of vehicles

at critical points in a central control room, and then directing motorists to detours and alternate routes, through traffic officers.

One project at present under consideration by a major motor manufacturer, would place cameras at key points on the subassembly lines feeding into the main assembly. Thus an engineer watching the progress of work on a dozen smaller lines, could spot a bottleneck before it developed, and do something about it.

Hooked up to a microscope, such a small TV unit would enable a whole class of students to watch a demonstration by an instructor. Several receiving sets could be placed around the classroom.

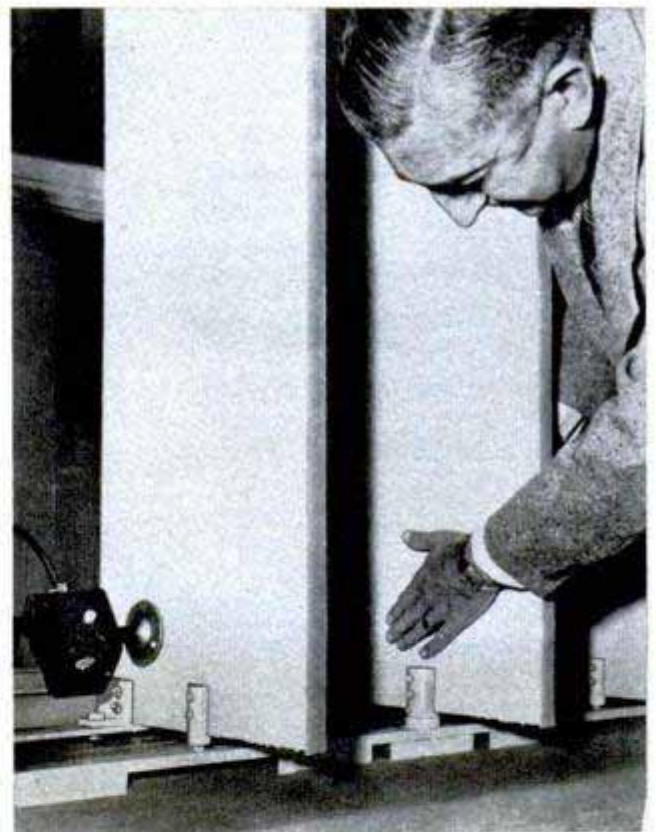
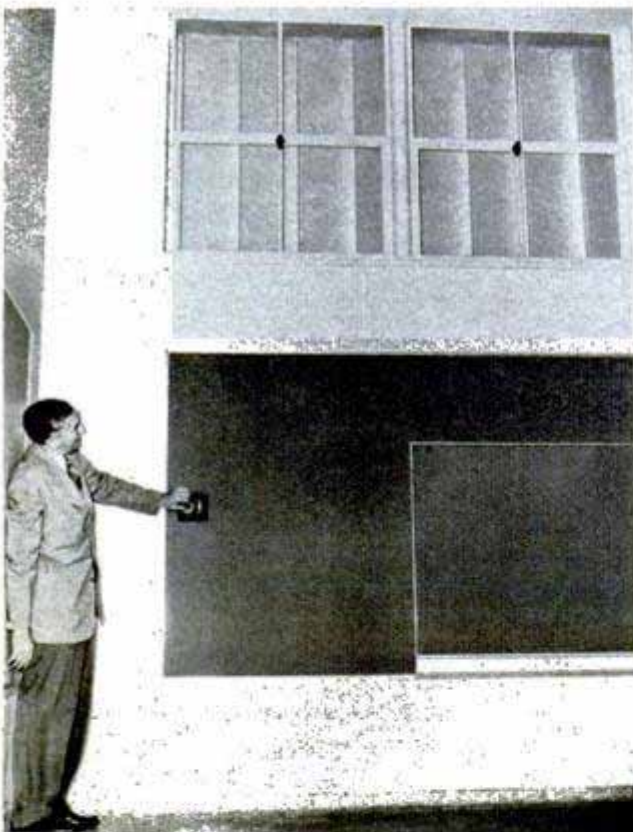
The present development of wired, industrial television was of course inevitable, but long before millions of people were watching Milton Berle in their homes, both the Navy and the Air Force had experimented with both planes and weapons equipped with television.

In one form tested at Lake Muroc, Calif., a TV transmitter was mounted in the nose

(Continued to page 260)



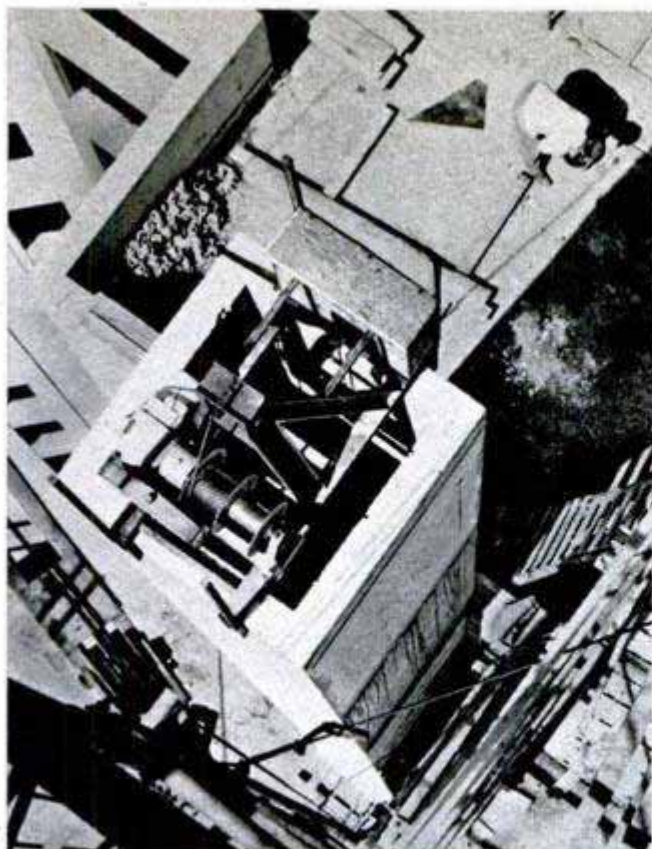
Electric eye measures sunlight and adjusts window louvers of this new school. Below left, switch permits teacher to darken room manually. Right, "eye" peers through one louver to measure light on adjacent panel



Sun Operates Window Louvers

There's never too much or too little sunshine in the classrooms of the new Will Rogers Elementary School, Ventura, Calif. Robot louvers automatically pivot to maintain exactly the right illumination inside the rooms. On a dull day the aluminum louvers are wide open; when the sun shines brightly the louvers are partially closed. An electric eye constantly meas-

ures the outdoor light that falls on a master louver to operate the concealed motors mounted in each classroom. The electric eye does an efficient job except on some foggy days when there is a great deal of glare from the sky. Then a second eye, installed inside one of the classrooms, takes control and measures the amount of light that is actually present. The louvers can be operated manually when the room is to be darkened.



Chimney Is Shaft for Bricklayer's Elevator

Bricklayers at a giant housing project in Los Angeles must have felt like Santa Claus on Christmas Eve as they worked on one-man elevators inside the project's chimneys. The inside of the concrete stacks had to be lined with brick. To do the job, bricklayers rigged up tiny elevators inside the stacks on which they worked. Controls on the elevators allowed the bricklayer to

move up as his work progressed and to lower himself to the ground for more bricks and mortar. An electric motor and winch, mounted on a frame that straddled the stack opening, provided the power. There are 18 chimneys, each 150 feet high, in the project. It took 13,000 bricks to line each stack and the bricklaying time per stack was between 11 and 14 days.

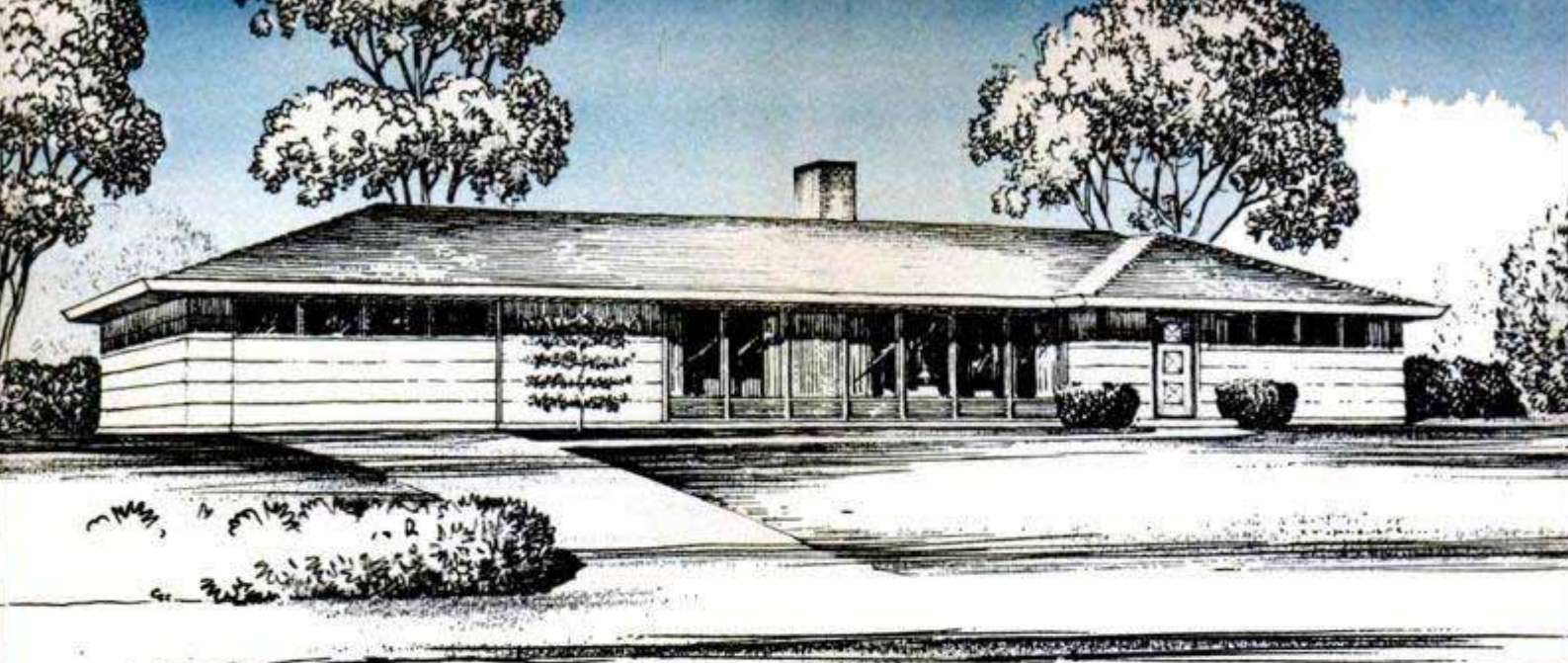


Army Paint Mixer

Army ingenuity again makes news. T/Sgt. James Parish, at the Air Force Base, Chanute, Ill., was given the job of mixing paint for remodeling barracks. After mixing 15 gallons of the stuff, Parish figured there must be an easier way to do the job. With some discarded oil drums, borrowed electric drills and handmade paddles he fashioned a series of mixers which pour out the paint in wholesale lots. Parish can mix 150 gallons in 15 minutes.

¶ In 1949, 31 percent of our electricity was generated with gas and oil, a big jump over the 1929 figure of 14 percent.

U. S. Air Force photo



This is the architect's drawing of the new PM plywood house which Tom Riley is building in Portland, Ore.

I'm Building the POPULAR MECHANICS **PLYWOOD RANCH HOUSE**

By Tom Riley

HAVE YOU toyed with the idea of building your own home? After looking at some "for sale" prices I certainly did. Before the last war, few amateur carpenters even thought of building on their own. Since the war a hundred thousand families a year are building all or large part of their homes.

There are two reasons for this: One is that you can do it! Modern methods of construction and power tools have eased

the job for the amateur carpenter. The other is that you can do so much more with the money you have; 55 to 65 percent of the cost of a house is in the labor. You can save that 55 to 65 percent by doing it all yourself, or a very good percentage by doing part.

House-building is one of the few things you can jump into and learn the mechanics as you go. The first months are spent in rough carpentry, building forms and sub-floor, places where cabinet-fit joints are not needed. You can bang your fingers the first day (as I did) but you will have plenty of time to learn how to use a hammer and saw before it is important in the final appearance of the house.

This project started in June 1949 when Roderick M. Grant, the managing editor, was on a trip throughout the West Coast. He noticed the high amount of modern construction used there on the popular ranch-type home and as I live in Portland, Ore., amidst this modern construction, he asked me to write a book.

"Riley, you're not a carpenter. If you personally build a modern home you'll

James R. Ward, crafts editor, studies plans for the house with — you guessed it — Mrs. Riley who is helping Mr. Riley saw boards and drive nails



meet every complication the average amateur will meet. With that and the advice and supervision available from our staff in Chicago the book will be really authentic!"

My reaction was that if Riley could build it that would be a mighty good test.

One of the country's most capable home designers was on the West Coast, John J. Whelan, the architect who designed the Drew Pearson home in Virginia and the Lanai Rooms of Colorado Springs. The editors chose him to design the home.

This modern home will be outstanding in that it is designed for three different exteriors. Basically a ranch house, its exterior can be the rambling conservative ranch house, or the contemporary ranch house with louver windows and ground-hugging lines, the one I am building; or you can build it as a modernistic home with a flat, water-layer roof.

Today's improved plywoods will be used extensively; they are easy to build with, and give the strongest construction.

I am first building the basic house—for this design is also that of an expansible house. You can build to the stage of two bedrooms and a carport. Or you can include, or add later, the breezeway and garage. Then the carport becomes a third bedroom or den.

James R. Ward, crafts editor, flew to Portland last May to choose this site, and a friend and I started construction during May and were framing the house in a month. First job is the foundation. Don't be afraid of hiring power machinery for

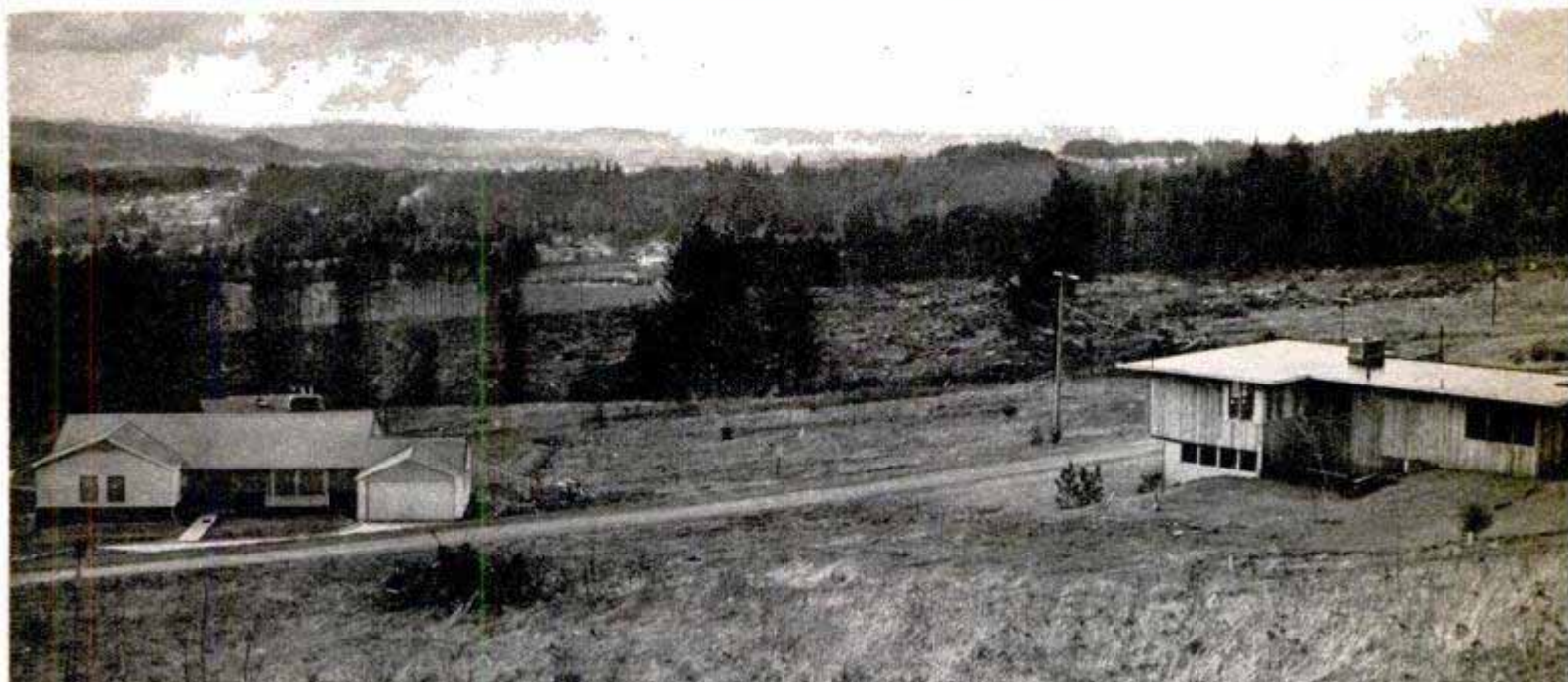


After a few turns with the shovel, Tom advises: "Don't be afraid of hiring power machinery for the excavation." Mrs. Riley kibitzes

the excavation. We started digging a water trench—oh, our aching backs—and then hired a small power shovel to excavate trenches and all for \$60, a job that would have taken us two weeks of heavy labor. The modern foundation being used is called the "stepdown" wall—poured concrete with a step or pocket inside so that the floor joists will be low instead of resting on top of the concrete. The finished floor of this ranch house, with or without basement, can be just a few inches above lawn level, giving true ground-hugging lines.

Progress reports on this house, third in the series of Popular Mechanics "build-your-own-home" projects, will be published monthly until the detailed story and step-by-step plans begin in the Craftsman Section early next year

Site of the PM plywood house is in the foreground and this will be the view from the Rileys' front windows



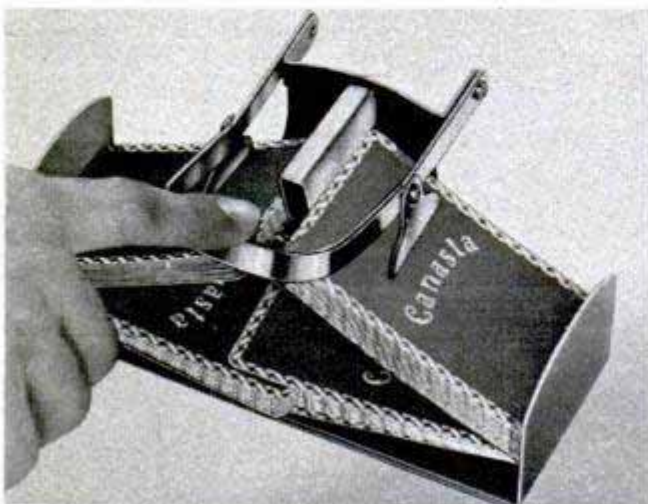


Color Photos of "Off Color" Eggs

Food inspectors who candle eggs to make sure they are suitable for eating now photograph each egg in color to preserve evidence of food-law violation until the case comes up in court. The egg-photographing machine, invented by Forrest E. Trimble, California agricultural inspector, uses a 35-mm. camera to photograph the egg as it is being candled. In natural color, the picture provides the court with an accurate description of the egg's condition even though the trial is held months after the violation was discovered.

Shuffler Mixes Canasta Deck

Canasta players will welcome a mechanical shuffler that thoroughly mixes the 108-card deck in 10 seconds. Two halves of the deck are placed in the shuffler and a simple finger-tip pressure on the boom riffles the cards without bending or curling. The device not only speeds shuffling, but is said to make cards last longer.



Armrest for Car

Easy-chair comfort for the car driver is provided by an adjustable armrest which hooks over the back of the front seat. The driving aid—a flexible metal bar with a sliding cushion—fits all cars. A small lever permits the foam-rubber cushion to be adjusted to the most comfortable height, then locked in place. The metal bar is covered with fabric to prevent damage to the car upholstery.

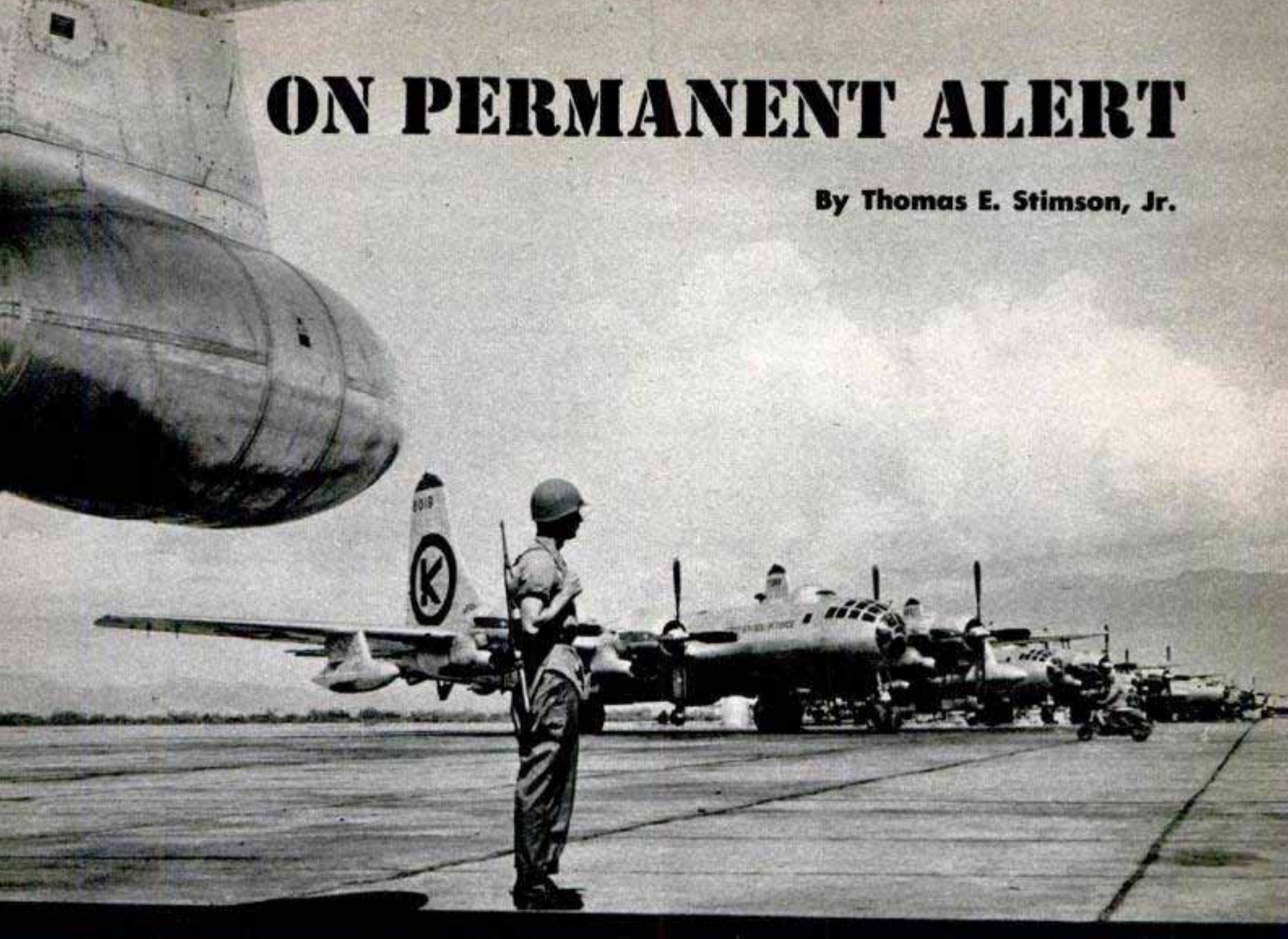
Monkey Tells Time By Rolling Eyes

You have to look a monkey in the eye to tell what time it is on a novelty clock manufactured in Germany. The monkey's right eye tells the hour and the left eye the minutes. The eyeballs revolve as the minutes elapse and a line painted on each iris serves as a clock hand. At quarter past three, the monkey has a sly expression, looking out of the corners of his eyes. At six o'clock, the monkey becomes completely confused with one eye looking up, the other down.



ON PERMANENT ALERT

By Thomas E. Stimson, Jr.



Guarding long line of "ready" B-50s in Arizona. Fitted for mid-air fueling, all are intercontinental bombers

LATE ONE RECENT evening the flight crews of the 43rd Bombardment Wing filed into their assembly hall for briefing on the next day's strike.

It was to be a training mission and it had been assumed that an aggressor nation had captured our west coast. The 43rd's big bombers were to hit enemy headquarters in San Francisco, simulate dropping of bombs and return to their base.

No bombs would be dropped, no shots would be fired; aside from that the training mission was in grim earnest.

Like the other elements of the Strategic Air Command, the 43rd is on a permanent alert. Intercontinental bombers can take off from Davis-Monthan Air Force Base in Arizona or any bomber base in America and fly direct to any part of the world, refueling as often as necessary from aerial tankers en route. In the

last couple of years the B-50s have roamed over much of the world on practice missions. They can carry anything from incendiaries to atom bombs.

In the 43rd's briefing hall the lights were turned off and on the stage an intelligence officer adjusted his microphone. Behind him a huge map of continental United States slowly became visible in the dark—

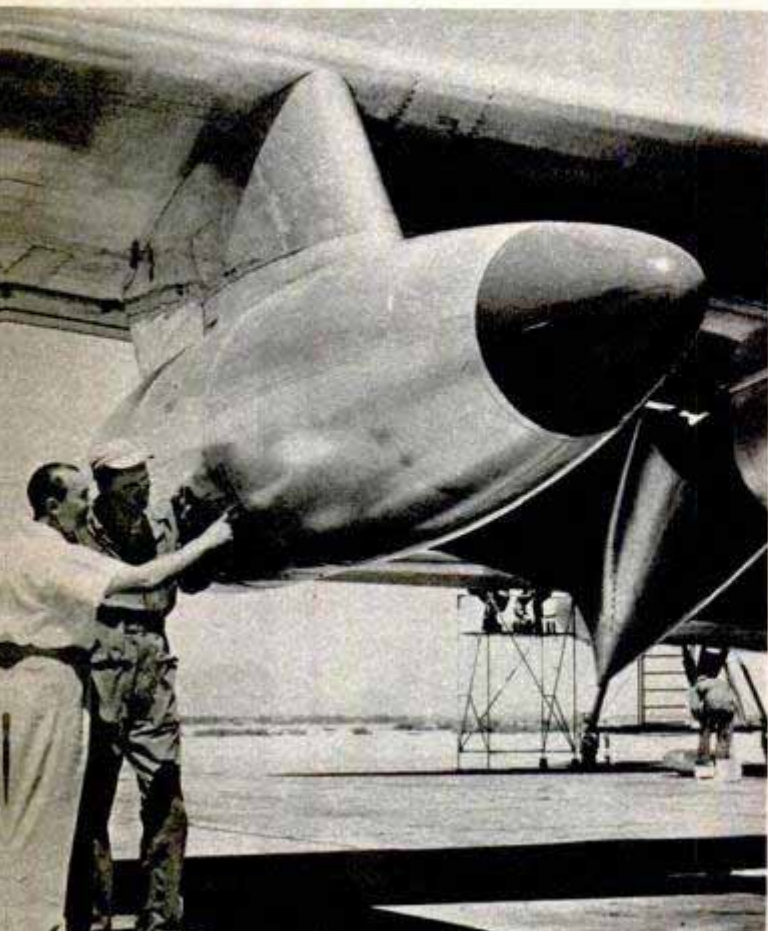
Eleven-man crew of bomber buckle on parachutes following a pre-take-off inspection by plane commander. Most missions are flown at high altitude





Intelligence specialists prepare a fluorescent map for briefing, marking route and other pertinent data

Two droppable 700-gallon fuel tanks, like this, or a pair of 4000-pound bombs can be hung beneath wing



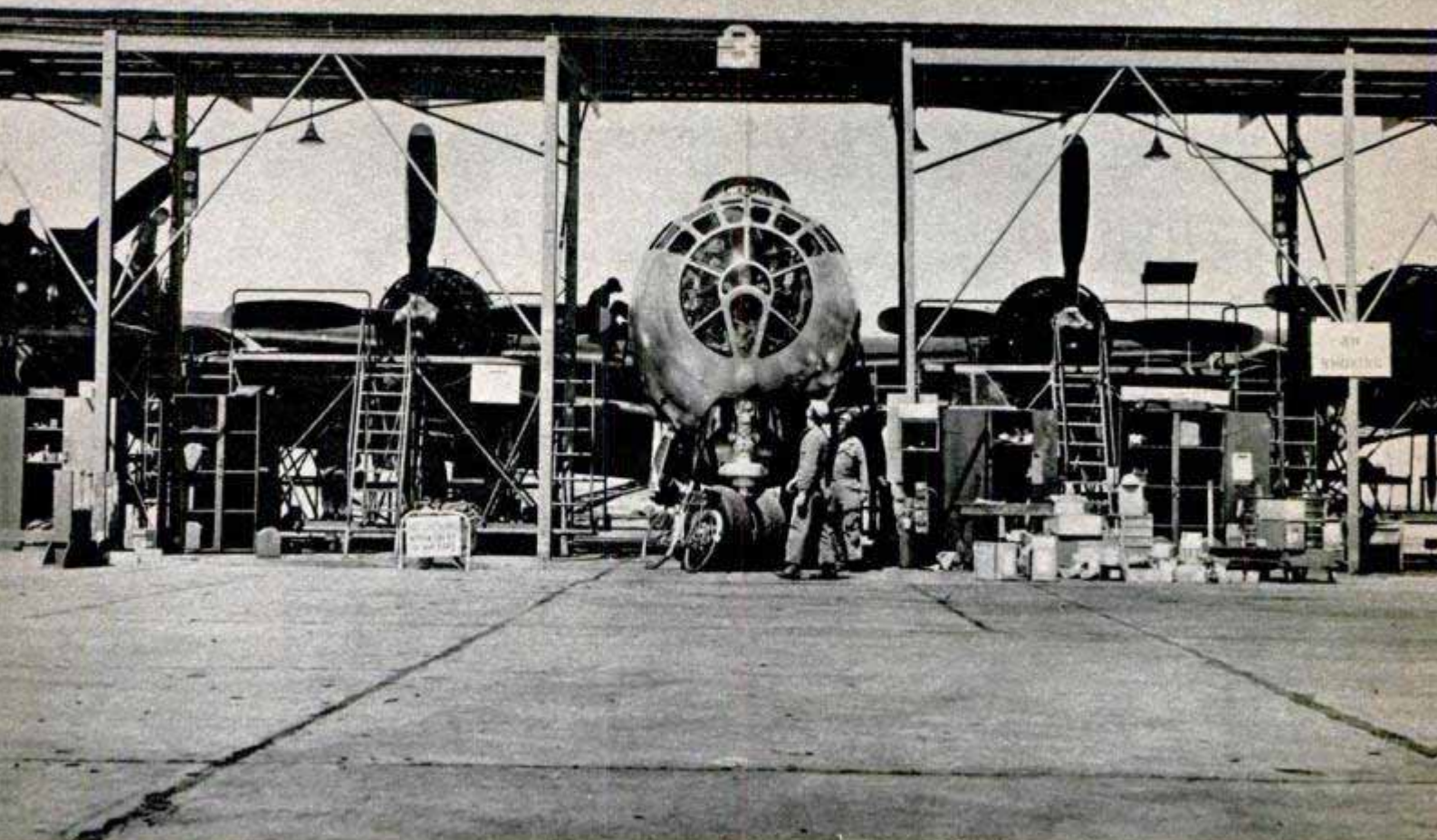
fluorescent colors glowing under the rays of concealed ultraviolet lights. Outlined across the map was the bright red course line that the bombers would follow.

"Remain on course from Mount Whitney to the initial point at Monterey," the intelligence officer instructed his audience after describing take-off and flight procedure. "The axis of attack from Monterey to the target is 343 degrees True and the 75-mile bomb run will take you 11 minutes.

"Primary method of bombing will be by radar, with the aircraft in the formation dropping by toggle switch as soon as the group leader's bombs fall away. In the event of a break in the clouds over the target, you will drop your bombs by visual reference."

A big round picture that glowed in the dark was pushed into place on the stage. "This," the speaker continued, "is a reproduction of a radar photograph. When you make your turn at the initial point the image you will see on your radar screen will look like this. The orange stripe on the picture is your bomb-course line.

"As you fly north you will be able to identify on your radar screens the bright image that locates Dumbarton Bridge and the area of return that identifies San Mateo Bridge. The next outstanding image ex-



Complete "power package" speeds servicing. In an hour men can replace engine with pretested unit

tending across the water will be Oakland-San Francisco Bridge. Your aiming point is west of the southwestern approach."

He went on, using a pointer with a fluorescent tip to indicate points on other maps that were slid onto the stage.

"If you get into trouble over the target area and are forced down, head west to the Pacific Ocean. Ditch your aircraft at points A, B or C. Friendly submarines will surface there at exactly 1230 hours to rescue any of the unlucky."

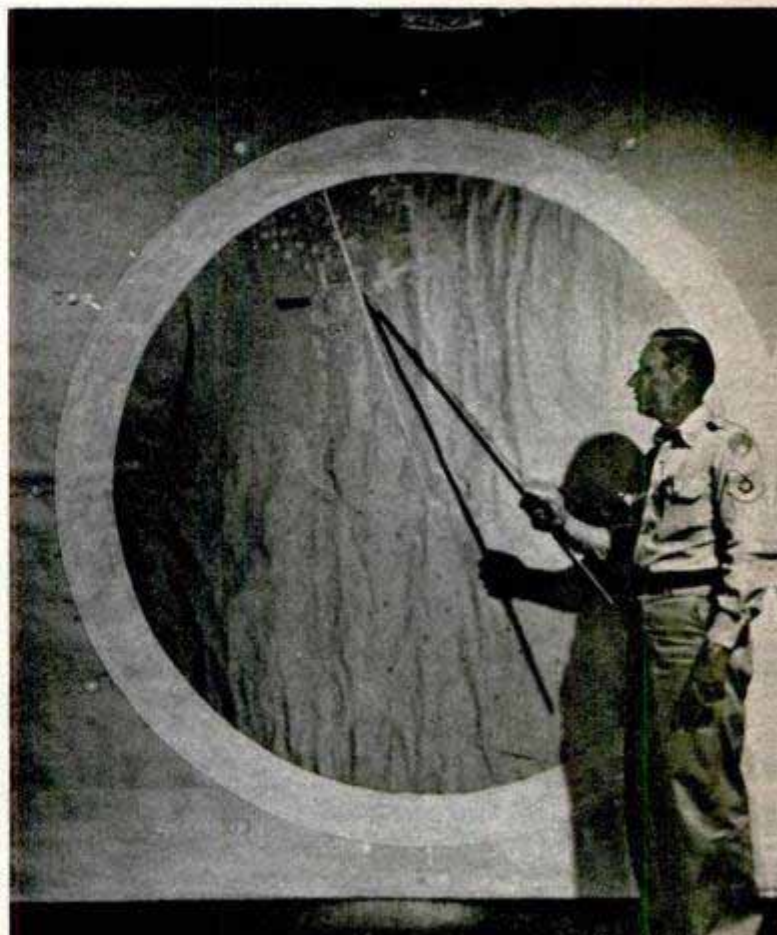
Another intelligence officer took the stage to outline the support that the bombers would receive.

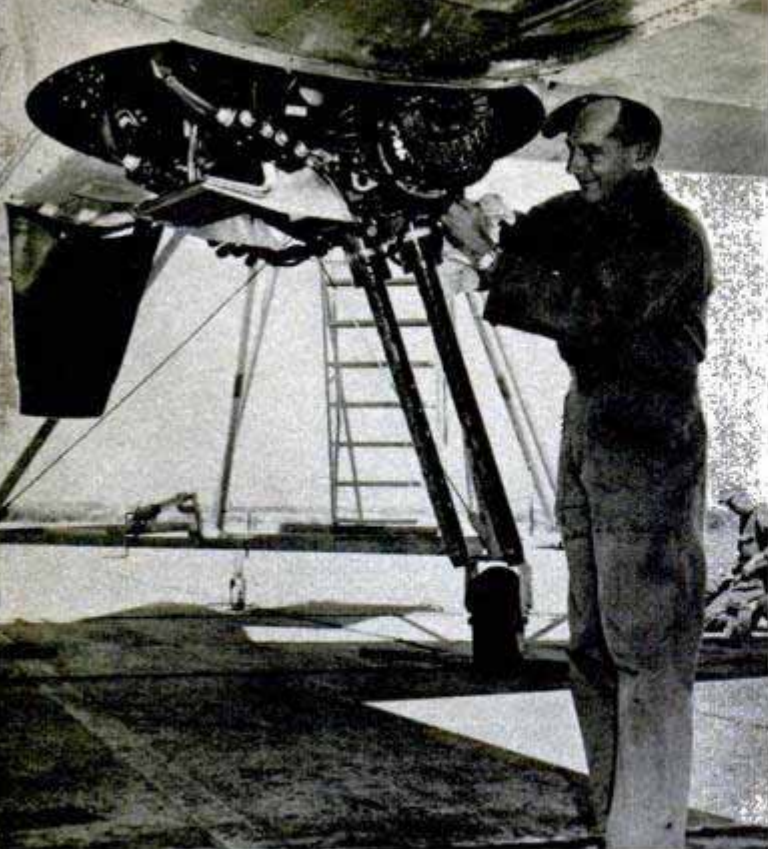
"Your first rendezvous with friendly fighters will be over Mount Whitney," he said. "The cover will consist of fifty F-86 jet fighters from Kingman, with two all-weather aircraft as guide planes.

"Fifty F-84 jets from Tonopah will join you at Monterey. They will provide high cover and will drop down for escort duty five minutes beyond the target. In addition you will have coverage from below by 50 F-80s from Elko, rendezvousing over the target at 1220 hours. A diversionary strafing and dive-bombing raid on Sacramento will precede your strike by one hour."

The talks went on, each member of the intelligence team contributing his special

Enlarged radar photo of the bombing-run area. Ultraviolet light causes the airman's face to appear black





One of the remotely controlled gun turrets in belly. The 400-mile-an-hour B-50 can also drop atom bombs

information. The expert on enemy defenses was last.

"Gentlemen," he said, "here is what you are up against. The target will be defended by 200 swept-wing jets marked with a yellow triangle on the vertical stabilizer. Each is armed with a pair of 25-mm. cannon and four rockets. Your own guns plus fighter cover can take care of this interference.

"In addition there are 108 anti-aircraft guns of up to 200-mm. in the target area, as indicated by this map. They are all radar-directed.

"Only a few of these guns can reach your

altitude, and your axis of attack has been planned to avoid most of the guns that could get to you. You'll be relatively safe.

"Four flak boats in the target area are equipped for launching a new radar-controlled rocket, but your axis of attack will keep you at a good distance from them.

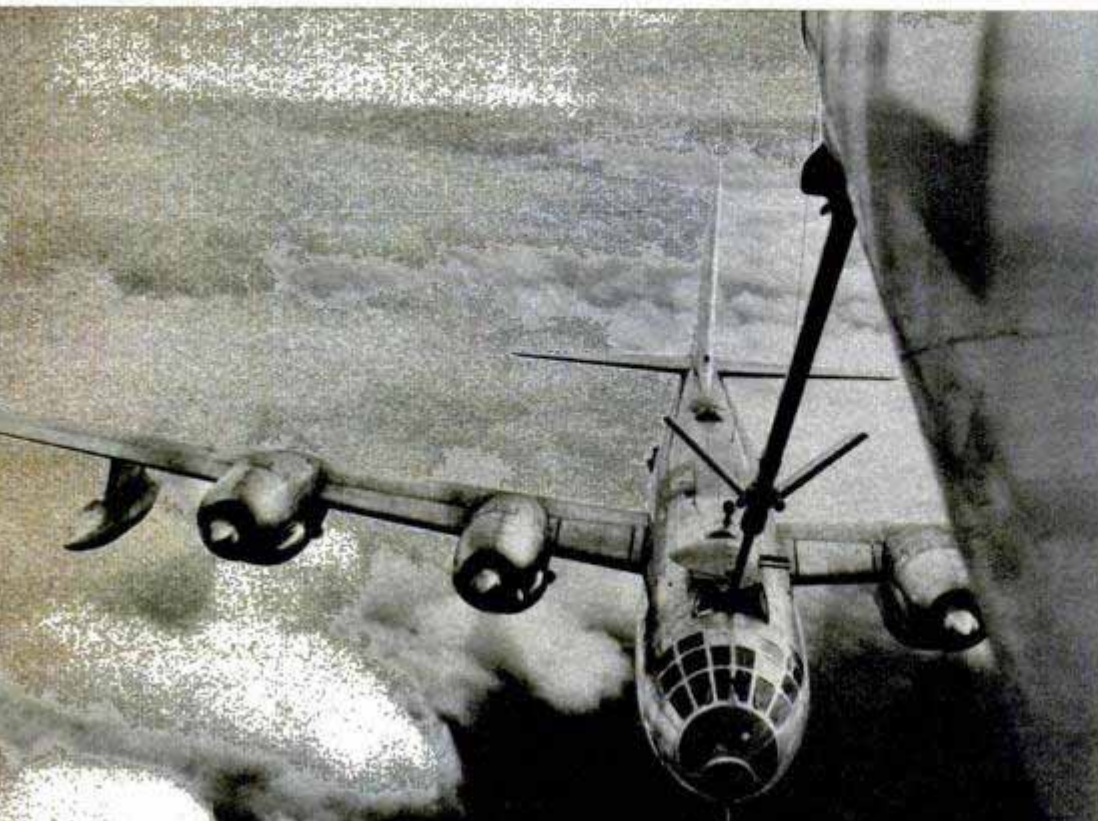
"The enemy also has three guided-missile sites in the immediate region. The missiles are radio-controlled and are very effective in a 50-mile radius, so you must be certain that your radio jammers are in constant operation to counteract their aim.

"We have information that the enemy is using a rocket which, when it reaches a certain altitude, opens a parachute and then shoots out incendiaries while it is descending. Report on these if observed. We want to know the size of the parachute, the area covered by the incendiary explosions, the color of the explosions and the number of times the substances are emitted. All this is important to our future operations.

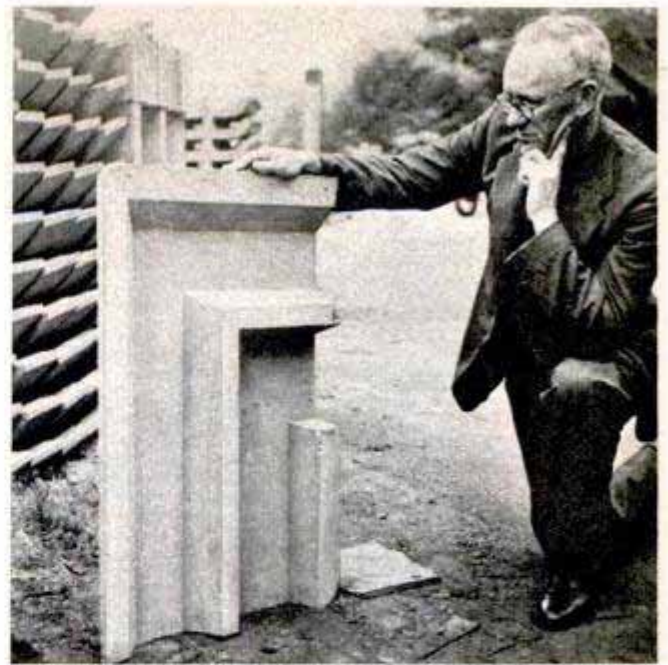
"We will now turn on the lights and synchronize our watches with a time hack. Pick up your survival kits when departing from this room. Any questions?"

Change some of the names and figures, and this briefing could apply to a bombing raid against any enemy anywhere on earth. The job of the strategic bombers is to destroy an enemy's munitions and fighting materials no matter where they are located. The 50s, like the even bigger B-36s, could carry bombs halfway around the world and continue nonstop around the other half of the globe in returning to their bases if necessary. This was demonstrated last year by the world-girdling flight of the Lucky Lady II, a B-50 of the 43rd wing.

(Continued to page 262)



Fuel from a tanker plane flows through telescoping metal tube into a socket behind the nose. V-shaped wing on boom helps guide nozzle into position for mid-air fuel transfer

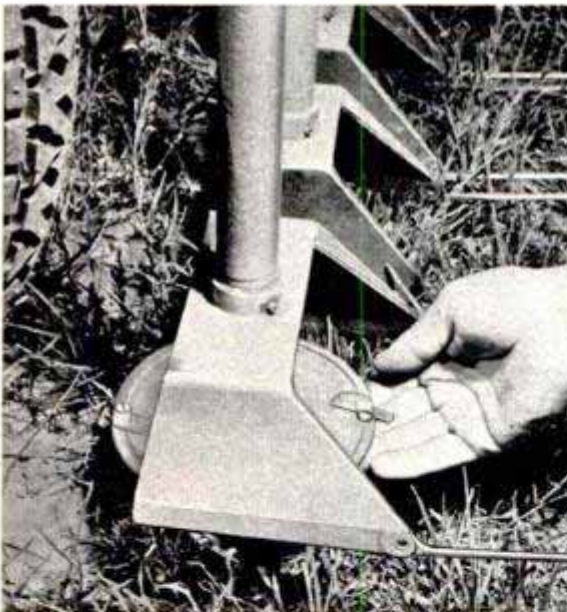


Copyright by Mirror Features

Prefabricated Eaves

Prefabricated concrete eaves for houses are being cast in England. The artificial stone block, made in nine-inch lengths, combines the gutter with the complete eaves, eliminating roof tiling and felting, some brickwork and rafters, offsets and

metalwork. Each block has a raised portion in the center and at either end. One raised strip holds the block under the rafters, and the outside "valley" forms the gutter. The blocks are cemented together and the gutter lined with a waterproof plastic. Special blocks are cast for the corners and for entrance of the downspouts.



Flax Weeder

Weedless flax fields are possible through a cutting machine developed by Floyd Grapp, a University of Minnesota machinist. Flax straw, free of weeds, is needed to produce linen fiber which will compete

with European imports. The machine cuts weeds from more than 20 rows of flax simultaneously. Revolving shafts on the machine terminate in disks which whirl between the rows. On each disk are four razor blades which clip off the weed stalks close to the ground.

No-Steam Coating for Mirrors and Windows

Bathroom mirrors, eyeglasses and car windows won't steam up when sprayed with a liquid containing silicones. The liquid is packaged in a flexible bottle that

sprays it on the glass when squeezed. After being sprayed, the glass is wiped dry with a cloth and remains free of steam for as long as three weeks.



DRAWBRIDGE
AHEAD



TELEPHONE
AVAILABLE



PEDESTRIAN
CROSSING



GAS STATION
300 METERS AHEAD



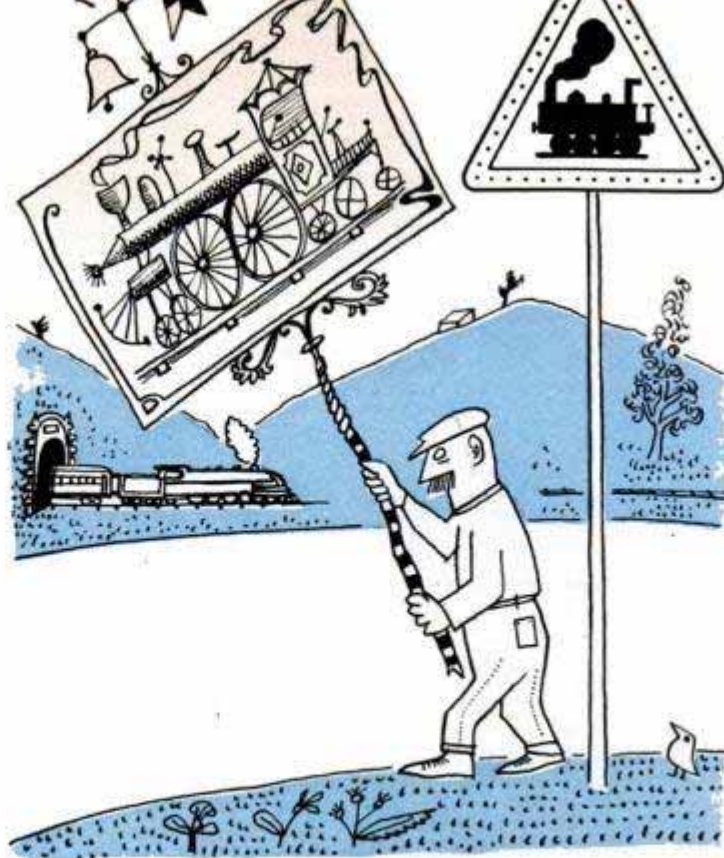
ROAD UNDER
CONSTRUCTION



MECHANIC
AVAILABLE



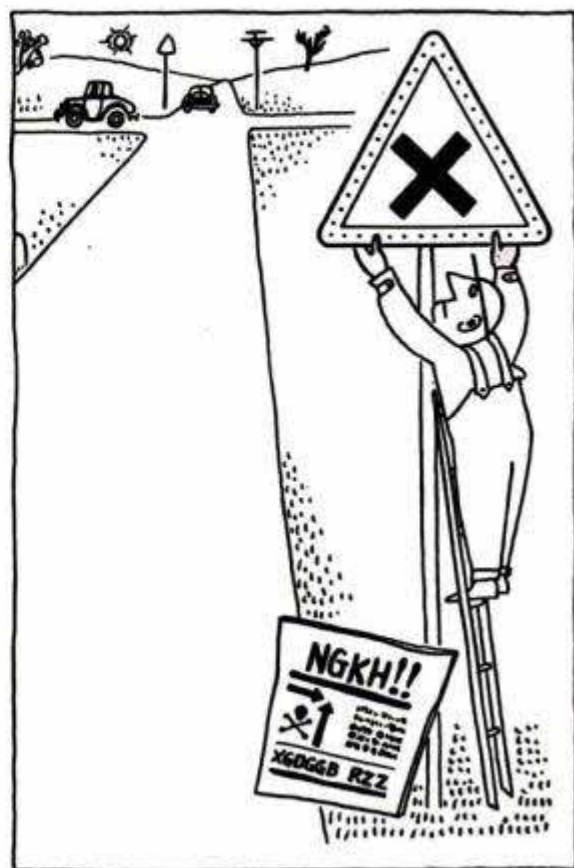
ANIMAL CROSSING



ROAD-SIGN LANGUAGE

MOTORISTS touring foreign countries won't be confused by strange, unintelligible road signs if a United Nations code goes into general use. Every country would use the same signs. Thus drivers with no knowledge of local language or custom would be able to "read" the warnings.

Many of the signs, some of which are shown here, have been in use abroad for several years. Cartoonist Steinberg's rib-tickling drawings are helping to make all of them familiar. Top, Steinberg's highway worker replaces a lacy railroad-crossing sign with the bold UN model. Below are two more of Steinberg's sketches.



Rockets

on a timetable

By **Richard F. Dempewolff**

X IS ZERO; the exclamation point in time when the 58-foot, two-stage "Bumper" rocket—combining a modified V-2 with a 700-pound WAC Corporal riding its nose—will stand on its fiery tail above the new long-range proving ground in Cocoa, Fla., whoosh to the stratosphere and lay itself out for the world's first long, horizontal stretch above the Atlantic.

No one knows when X will arrive. At any moment, time may stand still while men, hanging half in and half out of yawning hatches in the side of the four-story monster rocket, hold up the count as they make final adjustments.

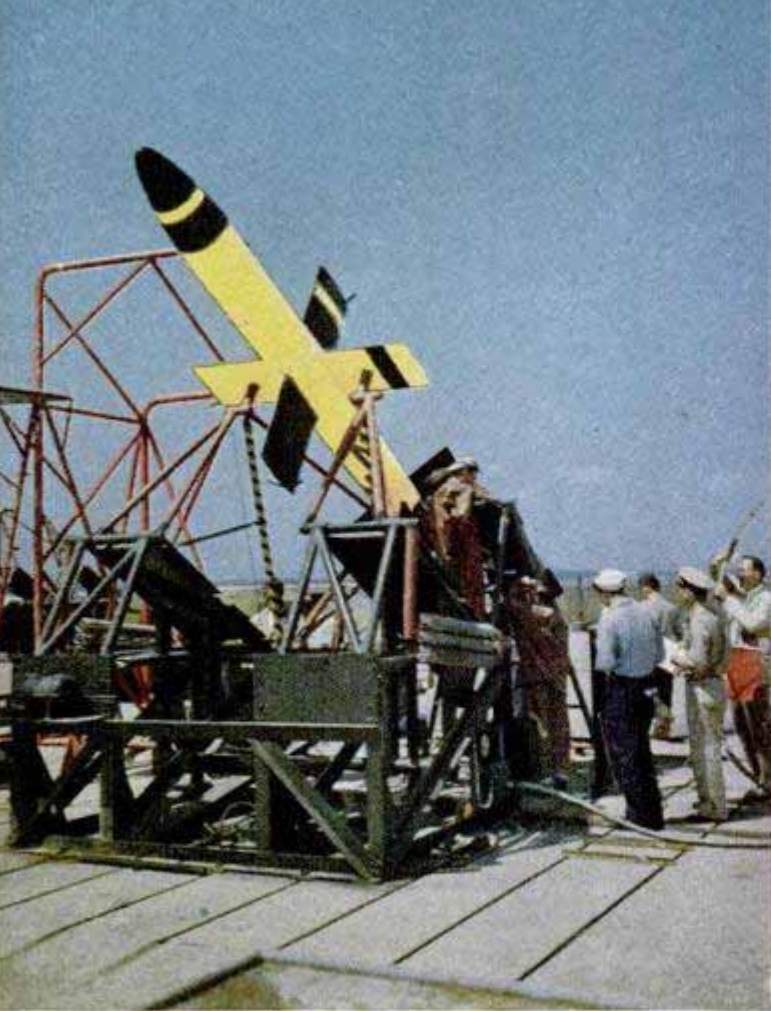
"It is X minus 20 minutes. Stand by," growls the PA system. In the massive concrete blockhouse beside the firing apron, you feel the tension tugging at the pit of your stomach. The "technical director" is clipping orders in gibberish: "Check the bucking voltage . . . you're four points down . . . keep a cheesebox on number three scope . . ."

Through the periscope mirror window in the 14-foot-thick concrete wall you see ladders come down. Hatches are locked. Knots of men move toward the blockhouse. Green lights flick on across a big board, as each department in the launching project indicates readiness. The droning count moves down the minutes—"X minus 15, X minus 14, X minus 13"—until minutes have run out. Then the loudspeaker punctuates the last tense 20 seconds with the finality of a metronome: "... five ... four ... three ... two ... one ..."

At "five" the engineer in the blockhouse jabs the red "fire" button. An electric current flashes out to the base of the rocket, igniting a pyrotechnic device like a Fourth of July pinwheel. There's a crack like a pistol shot as the rocket valves leap open. Alcohol and liquid oxygen drop through pipe

Instant XI Vivid color shot shows a V-2 as it stands on its fiery tail gathering power and speed. This moment is the result of months of preparation





Elaborate tubular scaffold holds the Lark as it is prepared for firing. Below, fuel experts load a big rocket with hydrogen peroxide. Chemical, which will explode if touched, rolls off plastic suits



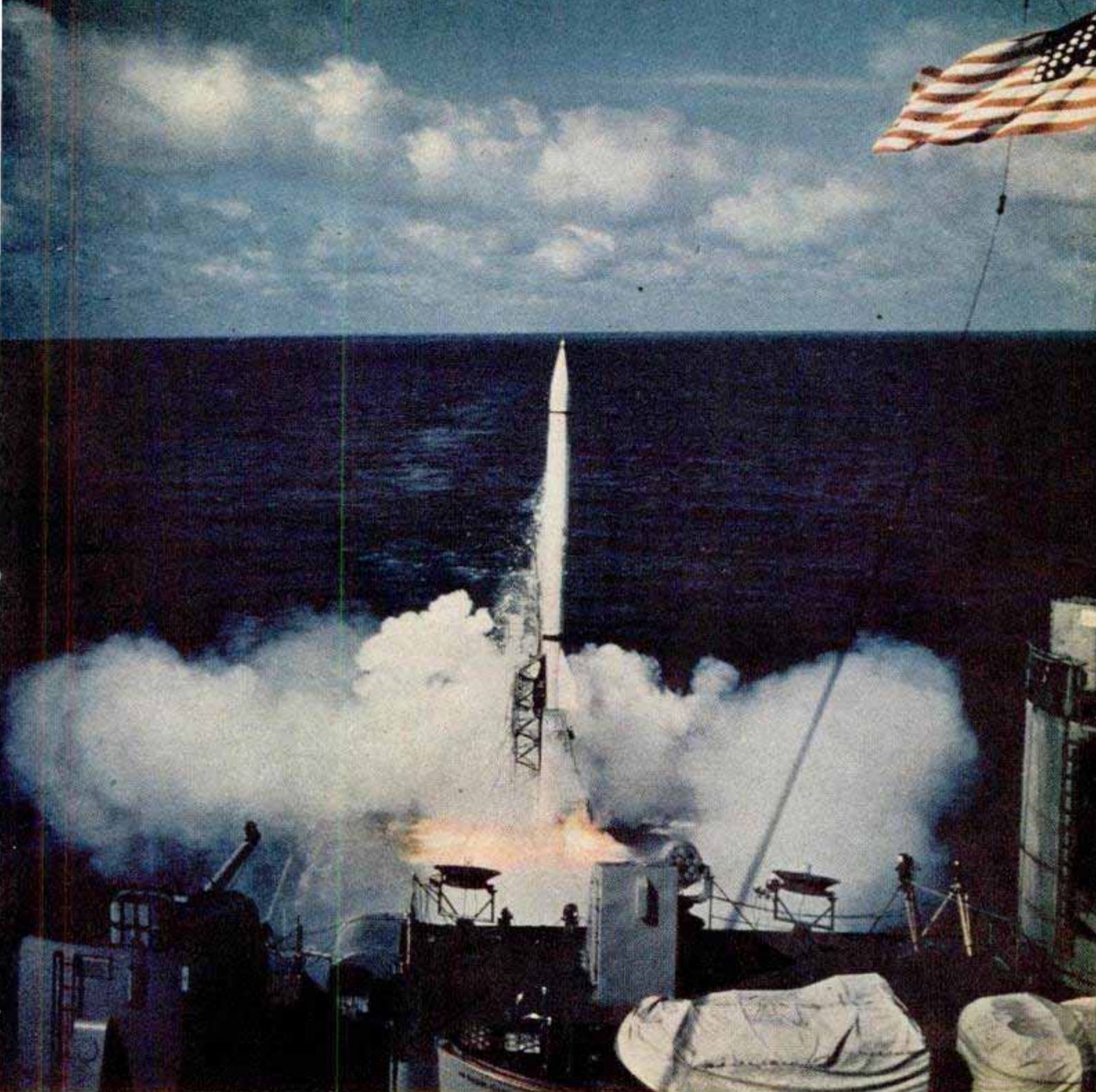
Few hours before X huge gantry rolls away to leave a four-story V-2 standing alone on launching pad

lines from fuel tanks into the motor, where the pinwheel spews its flame. Wispy vapors curl around the fins. A finger of fire stabs at the launching "pad." Then, with an uncanny roar, a dazzling fountain of white-hot flame gushes over the concrete in mushrooming waves.

"... ZERO!" The monster quivers, lifts slowly and hangs for one incredible instant on its own tail a few feet above the ground. There's a frightening storm of noise, like no other sound on earth. Another split second and the pad is empty of all but sound.

Before you can rush out the blockhouse door, the first preview of push-button warfare, and the first successful horizontal Bumper launching from the new 3000-mile proving grounds near Banana River, is over. Already the rocket is in the stratosphere, burning 10 tons of fuel per minute, traveling 2730 miles per hour and trailing a vapor plume. A gyroscopic steering device turns it on its side, to horizontal flight. As the main part of the rocket is spent, the WAC Corporal takes off and continues the flight to its watery finish while the V-2 shell drops to the sea. As they whoosh through the sky, both parts of the rocket send back valuable information to the telemetering stations.

X for this first big long-range rocket



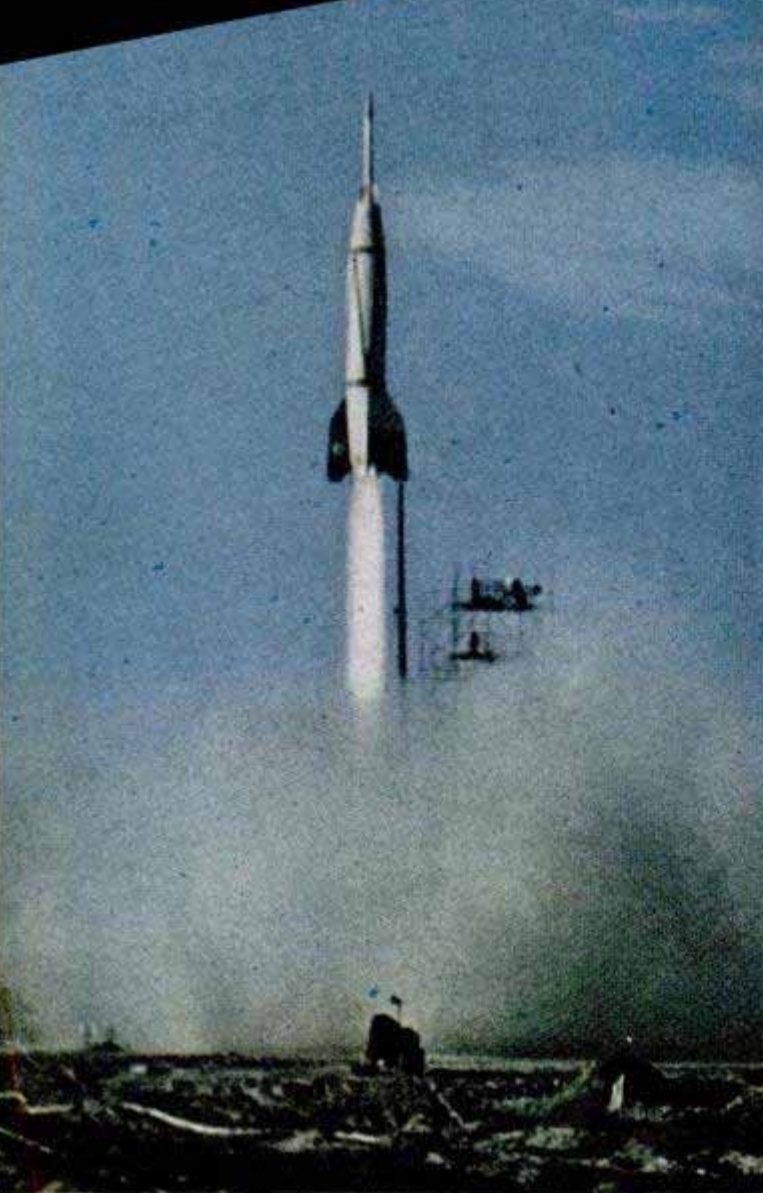
With a mighty roar a Navy Viking begins its 106-mile flight into space from deck of the USS Norton Sound

in the United States occurred last summer. Most details are still secret. But for any rocket, X is merely a crashing climax to months of preparation, tricky handling of fantastic materials, using equally fantastic equipment in a security-bound, guided missiles business that is strictly Buck Rogers.

More than a hundred days before firing, men hunch over drawing boards calculating trajectories, planning, revising, drawing up specifications for parts and instruments. Safety engineers, radar and radio operators, search units, optical scanners, fuel men—all form a vast army of experts marching toward X.

X ceases to be just a mark on a piece of paper on the day a big rocket rolls to the proving ground from the factory. It may come in several ways. V-2s arrive in three sections—nose, belly and fins—cradled on three weird flatcars with hayracklike ribs curling up from the sides. Rails lead right into the rocket hangar. The flatcars are pushed together until the rocket pieces butt so they can be joined.

About a week before X-Day, the rocket shell is transported from hangar to concrete launching site or pad. For smaller missiles like the eight-finned Lark or the WAC Corporal, Jeeps or trucks with special racks



USAF photo

Spectacular color shot shows take-off of first two-stage rocket launched by the Air Force at Cocoa, Fla. Below, smaller rocket filled with dangerous nitric acid

do the job. Some of these rack assemblies can be jacked up to become portable launchers. The boys just roll to a selected spot on the desert, tilt the rack and "let 'er go."

V-2s and Vikings are not so easy. An empty V-2, without its one-ton warhead and 5000 gallons of fuel, weighs 10,000 pounds. You can punch a hole in the "skin" with a screwdriver—it's only as thick as ordinary aircraft skin, and unsupported except for the motor mounts. To lug this around without damaging it takes some doing. More than a third of the Germans' V-2s were wrecked before they ever reached wartime launching sites.

The Navy's big Viking wheels out of the hangar on a special Martin-built carriage. It is an elongated tricycle airplane landing gear assembly, strapped by yokes to the long cylinder. At launching site, a crane hauls up the nose and the tail follows into place, rolling on its rear wheels. This is especially handy on the Navy's rocket launcher, USS Norton Sound, where heavy, complicated apparatus is impractical. It made possible the record flight of the Viking from her unique launching deck last year.

The V-2 makes its trip to the pad on a Meilerwagen, invented and used by the Germans when they were launching the rockets against England. Still best for V-2 toting, the Meilerwagen is a massive trailer with a steel cradle on its back. The cradle is hinged at the rear of the trailer and equipped with hydraulic lifts capable of raising 10 tons. In the hangar, a crane lifts the nose of the assembled V-2 off its flat-



car bed. The Meilerwagen backs underneath the missile, the crane lowers the rocket gently into the Meilerwagen cradle, and off drives the rocket to the launching pad. Once at the site, the "wagen's" hydraulic pumps go to work, the cradle rises slowly like the big ladder on a fire rig, until the rocket is setting vertically on its four-legged launching platform.

Once the big rocket is pointed skyward, X is in sight. The huge metal scaffolding of the gantry crane, about 60 feet high, is wheeled over the monster. Crews swarm over it like ants. New gantries, like the one at Cocoa, are masterpieces of design. The structural members are used for ladders to reach various sections of the rocket. A handful of men can wheel the vast tangle of featherweight metal tubing on its casters. The whole thing weighs only 600 pounds. It comes in two slices, which clamp around the rocket like a mold. Three of its hinged decks, about 34, 42 and 50 feet high respectively, "drawbridge" down by handcrank around the V-2's belly.

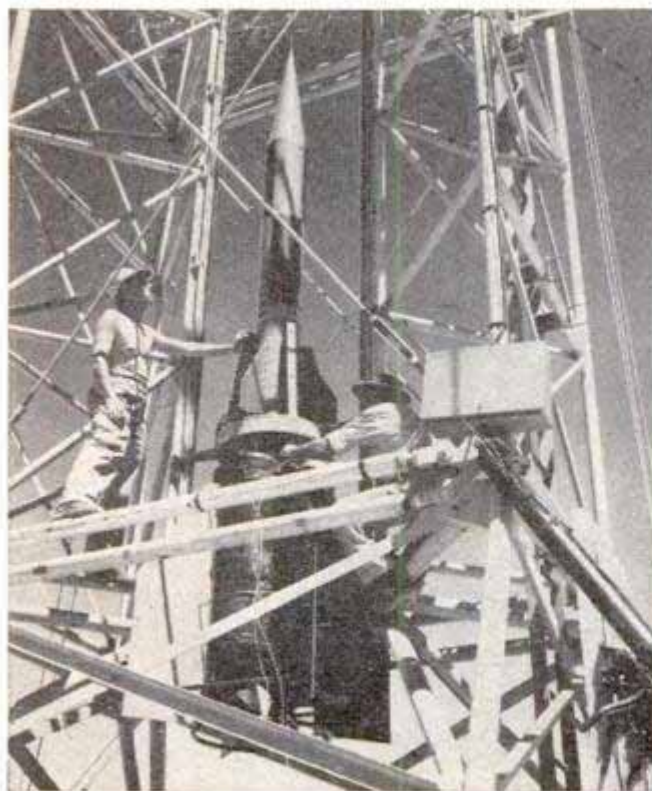
For a week, the launching site is a beehive of activity. In mobile machine shops at the gantry's base, machinists turn out precision parts. Signal men at outlying stations check and test equipment. Telemetering films from 30 channels are studied and adjustments made. At night, rocket and gantry lie under the eerie glare of floodlights. Up on the top deck, or "widow's walk," shadowy figures install the telemetering devices in the rocket's high nose—or the secondary rocket, if it's a Bumper. On the

second platform, men's legs jut from open ports containing pressurization tanks for the fuel, and the maze of electronic controls. One engineer at White Sands has a standing bet that some day a technician will fall in, get lost in the spaghetti, and be locked up inside on X-Day. "He'll have quite a ride," he says. On the bottom gantry deck, engineers and fuel men make final adjustments in the cavernous engine. The steering vanes, made of pure carbon to withstand the thousands of degrees of heat blasting from the rocket's tail, are adjusted with microscopic precision.

About 16 hours before X the ambulance rolls into the launching site, fire fighters move on station in their weird, Martian asbestos suits and the men prepare for a full-scale rehearsal. "Take-off" is prevented only by four small bolts that are enough to hold the rocket to earth under 20,000 pounds of thrust. The gantry is then hauled away, power lines attached and everyone moves to the protection of the fortlike blockhouse with its 14-foot concrete walls and 27-foot-thick ceiling, some 150 feet from the pad. "From the looks of it," remarks one engineer, "you'd think they expected the rocket might fall on them. That is just what they expect—and it has happened!" One Aerobee at White Sands fell over on take-off and the ensuing blast of white heat from its exploding fuel seared everything for hundreds of yards around.

After the "test hop," the gantry comes back, and the pace quickens. From his microphone in the blockhouse, the technical

WAC Corporal has become the "workhorse" of rocketeering. Here is one with Tiny Tim booster on its tail



Fire fighter wearing a new suit of aluminum foil can safely approach within two feet of 1500-degree fire





"NATIV" rocket rests in launcher while final adjustments are made. It is a test rocket, not a weapon

director begins to call off the time every 15 minutes. At X minus 20 minutes, it will be every minute; at X minus 20 seconds, every second. Meteorologists have checked weather for optimum flight conditions and at last the moment for firing is set.

"X minus six hours," blares the loudspeaker. "Check water and cooling systems; fire fighters on station."

No one expects that in six hours the rocket will take off. At any point up to within a minute or two of firing, the count may "hold" for a recheck. "Hold at X minus 18," the speaker may groan. When the failure is

remedied, minutes or days later, the count will pick up again at "18." This can be nerve-wracking. A draftsman at White Sands recalls a Bumper launching that had everyone jittery. "X minus two minutes," grated the loudspeaker—then, "HOLD IT!" Something was jammed up in telemetering. The count backed up to X minus 10, then 20, then one hour. Three times it came back to two minutes. The rocket finally took off a week later.

At about X minus four hours, crews dressed from head to foot in plastic suits and hoods, like men from another world, move into the area with trucks carrying queer metal tanks. This is hydrogen peroxide which, when combined with another chemical, suddenly becomes steam that turns the rocket's high-speed fuel injector turbines. It's tricky stuff. Almost any foreign matter—including skin—that touches it, will set it off. A handful of sawdust thrown in a container of it will cause a fantastic explosion. "Somebody spilled some on a Jeep at White Sands," recalls Dr. H. E. Newell, head of the Rocket Sonde Research Branch of the Navy's program (which has nothing to do with the Army's V-2, but includes the big Viking) "and POOF—no Jeep." It runs off Pliofilm like water, however, and the sterile alloy drums lined with inert material in which it is carried make it as easy to handle as cordwood. But it's treated like nitroglycerin just the same. So is the nitric acid, used as an oxidizer for some rocket fuels. While not explosive, you can see what nitric would do simply by dropping a penny in it. The penny disappears in a cloud of ugly green fumes.

"X minus three hours and 30 minutes," drones "the voice," and fueling goes on—all of it dangerous and requiring vast precautions. Tanks of soda for neutralizing acid can be seen everywhere—including each deck of the gantry. Smoking is prohibited within 75 feet of the area; sandbags

Here's one reason everybody hides before take-off: jet blast from a rocket throws up tons of rock and dust



surround portable equipment. Firemen stand by with water and foam hoses ready to flood the entire place at an instant. The big rocket's 2500 gallons of ethyl alcohol are poured in from tank trucks. No one worries about the alcohol. It's pretty stable.

"X minus three hours. Move oxygen into area, move tool trailer behind blockhouse."

In rolls the ingenious vehicle which hauls the frigid liquid that will make the alcohol burn. It's a regular truck chassis on which is a 3000-gallon Thermos bottle that looks like a cement mixer. Inside the big steel cylinder are huge bottles, fitting one inside the other. The oxygen is in the innermost. One odd property of the 247-degrees-below-zero liquid is that it insulates itself by forming a wall of frost on the outside of its containers. If tightly confined, the constantly "boiling" fluid will build up pressure and burst its container. Hence, it must be vented. But that pressure can be useful, too. The truck spews vapor trails through its vents only until loading time. Then the vents are closed, and the pressure is used to force oxygen into the rocket.

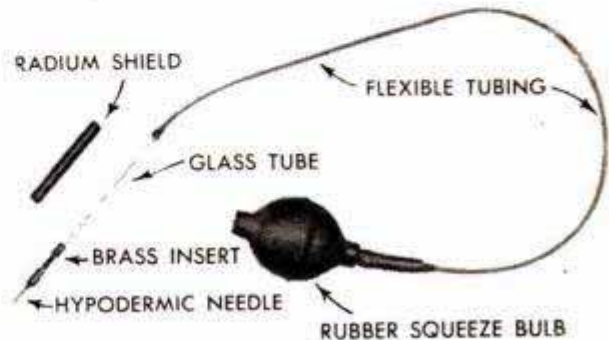
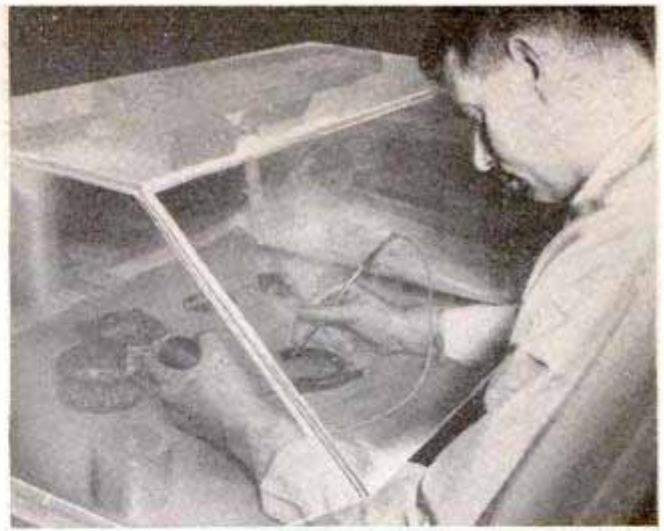
Finally, fueling is completed; checks are almost finished. The loudspeaker takes on a deeper more concise tone: "X minus one hour." Slowly, the gantry rolls back and the rocket stands alone against the sky, a white plume of venting oxygen pouring skyward from a hole in its nose. A long pole beside the rocket supports a power cable hooked near the tip, supplying electric power and conserving the batteries inside. This will fall away at launching. Quickly removable "German ladders"—square, four-sectioned telescoping affairs—are raised by handcrank against the side for last-minute adjustments. Each section of these odd ladders pulls the next along behind it.

All up and down the range, tension is mounting steadily. Observer stations report readiness by radio and telephone. At one of them, men are tracking through high-powered telescopes. From the instant of launching, the arc described by the swing of their scopes will be automatically transmitted to pens that mark the exact course and landing spot of the rocket on a map of the area. On land-bound ranges, planes scout for stray civilians who might still be within the boundaries.

"X minus 45 minutes!"

Red lights switch to green on the blockhouse control-board panel as Radar Tracking announces readiness. "Dopples," or sound tracking, switches green. The "Telemetering" light goes green too, indicating that all gear is ready to receive impulses from the soaring rocket, providing a progress report of the trip. "Rocket Controls" blinks green—and so does "Cut-Off."

(Continued to page 242)



Fountain Pen for Radium Paint

Workers who apply radium paints to luminous dials are protected from contact with the dangerous substance by a fountain pen invented by a Naval Air Base employee. A small rubber squeeze bulb draws paint into the glass tubing that forms the body of the pen and also forces out the paint during use. A hypodermic needle serves as the writing point of the pen. A radium shield slips over the end of the glass tube to protect the writer's fingers from radiation.

Steel-Hook "Gloves"

Steel hooks on the palm of a new fingerless "glove" sink into wood, meat, ice and other materials to give the wearer a firm grip. Anchored to the palm of the glove is a steel plate with two projecting hooks. The glove aids linemen in climbing telephone poles and gives meat workers a stronger grip for loading sides of beef. All five fingers of the hand are left free to grasp tools or other equipment.





Detroit Listening Post

By Siler Freeman

THE AUTOMOBILE manufacturers are gradually taking almost every human element out of driving a car. If progress continues, all that will be needed to get to a destination is to give the address to some automaton controlling the wheel and it will do the rest.

The process of making the driver one-legged is almost complete. About every car being made today has or will have before very much longer an automatic transmission. The coordination between left and right foot that once made learning to drive tedious and uncertain is no longer necessary. In fact, we are about due to become a one-legged race so far as driving a car is concerned, unless some enterprising inventor comes along with a device to keep the left foot occupied.

Steering is still a necessity but one large manufacturer is dabbling around in the field of an electric device which will make steering much easier. It may be a motor that helps turn the wheel.

Electric window lifts are due for a big increase in the automotive field. The crank-type are on their way out, it appears from the announcement that the Hupp Corp. has finally perfected a device after five years which has gained the eye of the passenger-car manufacturers.

The Hupp lift actuates each window by its own electric motor. The motor is mounted compactly so as to regulate the steel arms which are attached to the window glass through a positive-drive gear assembly. According to Hupp officials, it doesn't take much power from the battery.

Hupp also has perfected a similar device to adjust the front seats. Heretofore, most of the automatic devices of this sort have been confined to convertibles and the very plush sedan jobs in the higher brackets.

With Ford installing the automatic transmission on its 1951 models, only Plymouth is left without one. Chrysler is silent on its plans for the new models, due around the first of the year. But it may meet the competition, either by adding Fluid Drive to Plymouth or offering a fully automatic transmission as optional equipment.

Right now, Chrysler is concentrating on having its new V-8 engine ready for its 1951 Chrysler line. The functioning of the engine plant and its ability to expand production will determine how far the corporation will extend the use of the V-8 to other divisions. DeSoto may get it.

Buick's V-8 is still far off. It must build a new building to put the job in and the rush for machine tools has set the program slightly behind. The goal is for the engine to go into the 1952 models on which a lot of work has already been done.

The announcement that Ford's Lincoln-Mercury division will build a new plant in Wayne, a suburb of Detroit, indicates the ambitious plans which young Benson Ford has for the unit. The old plant, while large in floor space, was not laid out efficiently and with the aim to bring both Lincoln and Mercury under one roof, it was not considered economical to try to change the layout.

While the record over-all production of the auto industry has been the surprise of the year even to the best informed executives, the real upset has been in the truck field. With two more months of production ahead, there is about an even chance that both sales and output may approach, if not pass, the former record made in 1948.

Truck sales started off slowly but hit an increasingly heavy sales from about March on. Several of the big producers missed their early guesses and, despite crowding on heavier schedules, have been unable to make up their early losses. If the rate set in the past four months is maintained through the rest of the year, the 1948 mark will fall.

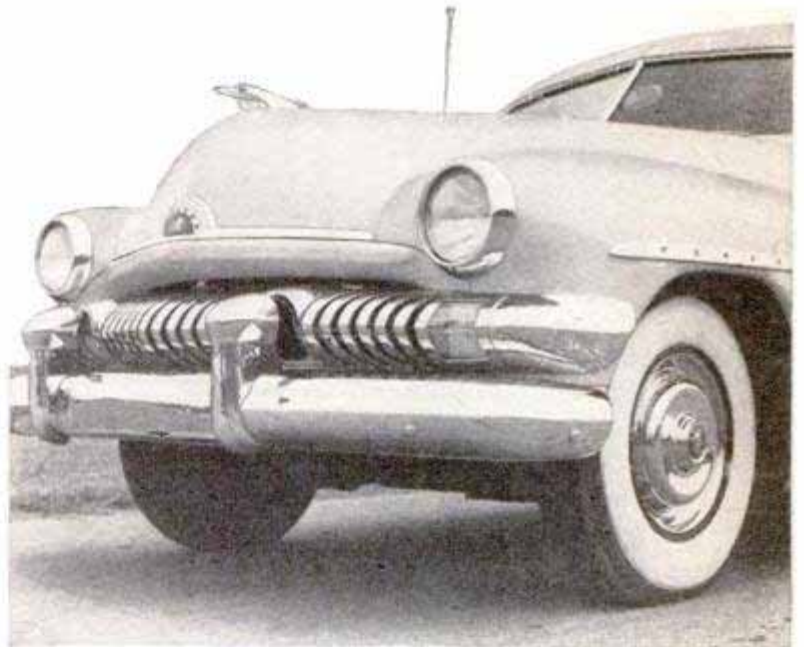
Nash's signing of an Italian designer as consultant has raised some eyebrows in the industry. The NXI, Nash's proposed \$1000 car, has much of the appearance of the higher-priced works which Signor Pinin Farina of Turin brought with him when he was introduced to the industry in August. Of course, Nash's 1951 models, now on the street, have not yet attained the foreign look which observers will seek in the next series. They were designed before Signor Farina joined the Nash staff.



1951 MERCURY

FIRST of the Ford line to introduce a new automatic transmission is the 1951 Mercury. Called the Merc-O-Matic, the transmission made by Borg-Warner is the chief feature of the restyled car. The Mercury has a new grille and has "grown" rear fenders. The latter extend the horizontal lines beyond the deck lid and give the car a longer look, although there has been no wheelbase change. An improved 112-horsepower engine combines with the automatic transmission for more power. The transmission is a three-speed of the torque-converter type, which actually makes it four-speed. It differs from the present torque-converter transmissions, with the exception of Studebaker's, in that it has a starting gear. Unlike Studebaker's transmission, however, it does not lock into high.

The 1951 Mercury convertible looks longer with rear fenders which extend horizontal lines. It has automatic transmission



Restyled grille gives appearance of massiveness and strength. New headlamps and parking lights also add to the "new look"

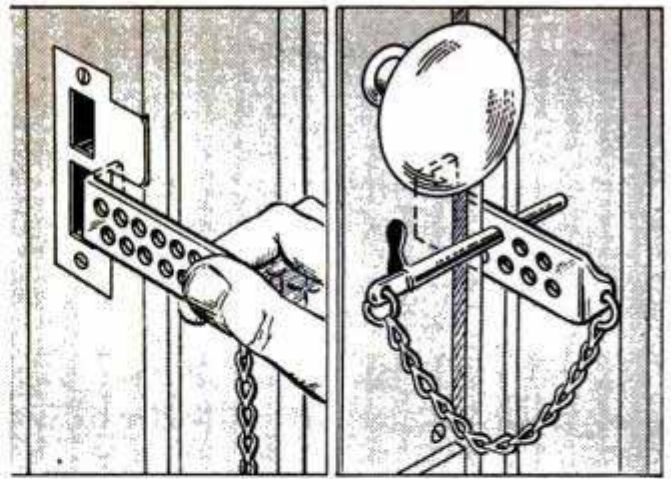
Mercury two-door below is predicted to be one of the most popular cars of the line with torque-converter transmission





Grass Trimmer

Trimming the edges of a lawn is an easy job with a new cutter that snips along at the operator's walking speed. A rubber-tired aluminum wheel powers the trimmer. Cams on the wheel oscillate an upper set of blades against a set of stationary blades to cut the grass. The angle of the handle can be adjusted to fit comfortably in the hand of the operator.



Burglar Guard

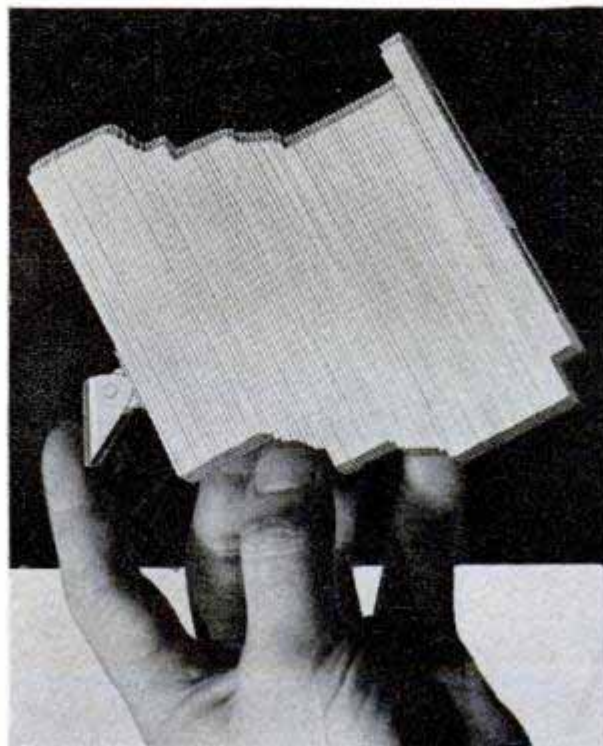
Passing a metal taper pin through one of a series of holes makes a portable door lock hold fast against intruders. The main portion of the lock is a strip that fits across the jamb and fits into the latch-bolt opening. After the door is closed, the pin is inserted in the hole that is closest to the door.

Chemical Cleans Sidewall Tires

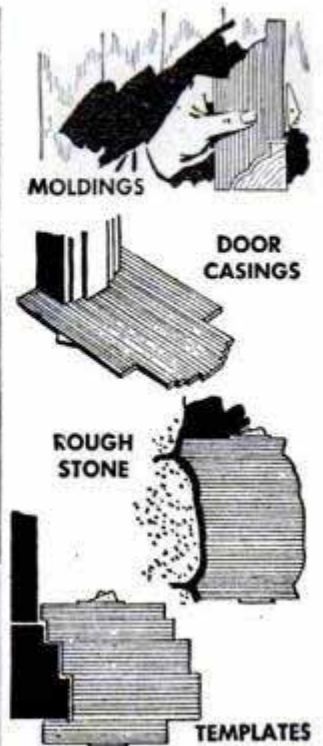
Chemical action rather than an abrasive removes the dirt from white-sidewall tires when a new cleaner is used. The liquid is simply wiped on with a cloth, then rinsed off with clear water. Chemicals in the cleaner loosen the dirt, which is carried off by the water. No rubbing is required except in the case of deep scratches when the cleaner must be worked into the rubber to reach the dirt. The liquid also contains titanium, the whitening agent of sidewall tires, which restores the sheen of the rubber.

Contour Marker

Contours of moldings and other uneven lines are accurately copied by a new tool for carpenters and bricklayers. The tool consists of a series of aluminum blades bound together by a locking mechanism. To copy a contour, the worker opens the lock and presses the blades snugly against the uneven surface. He then locks the tool and the resulting contour can be marked off on the material to be matched.



With lock open, marker can be pushed against uneven surface to record the shape. At right are a few of marker's many uses



W. L. Bush & Co.
1570 Northwestern Bank Bldg.
Minneapolis, Minn.



Air Materiel Command photos

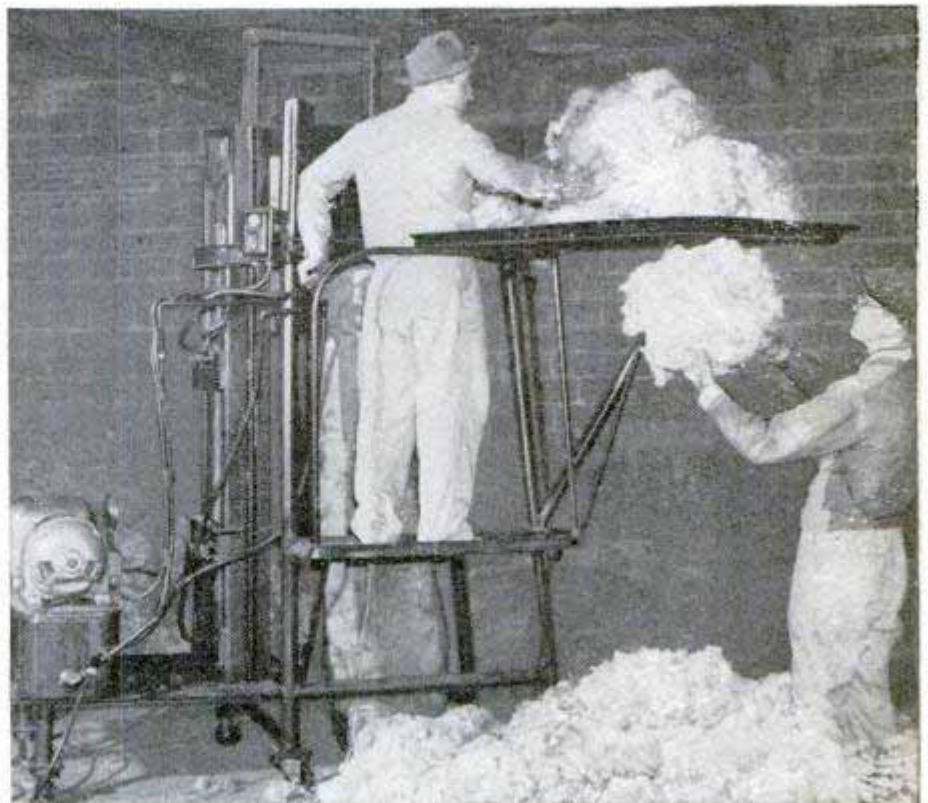
Automatic Parachute

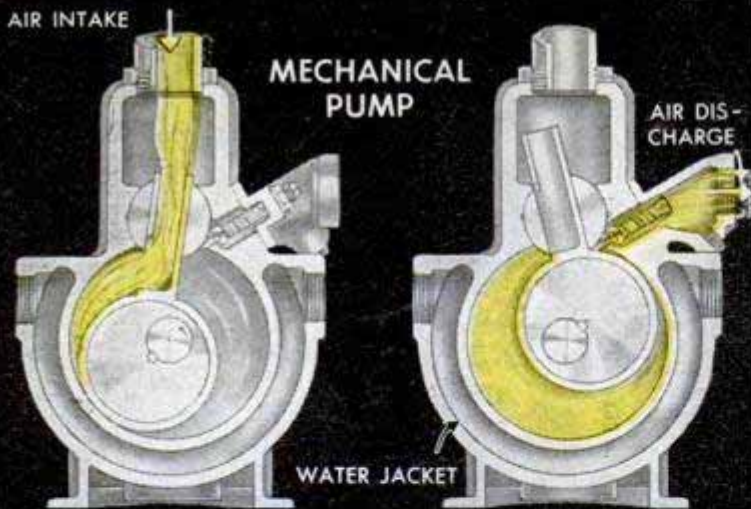
All the thinking is done for the jumper by a parachute "brain" developed by the U.S. Air Force. It prevents accidents caused by failure to pull the rip cord at the proper time or by a blackout preventing the airman from pulling it at all. With the new device a handle is pulled immediately upon jumping and a timer and an air-pressure

device—both preset—control the opening of the parachute. The timer can be set for one to 26 seconds, depending on the plane's speed and altitude, to give the jumper enough delay to clear the plane and slow down before the parachute opens. The pressure device, which supersedes the timer at high altitudes, opens the chute at an altitude safely above the highest terrain over which the flight is being made.

Wool Trampler

Hard footwork in a wool warehouse now has been replaced by the action of a small hydraulic compress. The most despised job in the warehouse until recently was that of wool trampler—crawling down inside a seven-foot burlap bag and tramping down wool as it was packed. Now the job is done by a machine which is essentially an electrically operated hydraulic compress. When the bag is partially full of fleeces, the operator flips a lever which lowers a plunger into the bag. A five-man crew can pack 20 bags of wool an hour with the new machine.

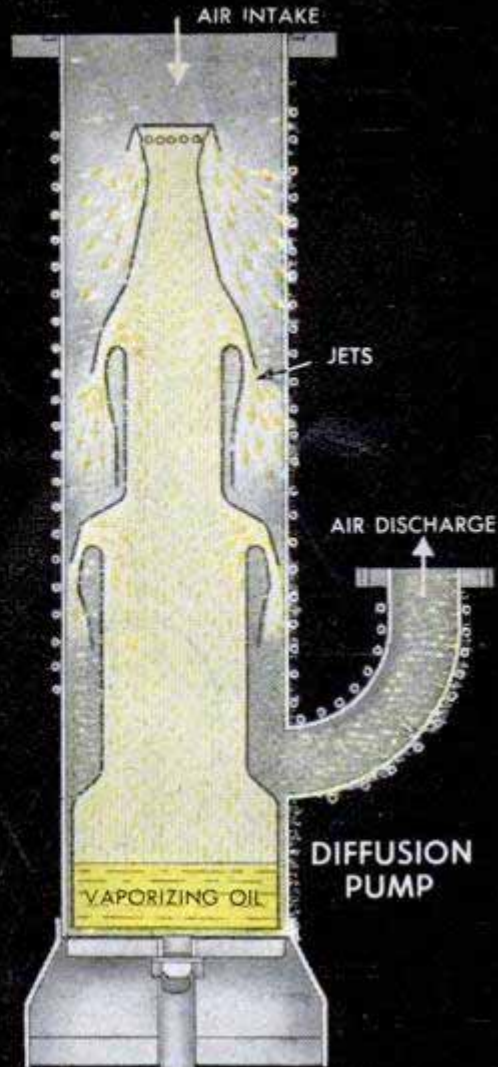
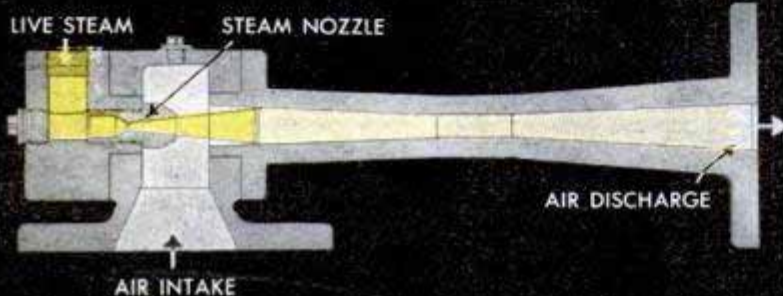




ROTATING PLUNGER SWEEPS AIR OUT DISCHARGE TUBE

STEAM-JET PUMP

HIGH-VELOCITY STEAM JET FORCES AIR OUT DISCHARGE TUBE



OIL VAPOR CONCENTRATES MOLECULES OF RAREFIED AIR SO THEY CAN BE PUMPED OUT DISCHARGE TUBE

This business is next

By Louis N. Sarbach

IMAGINE a tunnel with one end beneath New York City's Times Square. You enter a car at this end, stow your suitcase in the rack overhead and settle down comfortably with a magazine. You have been reading scarcely an hour when the vehicle stops. An escalator carries you back to the street level and you greet the light of day once more—in San Francisco!

Sounds like something out of pseudo-science fiction, doesn't it? Yet it's the idea of one of America's most practical scientist-executives, General Electric's noted physicist, Dr. Irving Langmuir.

"There is no fundamental reason," says Doctor Langmuir, "why we could not travel at a speed of 2000 to 5000 miles an hour in a vacuum tube. Such a tube extending from New York to Chicago, or to

San Francisco, could be constructed in which airtight vehicles would be magnetically suspended in space while moving forward at high speed. The Pacific coast might be only an hour away from the Atlantic."

Doctor Langmuir's cross-country vacuum tube is very much a project for the future, of course, but enough vacuum magic is going on right now to convince even the most skeptical that there's more to "nothing" than meets the eye.

High vacuum—until recently a tool mostly confined to research laboratories—plays a key role in a rapidly expanding list of industrial applications. Under high vacuum, vitamins and hormones are separated from their complex organic parent mixtures. Vital medicaments such as blood fractions and antibiotics, all notoriously unstable in the presence of heat, are safely freeze-dried in evacuated cabinets.



Drying time of penicillin has been reduced from 24 hours to 30 minutes with high vacuum. This bulbous device concentrates solution prior to final drying. Opposite page, the three basic types of vacuum pumps

of new technologists, vacuum engineers, men who humorously call themselves "specialists in nothing." These scientists spend their lives trying to produce the thing nature is said to abhor: a completely empty space. They haven't wholly succeeded yet and perhaps they never will. But of the estimated 400 septillion (400 followed by 24 zeros) gas molecules that occupy every cubic inch of air at sea-level pressure, high vacuum experts have managed to pump out all but some 18 billion—a mere trifle in this strange world of low pressure.

Why do we need vacuum in the first place? The most obvious reason is to prevent certain materials from reacting chemically with the gases of the air. In developing the incandescent lamp, Edison failed a thousand times until he realized that he would have to mount his electrical elements in an evacuated bulb to prevent the glowing filament from combining with oxygen—from burning up, in other words. Vacuum's newest and perhaps most interesting jobs have to do with materials too delicate to handle in certain ways under ordinary atmospheric conditions. At this point, let's take a brief trip upward, where the air is thin.

Everyone knows that water evaporates. Its molecules are always in motion, always trying to escape from the surface. But air molecules, pushing downward, force most of the water molecules back into the liquid.

To help overcome this air pressure, we energize the water molecules with heat. They then can force their way through the air molecules and into the atmosphere. In plain language, water boils when it has been sufficiently heated.

Now, the fewer air molecules pressing down on a liquid's surface, the less heat is needed to evaporate the liquid. That's why water, which requires 212 degrees Fahrenheit to boil at sea level, boils at 187 degrees Fahrenheit on the 14,108-foot summit of Pikes Peak, where the air is a good deal thinner.

Going a step further, we can bring Pikes Peak down to sea level, so to speak, by chasing enough of the air molecules out of a sealed chamber. In such a chamber, water will boil at 187 degrees Fahrenheit at sea level.

What happens if we continue pumping out air molecules? The boiling point drops still lower. It even falls below the freezing point! When this occurs, ice turns directly to vapor, without passing through the water stage.

to nothing

Lithium and magnesium, lively metals which eagerly unite with oxygen, are easily purified in furnaces from which all but a few stray molecules have been swept. Still other metals—gold, silver, aluminum—steam into luminous mists under vacuum, to condense a moment later as bright coatings on glass, paper, plastic and even fabrics.

To the housewife, high vacuum means flash-frozen foods. For the scientist, it plays a fundamental part in many new research tools: electron microscopes, mass spectrometers, synchrotrons, betatrons and cyclotrons.

For aviation people, high vacuum offers radar; for medical men, X-ray tubes; for the military, lenses of superior optical quality, and for all of us, the amazing magic of television.

Behind these developments is an army



Eastman Kodak photo

Camera lenses are coated in this bell jar. Coating material is vaporized in a high vacuum and the vapor covers lenses with thin, uniform coating

This "cold boiling" makes possible certain jobs once the despair of scientists. Penicillin, the miracle drug of World War II, quickly deteriorates in solution. For storage, it has to be bone-dry. The usual way to dehydrate anything is simply to build a fire under it and boil off the water. But penicillin breaks down in the presence of heat.

High-vacuum "freeze drying" solved the problem, not only for penicillin but for a host of other heat-sensitive organic substances: hormones, blood fractions (such as plasma), serums, protein solutions and the whole list of new antibiotic medicines.

There's nothing much wetter than an oyster, but the high-vacuum process dries the tasty sea food quickly without destroying its delicate flavor



Practically all food-stuffs contain heat-sensitive materials. That is why heat-dehydrated foods so often look unnatural and taste worse. With the new vacuum freeze-drying, foods not only keep their nutrient values intact but retain their original appearance and flavor.

In a typical process, a thin film of orange juice, running down the inside walls of a partly evacuated chamber, loses about 90 percent of its water. The residue is frozen, canned and sold. Or it can be processed still further, sprayed on chilled vertical cylinders under high vacuum. The frozen

coating gives up the rest of its liquid content, becoming a powder easily turned back into tasty orange juice simply by dissolving in water.

In the preparation of blood plasma, the liquid straw-colored plasma is separated from the red corpuscles in a centrifuge. It is then bottled, frozen and stacked on the shelves of a vacuum cabinet. As the inside pressure is pulled down, the water evaporates, forming as ice on condensers from which it is scraped by rotary blades. Eventually, shells of ivory-colored powder are all that remain in the bottles, which are then hermetically sealed. Penicillin, streptomycin and other heat-sensitive biologicals are dehydrated by the same process.

The new metal coating involves heat-sensitive substances, too. You can evaporate gold, silver and chromium without a vacuum — all you need is plenty of heat. But low temperatures are obviously needed to deposit films of these metals on such a material as paper. This can be done only under high vacuum.

In the center of a vacuum chamber, a heating element melts and vaporizes the metal to be deposited. The roll of paper (or cloth or cellophane) is rapidly unwound (500 feet per minute) passing over the vapor rising

over the vapor rising

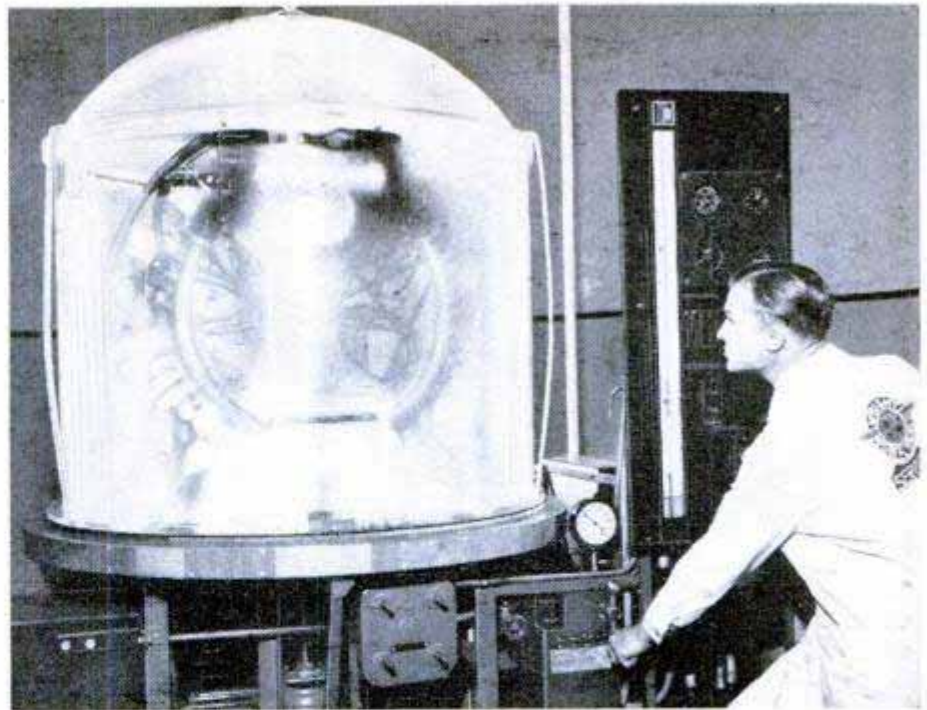
from the molten metal, which condenses as an extremely thin film on the underside of the sheet. The coated paper rivals foil in brilliance.

Or, plastic articles are placed in racks and subjected to the low-temperature vapor cloud, from which they emerge evenly coated and no different, in appearance, from articles made of solid metal.

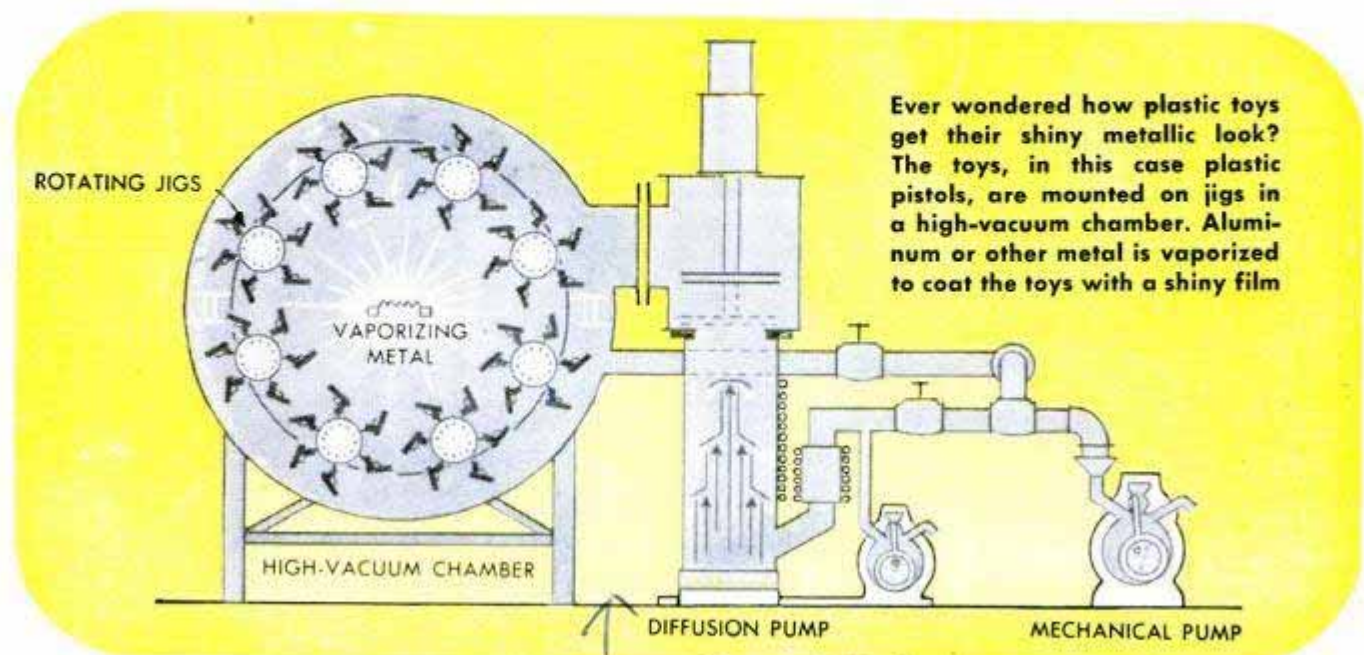
As vacuum coating becomes popular, you'll see innumerable applications. Already there are handsome metallized clock-cases, buttons, costume jewelry, sequins, decorative wrappings and ribbons. Zinc-coated paper is making its way in electronics for use in condensers. And aluminum-coated paper is being used in oil and wax-impregnated capacitors.

Lenses vacuum-coated with magnesium fluoride are rapidly replacing the old uncoated type in periscopes, telescopes, binoculars, cameras and other optical instruments. The microscopically thin film of the transparent salt cuts surface reflection to a remarkable degree.

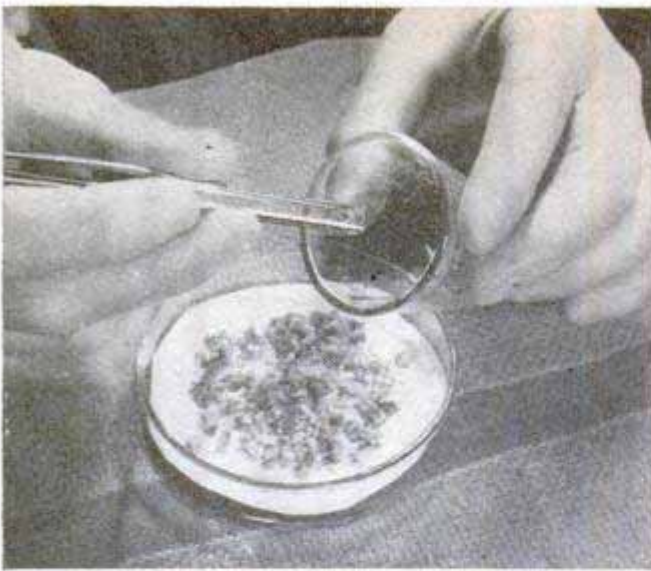
On the other hand, if bright metals (silver or
(Continued to page 256)



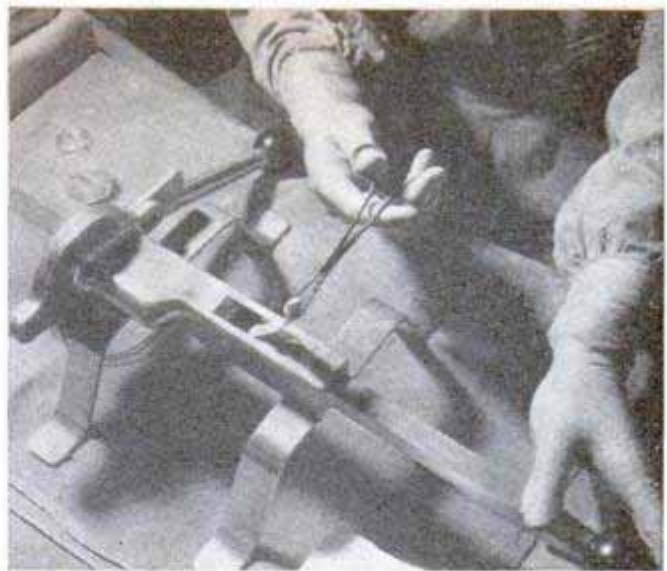
Although it's still on the ground, the aircraft engine inside the giant bell jar is being tested in atmosphere equivalent to that found at high altitudes, thanks to high-vacuum techniques. Below, TV tubes move along a DuMont conveyor line and are automatically evacuated by vacuum pumps



Ever wondered how plastic toys get their shiny metallic look? The toys, in this case plastic pistols, are mounted on jigs in a high-vacuum chamber. Aluminum or other metal is vaporized to coat the toys with a shiny film



Ground bone is stored in sterile jars at low temperatures. Particles are fused to a patient's bones



Technician wearing rubber gloves and working under the most sterile conditions grinds a bone to bits



Banks for Bones

Miracles of lifesaving accomplished by blood banks now are being duplicated by another type of "bank"—this one for the deposit of bones. The first bone bank was established two years ago; today there are bone banks in many American hospitals. They have restored health to hundreds of persons who otherwise would be cripples. In these banks, parts of man's bone framework are stored indefinitely. The bones are obtained from amputated limbs and kept in sterile jars inside freezing units at temperatures as low as 20 degrees below zero. They can be thawed for surgical use in 10 minutes. The bone particles are grafted and fused to patients to correct curvature of the spine and to repair bones damaged by infantile paralysis. Pieces of many bones may be used in the same operation, so it's not unusual for a patient to have spare parts from several fellow humans.

Into bone bank goes another jar of bone fragments. Navy believes bank would be invaluable during a war

Radioactive Car Engines Test Efficiency of Oil

Radioactive materials from the Oak Ridge pile are helping scientists improve the lubricating oil for your car's engine. Engine parts are made radioactive in the pile for the test. After the engine has run

for three hours, a Geiger counter is dipped into the crankcase oil. The counter measures the radioactive particles in the oil, revealing the amount of wear on the engine during the test.

Flame-Sprayed Rubber Protects Underwater Metal

Ship propellers, rudders and other metal parts below the water line are protected from the erosion of turbulent water by a coating of synthetic rubber sprayed through a ring of flame. The flame-spraying technique, developed for the Navy, covers the metal with a molten rubber that fuses to

form a resistant coating. The coating absorbs the shock of the turbulent water, which wears away metal just as a waterfall erodes rocks. The synthetic rubber, in powdered form, is forced in a stream through the flame, becoming a liquid which fuses to an impermeable film.



Barriers Deflect Blowtorch Blast of Jets

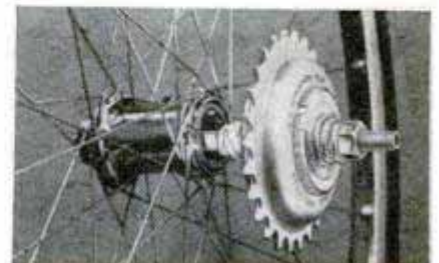
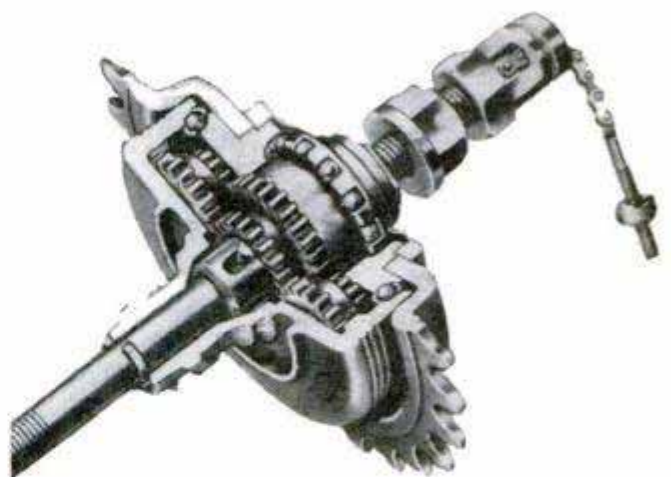
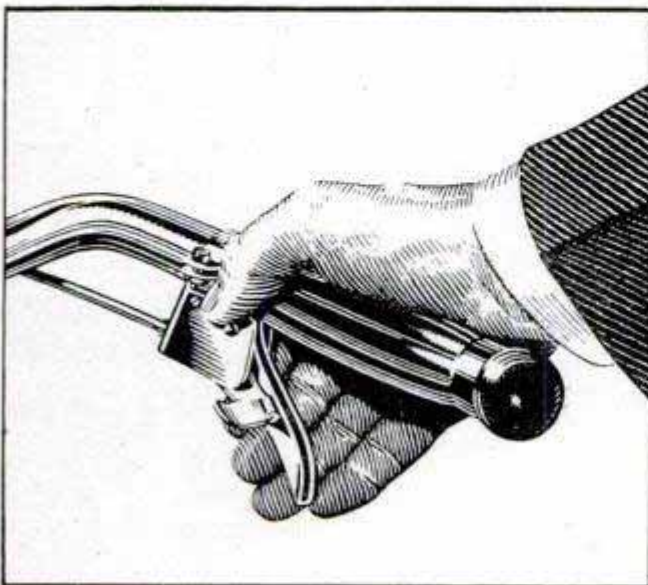
As protection against the blowtorch blasts of jet aircraft, both the Air Force and the Navy are working on defensive barriers. A person caught unawares 25 feet behind a taxiing or starting plane can be burned and blown away by a 225-mile-an-hour blast of air 340 degrees hot. Its stream is concentrated, issuing from the tail pipe in a cone of between 16 and 20 degrees. The Air Force has devised a sloping, port-

able fence that deflects the blast harmlessly upward. Nine feet high and 15 feet wide, with a sheet of corrugated iron covering the exposed side, they can be towed wherever needed on the air base. For aircraft carriers Navy men are experimenting with a deflector plate that would be set at an angle, like a blast fence, and direct the hot air skyward. This plate could be lowered flush with the deck when not in use.

Three-Speed Transmission Slips Into Bike Wheel

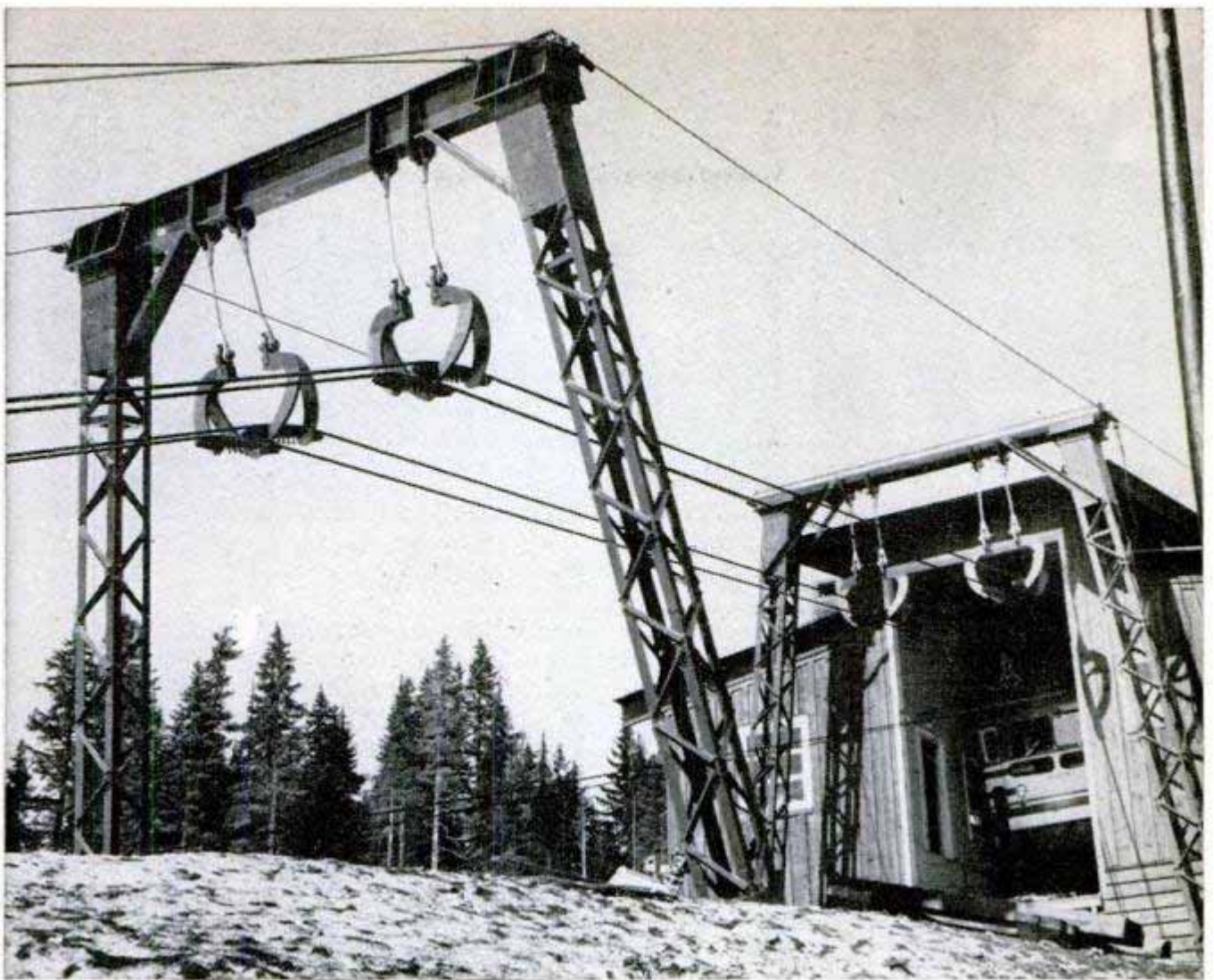
Bicycle riders can convert to three-speed transmissions with an adapter assembly that fits any New Departure coaster brake. For hill climbing and rough going, low speed provides a 25 percent gear reduction from normal or second speed. High gear is a 33 percent overdrive for high-speed cycling on level ground. Shifting is done by a convenient handle-bar control at any

time, whether driving or coasting. Back-pedal braking is retained in each speed. Installation of the conversion unit takes less than a half hour.



SKY-RIDING BUS



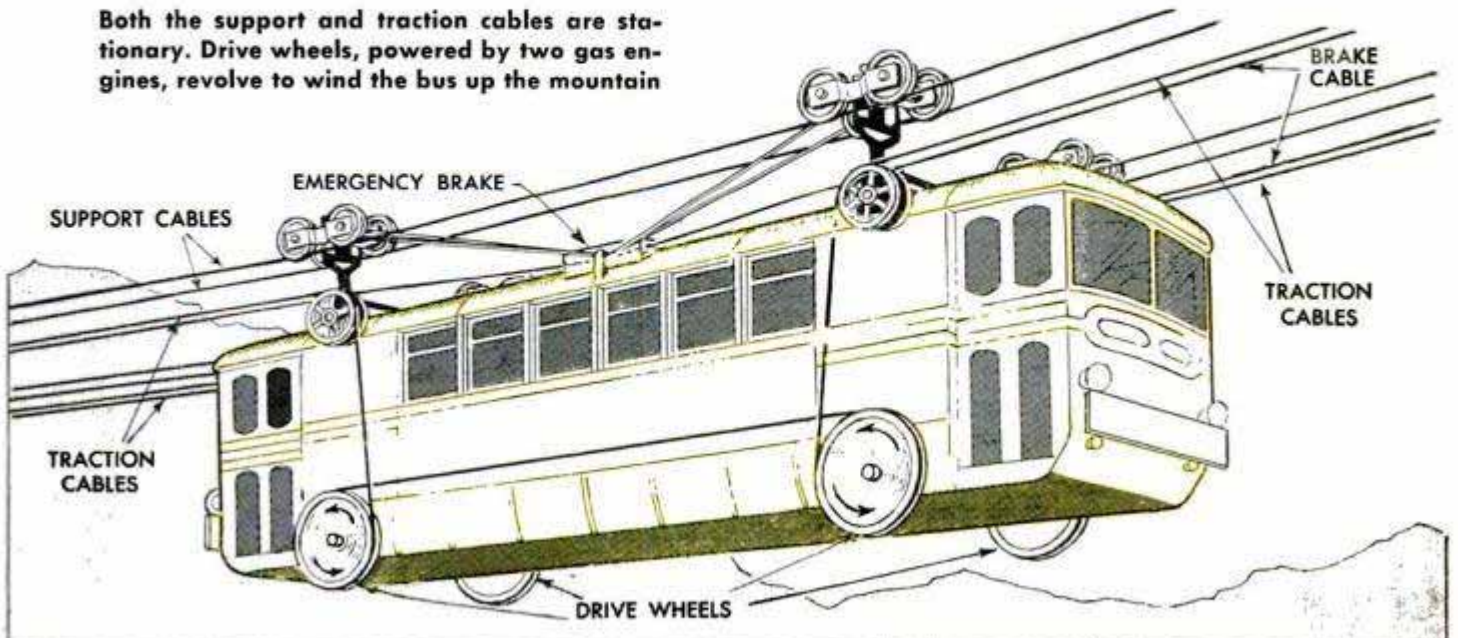


"Skyhooks" on steel towers support the aerial cables; 36-passenger bus is visible in the lower terminal

TWIN BUSES that glide high through the air will carry sightseers and skiers up the slopes of Mount Hood in Oregon during this year's winter sports season. The 36-passenger busses literally wind themselves along their cables, completing a trip of more than three miles in less than 10 minutes. Said to be the longest aerial pas-

senger lift in the world, the tramway whisks skiers from the 3800-foot level to Timberline Lodge at 6000 feet. The cables are supported by 38 A-shaped steel towers up to 72 feet tall. The traction cables wind around power pulleys on the car which are rotated by two 185-horsepower engines to carry the coaches up the mountain.

Both the support and traction cables are stationary. Drive wheels, powered by two gas engines, revolve to wind the bus up the mountain

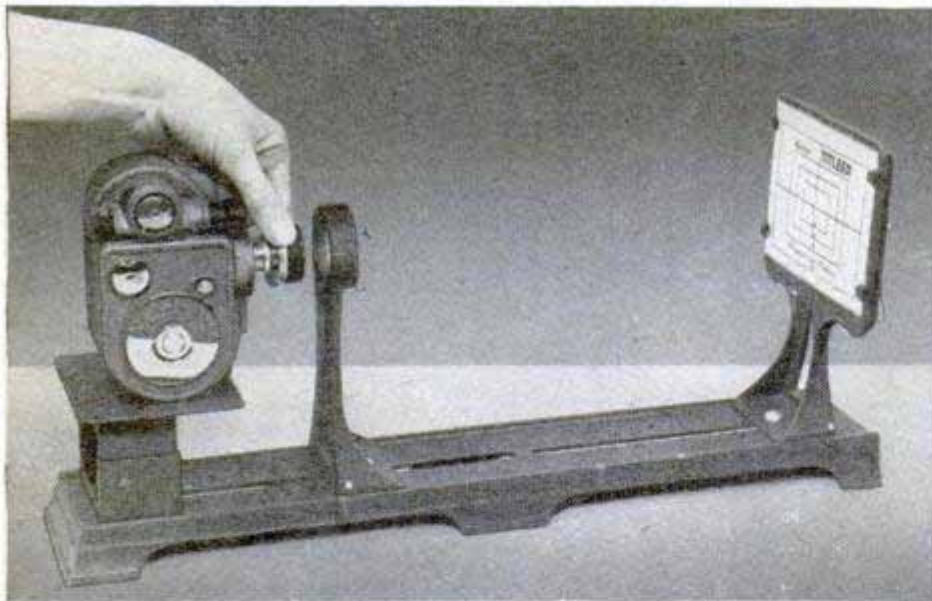




Log-Weighing Aids Forecasts of Forest Fires

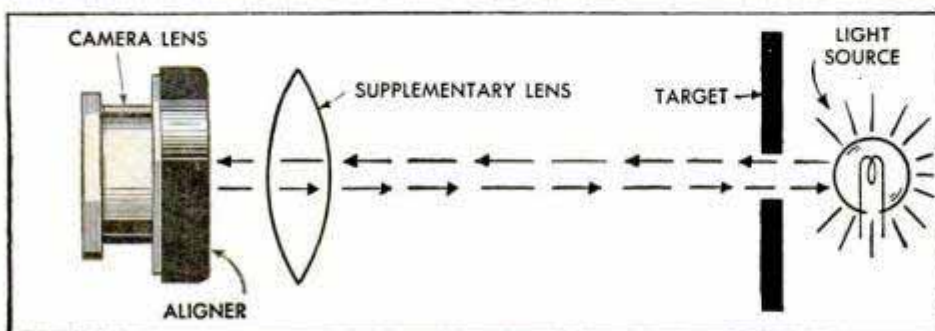
Logs have their weights checked as closely as movie queens on a diet at the Priest River experimental station in northern Idaho. For the past nine years, two sets of logs have been weighed every 10 days during the months from June 1 to October 31, as a method of determining the likelihood of forest fires. Part of a program carried out in the National Forest system, the weighing-in of sticks and logs tells foresters when fallen branches are dry

enough to burn easily. There are two sets of logs, one in a clearing where it gets full sunlight and the other in a dense grove where the sun virtually never penetrates. Half of the logs lie on the ground and the other half are kept about 18 inches above the ground to provide full ventilation. By using weight to determine the log's moisture content, researchers can accurately determine the fire-danger rating of the forests in the vicinity.

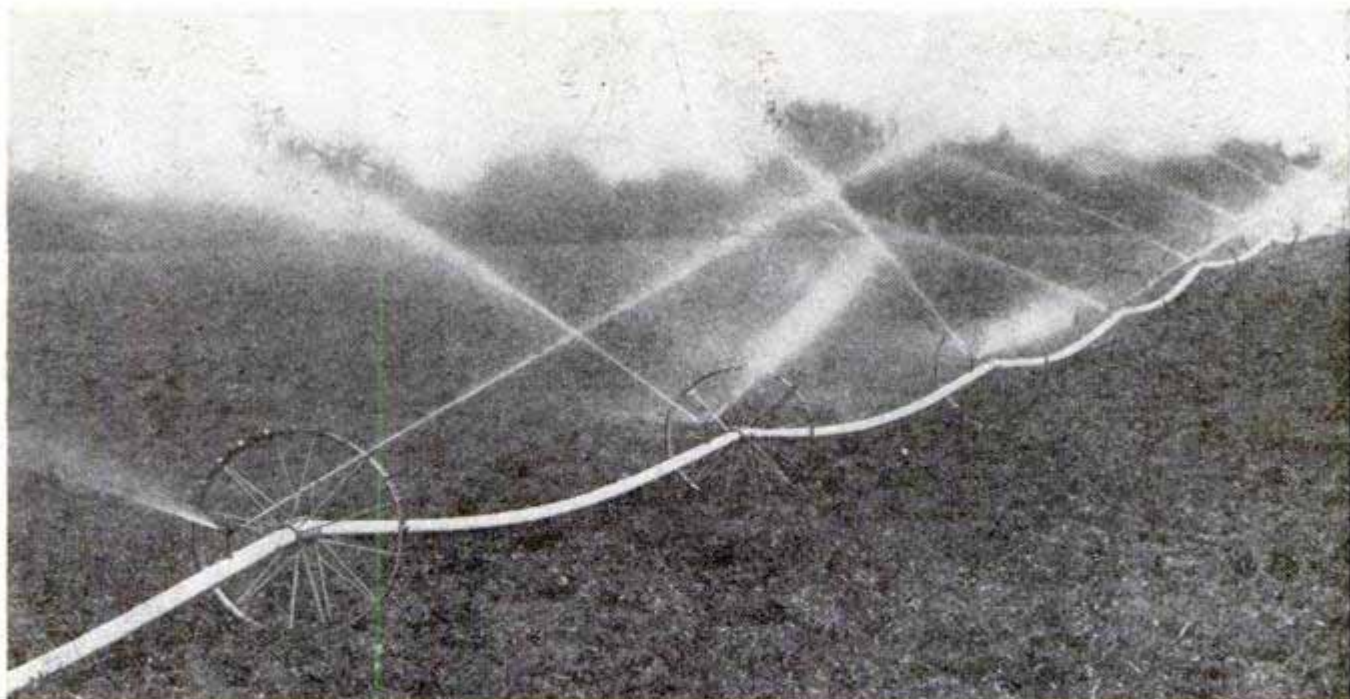


Title Aligner For Movie Fans

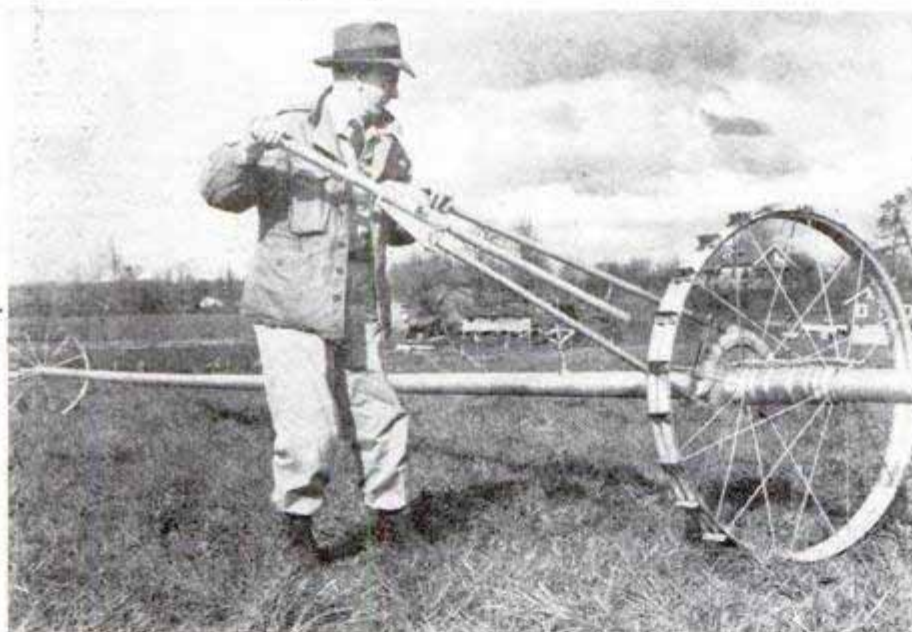
Using reflected light as a guide, an aligning device assures the photographer that the title is exactly in the center of the frame, thus saving film and time. In place of the title, a target with a hole in the center is inserted in the title holder. The aligning device is placed over the lens barrel and a light directed through the hole in the target toward the lens. The aligner reflects the light back to the target. If the lens is properly centered on the title area, the light rays are reflected back through the hole. If the light misses the hole, then the camera is adjusted until it is properly centered. The aligner also can be used with a still camera for centering close-ups.



Top, target card replaces title in lining up camera. Diagram shows how light passes through hole in card and is reflected back by the aligner



Above, 400 feet of irrigation pipe are supported by these wheels. Below, one man can roll the pipe system across the field with a ratchet drive



Portable Sprinkler Covers $\frac{1}{8}$ Mile

By using aluminum irrigation pipe as the axle for a series of wheels, farmers can make their sprinkler systems mobile. A ratchet drive at the center wheel of the system enables one man to roll a $\frac{1}{8}$ -mile line of pipe across a field. All wheels roll with the center wheel and sprinkler heads remain lined up. Automatic drain valves empty the system whenever the pressure is shut off, making it light enough to be rolled.

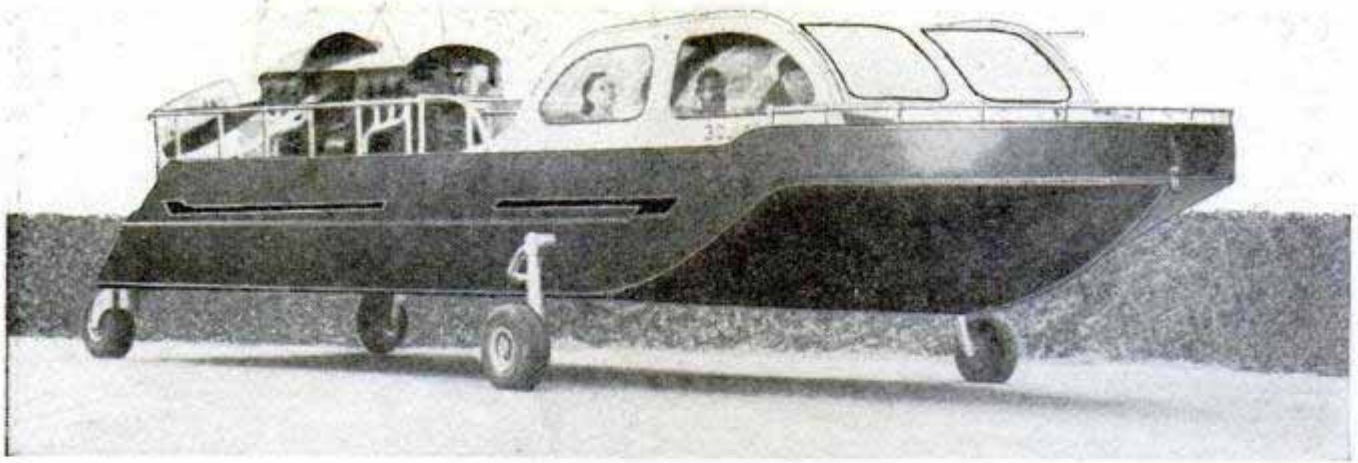
"Upside Down" Lamp For Night Hikers

Walking in darkness over unfamiliar ground is made less dangerous by a new "upside down" gasoline lantern developed by the Army Quartermaster Corps. It is carried by a chain so the light is just a short distance above the ground. The bottom of the lantern is protected by a metal grille.

Chemists have now synthesized a spearmint flavoring from the peels of oranges and grapefruits.



Department of Defense photos



Strange craft rolls along the highway on its four aircraft wheels, which are retracted when vessel is in water

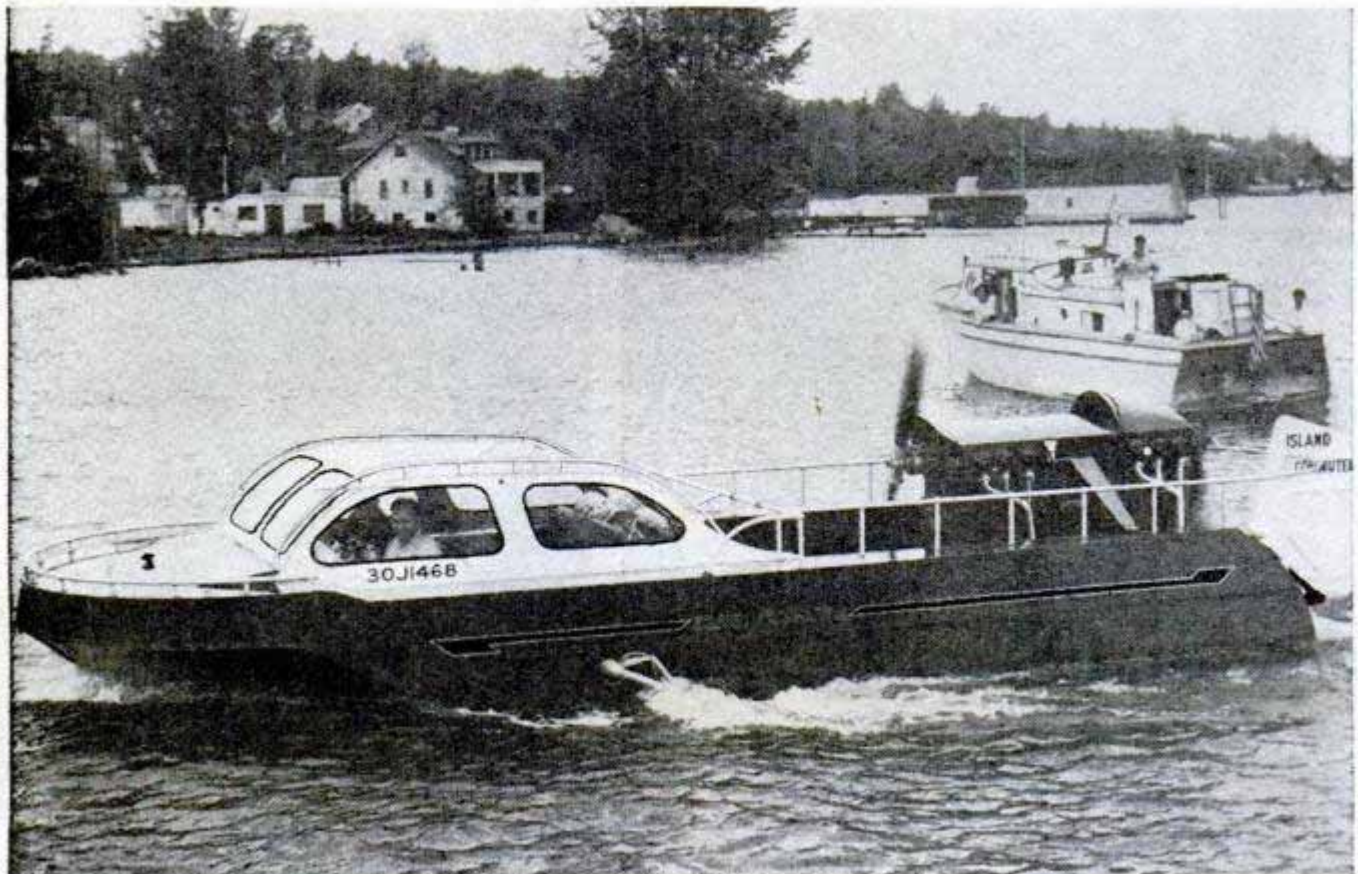


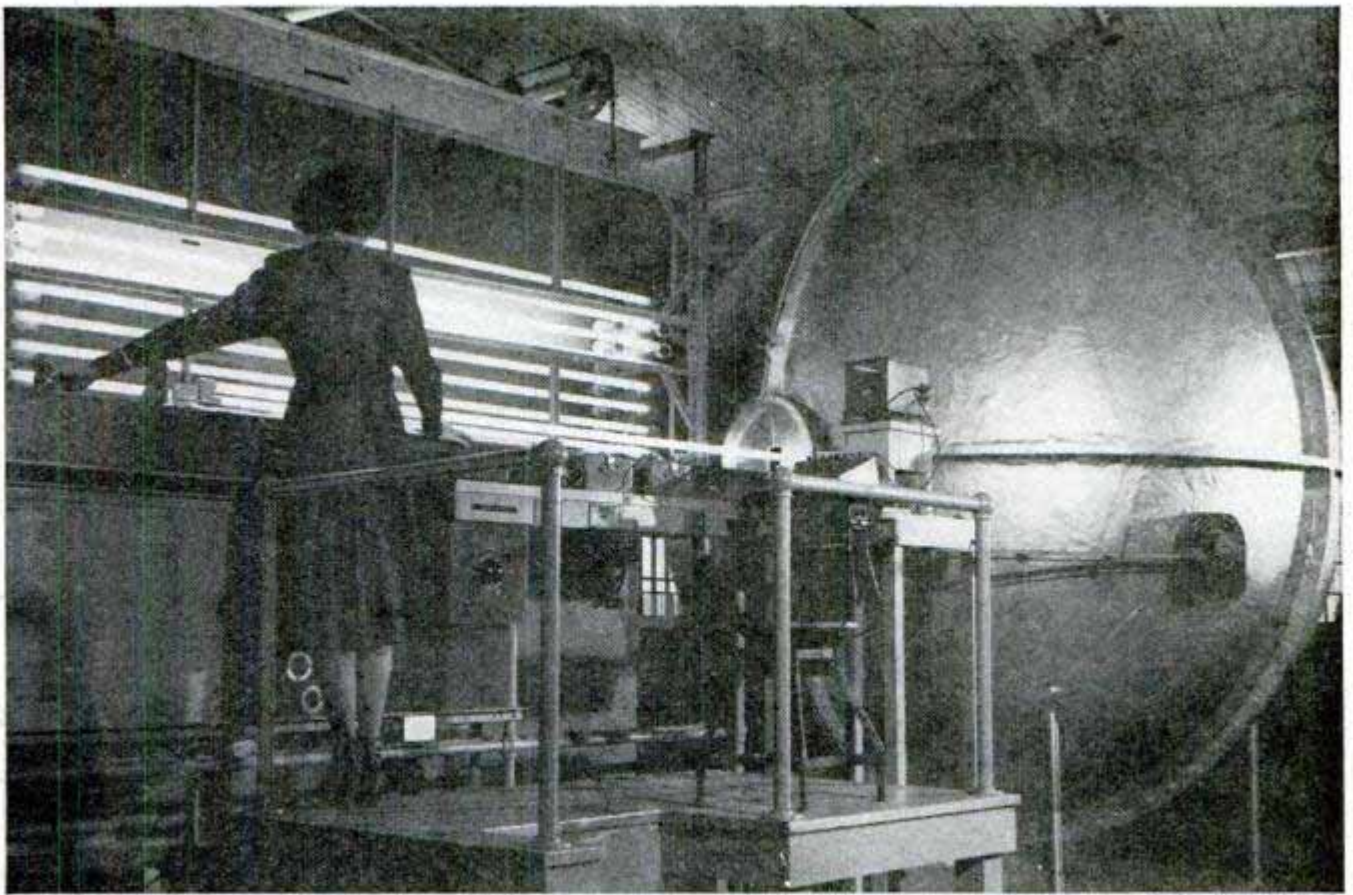
Built of aluminum, the boat is 36 feet long and weighs only 3200 pounds. There's room for pilot, copilot and five others

Island Commuter

COMBINING many features of an automobile, an airplane and a boat, the Island Commuter cruises through the water at 50 miles an hour. The 36-foot aluminum vessel was built by Anthony Sulak to carry him between Seattle and an island 85 miles away. Two airplane propellers drive the craft on water or land. The vessel has four retractable airplane wheels which are used when it is beached. At rest, it draws only 1½ inches and at top speed it planes four or five inches out of the water. The 3200-pound craft costs \$24,000.

In the water it draws only 1½ inches at rest. Two airplane propellers power the craft both in water and out

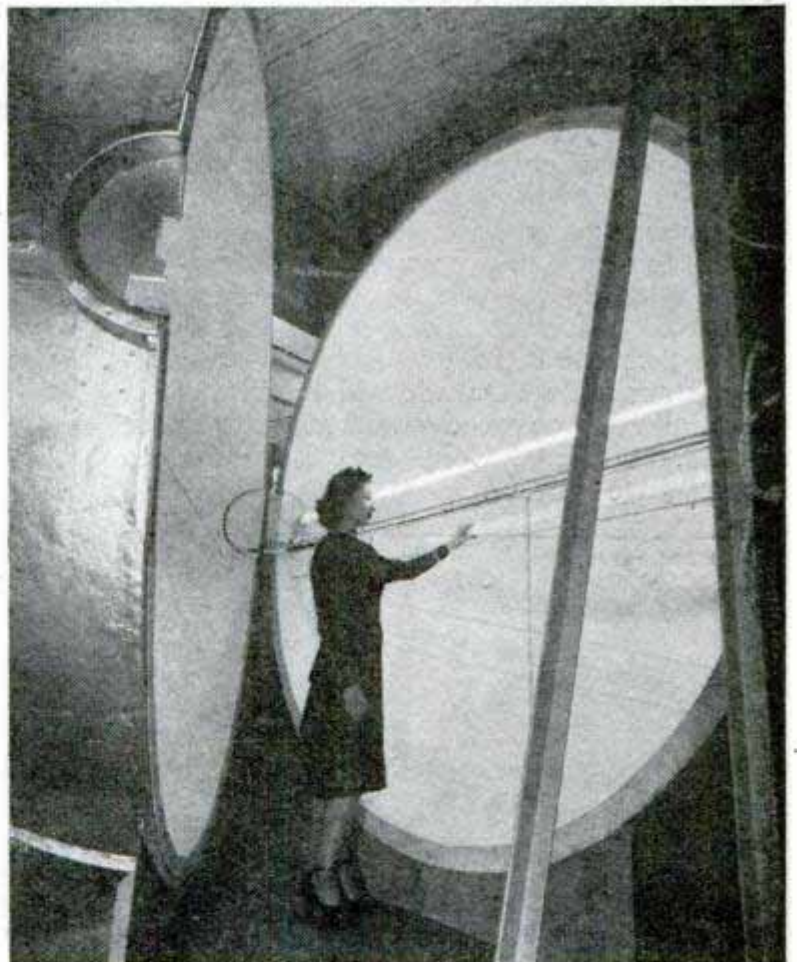




Westinghouse photos

Plastic Sphere Tests Lamps

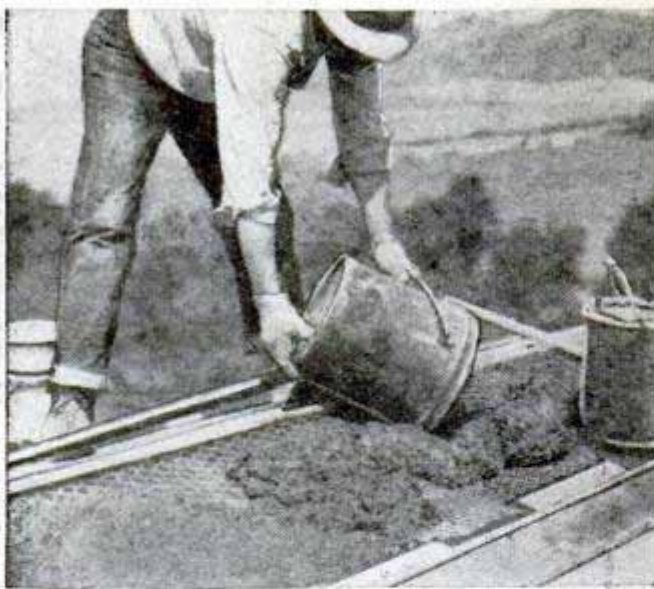
King-size fluorescent lamps are tested inside a giant plastic sphere with such ideal reflective qualities that light output is measured to an accuracy of more than 99 percent. The 12-foot-high sphere contains instruments for recording watts, volts and amperes and its inside surface is covered with 11 coats of paint, including six top coats of white paint. Testing is done by an operator outside the huge ball. The tubes are fed on a track into the sphere through a small opening on one side. The light from the lamp bounces off the sides of the sphere in all directions, striking a photocell which measures its output.



Graphite Atoms Are Wet

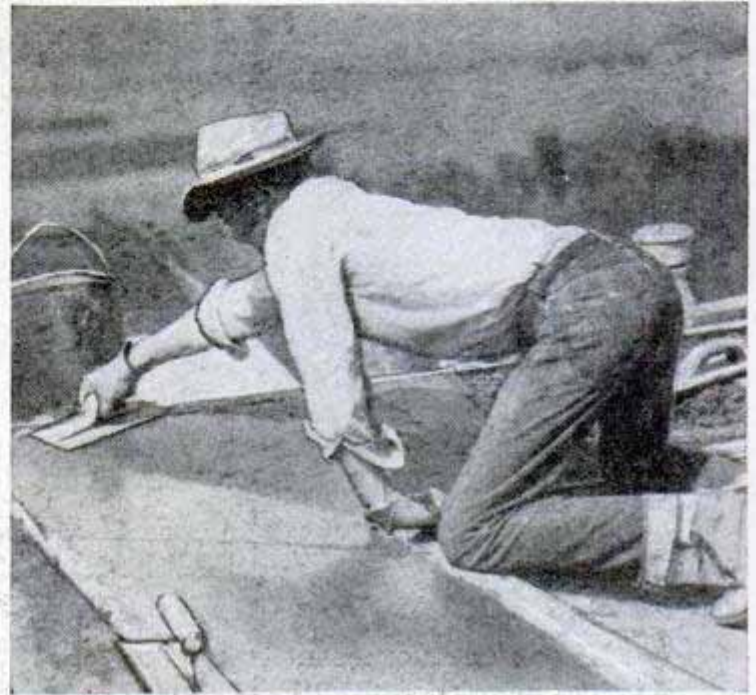
Invisible films of moisture are what make graphite the excellent lubricant it is, according to a General Electric scientist. Graphite consists of layers of atoms which slide easily over each other and it was formerly thought that this slippery quality was inherent in the graphite. The new discovery proves that an invisible film of moisture, such as is normally provided by the earth's atmosphere, is what makes the

particles slide so easily. Generators and motors used in high-altitude aircraft have to be specially designed to provide this vapor for the graphite brushes because of the absence of water vapor at such tremendous heights.



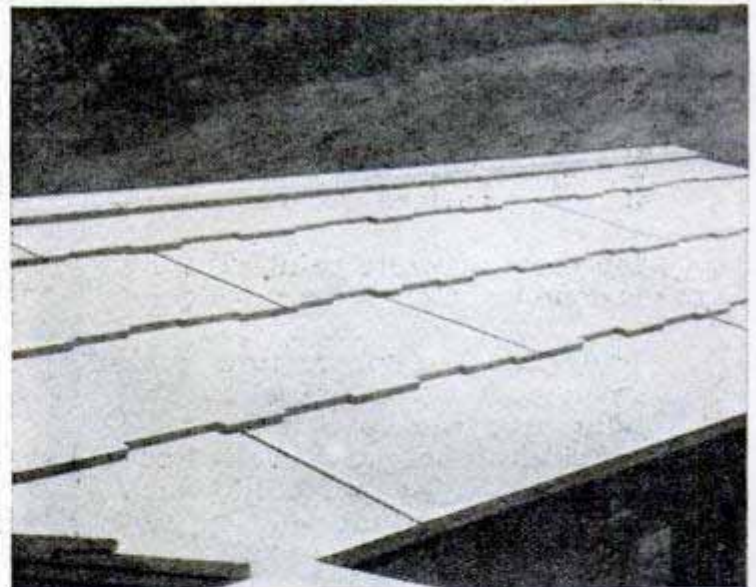
Left, pumice mixed with cement in about a one-to-five proportion is poured into a wooden form on the roof. The tapered form is two inches thick at one end and one inch at the other. Wire mesh reinforces the slab

Below, after it is poured, the pumice mix is troweled the same as concrete. Colors may be added to the wet mix if desired. Combing the slab before it sets gives the roof an attractive, nonglare surface

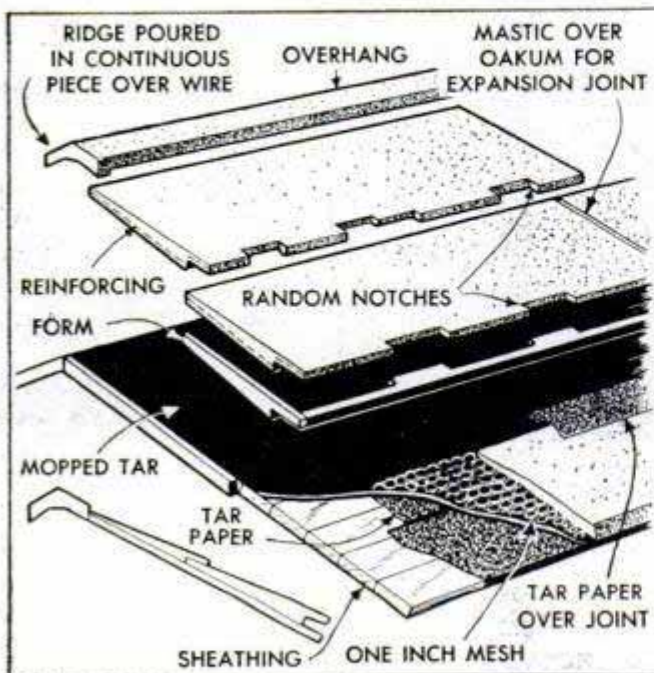


PUMICE ROOF

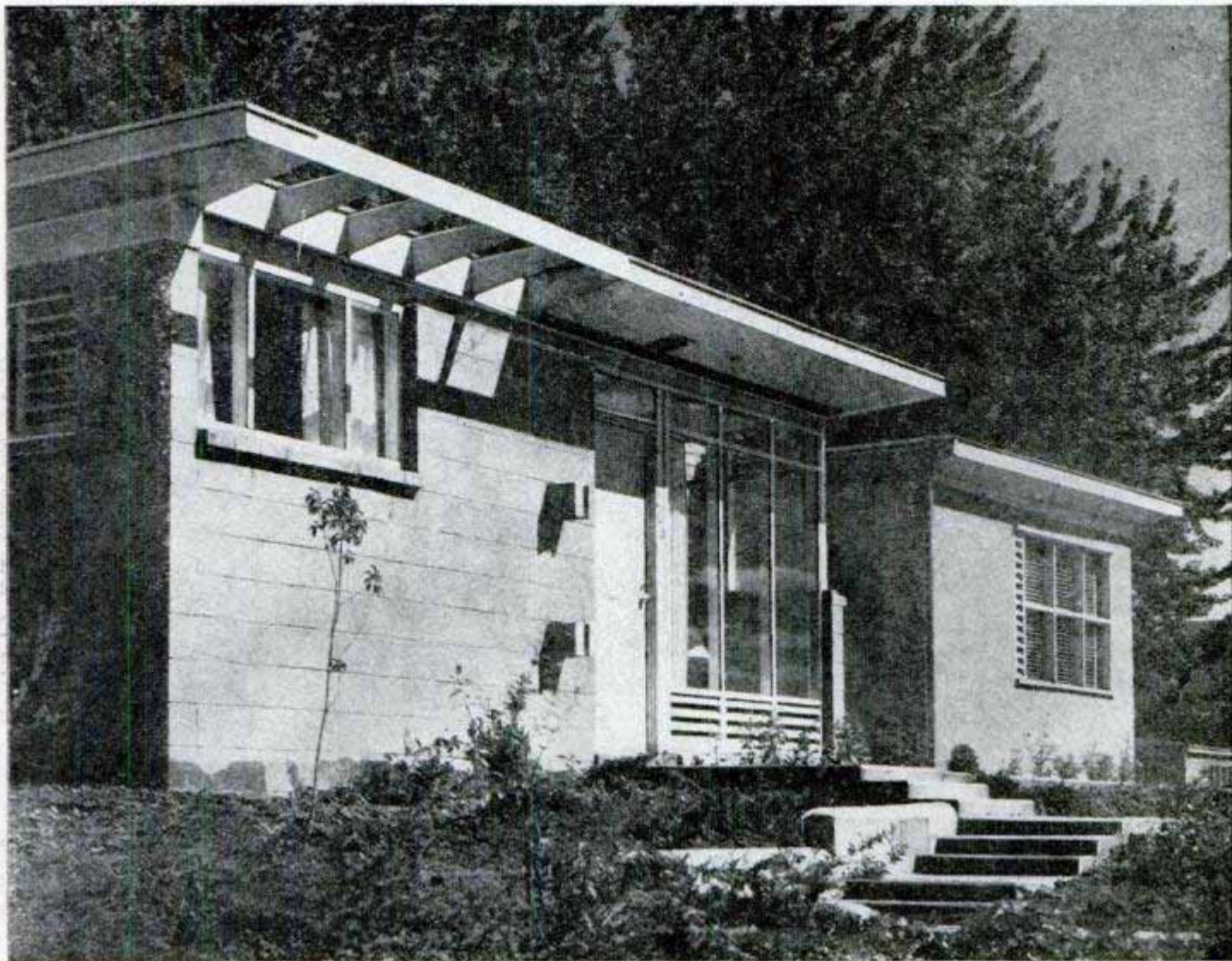
ROOFS made of pumice, which is poured and troweled like concrete, have the neat appearance of shingle roofs, yet they cut the requirements for ceiling insulation in half. Pumice weighs only one third as much as sand and gravel, so the roof structure which supports it need be no stronger than one designed for Mission tile. A. C. McCoy of San Bernardino, Calif., pours such a roof in three by eight-foot sections. First he applies two layers of tar paper and liquid tar to the roof sheathing. Then, beginning at the eaves, he builds forms, notched at random points to give the appearance of shingles. One-inch mesh wire is laid into the form and the pumice mix poured in and troweled. After it is set, another slab is poured beside it, followed by the overlapping slabs above. Oakum is driven between the slabs and covered with mastic to make expansion joints. Color may be added to the pumice mix if desired.



Above, finished roof has the appearance of shingles. Notches on lower edges are made by wood blocks set at random along the bottom of the form. Oakum, driven between slabs, provides a neat expansion joint



Exploded drawing shows how the slabs are made. Two layers of tar paper and liquid tar are first applied to entire roof sheathing. Strips of tar paper also are laid between the slabs in overlapping joints



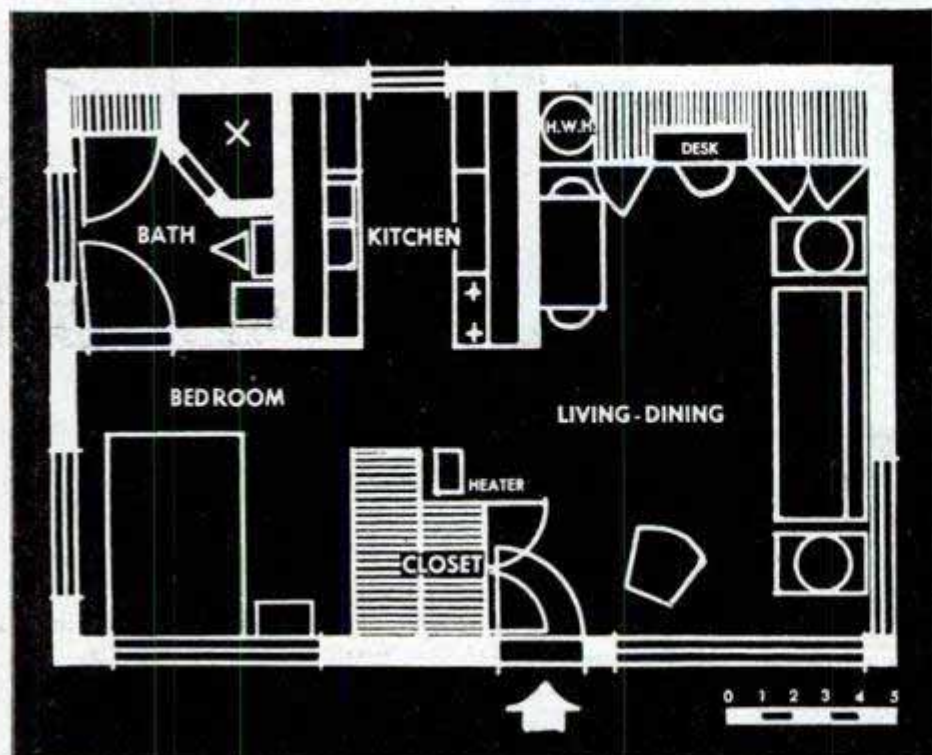
Small Homes of PUMICE BLOCK

Not castles, but mighty fine homes for married couples attending college. Each was built for less than \$2500

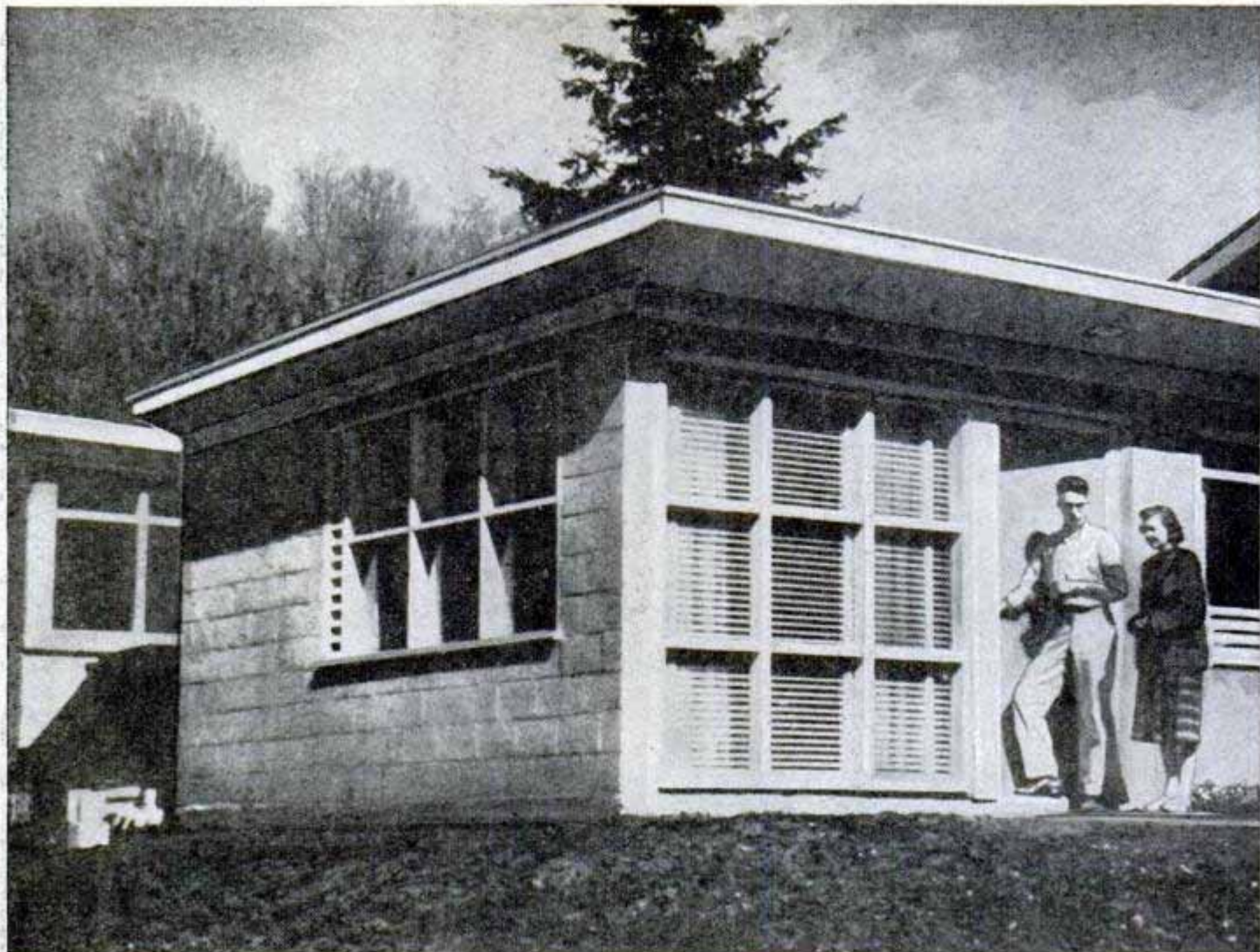
By *Kenneth M. Jackson*

LIKE MOST college towns, Pullman, Wash., home of Washington State College, had an acute housing shortage following the war. Married couples were ferreting out single rooms, shacks and trailers to live in. The home economics department decided to find out whether a comfortable, small home could be built by inexperienced labor at a cost an average college couple might be able to swing.

The result is a pair of bungalows erected by husband-and-wife teams, homes which now have withstood two of the severest winters in Northwest history and still look as new as

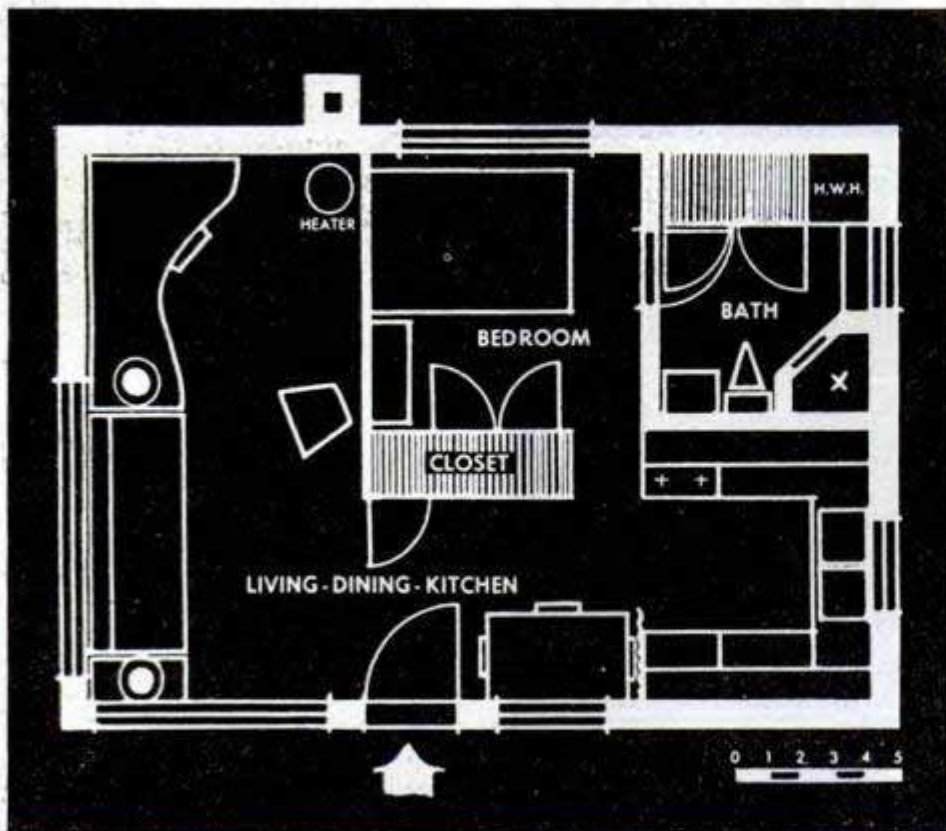


Floor plan of one of the houses has clear pathways through all the living areas and plenty of built-in storage



Student and his wife walk proudly into the home they built themselves. With no construction experience they laid up the frothy pumice blocks

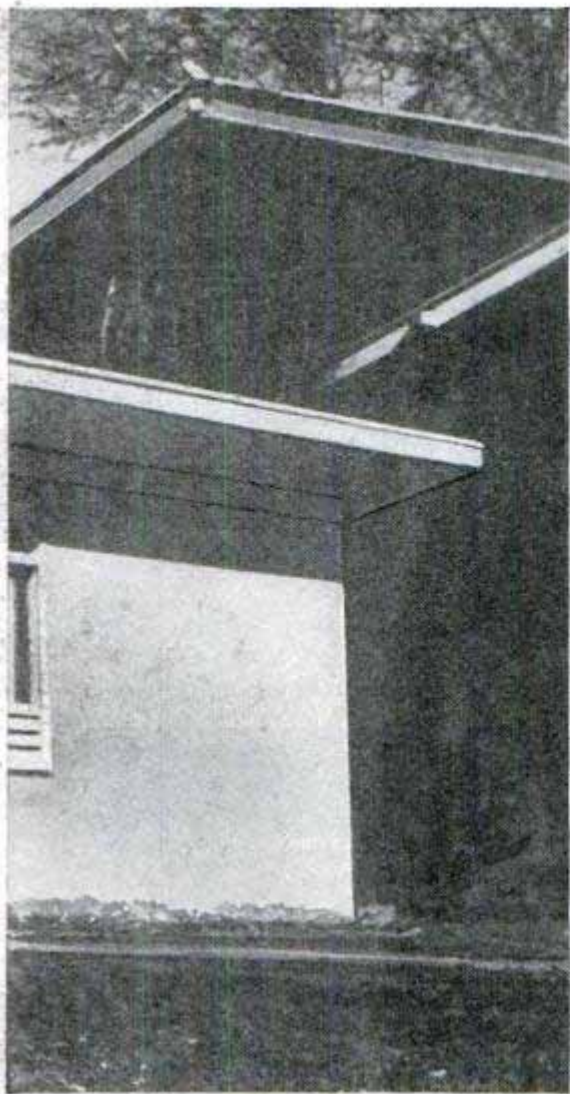
Floor plan of the second home has a combined living-dining-kitchen area. It was designed after time and motion studies of typical housewife's work



the day they were completed. Best of all, they cost under \$2500 apiece.

The magic construction material which made the houses—and their prices—possible is pumice. When volcanoes erupt they not only bubble up lava, but they also blow out a fine froth which solidifies as pumice. It is this airy quality of pumice which gives it superlative traits as a construction material. Pumice is cast into blocks which are lightweight and correspondingly easy to transport and lay. One row of pumice block has more than twice the insulating ability of two rows of concrete block.

Plaster can be applied directly to pumice blocks, or the surface can simply be painted. In addition, nails can be



Above, right, co-builder of one of the homes tries her kitchen for size. Pre-made kitchen cabinets, windows and doors were included in the \$2500 cost



One of the homes has a storage wall with a built-in desk. The homes are small but take advantage of every inch of space for living area or storage

driven directly into the material, simplifying the job of installing door and window frames and rafters.

For all these reasons, the architectural experts at Washington State decided that pumice was their building material. Home economics and architectural students made time and motion studies, then designed floor plans which would lighten the housewife's work.

Eventually, the first blueprints and the building materials were turned over to a married couple with no previous experience in construction work. The husband poured the concrete foundation and floor

slab, then laid up the exterior walls in only 56 hours. His wife helped by painting, putting and laying asphalt-tile flooring while he installed the windows, partitions and cabinets. They finished their home in about 3½ months, despite the fact that the husband was taking a full college course and working part time as a bookkeeper.

The two bungalows are not alike, but both are designed to make the most efficient use of limited space. The amount of furniture is restricted and there are roomy pathways throughout the living areas. Storage space has been provided for everything from thimbles to skis.



Department of Defense photos

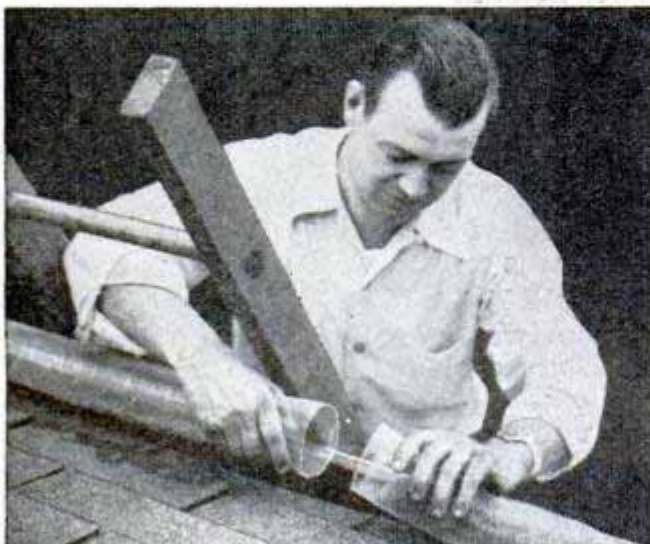
Above left, that's a 1000-pound bomb being lowered onto a tray at the muzzle end of the test gun. Right, at the breech, the gun crew places a powder charge in the chamber for firing the bomb. Below, this is what happens when the bomb hits the target. Clouds of sand and burned gases hide the target from view at instant of impact



Ship's Gun Does Shore Duty

Once mounted on the turret of the battleship, South Dakota, a 16-inch gun has been sawed off and altered to become an experimental 24-inch gun used for testing bombs and guided missiles on shore. The

gun shoots bombs and warheads as heavy as 2000 pounds against armor plate and concrete targets at supersonic velocities. The effect of the impact on the missiles and their components is measured and analyzed to determine possible changes that might improve them.



Mesh Tube Laid in Gutters Prevents Clogging by Leaves

Leaves can't collect in gutters protected by a tube made of bronze screen. The tube, 3½ inches in diameter, has an internal brass spring which prevents the screen from being bent out of shape. Five-foot sections of the tube are simply telescoped together at the ends and laid in the gutter. No fasteners are required and the tube can be lifted out when the gutter is to be repainted on the inside.

More than 7000 high schools in the United States are providing courses in automobile driving during the current school year.

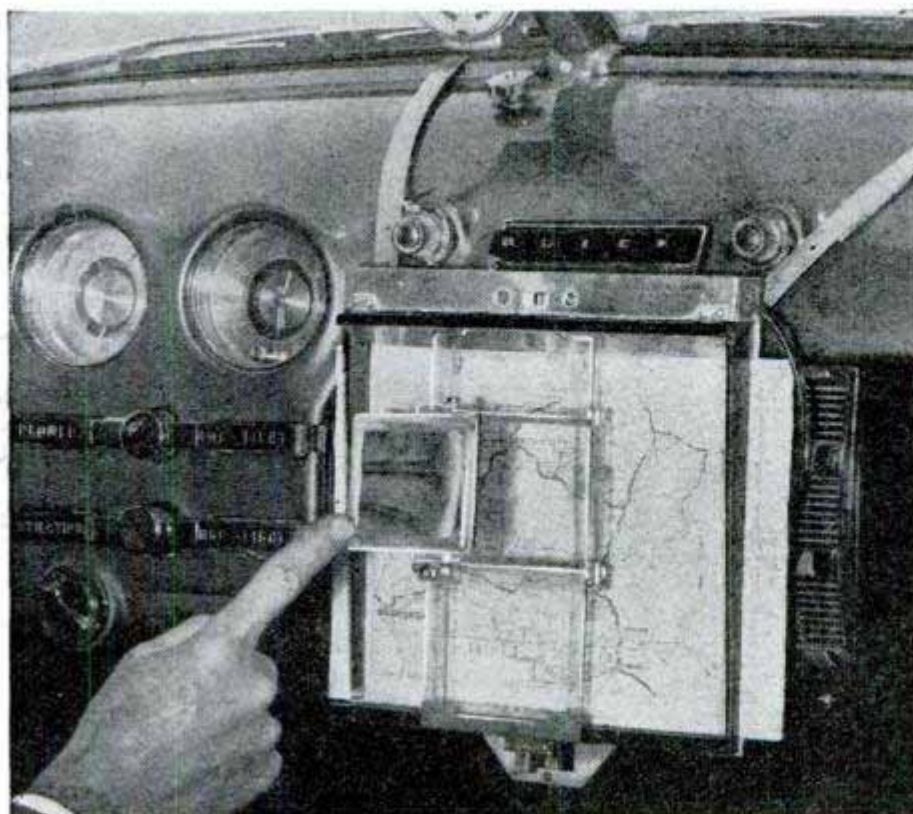
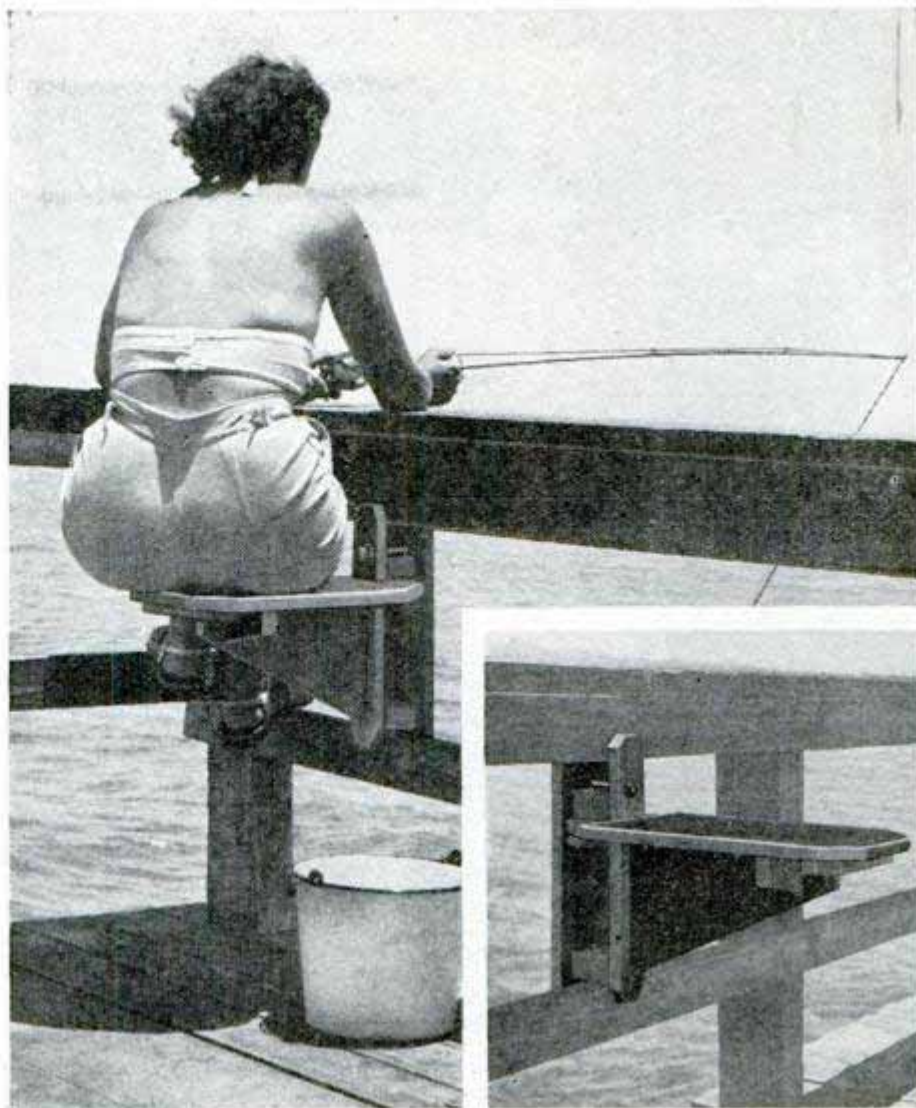
Pier Seat For Anglers

Florida fishermen who stand for hours on a pier hauling in their catch can now sit down and relax. A sport-shop owner designed a simple seat arrangement that slips between the rails of the pier. The seat is not fastened to the rails, it simply fits between them. The designer has had many of the seats made and rents them out for a small fee.

Faster Processing Of Color Films

Developed for the United States Air Force, a high-speed technique for processing color film promises to make color pictures as readily available as black-and-white. Processing time for color film is reduced from 90 to 20 minutes and for color prints from 90 to 15 minutes by the system. Basis of the new Ansco system is a prehardener that permits processing to be done at 80 degrees instead of the 68 to 70 degrees normally used. The increased temperature speeds development. At present

the processing kits, which are the first ever developed for use with either paper or film, are available for distribution only to the Armed Services.

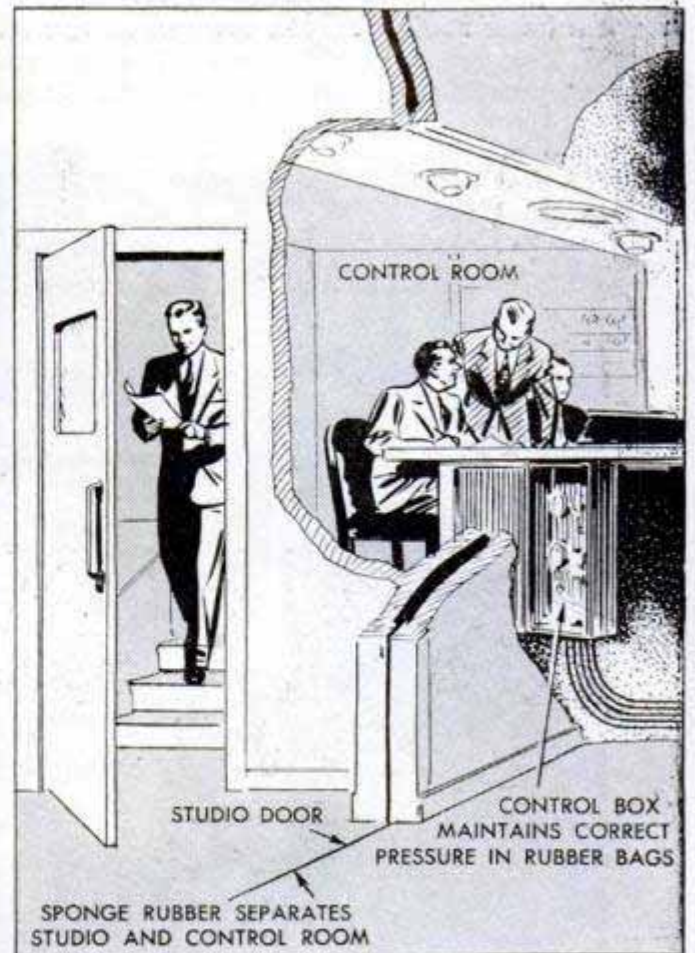
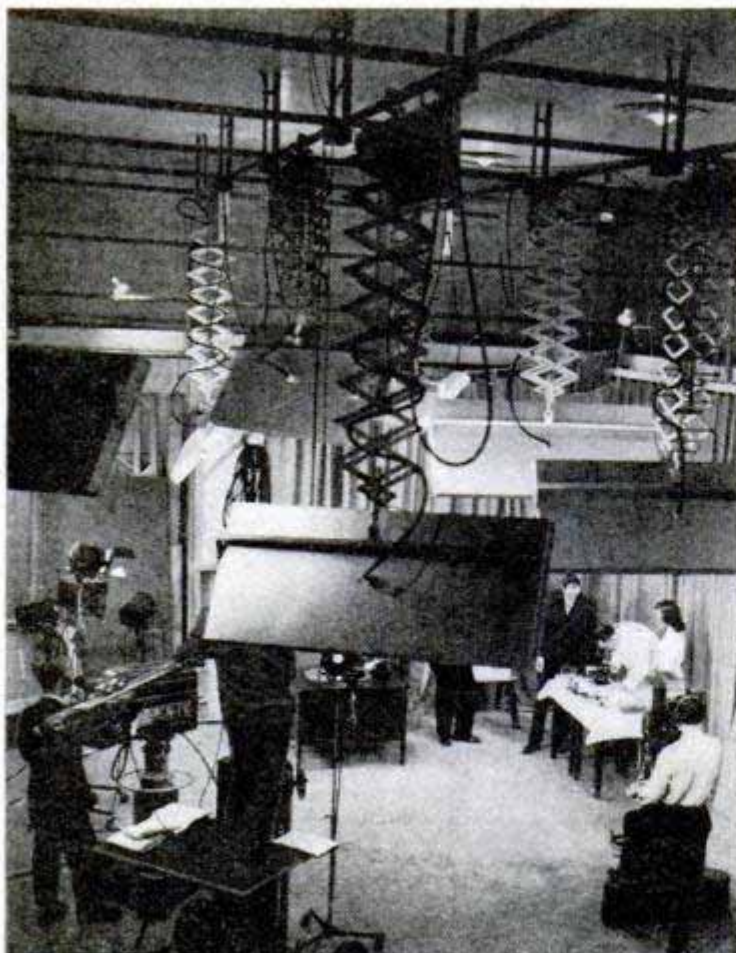


Dashboard Rack Holds Road Map

Mounted on the dashboard, a plastic-covered map holder provides the driver with a ready reference while driving over strange roads. Two concealed bulbs in the top of the device illuminate the map without glare. The light cord plugs into any cigarette-lighter socket. A sliding plastic lens, mounted on a swivel so it can be used by either the driver or passenger, enlarges any portion of the map, providing a large, clear view of the details. The mounting arms hook into the defroster openings at the base of the windshield.



Big band-shell studio gives listeners the impression that they are seated outdoors. All sound is projected forward, then absorbed in one end of room. Below, left, banks of fluorescent lights on lazy-tong hangers have replaced old TV "hot" lights. Drawing shows how the new studios float on rubber bags filled with air



FLOATING TV THEATER

PROBLEM: How to construct a television studio in the same building with a battery of pounding newspaper presses in such a way that the TV picture won't shimmy all over the receiving screen.

Solution: Float the studio on a layer of air.

That's exactly what architectural engineers have done in building not just one, but 14 studios in an addition to The Chicago Tribune's big structure. Some of the studios will be used as TV theaters, others for AM and FM broadcasts and a few will accommodate both television and radio. Although some of the studios are in use already, others will not be completed for a year or more.

The conventional radio or TV studio is isolated because it is a room within a room. That wasn't enough in this case, for the rumbling presses would shake even the inner room to a degree that couldn't be tolerated. The new studios were designed so that they literally float on a layer of air without touching the primary structure.

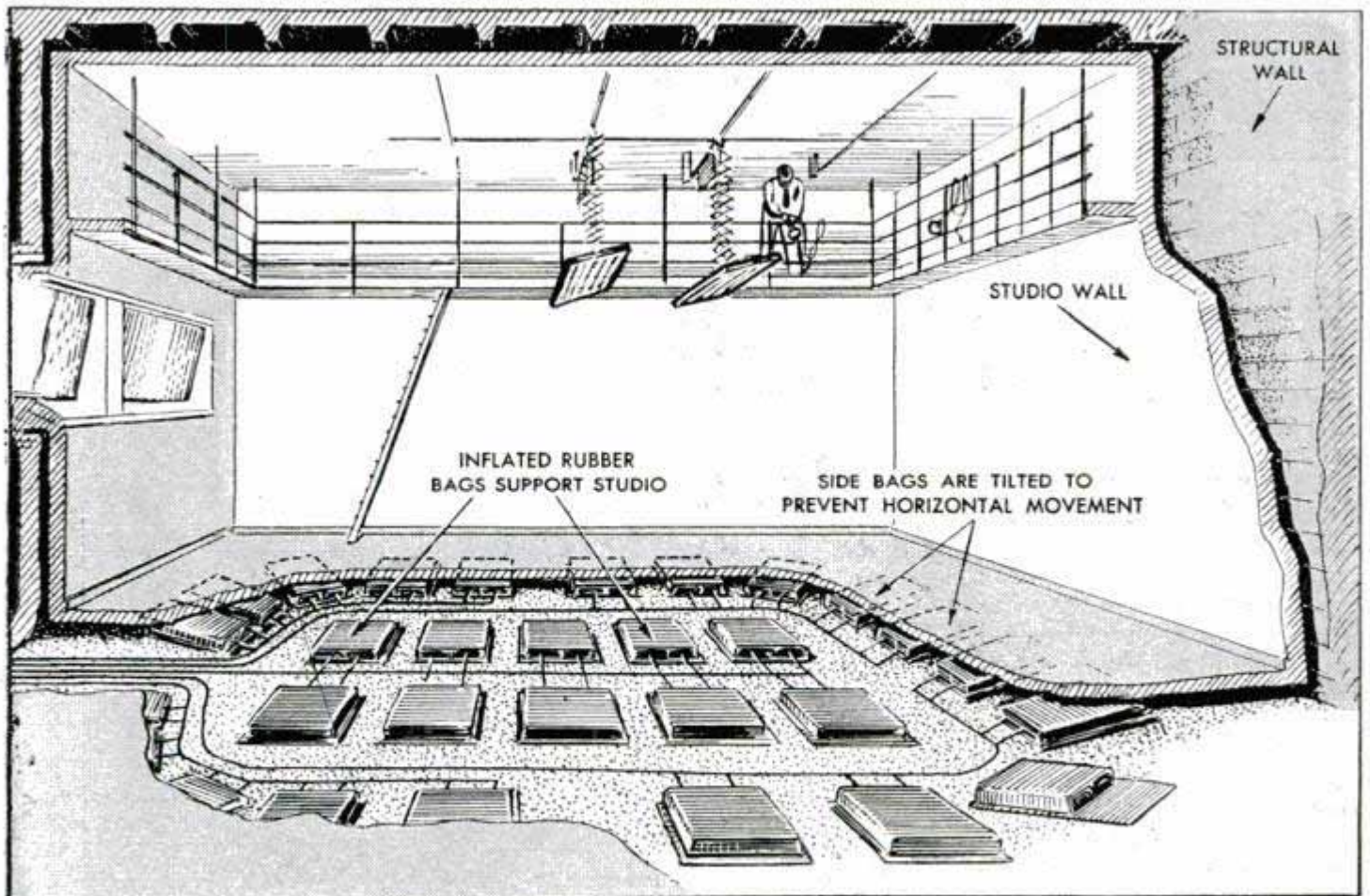
A typical TV studio in the new building is separated from the rest of the structure by a 2½-inch air gap around all sides and at the top. The entire room floats on a nest of rubber bags, inflated like flat balloons.

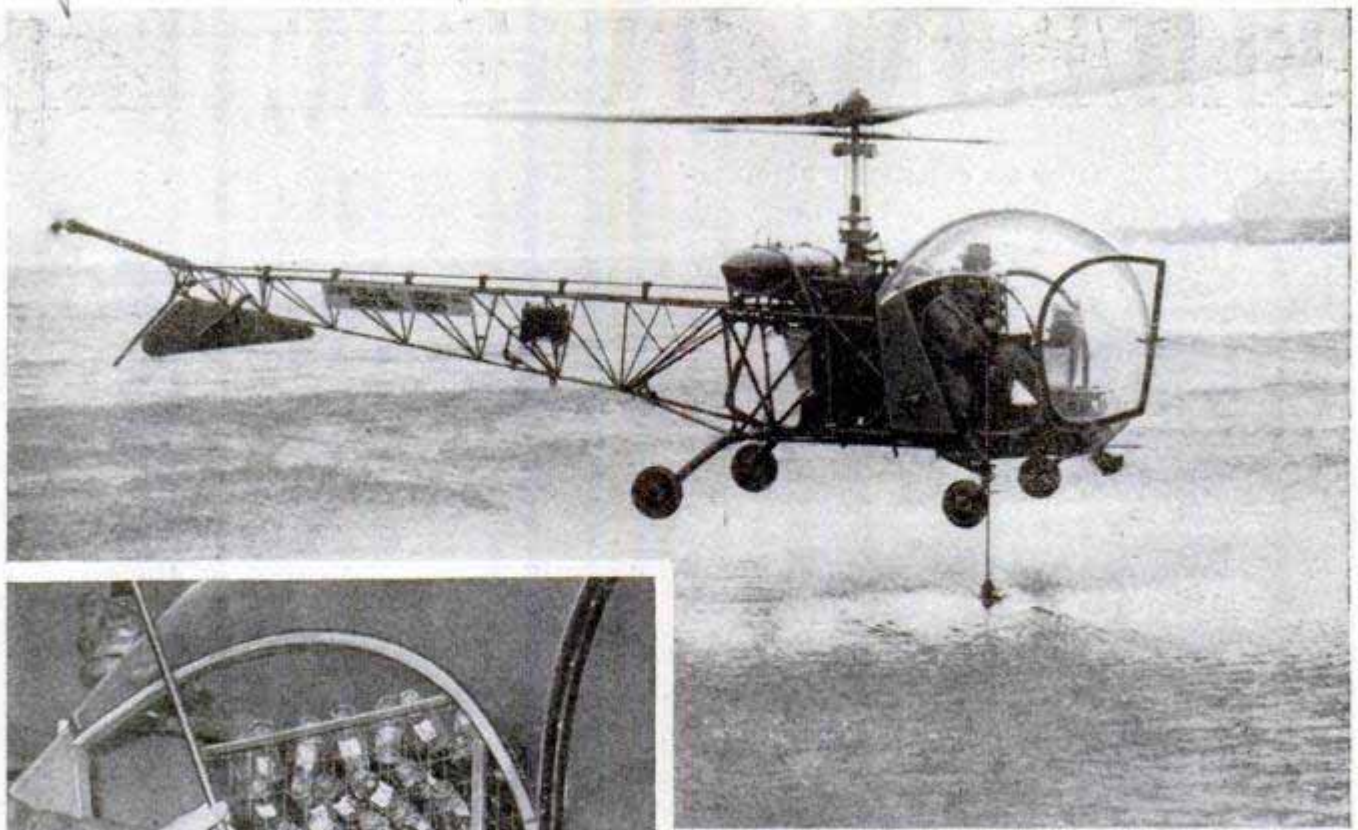
These rubber shock absorbers, measuring 14 by 30 inches, are inflated to a pressure of 40 pounds per square inch. This raises the studio floor ¼ inch from its base, and the gap thus created is maintained to within ⅓₂ inch by automatic controls which pump more air in or release it as needed. All the control lines lead to a box, where sensing switches click on and off at intervals, raising or lowering one section of the studio to level up the room.

The outer row of rubber bags is tipped slightly toward the center of the room, so the studio nestles in the bags and can't shift in any direction. The studio is separated from the control room by a wide gasket of sponge rubber.

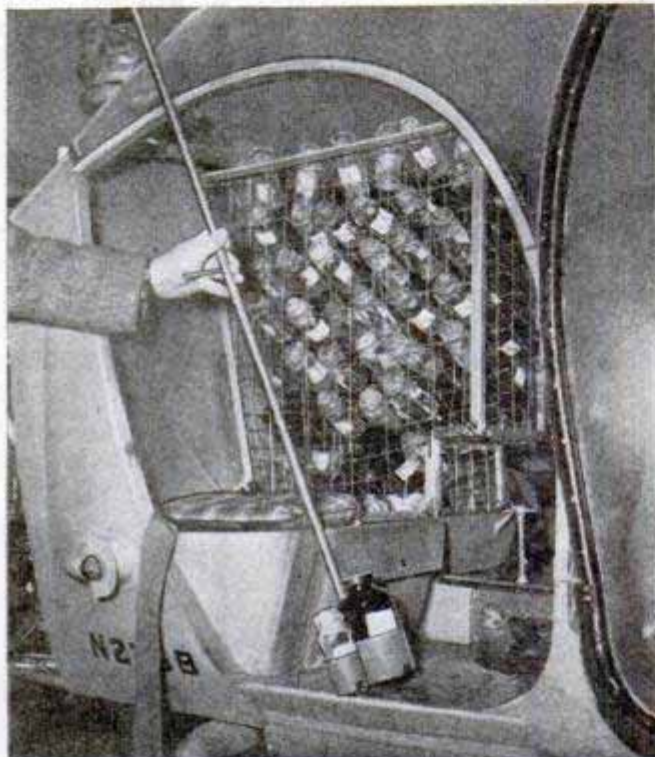
Most of the old-fashioned "hot" lights for telecasting have been replaced in the new studio by 12 banks of fluorescent tubes suspended from the ceiling on adjustable supports.

Another studio within the building, designed for both TV and radio broadcasts, is actually an outdoor band shell transplanted indoors. The band-shell area of the mammoth room has no sound absorbers. The sound is projected toward the "outdoor" end of the studio where it is absorbed in a porous acoustical material.





While helicopter hovers a few yards above surface, engineer with bottle attached to long pole scoops up water samples from lake for purity tests. Left, rack for bottles is in cockpit, beside sample taker



Aerial Waterworks

Samples from the source of Chicago's drinking water—Lake Michigan—are now being collected by helicopter for periodic purity tests. While the craft hovers a few yards above the surface, water samples are scooped up in bottles attached to the end of a long pole, then capped and labeled as to point of collection.

Rifle From Shotgun

Your shotgun does double duty when you use a converter that slips inside the barrel, changing the bore into one that takes .22 rifle bullets. The converter slips in and out easily and can be changed in the field. Double-barrel shotgun owners can convert one barrel for .22 ammunition, leaving the other for shotgun shells. The converter uses the shotgun's firing pin and shell ejector.

☛ Farm accidents take a toll of 17,500 lives each year and cause 1½ million disabling injuries.





Like cars on an assembly line, the machine-made tortillas, precisely baked, pour from the ovens on a conveyor

Tortillas Meet The Machine Age

By Jack B. Kemmerer

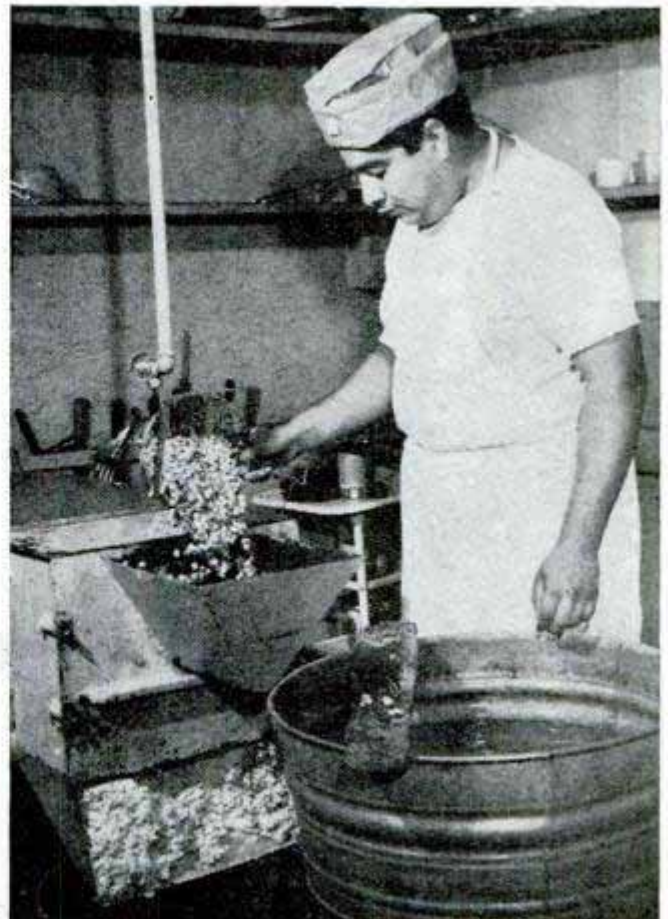
THE INDIANS of Mexico first made tortillas between 2000 and 1000 B.C., when most historians agree that corn originated in Guatemala and southern Mexico.

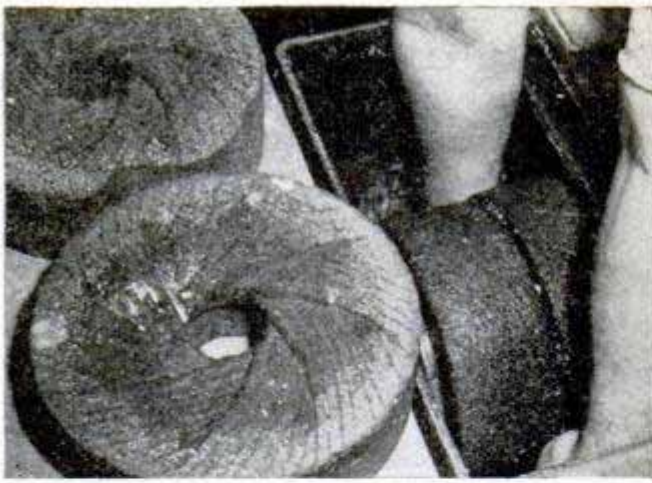
The ancient method of making tortillas by hand had never changed until recently. Now, the tortilla has met the machine age.

The El Zarape Tortilla Factory in Los Angeles uses an automatic tortilla-making machine that has reduced the cost of tortillas more than 30 percent. The dough is put in one end of the machine and a perfectly cooked, ready-to-eat tortilla comes out the other end. This machine has made more than 6,000,000 tortillas in the last three years. An expert can make about eight dozen tortillas per hour by hand while the machine makes 100 dozen.

Although the methods of making and cooking have changed, the tortilla is the same. Corn, powdered lime and water were used 3000 years ago. These same ingredients are used today.

Corn, the raw material for tortillas, is ground in this machine between porous stones called "canteras"





Above, these are the stones or "canteras" in the grinder. Very porous, they are cooled by a stream of water



Above, after grinding, corn is kneaded by hand and placed in cutter, below, coming out tortilla-shaped



The dried corn and lime are cooked slowly for several hours to soften the hull of the corn. After cooking, the grain sets overnight and is ground the following morning.

Grinding is done by a machine which uses two porous stones. These stones, called "canteras," are found only in Mexico. A stream of cool water flows on the stones during the grinding. The water goes through the porous stones keeping them cool and at the same time adds the required amount of water to the grain. If the stones were to get hot during the grinding the corn would be overcooked.

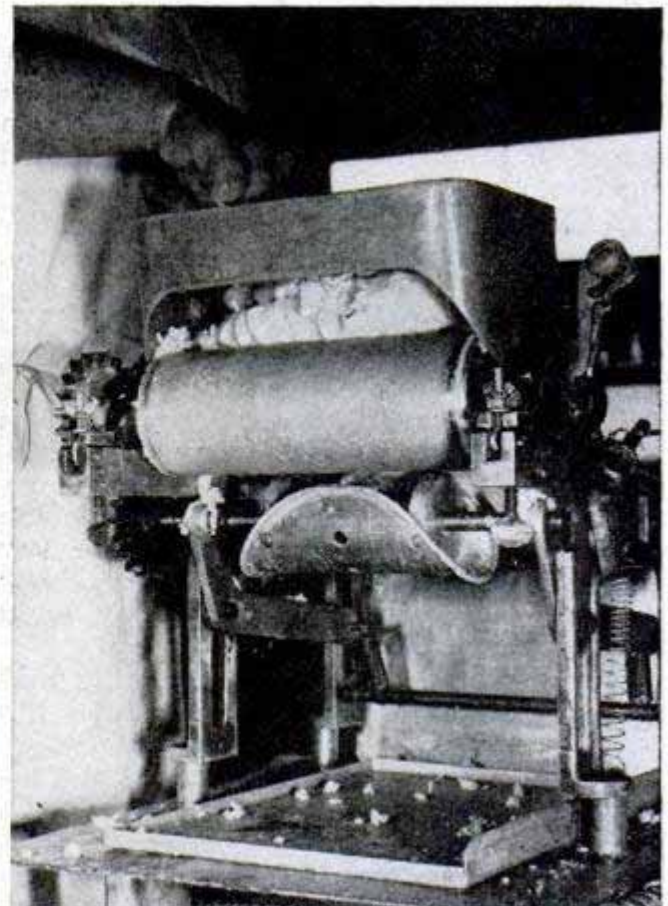
After grinding, the corn is rinsed to remove part of the hull, the remainder being left in the dough to add body to the finished tortilla. The corn is then kneaded into a stiff dough and is ready for the machine.

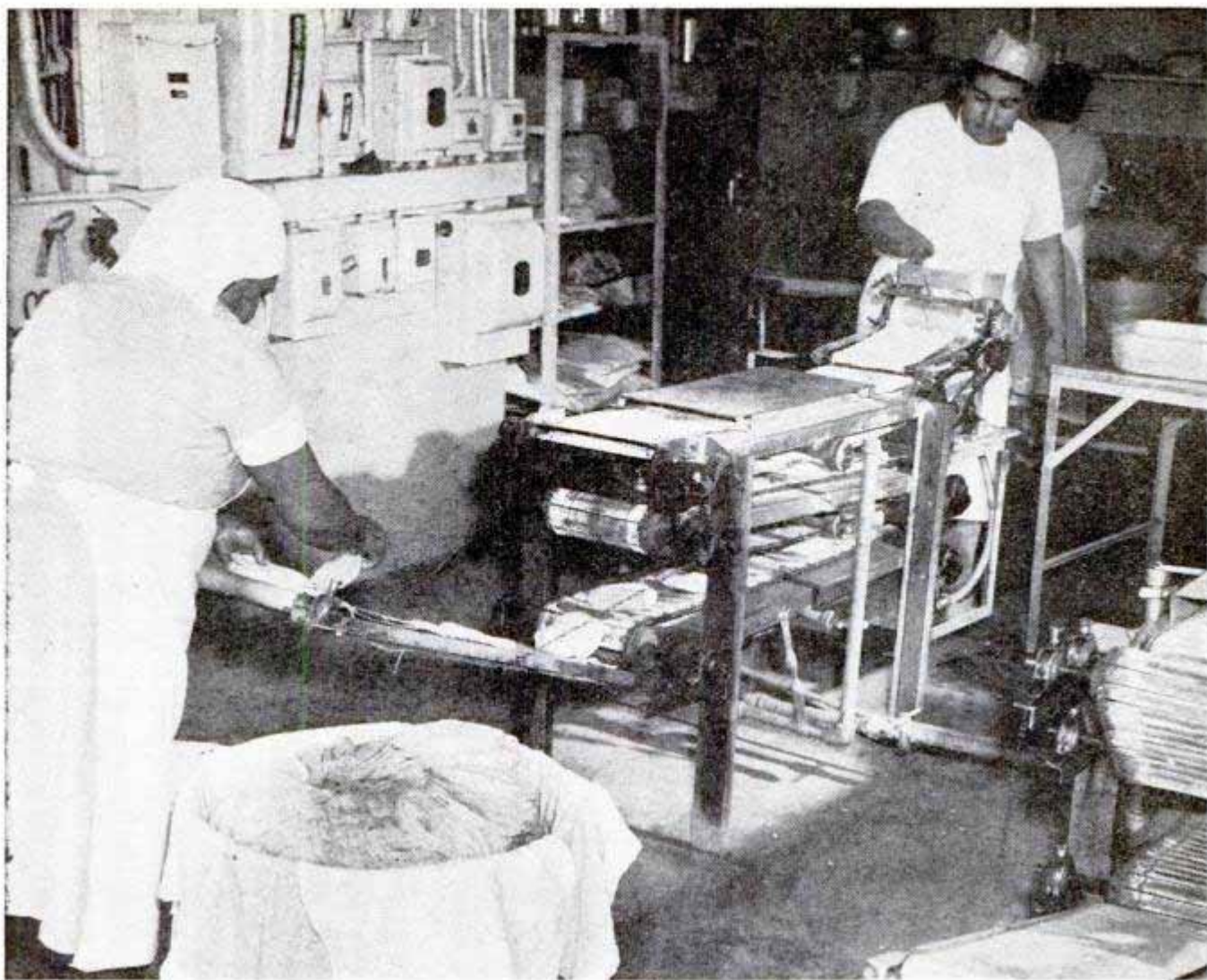
The dough, placed in the hopper of the machine, is rolled flat by two bronze rollers. These rollers are adjustable and the dough may be rolled to any thickness.

The cutter, which is a curved disk located below the rollers, rotates against the front roller and cuts a tortilla with each revolution. After being cut, the dough is carried on a canvas belt to the asbestos conveyor of the first oven.

The three gas ovens are located one above the other. Each oven has an endless belt which carries the tortilla through it. As the tortilla leaves the first oven it

Close-up of the cutter. Curved disk rolls against a front roller, cutting a tortilla with each revolution



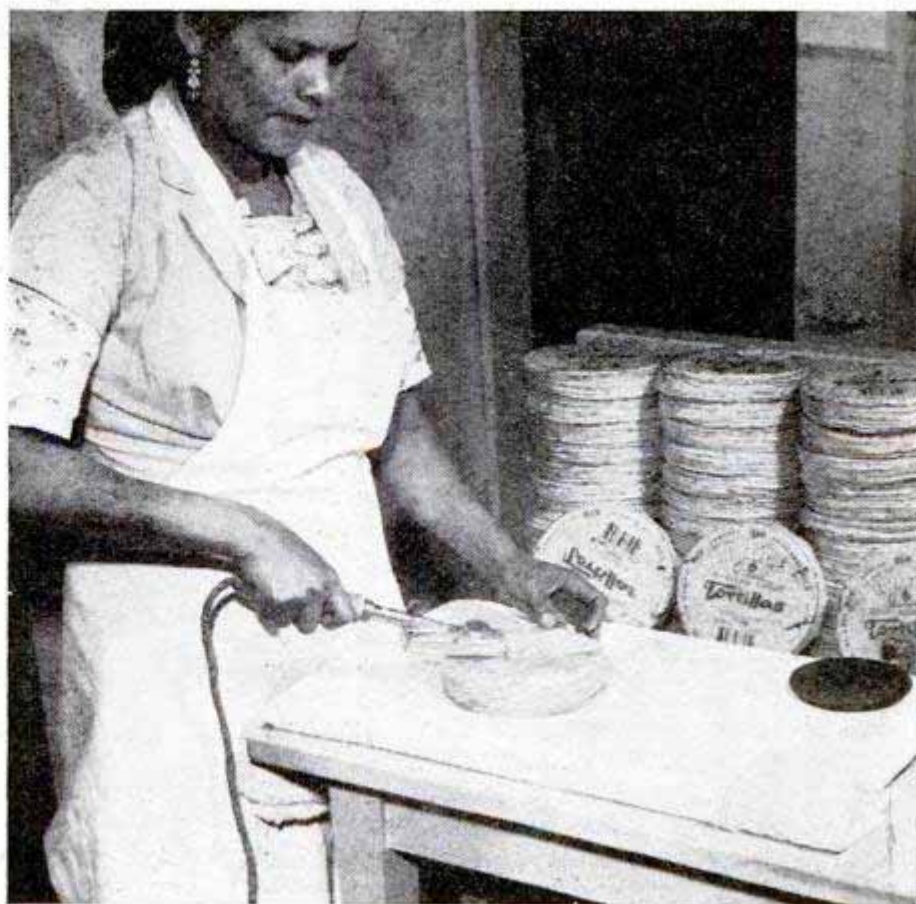


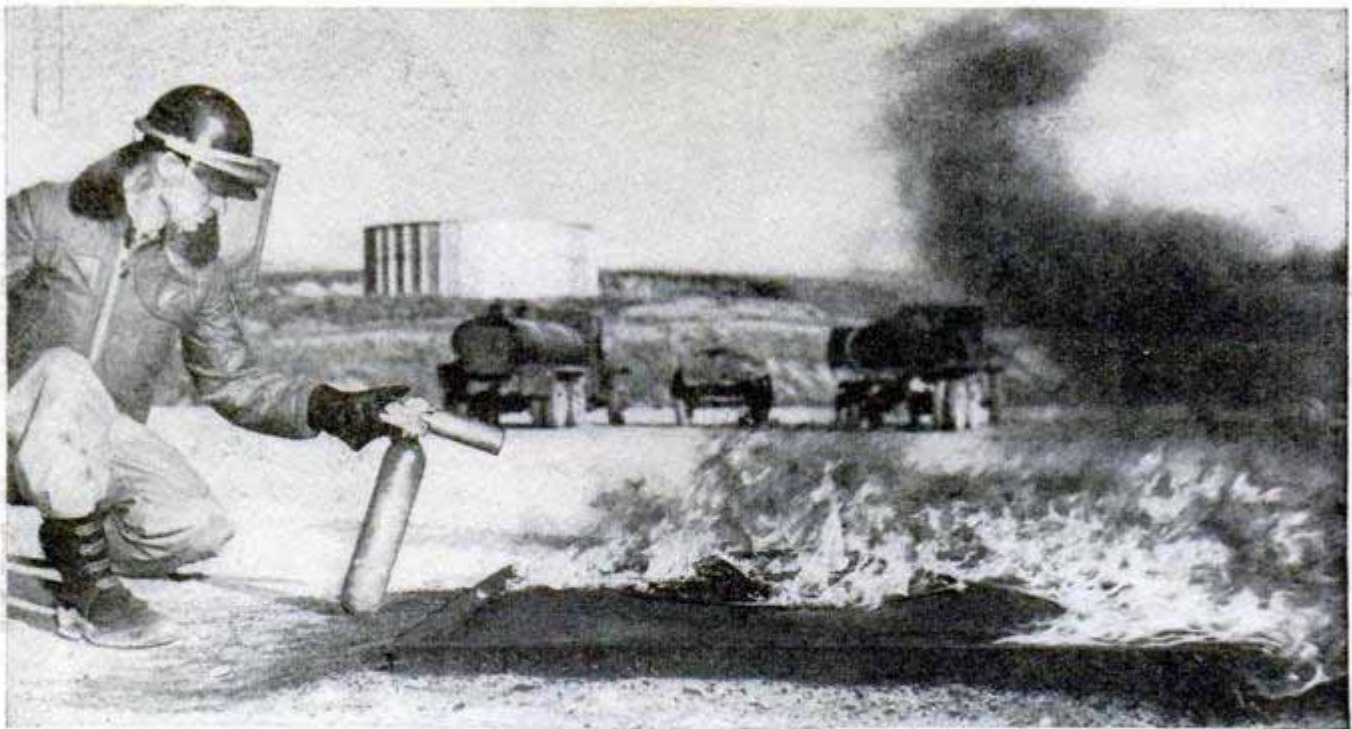
turns over and falls to the oven below. When it drops from the third oven it falls onto a canvas belt and is carried from the machine. This entire operation takes one minute.

As the tortillas leave the machine they are puffed up to about three times normal size. When cool they resume their normal thickness. They are then wrapped in wax paper for delivery.

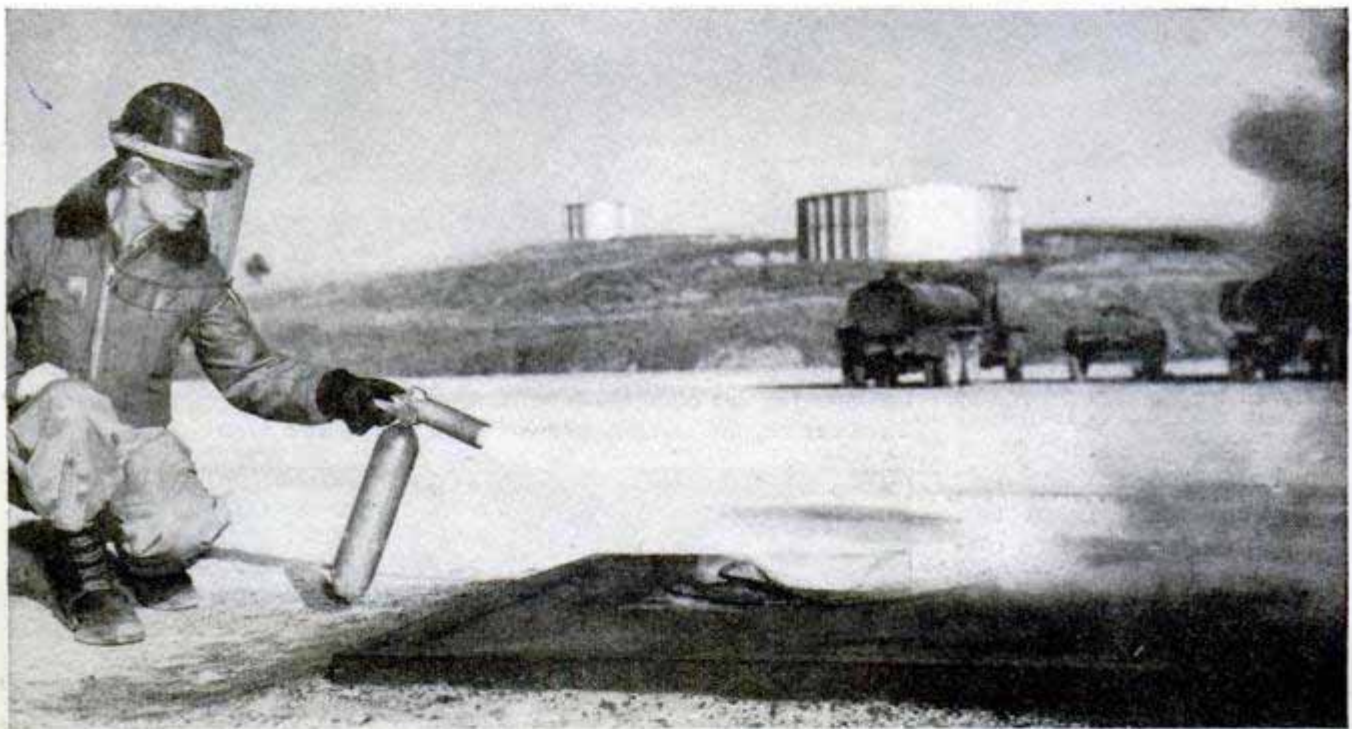
The tortilla is rather stiff which is advantageous, because it is also used as an eating utensil. Tortillas are used as plates for salads, vegetables and meats, a practical application as the dishes are then eaten instead of washed. The tortilla, whether machine or hand made, is basically what it was 3000 years ago. It has met the machine age and come out of the battle unchanged.

From the cutter, the tortillas are carried through three gas ovens for baking. The complete machine is shown in this photo. Below, after they have cooled, the tortillas are wrapped and sealed for shipment to shops





Department of Defense photos



Fire Put Out in Split Second

Faster than you can say "dibromodifluoromethane," a new fire-extinguisher agent with that jawbreaking name snuffs out flame. Developed by the Army Engineers, the agent is said to be at least twice as ef-

fective as carbon tetrachloride, the standard fire-extinguisher fluid in use today. It is also less toxic than the present fluid. In a test at Fort Belvoir, Va., electrical wire was set afire with gasoline. One fifth second after the extinguishing agent was released, the fire was out.

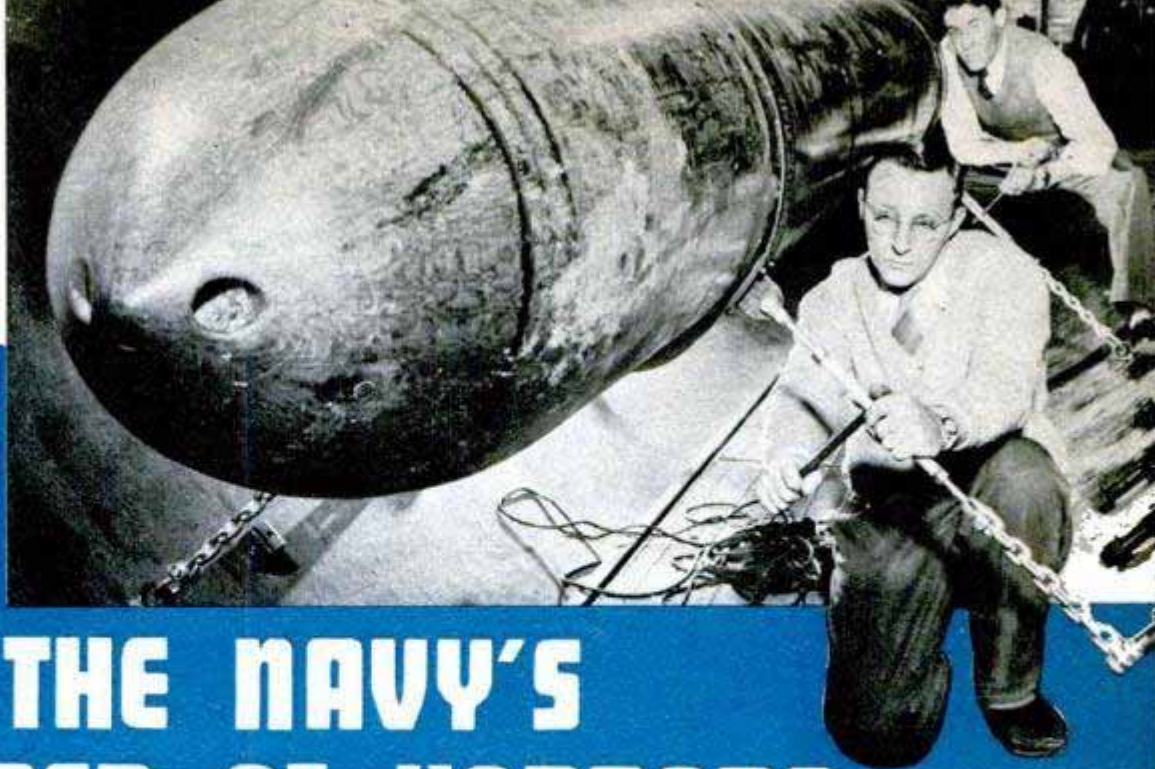
Chlorine Powder Makes a Nontoxic Farm Disinfectant

Farmers can now keep milking equipment germfree with a newly developed form of chlorine that comes in powder form and is easily dissolved in water without leaving a toxic residue. The soluble disinfectant, a form of the organic compound, dactin, is inexpensive enough to be used for water purification and sewage decontami-

nation. Turkey and poultry runs can be disinfected with the chlorine compound, eliminating the necessity of moving flocks to different areas annually. The compound, which contains 66 percent available chlorine, leaves a residue containing nontoxic acetyl urea, a chemical similar to that used in antidecay toothpastes and chewing gums.

DAVE M. GOTTFRIED
N.W. ON

Lashed into place in a huge steel cylinder, ugly torpedo will be subjected to pressure equal to 1/2-mile depth



THE NAVY'S CHAMBER OF HORRORS

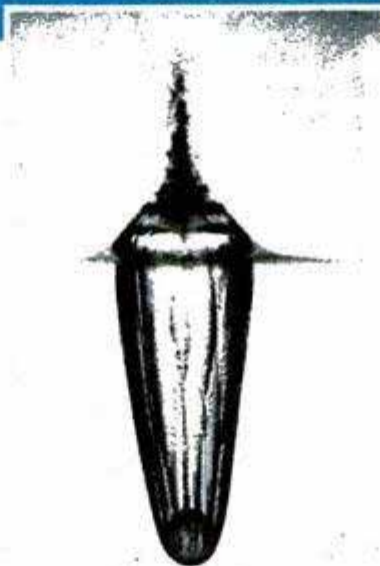
WITH A ROAR the big Navy plane nosed in over the testing grounds off Bermuda. A new-type surface mine hooked under its belly vibrated and tugged as the engine revved to a high whine and the plane flattened out. An instant later the mine dropped away. A parachute bloomed behind it, breaking its fall as it hit the waves with a mighty splash, tumbled and disappeared forever.

It wasn't supposed to do that. What happened? Navy engineers shook their heads. "Send those plans to White Oak and run a model through the tank," ordered the project chief.

Up in the Navy's new \$4,000,-000 environmental laboratory, opened this year at White Oak, Md., Dr. Albert May's staff of water-entry scientists took the plans and made a tiny model of the faulty mine. It was inserted in a steel cylinder and carefully loaded in the breech of a little air gun pointing downward into a glass-sided water tank. With a dull "pow" the model shot into the water, while a high-speed movie camera recorded the progress of its journey to the bottom.

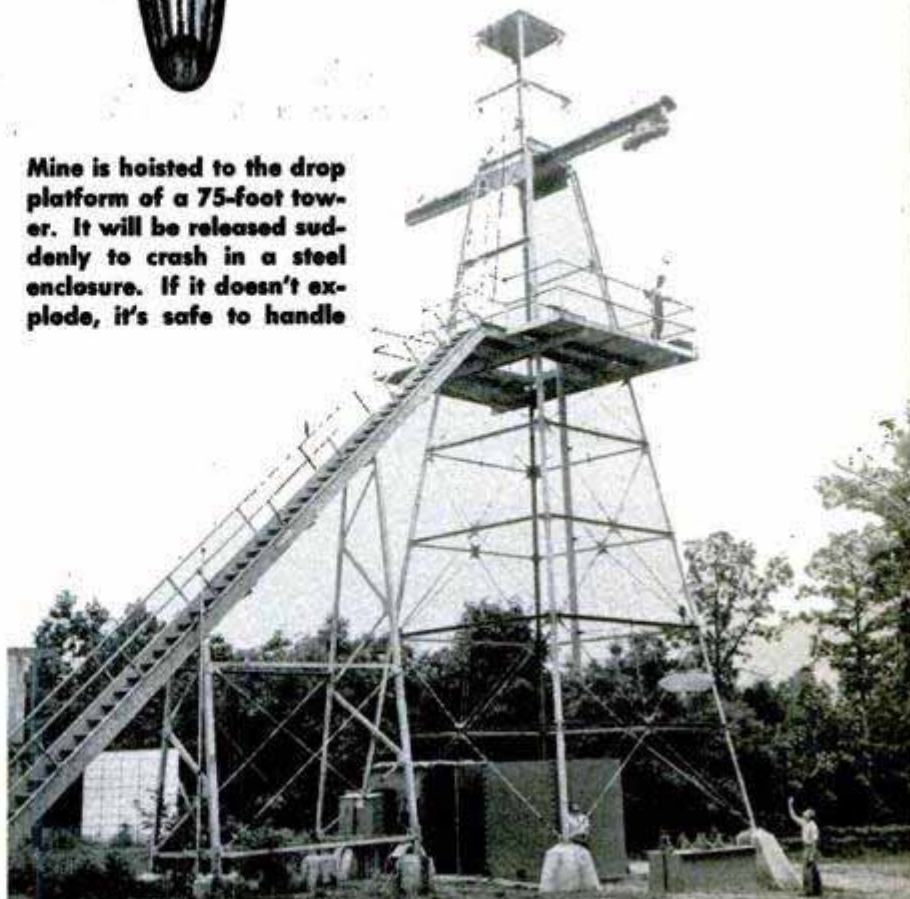
Later, on a screen, the men watched the little model drift into the water, set up a great

By
Michael Day



← When steel ball is fired into water, a "chimney" forms behind it. Depth charge which forms a similar cavity would blow most of its force up through the hole, wasting it

Mine is hoisted to the drop platform of a 75-foot tower. It will be released suddenly to crash in a steel enclosure. If it doesn't explode, it's safe to handle





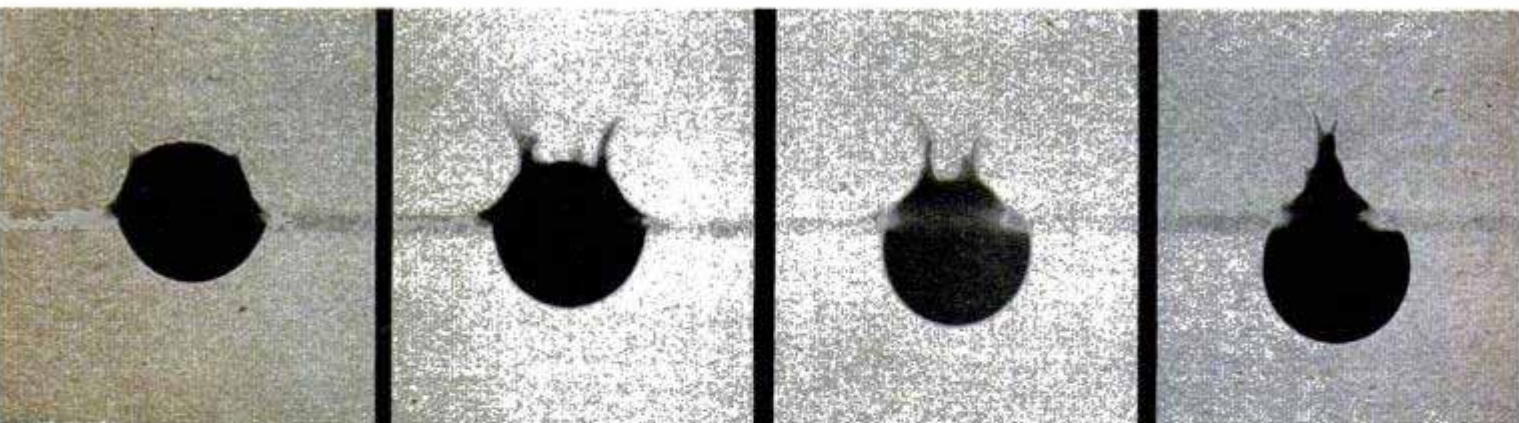
Models which duplicate all the metal construction on big ships enable the Navy engineers to learn to demagnetize hulls so enemy's magnetic mines won't be triggered as ships pass by



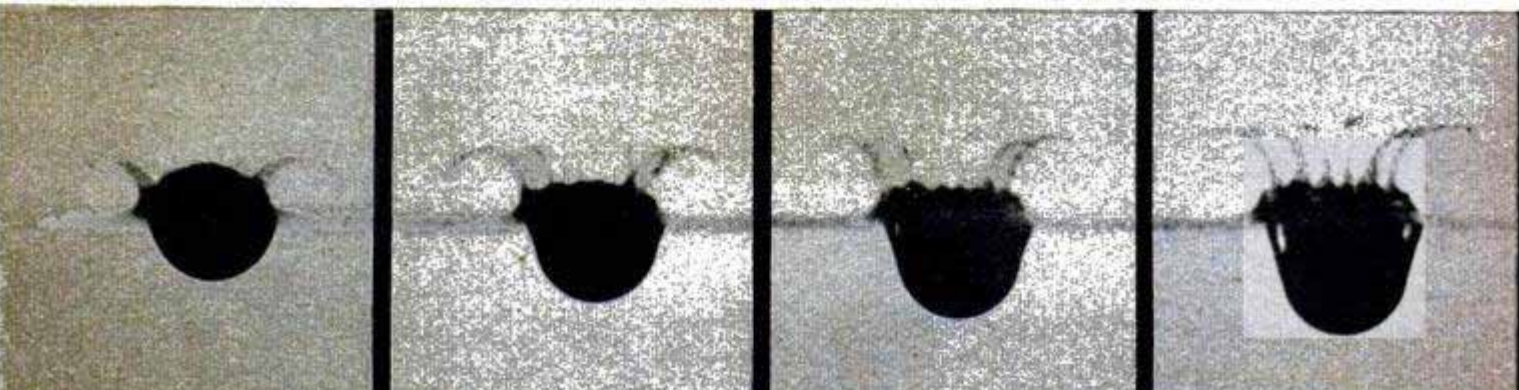
Model of mine goes into steel cylinder to be fired into water. Its behavior will be filmed

basket splash in slow motion and sink downward. "A small metal ring around the vanes for attaching the parachute had changed the hydrodynamics of the weapon," recalls one of the men. "Instead of the vanes guiding the mine in a long curved sweep up to the surface as they should have, the ring was acting as a sort of extra rudder, steering it to the bottom where it cracked up."

Ever since German ships in World War I blew themselves sky high on U. S. mines in the North Sea, the Navy has been elaborating on a wide variety of infernal machines with which to pepper enemy oceans in wartime. Out of Naval ordnance plants in the last war came a fiendish assortment of intricate mechanisms: acoustical mines and depth charges, triggered by the sound of ship propellers; explosive charges that wouldn't blow up unless set off by the magnetic field of particular ships they were designed to "get." Some mines lie on the bot-



Series photos show how slightest projection on mine or depth charge can make a bad cavity. The steel ball above is perfectly clean, makes very little splash, and the water closes above it instantly. Below, a similar ball, touched only by fingers, enters water. Fingerprints cause a big splash and a wide cavity in water



tom, some on the surface, some in between. "There were torpedoes and other ordnance," says one scientist, "that would do everything but play 'Taps' before sending an enemy ship to Davy Jones." There were mines and depth charges designed to let five ships go by, for instance, but blow the sixth out of the ocean. Others might change from magnetic to pressure-triggered after a designated time, to confuse the enemy.

All this delicately instrumented equipment was fine when the Navy could lower it gently over the side of a ship in the night. But today, it must withstand firing into the ocean from speeding jet planes. It must take thousands of miles of punishing travel in jolting trucks and shuddering transport planes, stock-piling in humid, corrosive jungle atmosphere or sub-zero Arctic. How it reacted to all this used to be a matter of expensive testing under actual conditions.

Now, in a huge three-story building taking up an entire wing of the new Naval Ordnance Laboratory at White Oak, a collection of fantastic machines fling weapon models into water at varying speeds, jolt and jar equipment to simulate the rough handling it may get. There are machines to bake it like the desert, freeze it like the Arctic, humidify it like the jungle, drop it, thump it, pummel it and squeeze it under the fantastic pressures of deep ocean. In this labyrinth of environmental wonders, marine weapons can be subjected to any conceivable condition they may encounter anywhere in the world—from assembly line to explosion against target.

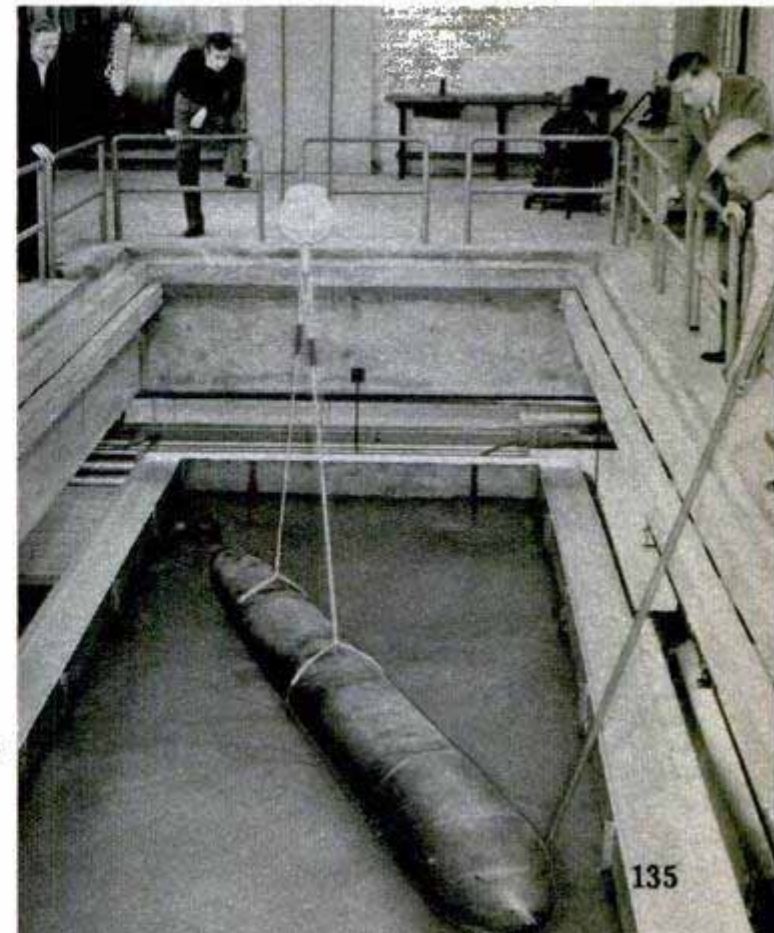
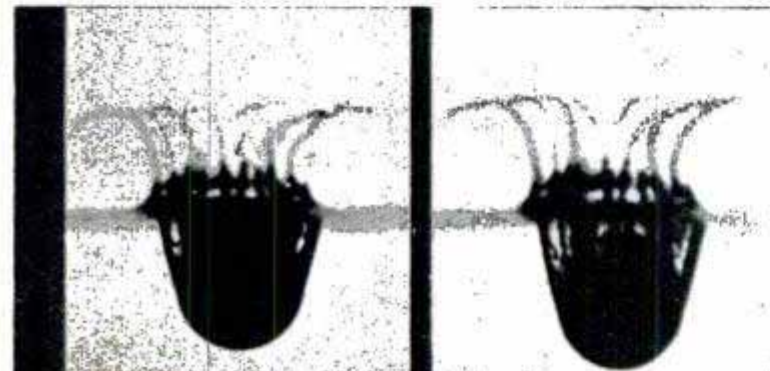
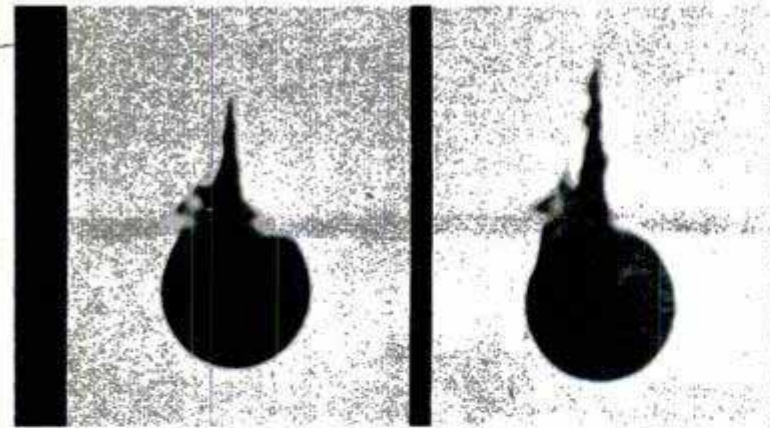
To learn what happens when a mine, tor-

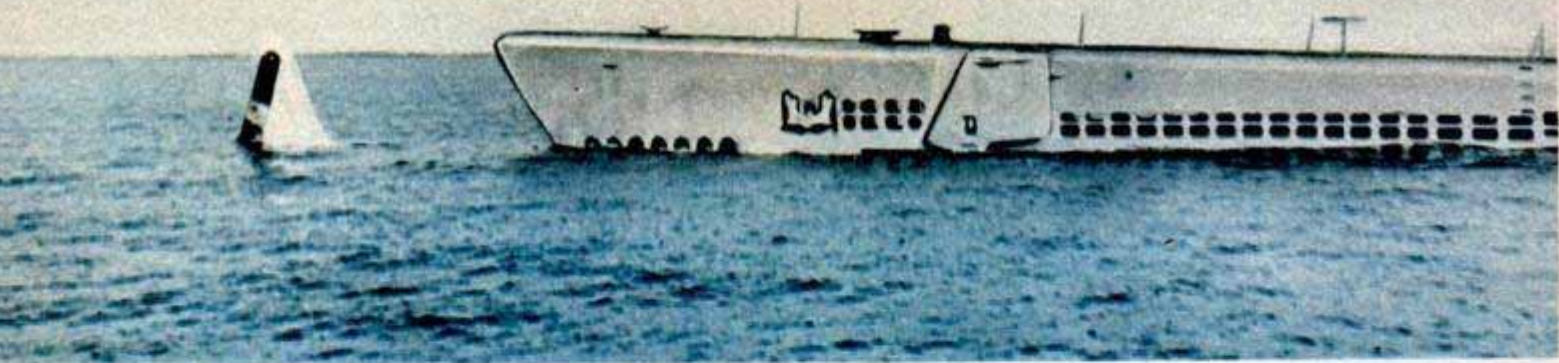
pedo or other weapon plunges into the water from speeding aircraft, Navy scientists have built a glass-sided tank about five feet high and three feet square. On top of it is an air gun into which the men load weapon models or steel pellets that they will fire into the water. By rotating the whole tank on geared wheels, projectiles from the gun can be made to enter the water from almost any angle.

The tiny mine or steel ball to be tested is dropped into a cylinder, which fits into the gun breech. Air hisses through the valves, fills the gun chamber. Then you hear the "pow" as the flap valve is released and the missile plunges into the water. It's all over in a second. So they can see what happened, engineers have rigged their electronically controlled high-speed photographic system to the tank. A special movie camera, which shoots 2000 frames a second, records every move the missile makes. Preserved on the film is a two-minute slow-motion record of how the mine, torpedo, depth charge or pellet behaved in one second of actual plunge time. Stills can also be taken. Doctor May points out an electric eye attached in front of a slitlike opening on the gun barrel. This tags the missile as it goes by and triggers the camera and flash simultaneously. On the big relay panel, time lag can be adjusted so that the plunging missile will be "trapped" at any point above or below the water line.

Mysterious things happen when missiles enter the water at supersonic speed. Doctor

Torpedo crackling with frost is suddenly dunked in warm water, simulating delivery by high-altitude plane





May's men have sent steel balls crashing into their tank at 4770 miles per hour. Water is almost like concrete at that rate. The balls slow down with the alarming force of about two million Gs. That's like hitting a brick wall in a supersonic plane. The average jet plane in sharp pull-out subjects its pilot to a blackout force of only about 10 Gs. You can guess what would happen to a delicate torpedo at that speed. The pellet also cuts a hole in the water behind it like a marble dropped in soft butter.

That hole, directly behind the missile, never completely closes, but stretches out like the tail of a comet—a long hole filled with air bubbles, created by the speeding missile as it pushes the water away from its nose and around itself. "Vaness on torpedoes and droppable mines," points out Doctor May, "are designed to act on the water and steer the weapon into place. If the cavity behind a piece of marine ordnance is too big, there's nothing for the vanes to grab hold of. If a depth charge makes too long a cavity, the cavity acts as a chimney and most of the explosive charge will go up

Sometimes torpedoes leap out of water like dolphins. Water-entry studies show how to correct this fault

through it instead of being transmitted through solid water."

By studying water-entry movies, Navy designers can see what makes their weapons tumble, why torpedoes "broach" or leap from the water like lively porpoises, why mines dive or act strangely when dropped from speeding aircraft. "The optimum mine case today is smooth and clean," says Doctor May. "We know that at low speeds, even fingerprints on a steel ball were enough to make a big splash and big cavity, whereas a perfectly clean ball went in smoothly and the cavity closed up quickly." Designers of droppable ordnance now make vanes that will guide the weapon properly by catching in the cavity's watery walls. Queer-shaped noses, proved out in the model tank, help steer the falling missile.

Soon the water-entry men at White Oak will have a bigger and better setup. A monster tank, already designed, will sit in a 15 by 40-foot pit in the sub-basement. Gun

This lightweight mine case couldn't take it. High water pressure inside cylinder pushed big dent into the case





Model of torpedo dives toward bottom of test tank instead of running along the surface. Experiments enable designers to change model to correct faults

mounts along the top will accommodate movable air guns for firing larger models into the water from any angle. A port on the side will open below the water level and take an air gun that will be used in studying submarine-torpedo launching.

What happens to a complicated piece of modern marine war ordnance when it whacks into the ocean? Will it break up on impact? Will the jolt set off the fuse? It's not supposed to. The new environmental lab has several mammoth air guns to find out. A 15-inch gun, 58 feet long, was made from a discarded 14-inch liner from a big gun on the USS Tennessee. But "Big Bertha," which has a tunnel-like barrel 93 feet long, was carved out of two discarded propeller shafts designed for the USS Iowa. This gun has a 21-inch bore, enlarged from a 14-inch hole in the original shafts. The shop that did the enlarging job wound up with 24 tons of steel chips.

The mine fuse or mechanism to be tested in the air gun fits in a cage-like piston which is inserted in the gun breech. Pressure is built up in a tank above the barrel, flap valves released, and wham! The cage zips to the other end, is stopped by the air cushion it builds up ahead of itself, rebounds back and forth until it stops. Impact is measured on the release—up to 25,000 Gs. And that's when the mechanism being tested either breaks or doesn't.

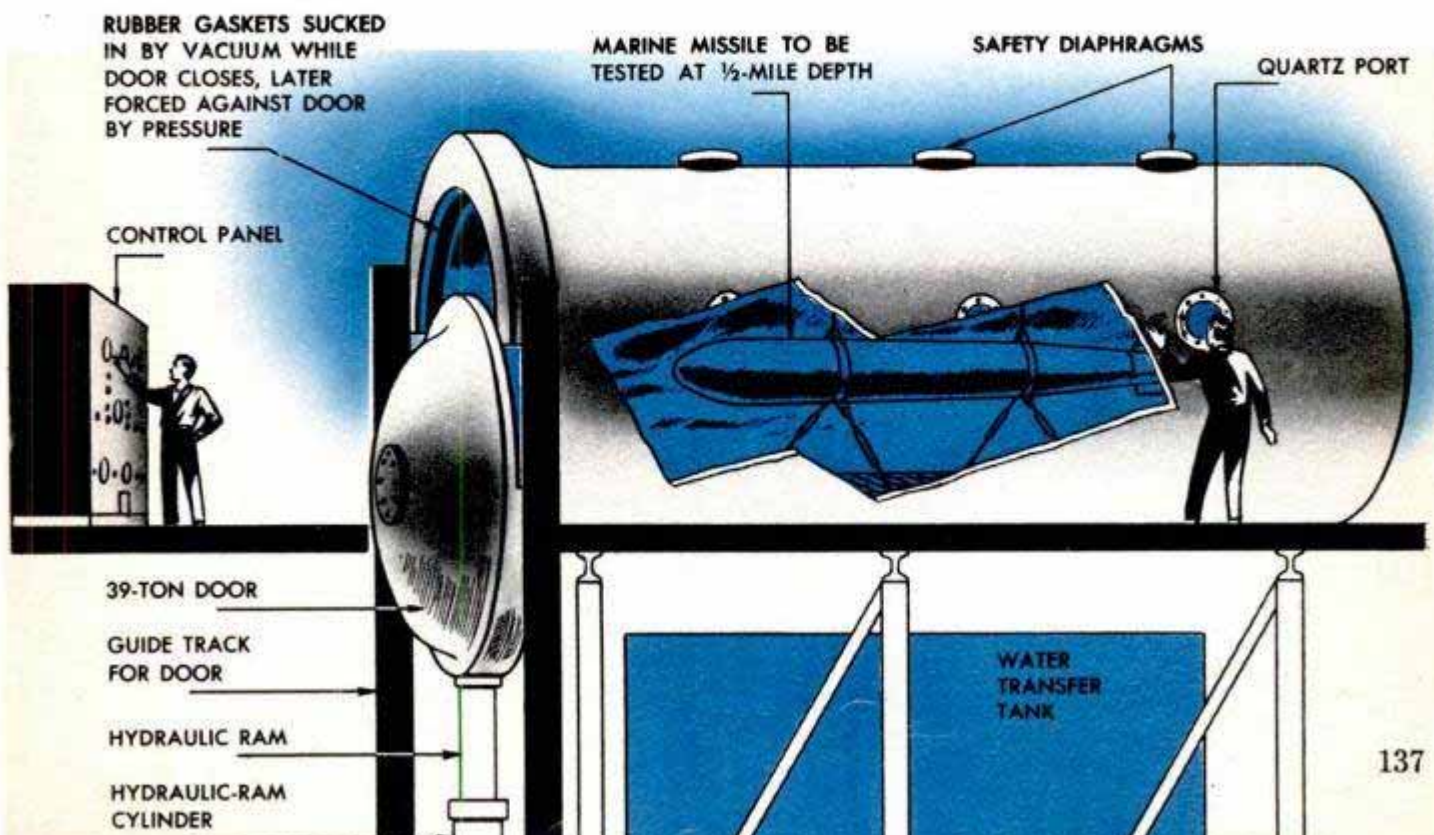
Odd things show up in Big Bertha. "One carefully constructed bit of ordnance on which we were testing a minor repair broke into hundreds of pieces—except for the spot that had been repaired," explains one of the men.

The rumble of the big gun is frightening, and so resembles the sound of ship propellers moving underwater that the boys had trouble for a while testing fuses for acoustical mines. They went off, not from the impact, but from the noise. It took weeks to mount them properly so they wouldn't "hear" the racket.

If the air guns aren't enough to assure that a new magnetic or acoustical fuse won't go off accidentally if dropped by a careless stevedore, or jolted loose from a plane landing on a carrier deck, then the live fuse is mounted in a 1000-pound bomb case, hauled outdoors, up to the top of the lab's 75-foot drop tower, and let go. Down she comes into a sand pit or concrete apron. If it still doesn't go off, then all's well. It goes on to tumbling ordeals in the tumble drums, and gets whirled in centrifuges up to 2500 revolutions per minute.

Some torpedo and mine mechanisms are
(Continued to page 264)

Diagram shows huge pressure vessel. Missile is subjected to pressure it would receive a half mile down

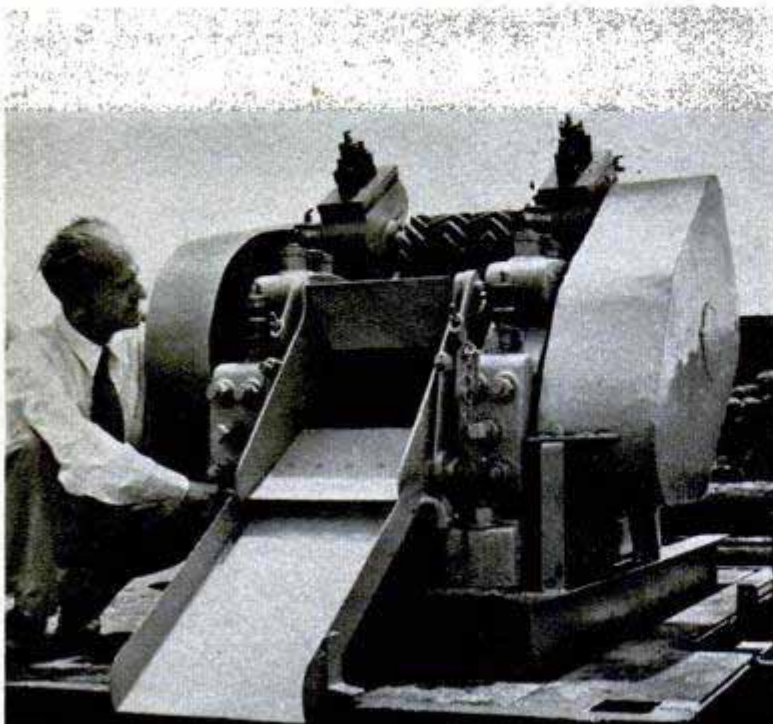
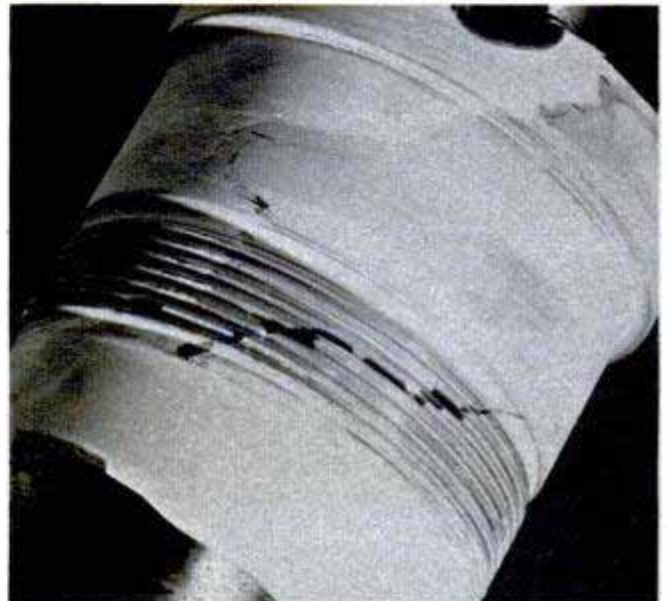




Kit contains the dye liquid, cleaning solutions and the white developer. Right, after dye has penetrated any cracks, white solution is applied to bring dye back to surface. Below, dark line shows crack in a crankshaft

Dye Shows Metal Flaws

Cracks and other flaws too small to be seen with a magnifying glass can be easily discovered in metal machinery parts through a new inspection process based on the penetration of a red dye. The dye is applied to the metal part and allowed to stand for five minutes, then wiped off. During this time it penetrates into any cracks which may exist. A white solution then is applied to the part. The dye, which has extremely high capillary action, is drawn from the cracks by the white solution. Any surface openings then can be detected by the presence of red lines created by the dye. The inspection system can be used on metals of any kind.



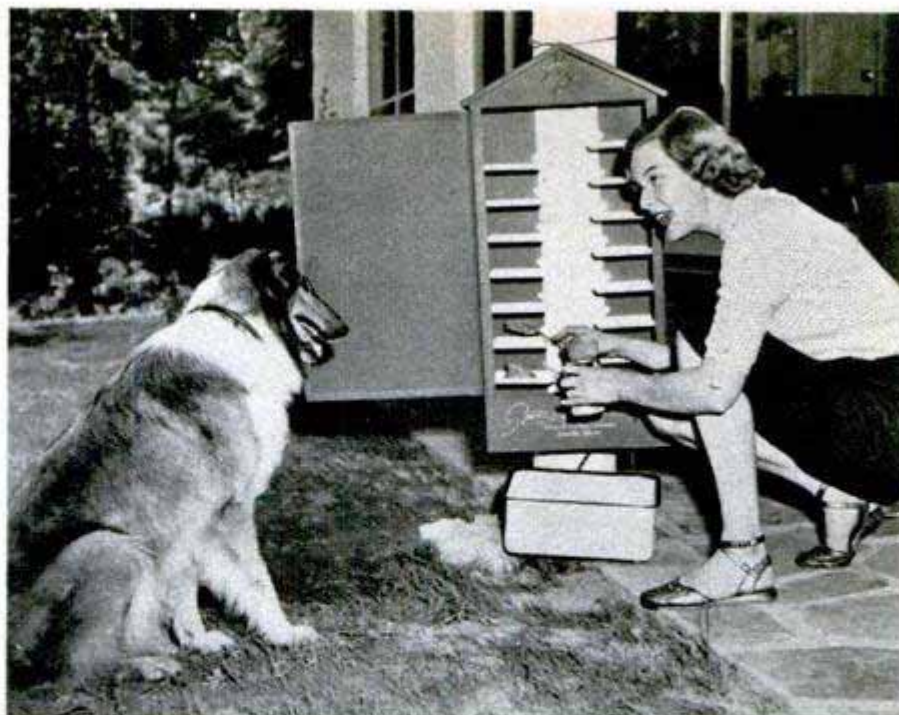
Truck-Mounted Sugar Mill

Mounted on a truck body, a miniature sugar mill rolls from plantation to plantation in the Hawaiian Islands, testing specific types of sugar cane for their juice content. Sampling cane juice in a regular mill is impractical because many types of cane are ground at one time. The miniature mill, operated by the Hawaiian Sugar Planters' Association, can roll to a particular area and determine the quality of the juice and the correct time to harvest the cane. The mill also supplies its own power.

☐ The pesky rabbit has a new foe—a rabbit repellent that can be dusted or sprayed on vegetables and flowers.

Tender Feeds Dog For Seven Days

For a seven-day period a new clock-operated feeder gives rations and water to a dog, making it possible for the owner to leave his animal unattended for a full week. The electrically operated feeder has 14 shelves, which hold moist or pellet-type foods or any other food that will not spoil, and a water tank. All the owner has to do is fill the feeder with food and water, set the time clock and close the door. Then once or twice a day, in accordance with the dog's established eating habits, a bell rings to call the animal and food drops out of the feeder into his pan. Water flows into another pan as fast as it is consumed by the



dog. Food remaining on the shelves is covered and can't be reached by insects. The feeder weighs about 32 pounds.

Retired Fire Engine

In Columbia, Mo., a retired fire engine is a stellar attraction on a children's playground. Sold by the city to a civic club for one dollar, the pump-er was polished up, all usable equipment taken off, and all removable parts welded on to make sure they survived prying fingers. Then it was mounted on concrete supports amid the slides and swings of the playground.



Tree Puller

Trees complete with their root systems are scooped out of the ground by a tractor attachment. James Bacon, who owns a small nursery in Lowell, Ind., developed the tree puller to prepare young trees for delivery. The attachment has a sharp scoop which noses down beneath the tree roots, lifts the entire tree and sets it down in the delivery truck. The digger not only speeds tree handling but also prevents heavy damage to roots.



WHAT'S NEW *For Your Home*



SHOWER STALL can be set up wherever there are running water and a drain. It can be connected by garden hose. Attached to the wall with screws, the stall is made splashproof by a wrap-around curtain

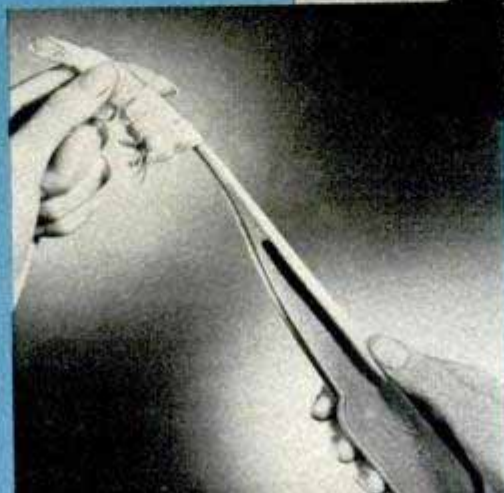


HAIR DRIER is an attachment for a new vacuum cleaner. With it, you can dry your hair quickly without heat. The upright is adjustable for height

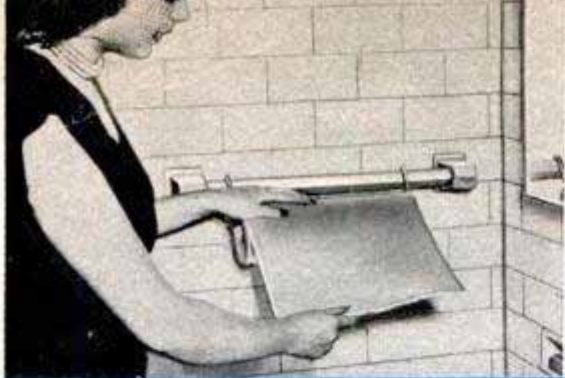


CORNER BIN makes use of usually wasted corner space in the kitchen. It has ventilating holes to prevent spoilage of fruit or vegetables and it slides out for convenient access

LIKE SHRIMPS? You can clean them quickly with a daggerlike plastic utensil that separates shell from meat with a single thrust

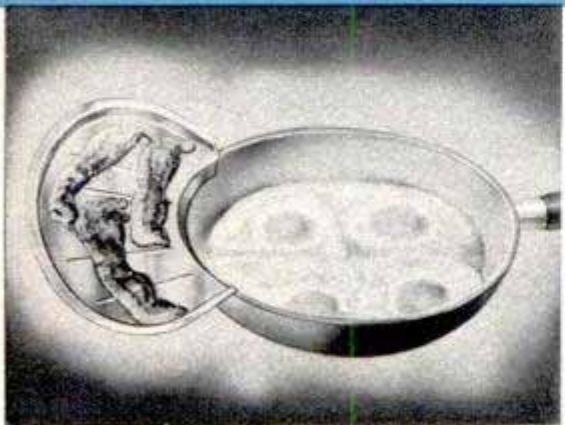


POPULAR MECHANICS



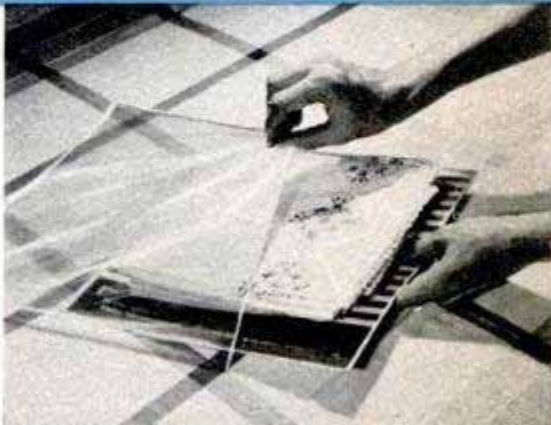
GUEST TOWELS of colored paper come in rolls. The dispenser fits over towel rack

CUT FLOWERS are held in place neatly by granular plastic. It is nonabsorbent



HOT TRAY snaps on skillet, allowing the grease to drain away as food is kept warm

PLASTIC POCKET keeps linen clean and wrinkle-free. Insert makes loading simple

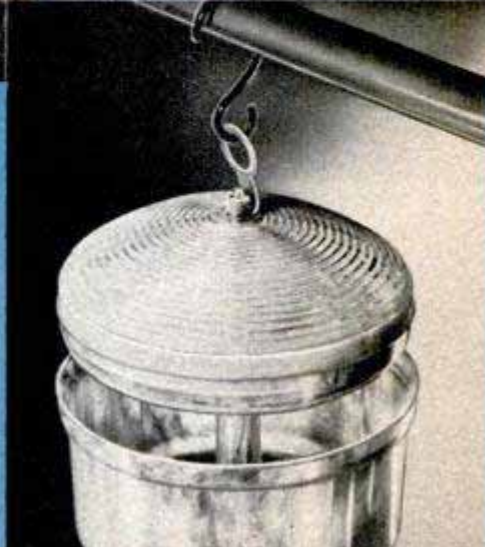
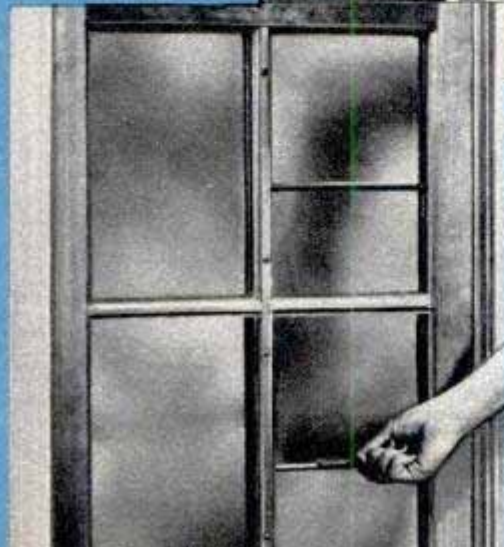


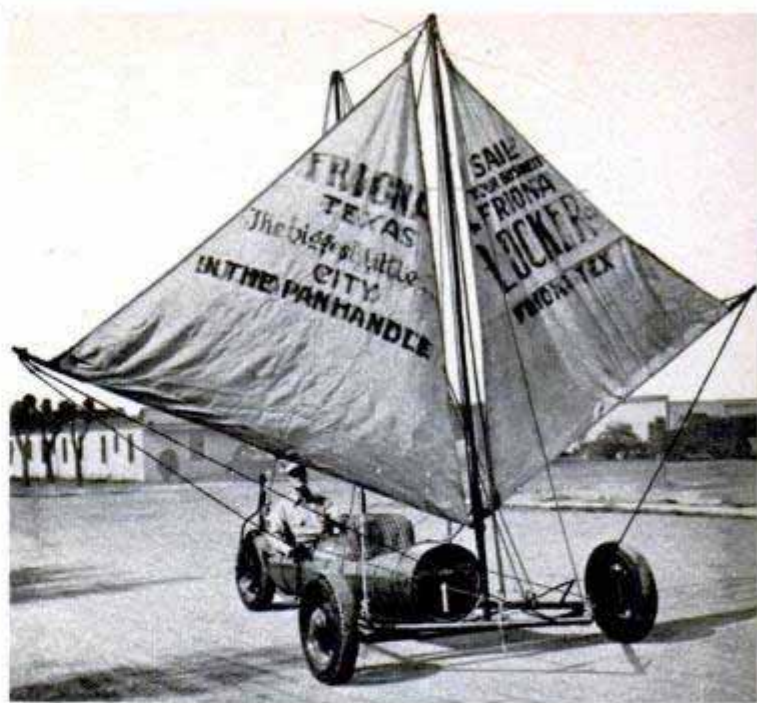
BED that adjusts like those in the hospital lets you eat, read or relax in comfort without extra pillows and backrests. A lever cranks it up



STATIONARY WINDOW can be sealed draftlessly into the wall. The panes slide open. No weights or springs are needed

DEHUMIDIFIER that uses absorbent crystals is molded of Tenite plastic so that it can't corrode. Water collects in base

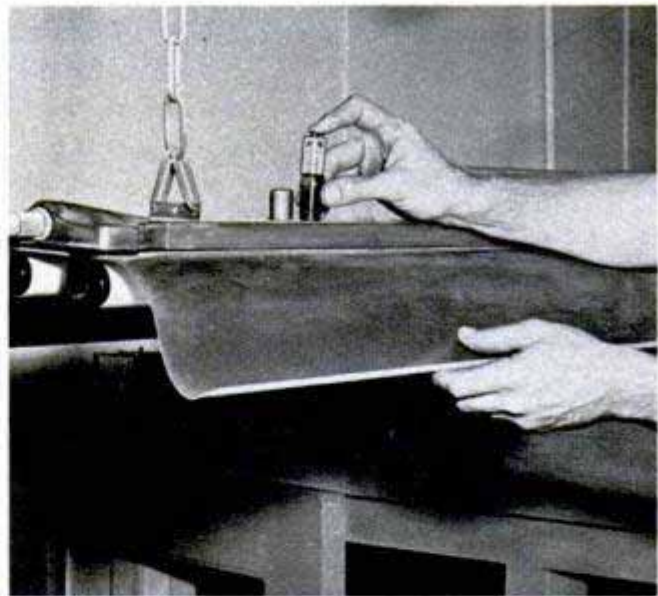
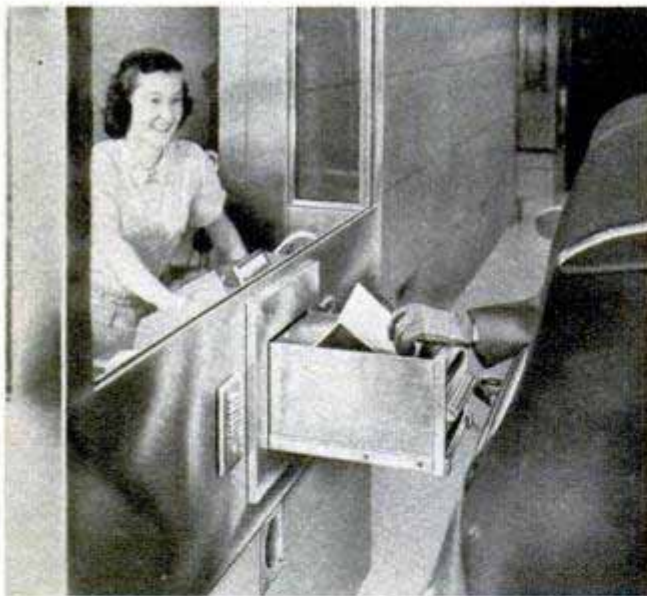




Dry-Land Sailing

Although his home town, Friona, Tex., is miles from any large body of water, Ray Landrum still goes sailing whenever he wants, but in a dehydrated fashion. He sails along the highway in a three-wheeled motorless vehicle called a Windmobile, which was built to his design by a local mechanic. In a brisk crosswind, the dry-land sailer has hit 60 miles an hour. In the

Windmobile, Landrum used the front axle, steering gear, brakes and three wheels from a 1934 Chevrolet sedan. The chassis consists of 1½-inch pipe welded in a triangle. Three oil drums, welded into a long cylinder, form the body. Two cotton sails, both hoisted on one mast, propel the vehicle. A second mast, mounted between the two single seats, serves as a brace for the mainmast. The steering wheel is linked to the single wheel in the rear.

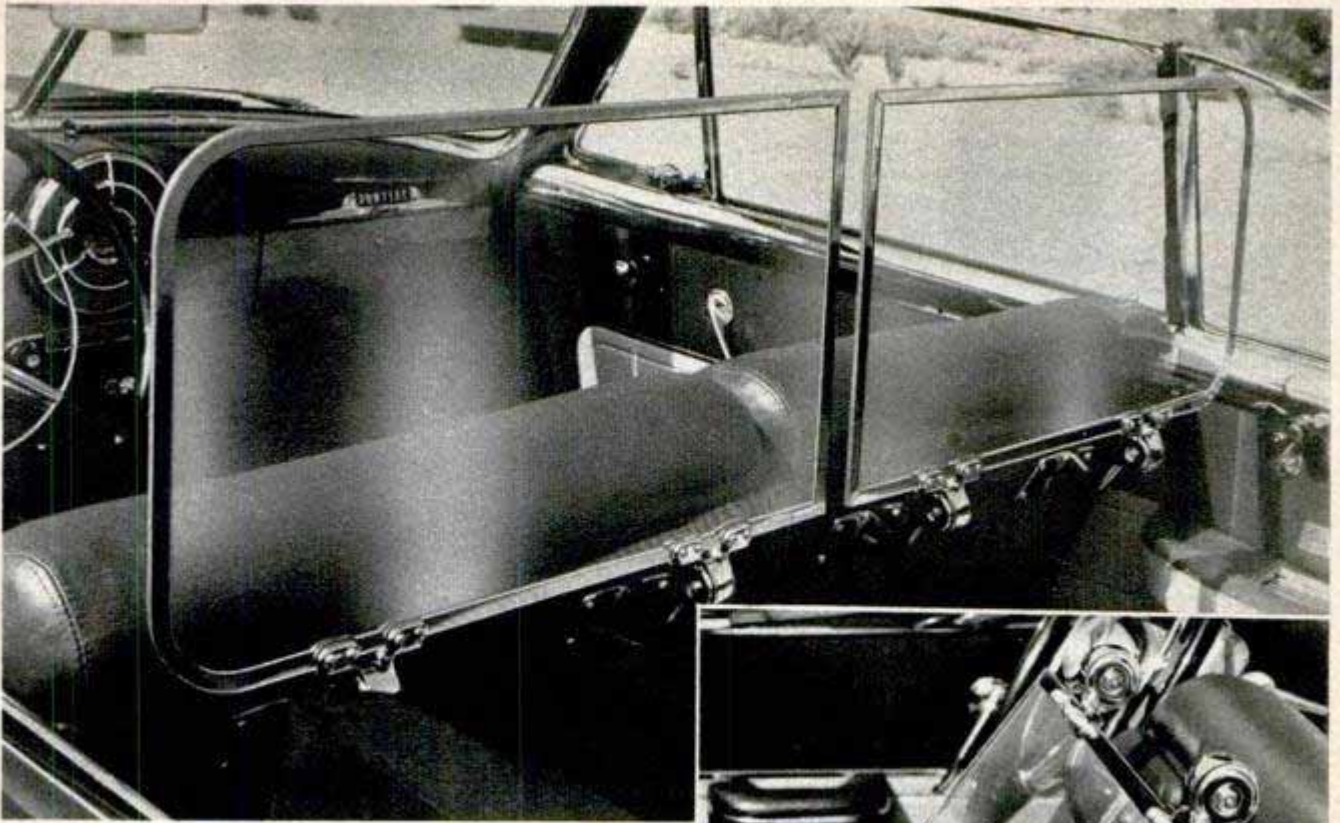


Auto Bank "Reaches" for Cash

Motorists can bank comfortably from their cars at a drive-in bank that has a sliding-drawer depository. The teller pushes the depository out so the motorist can reach inside easily without leaving his seat. He fills out a deposit slip, drops in his money and bank book and that's all. The teller then retracts the depository and makes a record of the transaction.

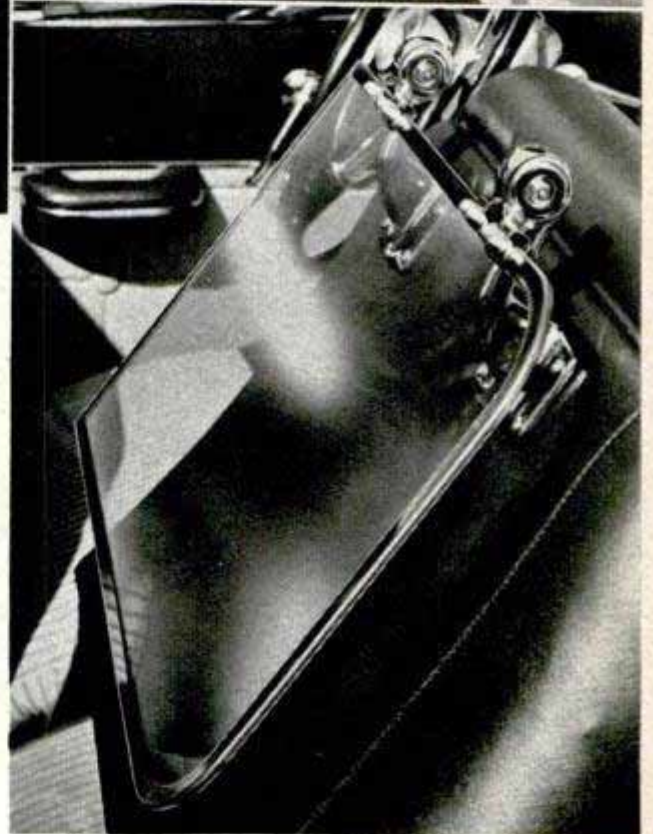
Fluorescent-Light Tester

Defective fluorescent lamps can be quickly checked with a pocket-size instrument to find out whether the circuit, tube or starter is at fault. Tests are made by removing the starter and inserting the instrument into its socket. If the starter socket is concealed behind the tube, an adapter enables the test device to be used with the tube in its sockets.



Back Shield for Convertibles Has Paraffin-Friction Hinges

Convertible riders are shielded from any back-of-the-neck drafts by a plastic back shield supported by unusual paraffin-friction hinges. Locknuts are unnecessary as the hinges "freeze" in any position, holding the shield securely. Similar to a multiple-disk clutch, the hinge consists of disks pressed tightly together. One disk is saturated with paraffin, allowing it to open and close smoothly. When the motion stops, the paraffin solidifies, locking the hinge. The shields are transparent plastic framed with chrome for strength. They can be swung down against the back of the front seat when not needed.

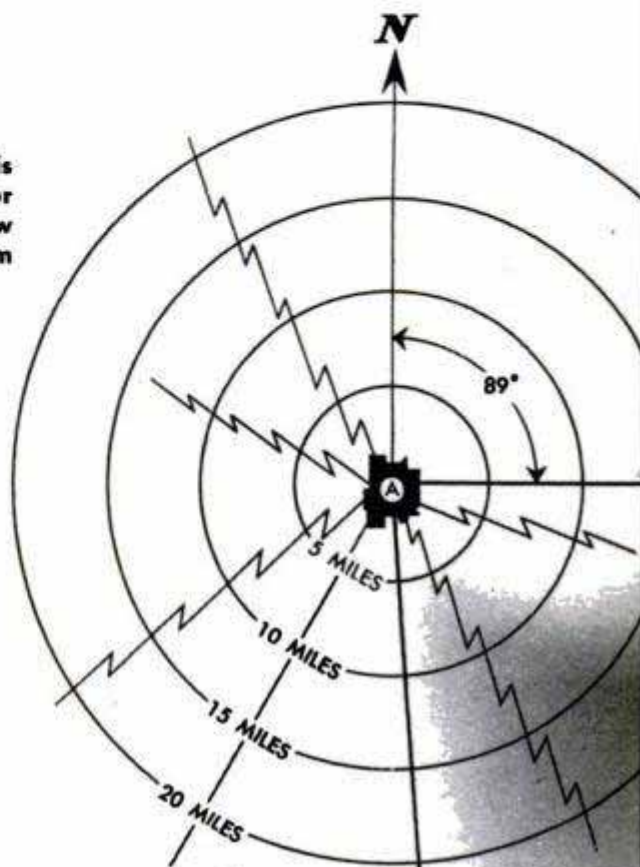


Life Without Germs In a Laboratory

At the University of Notre Dame there are some laboratory animals living in a world apart—a world without germs. Their world consists of a giant tank, large enough to hold 1000 animals, which has been made completely germfree. Attendants and scientists who must enter the tank to feed and examine the animals do so by diving through a germicidal solution. They also wear plastic suits and masks which completely enclose their bodies. The scientists hope to discover how much longer the animals will live if they are kept in a germfree atmosphere.

Three-quarters completed, by 1953 the CAA's system of fixed air "highways" will crisscross the entire United States

Small omni-range antenna is the only additional exterior equipment needed to use new simplified navigation system



Skyroads to Everywhere

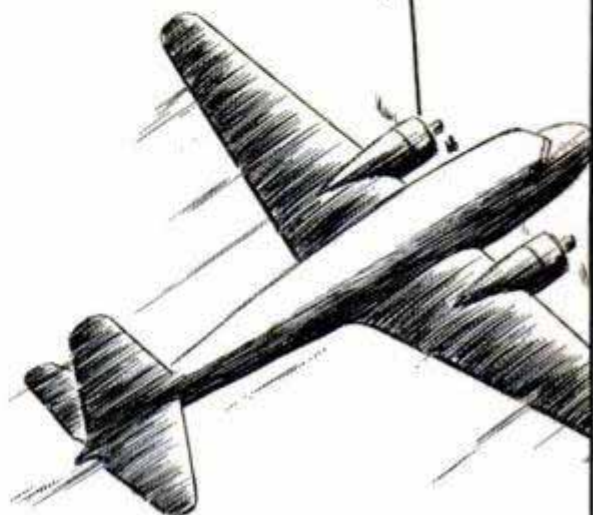
By
Aubrey O. Cookman, Jr.

52 MILES

IN TWO YEARS the sky above the United States will be crisscrossed by a vast network of straight, sharply defined "highways"—longer and more numerous than those on the ground below. Plainly marked and easy to follow in even the foulest weather, they'll offer scores of through routes to both coasts and the smallest hamlets.

This is no visionary's pipe dream. It is already three-quarters completed. Called omni range, it is a major part of the Civil Aeronautics Administration's new Common System of Air Navigation, an all-embracing traffic-control program that may do for the airplane's popularity what hard roads did for the automobile.

The Common System will help all airmen, from week-end putt-putt pilots to commercial veterans and the jet jockeys of tomorrow's bombers. Its goal is to make travel in the airspace over the nation's 3,022,387 square miles reliable and safe at all times. The overall plan won't be fully implemented until 1963.



Three of its elements, distance-measuring equipment, the course-line computer and the instrument-landing system, require airborne equipment that will probably make them primarily useful to the large-plane users. Others, like ground controlled approach and the automatic direction finder, are now available for all with radio or a very-high-frequency voice transmitter.

Already operating, the omni range will be of direct value to the greatest number, some 85,000 private flyers, and potentially helpful to all air travelers. The "omni" in its title points up the fact it transmits fixed radio courses, or tracks, in all 360 degrees of the compass. The outmoded low-frequency system, which has been used since

aviation's babyhood, provides only four.

To show how the system works, let's pretend you fly your own small plane. You want to go from Oklahoma City to Mansfield, Ohio, on business and are taking the wife and daughter along.

Mansfield is about 900 miles away on a straight line, a long trip in a craft that will average under 100 miles an hour and require two or three fuel stops en route. Before omni it would have meant course plotting about a half dozen sectional maps, plus time-consuming compass and wind computations. Even then, the chances of flying a reasonably straight course would have been remote. And for 10 hours or more your ears would have been plagued by a monotonous "dit dah" radio signal.

Flights to places not having omni-range or distance-measuring equipment are guided by the course-line computer. This electronic calculator uses facts established by omni and DME in computing third side of triangle. Example below shows instruments as plane flies to right then left of course, finally finishing on correct path

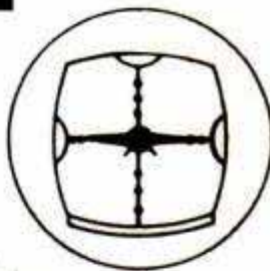
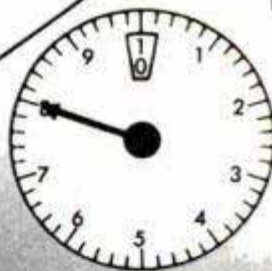
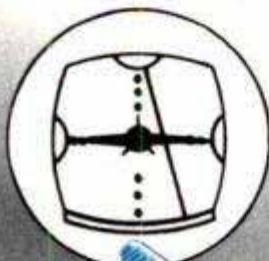
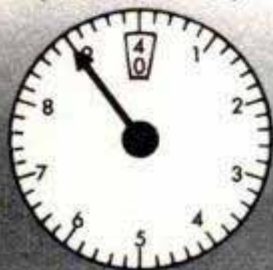
CITY A (EQUIPPED WITH OMNI RANGE AND DME)

CITY B (NOT EQUIPPED WITH OMNI RANGE OR DME)

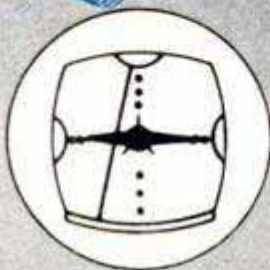
DME INDICATOR
(DISTANCE TO GO)

LEFT-RIGHT INDICATOR

76 MILES



94 MILES



CAA inspector Paul McDonnell points out simple panel instruments for omni range. Left-right needle is at left, and dial at right combines heading, to-from reading

Now the trip can be much simpler. A glance at an aeronautical chart shows a string of stations at Tulsa, Okla., Neosho, Springfield and Vichy, Mo. Loogootee, Ill., Terre Haute and Indianapolis, Ind., are also directly on your path. Spreading out from each, like the spokes of a wheel, are 360 separate courses—as fixed in space as if they were built of concrete or steel.

Four basic instruments are all you need to make use of omni. Airborne over Oklahoma City, you twist a dial to tune in 115.5 mc., the local omni-range frequency. On the bearing selector, graduated to 360 degrees, you stop at 48. That's the outbound heading or "track" to your first guidepost at Tulsa.

You next watch a vertical needle, hinged at the top, until it is centered. Then you are on the track to Tulsa. Since it runs two ways, how do you know for sure which direction you are headed? A side-hinged needle swinging to "from" or "to" answers that one.

Unlike the four-course, low-frequency system it is replacing, omni operates high on the radio spectrum, between 112 and 118 megacycles, free of static that grows worse in bad weather—when navigational help is most needed. Even when storms rage, the Morse Code and voice identification signals are as distinct as ordinary telephone conversation. Voice instruction may take over completely in the future.

Transmissions follow a "line of sight" path, like television and FM radio, but the

sending units do not similarly have to be located on tall towers or buildings, since the receivers are thousands of feet above the earth. Maximum reception is approximately 200 miles at 20,000 feet. By 1953 over 400 of the stations will be strategically spaced across the country, all with overlapping tracks.

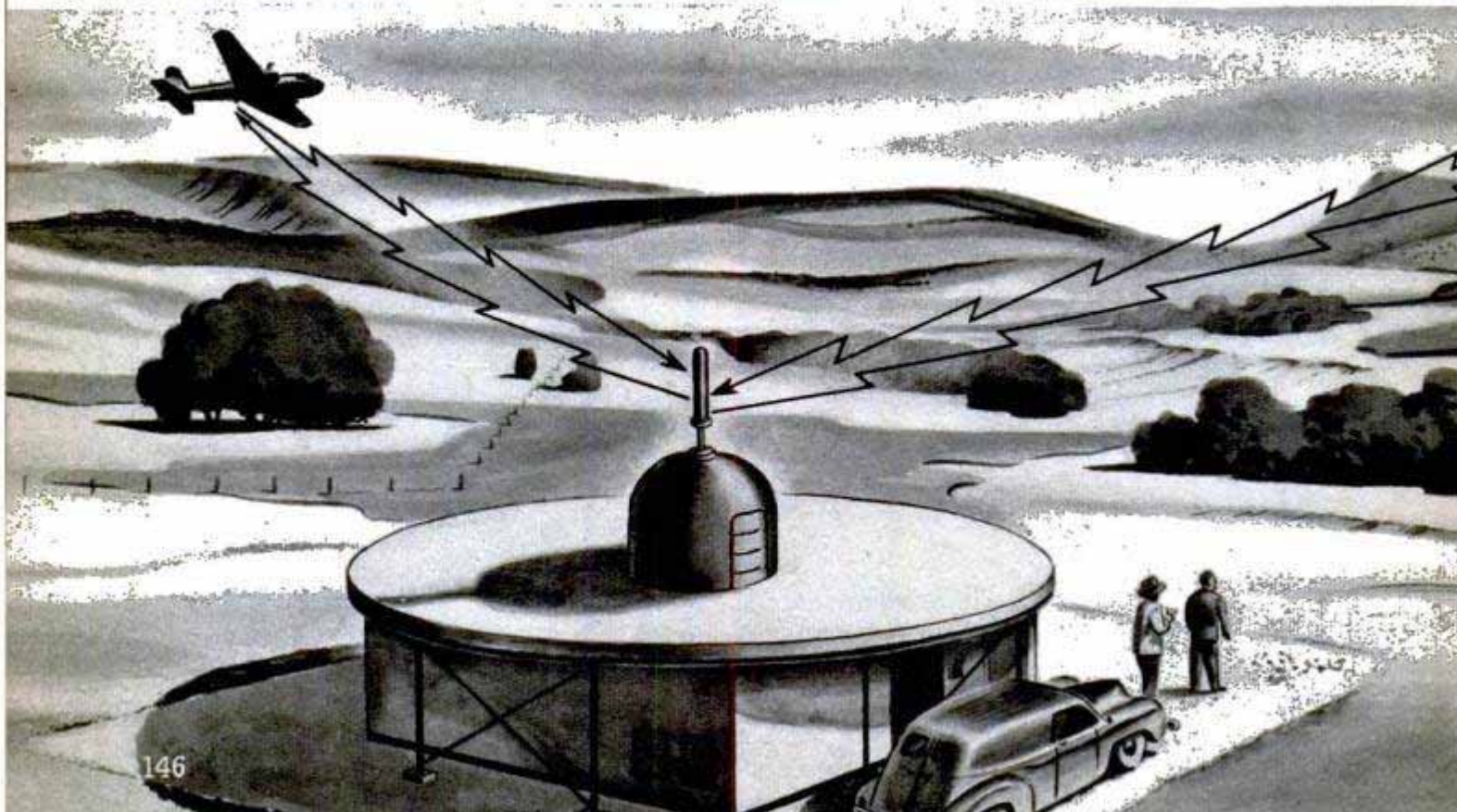
From here to Indianapolis your navigational problem is surprisingly simple. Twist the bearing selector to each of the en-route stretches of track you want in turn, then keep the vertical needle centered to hold the track.

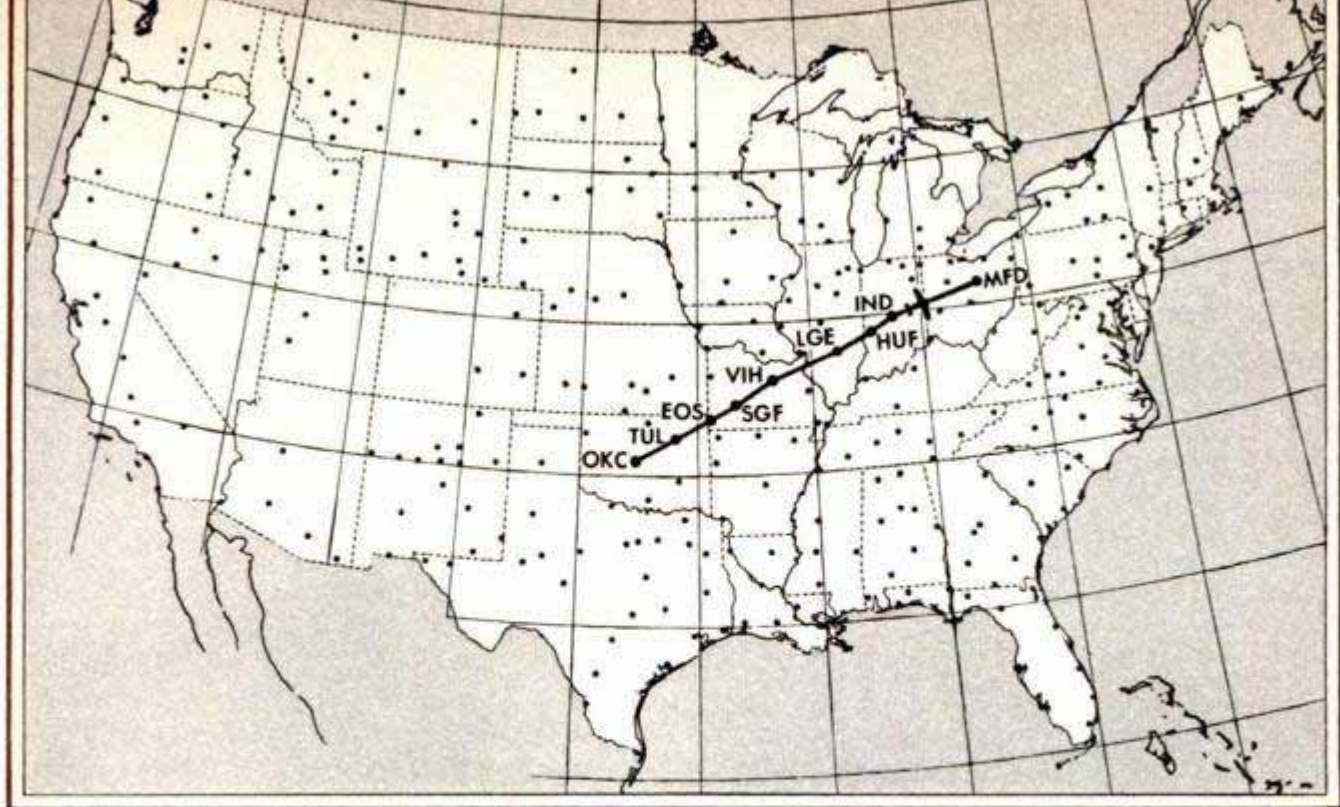
You're satisfied now that you're on the correct permanent air road and headed the right way. The map even shows what crossroads, rivers and hamlets you'll pass over. But you're curious about the mileage to the first guidepost, Tulsa.

See that dial on your instrument panel, the one resembling an automobile mileage meter? That is DME, distance-measuring equipment, another of the Common System's helpers. It works on the radar principle, with a pulse from the airplane triggering a responding pulse from a ground station. The distance between you and the station is computed by the time lapse between the signal and the response. There will be DME units at all omni and many ILS sites, with 450 of them already ordered for 1952 installation.

With a little extra effort you can pinpoint your location on an omni track even without DME. While the magnetic compass holds the heading, another range station to the right or left is tuned in and the bearing selector turned until the needle centers. The selector now shows the second omni range's bearing and you draw

Plastic dome eight feet in diameter and seven feet high will house omni antenna, solving the problem of a weatherproof covering that would not distort the signals emitted. Surmounting it will be DME antenna





Path of flight author describes between Oklahoma City and Mansfield, Ohio, relying entirely on omni directions

a line to it. The point at which the new line intersects the original track is your present position.

Now you've completed three quarters of the trip and passed over omni stations at Tulsa, Neosho, Springfield, Vichy, Loogootee, Terre Haute and Indianapolis. For simplicity, you've stayed strictly with the omni tracks and yet flown on almost a straight line toward your destination.

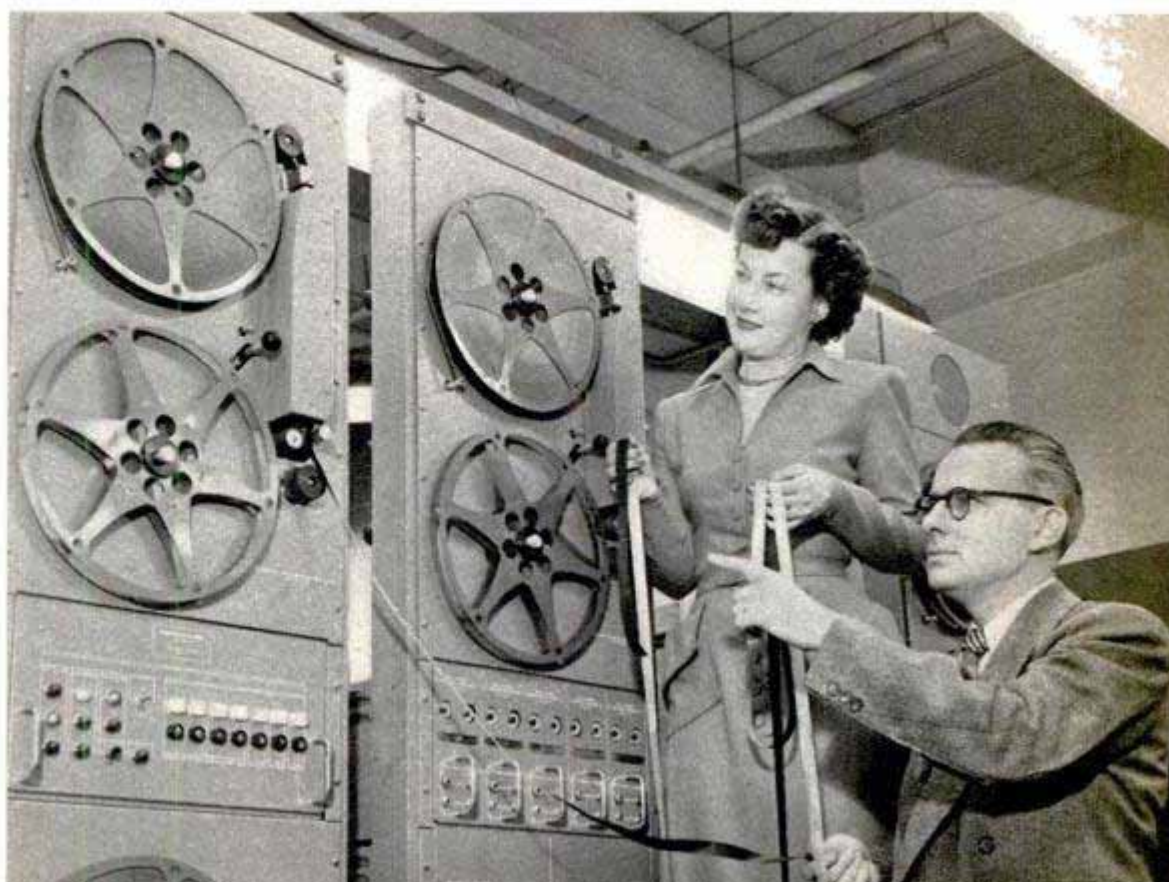
The next straight-line omni site is Mansfield, over 200 miles away. By climbing above 5000 feet you could bridge this last and longest gap, staying in touch with In-

dianapolis omni until you picked up the Mansfield signal, and remain on the system of interconnecting tracks you've been flying. But you and the family want to fly below 5000 and continue enjoying a close look at the rolling countryside.

For a quick solution you turn to another new navigational aid, the course-line computer. This electronic calculating machine

(Continued to page 252)

As many as 28 voices can be recorded on a magnetic paper tape a little more than 1/2 inch wide. It registers all conversations between pilots and control tower



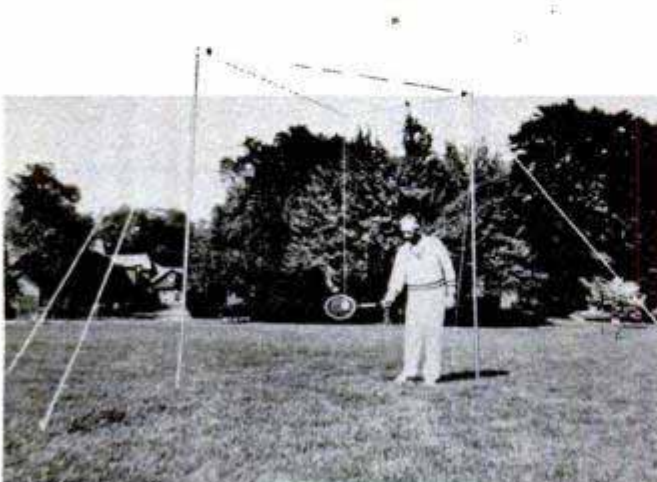


"Big Ben" Made of Paper

"Big Ben," the famous clock tower which rises above the Houses of Parliament in London, now has a seven-foot counterpart weighing less than two pounds. The model, built by E. Whiteside, is made of paper. Whiteside scaled it, item by item, from a large photograph. Made in sections, the miniature "Big Ben" can be dismantled and moved easily.

Tennis Trainer

Easily and quickly set up on any lawn or beach, a tennis-training device permits practice without a partner. When the suspended ball is hit, it snaps back like a returned volley toward the practicing player. Guy wires hold the trainer in place.



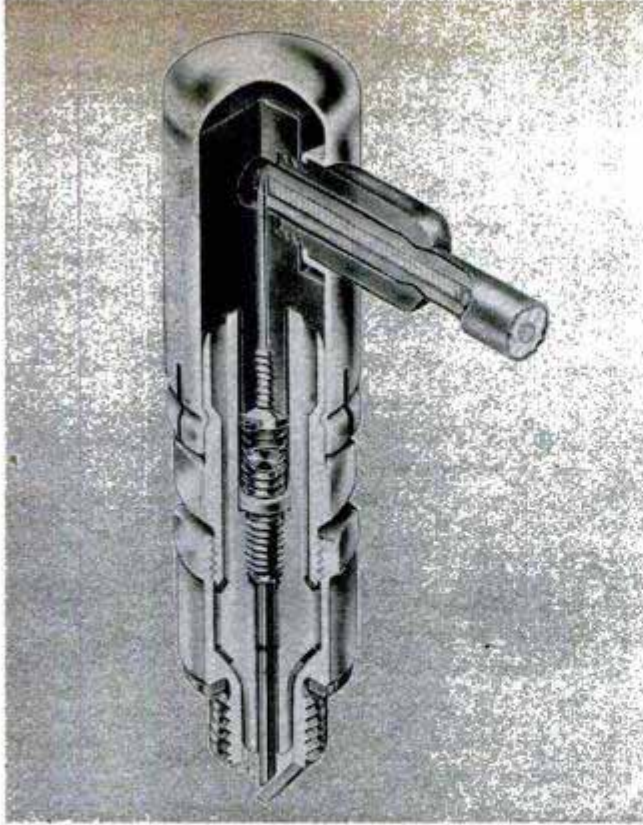
Snack Tray for Car Hangs From Dashboard

Travel snacks can be enjoyed while the car is in motion with a dashboard tray which prevents cold drinks or water glasses from tipping over. The tray hangs from two cords which are held on the dashboard by suction cups. Bottles or glasses rest on two disks which are suspended below the tray on chains. When not in use, the tray can be folded into small space for storage in the glove compartment.

Stereoscopic-Slide Viewer Has Built-In Light Source

Three-dimensional color transparencies are seen under perfect lighting conditions when an illuminator is attached to the back of the viewer. Two flashlight batteries supply the current for the bulb. Concave coated reflectors provide diffusion, eliminating hot spots. The illuminator is easily attached to a standard View-Master stereoscope.





Shielded Spark Plug

Its insulator and terminal completely enclosed in a steel shell, a shielded spark plug is waterproof, shockproof, virtually unbreakable and does not interfere with radio reception. Available for any standard gasoline engine, the plugs are protection against starting failures due to wet and oily insulators. The snap-on waterproof cover is permanent and does not have to be replaced when the plug itself is worn out.

Radio-Controlled Lawn Mower Lets Inventor Loaf in Shade

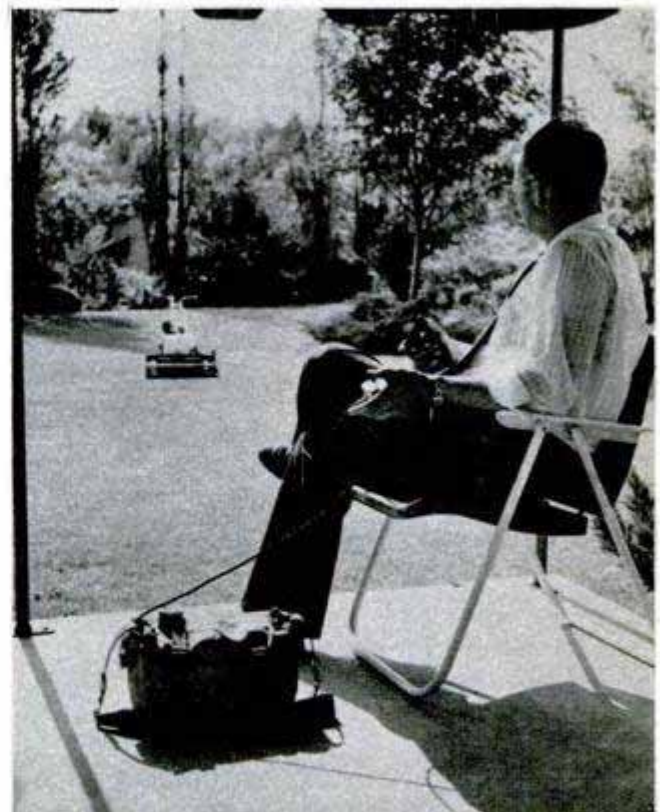
Engineer Paul Rosenberg of Reo Motors has designed a remotely controlled power mower that obeys every command of an operator as much as 50 yards away. Mounted on it are a 25-pound high-frequency receiving set and battery, with a small antenna. The operator has a one-watt transmitter with two small keys that control start, stop and direction. A pivot wheel at the rear enables the mower to make 360-degree turns and it will cut within 1½ inches of obstructions. The transmitter can be carried in a knapsack or placed on the ground or floor while the user manipulates the controls. The mower would require an \$800 to \$900 price tag and Reo has no immediate plans for production.

☐ Replacing the conventional, harsh-sounding horn on a diesel locomotive, an experimental whistle sounds five different tones to produce a musical chord.

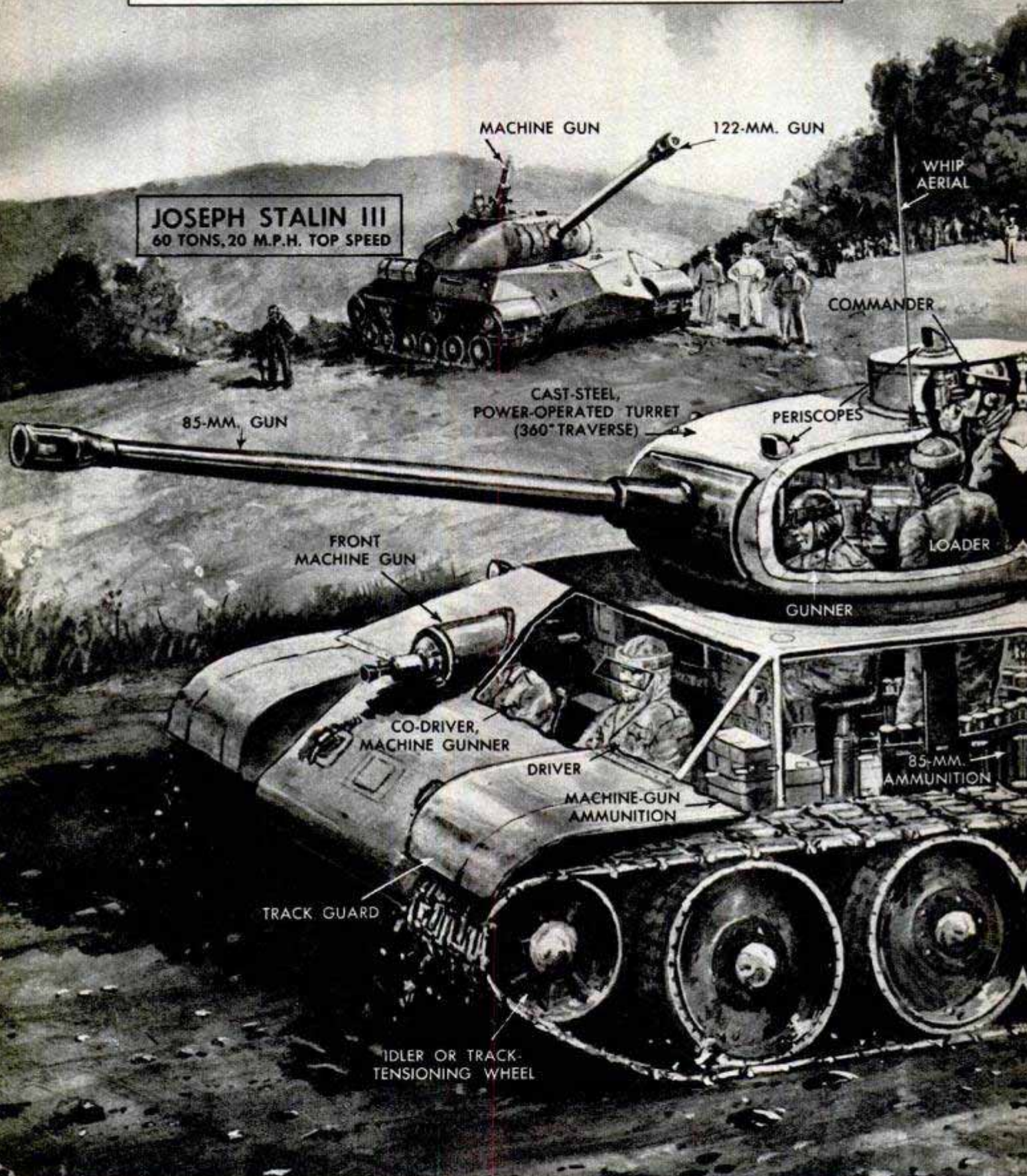


Sipper With Built-In Refrigerant

Every swallow is chilled when drinks are sipped through a novel aluminum tube containing a sealed-in refrigerant and tipped with a Tenite plastic mouthpiece and end. The sipper is kept in the freezing compartment of the refrigerator prior to use and its contents allowed to freeze solid. There is no dilution of the beverage and the plastic mouthpiece protects lips from frostbite. It is made in several colors and is easily cleaned and dried.



RUSSIAN TANKS



OUTSTANDING in number and effectiveness among the powerful ground armor used by North Korean forces in the opening phases of the Korean war was the Russian standard medium tank, the T-34, whose identity was fully authenticated by a number of captured examples. In the

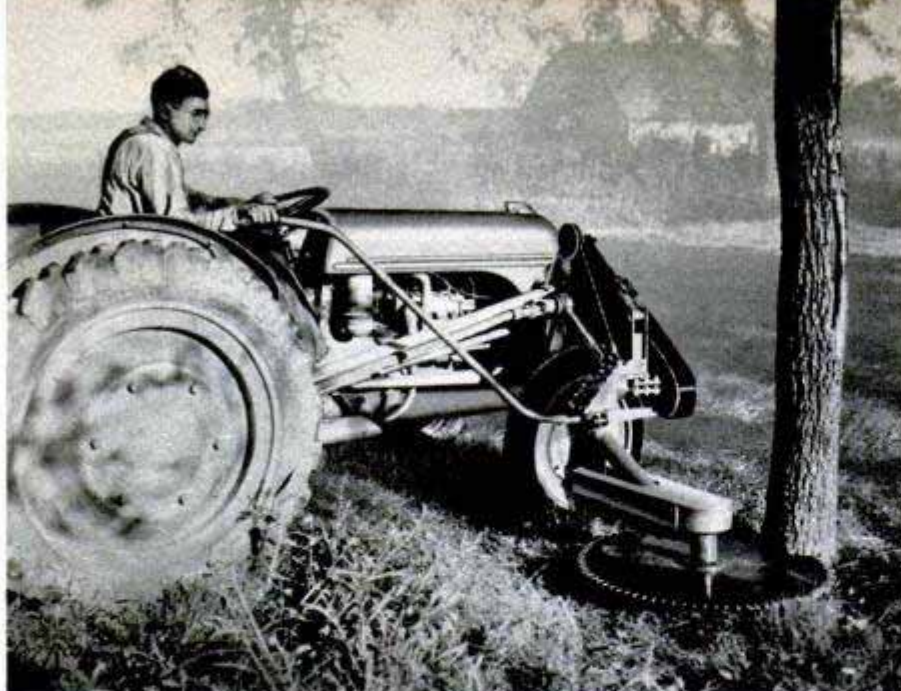
foreground above and to the right are two illustrations of it, with one cut away to show the interior arrangement. The T-34 has been used by the Soviet army for nearly 10 years, with the most modern types radically improved by a different type turret, a heavier gun and carrying a crew of



T-34 MEDIUM TANKS
34 TONS, 30 M.P.H. TOP SPEED

five instead of four. It weighs about 34 tons and has a V-type 500-horsepower diesel engine that gives it a speed of 30 miles an hour. A heavier tank, not yet officially confirmed as the Joseph Stalin III, also was reported in the early action. Shown in the background above, the Stalin is the stand-

ard Russian heavy tank and an example of it crowns the Soviet war memorial in Berlin. It is described as one of the most powerful tanks in existence, weighing 60 tons—about 10 more than either the General Patton or the British Centurion—and mounting a long-barreled 122-mm. gun.

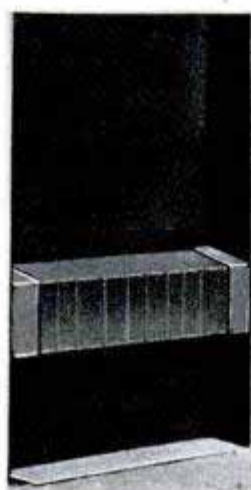


Tractor Saw

Without leaving the tractor seat, the operator can fell trees and cut brush with a saw attachment that is driven by the power take-off. The saw assembly mounts beside the front wheel and the blade is fed into the tree by a long lever that extends back to the driver's seat. A hydraulic system raises and lowers the blade. For cutting trees, the tractor must remain stationary, but in brush removal it can be driven forward at low speed while the saw is in operation.

Hidden Radiators Keep House Warm

Homeowners can install their own hot-water heating system in new or existing buildings now that a simplified low-cost system is available. The installation combines hot-water radiators and small fans to provide forced circulation of air through the radiator fins. Copper tubing is used throughout and the radiators, mounted between the studs flush with the wall, are connected in series to a small boiler. A high-velocity pump circulates the water through the system. There are two methods of control. A standard thermostat turns the heater on and off in



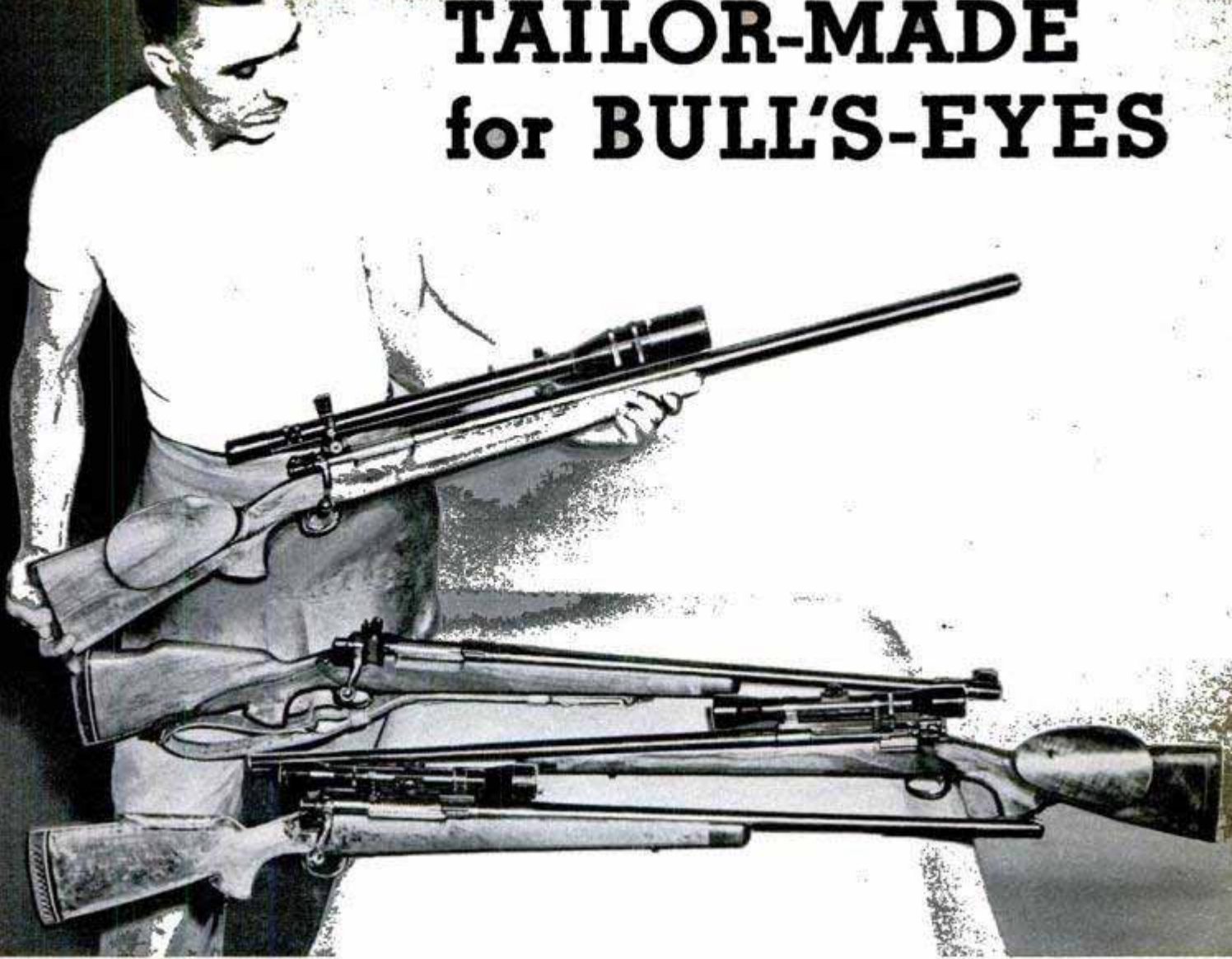
the usual manner. In addition, each radiator has a built-in rheostat to control the speed of its fan. These fans are turned on automatically when the thermostat turns on the heater.



Mechanical "Creep" Aids Fire Fighters

Fire fighters in Ontario forests now have a mechanical packhorse that carries their equipment over rough mountain trails without tiring. Powered by a single-cylinder engine, the track-laying machine will haul 700 pounds of hoses, nozzles, pumps and fuel cans. Steering is done by a dual clutch which throws one track out of gear. Canadian forest rangers have christened the machine the "Creep."

TAILOR-MADE for BULL'S-EYES



By Andrew Hamilton

EVER SINCE European artisans began building "gunnes" and "gonnes" in the 14th century, skilled craftsmen have been trying to construct a weapon that would pump a bullet into exactly the same hole every time it was fired.

Nobody's ever done it—and, chances are, nobody ever will.

But in the opinion of thousands of "gun bugs" in the United States and elsewhere in the world, the man who has come closest to building a 100 percent accurate, precision-perfect rifle is Joe Pfeifer of Sun Valley, Calif.

More than 90,000 Pfeifer-made rifle barrels are to be found all over the world. The barrels have set a large percent of the world's target records. They've knocked down elephants in Burma, bagged giant Kodiak bears in Alaska, killed pumas in Mexico.

A stocky chap with a shock of black, curly hair, Joe Pfeifer is a good example of a man who has built an interesting hobby into a prosperous business. Gunsmithing was once something he did at night after working hours. Now he spends full time at it as president of a \$500,000 corporation that hums with activity and frequently has more orders than it can fill.

As a kid in St. Louis, Mo., Joe got his first rifle

Four of the straightest-shooting rifles ever made are inspected by Monte Kennedy. In his hands is a 22-250 bench-rest "bull gun." On the table, back to front, are a .375 H and H for big-game hunting, a .220 Swift and a .300 H and H Magnum. All four are tailor-made

This is a world's-record target, made with a Pfeifer barrel. The tiny shot group was made by a rifle 312 yards away. Object of this kind of marksmanship is to group shots together





Kit made by Pfeifer includes the barrel and action above and the unfinished walnut stock with the rolled cheekpiece shown below. The sportsman who buys the kit can assemble the rifle with hand tools and decorate the stock himself

at the age of 12. It was a beat-up old Remington .30-06 caliber that had been used in World War I. But to Joe it was just about the most beautiful thing he'd ever seen. He cleaned it up, repaired the breech mechanism and made a new stock.

After high school he became a machinist and for several years worked at the U. S. Arsenal in Rock Island, Ill., turning out gun barrels for the Army.

In 1935 he came to California and served as an aircraft test pilot. A bad crash put an end to his flying and he turned once again to toolmaking and gunsmithing. For several years he built rifles in his own back-yard workshop. Orders increased so rapidly that three years ago he and Tod Oviatt, former Stanford athlete and one of the founders of Lockheed, set up their own gunsmithing business.

Today, the Pfeifer Rifle Company, Inc., in the opinion of many, is the leading custom gunshop in the United States. The difference between Pfeifer and, for example, Remington is the difference between a small outfit that builds high-speed racing cars and General Motors. One makes a product to the customer's own specifications, the other turns out fine rifles on a mass-production basis.

Located in a light, airy, functional building in the San Fernando Valley about 20 miles from Los Angeles, Pfeifer's shop is equipped with many power-driven machines that perform intricate operations on 100,000 pounds of high-grade steel annually. Some 27 different caliber barrels are

made, ranging from the well-known .22s to barrels for the .600 cordites, the largest rifle shot from the shoulder.

In addition to Pfeifer and Oviatt, the company employs 18 skilled craftsmen—including such men as Homer Brown, former armorer for the U. S. Navy rifle team; Sam May, shop foreman and big-game hunter; and Monte Kennedy, one of the best "stockers" in the country.

A Pfeifer barrel has no distinguishing mark on the outside. But if you look inside, you'll see the Pfeifer talisman: six wide grooves and six narrow lands with a right-hand twist. They're made that way because the smaller the lands, the less metal they scrape off the bullet—and consequently, the more accuracy you get.

A Pfeifer custom-built rifle costs all the way from \$350 to \$1800. Who are the people who buy this kind of highly accurate, precision-built weapon? In general, there are three classes:

The shooters. They're the target and range men who must have the straightest-shooting rifle obtainable. They want a weapon that will put all shots into a small ragged hole at long range. Shooters like Frank Parsons, holder of many N.R.A. records, and Audie Murphy, much-decorated soldier and movie star, use Pfeifer rifles.

The sportsmen. These are the nimrods who require dependable rifles of dead-eye accuracy and heavy striking energy. Howard Hill, the big-game hunter, carried eight Pfeifer rifles on his recent trip to Africa. Dr. Earl J. Thee of Los Angeles used a Pfeifer .300 Super Magnum in bagging the largest Dall sheep ever taken in the Yukon.

The gun collectors. These are the men who love and appreciate fine craftsmanship. They collect guns for the same reason that other men collect fine watches, vintage wines or yachts. They think nothing of paying a thousand dollars or more for a single rifle if it measures up to their standards of beauty. One of these is Lowell W. Saunders, noted Bakersfield geologist, who has one of the finest collections of modern weapons in the United States.

In addition to turning out custom-built jobs, the Pfeifer Rifle Company produces regulation barrels for a number of other American rifle manufacturers and gunsmiths. At the present time, production rate is about 700 per month. So you may get a Pfeifer barrel without knowing it.

Let's follow a rifle through the Pfeifer factory and see just how it is made:

We start with raw bar steel—12 to 20-foot lengths just as it comes from the mill. This is special, electro-furnace tool steel made to Pfeifer specifications. It is heat-treated and stress-relieved.

The 1¼-inch steel bars are cut into bar-

rel lengths and returned on semiautomatic lathes. This process removes 80 percent of the surplus metal and gives the bar a shape roughly comparable to that of a rifle barrel. It also allows complete liberation of any stress in the steel and assures perfect straightness of the bore.

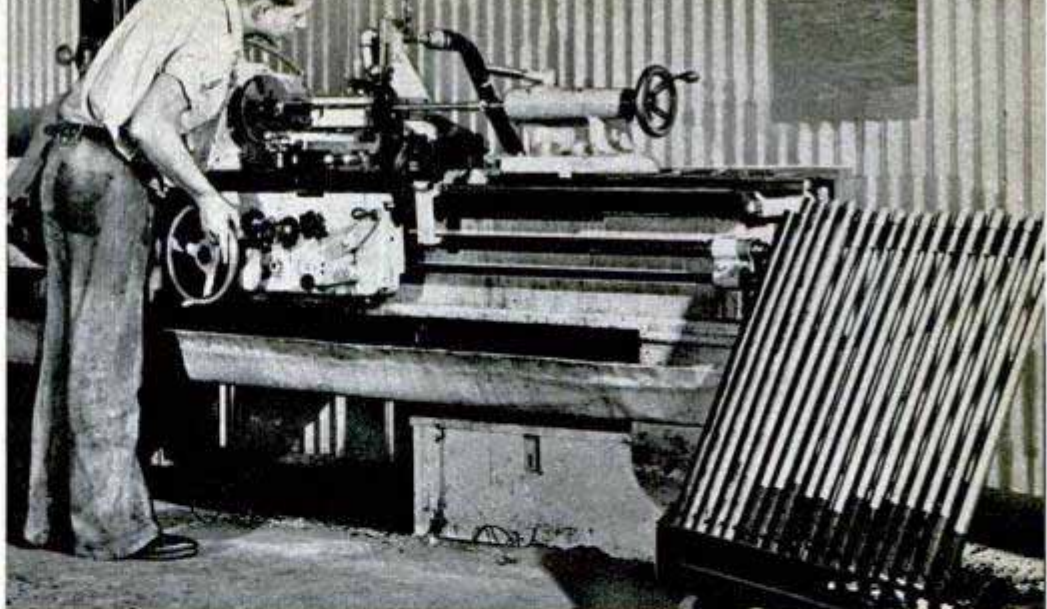
Then the barrel is drilled, reamed, rifled and contoured—giving it a hole down the center and riflings to spin the bullet. Delicate, split-hair accuracy is obtained by modern precision tools made especially for this gunsmithing process.

Next, the barrels are individually fitted to the receiver, and the breech to the action, sights are set and corrected, and the metal finish blued so that a flash of sunlight on the barrel will not frighten game. A special method of etching provides a 700 percent greater area for blueing oxides, resulting in a soft, long-wearing finish.

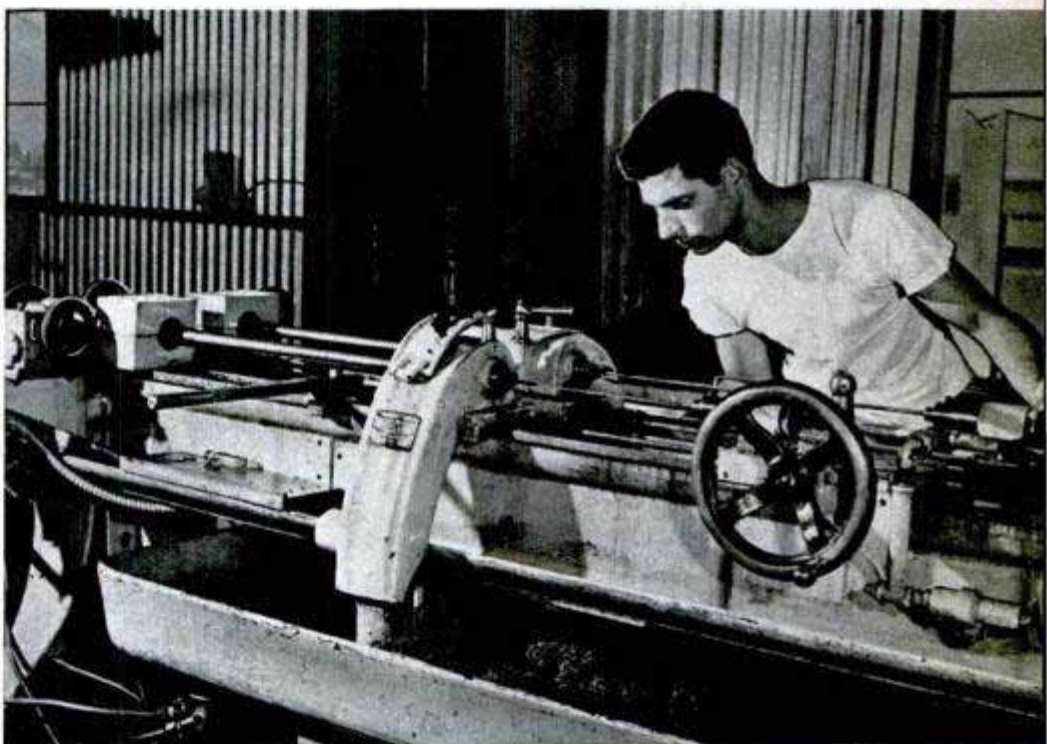
Finally, the stock is fitted to the action and barrel. Walnut and maple wood from the eastern United States are most often used for gunstocks, although occasionally rare walnut woods from France, Italy and Austria are used on special jobs. When necessary, a whole tree is bought to get choice wood for one rifle.

The rifle is now ready for shipping—and it may be sent anywhere in the world, so widespread are Joe Pfeifer's customers. An average production barrel requires about 10 man-hours of work, the stock about three man-hours. A specially designed and executed barrel and stock, though, sometimes run as high as 100 man-hours.

The secret of Joe Pfeifer's success as a custom

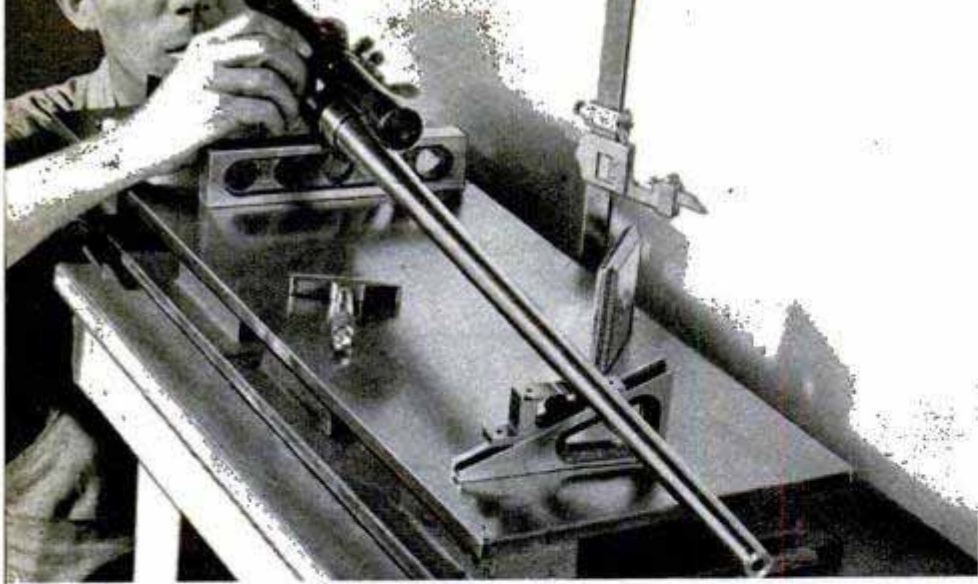


New barrel is started on a preturning lathe, which removes 80 percent of the metal from the special bar stock and produces a rough barrel shape

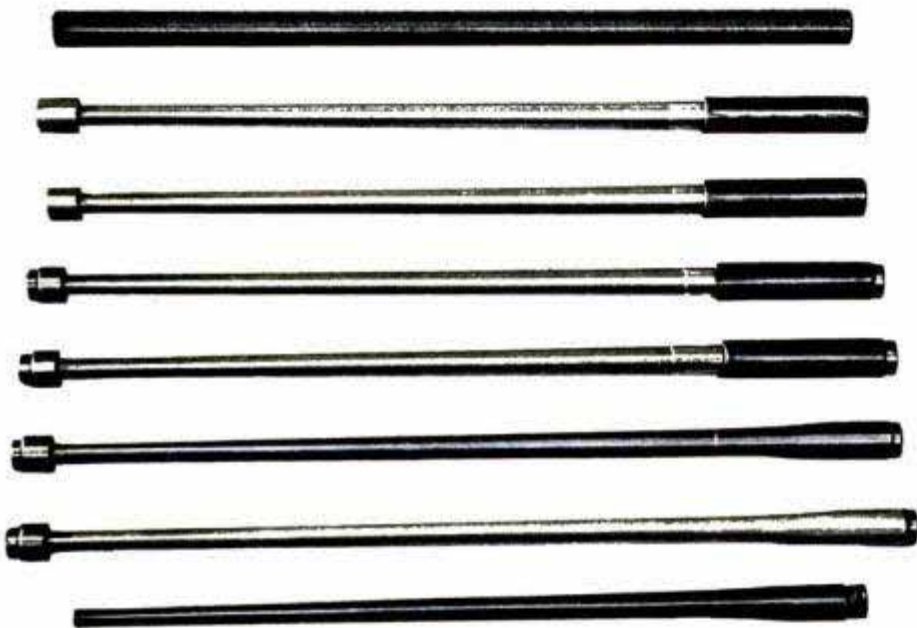


In next step the barrel is revolved against a hollow drill to produce the bore. The machine has split-hair accuracy. Below, the rifling machine produces the six narrow lands and six wide grooves inside the bore





Top-notch gunsmith installs and aligns telescopic sight. Even the finest barrel will be inaccurate if sight isn't in perfect alignment



From top to bottom is a barrel in eight stages of manufacture: the raw-steel blank; pre-turned barrel; drilled; reamed; rifled; contoured; surface ground; and the finished barrel. Below, mechanism is fitted to stock. Right, hand-checkering adds beauty to the stock



gunsmith is that originally he was a machinist and toolmaker—and a good one. Today, he designs and makes all his own machine tools and thus is able to obtain the highest precision and accuracy.

His toolroom in one corner of the Pfeifer shop is fitted with a Rockwell hardness tester, a Pratt and Whitney precision measuring instrument accurate to 1/200,000 inch, a Bausch and Lomb microscope, Johansson gage blocks, several precision-grinding machines and hand-finishing tools.

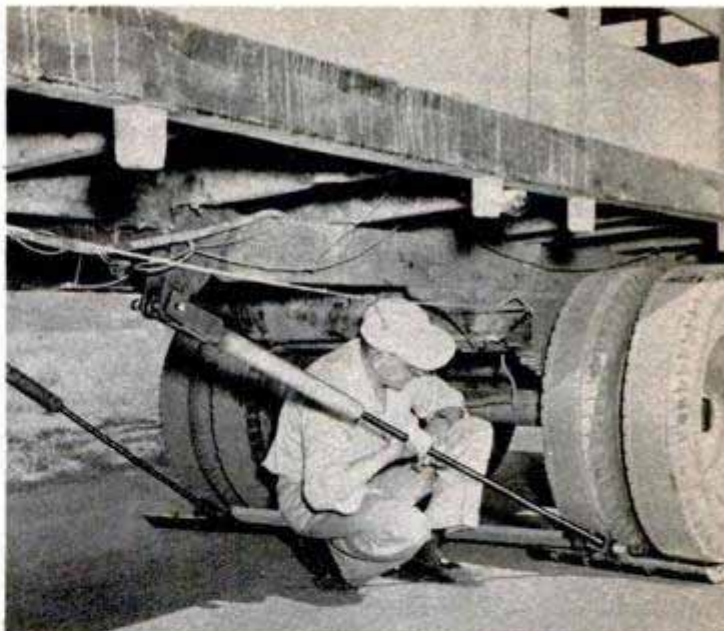
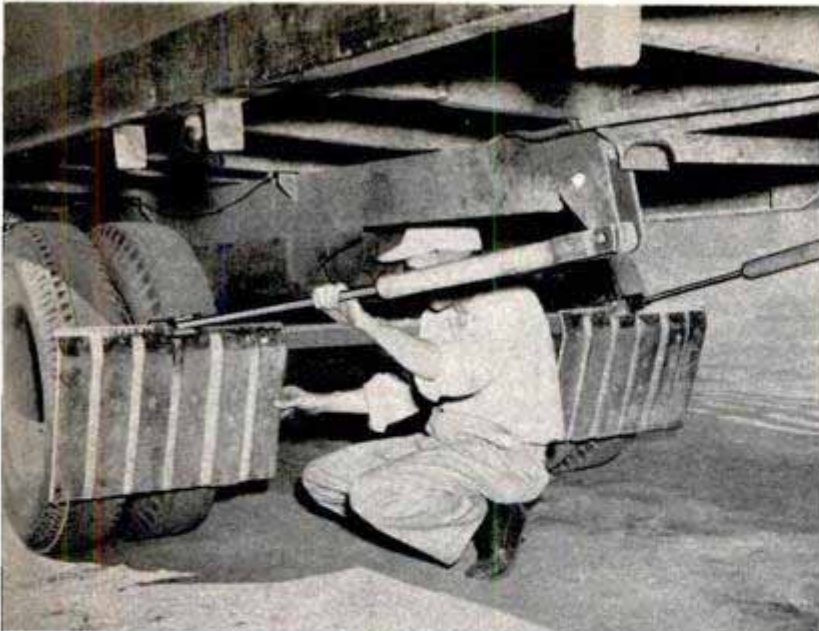
In the several hundred custom-made rifles Pfeifer has built, some have been bizarre and beautiful specimens.

A Sacramento deer hunter who normally shot right-handed injured his eye in an automobile accident. He couldn't seem to learn to shoot left-handed. So he ordered a rifle that could be put to the right shoulder, but aimed with the left eye. It required a specially built stock with an eight-inch "cast off" in it.

Paul Mantz, the well-known speed flyer, has ordered a .270-caliber weapon that will probably be the most beautiful ever built. It will have four Mexican \$50 gold pieces, four Mexican \$20 gold pieces, a fleur-de-lis design in gold and the initials "P.M." mounted in gold on the stock.

(Continued to page 246)





Emergency Brake Stops Truck

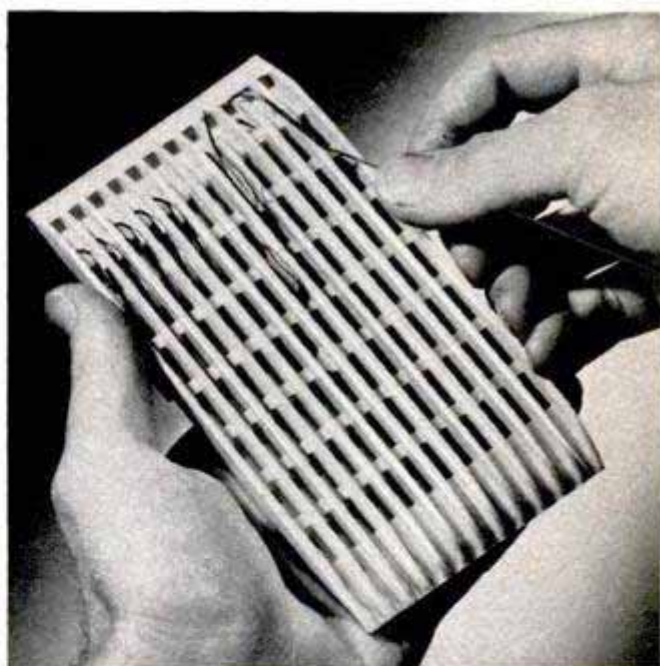
Completely independent of the regular brake system, an emergency brake for trucks will stop the vehicle quickly and safely when regular brakes fail. Designed to prevent runaway trucks, the braking device consists of a pair of steel plates that drop under the rear wheels. The combined area of the two plates is approximately the same as the braking area of the truck's

tires, so the vehicle stops in about the same distance as it would with full action of its regular brakes. Connecting rods between the plates and the truck body guide the plates into position under the wheels. These rods have heavy springs inside them to reduce the strain on the truck body as the brake plates take hold. The undersides of the plates are shod with rubber to prevent damage to the highway when the brakes are applied.



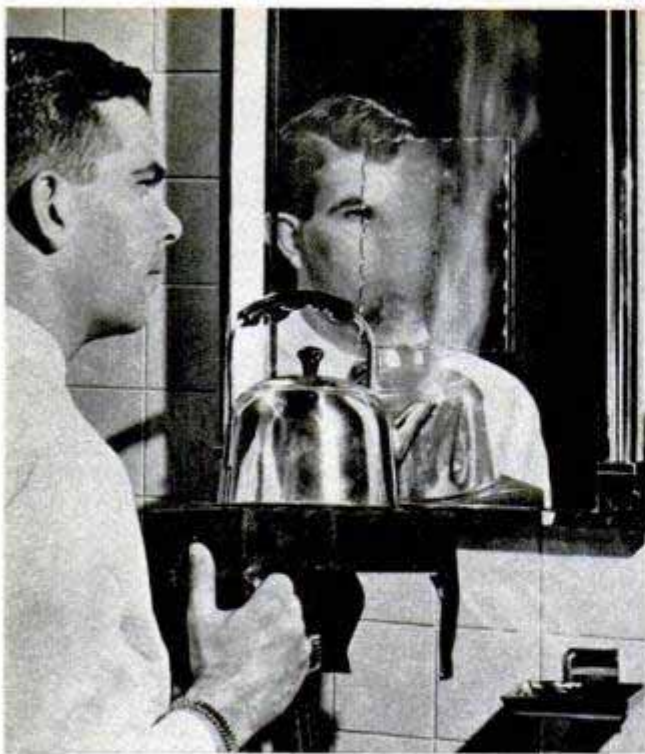
Strips Guide Typists' Fingers

Guide strips that separate the keys into finger groups are now available for typing students. Made of Lumarith, a Celanese acetate plastic, they are attached to a metal strip that fits in the back of the keyboard of any standard typewriter. When the fingers are correctly placed on the "home" keys, they can hit only the correct letters and numbers.



Hook Holder

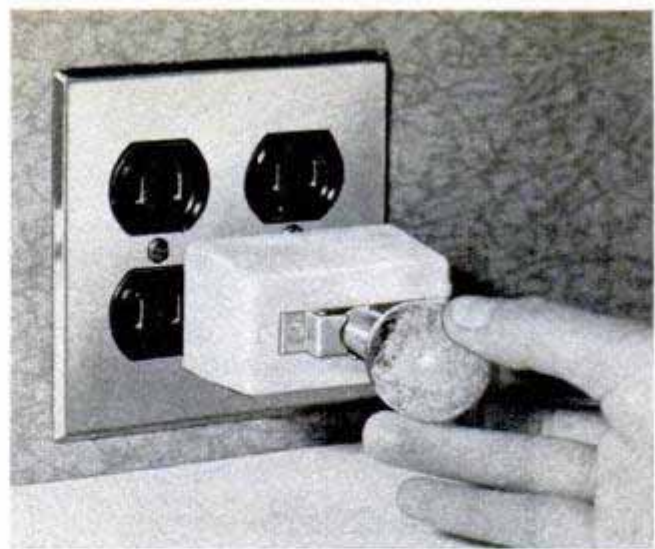
There are no tangled leaders and no exposed barbs to bother the fisherman when he carries his hooks and flies in a slotted plastic holder. Made of Tenite, the holder has 12 lengthwise slots intersected by seven crossbars on which hooks can be mounted. The leaders are drawn over the end of the holder and around to the back where they are looped over spring-operated pegs.



Steam from kettle condenses on regular mirror panel set in center of antifog mirror that stays clear

Antifog Mirror for Bathrooms

Irate shavers who find the bathroom mirror steamed over by someone else's shower now have an answer to their problem. Steam won't condense on a new "electrical mirror" which forms the door of a wall-type medicine cabinet. Behind the mirror is an electric heater made of an electrically conductive rubber which warms the glass to a temperature of 98 degrees—high enough to offset the condensation of steam. The rubber heater is turned off and on with a switch mounted in the corner of the mirror. It uses about the same amount of electricity as a 60-watt bulb.



Flash-Bulb Tester Serves as Night Light

You can test flash bulbs, Christmas-tree lights, fuses and regular light bulbs on a testing device that also serves as a night light. A small bulb inside the tester glows if the bulb or fuse being tested is in good condition. When used as a night light, the tester gives off a diffused light from a six-watt bulb inside the plastic shell.

Hot-Air Fog Dispersal

Furnace-heated air, blown skyward by electric fans, is the heart of a new fog-dispersal system devised in England. The air is heated to 1200 degrees Fahrenheit and driven through a series of concrete ducts to discharge nozzles along the runways. It is estimated that it will push a low-lying fog to the 150-foot minimum altitude in 20 minutes, at much less cost than present methods involving the use of oil burners.



"Switch Engine" Tank Shuffles Boxcars

Freight cars at the New York Port of Embarkation are pushed around by an old Army tank that makes a powerful substitute for a diesel locomotive. The tank, equipped with a bumper made of scrap metal, can push as many as 17 loaded cars. It is used to speed shipment of materiel from the New York port to Europe.

☐ It was 150 million years ago that the first flowering plants appeared on the earth.

Hot Water for Sale Via Special Delivery

Want to buy some hot water? In Brookings, S. D., two war veterans have started a new business enterprise — selling and delivering hot, soft water to the harried housewife. The two young men first went into the trucking business, then started selling hot water to keep their trucks busy. A 10-gallon milk can filled with steaming water costs the housewife 25 cents, delivered to any part of the house. The veterans buy the soft water from the city light and power plant, where it is used in the boilers to prevent scale. Biggest business day, of



course, is Monday—washday. Customers also use the water regularly for scalding chickens and pigs.



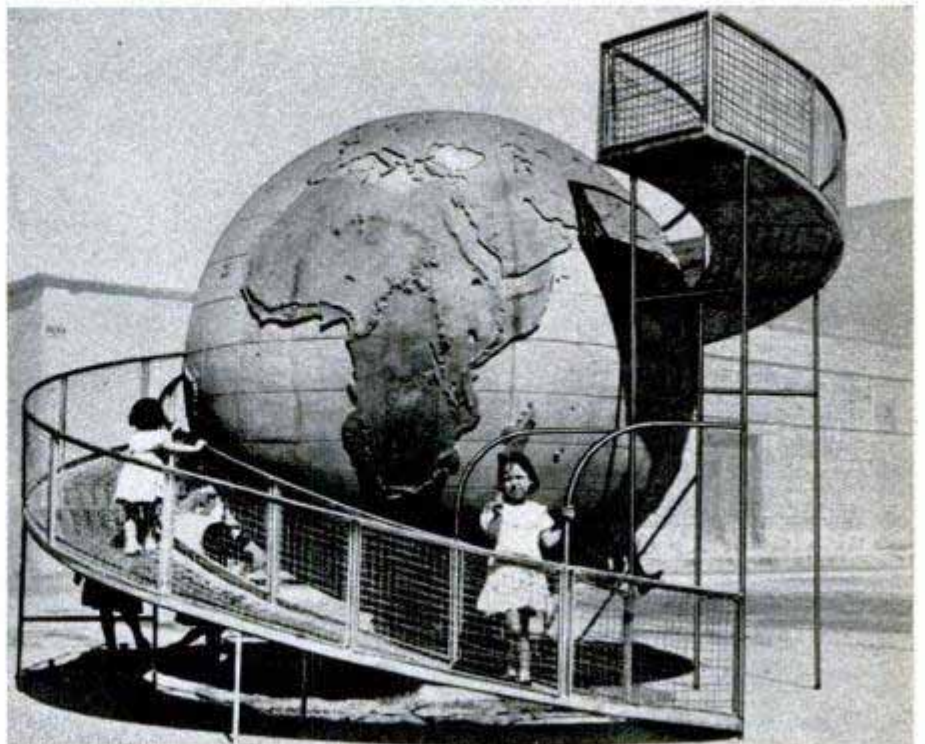
"Slow" Light

In fast-moving city traffic, split-second delays often mean accidents so a new "slow" signal that gives advance warning of braking action should reduce rear-end collisions. The slow light, mounted on the rear of the car, flashes a bright yellow light the instant you take your foot off the accelerator. When you step on the brake pedal, the slow light goes off as the stoplight goes on. The light can also be used as a warning light when you're disabled on the highway. With the ignition switch on, you merely tap the accelerator pedal and the light goes on, remaining lit until you press the brake pedal.

Playground Planet Teaches Geography

Pupils in a primary school at Hermosillo, Mexico, combine their recess periods with their geography lessons. A giant globe, cast of concrete, is part of their playground equipment. The land areas of the world are shown in relief. A curved ramp, up which the youngsters climb, provides a close-up view of the world's geography.

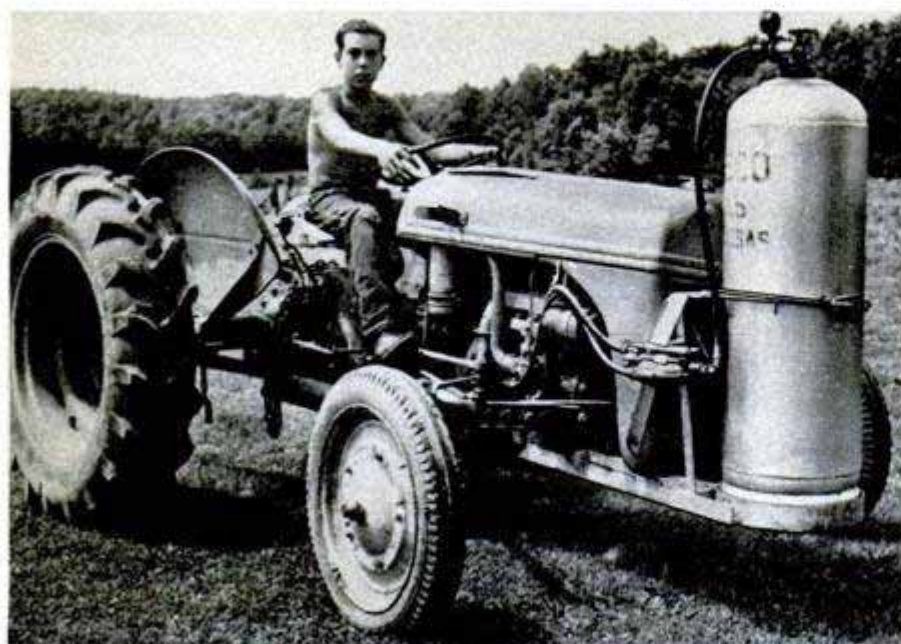
☐ When part of a train hauled by a diesel locomotive, a 40-ton freight car travels 16 miles on a gallon of fuel.





Farmers Put Air to Work

Some farmers don't hand-hoe the weeds these days—they just press a button and watch a blade flick out to topple the stalks. Likewise they saw wood, prune trees and trim hedges with pneumatic tools. New farm implements driven by compressed air even shake walnuts and prunes from the trees. To prune a tree, the orchard owner uses air-driven shears, or for larger limbs a vibrating saw powered by an air-motor piston inside the handle. Prune and walnut knockers operate similarly but deliver a shorter, faster stroke. The hooked end of the vibrator fits around a limb and gives it a severe shaking, plummeting the ripe fruit to the ground. All the pneumatic tools are built of aluminum or other light metals and weigh from three to eight pounds. They operate on 175 pounds' air pressure, and are connected by air lines to a portable compressor which can drive 12 of the tools simultaneously. In gang operations, the compressor is mounted on a light truck.



Bottled Gas Powers Tractor

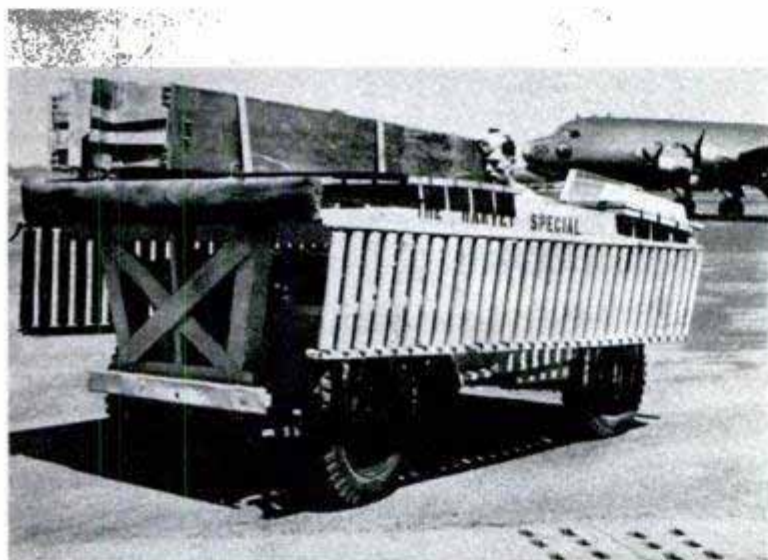
Bottled gas is the fuel used in a tractor owned by Levi B. Miller, a Virginia farmer, who says the machine now develops more power than it did with gasoline. Miller converted the engine himself. Two holes were drilled in the carburetor and a metering valve mounted alongside the propane tank, which is mounted in an upright position directly ahead of the radiator on an extension of the frame.



Jets Go to Sea

Not satisfied with conquering land and air, jet propulsion has now gone to sea. A 62-year-old Scottish paddle steamer, the

Lucy Ashton, was fitted with four jet engines and made the first jet-propelled ocean trip in history. The engines are mounted on a girder superstructure amidships and develop a thrust equal to 5000 horsepower.



Mobile Air-Lift Dock Fashioned From Jeep

Cargo air lift to Korea is speeded by a Jeep converted into a mobile loading and unloading platform. It was built by U. S. airmen in Japan at their base's machine, welding and carpentry shops. The cushioned front end is driven flush against the fuselage of twin-engine transports, just below the door, and a trap door closed over the driver's compartment to form a sturdy dock. Roller-type conveyor ladders for handling cargo are carried on the Jeep's sides.

Remote Salesmanship

Recorded talks, triggered by a proximity impulse, are being used to "sell" customers in large self-service stores. The message concerns a single product and the sound mechanism with its endless tape is activated whenever a person approaches the merchandise. The recording is in a soft voice directed only to those in the immediate vicinity.

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





THE WAR IN THE WHITE PINES

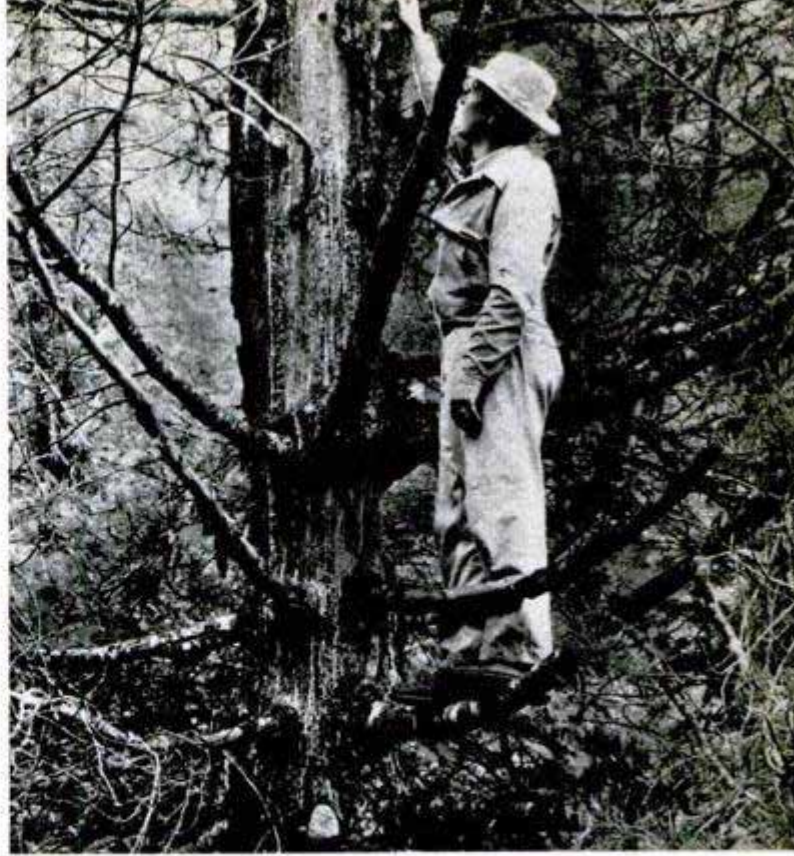
It's a bitter battle but it's being won by unique weapons — a college boy, a ball of twine and a secret pried loose from Nature

Science and Nature teamed up to accomplish the transformation on this page. Above, photo taken in 1931 shows timberland destroyed by blister rust and fire. Below, photo taken from the same spot 17 years later





Helicopter joins the battle, trailing fog across timber to wipe out bushes which spread the disease



U. S. Department of Agriculture photos
Victim of deadly blister rust, this tree shows ugly cankers which gradually ring the white pine to kill it

By O. A. Fitzgerald

OUT OF THE TIMBER into the open spaces of northern Idaho thundered a bull moose. Trailing from his horns was a snarled mass of string.

"That moose really was sore," chuckled Frank O. Walters, assistant regional leader in blister-rust control, as he recalled the incident.

Over near Elk River, also in Idaho, a buck deer was even angrier. He was so tangled up in string he couldn't move. Hunting season was on and for once a hunter actually found his deer staked out for him.

Although an annoying travel hazard to the deer, elk and moose, the string is a valuable weapon in a war that is raging in our white-pine forests. The twine guides control crews who are fighting blister rust.

Sometimes within a year a whole carload of string is unwound in the white-pine forests of northern Idaho, western Montana and eastern Washington — generally called the Inland Empire. Here are the nation's largest and most important white-pine stands.

But for the work of the crews leaving this string, and that of other string-spreaders who battle the rust in the white-pine forests of the East, the South and along the Pacific slopes, we would be writing white pine off the forestry books. Instead, we are now talking about how safe the tree is.

Saw-log dividends from the successful

battle in the forests of the Inland Empire are forecast at \$65,000,000. Completion of control projects now under way will save another \$94,000,000. It costs money to fight blister rust, but compared to these dividends it's bargain-basement warfare.

"For the better forest areas it costs between two and three dollars per thousand board feet of saw timber to protect the white pine from blister rust," explains H. E. Swanson, leader in blister-rust control for the Inland Empire area.

White-pine stumpage today is around \$20 a thousand board feet but in figuring tomorrow's dividends foresters use the nearer normal figure of \$13 a thousand.

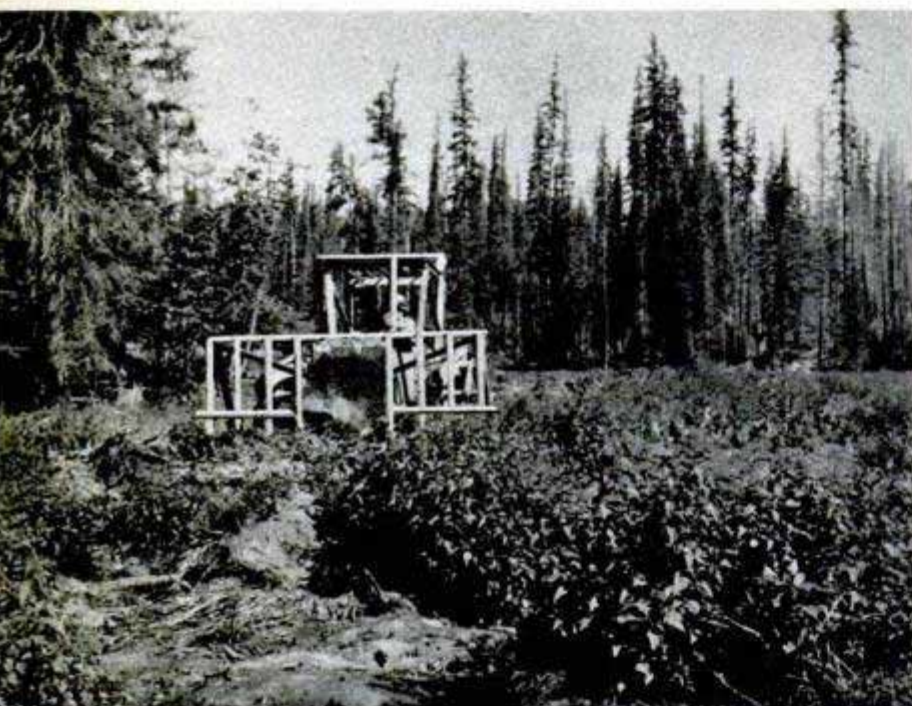
First observed in New York in 1906, white-pine blister rust by 1915 was so widespread that all hope of ever completely wiping it out was abandoned.

"White-pine blister rust threatens to eliminate an industry that now employs upward of 5000 men and pays more than \$7,000,000 annually in wages," Forest Service officials in the Idaho-Montana-Washington area declared when the full threat of the disease to forests became apparent.

The killer that threatened to topple our white-pine forests is a parasitic fungus. Spores from sick trees are carried up to 300 miles by wind. Landing on a currant or gooseberry bush, they take root and grow. These spores are like the seeds of a plant. When that berry bush gets the



Turntable from hook-and-ladder engine is used on this roadside sprayer which fires a weed-killing fog at 145 miles an hour



Bulldozer on a mountain meadow wipes out the currant and gooseberry bushes, which spread blister rust from one tree to another. Below, backpack sprayers are carried through mountains by college men to kill bushes. String shows area covered



disease it produces another kind of spore, which is also picked up by the wind. When this second spore lands on a pine, the tree gets the disease. Spores carried from pine to pine are harmless. Only those spores from gooseberry or currant bushes are deadly to the pines. Wind is the culprit in spread of the disease.

When the forest scientists first found that the rust spores were carried up to 300 miles the situation seemed hopeless. Then came the break that opened the door to control. Although spores from pine trees can give the disease to berry bushes hundreds of miles away, a tree must be within 900 feet of a sick bush to catch the disease. That discovery wrote the death ticket for all currant and gooseberry bushes in our white-pine forests.

For around a quarter of a century we've been digging up, killing with spray, and bulldozing out these bushes.

"Where the bushes have been eradicated, the progress of infection by blister rust has been definitely stopped," declares Swanson.

No section of the United States has a monopoly on blister rust. The disease is in Eastern white pine from Maine to Georgia, in sugar pine in Oregon and California, in all the white pines straddling the Rockies.

Blister rust operates very much like cancer in humans. At the start it is silent, insidious, relentless. Tree needles catch the flying spores. Slowly the disease creeps under the bark along the limbs to the trunk. First thing you know the tree breaks out in cankers. When the cankers completely girdle a tree its days are numbered.

Foresters nationally are busy trying to keep these cankers from forming on white pines. Cleaning out the currant and gooseberry bushes is a continuing job in 32 states. Organized extermination of these bushes began in 1922. Spearheading the rust-control drive is the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture.

About midway between two northern Idaho logging towns—Bovill and Clarkia—is a 200-acre argument for blister-rust control.

(Continued to page 234)

the

POPULAR
MECHANICS

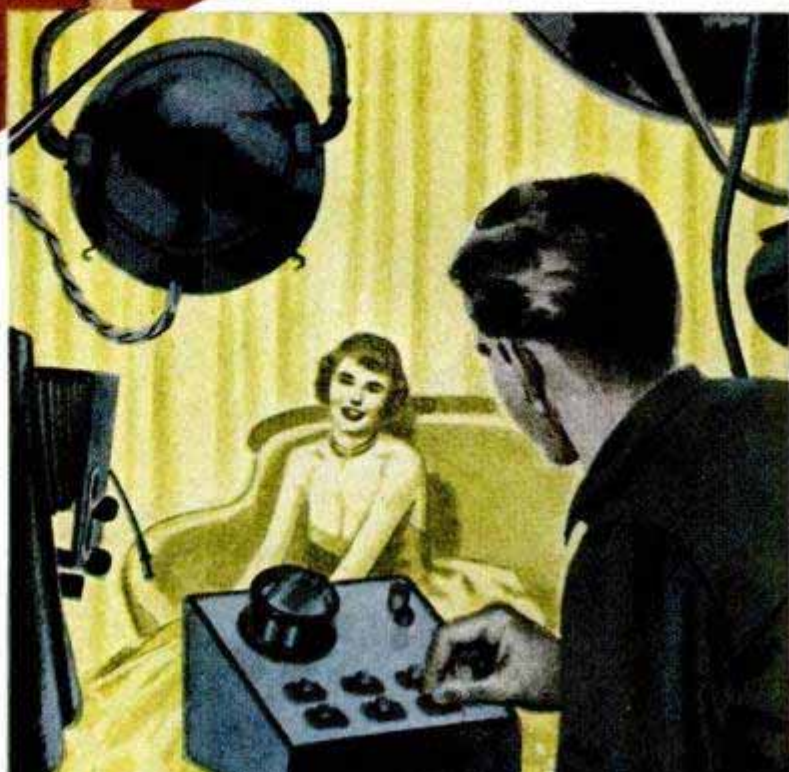
CRAFTSMAN



↑
Your dining table supports this pickaback billiard table which lifts off easily for storing in a closet. Leveling device fits one leg of table. See page 188

↓
A master control panel permits up to six photo lights to be turned on or off individually or simultaneously right at the camera. Details on page 206

NOVEMBER 1950



Give Santa a Hand

Route those toy orders to Santa through your workshop. Here are 10 wooden ones to bring shrieks of delight from your youngsters on Christmas morn



Photos by Paul Hutchinson, staff photographer

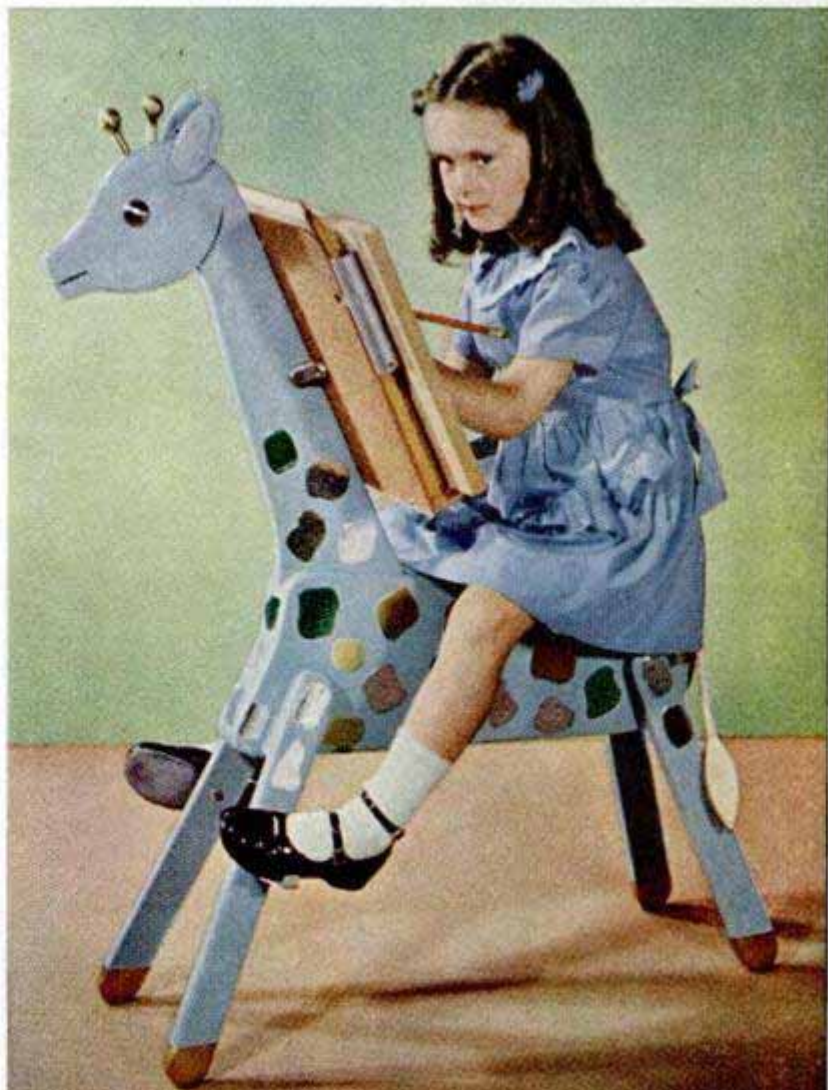
By Marvin Hartley

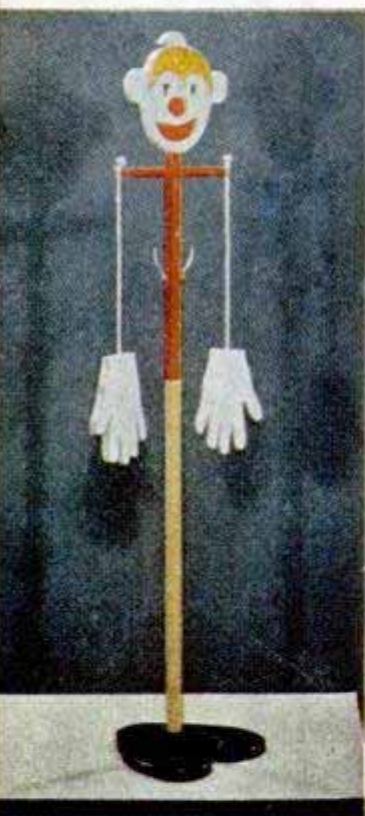
SANTA'S job will be easier when you turn toymaker and lend a helping hand to relieve the burden on his North Pole workshop. Among this group of 10 exciting toys, there's at least one that will surely make Christmas extra merry for some youngster. Except for the lighthouse stool, bucking bronco and the burp gun, which require some sheet metal, all of the toys are made mostly of wood. The step stool, shoe-shine kit and novelty lamp can be made of scraps from your wood box. Construction of these, as well as the others, is apparent from the drawings, which include patterns for the parts that require jigsawing. Enlarging the patterns full size is easy. First, count the number of squares given and rule on paper an equal number of 1-in. squares.





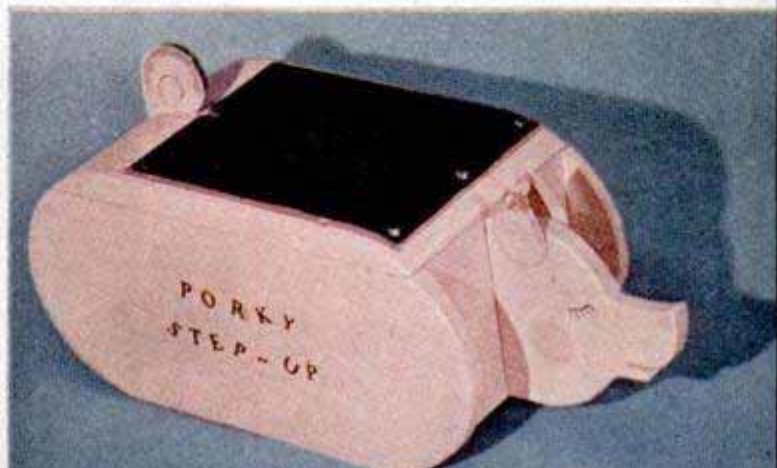
PLANS #105
INCLUDES
BOTH THE
BRONCO
&
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504

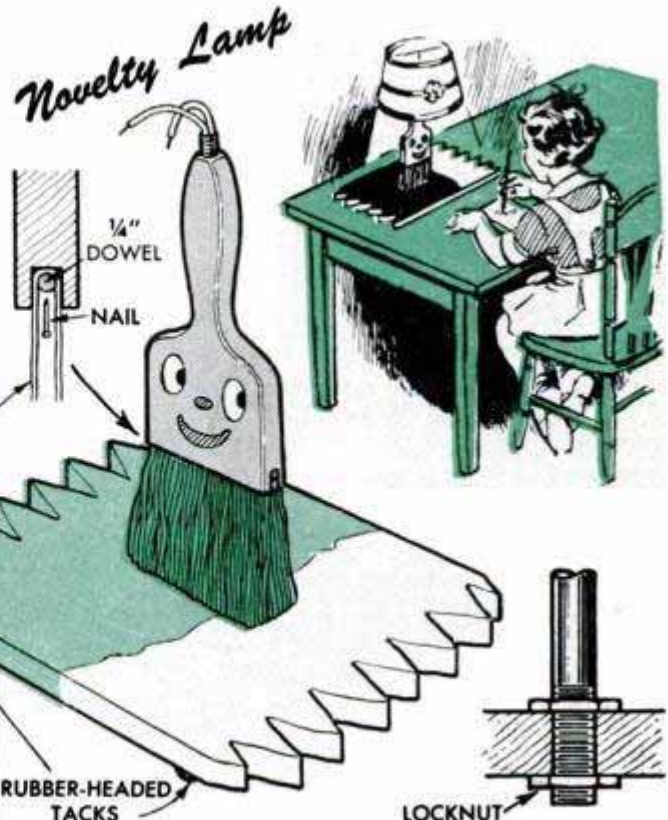
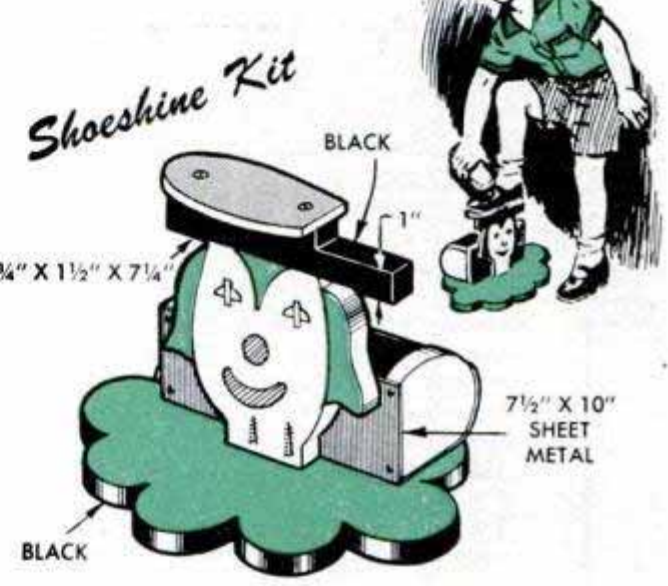
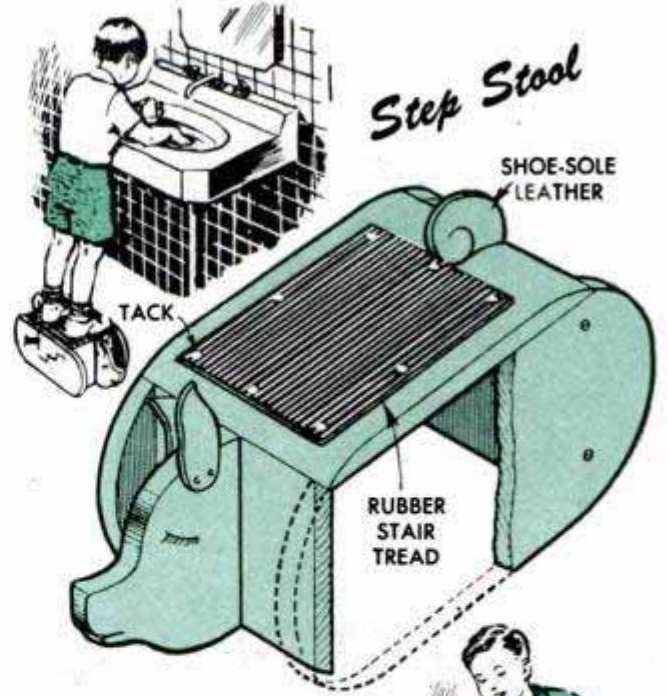
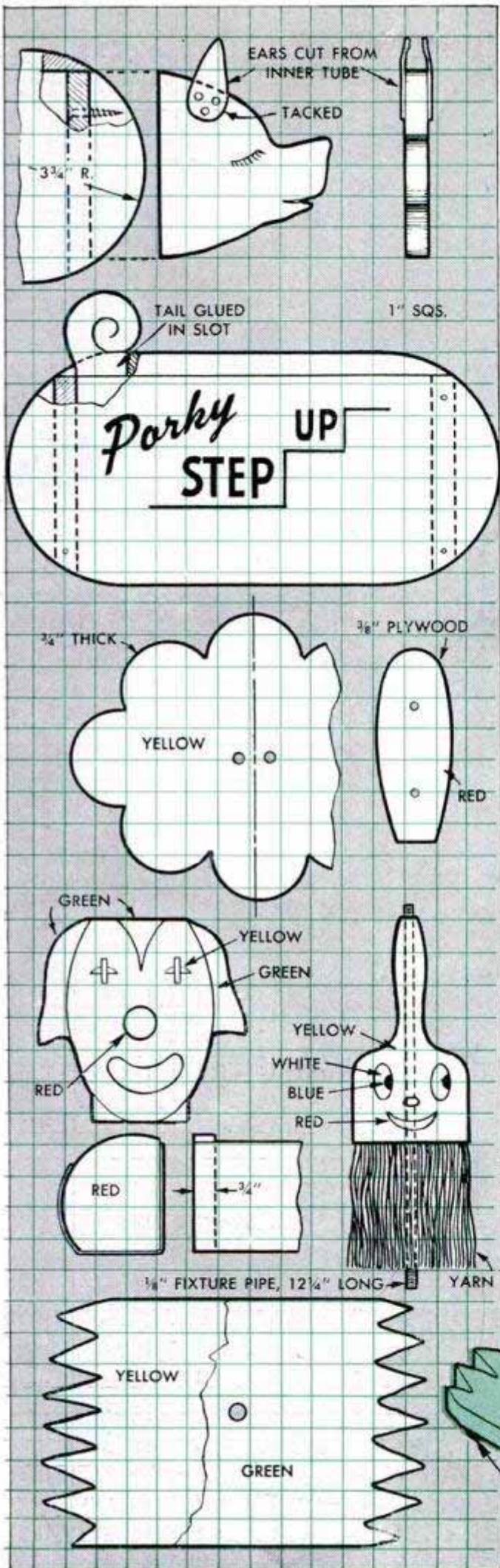


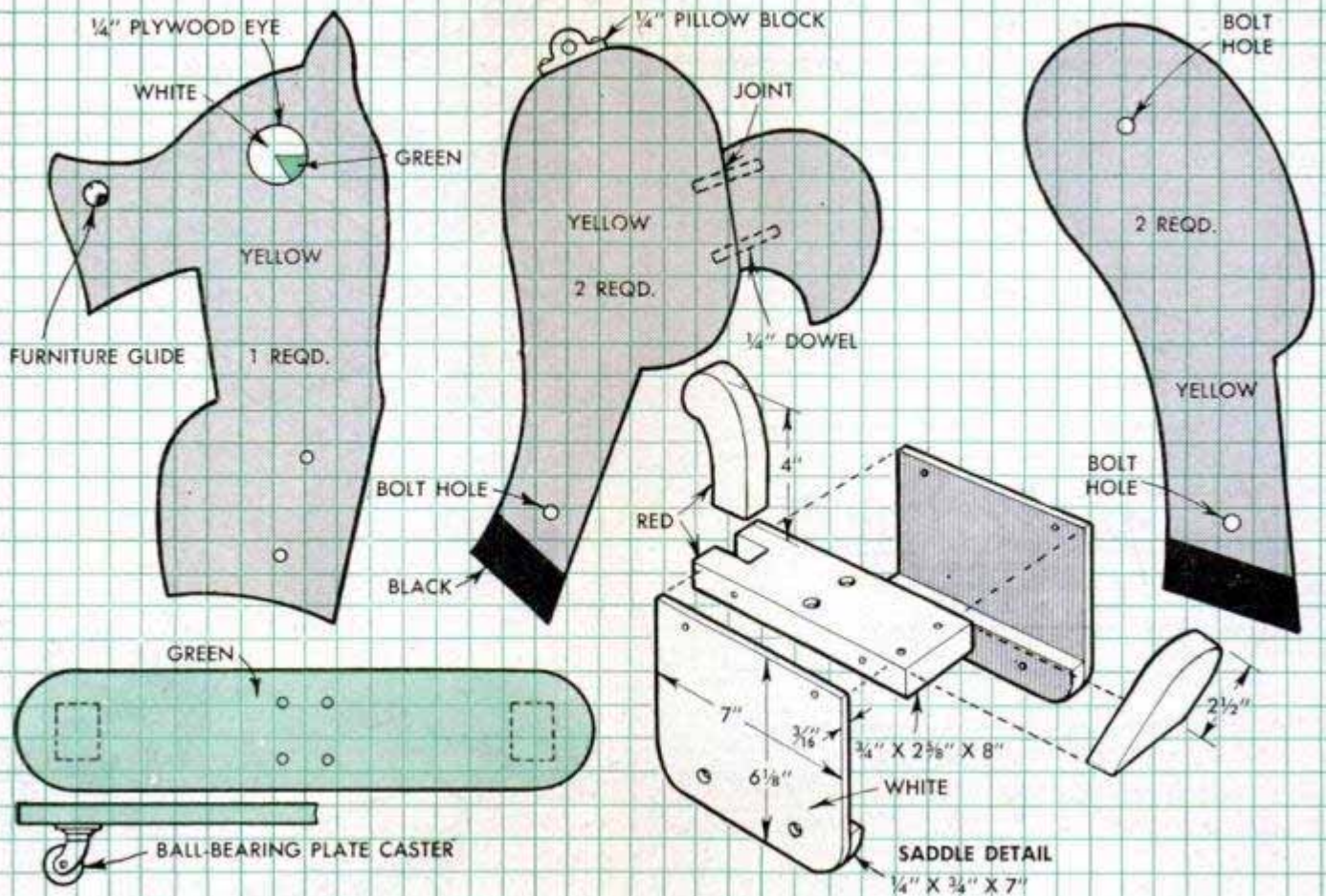


Next, number the rows of squares 1, 2, 3, etc., across the top and down one side of both the magazine pattern and the ruled paper. Now, begin enlarging the pattern by drawing that portion of the outline which is in square No. 1 in the magazine in the corresponding square on your ruled paper. Then advance to the next square, and so on, until the complete pattern is enlarged. With practice, you'll find it easy to enlarge any pattern by the square method.

With the exception of the table-and-chair set, which should be made of plywood, common $\frac{3}{4}$ -in. white pine is ideal material for practically all of the toys. Although the sides of the fish rocker were originally cut from wide solid stock, with the fins being added separately, they can be made in one piece by using plywood. Likewise, the hind leg of the bucking bronco, which shows the tail as a separate piece, can be of plywood. Duplicate parts of the various toys, such as the sides of the bodies, the legs, etc., can very well be cut at one sawing, thus assuring identical members. This is especially advisable if a bandsaw is being used. The pieces are simply tacked together in the waste areas and the work cut in multiple. In sawing duplicate parts, such as the clown hands, sides of the bronco body and fish rocker, you automatically produce a permanent pattern by simply inserting a sheet of thin cardboard or plywood in the stack of pieces being cut. Thus, when the sawing has been completed, you will have cut a full-size pattern at the same time. This is especially worth remembering if you plan to mass-produce any one of the toys in large quantities.

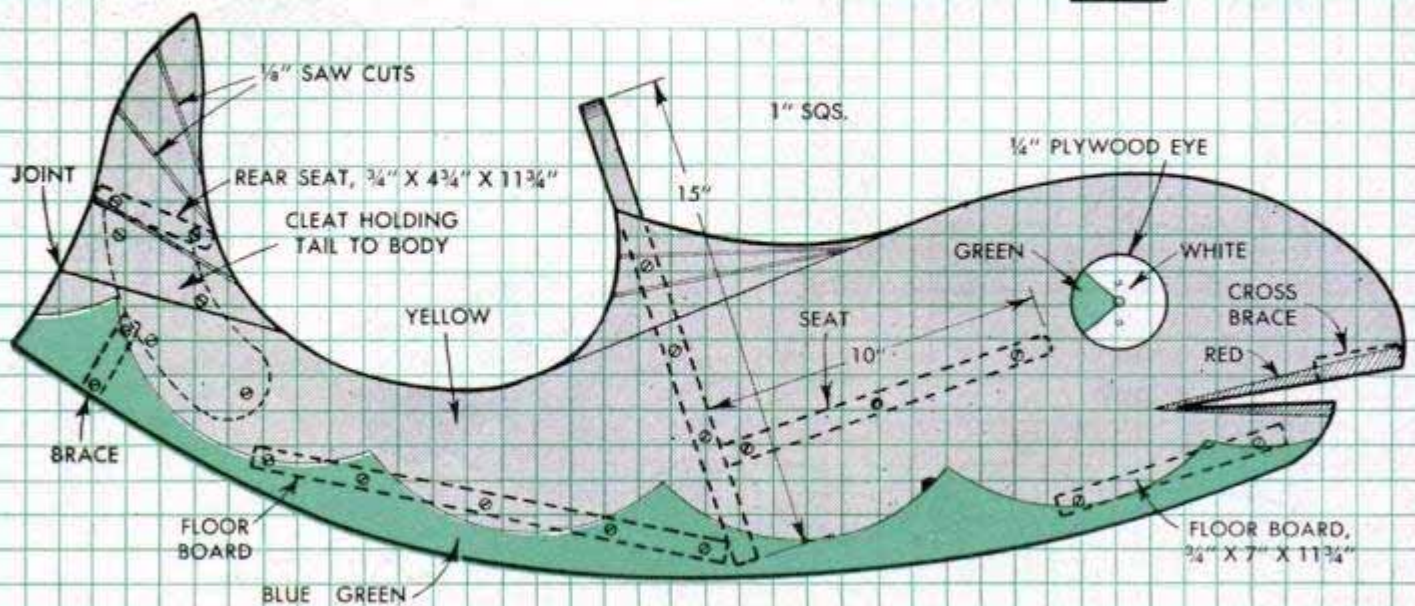
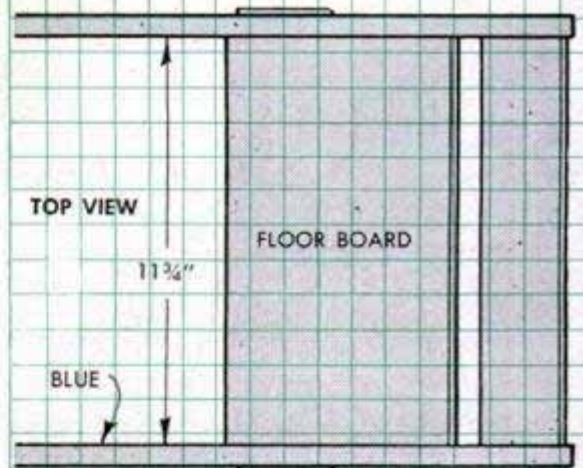


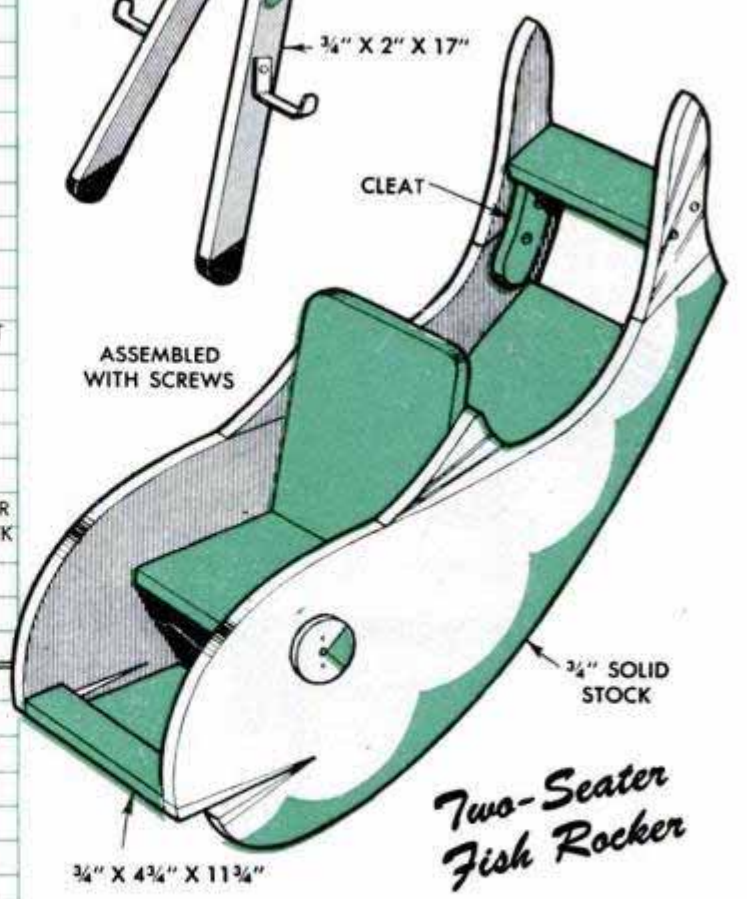
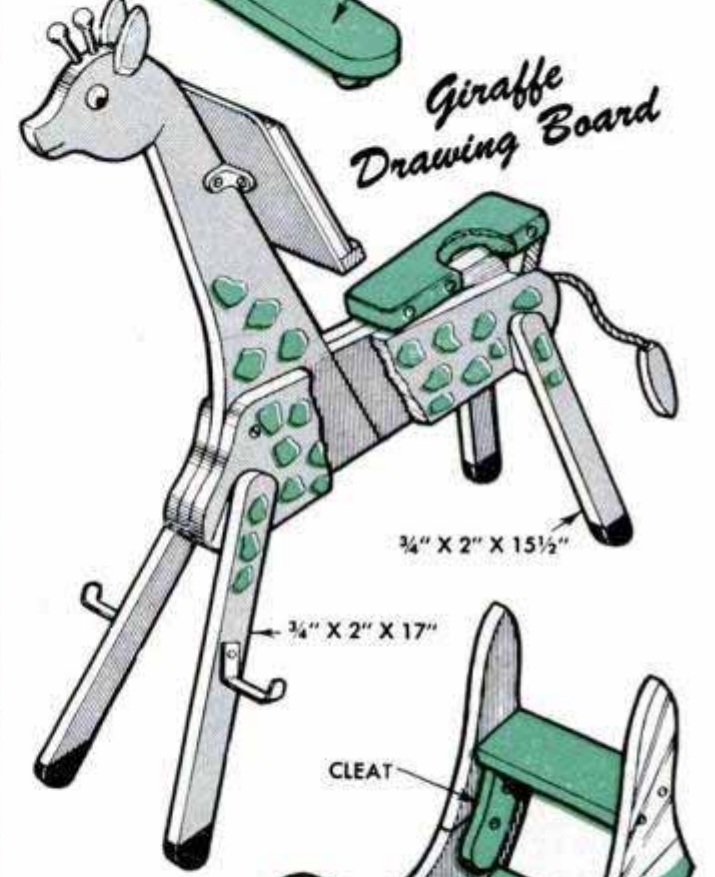
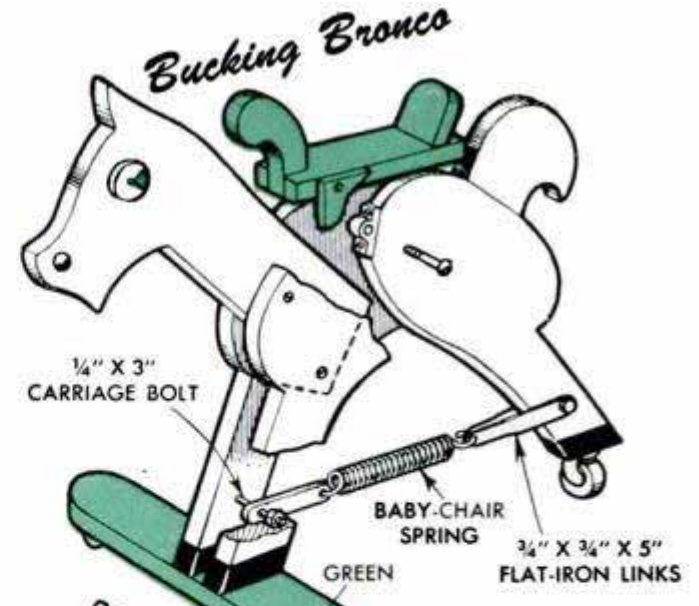
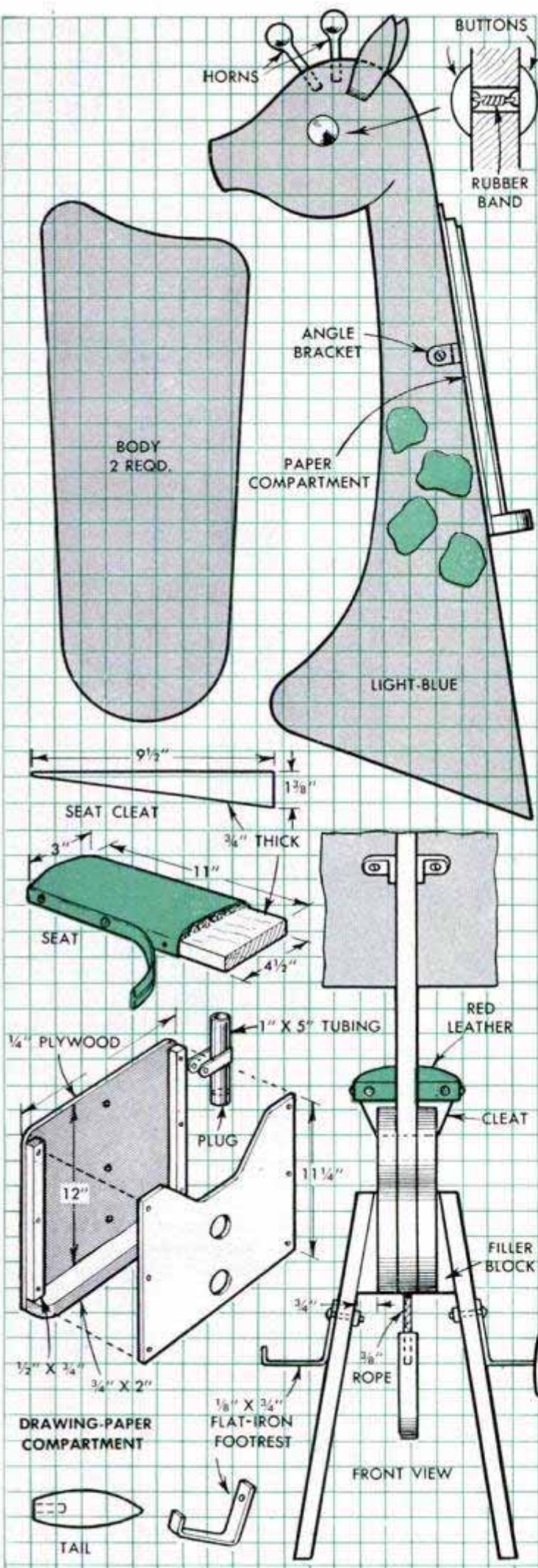


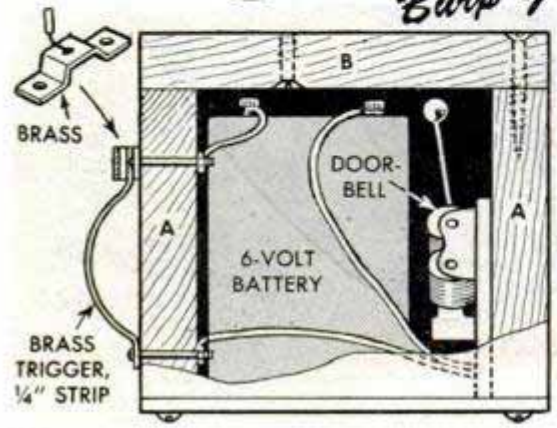
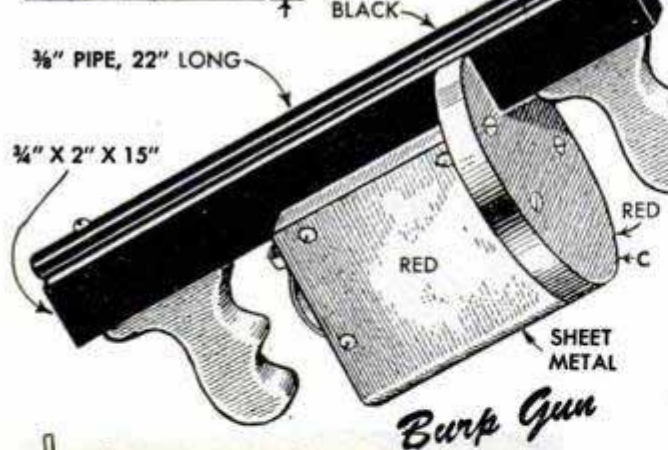
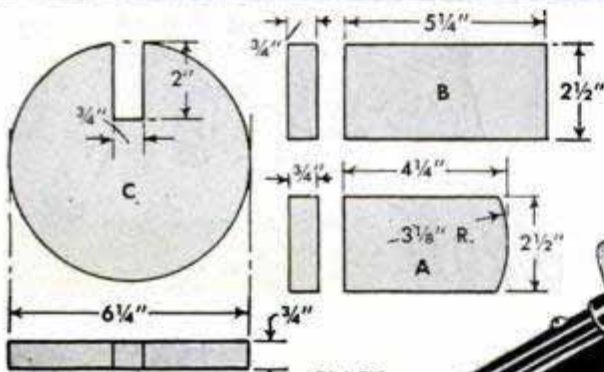
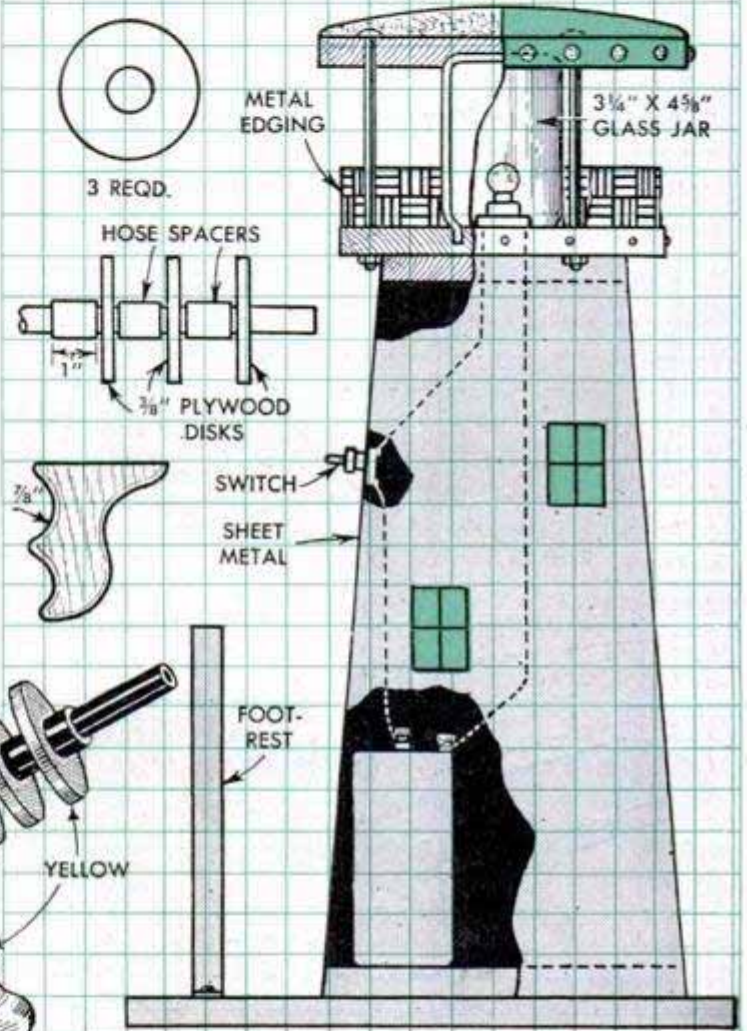
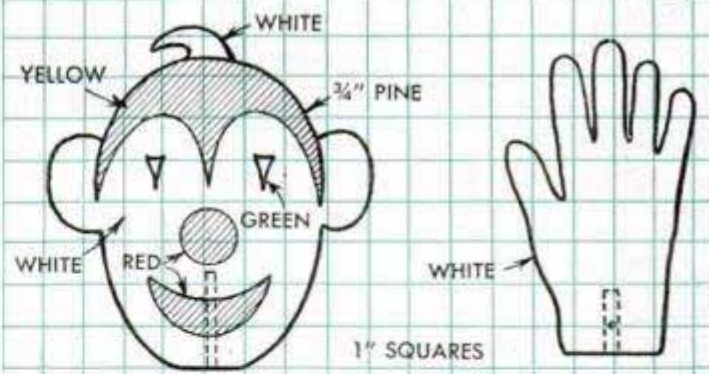


Bucking bronco requires plate casters for the footrest and a socket-type caster for the rear leg. The two sections of the toy are pivoted together with a carriage bolt and a small pillow-block bearing. A coil spring between the legs gives the "cowboy" a bucking ride that bounces him up and down in the saddle

The neck of the giraffe drawing board supports a compartment for paper which also serves as an easel for a small-size drawing board. The compartment can be made separately with holes provided in the front for admitting a screwdriver for attaching it, or the compartment can be partially assembled and fastened in place before fitting the front. Small metal brackets on each side of the neck cross-brace the compartment



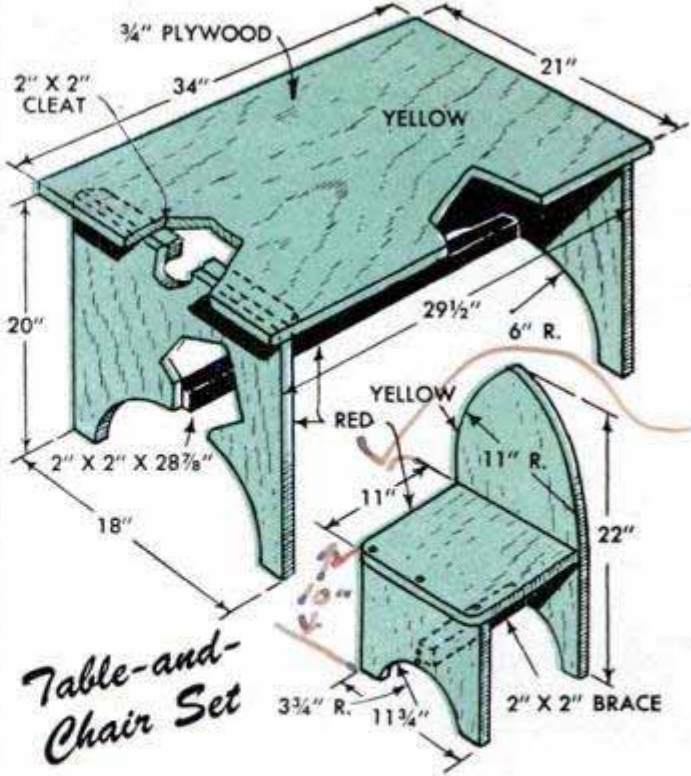
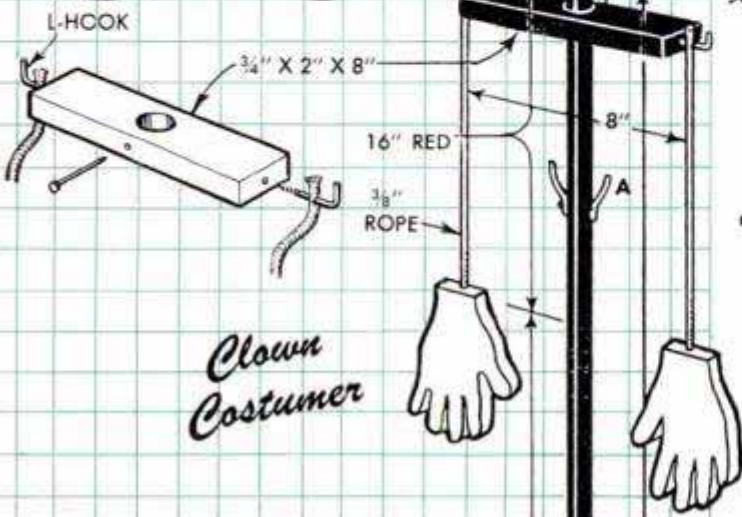
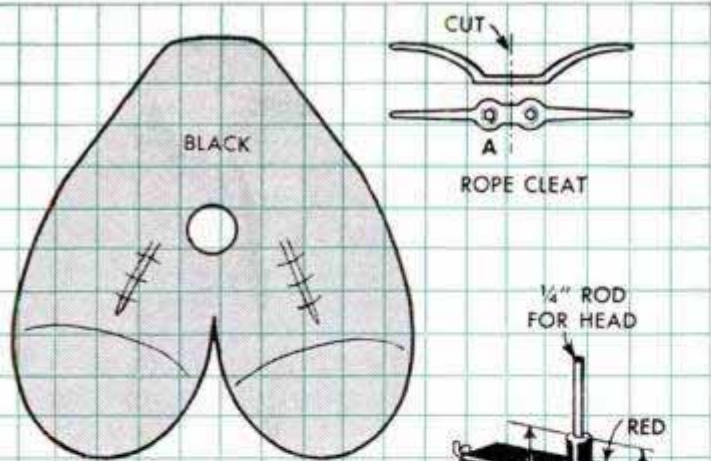




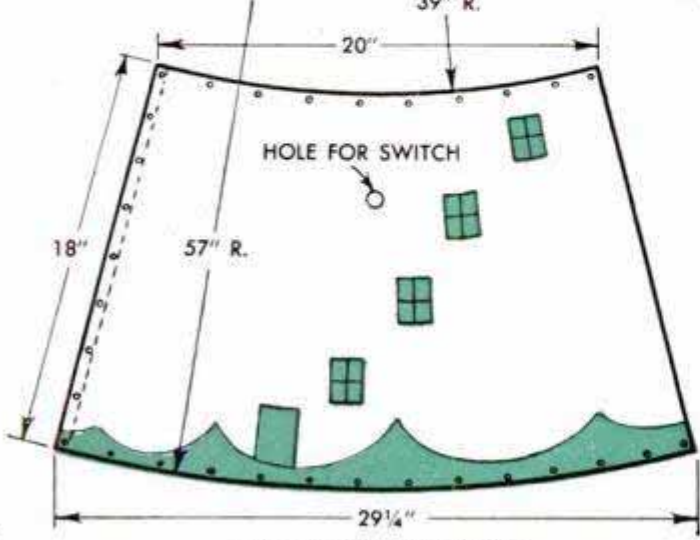
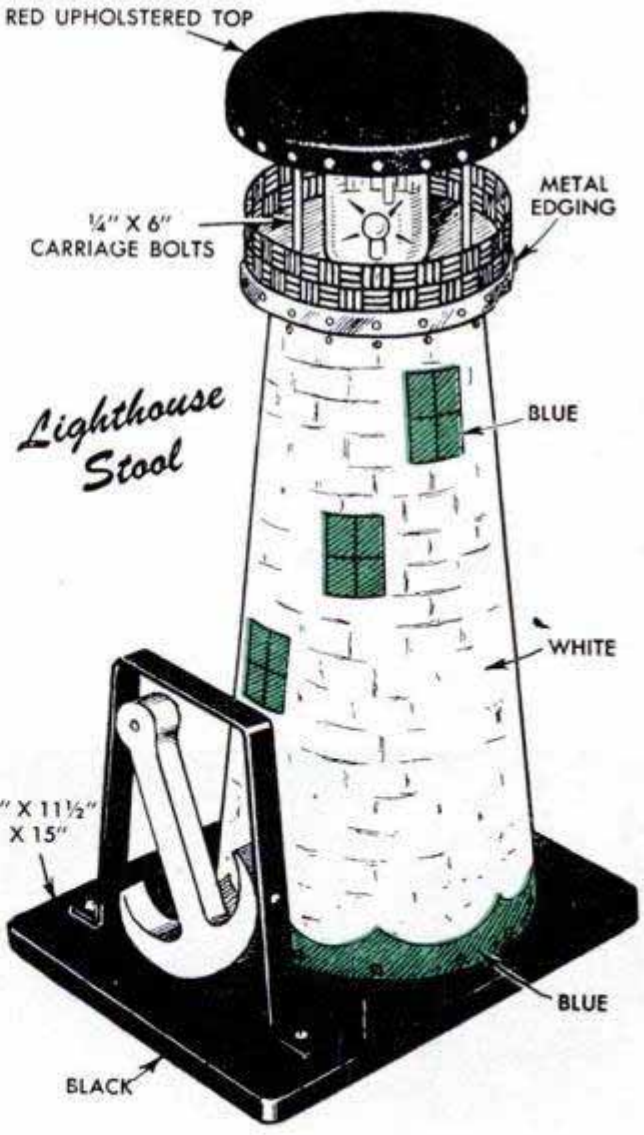
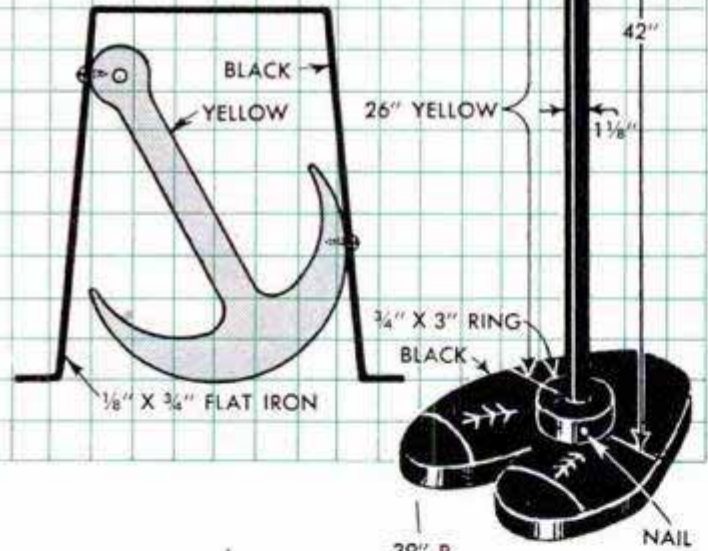
Burp Gun

Burp gun employs a doorbell unit with the bell removed, and a 6-volt battery to simulate the sound of a machine gun when the trigger is pulled. The wooden parts that form the compartment for the bell and battery are keyed to show how they fit together. A length of pipe provides the gun barrel, and the dummy cooling fins at the end are plywood disks held in place with 1-in. spacers cut from old garden hose

The "beacon" of the lighthouse stool, which is enclosed in an inverted glass jar, consists of a 1.5-volt flashlight bulb. This is inserted in a socket and wired to a push-button switch and dry cell. Removal of the screws at the base of the lighthouse permits renewal of the dry cell. Three 1/4-in. carriage bolts attach the padded top of the stool, lengths of tubing being slipped over the bolts to support the top slightly above the glass jar. The pattern for the sheet-metal base of the lighthouse is given at the right. The metal is lapped at the seam and fastened together with sheet-metal screws

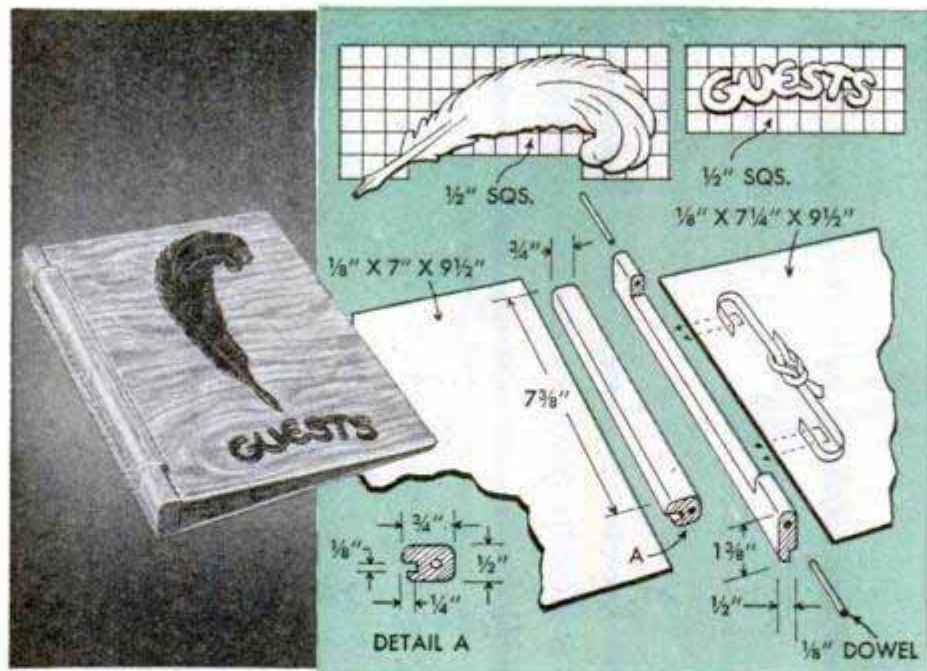


Exceptionally sturdy but not especially fancy, this plywood table-and-chair set will appeal to the dad or big brother who works with little more than a handsaw, drill, screwdriver and paintbrush



Dimension changes left out.

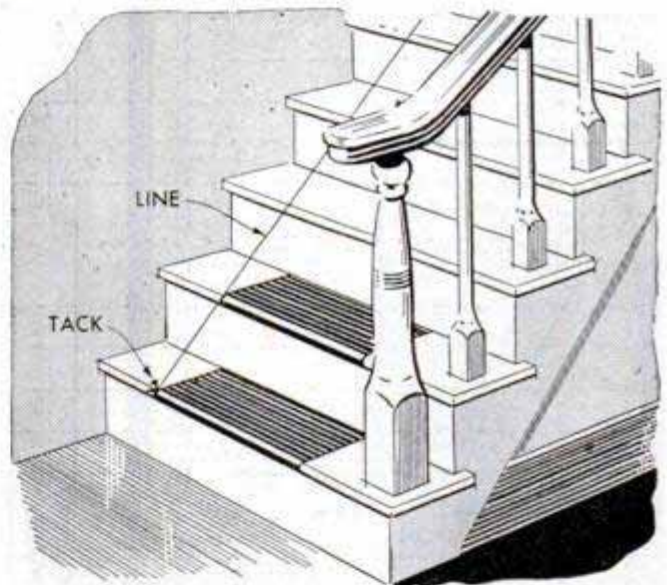
Guest-Book Cover Features Decorative Overlay



Combining birch-ply-wood covers, a hardwood hinge and a decorative overlay in veneer or hardboard, this guest book is a project that you can display with pride. Glue the covers in rabbets cut in the hinge sections, glue the overlays to the front cover and finish the book with shellac, painting the overlays if desired. The pages are sheets of paper which are punched, folded double and bound with thongs stapled to the lower hinge member.—Roland Cueva, Heyburn, Idaho.

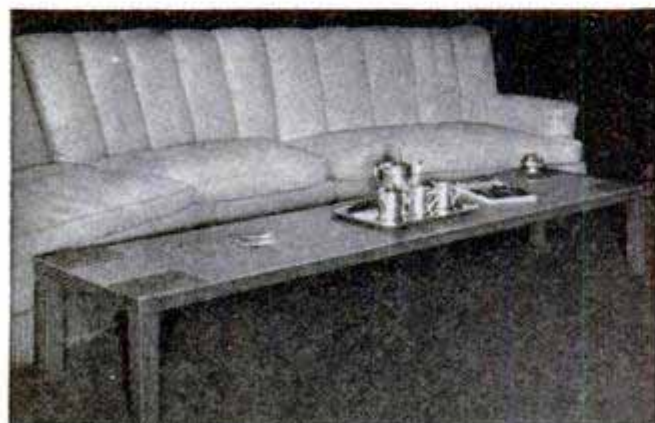
Installing Rubber Stair Treads Simplified by Using Chalk Line

Installing rubber stair treads seems easy, but for successful, neat-looking results, the job must be done carefully to align all the rubber treads. First, determine the exact width of the stair treads and from this figure subtract the length of the rubber treads to be used. Divide the remainder by two, thus arriving at the distance which must be allowed on either side of the rubber tread to center it accurately. Measure this distance from one edge of both the top and bottom stair treads and mark these points with carpet tacks. Then tie a length of cord, such as chalk line, between the tacks and install the rubber treads, aligning one edge of each tread with the cord. The treads may be glued in place or fastened with carpet tacks.



Flush Door Fitted With Legs Forms Modern Coffee Table

A modern coffee table which resembles the solid-oak tables available in decorator shops, can be made in just a few hours by fitting a flush-type door with four hard-



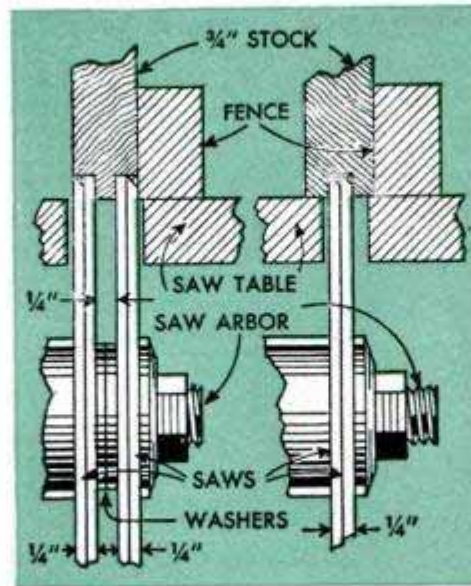
wood legs. Most lumber dealers carry rejected doors in several widths, the narrow closet doors being especially suitable for this purpose. Although the legs of the original table are 10-in. lengths of 2 x 2-in. stock, heavier stock may be used with wider doors, if a more massive appearance is desired. The legs can be fastened to the underside of the door with 2-in. angle irons, or screwed and glued in place, using cross-bracing or rails directly under the door for additional support. The table is finished to suit and may be fitted with small casters to facilitate moving it.

Richard L. Fisher, Milwaukee, Wis.

☛ Try a weak solution of household ammonia for cleaning crystal; rinse and dry.

Tongue-and-groove lumber is formed from ordinary stock by using the outside blades and chippers of your dado head to make the necessary cuts along the edges. As shown in the detail, a tongue can be cut on $\frac{3}{4}$ -in. lumber by using two pairs of $\frac{1}{8}$ -in. outside blades spaced $\frac{1}{4}$ in. apart, thus cutting $\frac{1}{4}$ -in. rabbets along both corners of the board simultaneously. To cut the groove, simply use one pair of $\frac{1}{8}$ -in. outside blades, locating the fence to run the kerf directly through the center of the work. Various thicknesses of stock can be cut similarly by employing single blades instead of pairs or inserting chippers between the pairs of blades. The tongue, of course, does not have to be in the proportion shown, but

Tongue-and-Groove Edges Cut in Lumber By Utilizing Dado Head on Circular Saw

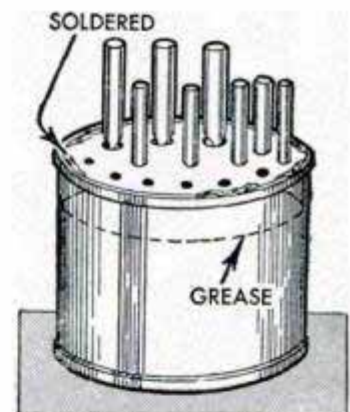


be careful to locate the fence so that the tongue and groove will be in exact alignment.—Dick Hutchinson, El Monte, Calif.

Bit Holder Filled With Grease Prelubricates and Affords Rust Protection

In basement shops that are excessively damp in summer, twist drills stored with their cutting edges embedded in grease are not only protected from rust but are also prelubricated for drilling metal. The holder illustrated is fitted with a sheet-metal top drilled for the various sizes of bits. In this way excess grease is wiped from the bits as they are removed from the holder. After the can is filled with grease, the sheet-metal disk, which has been drilled and marked to identify the bits, is simply soldered to the top edge of the can. A 1-lb.

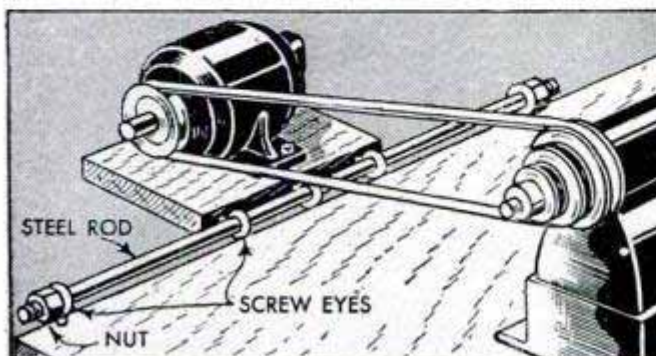
coffee can is particularly suitable for a bit holder, as the original top may be drilled and replaced on the can, eliminating the necessity of cutting and soldering a separate metal disk—F. E. Berndt, Denver, Colo.



Floating Mount for Small Motor Slides to New Location Along Bench Edge

By means of this sliding motor mount, one craftsman is able to use a single motor to drive several power tools. The mount is pivoted on a length of rod which runs along the rear edge of the workbench, and the weight of the motor keeps the belt taut. The

motor is shifted from tool to tool as needed simply by lifting the mounting block upward slightly, releasing the belt and sliding the block into the new position. The rod is threaded for a nut at both ends and supported by two screw eyes driven into the bench top as near to the edge as possible. Three screw eyes turned into the edge of the mounting block hinge the block to the rod. Determined by its length, the diameter of the rod should be large enough to keep it from sagging and the screw eyes should just fit over the rod in order to minimize vibration of the motor.



☞ To avoid finger smudges on lens filters, it is a good idea to wear lightweight cotton gloves when handling them.

Solving HOME

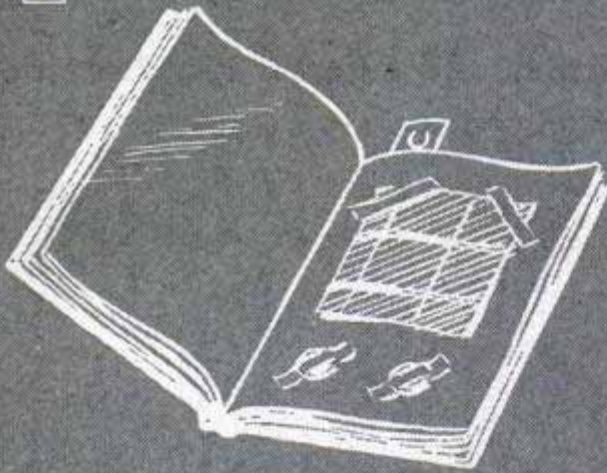
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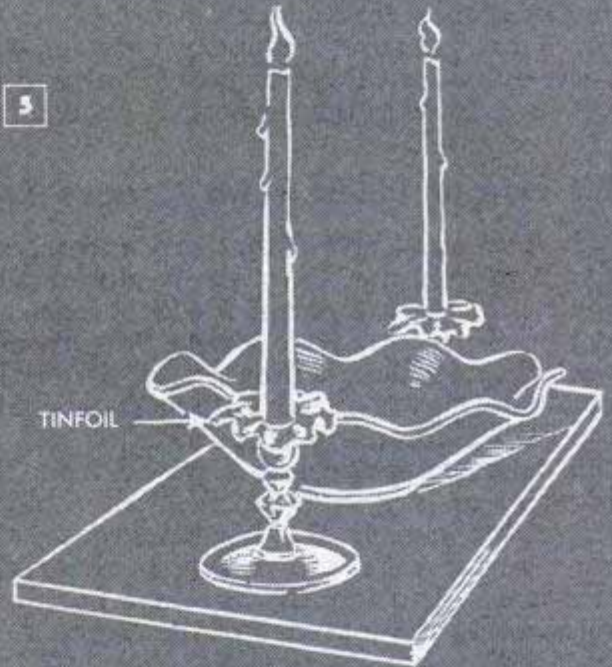
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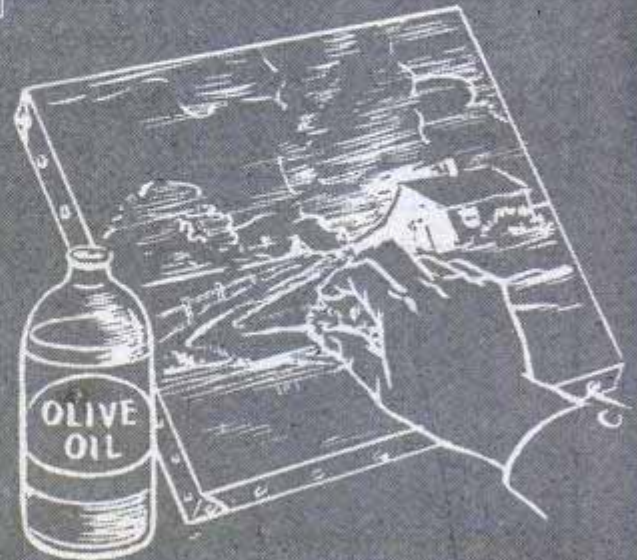
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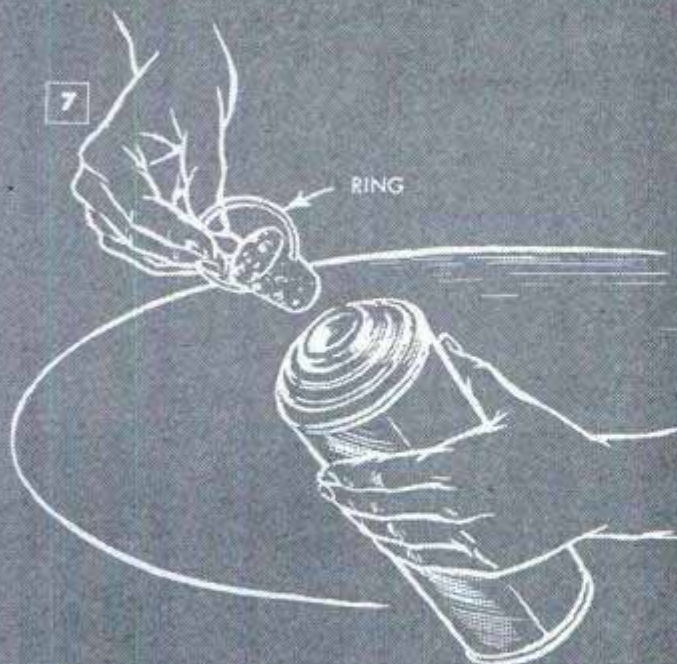


6



PROBLEMS

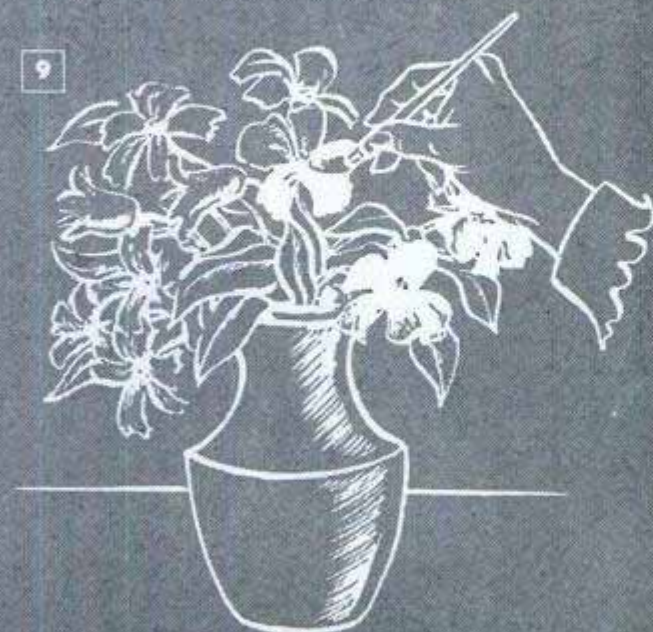
7



8



9



- 1 -

PRESSING CLOTH taped to a wire coat hanger remains evenly spread over the ironing board. This allows rearranging the cloth with your free hand without setting down the iron

- 2 -

HOMEMADE GARMENTS are patched and repaired quickly if an extra piece of material and a few matching buttons are taped in a special scrapbook as soon as the garment is completed

- 3 -

DARNING SOCKS will not strain your eyes if the sock is slipped over a lighted flashlight while mending. The light from inside the sock outlines the threads and work area

- 4 -

YOUR SOAP SUPPLY will last longer if the amount of chips or powder is measured out. To keep a measuring spoon handy, attach it to the top of the soap jar with a rubber band

- 5 -

TO KEEP CANDLEHOLDERS CLEAN and protect liners, place tinfoil or aluminum foil in the holders to catch the drippings. Neatly arranged, the foil adds a decorative touch

- 6 -

OIL PAINTINGS that begin to look dull can be given new life by rubbing lightly with cotton dipped in olive oil. First, wash the painting with a mild soap-and-water solution

- 7 -

REMOVING VACUUM-BOTTLE CORK is easy if a stainless-steel or aluminum ring is passed through a hole that is drilled in the cork. The threaded drinking cup should fit over the ring

- 8 -

FLOATING CANDLES that form novel centerpiece are made by pouring wax in a cupcake or gelatin mold and inserting a birthday-cake candle in the center of the soft wax

- 9 -

A CAMEL-HAIR BRUSH is just the thing for dusting artificial flowers and growing plants. Although the soft bristles whisk away the dust, they will not damage delicate blooms

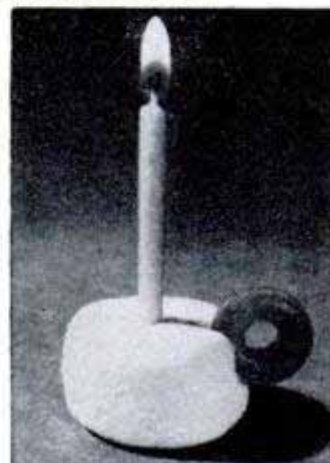
Drawing Board Is Easily Adjusted If Held by Storm-Sash Brackets



Adjustable storm-sash brackets used to support a portable drawing board allow the board to be moved quickly to almost any angle and held in place by tightening the nuts on the brackets. The latter are attached to the underside of the board near the edges and to each side of the supporting table. Fastening the brackets to cleats a little below the level of the table top permits the board to rest flat. The front edge of the board must be hinged to the front of the table.—Paul H. Will, Chicago.

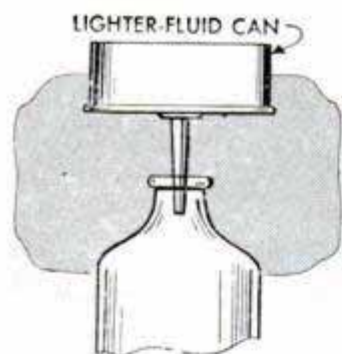
Marshmallow Candleholders

Tasty novelties for a children's party, these individual candleholders may be eaten by the young guests after the candles have been blown out and removed. To make the holders, press a piece of hard candy, such as a mint, or lozenge, into the edge of a marshmallow to form a handle. Then simply press the end of the candle into the center of the marshmallow.



Top Section of Lighter-Fluid Can Provides Small Funnel

Ideal for filling tiny oilcans and small-necked bottles, the top portion of an empty lighter-fluid can forms a funnel having a spout of extremely small diameter.



Use tin snips to cut around the sides of the can about 2 in. from the top, and cut off the tip of the spout to enlarge the opening for a faster flow of liquid.

Removing Muddy Taste From Fish Caught During Cold Weather

Fish caught in certain localities during the cold-weather months sometimes have an objectionable muddy flavor when cooked. To remove this taste, scale the fish as soon as it is caught, cleaning and scraping all clotted blood from along the backbone. Before frying the fish, soak it in salt water and a little vinegar for a few minutes. If the fish is scaled some time after being caught, scrub it with a fairly strong solution of baking soda after the scales have been removed and then soak it in salt-and-vinegar water before frying.

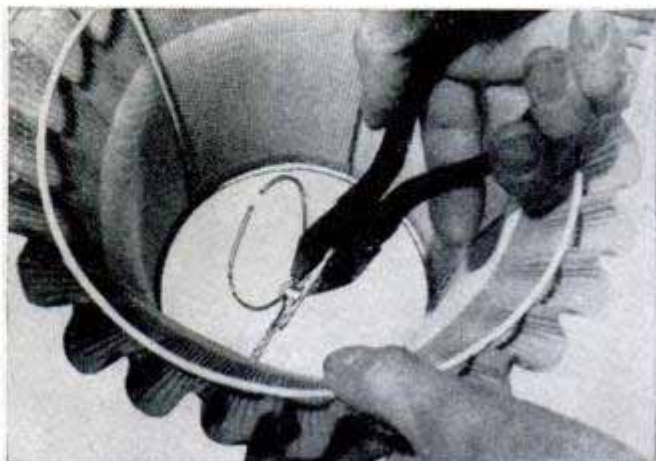
R. A. Jenkins, St. Louis, Mo.

☐ The inside of a metal salt-shaker cap will not corrode if it is coated with fingernail polish. When the polish is dry, the holes are opened with a needle.

Altered Lamp-Shade Clamps Fit Large Bulb

Homeowners frequently find that the wire rings of clamp-on lamp shades do not fit properly over large bulbs. This happens because the diameter of the rings does not increase and consequently they tend to slip off. This may be remedied, however, by cutting both the rings at their lowest point, forming a four-pronged wire claw which will hold firmly to any size lamp bulb used in the average home.

William Swallow, Brooklyn, N. Y.



TRAIL KNIVES

P.O. Box 452

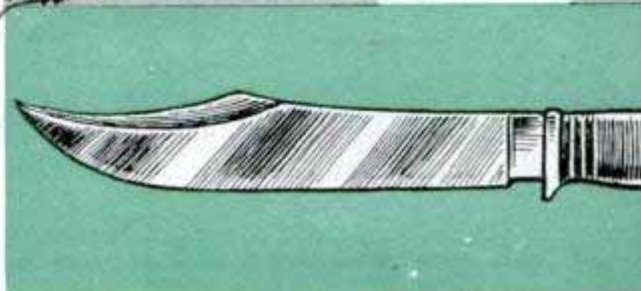
By Willis O. C. Ellis

Washington C. H., Ohio

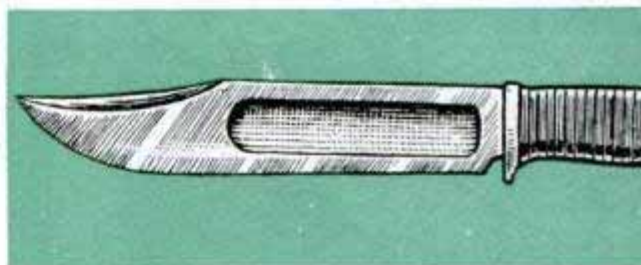
WHEN experienced woodsmen, surveyors and hunters take to the back country trails on foot, they go light, of necessity. Only the bare essentials are selected for the pack, but these always include a sheath knife or a trail knife and sometimes both. To hikers and hunters in wilderness country where there are no overnight accommodations, a dependable sheath knife is indispensable for building a shelter, skinning game, preparing food and cutting fuel for the campfire. Most old-time woodsmen thought of all one-piece knives as trail knives—that's what they usually called them—but later usage and new developments in design and type have tended to classify knives by such variable characteristics as blade length and thickness, over-all length, and so on. Now the sheath knife, or hunting knife as it is commonly called, is furnished in a variety of blade styles.

Of the four illustrated at the right, the top knife pictured can be classed as a trail knife as it has a long, heavy blade equally useful for slicing bacon or cutting a path through thick undergrowth on a forest trail. The blade is about 10 in. long, thick at the back and deeply beveled. With leather sheath the weight will average about 1 lb., which is a trifle heavy for comfortable packing in a belt sheath. Many experienced hunters and campers say such a knife is more suitable for specialized work and is not so well adapted to the all-around requirements of campers and hunters on the trail in open country. The long, heavy blade makes this knife better suited to swinging or slashing cuts and not so well balanced for palm use such as chipping or slicing. However, for the severe service for which it is designed this style of knife is the thing.

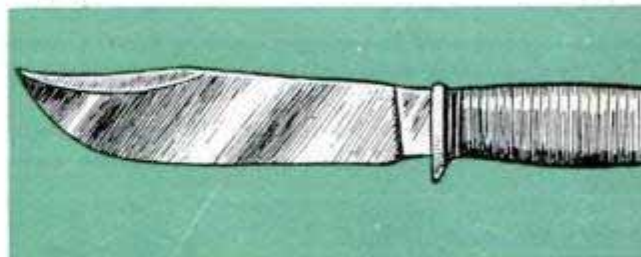
The best compromise between the heavy-bladed special-purpose knife and the true all-purpose knife is either of the two pictured second and third from the top. The upper one has a heavy, fluted blade somewhat shorter than the trail knife pictured at the top. Considering the weight of the blade, this model is comparatively well-balanced for both swinging and slicing cuts or chipping cuts. Many sportsmen prefer it for skinning large animals. The third knife shown at the right is very nearly the all-purpose type, although the blade is a little longer and heavier than many campers would pick for all-around service. On this one the sides of the blade are nearly



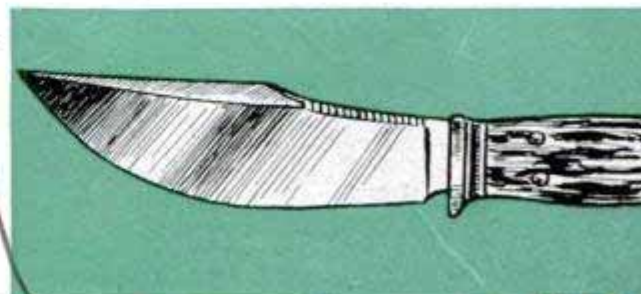
Classed as a trail knife, this one has a long, heavy blade suited to hard usage in camp and on the trail

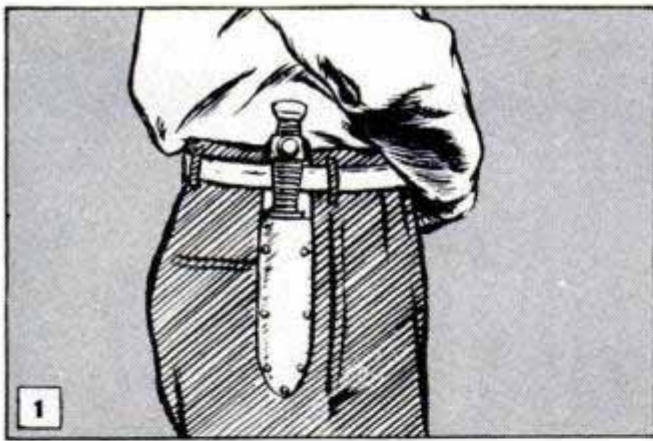


The blade of this knife is somewhat shorter and is deeply fluted. Edge has a shorter radius near point

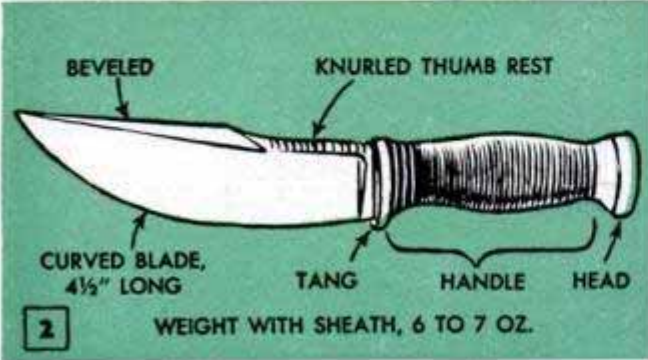


Above, short, wide blade is preferred by many hunters. Below, this knife is an ideal all-around choice





1 Experienced campers and hunters usually carry a sheath knife like this for comfort and maximum safety

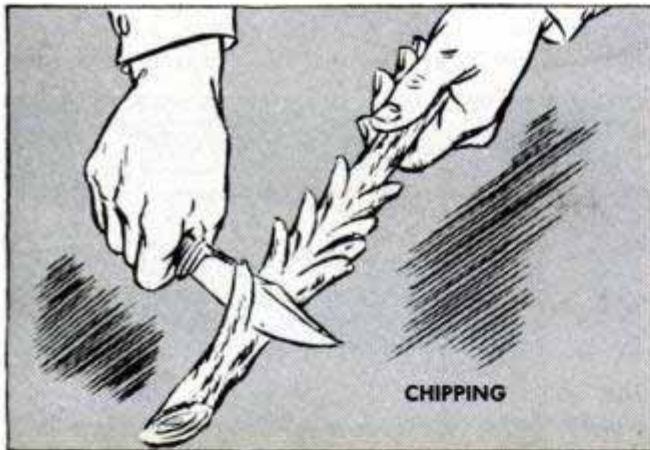


2 Points to look for in a good all-around hunting, or sheath, knife. Note blade knurl to provide thumb rest

straight from the edge to the back, making it especially suitable for slicing, skinning and chipping cuts.

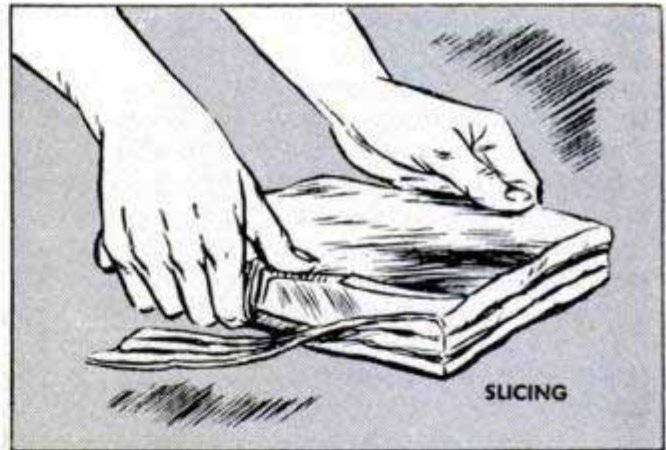
Nearly everyone experienced on the trail will agree that the knife pictured in Fig. 2, and the lower illustration on the preceding page, is the ideal all-purpose type. The blade is short, a little over handle length, wide through the center and has a long bevel. The back of the blade is knurled with a straight knurl to form a secure thumb rest. It generally is available with either a staghorn handle or leather handle. As a rule, the stag handle is preferred, probably because this type seems most appropriate on a hunting knife. So far as durability and a firm grip are concerned, there is little choice between staghorn and leather, except perhaps when the knife is used in the preparation of meats and other foods and must be frequently cleansed by a thorough washing in water. Leather handles do not withstand continued soaking as well as stag handles.

Woodsmen and hunters carry a hunting knife of average size in the position shown in Fig. 1. The belt can be run through the loop and over the flap of the sheath as shown, or the belt can pass under the flap and through the loop. This position of the



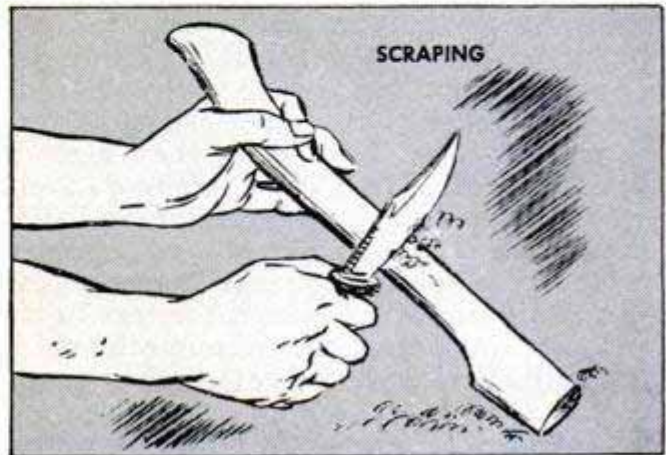
Here's a good way to prepare kindling for the campfire. Just make a series of chipping cuts on a stick

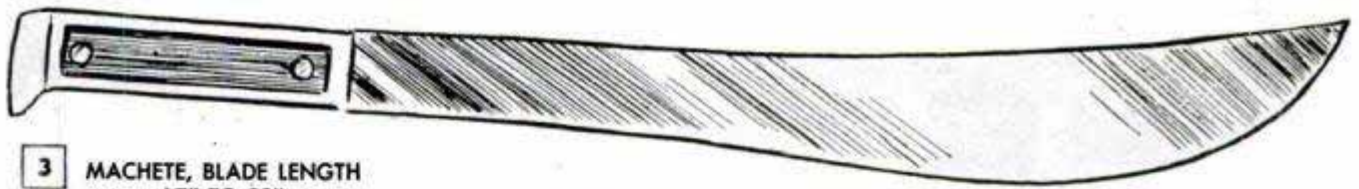
Your hunting knife can be used for chopping up twigs to make a good bed of live coals for roasting game



It takes a keen-edged knife to slice bacon to just the right thickness for frying over the open fire

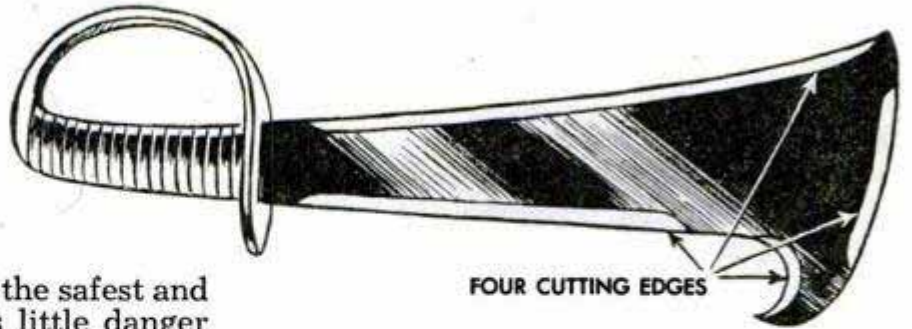
In camp you may need to smooth a damaged ax handle or do a similar job. Use sheath knife as a scraper





3 MACHETE, BLADE LENGTH
17" TO 22"
WEIGHT, 19 TO 25 OZ.

4 WOODSMAN'S COMBINATION
AX AND MACHETE. FUR-
NISHED WITH SHEATH.
WEIGHT, 1 3/4 TO 2 LBS.



FOUR CUTTING EDGES

knife is generally considered the safest and handiest. If you fall there is little danger of the knife causing injury and the sheath does not interfere with access to the side and back pockets. Of course, in some cases it may be more convenient to carry the knife sheath attached to the shoulder pack. In addition to the one-piece hunting knives, there are several combination pocket-knives of the folding type which are well suited to the use of campers and hunters. Some of these combine blades and other useful tools, such as a can opener, lifter for bottle caps, corkscrew and leather punch. Others have a single self-opening blade of the hunting pattern. Usually the blade is opened by pressing a button or slide on the handle and it locks securely in both the open and closed positions. These knives are preferred by some outdoorsmen because of the convenience in carrying. However, knives of the pocket type are suitable only for light service.

For clearing a camp site, cutting a path through jungle, blazing trees for lumbering and for chopping fuel for the campfire, outdoorsmen often carry a machete, Fig. 3. The long, heavy blade is especially suited to slashing and chopping cuts. Many sportsmen and explorers prefer the machete to a light ax as it has a somewhat wider application in camp and on the trail and is relatively easier to carry. Another tool which combines the uses of the camp ax, bush hook and machete is shown in Fig. 4, and three applications of this special trail knife are pictured at the right. For working in thick undergrowth where there's little room to swing the knife effectively, the sharp cutting edges across the end of the blade and also in the hook can be used as in the upper and lower views at the right. For straight or slashing cuts on twigs or small saplings or in cutting campfire fuel, the long cutting edge is used as in the center view. This combination unit is furnished with a heavy sheath to protect the cutting edges. The average weight of 2 lbs. is a little heavy for the pack, but many experienced trail men sacrifice other less useful items in favor of the heavy knife.



This heavy trail knife has a cutting edge across end of blade, which is useful where space is restricted



Two other uses for the combination trail knife. For slashing cuts use long edge as shown above. Below, for clearing trail in heavy undergrowth use the hook

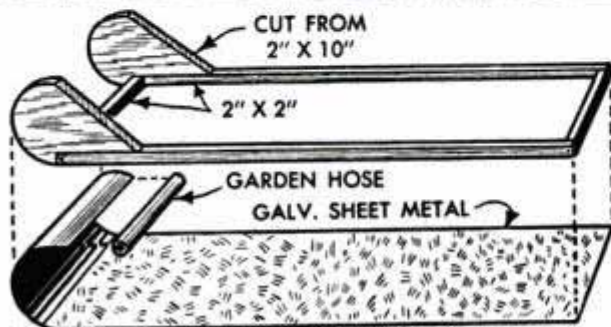


HOW TO TIE A

By Bruce Grant

An interesting project for the beginner in leatherwork is the tying of a Gaucho knot, for not only is it easy to weave, but the finished knot can be used as a neckerchief slide. The series of drawings on the opposite page shows step by step how the weaving is done around a piece of $\frac{3}{4}$ -in. dowel which is squared at the top and numbered on the four faces. A sleeve of cardboard or leather, over which the lacing is woven, provides a liner for the finished knot. The sleeve is formed by wrapping the leather or cardboard around the dowel and cementing the abutting edges with quick-drying cement.

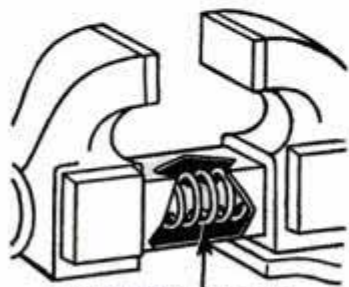
Start with a length of $\frac{1}{8}$ -in. lacing about 32 in. long and wrap it twice around the sleeve according to step A. The end of the lacing marked X indicates the standing part, the other end being the working end. Step B shows how the two turns thus far in place should look on the back side of the dowel and how a third strand brought around to the back lies across the first two. Weaving actually is begun in step C. Pass the lace under the standing strand X and then over two strands. This same step is repeated on the back side of the dowel as shown in step D. An awl will be found helpful in working an opening under the strands. Keeping the numbered faces of the dowel in the relative positions shown, bring the lace around to the front again and pass it under two and over two strands as in step E. Again, this step is repeated at the back side of the dowel, step F. In step G, the sequence changes, in that you pass the lace over one and under two and over two, then repeat the step on the back, over one, under two and over two, so that the weaving looks like that shown in step H. Coming around to the front again, pass the lacing over two, under two and over two, step I, and then continue around to the back, again lacing over two, under two and over two, step J. Note that at this point you have six strands. In step K, the lace is brought around to the front, passing it under one, over two, under two and over two. The same procedure is repeated in step L. Now, as in step M, pass the lace under two, over two and under two at the front, continuing around to the back. Step N brings you back to the starting point and shows where the working end of the lace is passed up alongside the standing part to complete the knot. A dab of quick-setting cement will hold the loose ends of the lacing secure.



Simple Toboggan for Children Has Sheet-Metal Bottom

Winter will be a pleasure for your children if they have some means of enjoying it, such as this simply constructed toboggan. To make it requires little skill and few materials. The frame is constructed of 2 x 2-in. stock and may be built to any dimensions, this one being 24 in. wide and 6 ft. long. The curved pieces for the front are cut from 2 x 10-in. pine and fitted to the frame as shown. A piece of sheet metal, 24 in. wide and the length of the frame plus the curve of the front end of the toboggan, is attached to the frame with small nails. Finally, a section of garden hose which is split the entire length is placed over the sharp edge of the curved metal front to prevent possible injury.

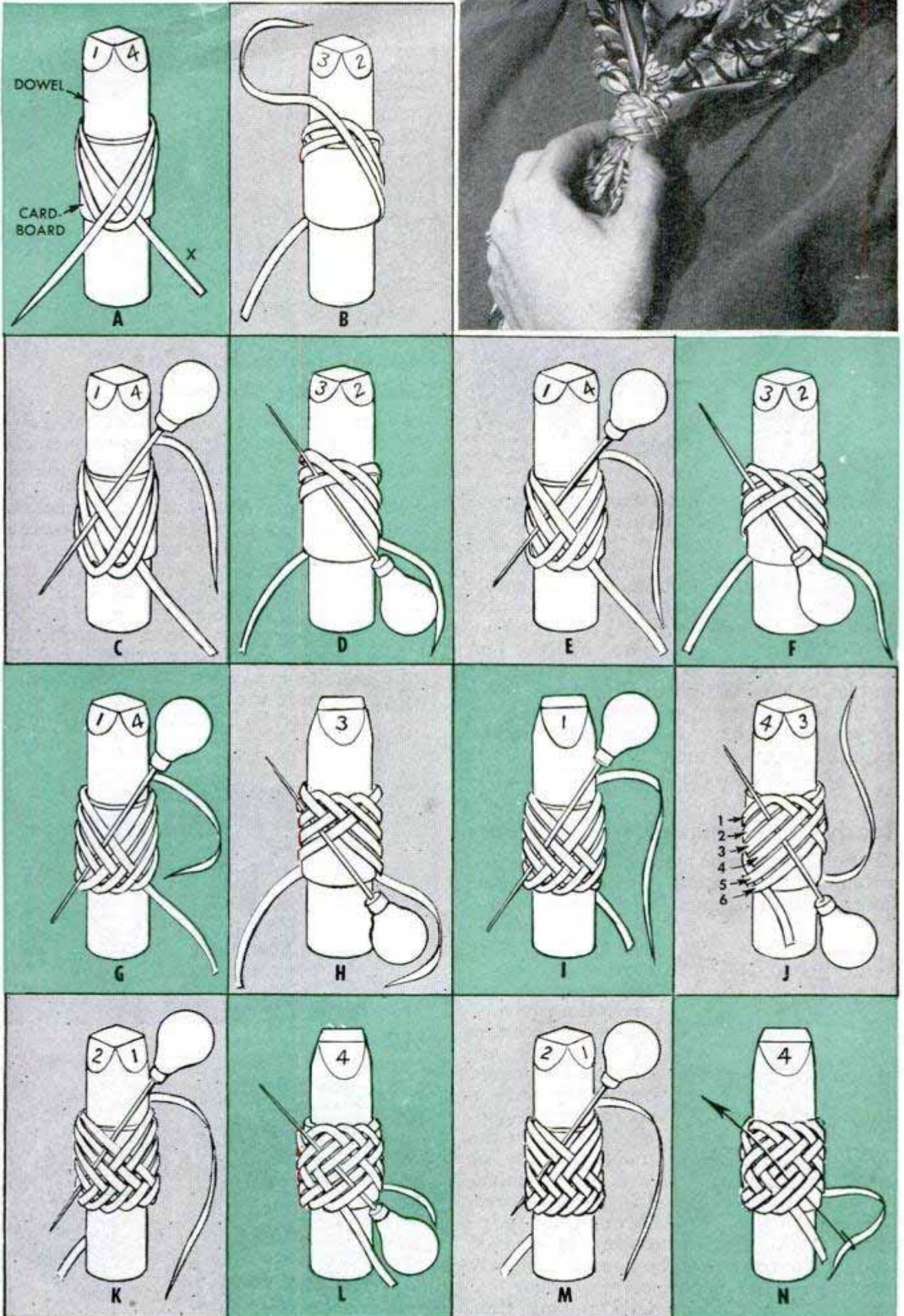
Compression Spring on Vise Screw Provides Positive Action



To obtain positive action when turning the handle of a bench vise, use a compression spring to take up the lag in the jaws. Just remove the traveling jaw and shaft from the vise, slip the spring over the screw and then reassemble the vise.

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

GAUCHO KNOT



Butter Churn From Washer



Here is a way of converting your washer into a butter churn in just a few minutes. Cut a triangular hole in the center of a sheet of plywood so that it fits tightly over the agitator of the machine. Then assemble four separate compartments on the plywood base, making them $2\frac{1}{2} \times 3\frac{7}{8} \times 7$ in. to hold quart-size fruit jars. Fill the jars half full of cream to allow for expansion and fasten the lids tightly. Churn the cream by laying the jars in the compartments, as shown, and turning on the washer for the required length of time.

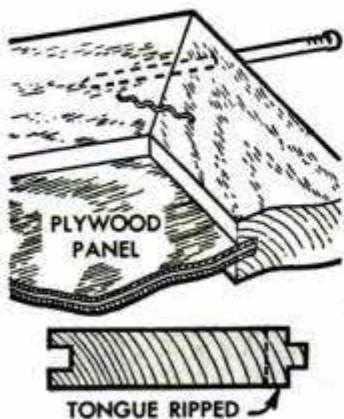
Elton L. Nash, Maple City, Mich.

Ready-Cut Framing for Panel Doors

Panel doors can be made quickly with just a handsaw by using tongue-and-groove flooring for the frame. The tongue is ripped or planed from the stock and the grooved edge is left intact to receive the plywood panel. The corners of the frame are mitered and joined securely with a corrugated fastener driven into the inside surface as well as a finishing nail driven through the edge

of the stock. The corners of the grooved edge of the frame can be rounded slightly to improve the appearance of the door.

C. Tate, Ottawa, Ont., Can.



Jar Covers Provide Small V-Pulleys

If small V-pulleys are needed for a model or toy they can be improvised from the covers of paint cans or jelly jars. To make the pulleys, simply place two covers of the same size back to back and sweat-solder them together. By using jar covers of different sizes, the diameters of the pulleys can be varied to attain desired speeds.

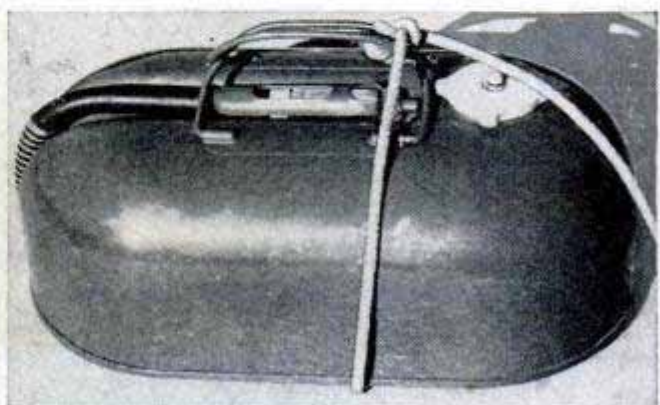
Louis Hochman, Sherman Oaks, Calif.

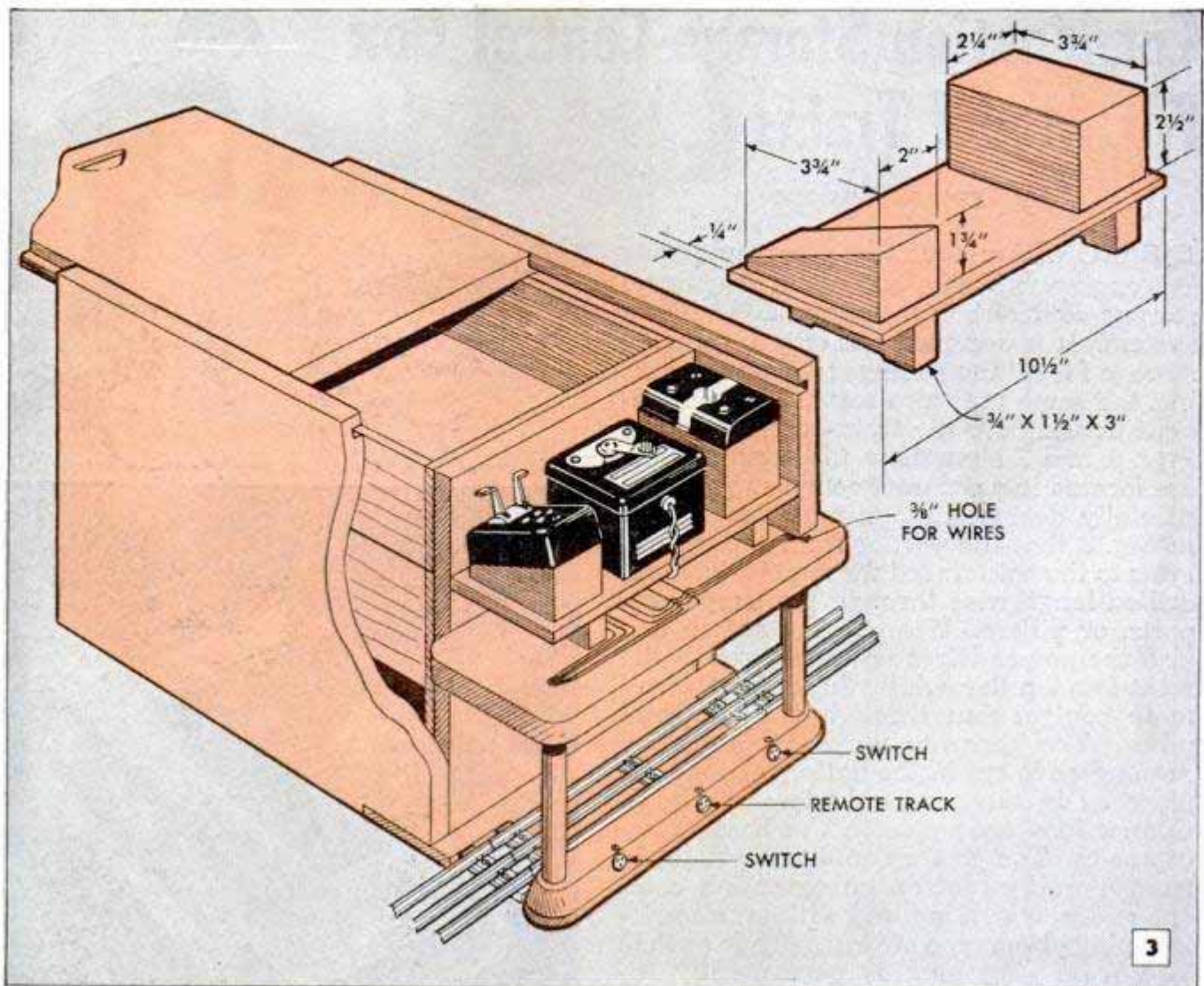


Partially Empty Fuel Can Serves as Sea Anchor

A partially empty 5-gal. fuel can provides an emergency sea anchor for small power boats. Solder a heavy galvanized wire over the bail as in the upper photo to prevent it from pulling out of the bracket. Then, if the motor quits in a storm, the half-filled container is secured to the bow line and tossed overboard to keep the boat headed into the waves. Be sure that openings are tightly closed to prevent the can from filling with water. For runabouts and rowboats, 2-gal. cans will work well if the handles are crossed and the rope is tied as shown in the lower photo.

Clinton R. Hull, Costa Mesa, Calif.





shut off at the control box. The cord from the male plug to the transformer is laid in a groove cut in the end of the box. It then passes through a hole drilled in the end of the box at the top of the groove and into the control compartment where it is connected to the transformer.

The storage box is made from $\frac{3}{4}$ -in. stock, the lower compartment being partitioned as in Fig. 2. In addition, there are two trays, each 3 in. deep. One is partitioned as in Fig. 1; the other is open for the storage of track sections. Both the main storage compartment and the control compartment are fitted with separate sliding

lids, or covers, having the edges rabbeted to form tongues which slide in grooves cut on the inside face of the box sidepieces. The track board, Figs. 2 and 3, is cut from $\frac{1}{4}$ -in. plywood and one section of track is permanently attached to it. The power wires leading to the track are laid in small grooves cut in the bottom of the track board. The ends of the wires are brought up through holes and soldered to the track terminals. The box is carefully sanded and the exterior finished in gray or orange enamel and trimmed in blue. The interior, including the trays, is finished in flat green of a light shade.

Decorated Potato-Chip Cans Form Novel Wastebaskets



Putting empty potato-chip cans to good use is accomplished by one homemaker who decorates the cans with old greeting cards to form attractive wastebaskets. The illustrated portion is cut from each card

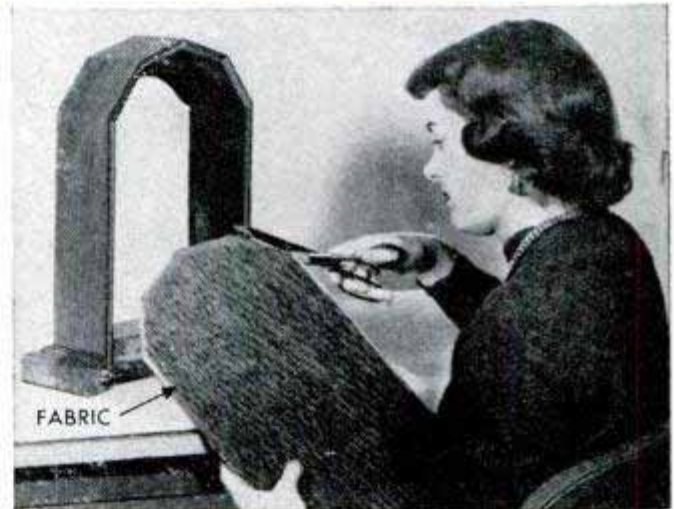
and glued to the side of the can. Then a coating of thin shellac or plastic spray is applied over the cards to protect them. The wastebaskets can be decorated in a hobby theme by using empty seed packages, sheet music or appropriate magazine covers.—Jeanne Stasack, Chicago.

ⓘ When the wooden parts of children's construction toys become loose, swell the parts that fit in the holes by soaking them in lukewarm water for a minute or two.

OLD CLOCKCASES MAKE ATTRACTIVE SHADOW BOXES

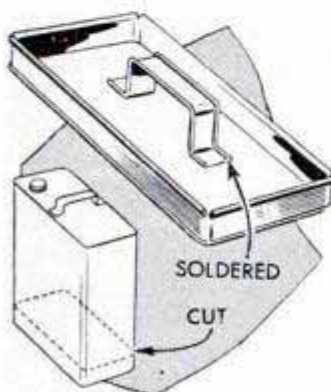


Although the works may be damaged or worn beyond practical repair, most old clocks have cases made from fine cabinet woods and many of the cases, especially those of the mantel type, are just the right size for a shadow box. In converting the case to this new use, the first thing to do is to remove the face and works. In very old clocks, these parts often are attached to a wooden mounting board with screws and also with small metal brackets. In some old cases, it will be found that the mounting board is glued into a groove cut in the sides and across the top, or hood, of the case. If the board is glued in place, use care in removing it as otherwise you may damage the case itself. Remove the old finish with a varnish remover and refinish in the natural color of the wood with filler, sealer and varnish. Glue a suitable fabric or paper covering to the inside face of the back panel and trim the edges flush as shown in the photo at the right. Paint the interior of the case



with a dark-colored flat paint and fit two glass shelves equally spaced as in the upper right-hand view. In some old cases, it will be necessary to fit a wooden block, or false shelf, in the bottom of the case to bring the shelf surface flush with the bottom of the door.—Otto Merker, Chicago.

Bottom Cut From Motor-Oil Can Provides Small-Parts Tray



Just the thing for carrying a small assortment of screws and nails when making repairs around the house, this small-parts tray is simply the bottom portion of a motor-oil or syrup can. After the bottom is

cut from the can as shown by the dotted line, the edges are hammered over, and the handle, which has been removed from the top of the can, is soldered to the center of the tray.—William B. Egan, Louisville, Ky.

Hairpin Controls Trailing Vine

If you wish a vine to trail over the edge of a flowerpot at a particular point, press a hairpin over the stem and into the soil to keep the vine from shifting.



PICKABACK BILLIARD TABLE

By John C. Wilson

A PARTMENT dwellers and small-home owners whose recreation-room facilities are limited to the kitchen or dining room now can enjoy a game of billiards with this new portable table top. It rests on an extension-type kitchen or dinette table, providing a standard home-size playing surface that is lightweight and easily stored in a closet. The cushion rubber and felt can be purchased from any billiard-supply or sporting-goods store. Use $1\frac{7}{8}$ -in.-dia. balls and 52-in. cues.

By extending the table, a clear space is provided for the side pockets, Fig. 3, and leveling the playing surface is accomplished by a "jack" fitted to one of the table legs as in Fig. 6.

The billiard top is built around a 3 x 6-ft. panel of $\frac{1}{2}$ -in. plywood which is available at some lumberyards. However, you may find it necessary to cut a 12-in. strip from one side of a standard 4-ft. sheet. The first step is to lay out the holes for the pockets, Fig. 2. Each corner of the panel is cut off at

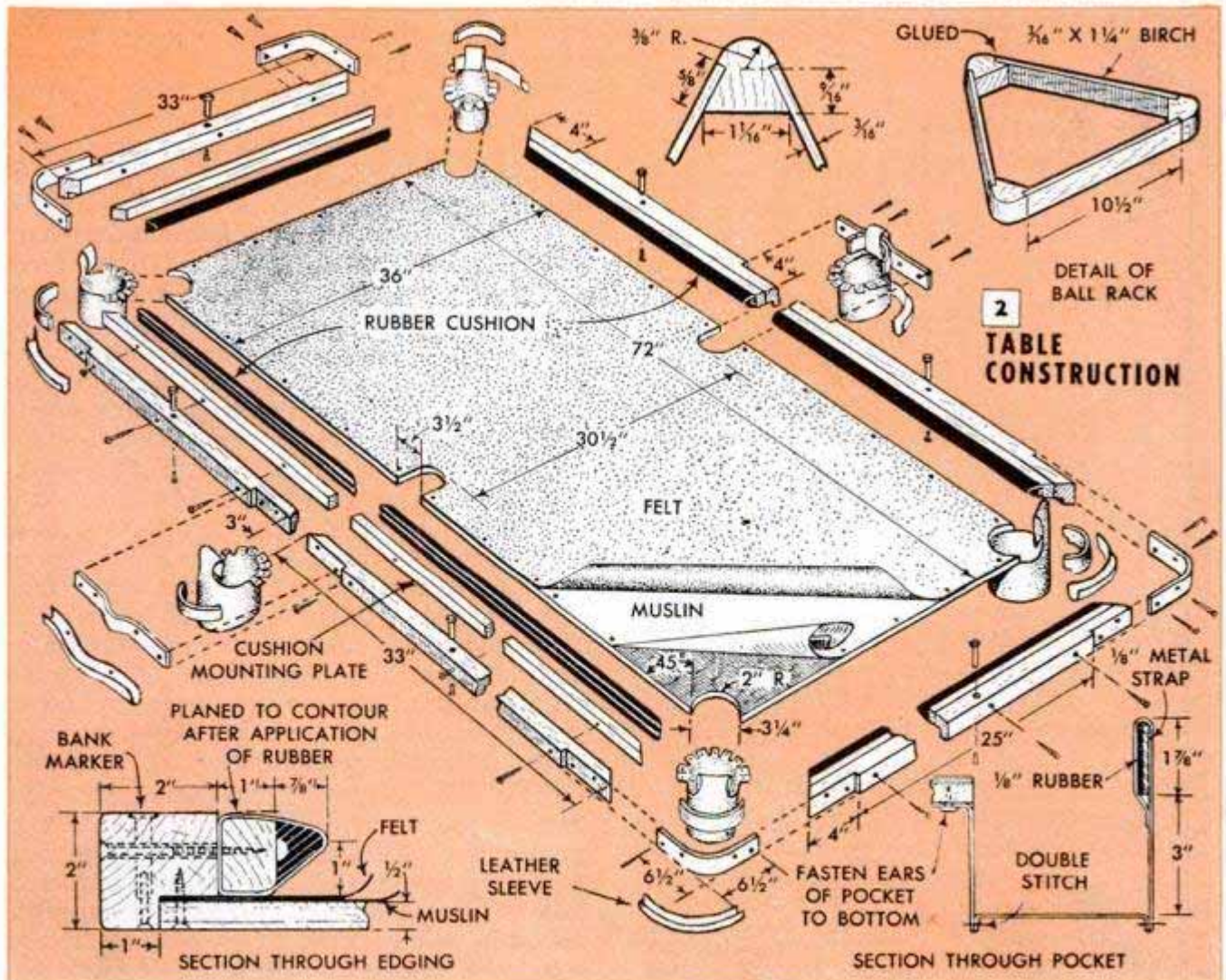
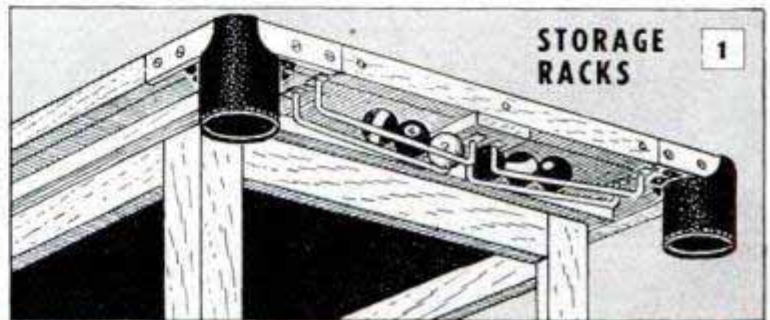
a 45-deg. angle to form a flat $3\frac{1}{4}$ in. long. The axis point for the 2-in. radius is located on a center line 1 in. in from the edge. The center of the side pockets is located $\frac{3}{4}$ in. in from the edge. The holes are cut best with a coping saw and then smoothed up with a wood rasp. The sectional detail through the edge of the table top shows how 2 x 2-in. hardwood rails are rabbeted to receive the plywood panel. Note that the depth of the rabbet brings the panel flush when it is covered with muslin and felt. The rails are joined at the corners and side pockets with $\frac{1}{8}$ x $1\frac{7}{8}$ -in. metal straps. These are fitted flush with the outer faces of the rails. Before fitting them to the rails, the straps are drilled and countersunk for oval-headed screws and then covered with sleeves of leather glued to the metal. The oval-headed screws make a neat job and prevent snagged clothing. Holes for bank markers are drilled at this time, the markers being flat-headed sleeve bolts located halfway between pockets. Measure from the center of one pocket to the center of the next one. Regular screw posts of the type

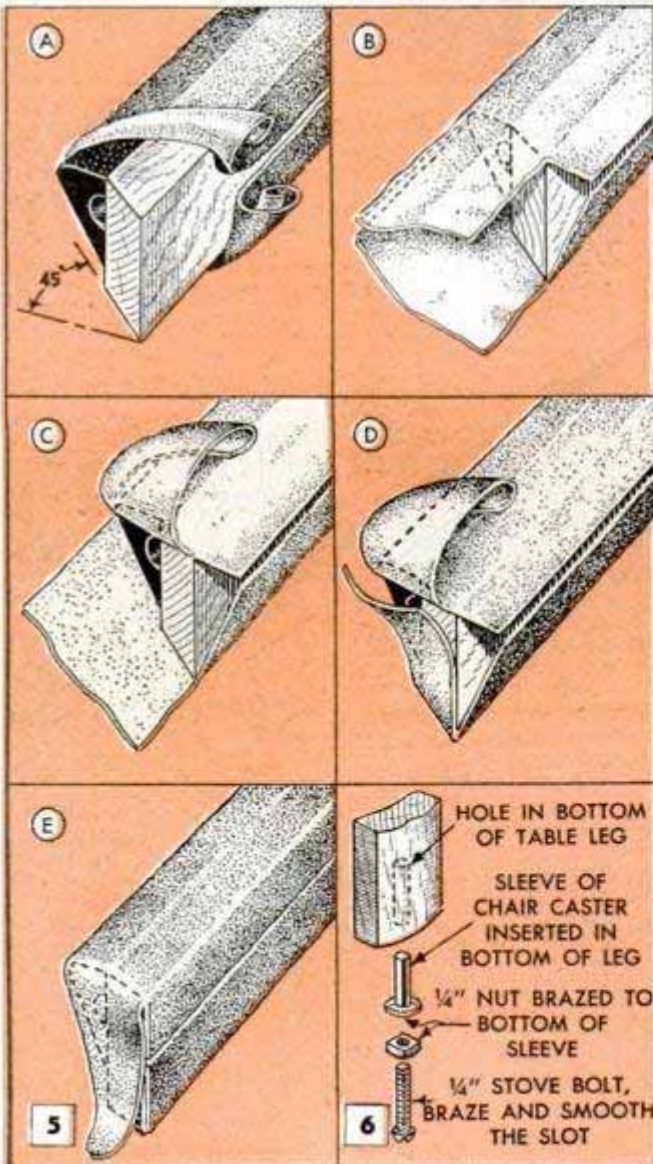
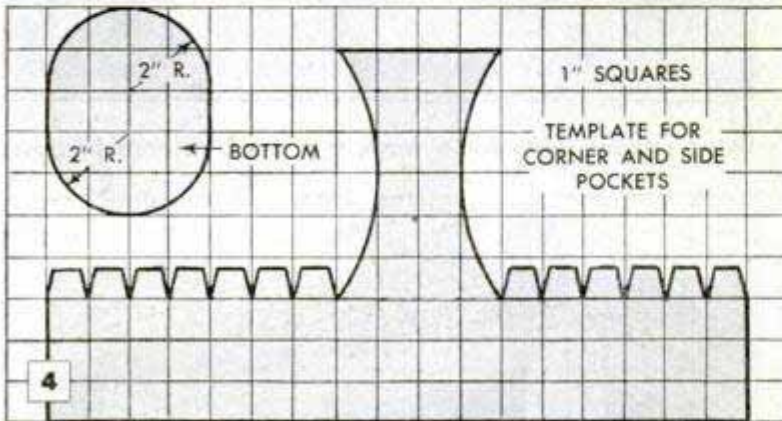
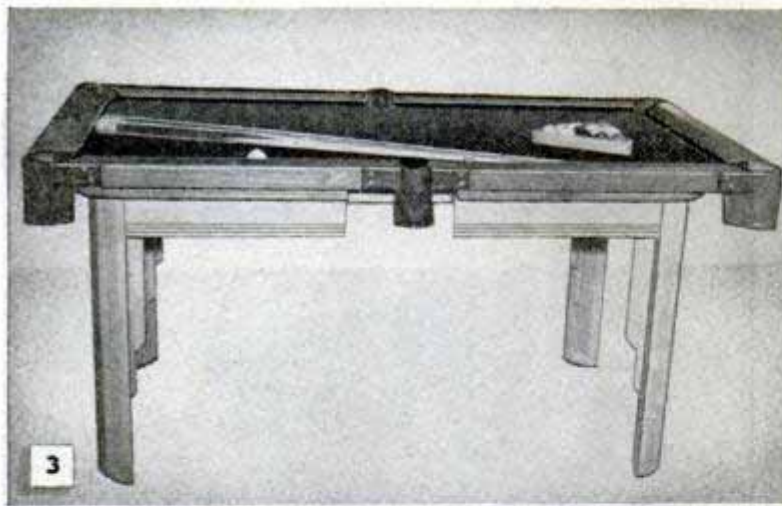
used for a memo pad make excellent markers and can be purchased in any stationery store.

At this point the side and end rails can be temporarily fastened to the plywood panel. The cushion mounting plates are ripped to size from 1-in. stock. With the ends mitered to suit the corner pockets, the plates are clamped in position on the rails and three holes are drilled through each rail and countersunk on the face to take long oval-headed screws which hold the plates. To determine the height of the cushion rubber above the playing surface, two pieces of felt are placed on the plywood, one representing the felt covering the top and the other the felt covering the cushion. The center of the ball should come about $\frac{1}{16}$ in. below the edge of the cushion. Now, hold the cushion rubber temporarily on the mounting plate, measure 1 in. up from the felt to the rounded edge of the rubber and mark along the lower edge of the rubber. Run this mark along the full length of each plate. This serves as a guide in gluing the rubber in position. Any good linoleum or tile cement can be



Using regular table for a base, top can be stored in closet





used and, after it dries, the inside edges of the plates are shaped to conform to the contour of the rubber strips. With the ends of the rubber cushions mitered to match the ends of the plates at the pockets, the cushions are covered with felt. In cutting the strips, allow enough felt to extend to the back side of the mounting plate, as in Fig. 5. The successive steps show the sequence in covering the rubber. Glue is applied to the wood surfaces only and the felt is pulled firmly from the top toward the bottom. The felt at the mitered ends of the cushions is double lapped and the end tucked under as in step E.

When all the cushion members are covered, felt is applied to the playing surface. First remove the rails which were temporarily fitted and apply two coats of shellac to the plywood, sanding each when dry. Next, stretch muslin over the plywood and tack it along the outer edges, letting the muslin cover the holes for the pockets. The felt is glued to the muslin and it is best

to work a small area at a time to prevent the glue from drying before the felt can be rolled out smoothly. The felt should be large enough to overhang the top all around so that it can be pulled and stretched tautly should any wrinkles remain after gluing. In the final stretching, the felt is tacked to the plywood all around the edges. The felt, which now covers the openings for the pockets, is cut into $\frac{1}{2}$ -in. strips. These are tapered slightly to form gussets so that, in bringing them down around the edge of the hole, adjacent edges of the strips will butt together. Drive tacks through the felt tabs and into the edges of the plywood and then tack the ends to the underside.

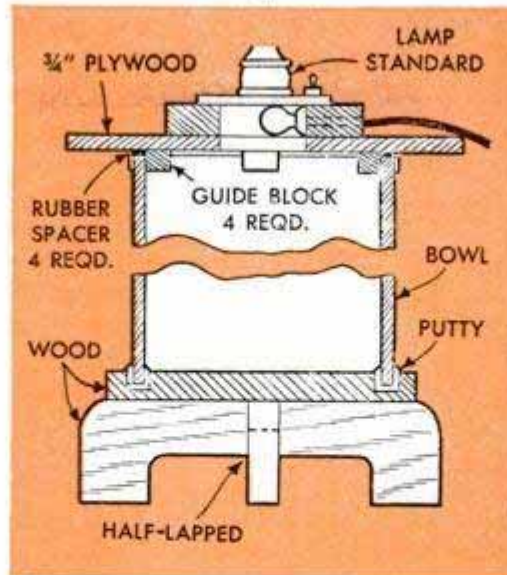
Fig. 4 gives a pattern for the leather pockets. The detail in Fig. 2, showing a sectional view through the pocket, indicates how each pocket is hung from the metal strap joining the rails. Note that the inner face of the metal is lined with a strip of $\frac{1}{8}$ -in. rubber glued in place to cushion the balls. After the pockets are stitched and slipped over the metal straps, they are tacked to the underside of the plywood, nailing through the tabs provided.

Finish the rails with two coats of shellac, sanding each one lightly, and then apply paste wax. The underside of the plywood should be covered with felt to prevent marring the finish of the table. Fig. 1 suggests a simple ball rack that can be installed at one end of the table, using towel bars.

Featuring an illuminated tropical aquarium, this unusual floor lamp combines beauty with utility. The lamp is relatively easy to build, the one pictured being made entirely with hand tools. An old floor lamp cut to the desired length provided the standard and lighting fixture for the aquarium lamp. However, if you have a wood lathe, the lamp standard can be a split turning which is first grooved for the wiring and then glued back together. Note that the 15-watt aquarium bulb is controlled by a small push-button switch making it independent of the floor lamp.

On the original lamp, the aquarium was fashioned from the glass bowl of a discarded gasoline pump. As one end of the bowl was broken upon removal from the pump, the irregular edge was cut off by clamping a 2-in. rubber belt around the bowl, marking the glass with a glass cutter and then tapping lightly on the inside. If this type of bowl cannot be found, a 5-gal. water bottle with the top cut off will serve the purpose. The aquarium rests on a wooden base consisting of a disk screwed to half-lapped legs. The bowl is set in a circular groove cut in the top surface of the disk. After the base has been stained and given three coats of marine-grade spar varnish, a strip of putty is placed in the bottom of the groove. Then the bowl is pressed into the putty and the joint is made watertight by tamping putty into the groove on both sides of the glass. As the pump-bowl glass was $\frac{1}{4}$ in. thick, a $\frac{1}{2} \times \frac{1}{2}$ -in. groove was cut in the base, thus allowing room for the putty seal. A disk of $\frac{3}{4}$ -in. plywood forms

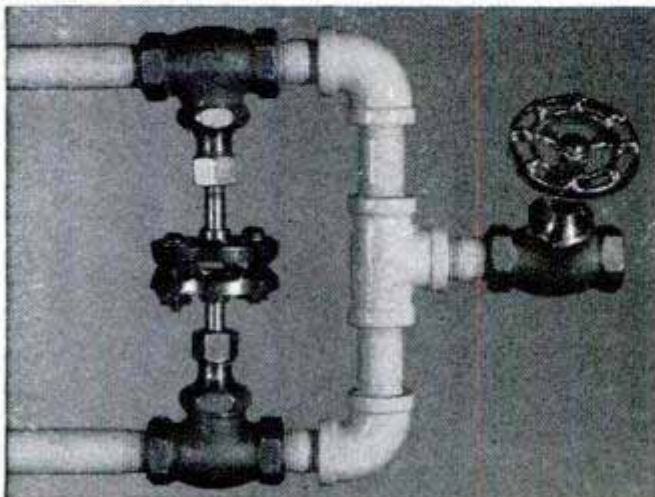
Unique Floor Lamp Has Aquarium Base Improved From Gasoline-Pump Bowl



the aquarium top, and this is centered on the bowl by means of four guide blocks which fit against the inner surface of the glass. One-inch-square rubber spacers are glued to the plywood top at the outer edge of each guide block. These provide a bearing surface for the top of the bowl and also elevate the plywood disk to permit ventilation. If desired, the metal rim usually found around one end of the pump bowl can be left in place so that the plywood top will rest on the metal instead of the glass. The wooden lamp base, which houses the aquarium light, is attached to the plywood top by means of two dowel pins which fit in holes drilled in the plywood. The dowels align the lamp housing with a hole cut through the center of the aquarium top, and allow the entire lamp to be lifted from the aquarium when it is necessary to feed the fish. Small vent holes are drilled through the top of the aquarium-lamp housing and around the standard to keep the bulb from overheating.

R. E. McCrary, Brownwood, Tex.

Mixing Faucet of Pipe Fittings Controls Water Temperature



Utilizing either globe or gate-type valves, a convenient semiautomatic mixing faucet is quickly assembled for use in the laundry room or shop. As shown in the photo, supply valves are inserted in the hot and cold water lines directly opposite each other and their handwheels are bolted together. When assembling the valves, one should be completely open while the other is fully closed. In this way, turning the handwheels closes one valve and opens the other simultaneously. The two pipes are brought to a single outlet where the flow of water is controlled by a third valve.

Ned S. Goss, Wilmington, Ohio.

Home Repairs

HIDEAWAY



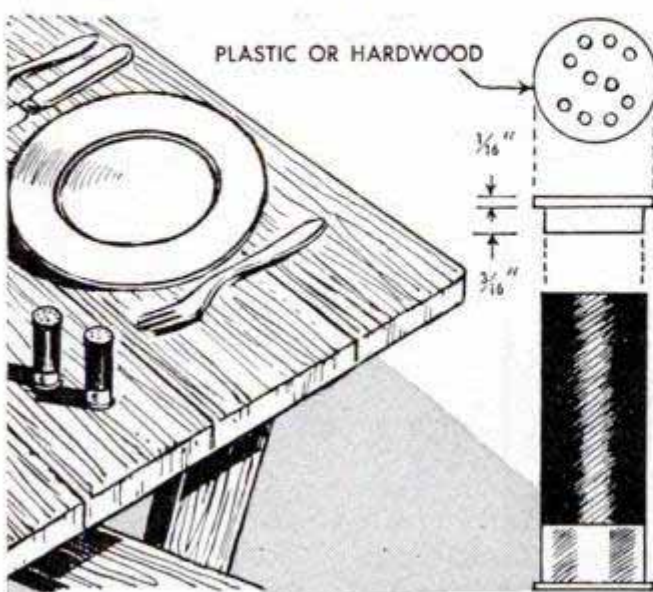
stand is made with glue and flat-headed screws, as all joints are invisible when the cover is in place. Exposed joints of the cover can be glued and bradded, or fastened with screws turned into countersunk holes which are then filled with hardwood screw-hole buttons. Note that the ends of the stationery compartment, Fig. 2, are grooved, or slotted, for plywood dividers. The door swings on special offset hinges made by bending ordinary strap, or gate, hinges to an S-shape and mortising the door so that the hinge joints fit flush. The drawer and door handles are handmade.



Salt and Pepper Shakers Fashioned From Shotgun Shells

A pair of decorative and practical salt and pepper shakers are made quickly from two empty shotgun shells. As a means of distinguishing between the shakers, use a

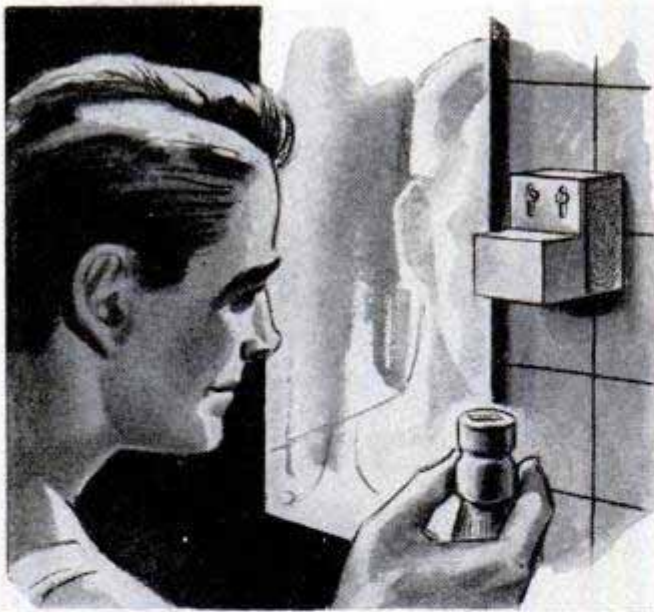
green 12-ga. shell for the salt and a red 16-ga. shell for the pepper. Remove powder residue from each shell with scalding water before using it. Then trim the blown-out ends of the shell by cutting them off straight. For the shaker caps, use plastic or bits of hardwood, turned as shown in the drawing, and drill them with a small bit. —Robert Hertzberg, Jackson Heights, N.Y.



Nylon Fishline Dyed With Tea

Feeling that my white nylon fishline would bring better results if it were dyed a dark color, I was faced with the problem of dyeing it without using boiling water. I dyed the line an amber color, that is practically invisible in water, by soaking it for two hours in a cool solution of tea. I boiled 2 oz. of orange-peko tea in 1 qt. of water and then allowed it to cool to room temperature before immersing the line.

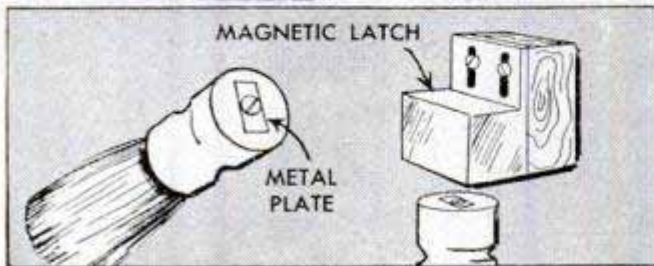
Karl N. Greife, Pittsfield, Ill.



Shaving Brush Stored Conveniently By Magnetic Wall Fixture

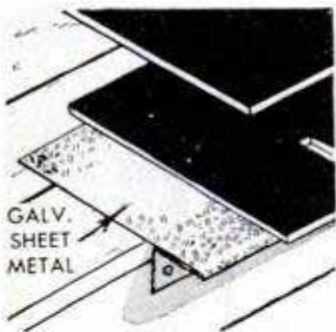
Mounting a magnetic door latch on a bathroom wall provides a handy shaving-brush holder from which the brush is hung in a bristles-down position, thus prolonging its life. A wooden block serves as a spacer to hold the magnet slightly away from the wall. The block is fastened to the wall within easy reach of the lavatory and the magnet is screwed to the block so the bottom edges of both parts are flush. The metal plate which is included with the latch, or a thin strip of sheet iron, is set flush in the end of the shaving-brush handle and fastened with a flat-headed screw. To store the brush, simply touch the handle to the bottom of the magnet.

Murray E. Anderson, Fort Valley, Ga.



Edge of Shingled Roof Reinforced With Galvanized-Metal Strip

Old-fashioned methods of reinforcing the edges of a shingled roof are "out" so far as one contractor is concerned. He found an easier and better way of doing the job by placing a sheet of galvanized metal under the first row of shingles. The sheet



metal is crimped to overhang the roof about 2½ in. and also to form a flange for nailing to the cornice, giving the shingle overhang strong, durable support.—Grover Brinkman, Okawville, Ill.

Strainer Holds Damp Washcloth For Carrying in Suitcase

One of the perplexing problems of traveling is what to do with a wet washcloth while living out of a suitcase. The solution is to rinse and wring out the cloth thoroughly and then place it in a screw-top metal strainer. The latter will keep the cloth from coming in contact with other items in the suitcase while still permitting necessary ventilation.

Wade Porter, Jr., Edgewater, Colo.

☐ A small magnet will hold steel pins and needles and pick them up from the floor.

Paper Clip Aligns Rubber Stamp

When a rubber stamp is used to print a return address on post cards and envelopes, the impressions on all the mail will be uniformly neat if a paper clip is used to aid in aligning the stamp.

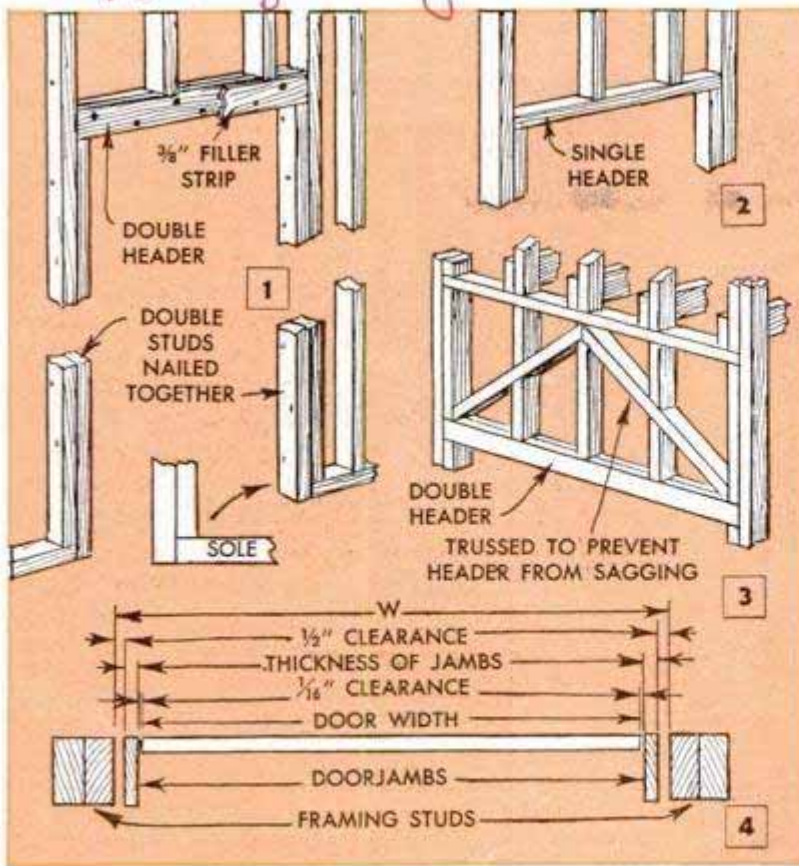


Pin the clip to one side of the stamp with a thumbtack, allowing it to project the desired distance. Then sight from above to bring the end of the clip directly over the top of the paper and keep the length of the clip parallel with the edge of the paper.

Resting Artists' Brush on Washer Raises Bristles Off Table

While using artists' brushes with different colors, slip a serrated washer over the handle and just behind the ferrule of each brush. This allows you to lay the brush down wet without danger of smearing the table top.—John J. Rea, Urbana, Ill.





DOORWAYS— *Make Your Own*

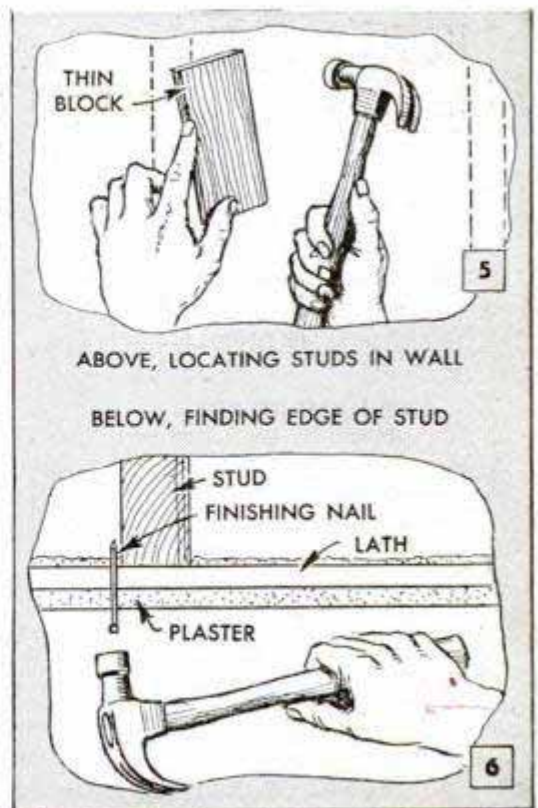
How to frame and hang interior doors properly in new or old walls

By E. R. Haan

INSTALLING a new doorway in an added partition or relocating a door in a plastered wall are jobs that any careful homeowner can do. A door-frame is nailed to a sturdy framework of studs. There are double studs—two studs nailed together securely—on each side and a header across the top. In load-carrying partitions the header consists of two lengths of 2 x 4 or 2 x 6-in. stock set on edge and spiked together for maximum strength as in Fig. 1. Filler strips, such as wood lath, will make a double header come flush with the studs. A single header, Fig. 2, although generally not recommended, can be used in wallboard partitions not subjected to weight. Headers over all doorways 4 ft. wide or more should be reinforced by trussing, Fig. 3. The truss carries weight of the wall over the opening.

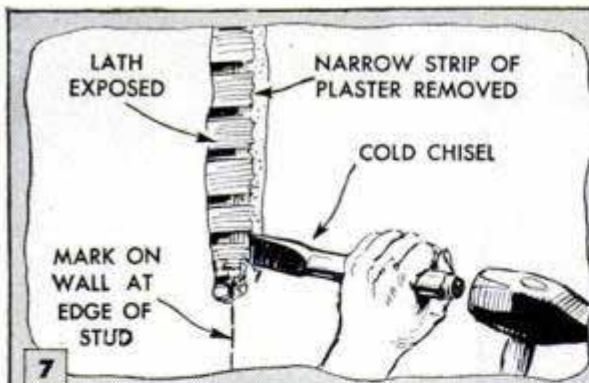
Doorway measurements: To determine the correct distance between the double studs of a doorway framework—distance W in Fig. 4—add together the door width, clearances and thickness of the door jambs. Vertical measurements, which include the thickness of the header, are given in Fig. 9. On outside doors allowance is made for a threshold above

After the door opening has been framed, cut the door to approximate size, install the hinges and then check for fit. A hand plane will enable you to shave down the edges of the door to compensate for the frame if it is slightly out of plumb

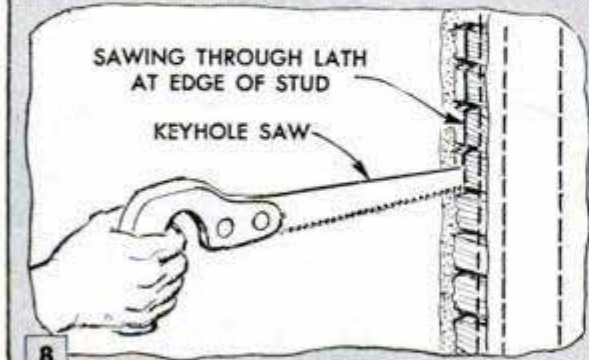


ABOVE, LOCATING STUDS IN WALL

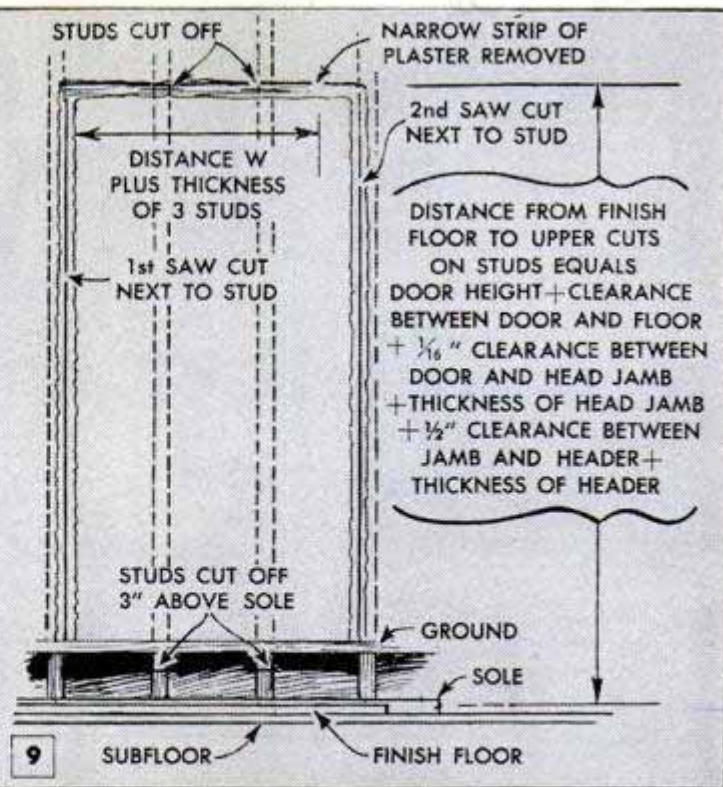
BELOW, FINDING EDGE OF STUD



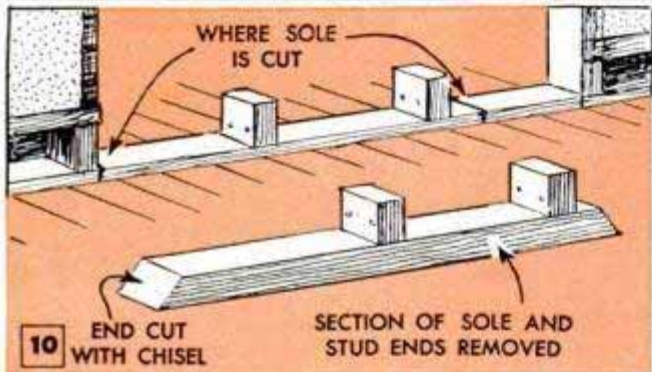
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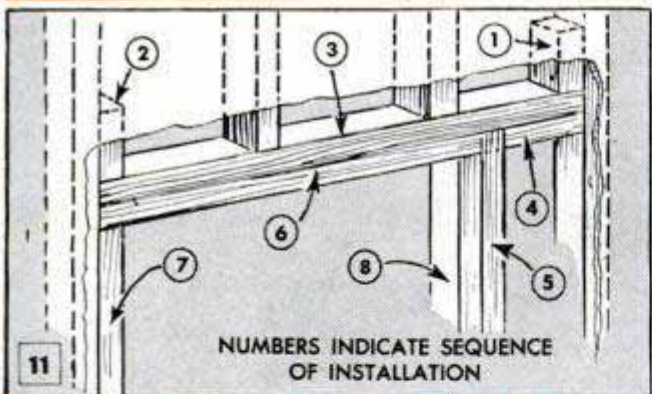
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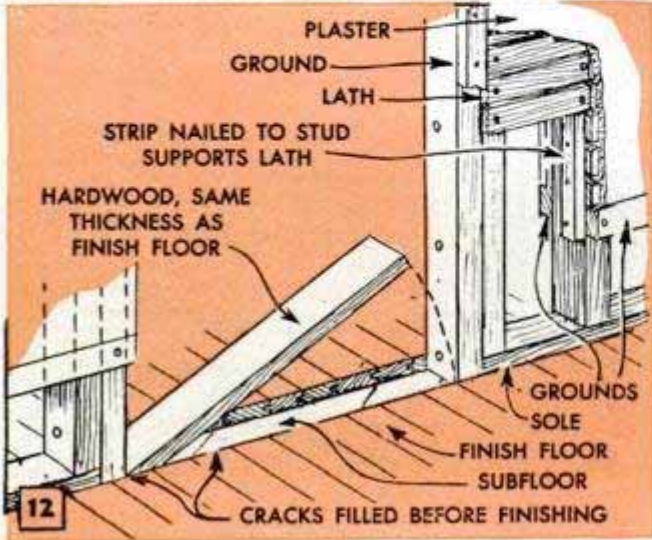
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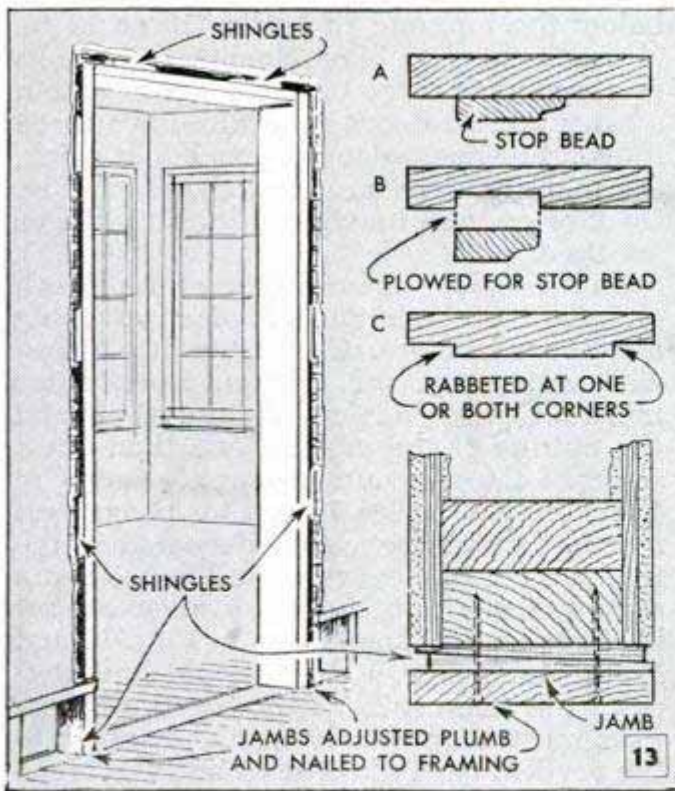


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the finish floor when cutting the door to fit.

Changing doorway position: When changing the position of a doorway in a plastered wall, first make sure that there are no pipes or heating ducts in the partition where the doorway is to be located. Then remove the base shoe or quarter round and baseboard. Next locate the studs in the wall at the new position. If the plaster is not carried all the way down to the floor, but stops at a "ground" a few inches above the floor, the stud locations are obvious. If the plaster extends to the floor, studs are located by "sounding"—tapping as in Fig. 5—using a thin wood block to avoid hammer-head marks on the plaster. Locate the edge of the stud on the door side by driving in a finishing nail as in Fig. 6. Do this where the stud was located by tapping and also a few inches above the floor. Mark a pencil line between the two nail holes to indicate where plaster is to be chipped away with a cold chisel as in Fig. 7. Also push back plaster between the laths where sawing is to be done as in Fig. 8. Walls that are lathed with plasterboard are treated in much the same manner as wood lath in cutting a doorway. In the case of metal lath, shears are used to cut material when removing it.

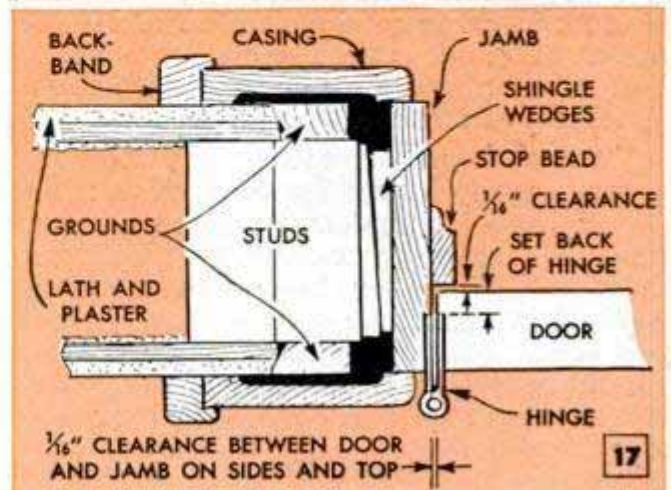
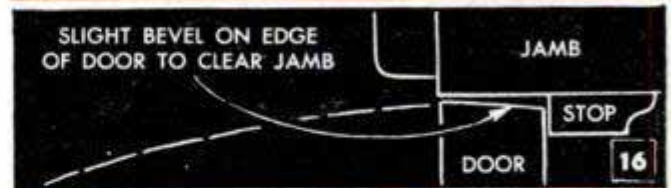
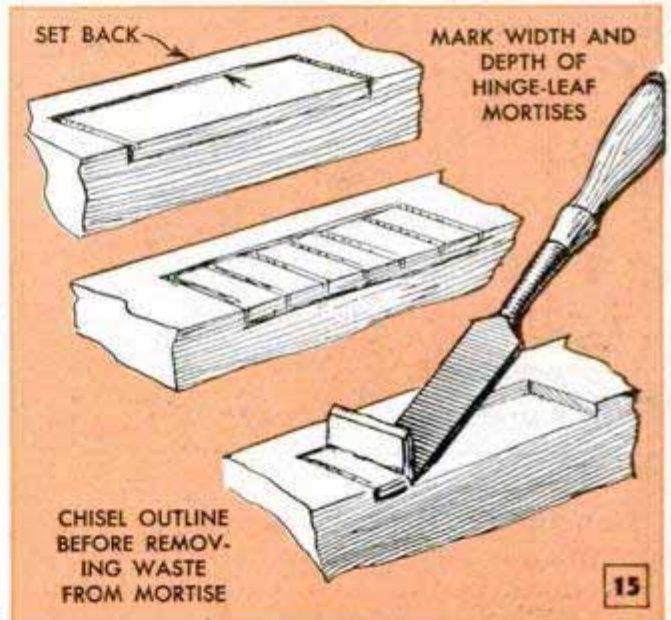
Next, measure off distance *W* of Fig. 4 from the saw cut, add the thickness of three studs — $4\frac{7}{8}$ in. — then locate the doorway edge of the next wall stud beyond this point. After marking, cut through plaster and lath as before. The same procedure is followed on both sides of the wall. Studs between the vertical cuts are sawed off at the bottom first, then at the top. If plaster runs down to the floor, remove a horizontal strip about 6 in. wide and saw the studs about 3

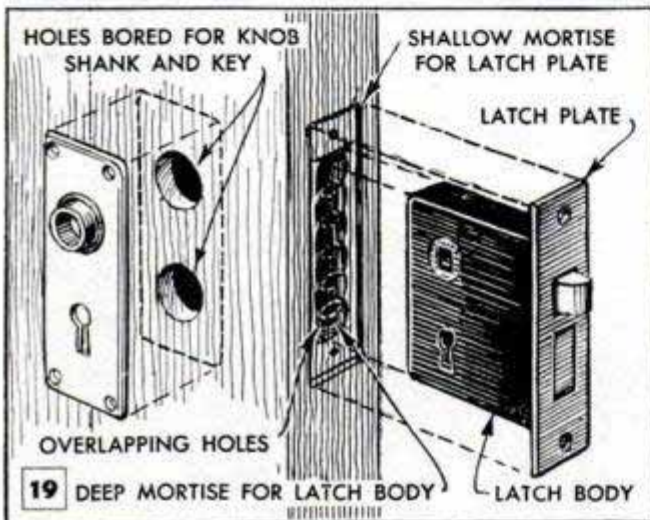
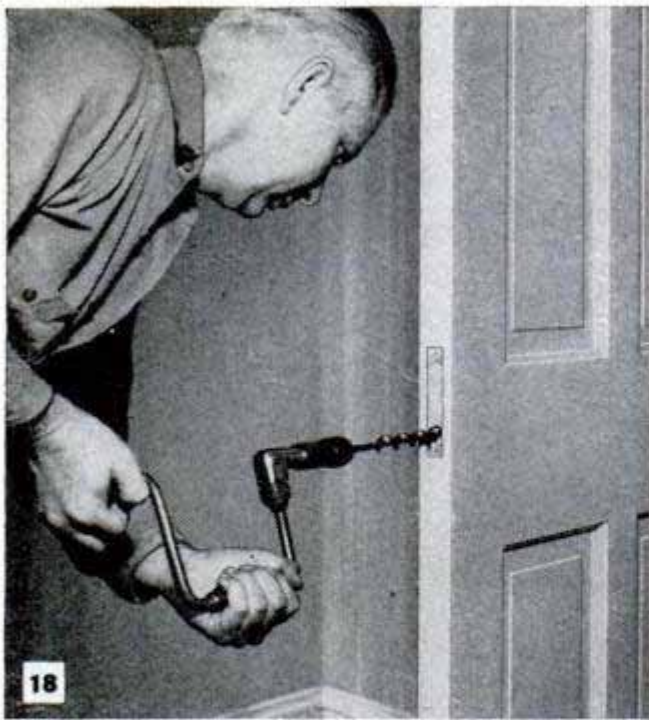


in. above the partition sole to avoid nails. A 2-in. strip of plaster and lath is removed across the top as in Fig. 9 to permit cutting off the studs at the top.

Now it should be possible to remove the cutout portion of the wall intact, after which the partition sole is cut off as indicated in Fig. 10, and the stud framework for the doorway is built following the sequence in Fig. 11. The joint at the bottom is shown in the lower details of Fig. 1. Lathing and plastering repairs are made as shown in Fig. 12. A strip of wood is nailed to the side of the stud where the old plaster ends to provide nailing support for the added lath or lath substitute. Other strips of wood of the same thickness as the plaster and lath are nailed along the edges of the opening to assure uniform thickness when plastering. These are "ground" strips, usually lengths of 1 x 2-in. stock beveled on one edge to "lock" the plaster. In applying wood lath it is customary practice to break the joints after each group of eight laths is applied to prevent plaster from cracking along a continuous joint. For plastering, it is advisable to get the services of a professional workman. Fig. 12 also shows how the floor can be patched with one or more hardwood boards of the same thickness as the finish floor.

Installing the doorframe is next. The head jamb must be horizontal and the side jambs plumb. Wooden wedges (butt halves of shingles) between the jambs and studs, Fig. 13, facilitate adjustment and provide nailing support. Use 10 or 12d finishing nails, and then apply trim pieces shown in Fig. 17. The stop bead generally is tacked on when hanging the door.





Hanging the door: By sighting, you can see which is the straightest edge of a door. This should be the latch edge since a slight warp can be corrected at the hinge edge by using a center hinge. On new doors the stile extensions are cut off first. Then the sides and top are planed to fit the jambs. There must be about $\frac{1}{16}$ in. clearance on each side and the top. The latch edge should be beveled slightly as in Fig. 16. On old doors planing to size is not done on the latch edge but on the hinge edge. The clearance at the bottom of an interior door should be about $\frac{1}{2}$ in. to avoid rubbing on rugs.

The stop beads are tacked in place temporarily while fitting the door which is inserted in the frame and removed a few times during the process of fitting. To mark door and jamb for hinges the door is wedged in the frame so that there is correct clearance all around. The surface should be flush with the edge of the jambs. Use a knife or scribe to mark the hinge positions on both door and jamb. Most interior doors have two hinges, one 5 or 6 in.

below the top, and the other 10 or 12 in. above the bottom. Make the hinge positions correspond to those on other doors within sight. Exterior doors generally have three hinges. For house doors $1\frac{1}{8}$ to $1\frac{3}{8}$ in. thick, $3\frac{1}{2}$ -in. butt hinges are used; for doors 2 in. thick or over 36 in. wide, 5-in. butt hinges are used.

Take the door down and mark the length and width of the hinge-leaf mortises, using a scribe as before. Carpenters use a special butt gauge for this purpose. After marking, make vertical chisel cuts around the outline of the mortise and then cut a series of chipping cuts to simplify paring to the right depth, Figs. 14 and 15. Hinge-leaf mortises should be a trifle deeper than the thickness of the leaves. On all house doors except those $1\frac{1}{8}$ in. thick, the hinges are set back about $\frac{1}{4}$ in. as shown in Figs. 15 and 17. All hinges on a door should have exactly the same setback; crosscuts of mortises must be precisely at right angles to the vertical edge of the door and the hinge pins must be in perfect alignment. After the hinge leaves are screwed to the door and jamb separately, the door is put in position and the hinge pins are inserted, the upper one first.

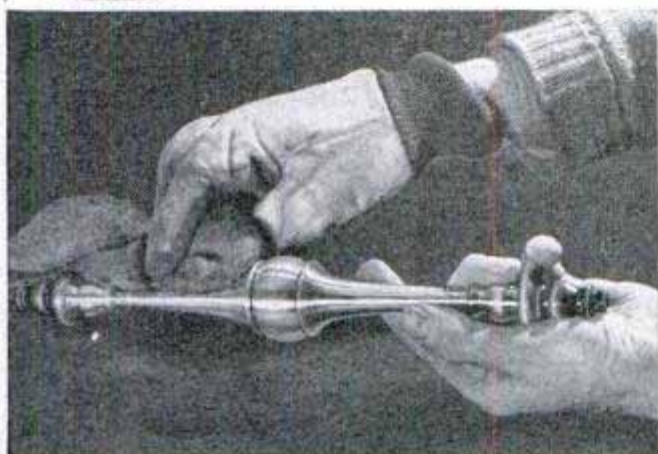
Jambs for most interior doors have the stop beads nailed on with 5 or 6d finishing nails, detail A of Fig. 13. Occasionally, in older construction, jambs are found that have stop beads set in plowed grooves as in detail B. Jambs for exterior doors generally have the jambs rabbeted as shown in detail C. There should be a clearance of $\frac{1}{16}$ in. between the door and stop bead at the hinge edge but the latch edge of a door should fit snugly against the stop bead to prevent rattling.

Fitting latches and locks: Most latches and locks are set into doors as shown in Fig. 19. To install a latch or lock, mark and cut the shallow mortise for the latch plate at the same height as those of other doors, which is usually about 36 in. above the floor. To make the deep mortise for the latch body, bore overlapping holes and then trim with a chisel. On cylinder-type latches only one or two holes are required instead of a mortise. As shown in Fig. 18, the door can be left in the frame and held securely with two wedges between it and the floor while cutting the latch mortise. After this has been done, bore the holes for the knob shank and the key, and screw on the side plates so that the knob shank will fit without binding. Then turn on the knobs and lock them with the setscrews. The strike plate is set into the jamb so that the latch bolt will slip into the hole when slight pressure is applied in closing the door. Be sure to locate the strike plate at the correct height so the bolt does not bind.

From CHANDELIER To CANDLESTICKS

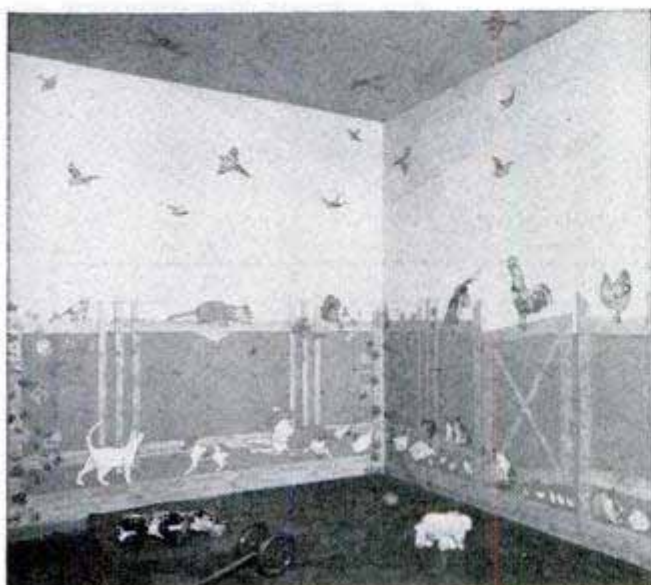
By Walter E. Burton

There's a pair of fine candlesticks in many an old-fashioned brass chandelier. Generally, the chandeliers can be had for the asking as most homeowners engaged in remodeling are glad to get rid of them. Dangling spindles and other metal parts formed by spinning usually are assembled with threaded brass rods or pipe and are easily separated without damage. Photos at the right, left, and below show how, in one instance, the separate parts of a chandelier were assembled to form an attractive pair of candlesticks. Careful hacksawing with a fine-toothed blade, soldering, and then polishing with a rouge-charged buffer produced the job pictured. To prevent tarnishing, coat the polished work with metal lacquer, clear lacquer or shellac.



Eye-Catching Outdoor Murals of Wallpaper Color Child's Playroom

Lively wall decorations that feature an interesting variety of birds and animals will lend a carefree outdoor atmosphere to a child's playroom. By utilizing solid-color wallpaper along with animal and plant-life



cutouts, one homeowner achieved the farm motif shown in the photo. Sky-blue paper is used for the ceiling and wall area above the fence and green paper for the wall below the top fence rail. The fence itself consists of strips of knotty-pine wallpaper pasted over the background. The animals and flowers are cut from wallpaper, magazine illustrations or children's cutouts. Mount the cutouts with regular wallpaper paste and use ordinary wax crayons to add nailheads to the fence, and stems and leaves to the flowers. For durability and ease of cleaning, the walls are covered with two coats of clear varnish. Other scenes can be depicted similarly or the murals may be applied only to the corner areas of the walls.—R. L. Morris, Washington, D. C.

☐ If you pump the water from a washing machine into a kitchen sink or laundry tub, place an old strainer over the sink drain. This will collect the lint which otherwise might clog the sink drain.

Extension Handle for Wooden Match Bent From Wire Coat Hanger



There is no danger of singeing your fingers when lighting the oven of a kitchen gas range if you use this wire extension handle to hold the match. The handle allows you to stand well away from the burner while placing the lighted match against the gas ports. The matchstick is inserted in a spiral holder formed at one end of a length of stiff wire which can be obtained by straightening a wire coat hanger. The other end of the wire is bent to form a handgrip. The spiral can be bent quickly by using a pair of pliers to wrap the wire around an ice pick or a length of small-diameter rod. If you have an oil-burning space heater, a similar extension handle will permit you to ignite the oil without cluttering the bottom of the pot with burned matches and scraps of paper. When using the extension to hold a match in a gas oven, be sure to stand in such a position that you can see when the flame of the match is near the burner ports. Otherwise, too much gas may collect before ignition, resulting in a small explosion.

Julius S. Hurst, Knoxville, Tenn.

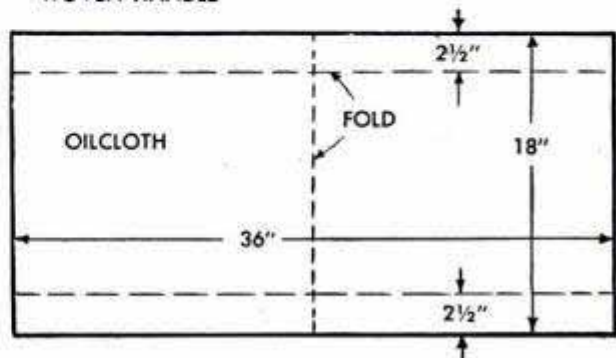
Melted Paraffin Simplifies Removing Duck Feathers

It is no job at all to pluck the feathers from a duck while the bird still retains its body heat, but most hunters wait until the birds are cold and the feathers have set. In the latter case, use paraffin to help remove the feathers. Just melt several blocks of paraffin, strip the ducks of the larger wing and tail feathers and dip each bird

slowly in the melted paraffin. After the paraffin cools, peel it off, and the feathers will come with it. To remove the small pinfeathers and down, rub the bird's body with powdered resin and dip it quickly in boiling water. Then rub off the down and pinfeathers with a dry cloth or, if no cloth is available, with the palm of the hand.

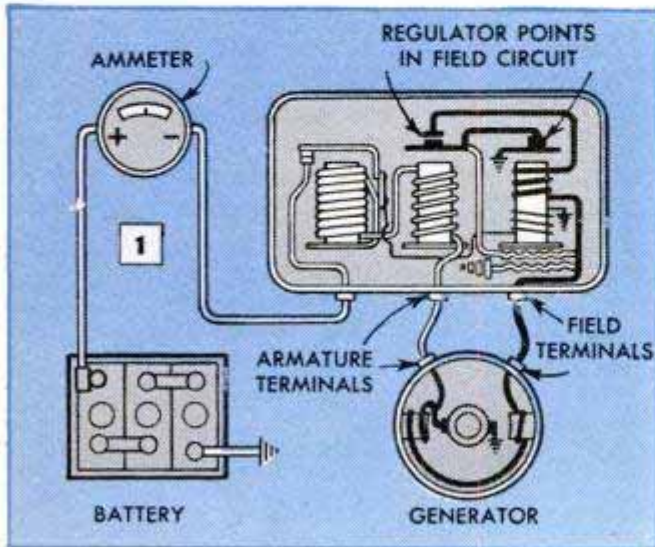
Oilcloth Utilized to Fashion Shopping Bags in Attractive Color Combinations

Sturdy shopping bags of any convenient size and in a variety of attractive color combinations are made easily from oilcloth, leatherette or awning material. To fashion a bag 13 in. wide by 18 in. deep, use a piece of material of the size given in the detail. On the unfinished side of the material draw a line parallel to each edge as indicated and fold the material inward along these lines. Double the material temporarily and crease the folds. Then unfold it, double the material wrong side out and stitch the edges. After stitching, pull the bag right side out, and you are ready to apply the handles. The latter are made from three strips of material, 26 in. long and $\frac{1}{2}$ in. wide. These are braided tightly together, resulting in a braid about 20 in. long, and then are cut into two sections. Attach one of the sections to each side of the bag, stitching it securely in place and reinforcing the edge with cloth tape which also serves as a colorful trim.



Servicing your car

GENERATOR REGULATOR

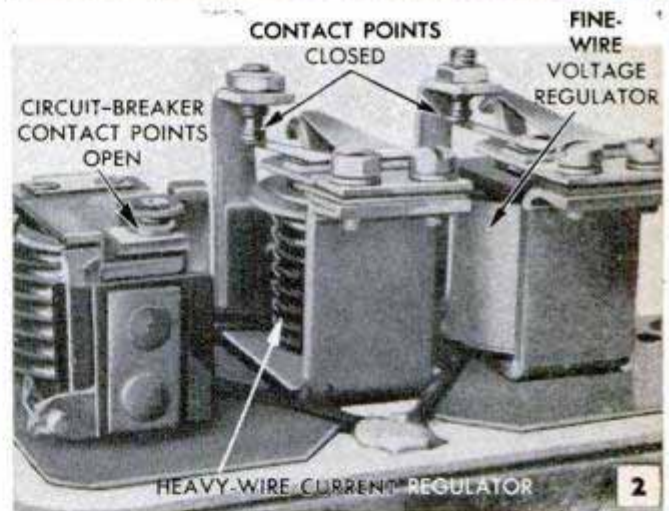
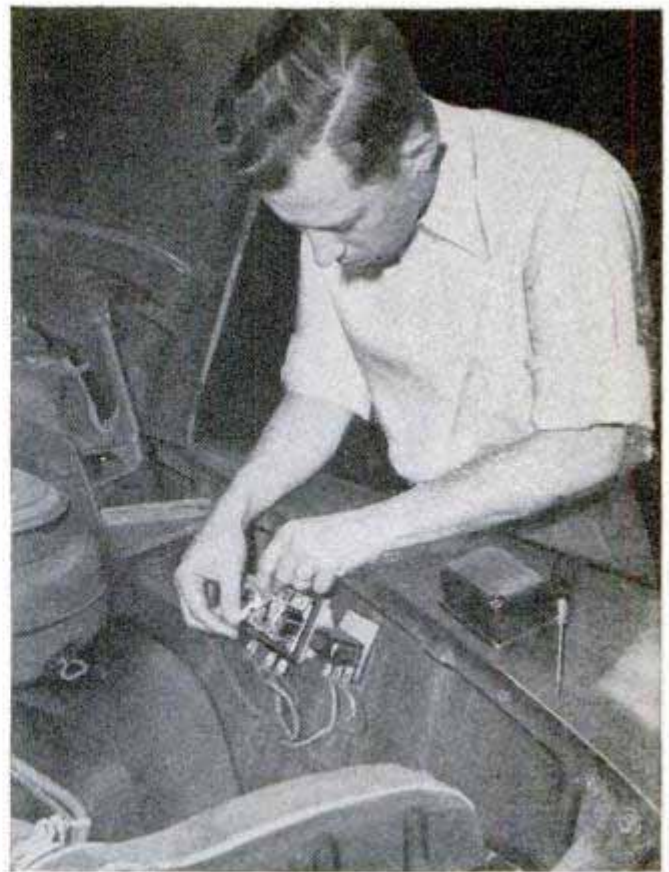


By C. E. Packer

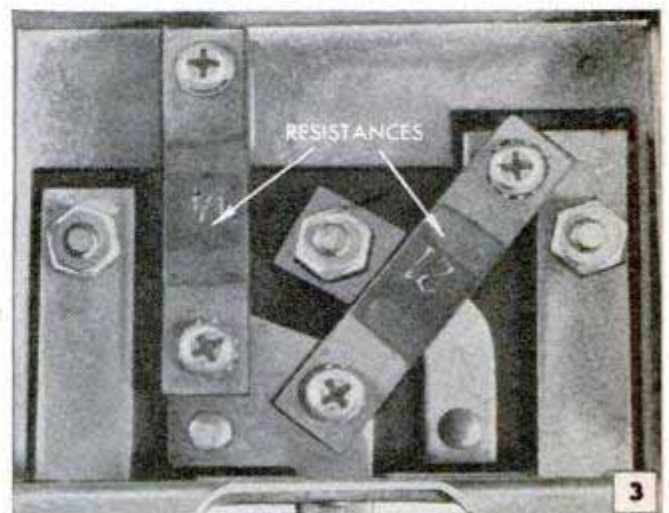
UNDER the hood of every modern car you will find mounted on the fire wall or on one side of the motor well what appears to be an insignificant little metal box into which wires enter. Housed inside the box is the generator regulator on which depends not only the life of the battery and generator but, to a great extent, the operation of your car. The regulator controls the flow of current (amperes) and the voltage (pressure) produced by the generator, thus preventing overcharging or undercharging of the battery, or possible burning-out of accessories or the generator itself.

As pictured in Figs. 2 and 5, the regulator consists of three instruments—the circuit breaker, current regulator and the voltage regulator. All three instruments are merely relays, two of which—the current and voltage regulator—open and close the generator field circuit. In reality, the circuit breaker is an automatic switch, which opens the generator-charging circuit when the generator is inoperative, or when the voltage output is below that of the battery. This prevents discharging the battery back through the generator.

You will notice one of the two remaining instruments is wound with heavy wire and the other with fine wire. The heavy-wire instrument is the current regulator and the one with fine-wire winding is the voltage regulator. Space does not permit a complete description of construction, but

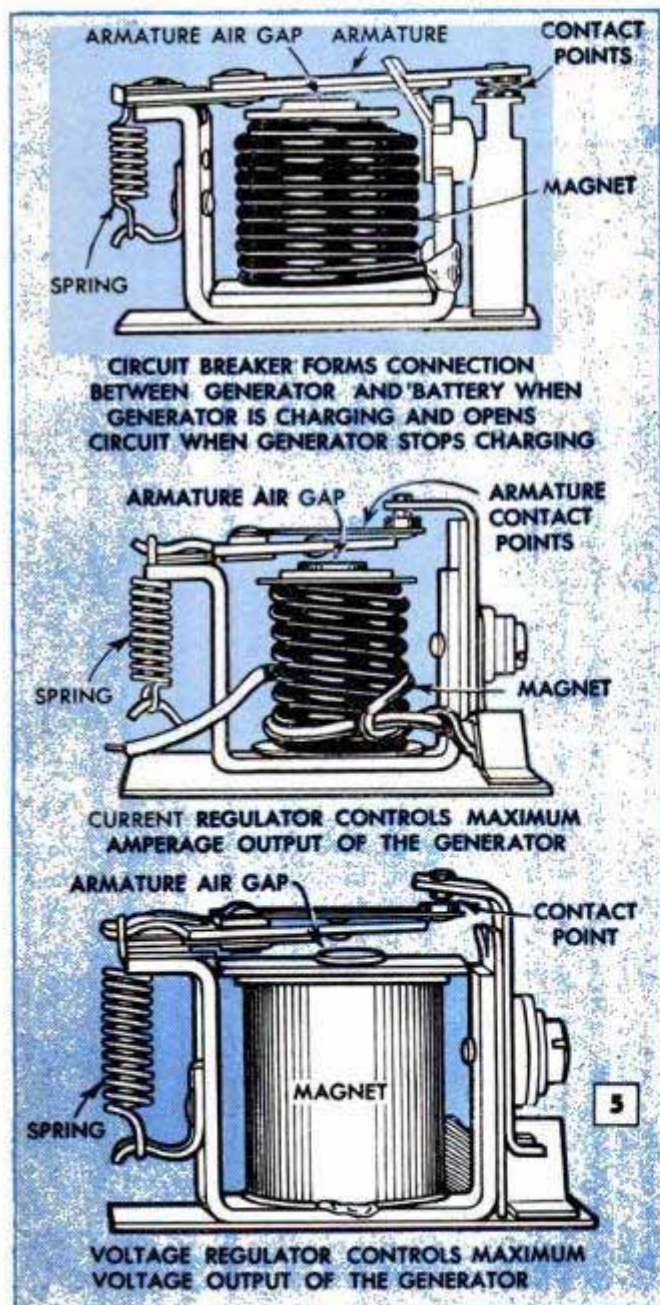


Above, a popular-type regulator having an automatic circuit breaker. Unit with heavy wire is the current regulator, one with fine wire is voltage regulator. Below, resistances on back of the regulator control field strength and, consequently, generator output





Be sure battery cables and posts are not corroded. Brighten with sandpaper and then apply baking soda



a study of Fig. 1 will show the generator wiring through the regulator to the battery. Modern generators are shunt-wound, that is, the field coil is connected directly across the main brushes. From the brushes, the charging current flows to the battery. However, the field coils are connected into this circuit, too, and the amount of current flowing through them determines the output of the generator. Increasing the flow of current into the field increases the generator output and decreasing the flow reduces the output. In Fig. 1, the heavy dark line is the field circuit and the lighter, small line is the armature or output circuit. Notice that the armature circuit goes through the coil of the current regulator—the center instrument—on through the coil of the circuit breaker and then to the battery. The field circuit flows through the breaker contacts of both the current regulator and the voltage regulator to a ground. However, the field circuit also is wired to by-pass the contact points when they are open and pass through resistances, which may be pieces of carbon or resistance wire as shown in Fig. 3.

In normal operation, the contact points of the current regulator are closed but, should the generator output go above a given amperage, the coil, which is an electromagnet, exerts sufficient pull to open the contact points, thus causing the current to flow through the resistance and reduce the current flow into the field coils. This immediately reduces the generator output. This cycle repeats many times per second when the current regulator is in operation.

The voltage regulator works in a similar manner except that it controls the voltage. When the amperage output of the generator increases, the voltage also increases. Therefore, it is necessary to control it, too, otherwise, the lights and accessories might burn out. This regulator is wound with fine wire, which will allow only a given voltage to pass through it. If the voltage increases beyond this point, the magnetic pull of the coil causes the points to break as in the current regulator.

Although most major servicing of the regulator units should be left to an experienced mechanic, a knowledge of how the regulator works will enable the motorist to detect impending trouble and, in some cases, make the necessary repair.

A quick check of regulator operation can be made by watching the charge indicator on the instrument panel. With a fully charged battery, a very low charging rate is normal. A fully charged battery and a high charging rate indicate trouble, which may include a defective voltage regulator, incorrect setting, or a ground at the generator field terminal or in the wire from

the latter to the field terminal of the regulator. Also, a poor regulator ground connection may be causing the trouble. You can check this by connecting the regulator frame to the frame of the generator as in Fig. 6. If this reduces the ammeter reading, clean and tighten the regulator base. A high charging rate is normal for a "low" battery, but a low charging rate for the same battery indicates trouble which may be due to one of the following conditions: 1. Loose, corroded or damaged wires. 2. Faulty battery. 3. High resistance in charging rate. 4. Low regulator setting. 5. Burned or rough contact points. 6. Faulty generator. After cleaning and tightening the connections in the charging circuit, check the generator by grounding the field terminal with a jumper wire or screwdriver as in Fig. 4. If the charging rate increases, the fault likely is in the regulator or wiring.

However, most regulator troubles are caused by oxidized or burned contact points, or weak spring tension. Only a fine-cut file like the one in Fig. 7, which is called a spoon or riffler file, should be used.

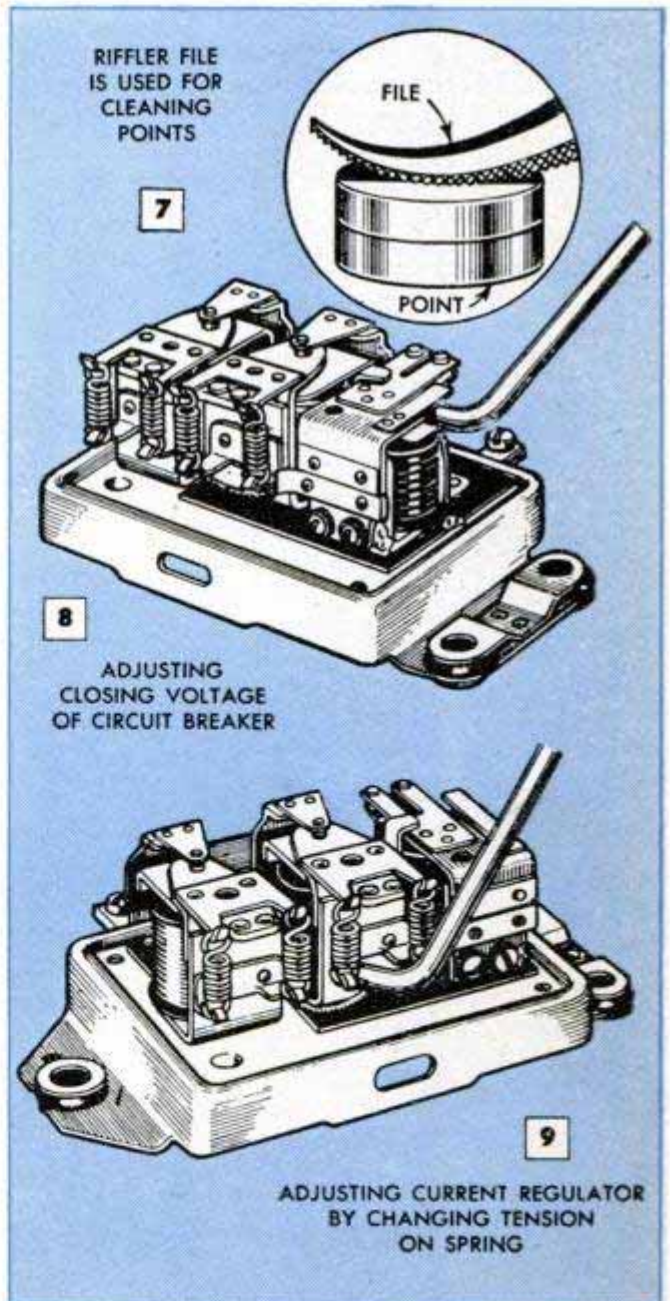
Before the points are cleaned, check the air gap between the core and its moving arm or armature with a feeler gauge for resetting the gap after filing the points. The same spacing or gap must be maintained as the magnetic influence diminishes with an increase in the air gap.

After servicing the regulator, Figs. 8 and 9, adjust the spring tension on the points, checking the final operation with the cover in place, as it forms part of the magnetic circuit in some regulators. Before adjusting the tension, allow the generator to charge 20 or 30 min. to establish a normal temperature. Newer regulators have a bimetallic arm which stiffens when cold to increase generator output until the unit warms up. After adjustments have been made, check the circuit breaker to see that it opens and closes correctly. Increasing spring tension on the cutout points will delay closing, decreasing it speeds closing, Fig. 8. Hold the voltage-regulator points firmly together and accelerate the engine to see if the current regulator limits the maximum output of the generator to a little less than a full-scale reading of the car ammeter.

With all connections in the charging system clean and tight, and the battery in good condition, only the slightest charge should show on the car ammeter, possibly three amperes. If the rate is greater than this, reducing spring tension on the voltage regulator points will lower the rate. If the generator is showing no charge whatever, a slight increase in the spring tension will usually produce the preferred charging rate.



Regulator and generator frames connected together with copper wire determine poor ground connection



Clothespins Slipped Over Handles Facilitate Carrying Bushel Basket



When laundry, fruit or other heavy loads are carried in a wire-handled bushel basket, the task is easier if a wooden clothespin is slipped over each of the handles to provide a more comfortable grip. If the basket is used frequently, fasten the clothespins in place by wrapping strips of adhesive or cellulose tape around them as shown in the detail.

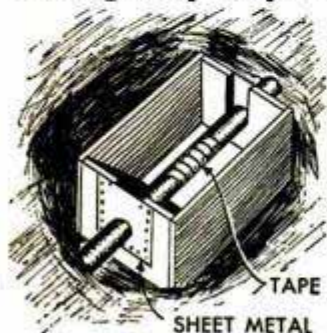
G. E. Hendrickson, Argyle, Wis.

Laundry Starch Loosens Wallpaper

After some experience in trying to remove wallpaper by loosening it with warm water, I have found that a solution of laundry starch does a much better and faster job. Soak the paper with the starch, applying it with a rag or brush. Allow the starch to remain on the paper for about 10 minutes and then scrape off the paper with a wide-blade putty knife.

Mrs. Jack Stewart, Milwaukee, Wis.

Emergency Repair for Pipe Line



cut a slot in each end of a wooden box, making the slot at least as wide as the diameter of the pipe. After positioning the

box under the pipe and around the break, fit two sheet-metal shields over the pipe to close the slots at each end of the box, tacking the sheet metal to the box. Wrap the break with tape and fill the box with concrete. When the concrete has hardened, replace the earth around and over the box.

W. H. McClay, Pasadena, Calif.

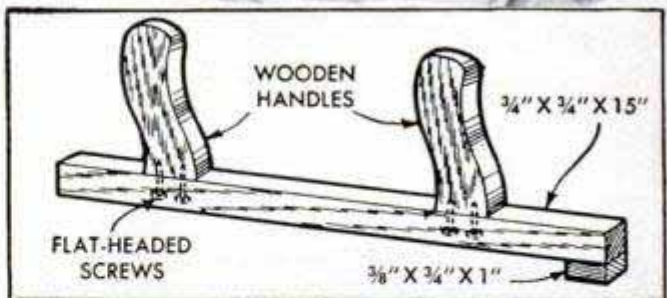
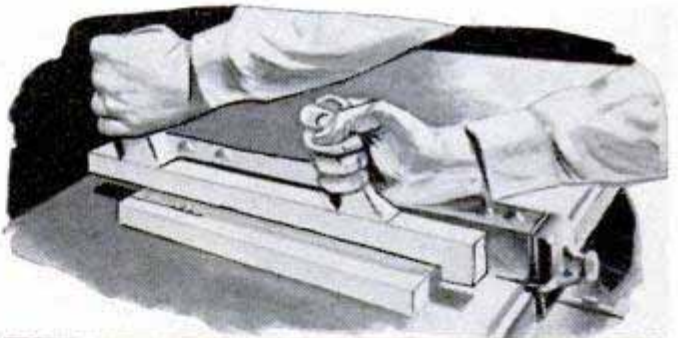
Prolonging Life of Outdoor Steps By Draining Moisture

The life of wooden steps exposed to the weather can be prolonged two or three years by draining off the water which ordinarily clings to the underside. This is done by dabbing paint thickly on the underside of the treads so that it hangs in tiny strings or droplets which aid the water in dripping from the surface.

T. F. Watts, Charlotte, N. C.

Combination Pusher and Hold-Down Increases Bench-Saw Safety

By using this combination pusher and hold-down to feed narrow stock into the circular saw, the work can be ripped without endangering the fingers. The tool is easily made from scrap stock, the bottom



piece being about 15 in. long with a wooden block nailed under the rear end to engage the edge of the work. Jigsawed handles are mounted on the top of the cross-piece with countersunk flat-headed screws. Finally, a strip of coarse abrasive cloth or sandpaper is cemented to the underside of the tool to provide a gripping surface.

Will Thomas, Buffalo, N. Y.

☞ To make sure that you won't pull the garden hose over valuable plants, guide the hose between the plants by pressing croquet wickets over the hose as necessary.

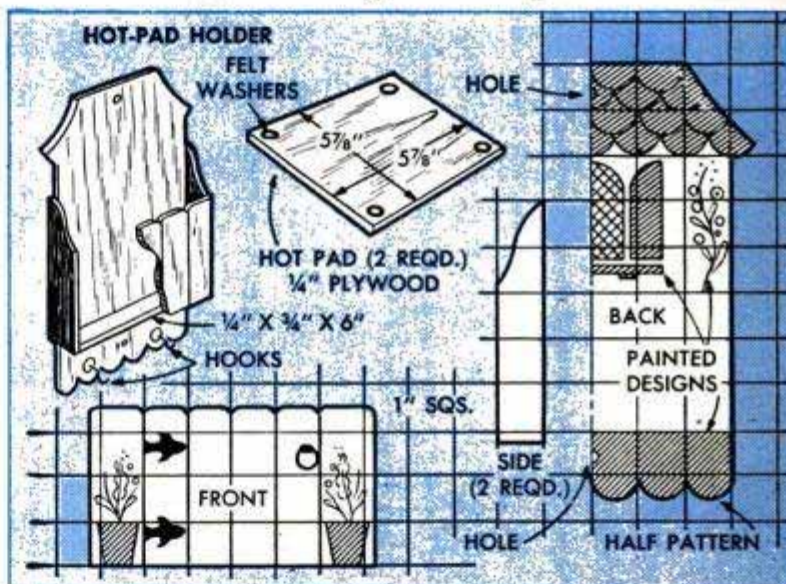
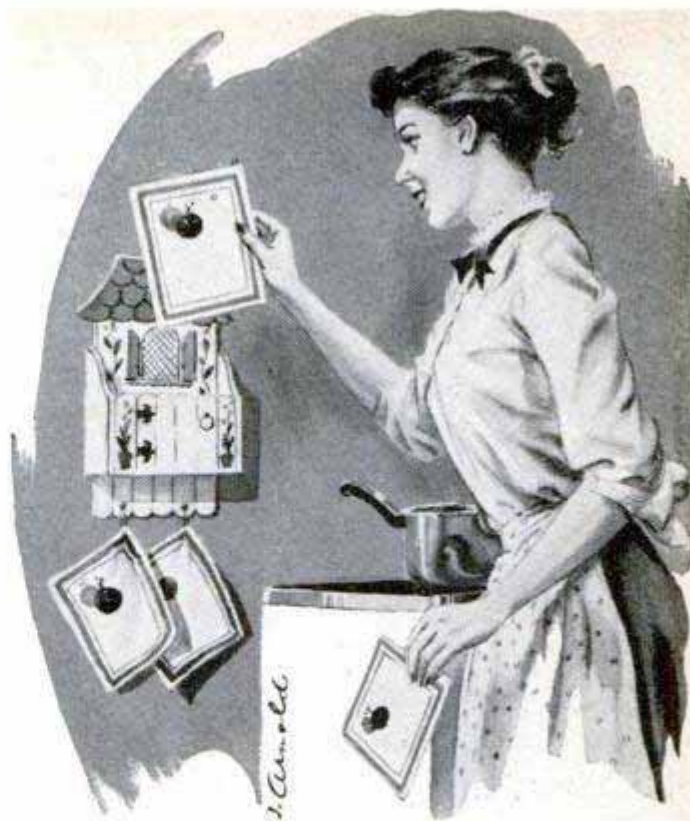
KITCHEN NOVELTIES

By Roberta L. Fairall

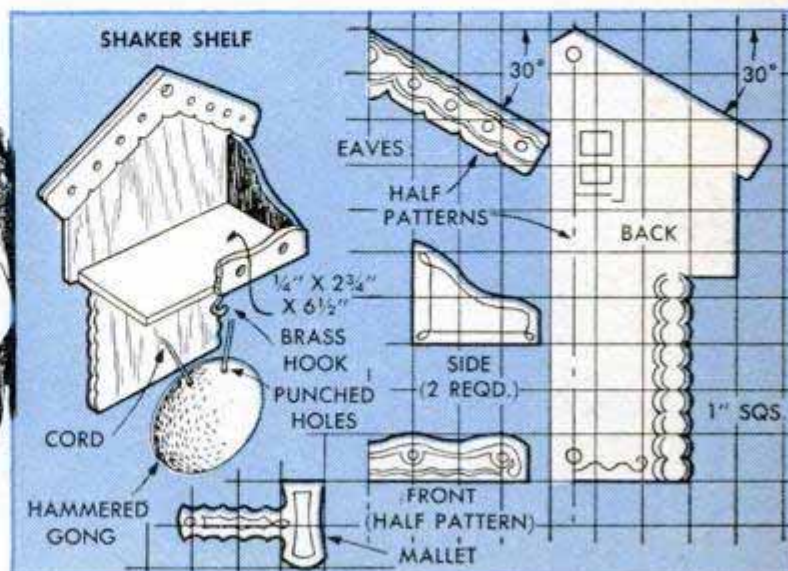
JUST THE THING to brighten up the kitchen, these two wall novelties, representing little cottages, provide convenient storage for hot pads, pot holders and condiments. The salt-and-pepper shelf also includes a dinner gong and mallet.

To make the hot-pad holder, enlarge the design on paper ruled in 1-in. squares, transfer it to $\frac{1}{4}$ -in. plywood and jigsaw the parts. Sand the sections smooth and fasten them together with brads. Then drill two holes for hanging the shelf, one at the top and the other at the bottom of the backboard. Cloth pot holders are hung from two screw hooks turned into the backboard below the hot-pad shelf. Thin felt washers glued to the back of the plywood hot pads will keep them from marring the surface of the table.

The shaker shelf is assembled in the same manner as the hot-pad holder, except for holes drilled in the eaves and front of the shelf for decoration. The gong is made from a tin-can lid having a finished edge, such as the lid of a shortening can. Dish the gong and give it a hammered finish before polishing it with steel wool, and then punch two holes near the edge for hanging it from the shelf. Finally, wax the gong or coat it with clear shellac and hang it with a length of cord attached to the underside of the shelf. The mallet is made of plywood and should be hung from a brass screw hook directly in front of the gong.



Colorful designs similar to those shown in the diagrams may be painted on the plywood shelves with poster, or show-card, colors and then protected with a coat of clear varnish



FINGER-TIP

By Alexander Maxwell

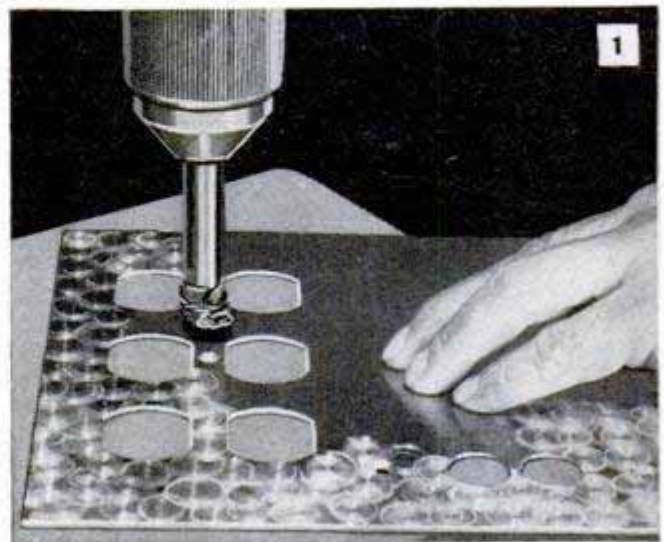
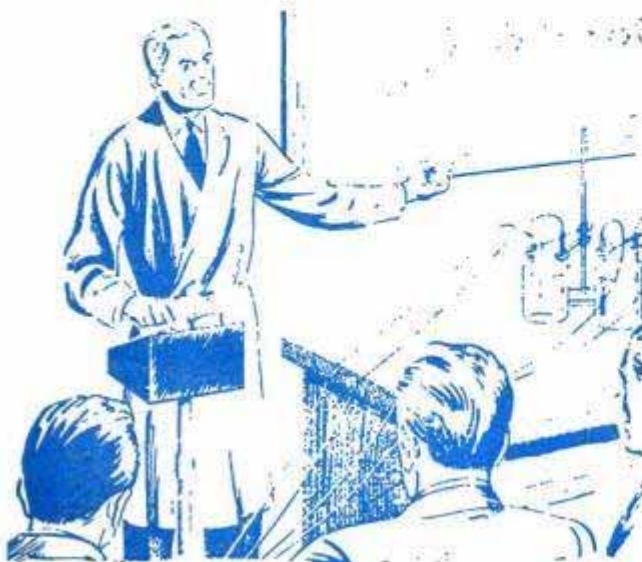


THIS UNIT is just the thing for controlling composition and lighting in the photo studio, spotlighting theatricals and operating apparatus in the school laboratory. Six separate electrical circuits are wired from a distribution panel, or board, to a control panel mounted on a portable stand. Each circuit is operated by its own switch and an ammeter of 15-amp. capacity provides a visible reminder of the current consumed to help avoid overloading the house wiring. A No. 1 floodlight bulb requires about 2 amps. and a 500-watt bulb, 4 amps. at 110 volts. The ammeter adds up the total amperage as the lights or other apparatus are switched on individually. A master switch cuts off all the circuits simultaneously and to short the ammeter out of the main circuit a separate line and switch are provided.



Nearly all parts used in assembling the distribution panel, control panel and stand are stock items and are readily available. Ammeters are obtainable in a wide range of readings but, of course, the 15-amp. meter is more or less standard and should be used if the control unit is plugged into branch circuits in the home photo studio. When convenient to do so, the feed line to the distribution panel should be run directly to the entrance box at the meter. Switches on the control panel and corresponding outlets on the distribution panel are of the ordinary types used in wall outlets and switch boxes. The switches preferably should be of the toggle type. The master switch is an industrial-type switch with red and black buttons. Pushing the red button closes the circuit; pushing the black button opens it.

Both the control panel and the distribution panel are spot-finished on drill press with improvised tool

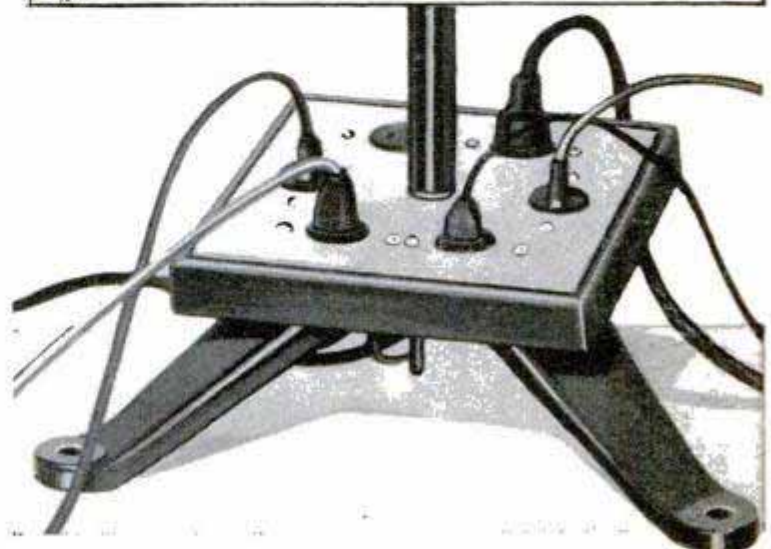
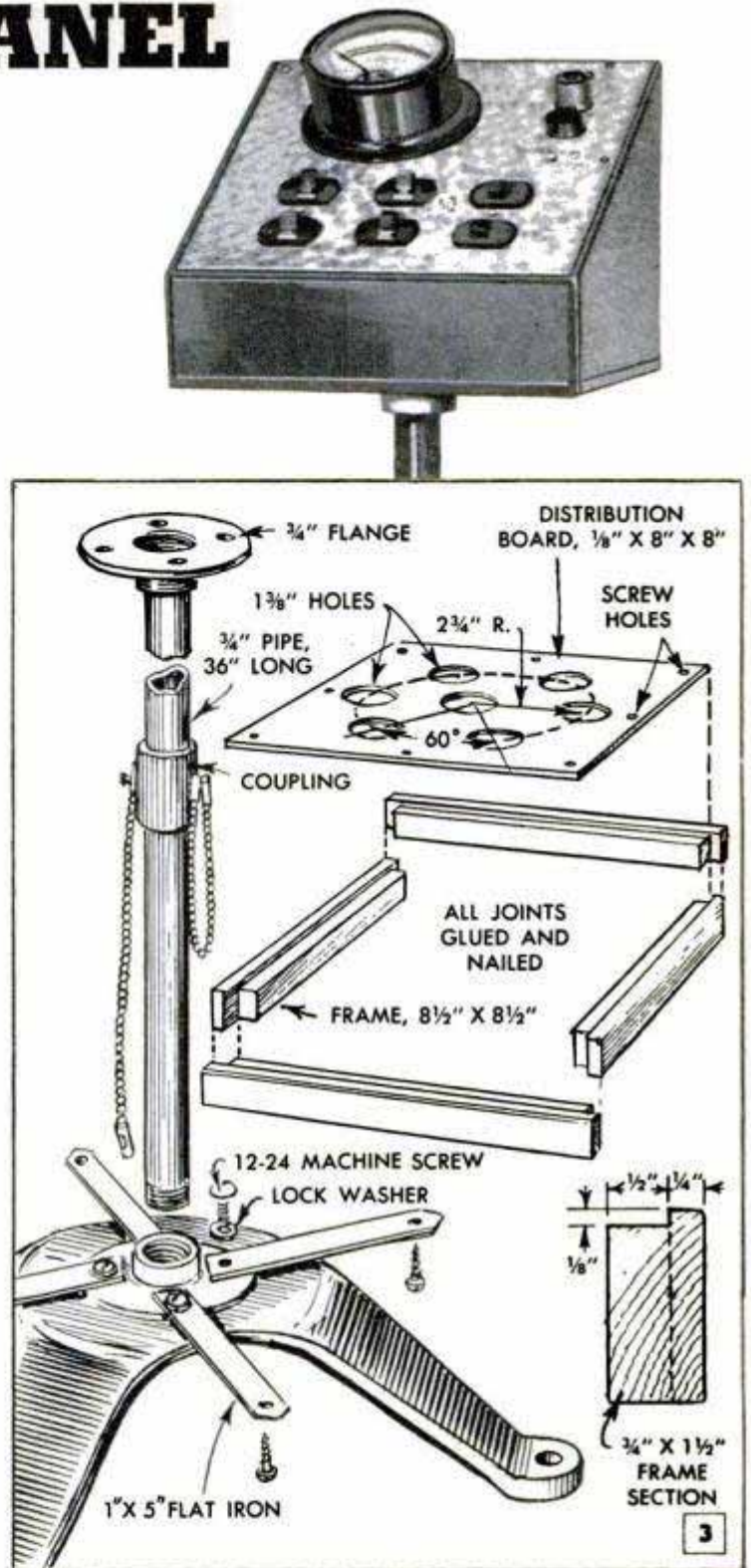
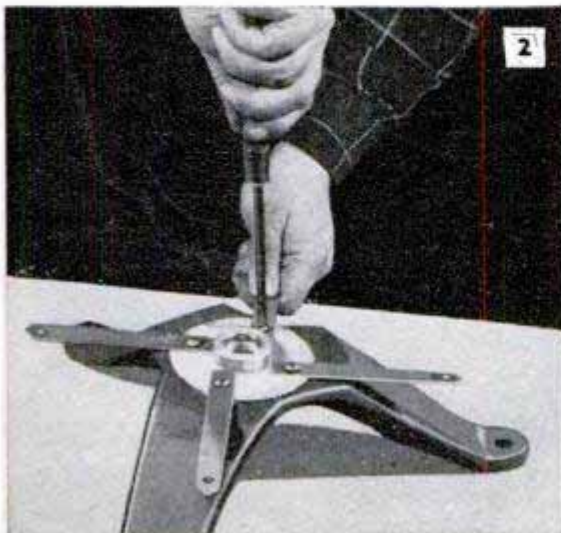


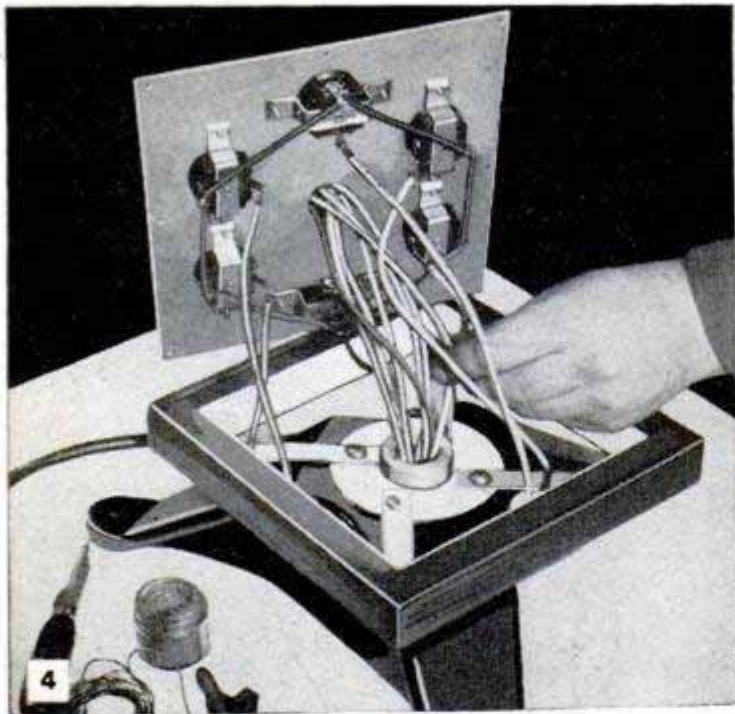
CONTROL PANEL

The control stand is built up on a three-legged base of the type used for light machine stands. Some of these units are tapped for pipe columns of various sizes, but the one pictured was not, so four holes were drilled and tapped through the flat top and a $\frac{3}{4}$ -in. pipe flange and four flat-iron arms, forming a spider, were attached to the base as in Figs. 2 and 3. The arms support the wooden frame carrying the distribution panel. The latter is made of sheet aluminum cut to the dimensions given in Fig. 3. Holes are drilled or sawed for the outlets and the pipe column, and the panel is set into a rabbeted frame as in Fig. 3 and the photo below. If desired, the surface of the panel can be burnished on a fine wire wheel, or, the surface can be attractively spot-finished as in Fig. 1. This is done with an improvised spot-finishing tool made by binding a felt pad and a strip of emery cloth on one end of a short length of $\frac{1}{2}$ -in. steel rod mounted in the drill-press chuck. Run the drill press at the lowest speed and use a very light spindle pressure. Although not shown, the circular patterns are frequently made to overlap in a straight line. This method takes longer and requires a guide, but it produces a somewhat neater job. Both panels may be finished in this way. If you have no way of drilling the large holes for the outlets, your plumber can do the job.

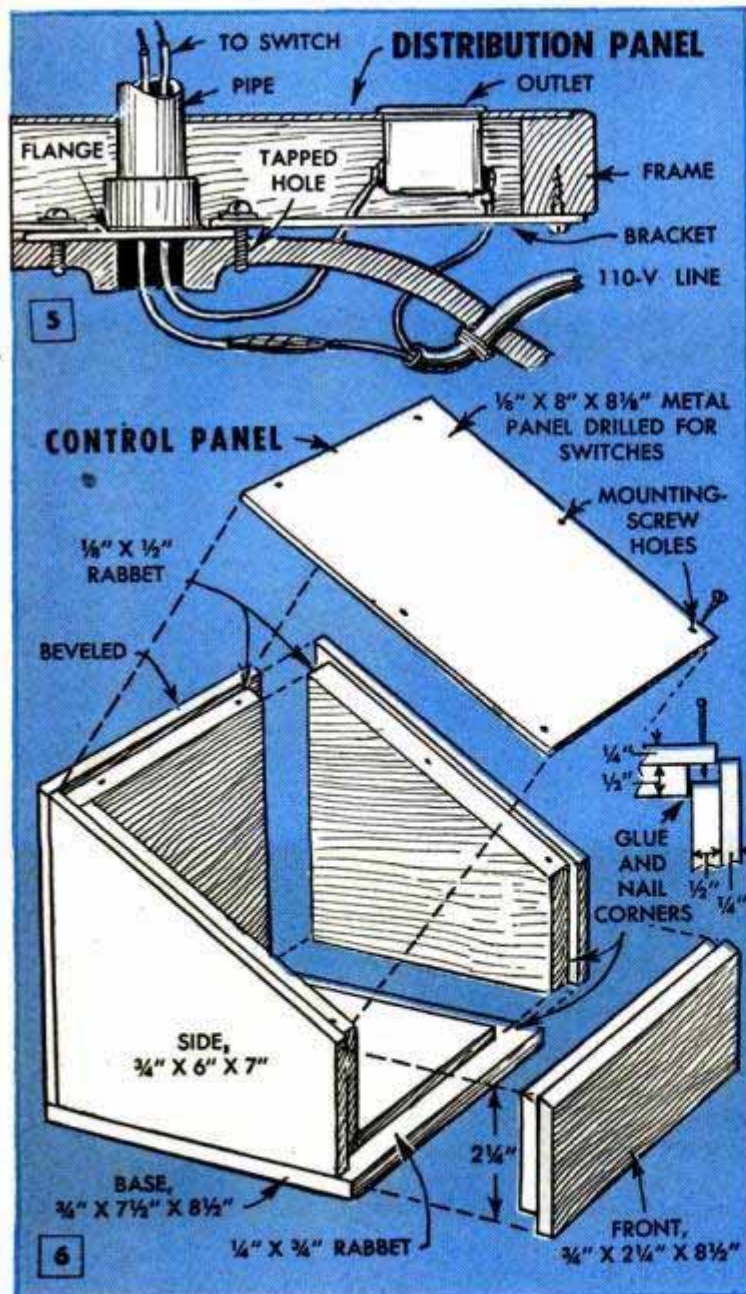
Note that the pipe column, Fig. 3, is 36 in. long over-all, but that it consists of two 18-in. lengths of $\frac{3}{4}$ -in.

Four flat-iron arms screwed to the base support wooden frame for distribution panel

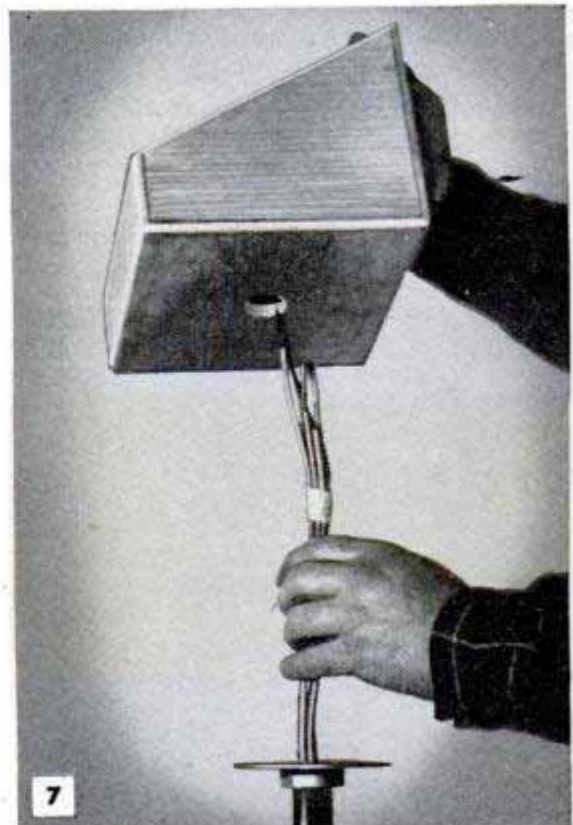


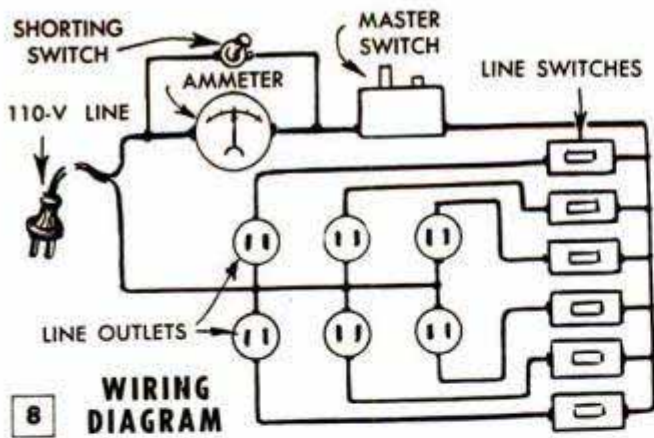


Here the outlets have been attached to underside of the distribution panel and wired ready for assembly in stand



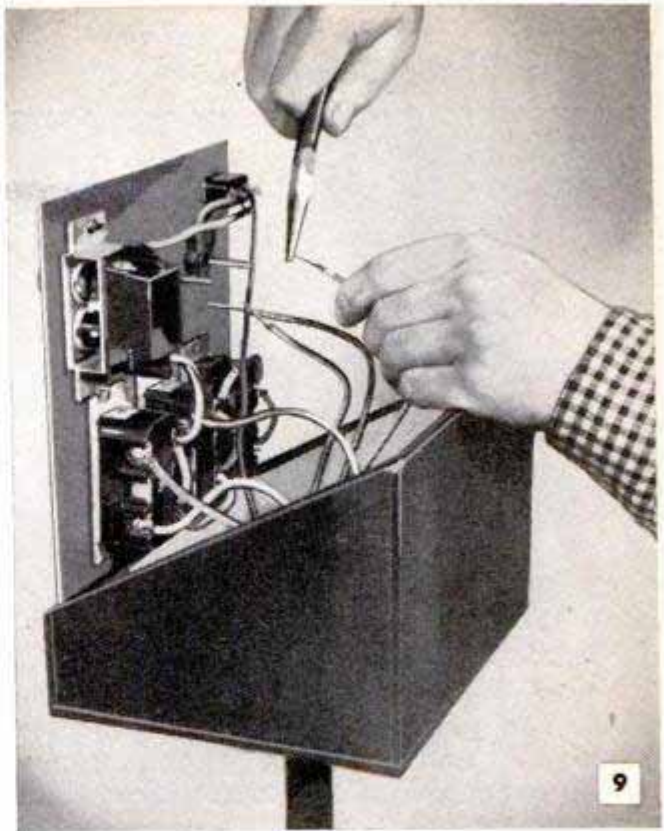
pipe joined with a coupling. Loops of ball-type pull chain are attached to the coupling for holding the coils of electric cord when not in use. A $\frac{3}{4}$ -in. pipe flange is turned onto the upper end of the column to provide a rigid base for the control box, which is assembled as in Fig. 6. To make a neat job of the box, use hardwood and join all parts with brads and glue. The method of wiring the distribution board is detailed in Fig. 5 and pictured in Fig. 4. The circuit is diagrammed in Fig. 8. Although the wiring looks rather involved it is actually quite simple. First, the six outlets are connected with a jumper wire and the free end of this wire is soldered to the common lead. Next, a lead from each load terminal is carried down around the spider, Fig. 5, and the end is brought up through the center hole in the distribution panel, as in Fig. 4. These wires are then "harnessed" by wrapping with tape at intervals along the length. The harness is next fed up through the column and into a hole in the bottom of the control box as in Fig. 7. To avoid confusion in making connections to the switches, it's a good idea to tag each wire with a key number or wrap the wires individually with cellulose tape of different colors. This will simplify the connections in the control box. Turn the flange at the upper end of the column down tightly and attach the control box to the flange with four





wood screws. After the switches and ammeter have been fastened in place on the underside of the control panel, you're ready to make the connections as in Fig. 9. Bare the free ends of the wires and twist each bared end into a small loop with long-nosed pliers before attaching to the switch terminals. Be sure to turn all the terminal screws down tightly. Then fold the wires into the box and screw the metal panel in place.

All parts of the stand, except the panel are painted flat black, or enameled in whatever color you choose. Sand the wood thoroughly and round the corners slightly. If you use an open-grained wood such as oak or walnut for the distribution-panel frame and the control box, then these parts will be very attractive if finished in the natural color of the wood. After sanding, fill the wood, sand again lightly after the filler is dry, and finish with two coats of varnish or

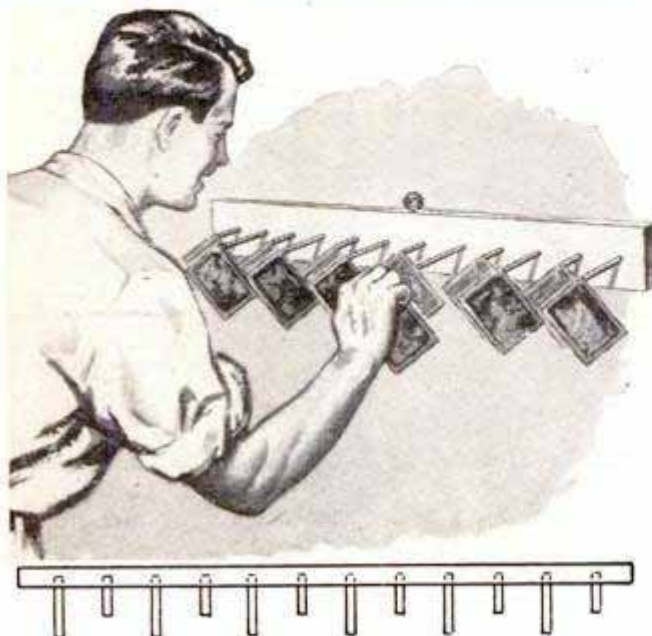


one coat of clear lacquer. Enamel all other parts except the panels. If finishing of the wooden parts is done before assembly the job will be somewhat simplified. The cord or cable connecting the unit to the current source should be of the heavy-duty industrial type which will carry a current load for long intervals at least three times as great as the maximum requirement.

Wall Rack for Drying Cut Film Improvised From Board and Dowels

Having a capacity of a dozen or more sheets of film, this inexpensive drying rack requires little space in the darkroom. The film sheets are attached to the ends of dowels, allowing adjacent film sheets to overlap without touching each other. Pushpins which leave only a small hole in one corner

of the sheet are used to hold the negatives in place. Alternate long and short dowels are pressed in blind holes drilled in the mounting board, the holes being spaced according to the size of the film. A screw eye is centered in the top edge of the mounting board or one is driven near each end to hook over a nail or screw driven into the wall.—Howard N. Findley, Fort Myers, Fla.



Cotton Stored in Bottle Cap

Cotton used for cleaning camera lenses is always handy if it is stored in the cap of the cleaning-solution bottle. As a wad of cotton placed in the cap is compressed when the cap is screwed on the bottle and as only a small amount is used for each application, the supply will last for a considerable length of time.



Wooden Stand Supports Funnels To Filter Photo Solutions



Filtering photo solutions can be done quickly and without danger of contamination by using several funnels supported on a wooden stand. The latter consists of a top piece nailed across two sides so that it can be set over a tray. Holes for the funnel spouts are drilled through the top and a bracing strip is nailed between the lower edges of the two sides at the rear of the stand. Ordinary absorbent cotton is placed in the funnels to filter the solutions. Various types of stands can be made to suit your particular needs, such as a single-funnel stand to filter the solution directly

into a measuring bottle, a double-funnel stand to take a film tank or a stand similar to the one shown to fit over a tray of the size on hand. Finish the stand with asphaltum paint or enamel. Be sure to rinse thoroughly both the funnels and the stand after each use.

Inexpensive Darkroom Heater Utilizes Photoflood Reflector

Installing a 500-watt heater coil in an old photoflood reflector provides an effective darkroom heater at a minimum cost.

The heater stand is made by mounting the upper section of a light stand in a wooden base, the latter being two pieces of wood which are half-lapped and drilled centrally for the standard. If desired, the clamp may be left on the reflector and used to mount the heater in various parts of the darkroom.

As there is no guard in front of the heater, do not use the unit where children are likely to come in contact with it.

Roland Wolfe, Palo Alto, Calif.



Let Your Workshop Pay Santa

How do you spend these cool November evenings and week ends? Ever think about using them for some needed recreation or to make a little Christmas money for yourself and son, or the whole family for that matter? If yours is like most families, Christmas presents put a severe strain on the pocketbook, which can be eased by making some of the gifts yourself. Difficult? No, that's where these evenings and week ends come in. If you already have a shop, you are all set. A little subtle questioning of persons on your list will bring to light things that you can make easily. If you do not have a shop, then *Popular Mechanics* book **PLANNING YOUR HOME WORKSHOP** will take care of that problem. The shop doesn't have to be elaborate—just a bench and a few hand tools will do. In this book you will find many shop floor plans, lighting layouts and projects. It is a must for anyone planning a shop at home. A remittance of \$2.50 will bring it to you.

A simple trinket isn't the only gift for Christmas. No doubt the important lady in your home has wanted a certain piece of furniture for a long time, or perhaps you need a

complete suite and have delayed buying because of the cost. Such a present would be the ideal gift so why not make it yourself?

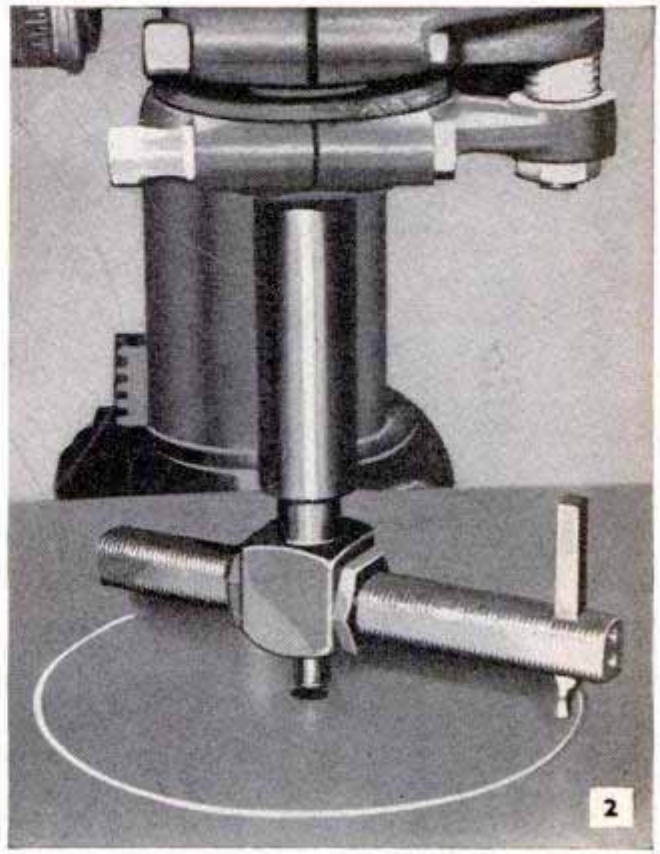
This way it would be doubly appreciated.

Popular Mechanics book **100 BEAUTIFUL PIECES OF FURNITURE YOU CAN BUILD** will get you well on the road to a happy Christmas. This 160-page book is just off the press and contains plans, diagrams and step-by-step instructions for building suites for the dining

room, bedroom and living room as well as matched occasional pieces, all of which are shown in full color. There are also many other occasional pieces, in both period and modern design. Send \$3.00 for the book, get started so you can have the job completed in time and then see what an important guy you are on Christmas morning.



All books are available from *Popular Mechanics* Book Dept., 202 E. Ontario St., Chicago 11

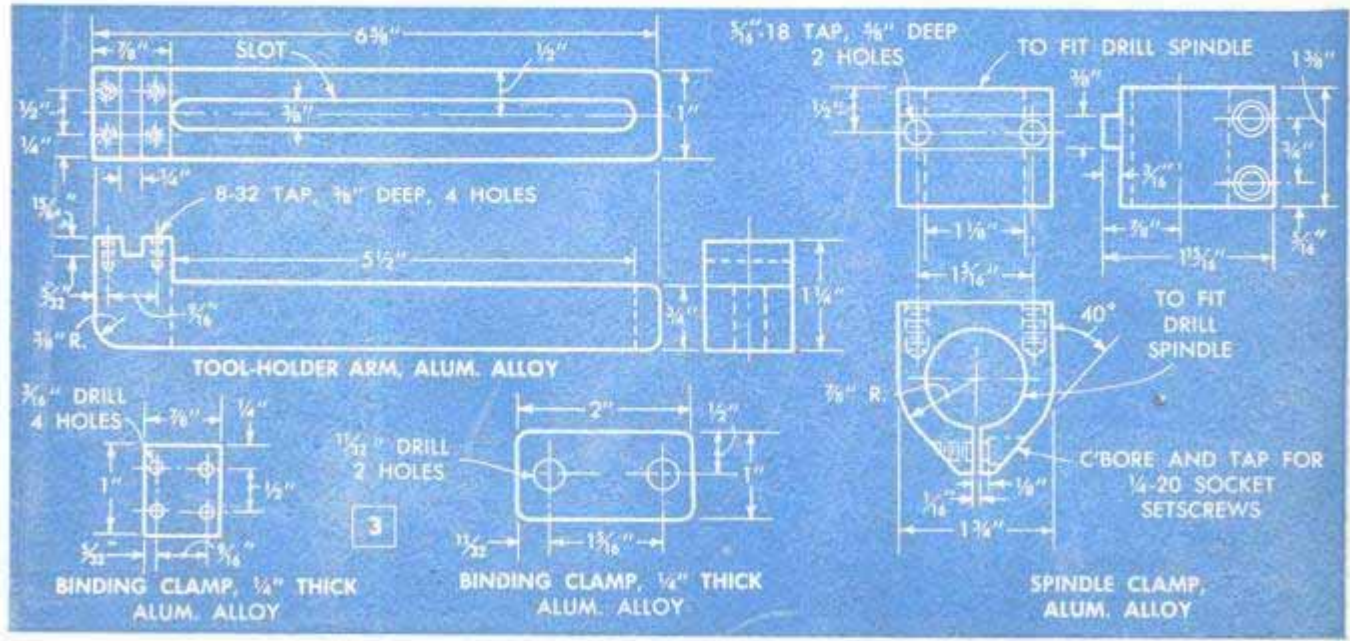


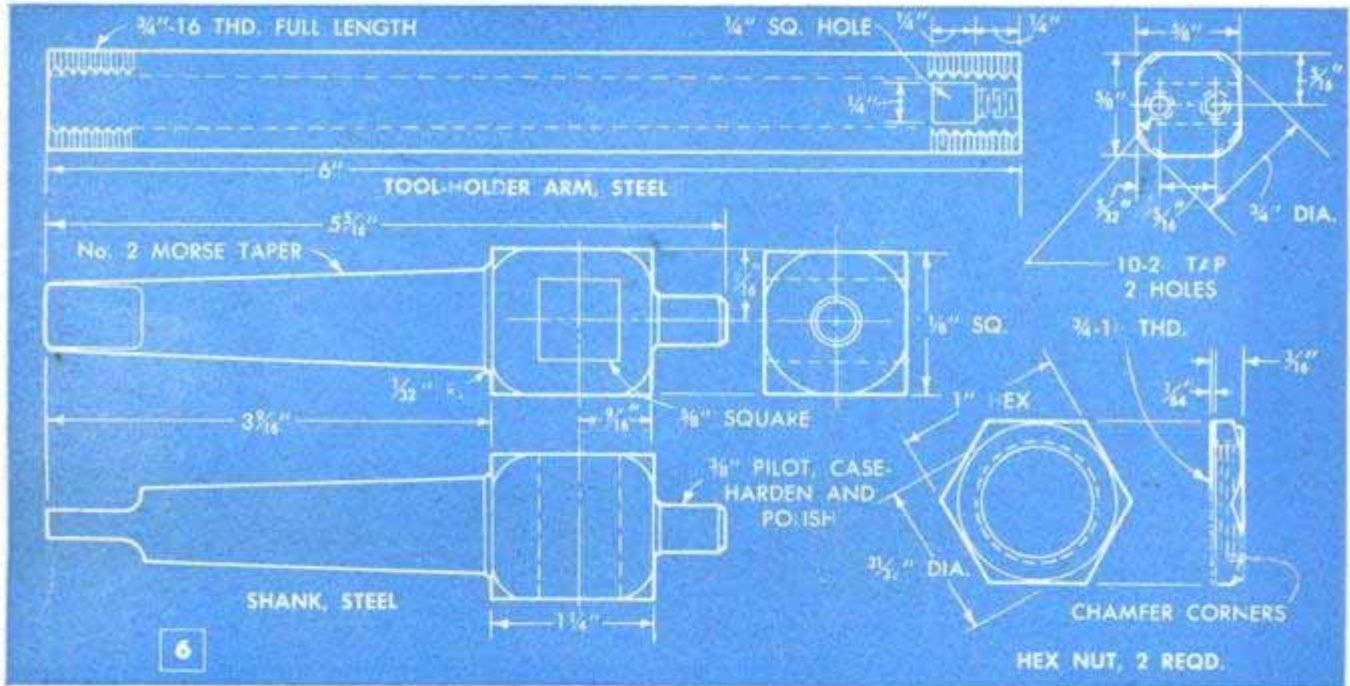
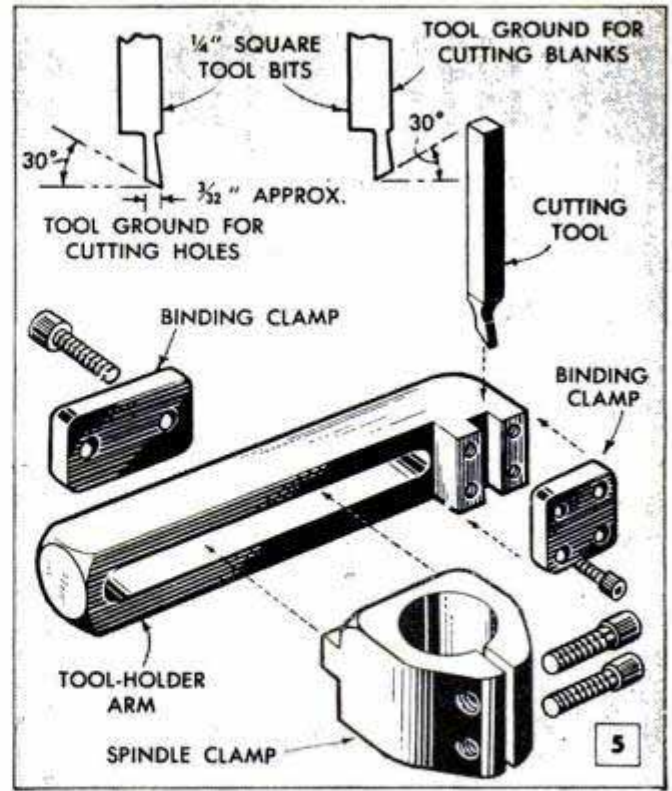
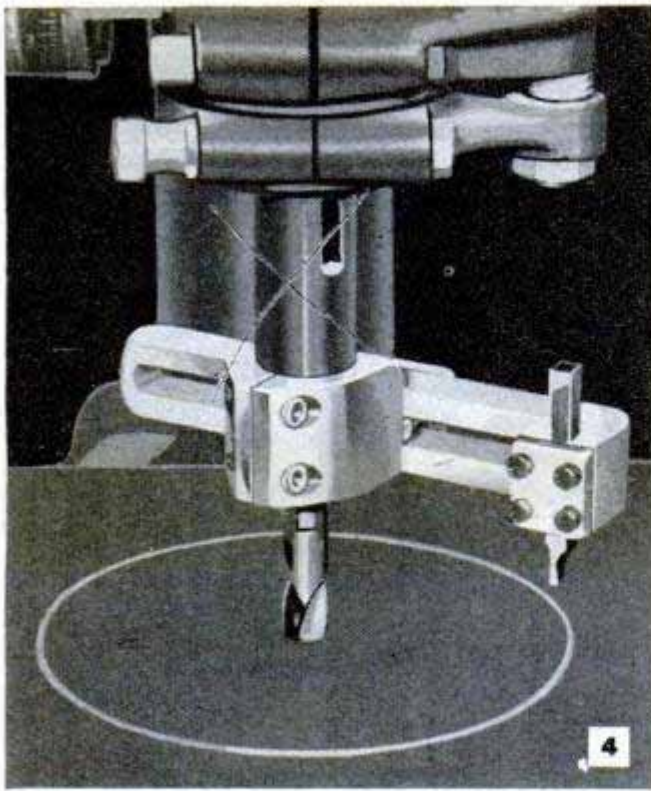
CIRCLE CUTTERS for sheet-metal shops

By J. C. Magee

SMALL SHOPS that do a variety of work in sheet metals have frequent use for circle cutters of the type that can be driven by a drill press. Home craftsmen also find use for these cutters in toymaking and ornamental metalwork. Pictured are two approved designs, one made from aluminum alloy especially for light work in wood, hardboard, plastics and soft metals, the

other for the heavy-duty jobs in metals. The latter type, shown in Fig. 1 and pictured in use in Fig. 2, is fully detailed in Fig. 6. The shank is machined with a No. 2 Morse taper to fit a drill-press spindle, or sleeve, and it also is turned with an integral pilot. The lightweight job detailed in Figs. 3 and 5 and pictured in operation in Fig. 4, clamps directly to the taper spindle of the drill press into which the pilot drill, of the tapered-shank type, is fitted.





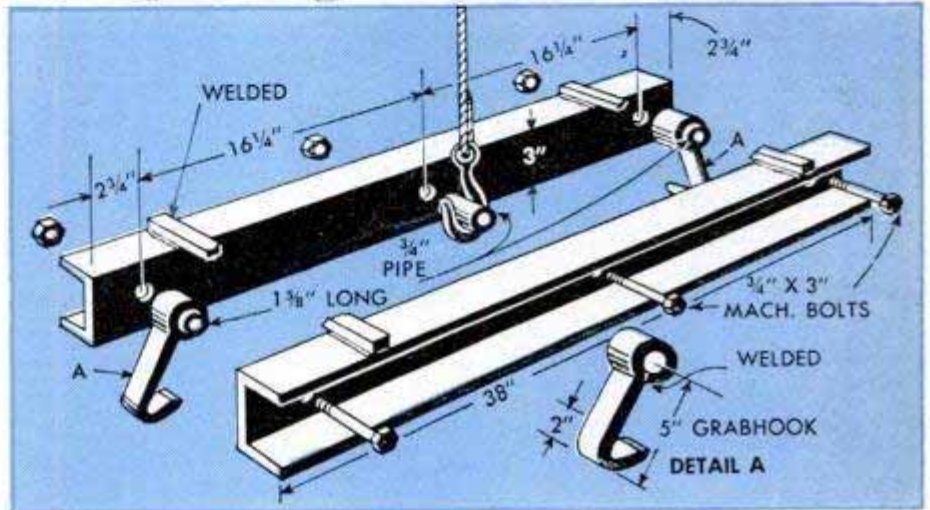
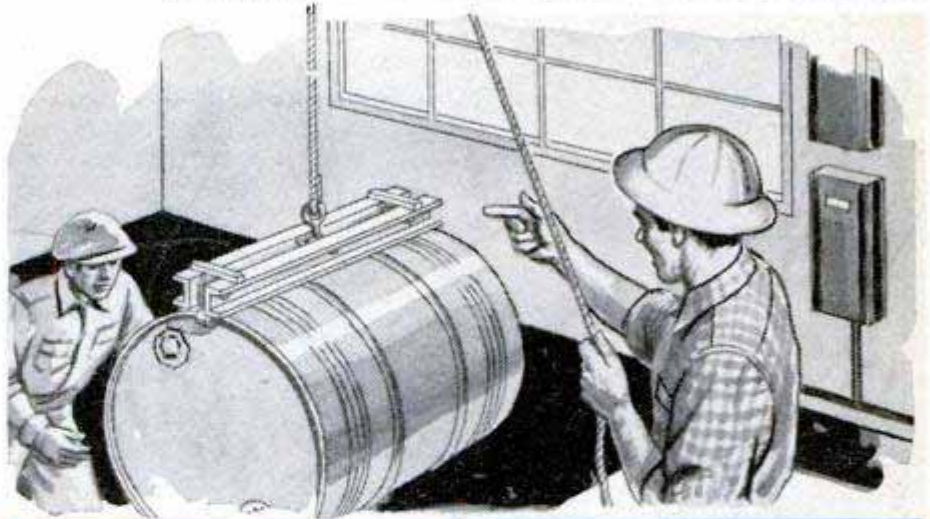
Although the best workmanship would require that the square holes in the shank and tool-holder arm, Fig. 6, be broached, it is possible to drill holes and square them with a file with sufficient accuracy. However, the tool-holder arm must be a smooth, sliding fit in the squared hole in the shank to prevent chattering in heavy cuts. The tool-holder arm, Figs. 1 and 6, is threaded its full length and flats are milled on the four sides, bringing the dimension across the flats to $\frac{5}{8}$ in. The length of the arm gives a maximum radius adjustment of approximately 5 in.

The lightweight cutter, Figs. 3, 4 and 5, does an exceptionally smooth, clean job on a variety of materials. When carefully made, it is practically chatterproof. Both

the cutting tool and the tool-holder arm are held in place with binding clamps of special design and these two parts are attached to the taper sleeve with a binding clamp of sufficient length to hold the parts in exact alignment. Note that the cutting bit is supported in a groove milled across the face of the binding-clamp seat and that the groove is slightly less than $\frac{1}{4}$ in. deep, Fig. 3. This allowance is necessary to permit the clamp to seat the bit firmly. The upper details in Fig. 5 show how to grind the bit for cutting holes and blanks in thin material. When ground for hole cutting, the bit leaves the outer edge smooth. When ground for blank cutting, the inner edge of the cut is smooth. For work in metals, the speed of the cutter should not exceed 100 r.p.m.

Designed for handling full 55-gal. drums where minimum clearance under the hoist hook is important, this drum sling affords as much as a 16-in. gain in hook-to-ground clearance. In addition, the sling is heavy enough to permit removing the antikinking weight from a cable-equipped hoist in some cases, thus gaining several inches in hoisting distance. The frame of the sling consists of two lengths of 3-in. steel channel joined with $\frac{1}{2}$ -in.-sq. bar stock. Aligning $\frac{1}{16}$ -in. holes are drilled through the frame, and a grabhook is fitted at each end, using a short length of $\frac{3}{4}$ -in. pipe as both spreader and bearing surface. The hoist hook engages a length of pipe bolted between the channels. Detail A shows how the grabhooks are formed from $\frac{1}{2} \times 1\frac{1}{2}$ -in. bar stock.—Harry H. McIntyre, Midland, Mich.

Low-Clearance Hoist Sling of Steel Channel Grasps Drums With Positive-Action Hooks

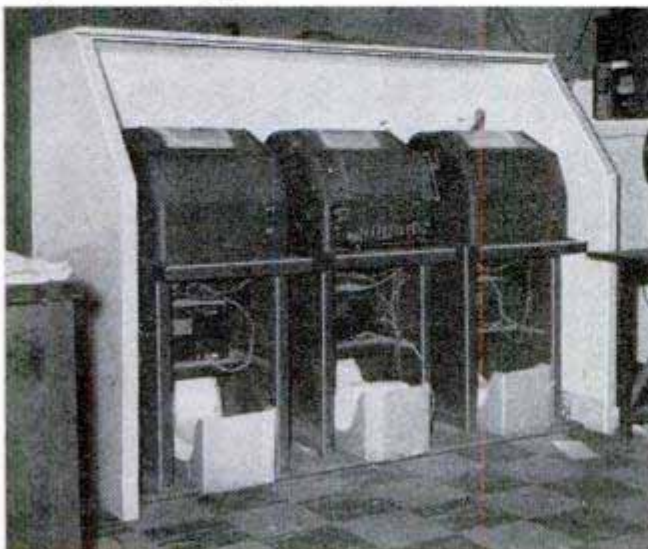


Correcting Typewritten Sheets Stapled Together

To make a correction on a typewritten page, which has been stapled to other pages, insert the page into the machine in front of the platen. To do this, place a sheet of paper in the typewriter and turn the platen until the paper projects above the roller guides. Then insert the page to be corrected between the projecting sheet and

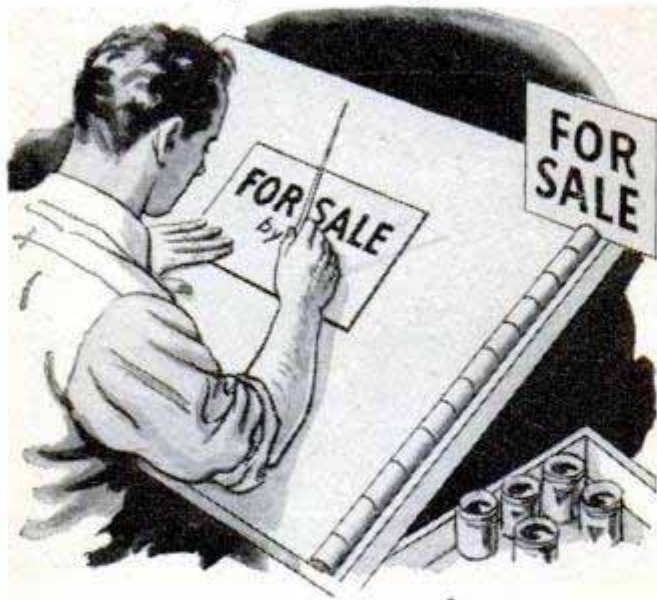
platen at the front of the platen, and turn the platen backward until the second sheet is ejected. This pulls the typewritten page around the platen where it can be positioned to make the correction. This method, however, cannot be used where corrections must be made near the top of the page.—T. E. Mortimer, Isola, Miss.

Open Teletype Enclosure Has Sound-Absorbing Walls to Minimize Noise



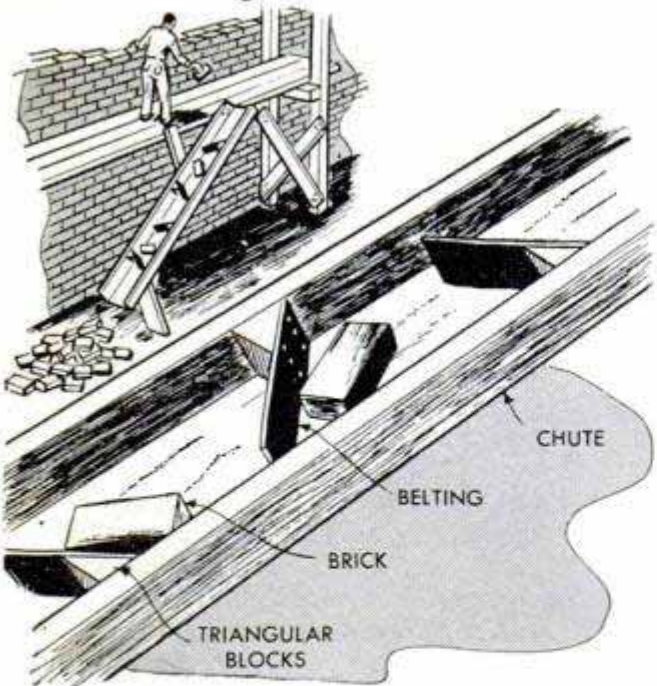
Newspaper offices and broadcasting stations as a rule have Teletype machines running constantly, and this is often annoying when there is other work being done in the same room. However, it is possible to eliminate most of this disturbance without making the machines less accessible. An open-faced enclosure lined with sound-absorbing material will do the trick. As an example, take the enclosure and three machines illustrated. The enclosure in this case is $2\frac{1}{2} \times 4\frac{1}{2} \times 5$ ft., and is made from 2×4 s covered on the outside with $\frac{1}{2}$ -in. wallboard and lined inside with sound-absorbing material, $\frac{7}{8}$ in. thick, forming a dead-air space between inner and outer walls.—S. P. McMinn, Fort Myers, Fla.

Notched Molding on Drawing Board Holds Freshly Inked Signs



When inking a number of simple hand-lettered signs, there is always the danger that the ink on a finished sign will be smeared before it has had a chance to dry. To dry the signs safely, stand them upright in this handy rack which is made from a length of 1-in. half-round molding. Cut a series of saw slots partially through the molding and fasten the rack along one side of the drawing board or to a convenient table top.—Edmund Loper, Salem, N. J.

Flexible Baffles in Chute Retard Falling Bricks



To reduce the percentage of damaged bricks on a wrecking job, one contractor installed flexible retarders in the chute which conducted the loose bricks from the scaffold to the ground. The retarders were made by nailing triangular blocks to the

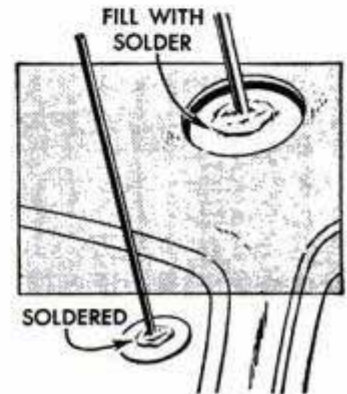
sides of the chute. The blocks were spaced alternately with the sloping edge up as shown. Then lengths of heavy rubber belting were nailed securely to the sloping edges of the blocks, the free end of each piece of belting reaching diagonally across the raceway. Each brick coming down the chute must force its way past the retarders. This slows the fall so that the brick drops lightly onto the pile at the bottom of the chute without damage.

W. C. Wilhite, Carlinville, Ill.

Repairing Holes in Car Bodies Without Removing Upholstery

Small holes remaining in car and truck bodies after the removal of identification lights or spotlights can be repaired quickly from the outside without the necessity of taking off the upholstery or trim.

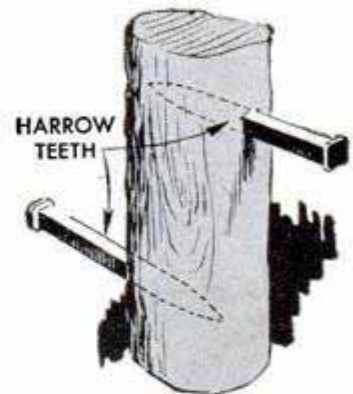
To provide a backing for the solder which is used to fill the hole, carefully cut a sheet-metal disk slightly smaller than the diameter of the hole, and solder a 6-in. length of wire to the center of the disk. Using the wire as a handle, hold the disk in the hole barely below the outer surface of the body metal. Then fill the hole with solder and, after the solder has cooled, file or cut off the wire. Finish the new surface flush with the car body prior to painting.



Claude E. Pitts, Lexington, Mo.

Scaling Yard-Light Pole

After experiencing the trouble of setting up a heavy ladder each time it was necessary to replace a burned-out bulb in his yard light, one farmer drilled a series of small holes on opposite sides of the light pole and drove in discarded teeth from a peg-tooth harrow to form steps for easier climbing. The holes are carefully located so that one tooth is about 14 in. above the other on alternate sides of the pole. The first tooth is placed 4 to 6 ft. above the ground to prevent children from climbing the pole.



Kenneth Hadenfeldt, Storm Lake, Iowa.

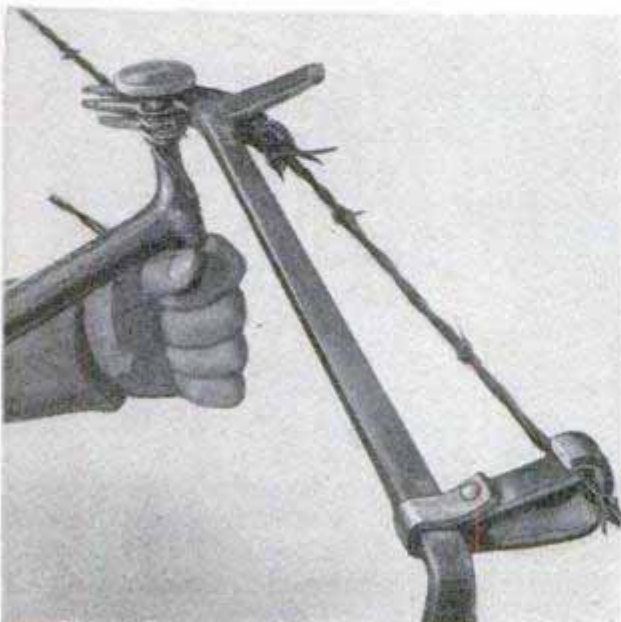
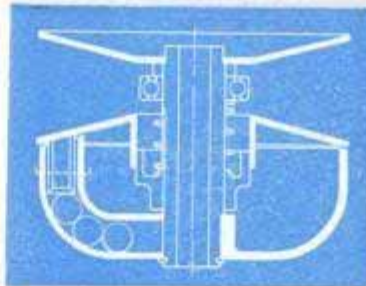
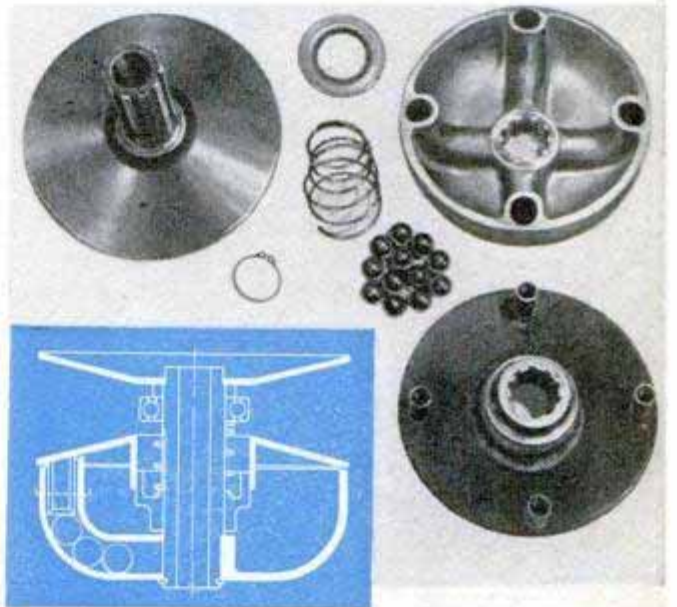
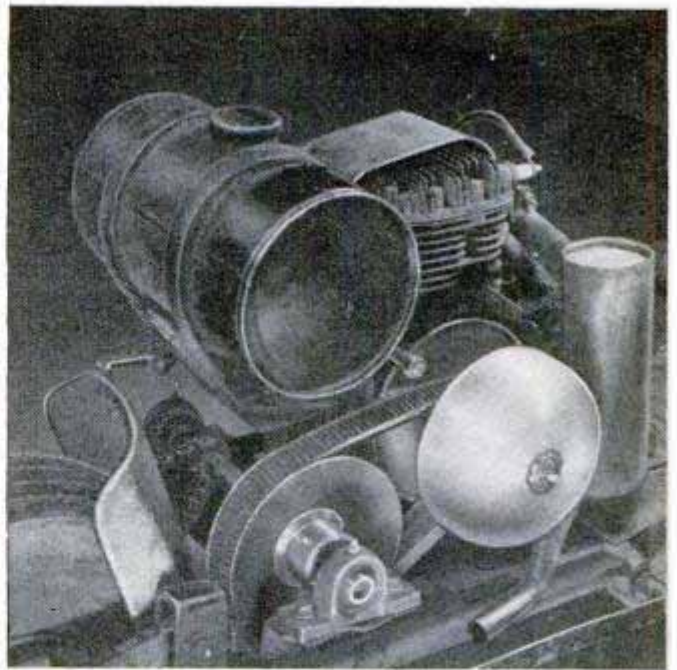
PRIZE-WINNING INVENTIONS

EVERY inventor interested in promoting his ideas should consider the Inventors Congress held at Pueblo, Colo., during the latter part of June each year. Sponsored by the Pueblo Chamber of Commerce, this show offers inventors the opportunity of displaying their inventions to the public, and also a possibility of interesting manufacturers. The three items pictured shared the top prize money this year.

The first-prize article was a variable-speed pulley, which also could be used as a clutch on belt drives such as pictured on the scooter at the top of the page. This pulley differs from others in that steel balls, when under centrifugal force, bear against a pressure plate—one side of the pulley groove—to overcome pressure of a coil spring and thus increase the diameter of the pulley groove. The amount of increase is dependent on the speed of rotation. The detail in the center of the page shows the parts.

The fence-wire stretcher and splicer shown in the lower left-hand detail took second place, and consists of two parts with which broken wires can be pulled together and spliced or stretched as required. One part clamps to the wire near one broken end, and the other part, which somewhat resembles a hammer, is used to wind up the wire as pictured.

First prize in the gadget division of the congress went to a folding high chair pictured in the lower right-hand detail. As indicated, the chair folds flat for easy transportation or small storage space, yet can be opened to provide a sturdy chair of full size and neat appearance.





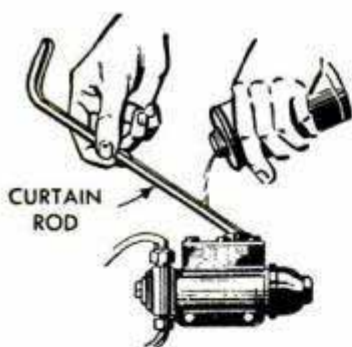
Two-Wheel Cart for Hauling Linen Speeds Motel-Operator's Chores

Having a number of cottages that require fresh linen every day, one motel operator devised this plywood cart to lighten the job of changing the linen. The front of the cart is divided into individual compartments for throw rugs and linens plus a drawer for cleaning supplies, while the rear of the cart forms a generous-sized laundry bin. As the cart is made entirely of $\frac{1}{2}$ -in. plywood and supported by the dividing partitions, the use of framing is eliminated. The cart rolls on two semipneumatic wheels positioned slightly forward of the center and rests on a pipe crosspiece fitted between two handles of bent pipe. The handles are drilled and bolted to the plywood sides. A door which comes within a foot or so of the top of the cart is hinged to the back to facilitate removal of the soiled laundry. Although the original cart was approximately 2 x 4 x 4 ft. over-all, these dimensions as well as those of the individual compartments are determined by the size of the finished linens and the quantity to be carried.

P. O. Anderson, Tacoma, Wash.

Filling Master Brake Cylinder With Aid of Curtain Rod

After experiencing considerable difficulty filling master brake cylinders with fluid, one auto mechanic did a little experimenting and finally came up with this novel stunt, which, he says, works perfectly.



When filling brake cylinders, especially those located close up under the cowl, he places one end of a short length of flat telescoping curtain rod in the filler opening of the cylinder. Then he pours the fluid

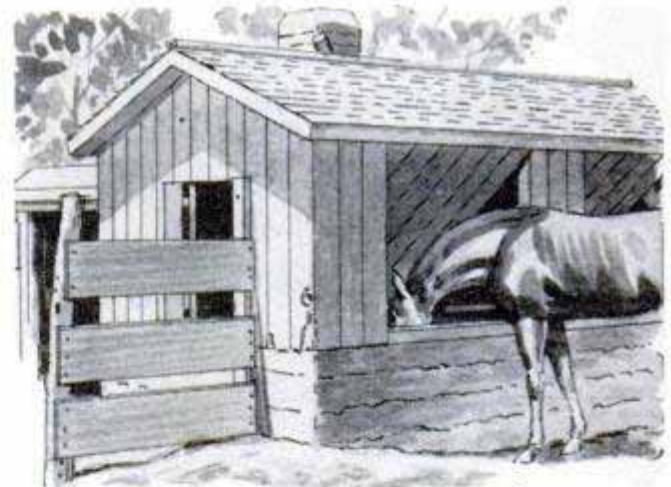
into the rod channel at a point above the filler hole in a small steady stream. The liquid will follow the rod down to the end where it runs into the cylinder reservoir without dripping or spilling.

F. Schafer, Oak Ridge, Tenn.

Removing Broken Screws

Hardened-steel screws from which the heads have been broken can be removed by grinding a small pocket in the top end. This produces a shoulder against which a pin punch can be held for backing out the broken stub. Just chuck a small grinding wheel in a hand grinder and grind the pocket near the edge of the screw, holding the wheel at an angle so that one side of the pocket will be nearly vertical. To back out the stub, tap the shoulder until the stub can be grasped with a pair of pliers.

Boarded Stock-Tank Shelter



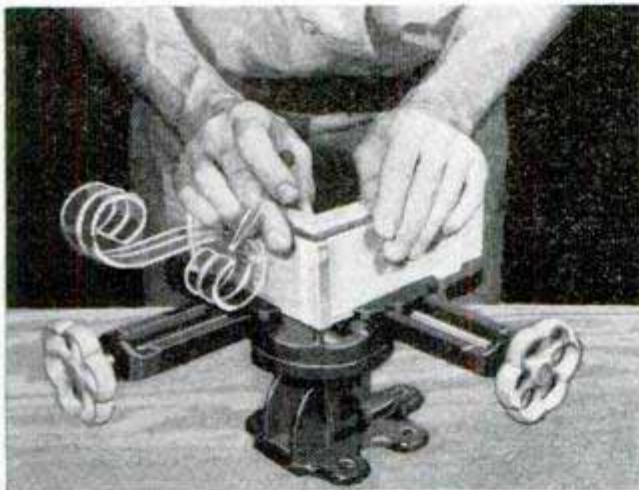
In severely cold weather, farmers and stockmen experience considerable trouble with freezing of exposed stock tanks, even though the tank heater is kept going full blast during the day and well into the night. One farmer, having this difficulty with a large, exposed concrete tank, built a tightly boarded and roofed shelter over the tank and also laid up a brick chimney to which the tank heater is vented. One side of the structure is fitted with large doors hinged at the top so that they can be swung inward during the day to give livestock access to the water. By closing the doors at night and banking the fire in the tank heater the water is prevented from freezing in the most severe weather.

PICTURE-FRAME VISE

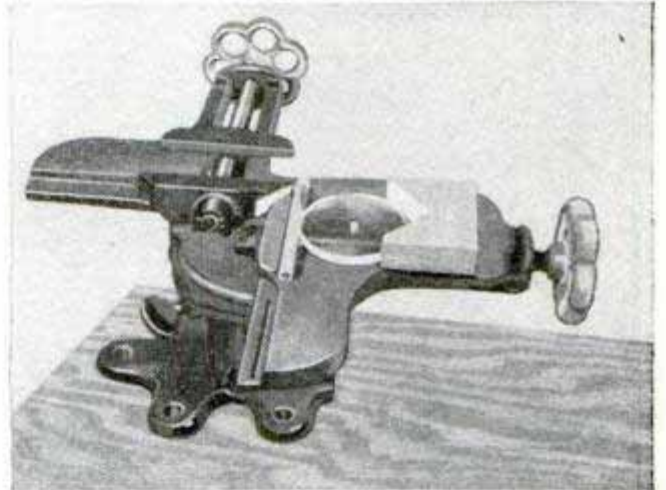
has many uses in the shop

By John P. Arnold

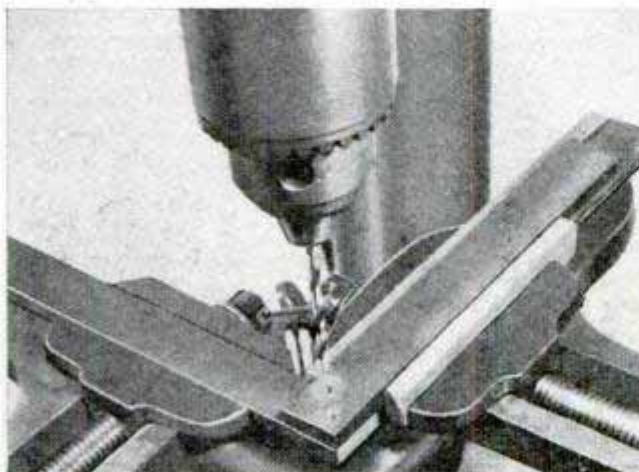
A UNIVERSAL miter vise of the type used in assembling picture frames is handy in the shop for holding small, intricate parts firmly in place when assembling. The narrow metal jaws of the vise can be built up with hardwood pads for clamping work up to 2 or 3 in. wide. Wooden novelty boxes, mitered frames and similar parts are easily clamped in position for nailing, gluing, cementing or soldering. The illustrations below and at the right suggest a few of the many applications of this type of vise. Plastic parts of a considerable variety of shapes and sizes are readily held in place for cementing as in the upper right and left-hand photos. The unit pivots on the base so that it may be used either in the horizontal position as shown or in the vertical position. It may also be tilted at any convenient angle between and locked firmly in place. The movable jaws open to approximately 4 in., which makes it possible to use the unit as a drill vise, as in the lower left-hand photo, and for holding metal parts when soldering or brazing as pictured below at the right.



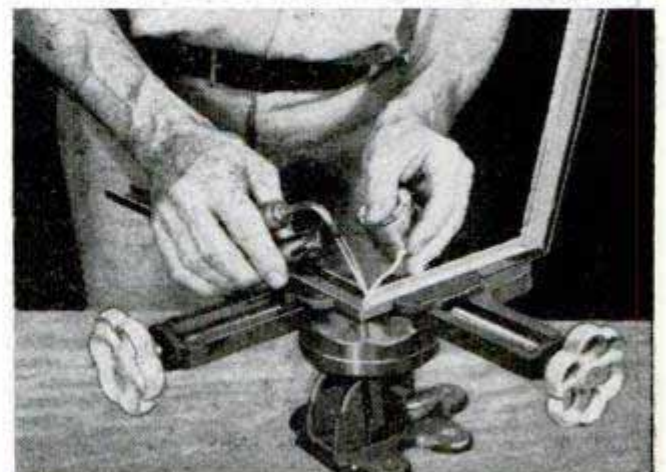
Plastic butt joints can be easily assembled and firmly clamped without marring adjoining surfaces



The wide jaws and flat bed of the vise are well adapted to clamping plastic parts for edge-cementing



Showing how vise can be used on a drill press on work where accurate alignment of parts is important



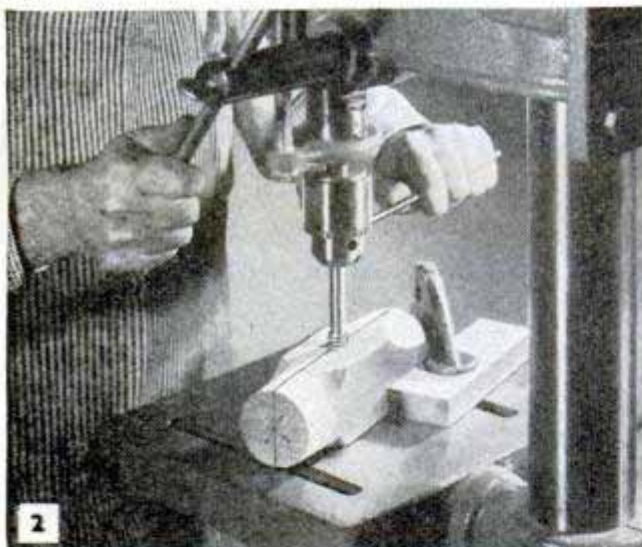
Securely holding two small pieces of brass channel positioned at an accurate right angle for soldering

How to Use

By Sam Brown



1 ABOVE, TAPPING IS DONE FIRST BEFORE MAKING SPINDLE. BELOW, CHUCKING ASSURES A TRUE START

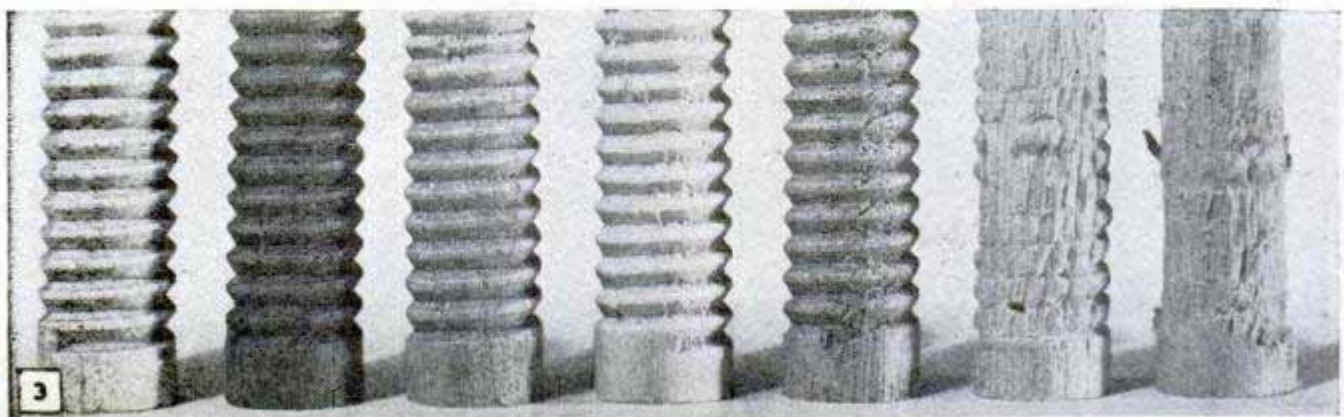


2

ONE OF THE less-known hand tools, yet one most home craftsmen often need, is the screw box, a device for cutting threads on a wooden spindle. The screw box is matched with a corresponding tap for internal threading, the two permitting all of the varied applications of the screw thread. Tap sizes run from $\frac{1}{4}$ to $1\frac{1}{2}$ in. in diameter, the corresponding screw box cutting a somewhat smaller spindle diameter. Practically all of the tools are handmade, with the tap matched to the screw box and sold as a set. Other than tap diameter, specifications vary considerably so that the table in Fig. 6 is only an approximation.

General construction: The working parts of a screw box and tap are given in Fig. 6. The metal thread cutter fits in a recess in the wooden body and is nonadjustable except that it can be driven forward to compensate for wear. The thread shape of the tap is approximately 68 deg., 8 deg. wider than the standard 60 deg. used for threads in metal. Screw boxes are available for cutting thread shapes ranging from 65 to 110 deg. Taps present no difficulty in conditioning or using. The cutting action can be improved slightly by giving the cutting edges more curve with a tiny grinding wheel as in Fig. 5.

Using the screw box: The spindle to be threaded should be turned to a snug fit inside the lead hole of the screw box, and the end of the work should be tapered a little to allow the thread to start easily. The screw box is turned like a tap wrench, Fig. 4, using a little pressure at first to get the cut started. If the cutter is sharp and properly set, the job is simple and fast. Evidence of a good cut is a continuous, peeling chip, as shown in Fig. 4. It is helpful in all cases to oil the work. Use linseed oil, rub-



3

HARD MAPLE
(BEST)

WALNUT
(GOOD)

SOFT MAPLE
(FAIR)

BIRCH
(FAIR)

MAHOGANY
(POOR)

FIR
(FAILURE)

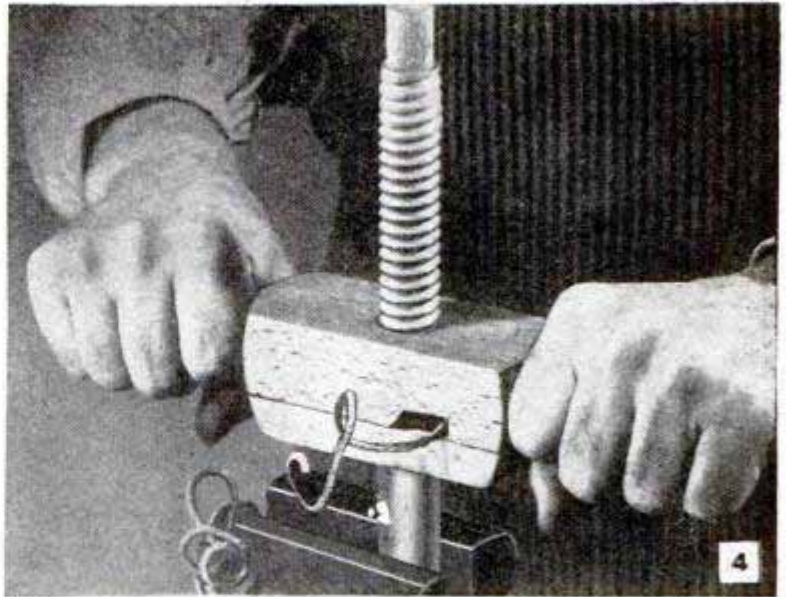
POPLAR
(FAILURE)

WOOD TAPS and SCREW BOXES

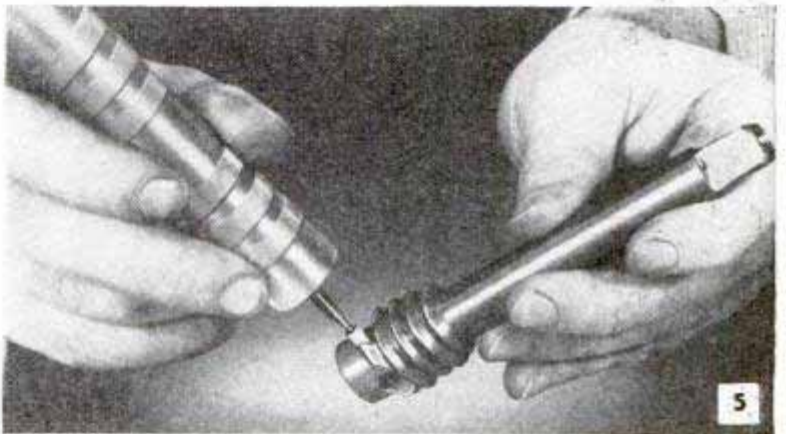
bing oil or castor oil—anything to bind the surface of the wood. However, don't expect oil to work wonders. If you are getting a fair thread with a slight amount of tearing, oil will make it better but it will not overcome a dull cutter or improper setting of the cutter.

Using taps: The tap will tear the wood slightly on entering and emerging. Where appearance is important, the best way to eliminate this is to use thick stock and then slice off $\frac{1}{16}$ to $\frac{1}{8}$ in. to remove the torn portion. Fair results can also be obtained by clamping the work between wood blocks. It is impractical to tap into end grain. When possible, the tap should enter from the flat grain side instead of the edge grain. Getting a straight start is the only difficult part of tapping. Chucking of small taps in the drill press, Fig. 2, is recommended. Tapping should be done before the work is cut to size, Fig. 1, as strain on delicate edges, especially near ends, may cause splitting.

Cutter mechanics: The main secret of a clean thread is minimum clearance behind the cutter. As a refresher, it is worth while to take a wood chisel and do some cross-grain paring, Fig. 7. You will find that a low angle of clearance—



LONG, PARING CHIP INDICATES PROPER ADJUSTMENT



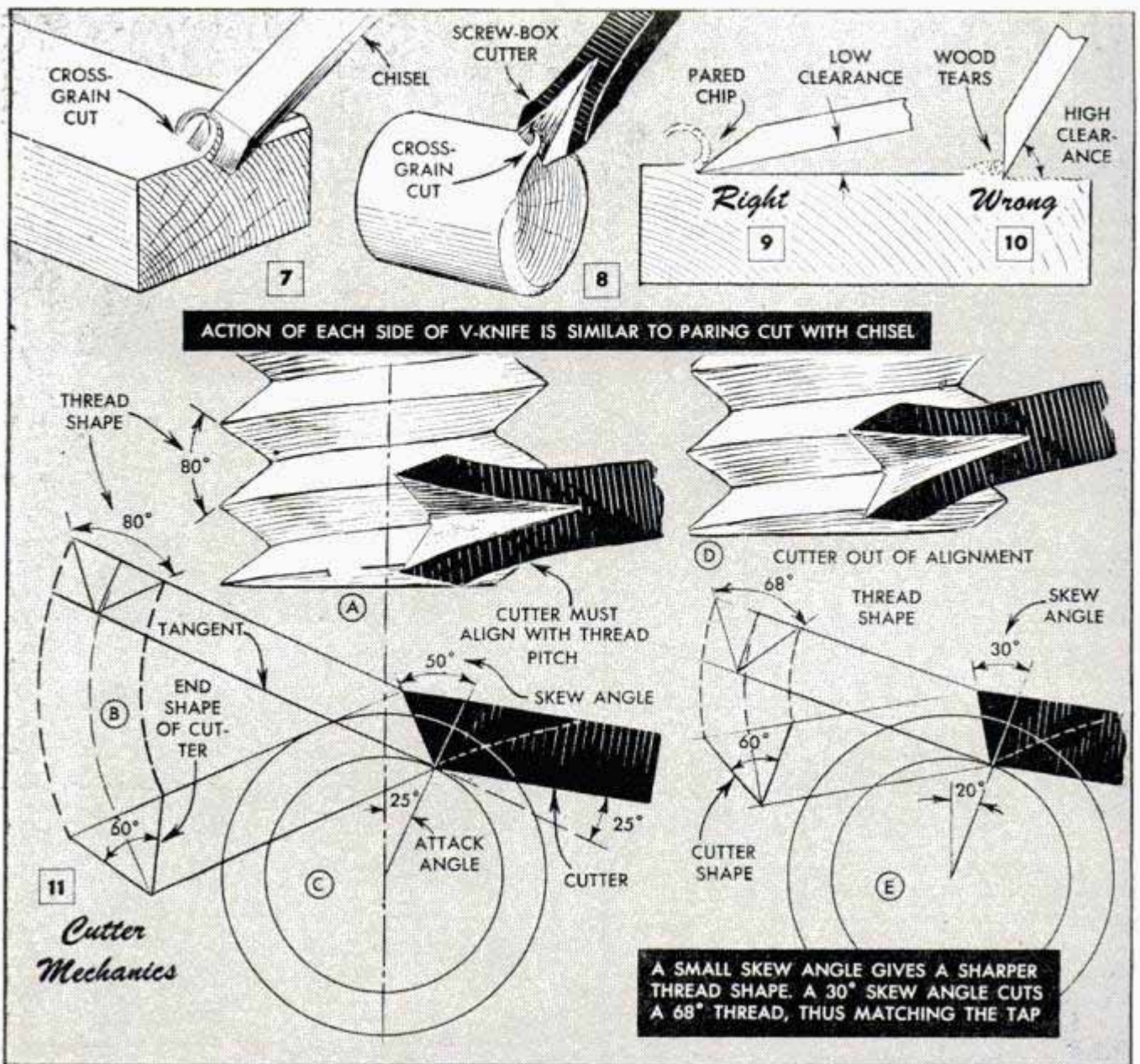
A LIGHT TOUCH WITH HAND GRINDER SHARPENS TAP

Average DIMENSIONS*

TAP DIA.	SPINDLE DIA.	TAP DRILL	THREADS PER INCH
$\frac{1}{4}$ "	$\frac{7}{32}$	$\frac{1}{8}$	10
$\frac{3}{8}$ "	$\frac{1}{4}$	$\frac{1}{4}$	9
$\frac{1}{2}$ "	$\frac{3}{8}$	$\frac{3}{8}$	8
$\frac{5}{8}$ "	$\frac{1}{2}$	$\frac{1}{2}$	6½
$\frac{3}{4}$ "	$\frac{5}{8}$	$\frac{5}{8}$	5
$\frac{7}{8}$ "	$\frac{3}{4}$	$\frac{3}{4}$	5
1"	$\frac{7}{8}$	$\frac{7}{8}$	4
1½"	1	1½	4
1¾"	1½	1¾	4
1¾"	1¼	1¾	4
1½"	1¾	1¾	4

*Tools are handmade and dimensions may vary from those given

Screw Box



practically touching the wood—is essential for clean cutting. Observe also that if the chisel is held at a slant across the direction of cut a better slicing action will be obtained. These two features—minimum clearance and skew angle—apply to the screw-box cutter, Fig. 8. Each side of the vee cutter can be considered as a separate chisel. The clearance behind the cutting edge must be minimum and the cutting edge should attack at a skew angle.

If a new box does not cut, a systematic check should be made. First, see if the cutter is set too deep (too far forward). This is a common fault in a new box and can be corrected by regrinding the cutter, carefully maintaining the same angles. Next, check the cutter position in relation to the guide thread in the cutter body. The cutter point must align with the thread, as can be seen in Fig. 6. Now, turn the spindle into the box and check the slant of the cutter—it should align with the pitch of the thread as shown in detail A of Fig. 11. Any departure from this position will increase the

clearance angle on one side of the cutter and decrease it on the other as at detail D.

Carefully examine the cut thread on a wooden spindle at the point where the cutter stopped. If the cut is shallow and appears polished, it means the cutter lacks clearance on one or both sides. If you want to check this all-important point exactly, paint the underside of the cutter with bluing and then test to see if the bluing rubs off. Actually the bluing may rub off with a perfectly set cutter, but it should not rub off heavily. Rubbing can be corrected by regrinding or by pushing the cutter back in its slot. However, in no case should the chisel wedge be reduced to an angle of less than 20 deg. If the bluing does not rub off, the cutter evidently has clearance, but it may have too much clearance, and this is the condition that causes tearing. See Figs. 9 and 10. Excessive clearance can be reduced by regrinding or by pushing the cutter forward. It should be noted that the inner of the two chisels forming the vee knife requires less clearance than the outer chisel

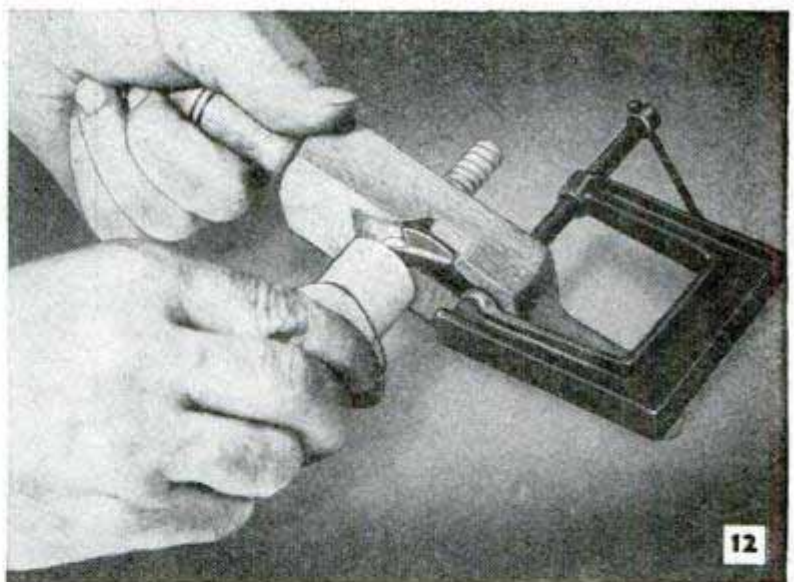
because of the slant of the thread. Slight changes in the clearance angles can also be obtained by wedging the cutter up or down in its slot, but any radical change obtained by removing wood from the cutter slot should be avoided until everything else has been checked thoroughly.

Thread shape: In addition to giving the cutter a slicing action, the skew bevel controls the shape of the thread. A skew angle of 50 deg. will give a thread shape of about 80 deg., as shown in detail C, Fig. 11. Threads up to 90 deg., Fig. 15, are satisfactory for most work. If the skew angle is decreased, either by grinding or by tilting the cutter, the cut thread will be sharper, as shown in detail E. The small skew angle also gives more clearance. It should be noted that the skew angle is measured on a diagram of the work and is not the angle of the cutter itself. Attack and tangent angles, detail C, are not fixed values. The cutter will work at any point around the circle and can be set from exact tangency to about 40 deg. above the tangent from the contact point.

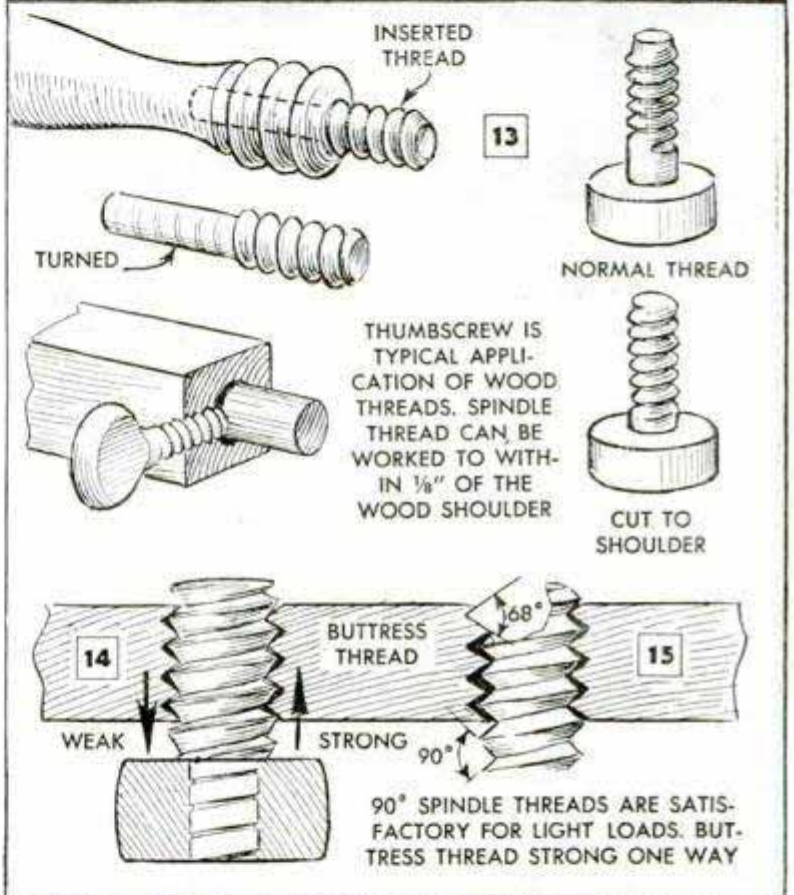
Most cutters will cut a more or less buttress thread, although not the extreme shown in Fig. 14. If the cutter is working well, it is not worth while bothering about this condition. However, if you are using inserted threads, Fig. 13, it is obviously good practice to reverse the thread as needed to resist the load. A thumbscrew should be reversed from the Fig. 14 position, and the same applies to a hand screw, Fig. 16. A definite buttress thread can be corrected by cocking the cutter slightly in its slot or correcting the cocking which has caused the off-balance thread.

Shoulder threads: With the cover plate in place, the screw box will thread to within about $\frac{1}{2}$ in. of a shoulder, Fig. 13. With the cover plate removed and the cutter clamped in place, Fig. 12, threads can be cut to within $\frac{1}{8}$ in. of a shoulder. If a complete thread is required, the remaining $\frac{1}{8}$ in. can be filed by hand or an inserted thread can be used.

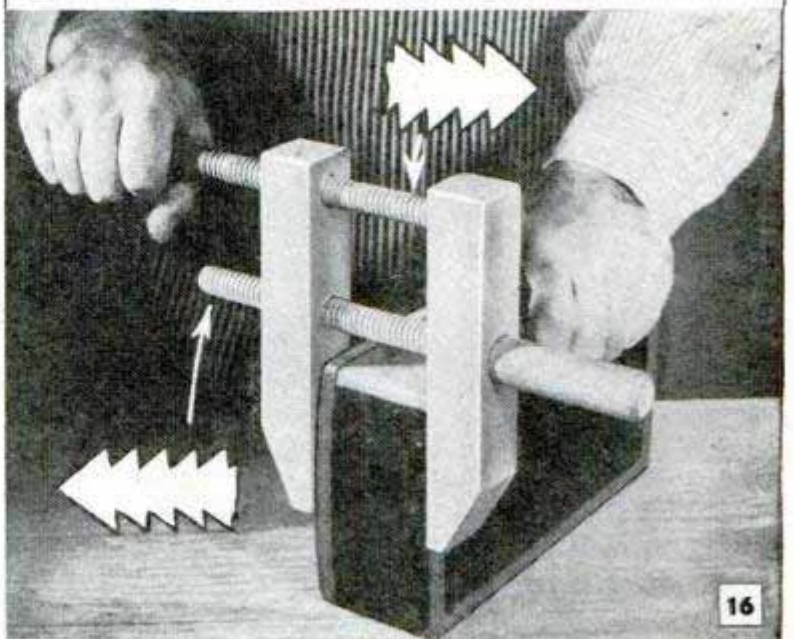
Grinding the cutter: Cutters are carbon steel and the thin chisels (20 to 30 deg.) must be ground carefully, wetting the cutter repeatedly to avoid burning. The



12



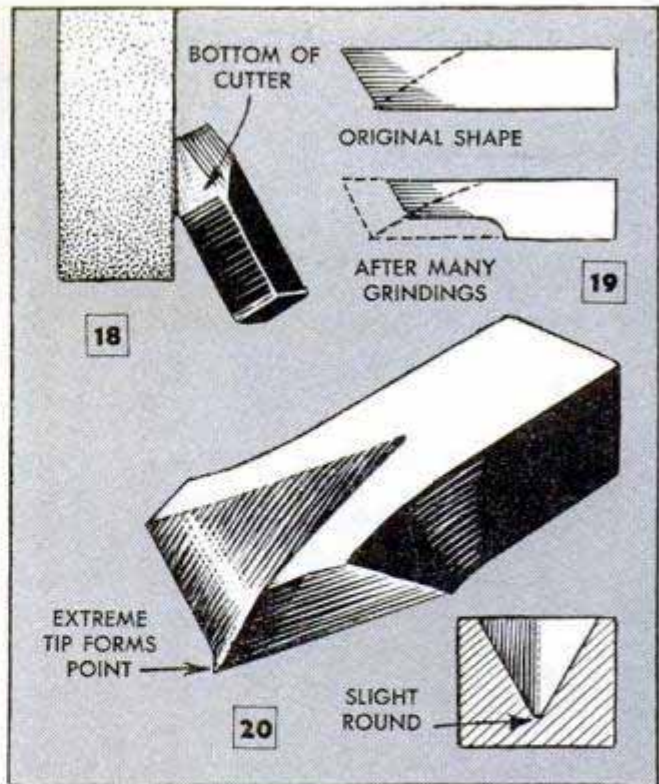
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16



17



18

19

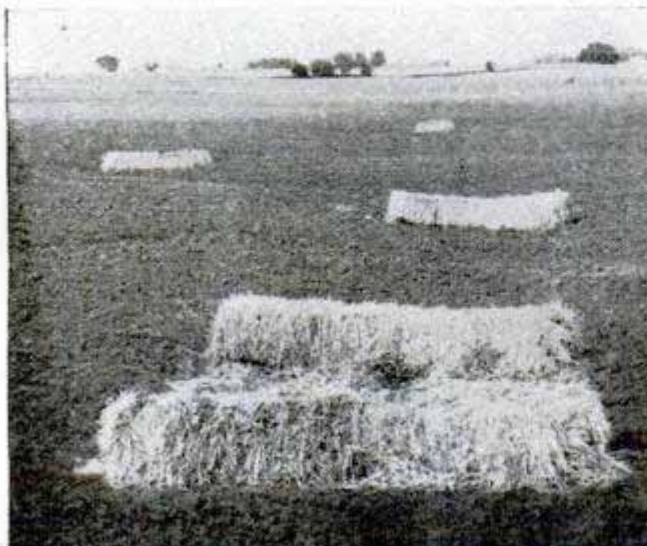
20

best grinding position is shown in Figs. 17 and 18. The bevel must be perfectly flat. Grinding will raise a small projection at the extreme tip of the cutter as indicated in Fig. 20. This is controlled by the round at the base of the vee groove—the more round, the more projection. Normally, the slight round obtained with a triangular file is sufficient. The cutter should not be ground unless chipped. Once ground it should be honed to a perfect edge, and will stay sharp by repeated honings. If grinding is required for any reason, the cutter will retain pretty much its original vee, but will have less height. Surplus metal at bottom of cutter should be ground back squarely, Fig. 19.

Woods to use: Threading a wooden spindle is a delicate job of cross-grain cutting and only a few woods will hold the cut without crumbling or tearing. White birch and hard maple are commonly used. Other good woods are apple, pearwood, cherry and walnut. Hard maple is by far the best and, since it is readily obtainable, there is no point in using anything else. Fig. 3 gives typical examples of how different woods thread. The tap will tear on the cross-grain portion of almost any kind of wood, but at the same time it will make a workable thread in almost any wood. As this part of the work is concealed it does not demand the perfection of the spindle thread.

Bales of Straw Check Soil Erosion in Sloping Fields

To prevent soil washing in sloping fields which have been newly planted, one farmer dams the shallow waterways with bales of



straw. The straw dams are placed across the waterway at intervals extending all the way from the top to the bottom of the slope, the distance between the dams varying with the degree of slope. On a steep slope the dams should be placed only a few feet apart, but where the fall is not more than 6 in. to 1 ft. in 100 ft. the dams may be placed from 1 to 3 rods apart. The purpose of the dams, of course, is to slow the flow of surface water and thus prevent it from carrying loose topsoil down the slope and forming a deep gully. This same method of checking the surface movement of water from heavy rains also can be used when establishing a sod waterway. The dams will slow the flow of water until the grass is rooted and has attained sufficient growth so that the individual blades will flatten and overlap under the flow of water.

Sturdy Sawhorses From Angle Iron

Wooden sawhorses soon break up under rough usage on the farm, so many farmers build a pair to suit their own needs from pipe and angle iron welded together to form light, rigid units. The legs are formed in pairs by bending 1 or 1½-in. pipe to a U-shape and then welding 2-in. angle iron to the leg units. Note in the illustration that the angle is turned with the corner up and that the sawhorse legs are inclined, or splayed, about 12 deg. from the vertical. After welding, place the units on a level floor and saw off one or two of the legs so that each sawhorse stands firmly.

A. M. Wettach, Mt. Pleasant, Iowa.

Sand Supports Work for Welding



Irregularly shaped parts or complicated assemblies which cannot be clamped or held by hand for welding are easily supported by partially embedding them in a container filled with sand. Pour the sand into a metal container such as a large

washtub or the bottom section of an oil drum, making the sand layer several inches deep.—George J. Berkwitz, New York City.

Dual-Wheel Farm Trailer Used on Muddy Fields

For heavy loads and a high degree of flotation on muddy fields, a dual-wheel trailer is recommended. This combination will also be a lifesaver for your tires, and in case one should become punctured the



trailer can be kept in operation until it is convenient to make repairs. The rig pictured here was made from the rear end of an old truck, using the original springs.

L. H. Houck, Jefferson City, Mo.



Barrel Provides Self-Feeder

A small barrel of the type used for storing buttermilk, or an old churn of the tumbler type, is just the thing for making a self-feeder for sheep. First, tighten the hoops by driving them down, then nail the hoops to the staves so that they cannot loosen. Next, drill holes for the insertion of a compass-saw blade and cut spaced openings around the circumference by sawing through the staves between the center hoops.

Leave at least one full stave between the openings, as pictured. Usually, the end cut from a 55-gal. oil drum will fit neatly over the top of a barrel of this size to provide a weather-proof cover. Self-feeders made in this way are suitable for either hay or grain.



Colors Identify Edges of Scale

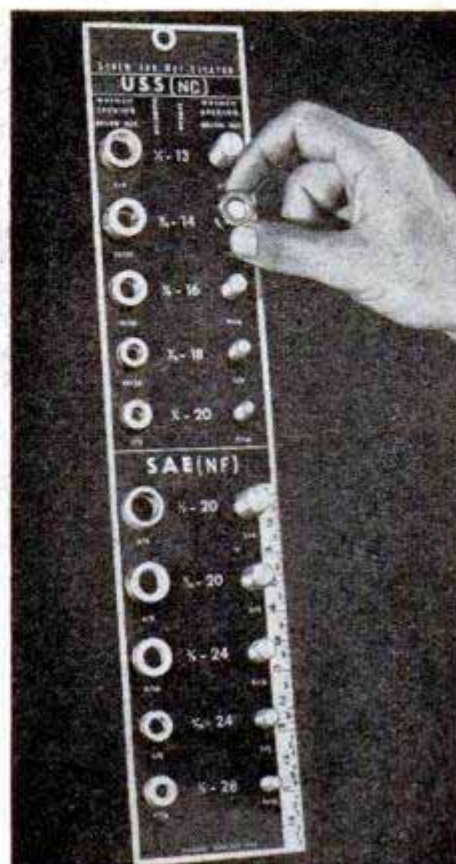
When you pick up a draftsman's scale, you can tell at a glance which scale is up if the chamfered edges at the ends are painted with identifying colors. For instance, one end of the scale can be dipped in red ink and the other in blue, or the tips can be coated with colored fingernail polish.

H. Drouyn, Montreal, Que., Can.

SHOPPING



BANDSAW having guards, frame, table and quadrant made from hardwood plywood will be new to most homecrafters. Table tilts to 45 deg. and is grooved at the outer edge for a miter gauge which is furnished as an accessory. The machine will rip to the center of a panel 18 in. wide and will take work 3 $\frac{3}{4}$ in. thick under upper guide

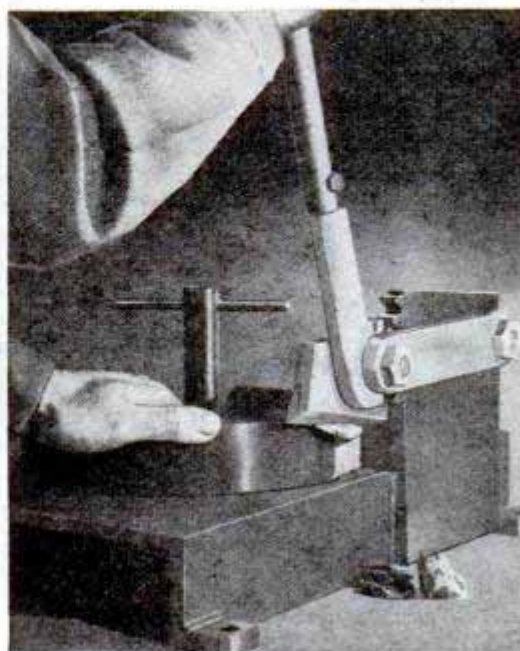


THREAD GAUGE that matches threaded nuts and bolts should prove useful in repair shops, garages and stock rooms. Threaded sleeves on one edge of the gauge are for checking the thread size of the bolt. On the opposite edge threaded studs make it easy to select a nut of the correct size to fit the bolt. Studs and sleeves threaded NC (National Coarse) and NF (National Fine) in various sizes are supplied on each gauge



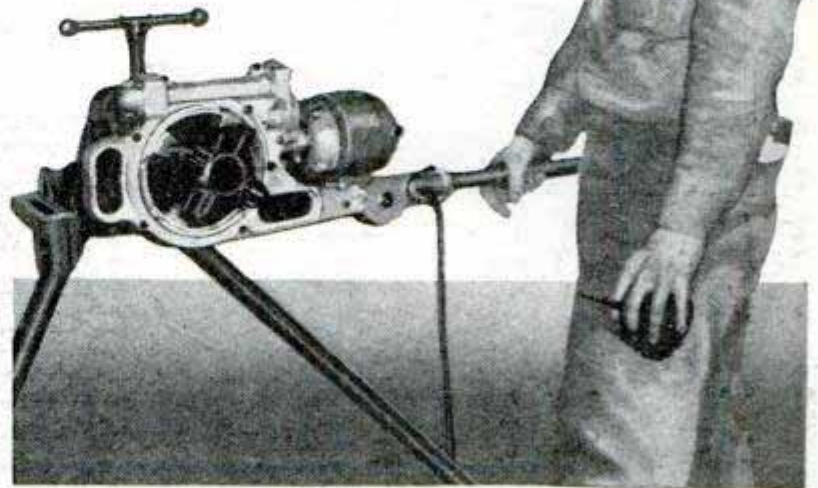
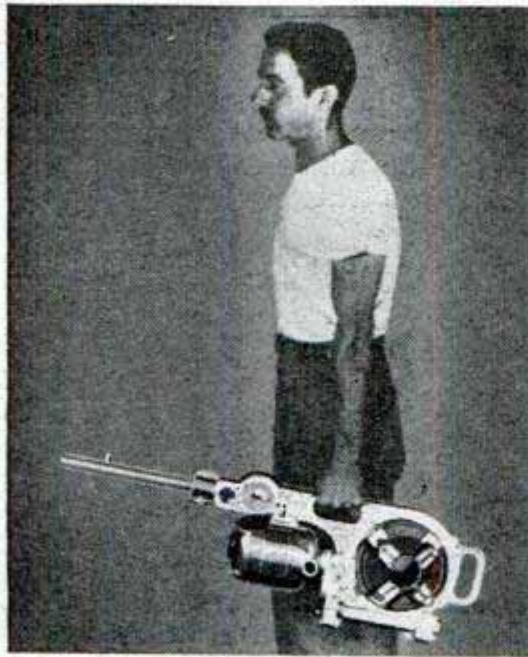
QUALITY IGNITION KIT consisting of four tools—chisel-nose and slip-joint pliers, long-nose pliers, screwdriver—will find ready acceptance not only by garage mechanics but also by radio and electrical repairmen who have use for special tools of this type. The long-nose pliers are provided with a wire cutter and stripper. The four tools are supplied with a neat plastic holder having four pockets with flap for tight closure

BRAKE-LINING CUTTER now available performs two operations with only a simple change from guide to shear plate. With the guide in place, as pictured at the right, the tool removes either bonded lining or riveted lining from the shoe. Removing brake-shoe guide and substituting shear plate sets it up for cutting the new lining to required lengths. Unit is furnished complete with guide, shear plate and lugs for bolting to bench



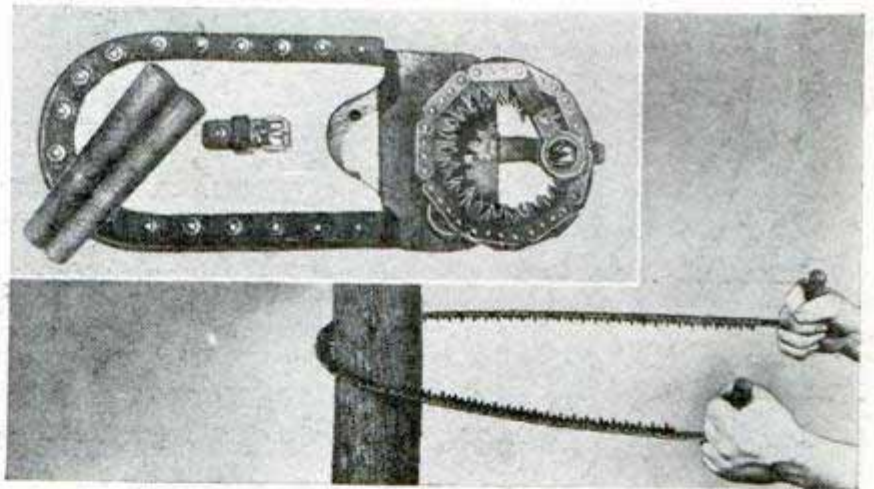
POPULAR MECHANICS

FOR TOOLS

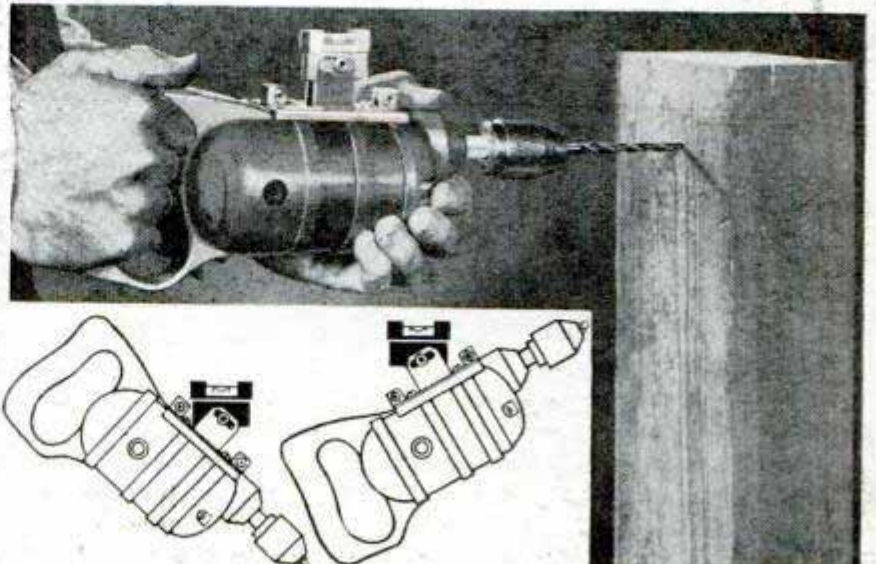


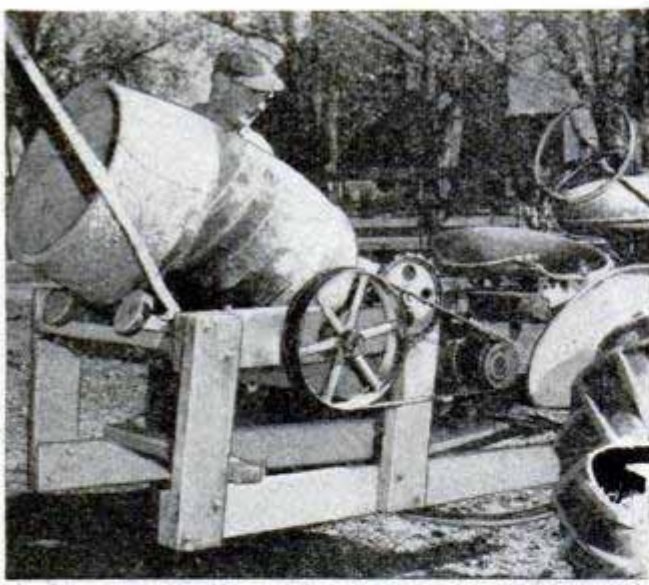
MOTOR-DRIVEN PIPE THREADER is carried to the job in one hand and mounted directly on the pipe-vice stand. It takes standard interchangeable pipe dies from $\frac{1}{2}$ to 4 in. Motor is directly connected to the die through a reduction gear which is reversed for backing off. The machine can be adjusted to operate in a space as small as 12 in. wide. It also can be set up to work within 5 in. of a wall without any interference

HAND-OPERATED CHAIN SAW is just the thing for tree trimming, cutting cordwood and felling small trees in the wood lot. It cuts horizontally, vertically and at any angle where you have elbow room to operate it. Just loop chain blade around material to be cut and pull alternately on the handles. In green wood it cuts faster than any one-man saw of conventional type. Because of narrow chain blade it does not bind in cut



LEVEL FOR A PORTABLE DRILL makes it possible to drill true holes horizontally through timbers or at any angle in floors and ceilings. The level is a separate unit which is attached to the top of the motor frame. The level glass is supported in an adjustable frame which can be tilted on a center and locked at any point from 0 to 90 deg. to the drill bit. The level is easily detached from the drill motor by removing two screws



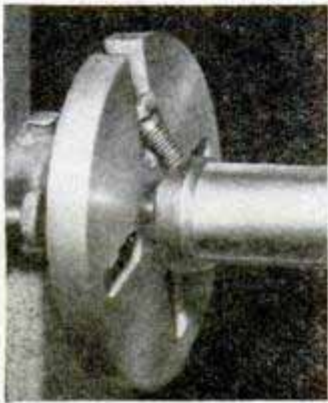


Tractor-Mounted Concrete Mixer Dumps Load Into Forms

Mounted on a tractor, this small concrete mixer can be emptied directly into the forms, thus saving time and work by reducing the amount of wheelbarrow pushing needed to complete a job. The mixer rests on a wooden frame fitted over the drawbar and under the axle of the tractor, and is driven from the power take-off. A V-pulley for the mixer drive was welded to the end of the tractor pulley.

Cap Screw Serves as Lathe Dog For Working Close to Faceplate

While machining work between centers, it frequently is necessary to work closer to the faceplate than an ordinary lathe dog will permit. When faced with this problem, one machinist mounts the work as in the illustration. First, a flat is ground on the end of the work at an angle of 45 deg. with the axis. Then a hole is drilled and tapped in the flat at right angles to its surface. A cap screw turned into the tapped hole serves as the driving dog, the head



of the screw engaging the faceplate slot as shown. With this setup, it is possible to work within $\frac{1}{2}$ in. of the end of the stock.

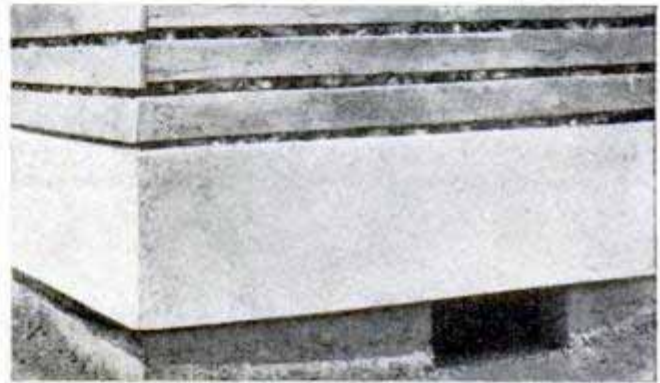
Morris S. Dollens, Los Angeles, Calif.

Improved Cutoff Tool

When needing a cutoff tool and one was not available, I improvised one quickly from a broken center drill. I simply ground a flat on each side and sharpened the end of the drill to serve as the cutoff tool.

LeRoy Oaks, Glendale, Calif.

Corncrib Protected From Rats



To prevent rats from climbing the concrete foundation and entering corncribs through openings between the slats, some farmers nail a strip of galvanized sheet metal to the slats all the way around the building as shown. The rats cannot gain a foothold on the smooth metal surface.

Oil-Drum Halves Welded Together Provide Large Stock Feeder

A large feeding trough which considerably reduces feed-hauling time is made by cutting two 55-gal. oil drums in half



lengthwise, tack-welding the four halves end to end and mounting them on a stand. Tack-welding the seams permits moisture

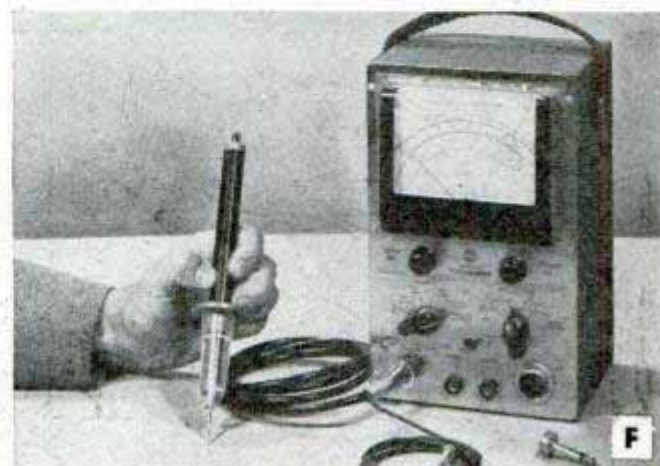
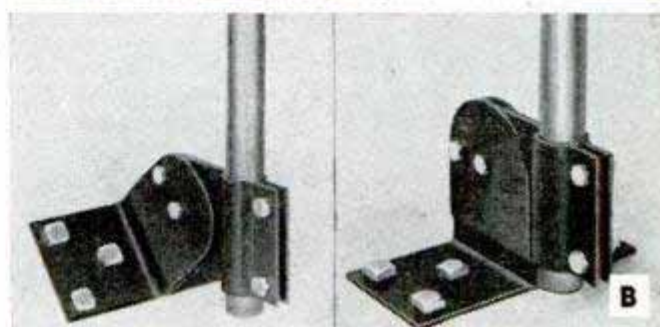
to drain off, thus helping to keep the feed from rotting. After the drums have been cut in two, remove both ends from the drum sections that will form the center portion of the trough, but remove only one of the ends from each of the two outer sections. The drum ends which are left intact will form the ends of the trough as in the photo.

TELEVISION TODAY

COLOR television in the home is claimed to be much nearer today because of two new factors, the RCA direct-view Tri-Color Kinescope tubes, and the recently announced General Electric's Frequency Interlace Color TV system. The single and three-gun RCA color tubes were described in detail in the August 1950 issue of *Popular Mechanics Magazine*. The original demonstration receiver using the Tri-Color three-gun color tube appears in photo A. General Electric's new Frequency Interlace Color TV system is claimed to have important advantages, and a preliminary demonstration will be given soon.

Photo B shows a sturdy "Brach" universal TV antenna base mount that may be installed vertically, horizontally, or at any angle. A new air-spaced feed line for TV and FM antenna installations is illustrated in photo C. This "Goodline Airlead" is claimed to have special low-loss features.

TV set owners in fringe areas can improve picture definition by adding a TV booster. The Electro-Voice unit shown in photo D is an easily installed, improved high-gain automatically tuned TV booster, with four stages of amplification. It turns on and off automatically with the TV set switch and all tuning is done with the television set controls. Photo E shows one of the recent Philco TV models which includes a new remote-control device so the viewer can adjust the receiver from any location. A high-voltage probe is a necessary tool for the TV serviceman. The I.C.A. model shown in photo F multiplies the ranges of any standard 10 or 11-megohm vacuum-tube voltmeter by a factor of 100.

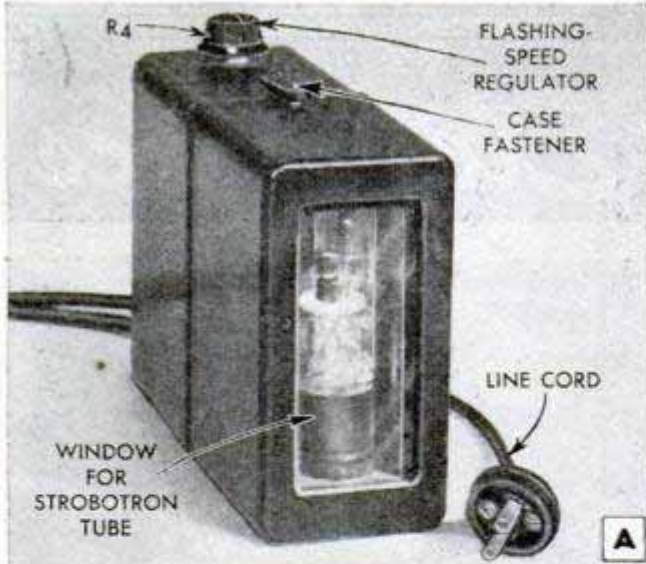


★★ STROBOSCOPE UNIT FOR

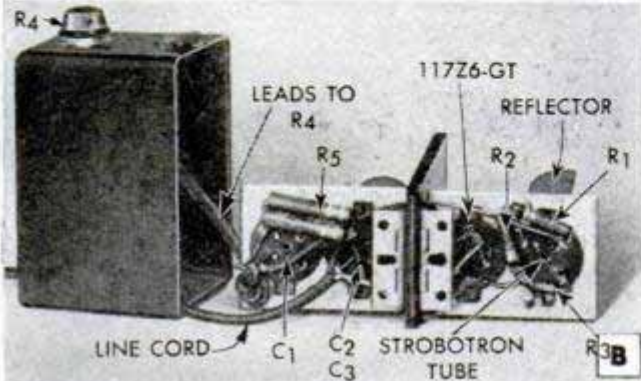
By Dr. R. C. Hitchcock

THIS "flashing lamp" for motion analysis is quite simple to build and operate. It has many useful applications in machine shops, classrooms, auto-service departments and in any shop, plant or laboratory where moving equipment is serviced or employed.

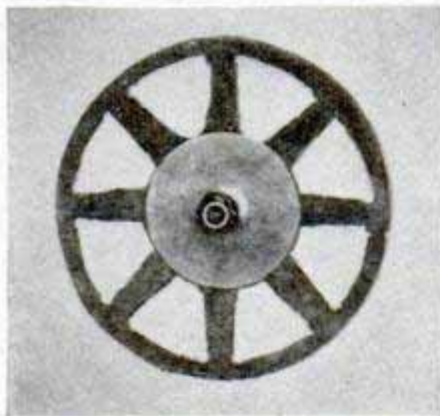
Several phenomena, common in some degree to all types of machines, occur only when the machines are operating at their rated speed. It is often possible to calculate the performance of the machine under these working conditions, but a short-cut method, and often a much better one, is to see the effect of speed instead of figuring it. Centrifugal force, absent when the machine is at rest, may assume important proportions at full speed—but the unaided eye sees only a blur. If, however, a light of short duration is flashed once per revolution, the blur is replaced with a distinct picture. The machine is apparently stationary but with the centrifugal forces in full action. The sponge-rubber wheel



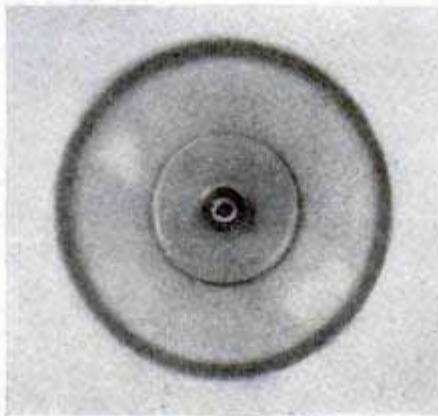
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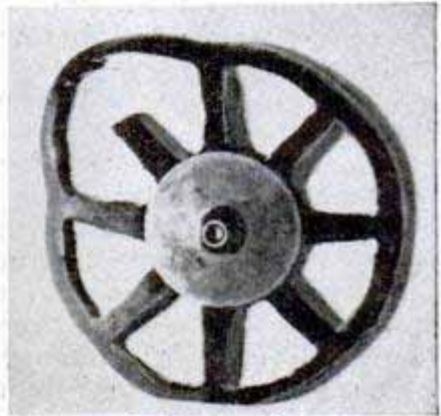
B



THE RUBBER WHEEL—AT REST



THE WHEEL AT 1800 RPM



THE WHEEL AT 1800 RPM AS VIEWED UNDER THE STROBOSCOPE LIGHT

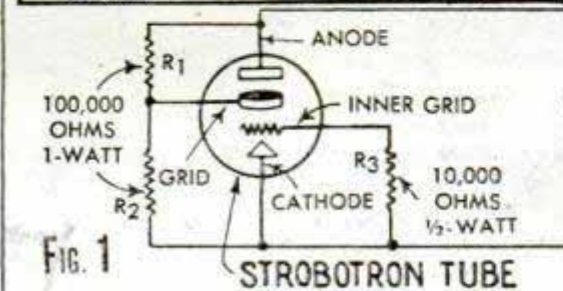
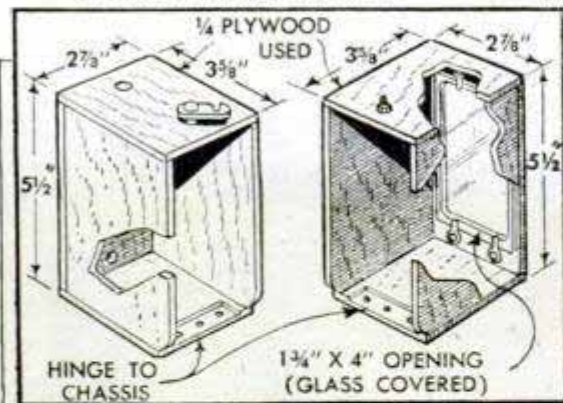
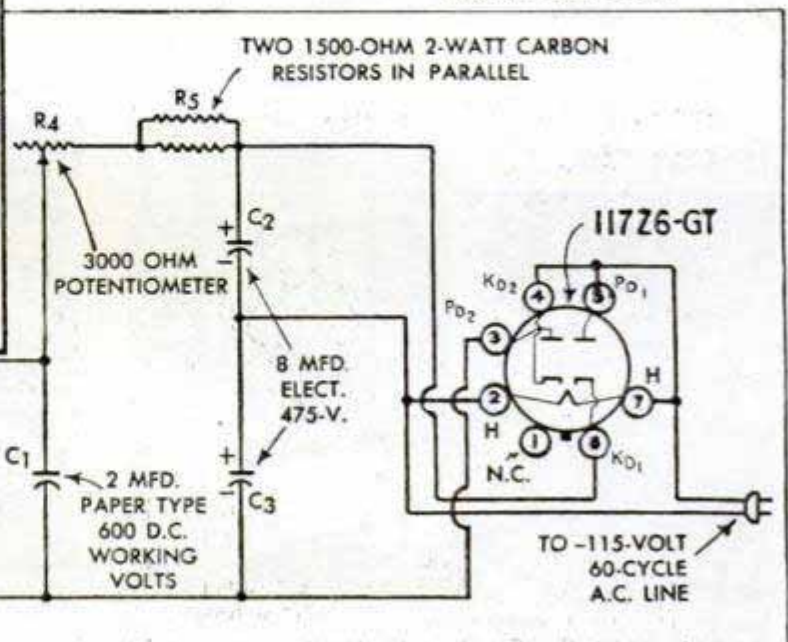


Fig. 1



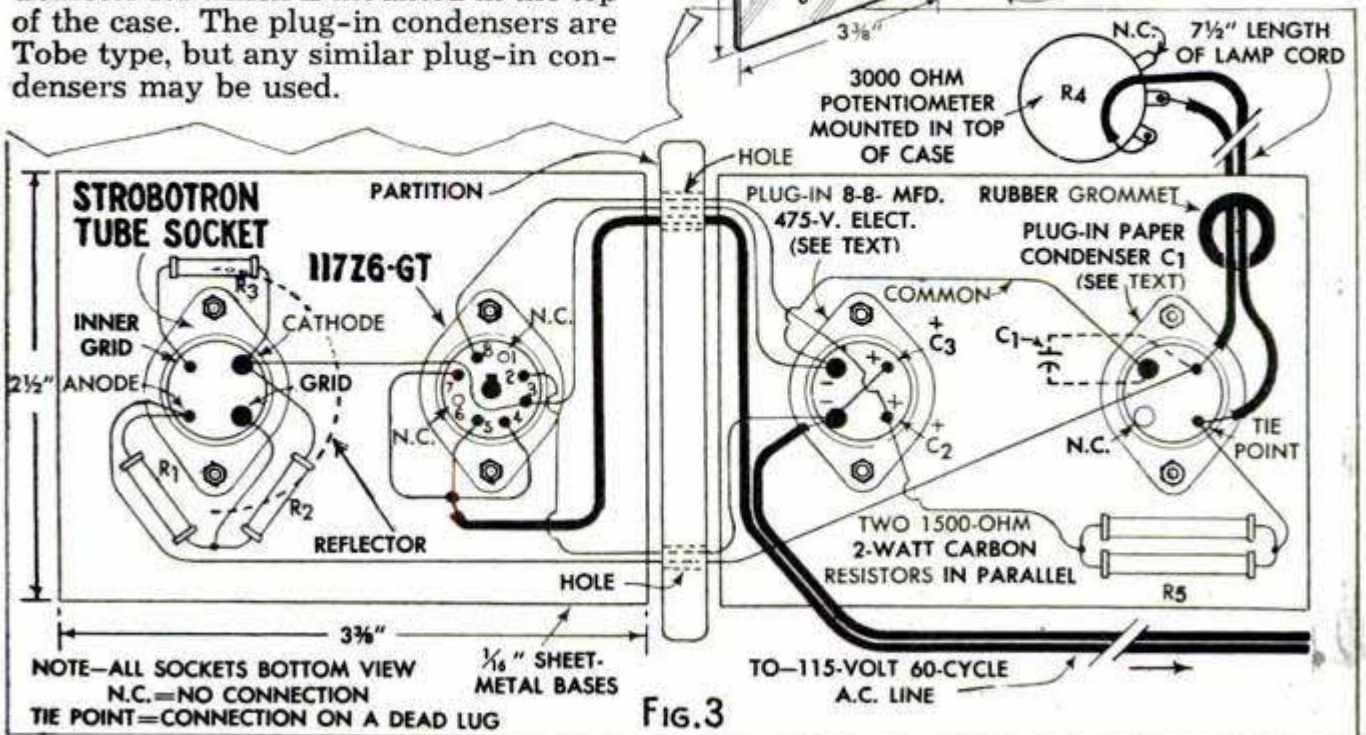
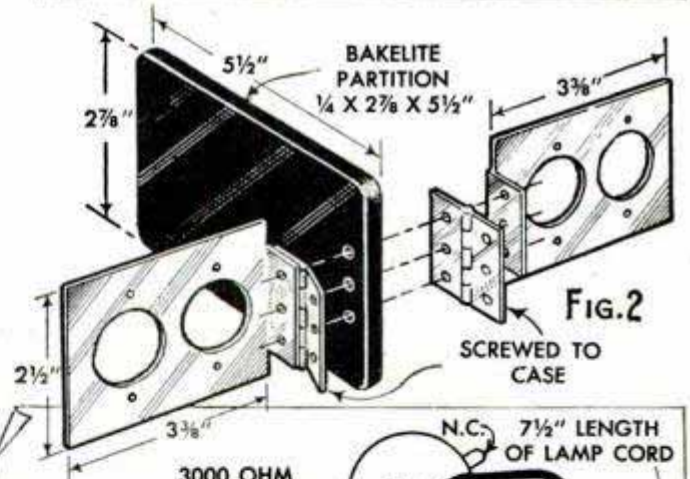
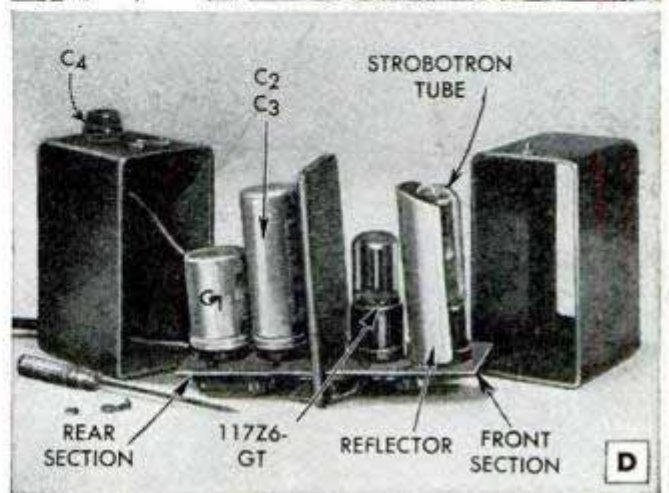
STUDYING PARTS IN MOTION

shown in the photos gives a clear demonstration, and the principle is equally applicable to wheels which are made of stronger materials.

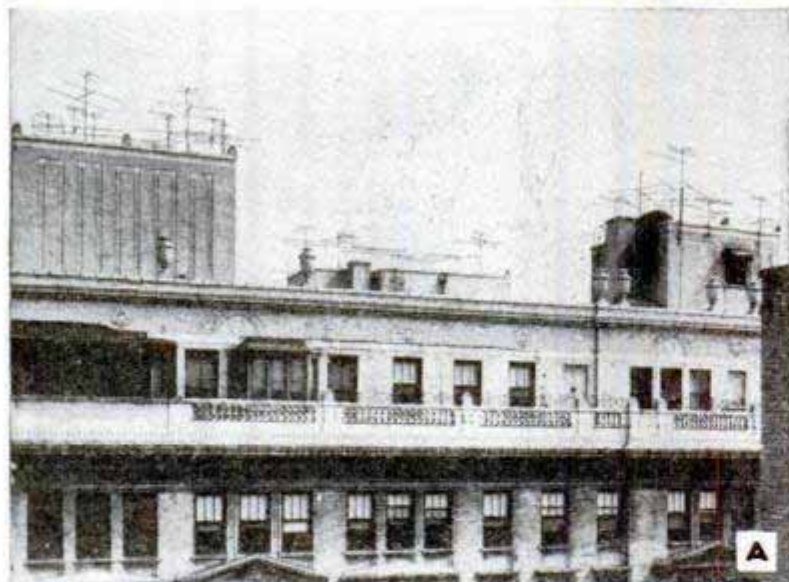
The case in the photos is made of Bakelite but any plywood case of the same dimensions may be used. A suitable wooden case is detailed in the inset sketch in Fig. 1. A schematic circuit diagram appears in Fig. 1, and a pictorial wiring diagram is shown in Fig. 3. The chassis base is in two sections and these are hinged to a Bakelite or plywood partition, as detailed in Fig. 2. Photos A, B and D show various views of the completed instrument. Holes are drilled in the partition for the various circuit leads, as indicated in Fig. 3. Chassis-base plates can be of sheet brass, $\frac{1}{16}$ -in. aluminum or sheet steel.

The Strobotron tube can be either a 631-P1 or a Sylvania 1D21/SN4. The type 631-P1 is available directly from the General Radio Company, Cambridge, Mass., and the Sylvania 1D21/SN4 Strobotron tube will be found listed in parts house catalogues.

It is important that the Strobotron tube socket be mounted on the chassis base with the tube prongs faced exactly as shown. Light emerges from the side nearest the small pins. Photo D shows the reflector that is mounted on the base directly back of the Strobotron tube. This reflector was made from sheet brass curved as shown and with two mounting tabs at the bottom. The reflecting surface was nickel plated. A piece of bright sheet tin can be substituted if desired. The frequency of timing is adjustable with the 3000-ohm potentiometer R4 which is mounted in the top of the case. The plug-in condensers are Tobe type, but any similar plug-in condensers may be used.

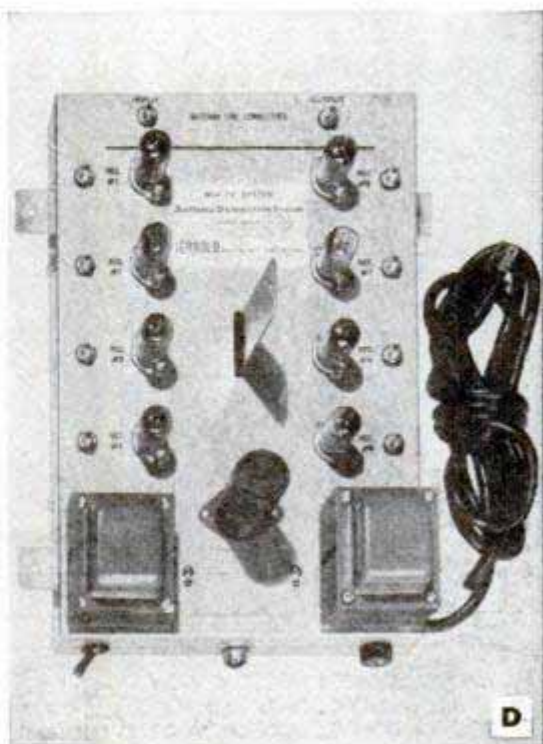
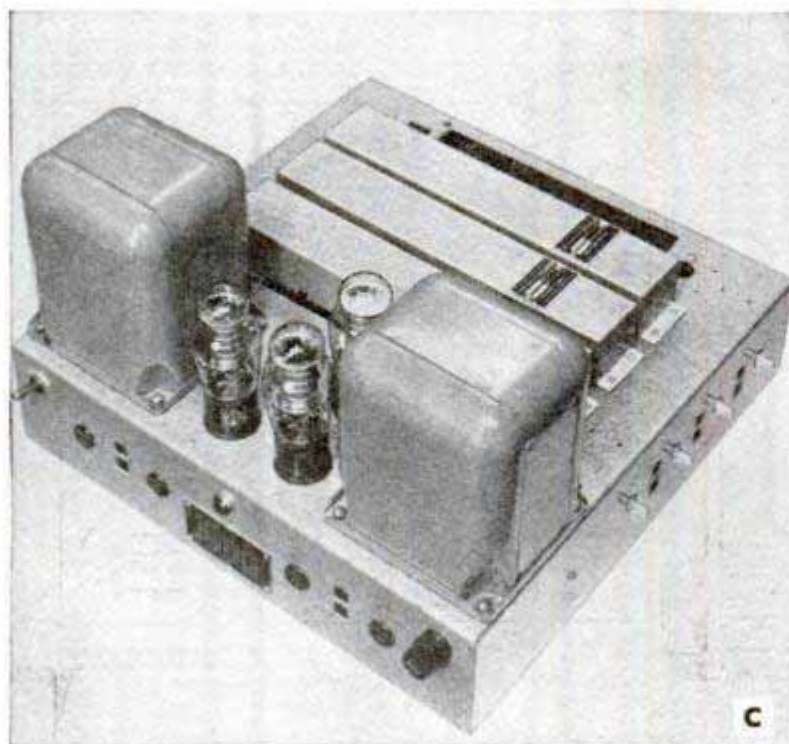
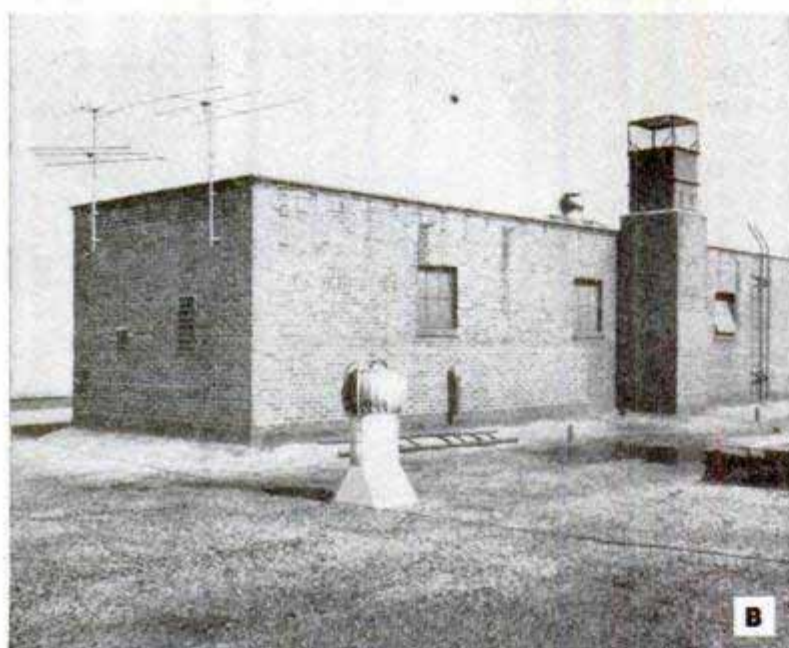


MASTER TV ANTENNA SYSTEM



ROOF-TOP TV antennas on apartment buildings and hotels have presented a problem that has been troublesome to some managers of these properties in large metropolitan areas. Tenants in some locations are discovering that various types of indoor television antennas are not satisfactory. In many apartment buildings, these tenants cannot pick up a good picture signal by using anything except a roof antenna.

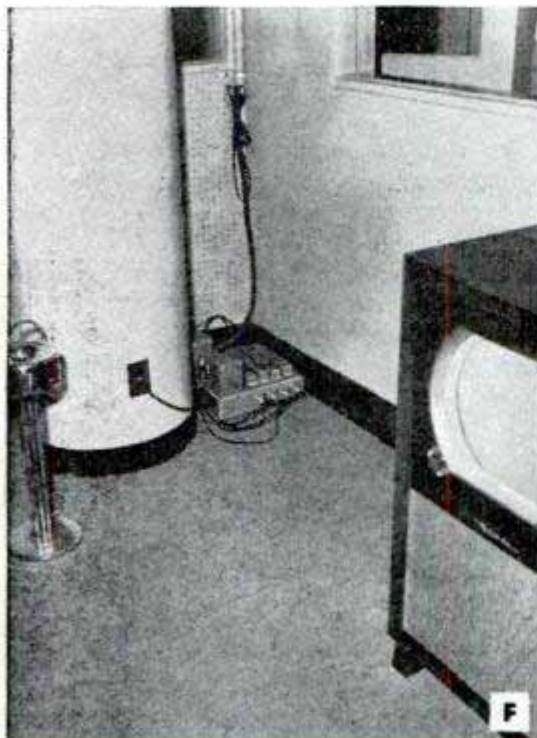
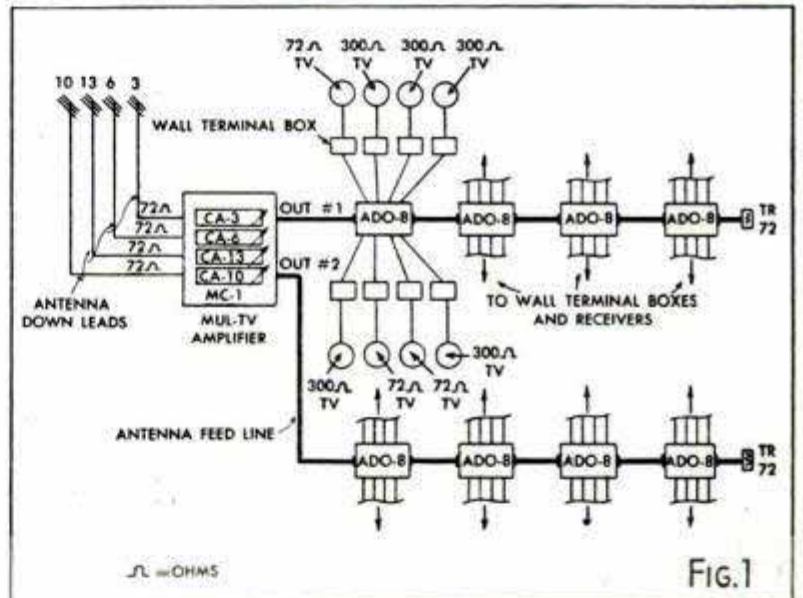
When the tenant finds out that he has a television reception problem of this sort his first course of action is to request permission to install a roof antenna. The manager desires to please the tenant and, if he gives his consent, the result may look like the TV-antenna jungle on a prominent Chicago building, photo A. The answer to this problem is a master TV-antenna system designed to accommodate a large number of TV receivers within a single building, or a number of buildings in a group or block. The installation illustrated is the Jerrold Mul-TV system that employs a master amplifier, photo C, and requires only the necessary number of roof-top antennas that will provide maximum reception from each TV transmitter in the area. Each channel signal is sent by means of shielded wires to the master amplifier unit where it is



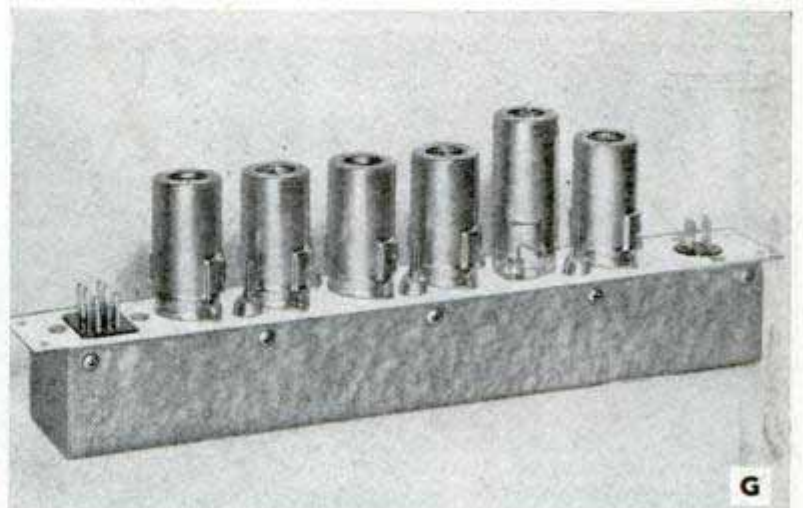
FOR APARTMENT BUILDINGS ..

amplified separately and distributed to the various apartments through one or more distribution units. Photo B shows the roof of another prominent building on Chicago's North Shore after the installation of this system by a local TV service company.

The distribution unit, type ADO-8, illustrated in photo D serves eight different apartments. Coaxial cable is employed to distribute signals to receivers. The cable permits picture signals from all local TV stations to be presented at one outlet which may be placed at a convenient spot in the apartment. Multiple ADO-8 distribution units are connected as shown in Fig. 1 to serve a large number of apartments. The entire block of buildings shown in photo E is served with one of these master TV-antenna systems. A typical master-amplifier installation in a basement office is shown in photo F. One of the individual plug-in TV channel amplifier sections appears in photo G. Some of these master TV-antenna installations are made on the basis of an agreement with each tenant and a fixed charge is made for the apartment installation, plus a yearly charge of \$10.00 per outlet for the service and maintenance of the system. To use the system the set owner merely plugs into the antenna outlet.



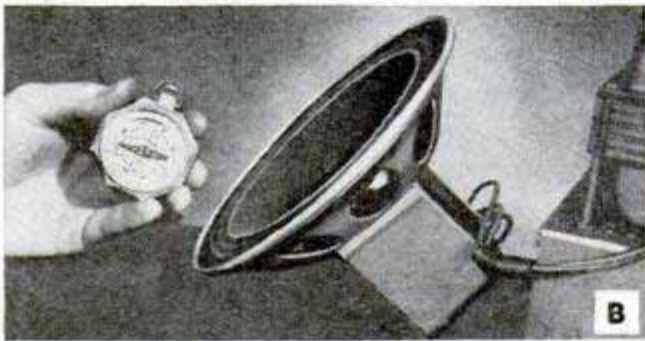
Below, one of the channel-amplifier strips that plug into the master amplifier unit. There is a strip for each of the TV channels; these strips amplify the sound and picture for each one of the local TV stations individually for maximum results



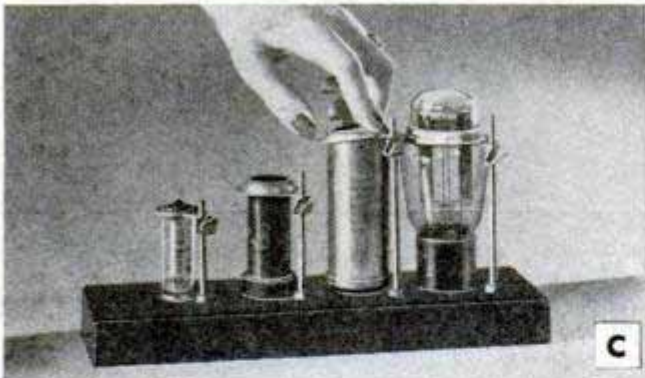
HINTS FOR RADIO EXPERIMENTERS



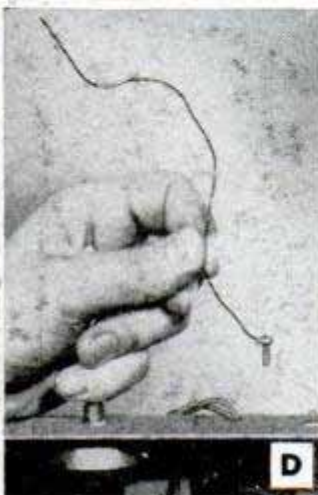
A—Small electric hand drills of the type illustrated are convenient for drilling out old solder in salvaged control terminals, or for enlarging such holes. They are also handy for marking chassis bases to identify tube-socket locations and various terminals. A tiny grinder attachment supplied with these tools is ideal for cleaning lugs and spots on chassis bases where soldered connections are to be made



B—A compass provides a quick and accurate means for detecting an open coil in a loudspeaker. Hold the compass near the speaker, but not on it; switch your receiver on. If the speaker field coil is operating, the black end of the compass needle will be attracted and will move toward the speaker and remain in that position as long as the set is in operation



C—Plug-in parts will stay in position in portable radio and electronic equipment if they are held down with "Top Hat" retainers as shown in the photo. These adjustable retainers have a "hat" or clamp that slides down over a threaded post and locks in place on the thread. To release the clamp, a slight pressure is exerted downward on the upturned end. Where severe shocks might be encountered, as in mobile or aircraft installations, metal rings of various sizes can be employed with the retainers



D—If you have ever tried to insert a machine screw in a chassis mounting hole in a narrow space between transformers or other components, you will welcome this idea of using a piece of soft wire which provides the necessary "third hand." When the threads start, the wire can then be pulled loose from the screw



E—The abrasive strip on match books or boxes makes a good emergency substitute for fine sanding paper to clean small contacts. Coupled contacts in the lead to a car radio were cleaned in this manner, as shown in the photo, while on an extended trip. Permanent repairs were made when emery cloth was available. Sticking vibrator contacts may also be given an emergency cleaning in the same manner

F—A discarded record holder of the type illustrated has many useful applications around the experimenter's workbench, radio shop or amateur radio "shack." It may be used as a holder for tube manuals, instruction booklets, diagrams, blueprints or maps. The amateur radio operator will also find it handy for holding mounted international prefix charts, time-conversion and postal-information charts



If it's worth enlarging



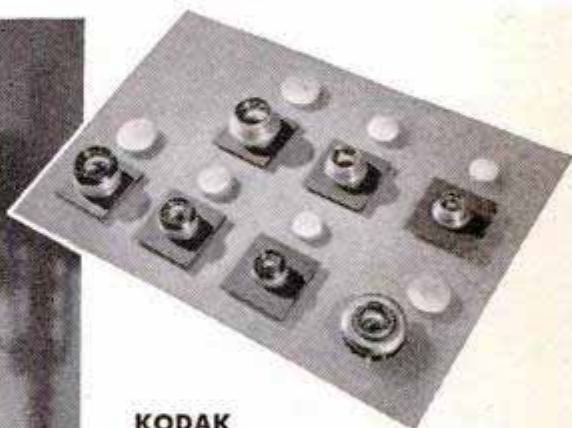
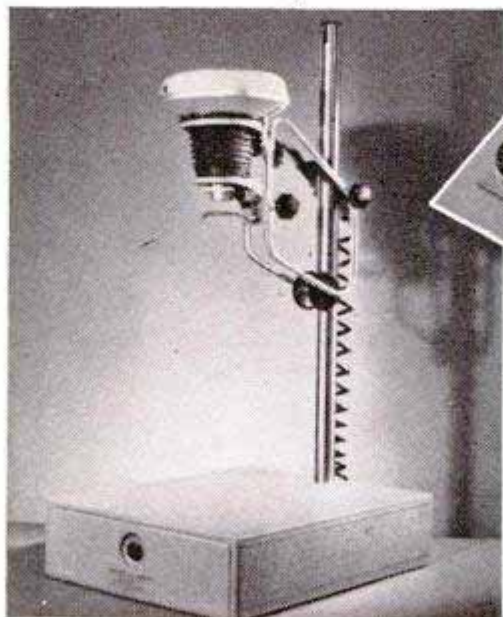
it's worth enlarging right

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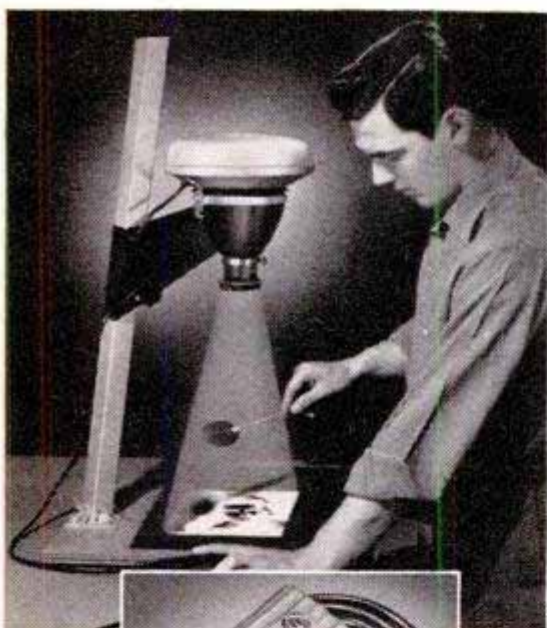
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The War in the White Pines

(Continued from page 164)

Young white pines were planted on a burned-off area in 1938 by the Forest Service. Today, there are 200 healthy trees to the acre on this experimental planting. Foresters estimate these 200 acres will produce 47,000 board feet of white pine to the acre in another 60 to 80 years.

"Blister-rust-control cost on that 200 acres will be about \$1.50 per thousand board feet," Swanson explains. "That will be the total cost of control from seedlings to saw logs."

Without protection there wouldn't be any white pines at all on those 200 acres.

Protection of the young trees is but one phase of blister-rust control. The bushes also are being cleaned out of forests of older and middle-aged trees—trees that will keep the mills humming until the young stands grow up.

Blister-rust control does not attempt to protect every acre of forest land that has white pine on it. Foresters are getting to be very much like farmers; they are picking their best land for their best-paying trees. Land which produced the biggest and best trees in the past—and the most per acre—is drawing the tree-production assignment.

Foresters figure that out of the 3,600,000 acres once in white pine in the Inland Empire, around 2,600,000 acres are capable of producing trees again. Of this, around 1,000,000 acres have been spotted as the most productive in the past and therefore likely to be in the future. Nearly 2,000,000 acres have been partially cleared of the troublemaking bushes.

For the nation as a whole, 28,000,000 acres have been selected for white-pine production. Rust is now under control on about 12,000,000 acres. Initial phases have been started on another 11,000,000 acres.

Every possible type of attack is being used. Right now a new weed killer, 2,4,5,T (a close relative of the popular 2,4-D) is riding high—actually as well as figuratively. Helicopters spray it on hillside patches of bushes. Power sprayers with mile-long hoses and 300-foot laterals carry chemical control to patches that can be reached by road. An atomizer which generates a wind up to 145 miles an hour moves along logging roads. Bulldozers clean the bushes off open meadows.

But in blister-rust control, as in the Army, the foot soldier is still a mighty important fellow. In the Inland Empire forests last year, foot soldiers in blister-rust control worked out of 37 camps. Mostly

(Continued to page 240)



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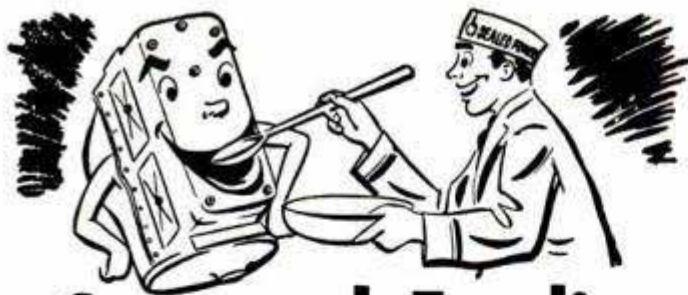


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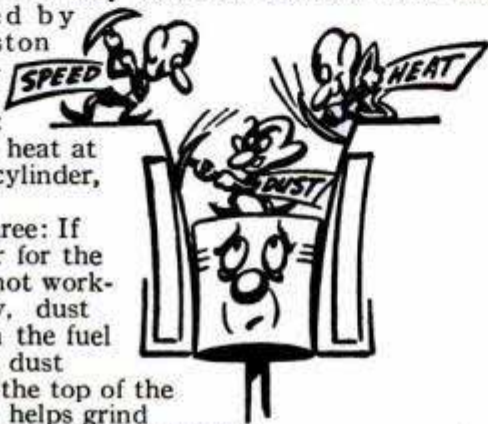
BY S. P. CORP

WHY CYLINDER WALLS WEAR

Cylinder walls wear faster at the top than they do at the bottom. Why? There are three good horse-sense reasons: Number One: Pistons move faster at the top of the stroke than they do at the bottom. That has been proved by checking piston speed through-out the stroke.

Number Two: There is more heat at the top of the cylinder, and less oil.

Number Three: If the air cleaner for the carburetor is not working efficiently, dust comes in with the fuel mixture. That dust naturally hits the top of the bore first, and helps grind away the metal. It always happens.



CHANGE OIL OFTEN

Back in the days when compression ratios were low, speeds were slow, and temperatures were less than now, lubrication was the one big job of motor oil.

In today's high speed, high-compression, high temperature motors, the oil must do FIVE jobs and do them well:

- (1) Reduce friction.
- (2) Cool.
- (3) Seal.
- (4) Penetrate.
- (5) Cleanse.

No motor oil can do all these jobs well, and keep on doing them indefinitely. The only safe way is to change oil often—every 1000 or 1500 miles!

WATCH THOSE RINGS

You can see rings in the bathtub. You can hear rings on the telephone. But the only way you can watch piston rings is to watch for the effects of wear—blue smoke at the exhaust, loss of power, excessive oil consumption. When those signs appear, re-ring with the best piston rings you can buy—Sealed Power Piston Rings. There is a Sealed Power Ring Set specifically engineered to do the best possible job in your engine, whatever the make, model, or wear condition. For oil control, the Sealed Power MD-50 Steel Oil Ring is the best ever built. It is the only ring with the Full-Flow Spring. It works even in badly tapered and out-of-round bores. Write a card to Sealed Power, Dept. G-11, Muskegon, Mich., and ask for free booklet, "7 Ways to Save Oil."



Clinic



for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Peeling Paint

Q—I painted my frame house last year for the second time in three years. Now the paint is peeling from the siding all around, although it seems to be worse on the north side of the house. It peeled in much the same way after I painted the first time. What causes this?

F. M., Danville, Ill.



A—Moisture condensation in the walls is a common cause of this trouble. Lowering the moisture content of the air in the building will help to cure the cause of the trouble. Of course, the installation of a vapor seal on the inner walls between the plaster and studding usually effects a permanent cure. This is expensive in homes already built. Another temporary measure is the application of two coats of oil-base paint to the interior walls and ceilings. This will result in a fairly reliable seal, but cannot be considered a permanent remedy. Recently a means of venting walls has been made available. This consists of a small, screened sleeve which is inserted in a hole drilled through the siding and sheathing between the studs. It is said to be quite effective when installed according to the manufacturer's instructions.

Stainless Chimney Liner

Q—I'm having a forced-air heating system installed to burn natural gas. My chimney is brick, lined with tile and is in good condition. However, my contractor insists that a stainless-steel liner will be required to prevent rapid deterioration of the chimney. The liner is quite expensive and I do not see the necessity for it because the chimney is already lined. Is the contractor right?

W. C., St. Louis, Mo.

A—Your contractor is right. In some cases, where round glazed tile have been used as a chimney lining, gas-fired installations have been permitted without a stainless-steel or monel-metal liner. However, to avoid trouble later, it's now a general practice to line chimneys of older brick construction when installing gas-heating equipment. When making gas-heating installations in new homes, special insulated chimneys, or vents, often are used. Probably it would be a good idea to check with your contractor to make sure that the unit is installed in accordance with recommendations

(Continued to page 238)

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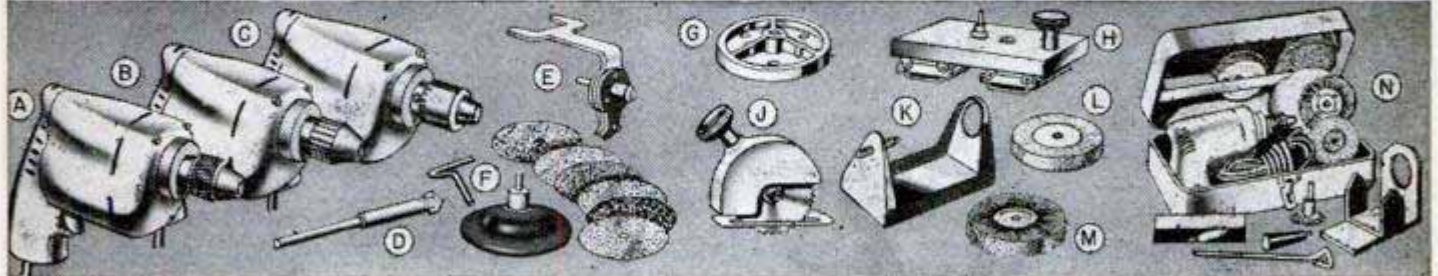
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The right "foundation" on which to build YOUR workshop!

★ A complete line of "matched" tools, attachments and accessories, engineered to work together.

★ World-wide service, 33 Factory Branches, 100% interchangeable parts.

★ Thirty years experience in building Power Tools for American Industry, Railroads and Contractors.



(A) Mall Drill Model 149, perfect for home or workshop use, has the speed and power to drill any material. Capacity $\frac{3}{4}$ " in metal to $\frac{1}{2}$ " in wood. Sintered bronze bearings, aluminum alloy housing, powerful universal type motor gives spindle speed of 2000 rpm. Weight only 3½ lbs. Genuine Mall dependability at extremely low price. Complete with hand-tight chuck, \$16.50 (B) Complete with hex key chuck, \$17.50 (C) Complete with Jacobs' geared chuck, \$19.50.

PARTIAL LIST OF ATTACHMENTS

(D) $\frac{1}{4}$ " Masonry Drill Bit (other sizes available). For fast drilling in brick, concrete, stone, etc. No. 32803, \$1.80.

(E) Metal Shear Attachment cuts sheet metal up to 18 gage, leaves smooth clean edges. No. 20980, \$7.20.

(F) Sanding Pad Kit includes 4" pad, 6 abrasive discs and assembling wrench. For fast, all-purpose sanding. No. 35555, \$4.20.

(G) Face Plate for wood turning. No. 31858, Price \$1.00.

(H) Reciprocating Sander, for fine sanding on any type of material. Many interchangeable types of abrasive bands available. No. 21000, Price \$14.50.

(J) Slitting Saw, cuts wood, plywood, masonite, plaster board, non-ferrous metals. Capacity 0 to $\frac{3}{4}$ ". Adjustable for depth of cut. Recommended for 800 to 2500 rpm. No. 32940, Price \$7.50.

(K) Horizontal Pedestal converts hand drill for use as bench grinder, buffer, tool sharpener, etc. No. 35890, Price \$2.00.

(L) Grinding Wheel 4" dia. Sharpens knives, chisels, bits, etc., grinds metal parts. No. 32099, Price \$1.00.

(M) Wire Wheel 4" dia. Made of the finest quality wire for long wear on tough jobs. Removes rust, paint, etc. No. 31263, Price \$1.25.

(N) Mall Electric Drill Kit. For all-around home and shop use, complete with Model 149 drill with hand-tight chuck, 4" grinding wheel, 4" wire wheel, paint stirrer, 2 abrasive Discs, rouge stick, 3 carbon steel drills $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ " auxiliary handle, polished pad assembly, sheepwool bonnet, horizontal pedestal and carrying case. No. 38180, Complete, Price \$23.45.

(P) Mall Polisher-Sander, a light weight, portable unit that will do all kinds of polishing, buffing and sanding around the house and can also be converted into a powerful $\frac{3}{8}$ " or $\frac{1}{2}$ " drill for workshop and repair jobs. Oil impregnated bronze bearings, die-cast aluminum alloy housing, heavy duty switch with built-in trigger lock. Universal electric motor operates on 110-120 volt, 25 to 60 cycle, AC, or DC, current with attachment speed of 2000 rpm. Large 7" backing pad gives extra large surface coverage. A handtool as well as for waxing and polishing wood floors, linoleum, etc. Mall quality throughout. Model 387, Complete with 4" Handle, Price \$30.50.

SHOWN BELOW ARE ONLY A FEW OF THE MANY ATTACHMENTS AVAILABLE

(Q) Knife Sharpener, gives perfect cutting edges in seconds! A time saver for both kitchen and workshop. No. 30374, Price \$1.00.

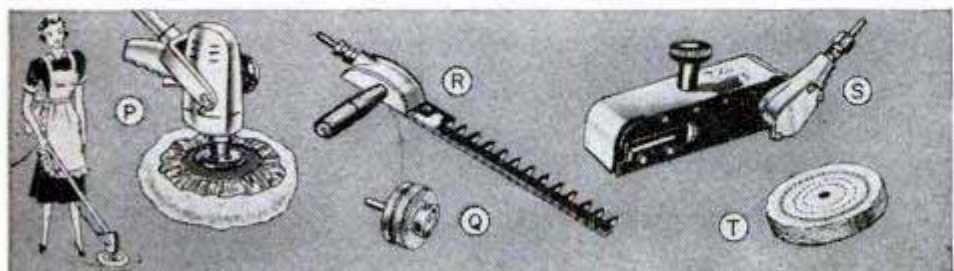
(R) Hedge Trimmer, makes a tough job both quick and easy. No. 35370, Price \$14.95.

(S) Belt Sander, fast sanding for floors, etc. No. 38170, Price \$14.95.

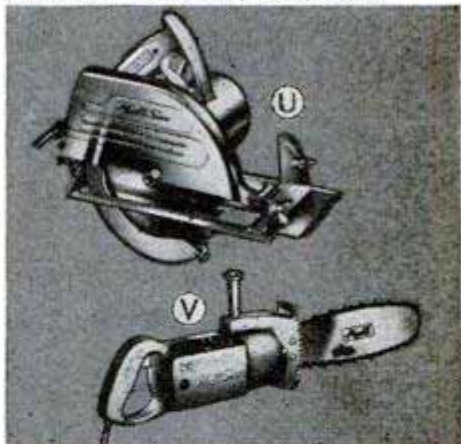
(T) Buffing Wheel, for silverware and all types of polishing. No. 31265, Price \$6.00.

(U) Mall Electric Saw, has plenty of capacity to frame with 2" material. Sleeve and ball bearings, 7" dia. saw which will cut from 2½" to 1½" deep at 90°; to 1½" at 45°. Sturdy, powerful. Universal Motor, 110-120 volt, 25 to 60 cycle, AC, or DC, speed 5000 rpm., 9 types of blades available. Mall dependability throughout. Model 71 Saw with Combination 7" Blade, Price \$49.50.

(V) Mall Electric Hand Chain Saw is ten times faster than hand sawing. Power to outlast 10 men cutting timber to 12" dia. with one cut; 24" dia. with two cuts. Light weight, but sturdy (only 11 lbs.) In a tree or on a scaffold or ladder it can be operated with one hand. Universal electric Motor, 110-120 volt AC, or DC, current. Heavy duty Mall construction. Model 1E12, Complete, Price \$95.00.



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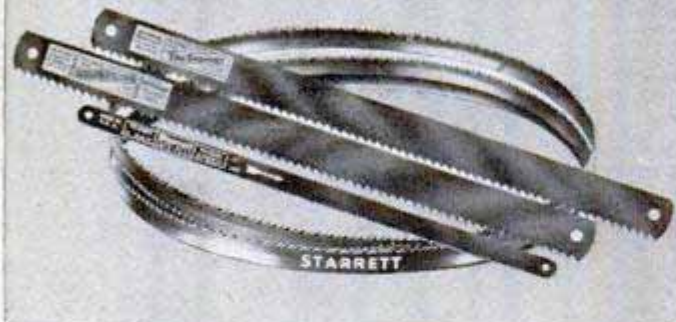
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Buy Through Your Distributor

(Continued from page 236)

of the manufacturer and also any local regulations governing this particular type of installation. In some cases these recommendations specify the size of the liner, the length of the horizontal run of the vent pipe from the furnace to the chimney and also the size of the gas line from the meter to the burner.

Noisy Water Heater

Q—Lately my gas water heater has become noisy. The sounds are sharp, metallic clicks and at times a hammering noise. This noise is not very loud, but is annoying. The heater has been installed about eight years and is of a reliable make. What could cause the noise?

T. F., Sturgis, Mich.



A—There are several possible causes, some quite common, others comparatively rare. For example, if the water temperature is too high the symptoms you describe may develop. Contraction of the hot baffle in the vent may be the cause of the metallic click. There also is the possibility that pipes of a smaller diameter than recommended have been installed. Too many elbows in the water lines may in time collect lime and sediment which restrict the flow of water. A horizontal hot-water line that inclines slightly may collect sediment and permit a pocket of steam to form. We think that as a first step in checking to locate the cause of the trouble, it would be a good idea to test the relief valve to see that it is working properly. Some relief valves have a manually operated tripping mechanism. Other types of valves have pressure elements, or units, that can be adjusted to open at pressures ranging up to about 125 lbs. per sq. in. Some are fitted with a fusible plug which melts at a predetermined temperature. Examine the hot-water lines for any of the installation faults listed.

House Framing

Q—I'm planning to build my own home of frame construction but I'm puzzled by certain terms used to describe types of framing. For example, what is meant by "balloon" framing, "platform" framing and "balanced" shrinkage as applied to house framing. Also what is "fire stopping"?

R. T., Goshen, Ind.



A—In balloon framing of the exterior walls of a two-story structure, one-piece studs extend from boxed sills to the top plate and the ends of the second-floor joists are supported on a ribband, or ribbon, usually a 1 x 4 or 1 x 6-in. strip fitted flush in notches cut in the studs. In platform framing of two-story structures, a boxed-sill construction is built in at each floor line. The top ends of first-floor studs are capped with a false plate, or girt, and the ends of the second-floor joists butt against a header which rests edgewise on the girt. Shrinkage is equalized on each floor by using a similar construction on the bearing partitions. The simplest description of balanced shrinkage is that the total thickness of all horizontal members of the framing is equalized as nearly as possible to give a uniform shrinkage of the lumber in the building. This would include boxed sills, top and partition plates and also girders. Fire stopping, or stops, refers generally to headers placed between joists at the sills and second floor and also between the attic joists over partitions. In some cases incombustible mineral fills are poured in behind the headers. The purpose of fire stopping is to prevent circulation of air in the walls which in turn tends to prevent the rapid spread of flames in case of fire.



from cups to *Coralox*

Blin, the great French ceramist, made the first spark plug insulators at Limoges, about the time of the American Civil War. He called them "porcelains," because they were of the clay used for artists' paint cups.

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America's finest saw—the champion of champions —Atkins No. 65—is the proud sire of a pedigreed son—Atkins Jr. -65.

Atkins Jr. -65 has a genuine "Silver Steel" blade only 16 inches long. It has the same type Perfection Handle, the same taper grinding, the same high polish, the same precision balance that have made Atkins No. 65 the prime favorite with careful craftsmen everywhere!

Not only students and women with small hands, but men as well, will welcome Atkins Jr. -65 as a light-weight, easily-handled, accuracy-plus instrument for fast-cutting, no-fatigue workmanship.



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ATKINS

college boys, they dug up berry bushes in areas that could not be reached by faster and cheaper equipment. First camps usually open in May. The last close in September. Camps range from a dozen to nearly a hundred men. These are the men who leave the fantastic miles of string. It is their way of showing what ground they have covered and to assure complete coverage of a particular area.

Competition is keen among college boys, particularly forestry students, for summer jobs swinging a claw-hammer mattock grubbing out the bushes. Pay is good. So are the meals, which rival the grub of a logging camp. There's plenty of fun—camps have their own boxing, baseball and basketball leagues.

These boys are too busy having a good time during the summer to realize how much good they are doing for the nation's forests, but the men in charge of blister-rust control know the value of their work. Many a summer evening in 1929, Frank Walters spent the twilight hours on the hotel porch at Clarkia, the Idaho logging town once hemmed in by the mighty white pine. Across the valley the scene was one of complete desolation. Early loggers were not the least concerned about tomorrow's saw logs. Loggers today are different. Then came fire.

"It just didn't seem possible there ever would be another tree on those hills," Walters recalls.

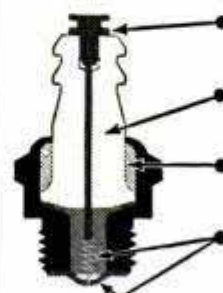
Look at those same hills today and the picture is one of hope. Covering them is a solid blanket of green—white pines 15 to 25 years old.

"These trees have come from natural seeding," Walters explains. "There were a few mature trees on the ridges that escaped fire. The land was good and was meant for trees. They were protected for a few years from fire and blister rust and a new forest resulted."

Just goes to show what Nature can do when given a little help.

CHAMPION V-GLOW PLUGS

for model engines only



CHAMPION TERMINAL—assures better center electrode seal and provides sturdier electrical connection.

CHAMPION - CERAMIC INSULATORS—proved dependable in millions of Champion Spark Plugs.

CHAMPION SILLMENT SEAL—prevents excessive compression leakage between insulator and shell.

CHAMPION "THERM-O-FLEX" CONSTRUCTION—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, O.

They're a Million Miles Ahead of Everything!



THE SENSATIONAL NEW
LIONEL TRAINS
 with **MAGNE-TRACTION**



MORE SPEED!

MORE PULL!

MORE CLIMB!

MORE CONTROL!

ONLY LIONEL HAS ALL THESE FEATURES PLUS **MAGNE-TRACTION!**

- Built-in, two-tone, remote-control whistle.
- Real smoke, puffing like a mainliner (clean, odorless, harmless)!
- Real R.R. remote-control knuckle couplers!
- Steel wheels, die-cast trucks

There's nothing like Magne-Traction...and only Lionel has it. With this permanent, motor-shielded magnetic force, wheels grip track so trains climb steep grades, take tight curves at top speed, pull twice as many cars twice as fast. Instant control, too...more thrills...more scope to track layout. *And prices are lower this year than in many years past!* Free catalog at your dealer's, or send coupon for special offer.

OPERATING COAL RAMP AND HOPPER CAR
 Remote control opens hopper bottom



OIL DERRICK & PUMP
 Motor-operated beam; illuminated oil column.



Look at the **JOE DIMAGGIO LIONEL CLUB HOUSE TELEVISION SHOW**

Every Saturday on NBC Network
 See local newspapers for time and station



- LIONEL TRAINS, Post Office Box 466
 Madison Square Station, N. Y. 10, N. Y.
 I enclose 25c. Please send me special Lionel Train Catalog offer postage prepaid.
1. The Big New Lionel 44-page full-color catalog.
 2. The "Magic of Magne-Traction Book" with new track layouts, scenic effects, landscaping, etc.
 3. The Lionel "Portfolio of 19th Century Locomotive Art Prints" —in color—suitable for framing.

SPECIAL COUPON OFFER

Name _____
 Address _____
 City _____ Zone _____ State _____

Rockets on a Timetable

(Continued from page 103)

Cut-Off is a fantastic safety system which consists of a detector circuit built into the radar scopes. If the radar loses contact with the rocket in flight, this system automatically detonates a TNT charge in the rocket, destroying it. A lost rocket may never be picked up again. In the early days, one V-2 from White Sands made an unscheduled stop in Juarez and the boys still hear about it. Though they carry no charge, big rockets falling from 100 miles up can blast a 50-foot crater 20 feet deep in the ground.

To double check against a rocket getting away, there's also a "continuous pressure button," which is held down under the safety engineer's thumb throughout the flight. If the rocket veers off its prescribed course, that button can be released and instantly the rocket explodes, no matter where it is.

By "X minus 30 minutes," all the hundreds of intricate operations involved in the launching project are ready. Everyone is standing by. Months of preparation border on climax. Faces of the men at the blockhouse control panel are grim. A dozen things still can go wrong. "Every rocket is different," explains Doctor Newell. We're still experimenting with new systems and firing techniques at every launching. Hence, there's always cause for new worries and tension—like the time we rigged a circle of jato units around the base of a big rocket. They were to fire on take-off and set the rocket spinning as it went up. Suppose they didn't fire simultaneously and the rocket went wild? Suppose they didn't fire at all? Actually, it worked perfectly, and the rocket bored its way skyward as planned—but the tension was rugged."

If anything goes wrong with any of the hundreds of circuits necessary to a perfect take-off, the firing button won't set off the rocket. Furthermore, there are fast-moving routines followed in such emergencies. They came in handy on one Aerobee at White Sands, Doctor Newell remembers. With only one minute to go, a diaphragm ruptured and hissing acid burst through it, poured to the pad and started a fire at the base of the rocket. Instantly the "fire" button was pushed—to get the rocket out of the way. But automatic controls already had cut the circuit. The button wouldn't work. Men raced around the blockhouse. Pressure was "dumped" from the rocket by remote control; within seconds water jets poured a Niagara over the missile; firemen standing by moved in with foam and high-pressure hose and added to the drenching;

(Continued to page 246)



AMAZING...worn Connecting Rod Bearings Killed this Plug!

Yes, amazing—but true—badly worn engine bearings affect other engine parts. With their increased clearance, worn bearings let excess oil reach combustion chambers, where it burns to performance-stealing carbon on spark plugs, valves, pistons and rings. *Performance goes up in smoke!* When you have sluggish engine performance, smoky exhaust or high oil consumption—check for worn engine bearings . . . replace in sets with Genuine Federal-Mogul Oil-Control Bearings for renewed power, pep and economy!

FEDERAL-MOGUL SERVICE

(Division of Federal-Mogul Corporation)

DETROIT 13, MICHIGAN

Control Oil Pumping
where it starts...replace with

FEDERAL-MOGUL
OIL CONTROL BEARINGS



What a Honey!



THE NEW 1951 HARLEY-DAVIDSON *HYDRA-GLIDE*®

SLEEK, smooth and beautiful. And what a performer. Takes off like a scared rabbit. Snuggles to the road like a clinging vine. Breezes over hills like a bird. Whisks you over rough spots with cloud-like ease ... brings you thrill after thrill as you take in exciting race meets, hillclimbs, gypsy

tours, sightseeing runs and other exclusive motorcycling fun events. You've never really been places and seen things until you've ridden *this* dazzler! Every moment in the saddle is fascinating. Every trip brings new adventures and new companionships. See your dealer today. Mail the coupon now.



Send free copy of ENTHUSIAST Magazine filled with motorcycle action pictures and stories; also literature on new models.

HARLEY-DAVIDSON MOTOR CO., Dept. P, Milwaukee 1, Wis.

Name.....

Address.....

City..... State.....

OPPORTUNITY: Valuable franchises available for full line of Big Twins and 125 Model. Write Today.

Sears Famous Power Tools . .



CRAFTSMAN Rotary Electric Tool Outfit

Unequaled for its type . . . at ANY price!

GRINDS	CUTS	ROUTS	BRUSHES
SHARPENS	CARVES	SANDS	CLEANS
DRILLS	ENGRAVES	POLISHES	Has many
SAWS	ETCHES	BUFFS	other uses!

A wonderful tool for hobbies, etc. A perfect Christmas gift! Look at these features! 50% more power than any other rotary tool of its type we know of! Cool-running, even after hours of use! New tapered design, strong metal housing—not plastic! New precision 3-jaw chuck adjusts 1/64 to 1/8-in.; takes 3/32 and 1/8-in. shank tools AND wire gauge drills. Large bronze bearings and ball thrust bearing. On-off switch. Condenser (cuts radio interference). Powerful 15,000 R.P.M., 110-120-volt, 25-60 cycle AC-DC motor; 6-ft. cord; plug. Underwriters' Labs. approved! 7 1/2-in. long. Complete 54-piece set with cutters, drills, bench stand, etc., in handsome, convenient 11x8 3/4x3 1/2-in. workshop case.

54-piece Set Complete

\$28⁹⁵*

Cash

\$3 Down



1/64 to 1/8-in. chuck capacity



120° rotating bench stand



Cool running; easy to handle

Use it on
WOOD
METALS
PLASTICS
GLASS
LEATHER
and other materials

Here's a Real Bargain!

SAVE \$2!
Was \$14.95*

NOW ONLY
\$12⁹⁵*

DUNLAP 4-inch Utility Grinder

It
buffs
grinds
cleans
polishes
sharpens!



Invaluable for light work! *UL approved!* Guaranteed 1 year! 4x1 1/2-in. grinding wheels; coarse, fine; 6 3/4 in. apart; Adjustable tool rests. Powerful 110-120-volt, 60-cycle AC motor; 3500 no-load RPM; 2 fans. Bronze bearings; on-off switch. With 6-ft. cord and plug. 6 1/4 in. high.

CRAFTSMAN Electric Magnetic Jig Saw

ONLY
\$12⁹⁵*
With 6 blades



No motor or belt needed!
Sturdy . . .
NOT a toy!

It's easy, inexpensive . . . to make hundreds of articles in wood, plastic or metal!

Look at its capacity!

Cuts to center of 22-in. circle
In wood up to 1-inch thick;
Plastics up to 3/8-inch thick;
Aluminum up to 3/32-in. thick;
Brass up to 1/16-inch thick;
Zinc up to 1/16-inch thick.

A perfect hobby gift for young or old! Use anywhere; just plug it in! *UL approved!* Magnetic unit gives 7200 SAFE, short cutting strokes per min. (TWICE former power)! Smooth edges need no sanding. 8 1/2x8-in. table; rubber feet. All-metal; well-made. For 110-120 volt, 60-cycle AC use only. With six 5-in. pin-end blades, 5 1/2-ft. cord and plug, and instructions.



ONLY
\$10⁹⁵*

Complete with 10 sanding sheets and polishing pads

CRAFTSMAN Electric Sander-Polisher

Hundreds of uses! No tiresome rubbing or pressing!



Polish cars easily



No pressing needed!



Adjustable stroke!

Handy! Easy to use! Weight of tool does work. A finishing sander only, for polishing cars, furniture, woodwork, silverware, even shoes! Sands furniture, walls, woodwork, shop projects super-smooth! Wonderful for body massage, too! *UL approved!* Heavy-duty magnetic power unit; 14-400 strokes per minute. Die-cast housing; bakelite handle. Size, 5 1/2x4 1/2x2 3/4 in. For 110-120-volt, 60-cycle AC only. Complete with 8-ft. cord and plug; 10 sanding sheets; and one lambswool and one velour polishing pad.

*Prices slightly higher south of the Ohio and west of the Mississippi rivers.

CRAFTSMAN Tools by **SEARS, ROEBUCK and CO.**

Sturdy! Accurate! Low Priced!

CRAFTSMAN 8-inch Tilting-Arbor Bench Saw



Saw Only

\$54.50*
Cash

Complete with blade, guard, splitter, miter-gauge, nonkickback pawls, rip fence, two pulleys and V-belt. \$5.50 Down, \$5 Monthly

Complete Outfit as shown

\$109.50*
Cash

With motor, front and side extensions, and bench \$11 Down



Sears Bench Saws are completely equipped; NOT stripped models, as are some saws on the market!

Sears Easy Terms make it easy to own the tools you need NOW... pay as you use them!

Look at these superior features!



Work stays level! Blade and guard (not table and work) tilt any angle up to 45°, for faster, easier and more accurate operation!



Exclusive! Tilting, raising and lowering blade are all controlled by a single hand wheel at front of saw!

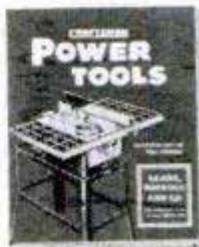


Floating motor mount fastens to bench for easier tilting. Controls belt tension; reduces vibration; lessens strain on frame!

We know of NO finer, more complete Saw at anywhere NEAR this low price!

This superb, heavy duty CRAFTSMAN tilting-arbor saw meets the most rigid demands of professional craftsmen! Large, smooth-ground, cast semi-steel table, 20x17 in. (34x20 in. with side extensions), has insert removable for dadoing, 2½-in. depth of cut. Saw has automatic leveling guard, non-kickback pawls, splitter, miter gauge and rip fence, 2-in. machine and 2½-in. motor pulleys, ½x40-in. V-belt, motor mount, and 8-in. combination blade (½-in. bore). Complete outfit includes CRAFTSMAN ½-H.P. 3450 RPM ball bearing capacitor motor (110-120-volt, 60-cycle AC.; 2 side table extensions; front roller extension; and steel power tool-bench (height adjustable 22 to 32 in.). See it at your nearest Sears Retail Store TODAY!

Free!



Sears new 60-page, 1951 Power Tool Catalog... FREE! Get yours NOW... at the Hardware Dept. of your nearest Sears Retail Store!

These handy accessories make your bench saw much more useful!

8-in. Cut-off Wheel. Cuts tile, concrete, stone, metals, ½, ⅝ or ¾-in. arbors.

\$1.39*

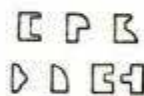


8-in. Nail-Cutting Saw. For rough work (rips; cross-cuts). ½, ⅝-in. arbors.

\$4.50

Molding Cutter Head and Cutter Bits. New! Make your own moldings. Dozens of uses! 3-in. diam. head fits most bench saws with ½ or ⅝-in. arbors. 1-in. wide bits cut styles as shown.

Cutter Head \$4.50 With Allen wrench



Cutter Bit styles \$2.95 per set, up.

Famous for fine quality... precision performance... low price!



MOLLY

SCREW ANCHORS



**IT'S EASY TO INSTALL MOLLY
NO SPECIAL TOOLS NEEDED**



**WHERE SCREWS
WON'T HOLD
USE MOLLYS**

MOLLY FASTENS SECURELY

- Sinks • Soap Dishes • Fuse Boxes • Wall Clocks • Mirrors
- Stair Hand Rails • Drapery Fixtures • Electric Fan Brackets
- Bathroom Cabinets • Tool Racks • Venetian Blind Fixtures
- Kitchen Cabinets • Awnings • Towel Racks • Wall Brackets
- Shelving • Heavy Pictures • Door Chimes • Curtain Fixtures

MOLLYS are inexpensive, easy to install in walls, floors, or ceilings and assure a safe, secure mounting that will never become loose. **ASK YOUR HARDWARE DEALER.**

MAIL THIS COUPON FOR **FREE** DESCRIPTIVE FOLDER

Name _____

Address _____

City _____ State _____

My hardware dealer is: _____

Address _____

MOLLY CORP., DEPT. 1157, READING, PA.

a switch in the blockhouse was thrown, sealing off the booster rocket so it wouldn't go off separately.

Usually, by the time the loudspeaker intones "X minus 20 minutes," everything rests on the success or failure of electronic and mechanical equipment. A purplish red smoke grenade goes off, warning all personnel that everything is set.

At X minus 2 minutes, a red Very flare streaks to the sky. There isn't much anyone can do now. "It is X minus one minute," drones the speaker, and you can hear a pin drop in the blockhouse. "The next count you hear will be minus 20 seconds. Stand by." If it's White Sands or Halloman, men at some 30 stations uprange will be fingering their instruments nervously. If it's Cocoa, observers way out on the Bahama Islands will be alert for the white vapor streak across the sky that tells them another long-range rocket is streaking horizontally for a new distance record.

"Eight . . . seven . . . six . . . five—down goes the button—four . . . three . . . two . . . one . . . zero."

ROCKET AWAY!

Tailor-Made for Bull's-Eyes

(Continued from page 156)

Also being built at the present time by the Pfeifer Rifle Company is a monster rifle that will weigh 70 pounds and will use .50-caliber machine-gun ammunition. This "Paul Bunyan" weapon will be used to test the accuracy characteristics of ammunition. The price will run around \$650.

In addition to making barrels and building custom rifles, Pfeifer does a considerable business in repairs and alterations. He rebarrels actions, supplies "velvet blue" metal finishing, installs sights, fits new stocks to weapons previously in use. If safety appears doubtful, however, the work is rejected—even though the customer assumes full responsibility for it.

All shooters know that some ugly rifles may show fair accuracy, while many beautiful showpiece weapons can be highly inaccurate. Joe Pfeifer sees to it that neither kind comes from his shop. Ugly rifles are poor publicity and beautiful "lemons" are worse. The gunsmithing business depends to a large extent on repeat orders and keeping the cost of high-grade craftsmanship within the reach of the majority of sportsmen and target shooters.

Not long ago Joe Pfeifer got to thinking about the average "gun bug" who can't pay a fancy price for a rifle—yet wants to own a weapon that will be highly accurate and

(Continued to page 250)

IF THE PIPES ACT LIKE THIS...IT'S TIME TO GET BUSY.

and

IF YOUR CAR FEELS LIKE THIS ...IT'S TIME FOR MARFAK CHASSIS LUBRICATION



THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

Want "cushiony" driving ease that's feather-bed soft? Get longer-lasting *Marfak* lubrication. *Marfak* fights wear and friction for 1,000 miles and more! It's specially compounded to stand up to rough "road work," and resists wash-out and squeeze-out. As a result, *you* get "cushiony" driving right from one lubrication job to the next! Today, ask for *Marfak* lubrication from your Texaco Dealer, *the best friend your car ever had.*



THE TEXAS COMPANY

TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America



TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

YOU GET A COMPLETE POWER WORKSHOP PLUS EXCLUSIVE BONUS FEATURES WITH SHOPSMITH

It's *more* than five rugged power tools in one compact unit. SHOPSMITH is a complete power workshop; saw, disc sander, horizontal and vertical drill press, lathe—each with *exclusive bonus features* that make SHOPSMITH far and away your best power tool buy!

Imagine a saw that locks in a vertical position for cutting extra-large panels, for trimming doors, screens, storm sash! A disc sander that *feeds into* the work. A drill press that does a perfect doweling job *without jigs*. A lathe that lets you *face the work* while faceplate turning.

Imagine a sturdy, guaranteed-for-one-year, precision-built unit so ingeniously engineered that you can convert it from tool to tool *in less than 60 seconds*. So compact it fits any 2 x 5 foot space. So completely flexible you can do 116 wood, plastic and metal-working operations. So unlimited in capacity you can build a house with it.

But why *imagine*? See SHOPSMITH for yourself. Compare it feature-for-feature with any other power tool or combination of single-purpose tools. Then compare prices *complete!* At any Montgomery Ward, leading hardware or department store.

\$169.50

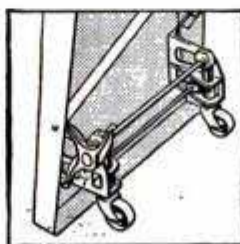
complete except for motor.
With special, 1/2-hp., capacitor-type motor (shown) . . . \$199.50

CONVENIENT TERMS

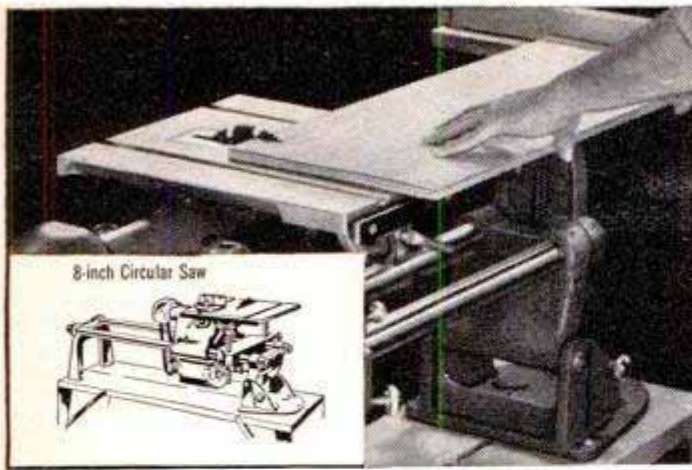


NEW RETRACTABLE CASTERS FOR SHOPSMITH

They save space, increase SHOPSMITH'S great flexibility

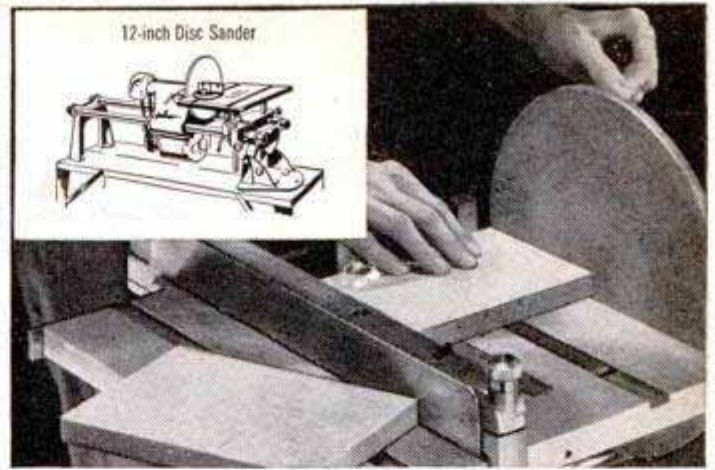


Now your SHOPSMITH can be completely mobile. Move it, roll it, lock it—on specially designed, three-stage, retractable casters. They're easily mounted on any wood or metal bench. Easy to set, too—each pair of wheels is operated by a unique foot lever. See your SHOPSMITH dealer. Price complete (4 wheels, 2 levers) . . . \$11.95



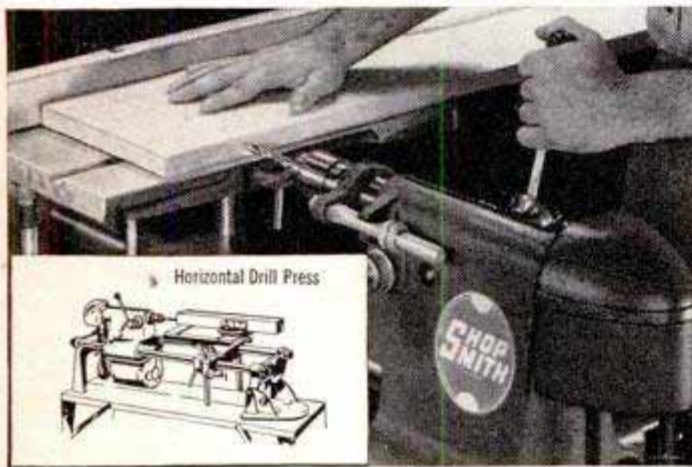
8-inch Circular Saw

HAIRLINE SETTING. Unique micro-quill adjustment positions saw blade for extremely accurate width of cut. No more difficult fence settings. Saw has 48" fence-to-blade capacity, large tilting table, precision tooled miter gauge, self-aligning rip-fence, table raiser. 2 1/4" depth of cut.



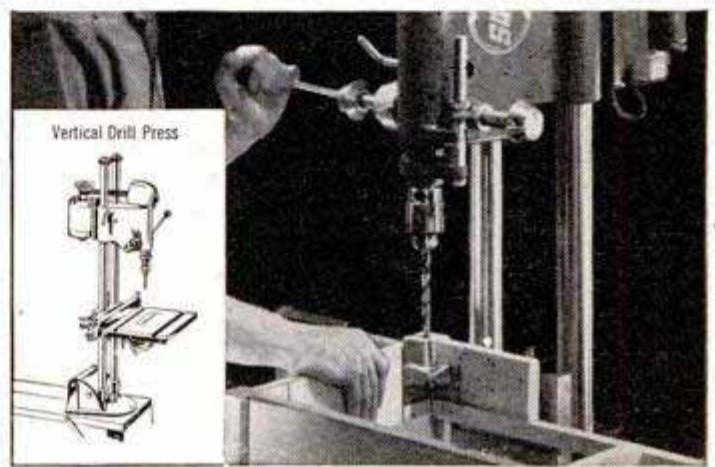
12-inch Disc Sander

DUPLICATE SANDING. For making two or more pieces exactly the same length. Only SHOPSMITH has this feature plus 12" precision balanced disc, 14 1/2" x 17" tilting table, both miter gauge and fence. Disc feeds into work for maximum speed, accuracy and safety. Stop-nuts set feed depth.



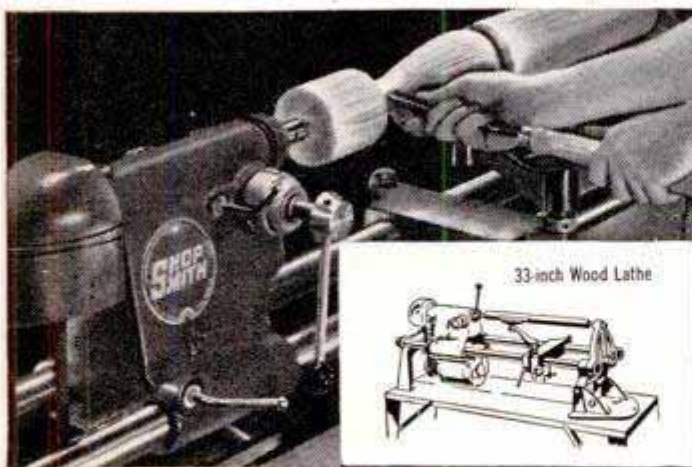
Horizontal Drill Press

PERFECT DOWELED JOINTS. No jigs required. Just lay work flat on table, feed drill from side. Dowel holes match perfectly. Especially handy for drilling or mortising large, heavy work. Speeds range from 875 to 3500 rpm. 4" quill feed. Unlimited capacity. Adjustable depth scale.



Vertical Drill Press

LEFT-HANDED, TOO. Only drill press on the market with right- or left-hand feed lever. Drills to the center of 15" circle. Maximum clearance table to chuck of 27", floor to chuck, 55". Jacobs key chuck takes drills up to 1/2" diameter. 4" quill feed. Miter gauge and rip fence form convenient jigs.



33-inch Wood Lathe

QUICK-SET TOOL REST. Always moves parallel to work. No need for constant adjusting. 15" swing, 3" more than most heavy-duty lathes. Distance between centers, 33". Absolutely rigid lathe bed assures minimum vibration, maximum accuracy. Steel ways take one ton stress.

SHOPSMITH TAKES ALL STANDARD ATTACHMENTS

GET ALL THE FACTS! Compare before you buy. Illustrated, 16-page booklet brings you detailed specifications, describes SHOPSMITH'S many operations. Send for it! It's FREE!



FREE

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Dept. 147-B, at factory nearest you:
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Name _____

Address _____

City _____ Zone _____ State _____



Just dial ANY WIDTH CUT
ON YOUR SAW



WITH

Warren

DADO SAWING WASHERS

Cut clean, accurate, parallel grooves—12 widths, any angle. No chatter, burning, chewing—or sanding! No more blade vibration—no screws to fuss with—just four balanced washers. Simply dial desired width with Micro-matic adjustment. Can be left on blade for straight cuts. Available in 5 sizes— $\frac{1}{2}$ ", $\frac{3}{4}$ ", $\frac{5}{8}$ ", 1", $1\frac{1}{8}$ ". A perfect gift for woodworkers. See your dealer or write—

YOUR
SAW
IN ACTION

\$4.95
SET

WARREN WASHERS CO.

Dept. 31 • 70 Medbury • Detroit 2, Mich.

dependable. So he developed the "gun kit"—action, barrel and unfinished stock—which the sportsman puts together and decorates as he wishes.

The kits are of three types:

The sporter rifle—which contains an F.N. Commercial Mauser action, a 24-inch No. 10 sporter barrel chambered for cartridges from .220 to .30-06, and a production stock with a rolled cheekpiece.

The varmint and target rifle—consisting of an F.N. Commercial Mauser action, a 26-inch No. 25 sporter barrel chambered for cartridges from .220 to .30-06, and production stock with a high, thick comb.

The bench-rest rifle—including an F.N. Commercial Mauser action, a 30-inch barrel, chambered for cartridges ranging from .219 to .250, and production stock with a long, beavertail forearm for best bench-rest position.

Anyone who knows a little about firearms and how to use ordinary hand tools can put one of these kits together in a day. An expert can do it in three hours. Then he can decorate the stock in any way he likes.

Gunsmithing has always had some of the home-workshop, fine-handicraft atmosphere about it. Colt, Remington, Winchester, Smith and Wesson—all the well-known American gunmakers got their start at home.

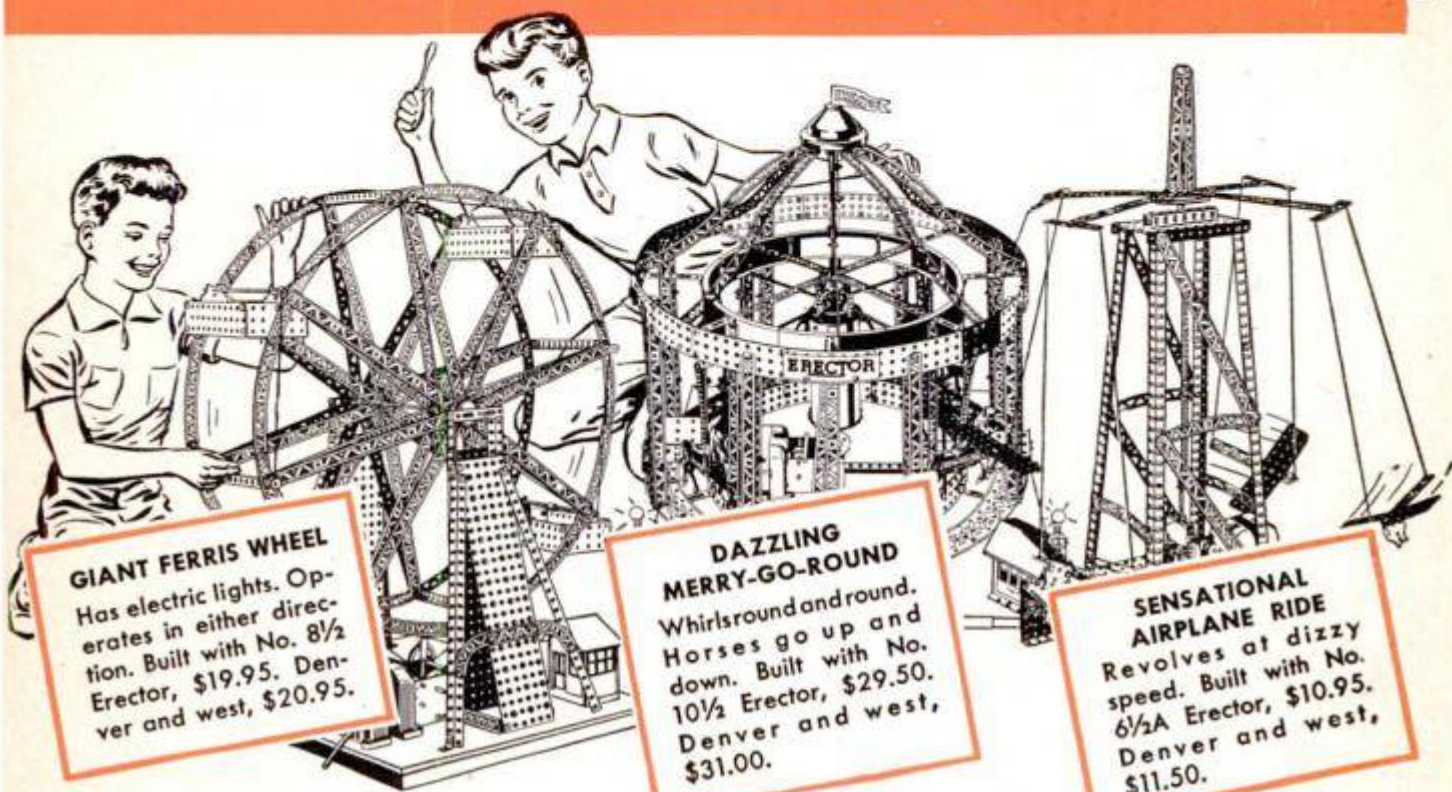
In building rifles of deadeye accuracy, Pfeifer is following in the same tradition.



Indoor Ambulance

On duty 24 hours a day, a small ambulance can speed down the aisles of a big factory to pick up any worker who becomes sick or is injured. The ambulance, made from a Crosley station wagon, provides quick pickup service inside the Transformer Division plant of the Westinghouse Electric Corporation at Sharon, Pa. The factory is $\frac{3}{4}$ mile long.

BUILD THIS SPECTACULAR ERECTOR AMUSEMENT PARK



GIANT FERRIS WHEEL
Has electric lights. Operates in either direction. Built with No. 8½ Erector, \$19.95. Denver and west, \$20.95.

DAZZLING MERRY-GO-ROUND
Whirls round and round. Horses go up and down. Built with No. 10½ Erector, \$29.50. Denver and west, \$31.00.

SENSATIONAL AIRPLANE RIDE
Revolves at dizzy speed. Built with No. 6½A Erector, \$10.95. Denver and west, \$11.50.

ERECTOR World's Greatest Construction Toy

HELLO BOYS! Think of the fun of building and running these Erector Amusement Park models! With your own hands you fit gleaming girders and other parts together—see them grow into gigantic engineering marvels. Then you hook up the powerful Erector electric engine and make them swing into action with glorious realism. You can build hundreds of spectacular models with *one* Erector set. Only with Erector can you build models that buzz with action—blaze with electric lights—whistle—puff smoke—give off “choo-choo” sounds—operate by remote control. Get a genuine Erector set. Prices start at \$1.75. Denver and west, \$1.85.

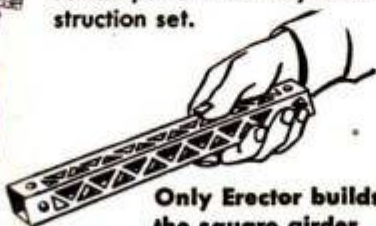


SEND FOR GIANT CATALOG

Cost over \$125,000.00 to produce. 56 full-color pages on Erector, American Flyer trains and equipment. Describes thrilling Erector contest. Catalog free at your dealer or send 10¢ with coupon.

A.C. Gilbert

Erector gives you girders of steel, to build like real—and more different parts than any other construction set.



Only Erector builds the square girder with interlocking edges.



Gilbert Hall of Science
143 Erector Square, New Haven, Conn.

Rush Giant Erector and American Flyer Train Catalog. I enclose 10¢.

Name.....

Street.....

City..... State.....

This offer good only in U. S. A.

Free folder tells—

How to own a

Chris-Craft

for as little as \$39 full price

Chris-Craft
8-ft. Pram



Chris-Craft
14-ft.
Rowboat



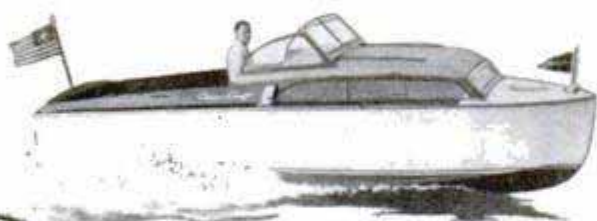
Chris-Craft Model 14
Outboard Boat



Chris-Craft
21-ft. Sportsman



Chris-Craft 21-ft. Express Cruiser



Easy-to-assemble Boat Kits! SAVE 1/2 or more! New Chris-Craft Boat Kits include pre-cut Genuine Philippine Mahogany parts, Fir Marine Plywood panels; all brass screws; illustrated instructions. Write for free folder today!

CHRIS-CRAFT CORPORATION
200 DETROIT ROAD, ALGONAC, MICHIGAN

Skyroads to Everywhere

(Continued from page 147)

uses omni and DME information to navigate when the pilot can't or doesn't want to follow the fixed radio tracks. After feeding in the three known factors—the destination's distance and bearing from the nearest omni station, and the actual course desired—you have only to keep the left-right needle centered to stay on course. The magic box is constantly figuring out the third side of the triangle. Relying on chains of omni stations, you can navigate anywhere in the U. S. without "riding the beam."

You're about 60 miles from Mansfield now and tune in on its 113.9 frequency. You put the track selector at 67 degrees, which will take you right into the airport.

It is a fine day and you need no help in getting downstairs, but the Common System offers additional aids for those who have to fly bigger, faster planes in all kinds of weather. Radio and radar combine to provide complementary guidance techniques for approach and landing. Operating separately and on different principles, together they provide an almost foolproof check against human errors and mechanical failures.

The instrument-landing system, older of the two, has a transmitter sending out one radio beam on a horizontal plane and another projecting a vertical beam. The correct approach follows the path along which the two beams intersect. The job of the pilot, watching a single dial with one needle hinged at the top and another at the side, is to fly so that those two needles keep crossed at the center of the dial—indicating he is centered on both beams. The needle's distance and direction off center show how much he must maneuver to make corrections.

Within three years over 50 of the busiest U. S. airports will probably also offer ground controlled approach, a radar boon that proved itself under high-pressure combat conditions. It differs from ILS in that ground observers, accurately following the plane's blip image on their screens, give the pilot a running voice commentary on his position relative to the landing path. All the pilot needs is a radio to receive the instructions.

Before the plane gets to the field it is picked up by surveillance radar, which keeps the airport traffic controller informed on the bearing and distance of all aircraft within 30 miles, and large planes for even greater distances. By 1953 the busier CAA towers will be equipped with

(Continued to page 254)

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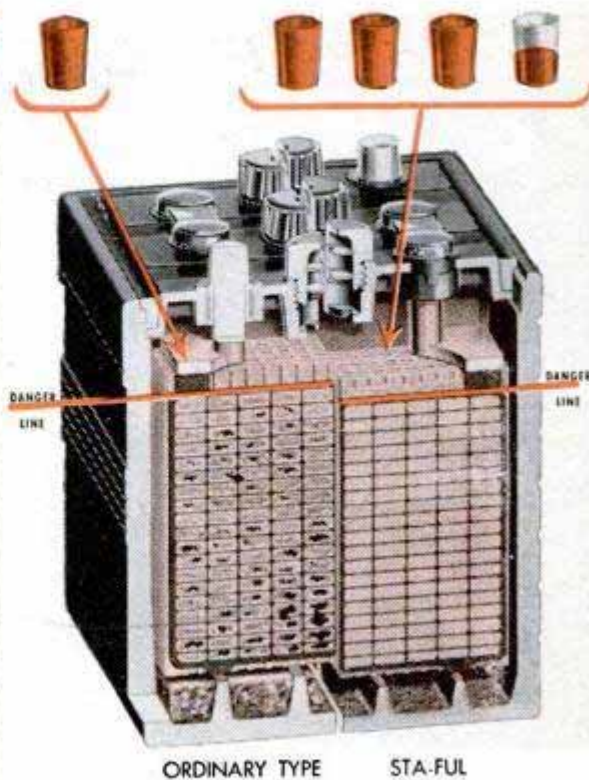
Toledo 1

Ohio



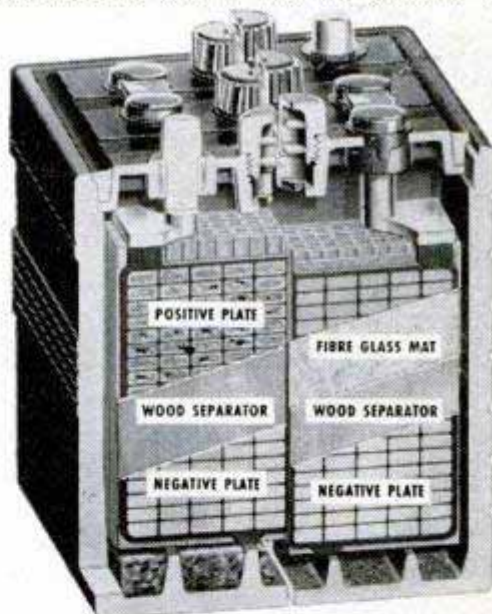
*Proven by tests conducted according to SAE Life Cycle Standards.

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high-frequency direction finders to simplify individual aircraft identification in dense traffic. The pilot's voice activates a line of light which passes through his particular aircraft's blip on the radar screen.

To check omni-range accuracy, the author flew with airways flight inspectors Paul McDonnell and Fred Kinsel of the Chicago CAA office. With the cockpit windows paper masked and his seat lowered to the floor to assure his inability to see outside—and only the four omni instruments within view—McDonnell made a test run on a small landmark 50 miles away.

After 20 minutes of blind flying, at about the time we should have neared our target, I tore a small strip from the top of our window mask and peered out. Directly ahead, as though we'd been sliding down a trolley line for 50 miles, was our landmark.

Charles F. Horne, who heads the CAA's federal airways program, believes the omni range will give the light-plane industry a badly needed "shot in the arm." By making cross-country navigation simple and safer, thus boosting the airplane's utility, Horne thinks the system will greatly widen the buying market. Max Karant, who tested omni for an association of some 35,000 personal-plane users, went even further to term it "the answer to the private pilot's prayer."

Changes and improvements are anticipated before the program reaches maturity in 1963, but the basic pattern is already forming. Scrapping of the antiquated four-course ranges, still the backbone of today's nationwide air navigation, should be finished by 1954. Now gaining consideration as possible additions are automatic block systems for traffic control and cockpit pictorial displays that show the pilot his own plane and all others in the vicinity. Another is a machine that makes continuous tape recordings of all conversations between the tower and pilots, a valuable adjunct for accident investigation.

Pioneering private pilots, using the first omni stations, are shuttling about on cross-country flights with growing ease and certainty. Indicating that the system may eventually have worldwide use, five experimental ranges are being set up in England, France and Italy. Commercial and military airmen have been reporting remarkable bad-weather assists from GCA already operating at Chicago, New York and Washington.

The U. S., with its progress historically in step with constantly improving transportation—from the horse and buggy through boats, trains and automobiles—is now crisscrossing the sky with reliable all-weather highways for the airplane.



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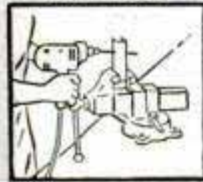
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This Business Is Next to Nothing

(Continued from page 111)

aluminum), instead of magnesium salt, are condensed on optical flats, the result is a mirror. These vacuum-coated mirrors, superior to those made in the conventional way, are used in precision devices: machine-tool comparators and infrared spectrographs, in television and astronomical instruments and in the latest types of sealed-beam headlights.

Quartz radio crystals are "loaded" with gold film under high vacuum until they vibrate at precisely the desired frequency. Then silver film, also vacuum-deposited, provides bases for soldering electrical leads to the crystals.

A particularly fascinating application of high-vacuum coating is metal shadow-casting, used by scientists in connection with the new electron microscope. The metallic mist is directed against the specimen to be studied, at an oblique angle. Irregularities on the surface of the specimen cause thickness variations in the layer of metal. This produces shadows from which heights and depths of the surface irregularities can be calculated.

Molecular (or "short path") distillation is still another of high-vacuum's important new jobs. Vitamin concentrates from fish oils, fine lubricating oils for watches and purification of hormones on a commercial scale are but three from a growing list of applications.

Vacuum engineers have upset the old theory that certain oils are "fixed"—undistillable. Under high vacuum, their long, delicate chains of molecules are tenderly handled, protected from disastrous bumps by the molecules of the air.

It was Dr. K. C. D. Hickman who first thought of molecular distillation, thereby providing millions of Americans with vitamins in convenient capsule form instead of thick, yellowish, evil-tasting cod-liver oil. Doctor Hickman mounted a heated, whirling disk inside an evacuated glass bell jar.

Fish oil, fed to the center of this "spinning pie plate," spreads outward in a thin film. Almost instantaneously the light-weight vitamin-bearing esters vaporize and condense on the bell jar's cool surface, from which they are collected and shipped to food and pharmaceutical concerns.

Three types of pumps are used in high-vacuum work:

Jet pumps trap air or gas molecules and sweep them forward in a high-speed jet of steam or oil vapor. The air goes into the atmosphere; the vapor condenses and returns to the boiler for recirculating.

(Continued to page 258)

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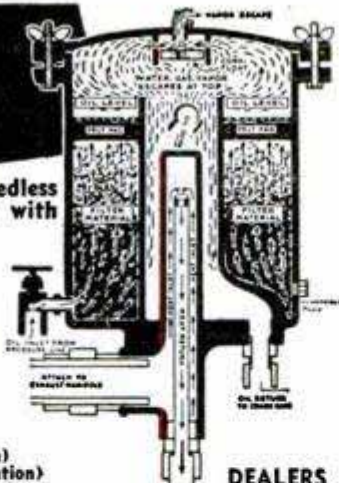
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Above: Combination Model pouch of Brazilian Peccary \$10 (Killarney Pipe \$5). Other models, \$1.50 to \$20. At left: Daily Model holds one day's supply compactly. Beaver Calfskin, illustrated \$2.50. Other leathers, and other models for full pack of tobacco, \$1.50 to \$15.

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A single pump of this type can lower pressure to about 50 millimeters (around one fifteenth of atmospheric pressure at sea level). Hooked up in series, five pumps can cut this to as little as .03 millimeter. Such pumps are favored where large volumes of air or gas have to be handled at high speed and where higher vacua are not required.

In the most efficient oil-sealed mechanical type, a rotor revolves eccentrically within a cylindrical chamber so that air (from the container being evacuated) is admitted to the chamber. As the rotor revolves, the container is automatically sealed off—at the same time, the air in the pump chamber is compressed into a small space and driven off through a vent, into the outside atmosphere.

These mechanical pumps work fast, the rotor turning at the rate of 600 revolutions per minute. But the highest vacuum possible with such equipment (about .001 millimeter) is still a far cry from the kind of emptiness needed in many of the new applications.

The real evacuator is the diffusion pump, which uses a curtain of mercury or oil vapor as a jet for dragging out the air or gas molecules. In one form of diffusion pump, mercury or oil of low boiling point is heated in a tank at the bottom of an inverted U-shaped tube. High-pressure vapor soon rises in one arm of the tube and rushes past the opening of the space to be emptied, sweeping off air molecules by the billion.

The process is speeded by stages of ejector orifices along the way, which keep building up the pressure of the vapor. In its passage down the other arm of the tube, the vapor condenses on the cool sides and returns to the tank, to be vaporized once more. The air molecules, meanwhile, are drawn off by a mechanical pump.

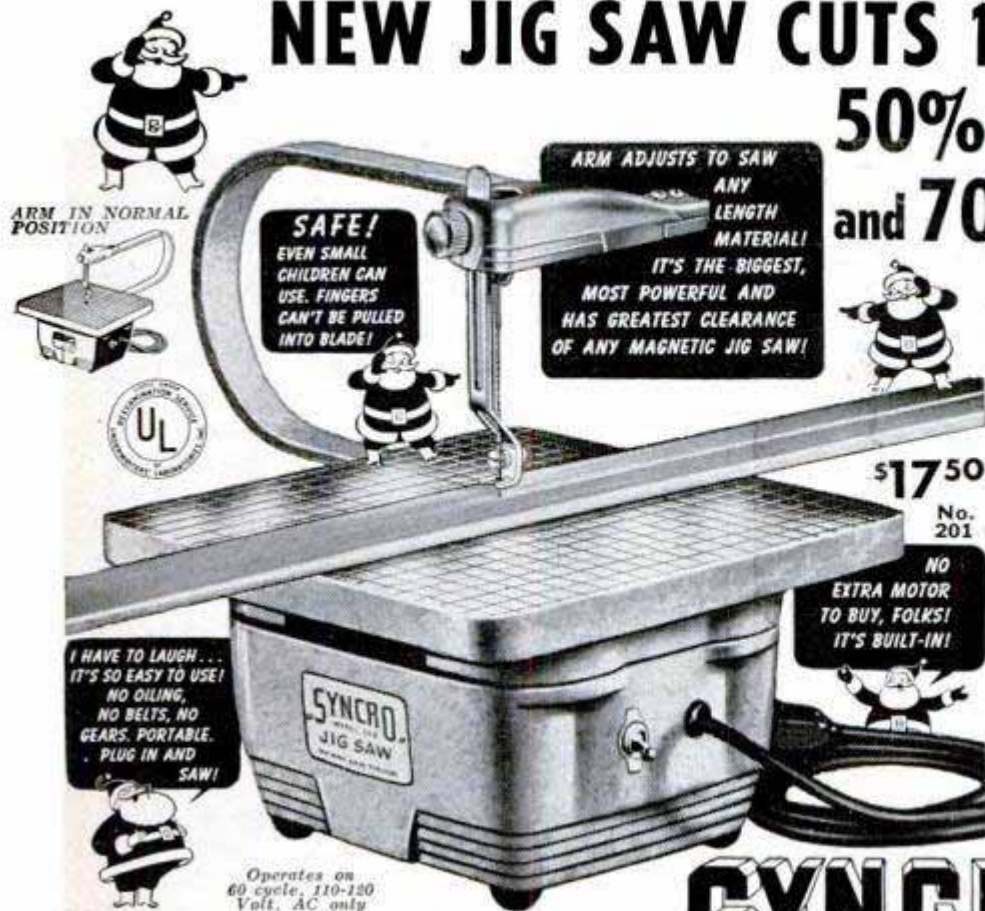
Developed by Doctor Langmuir back in 1916, the diffusion pump is capable, in theory at least, of producing a perfect vacuum. The latest types, used in advanced laboratory research, leave such a small amount of gas that it would have to be increased at least ten trillion times to bring it back to normal atmospheric pressure.

That's about as close to nothing as any human being has come, thus far.

Running an industrial process in such an evacuated space would be like taking a factory off the surface of the earth and moving it up into the ionosphere.

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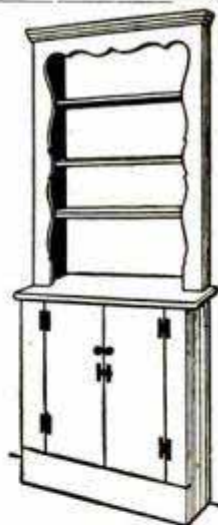
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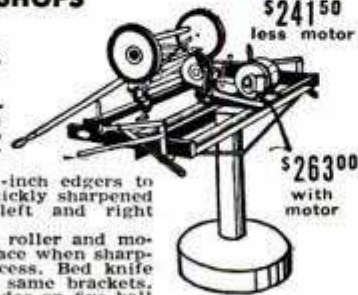
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TV's Little Brother

(Continued from page 85)

of a bomb equipped with small fins, or wings. The tail assembly held a steering mechanism operated by radio from the control plane.

Watching the drop in a receiving set in the plane, the bombardier could correct his drop by changing the pitch of the fins on the bomb as it fell. The difficulty with this was that these changes of direction could be achieved for only the first few seconds after the bomb had left the plane. As its velocity increased, changing the pitch of the fins had almost no effect.

Colonel Norvell, who was involved in this experimental work, recalls the horrifying experience of getting a bomb's-eye view of himself. In addition to the receiver in the control plane, another was set up in a shack in the desert not far from the bombing range. As the TV-equipped bomb ripped through the air, Norvell and his fellow officers could distinctly see the shack in which they were huddled grow larger and larger as the bomb came nearer the earth. Fortunately, the bombardier's aim was good and they were unhurt.

Stationed in England at the time the V-2 rockets were at their worst, Colonel Norvell was assigned the job of bombing the supply hangars in which the Nazis assembled and stored them. However, the roofs on these hangars were of reinforced concrete so thick that even blockbusters failed to open them up.

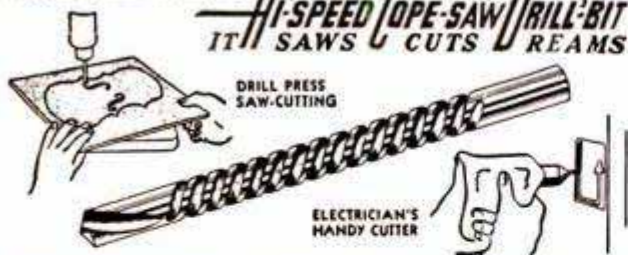
So Norvell equipped 34 bombers, B-17s and B-24s, with automatic pilots and loaded each one with 2400 pounds of TNT and Torpex. In the nose of each plane was a TV camera, and high over the Channel, in the Calais area, was a control plane with a TV receiver. The object was to fly these bombers, one at a time, right into the gaping mouths of the V-2 hangars, through which the rockets were brought before firing.

In order to follow the picture picked up by the cameras in these bombers, they were set to fly as slowly as possible. The openings to the hangars were not too large, and it was necessary to be very accurate. Consequently, many of them were hit by AA fire before they reached their objectives—but a fair number were successful—and this was the beginning of the end of the V-2s.

In recent months, the Army Signal Corps held a public demonstration in Fort Monmouth, N. J., of still another TV application. The camera was mounted in a small, low-flying reconnaissance plane, which sent back a picture to its ground base.

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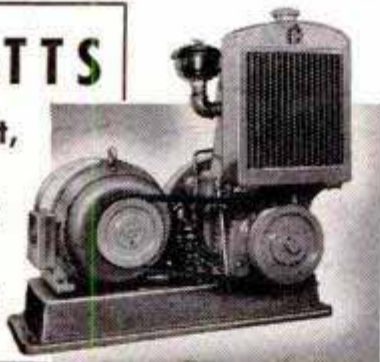


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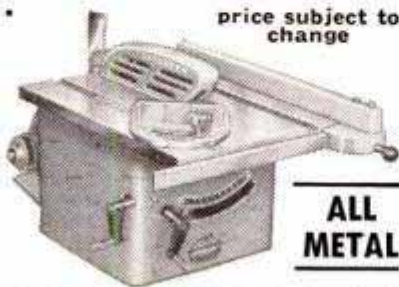
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expensive saws do . . .
plus these features:

- 8" blade cuts 2 1/2" deep.
- 12"x16" gray iron cast table ground smooth. (Extensions available)
- Double shielded, lubricated for life, ball bearings.
- 5 1/2" arbor size.
- Motor and blade tilt to full 45°. No belt twist.
- Guaranteed material and workmanship.

See your dealer
or write Dept. PM-115



for only
\$38.95

complete
(less motor)
price subject to
change

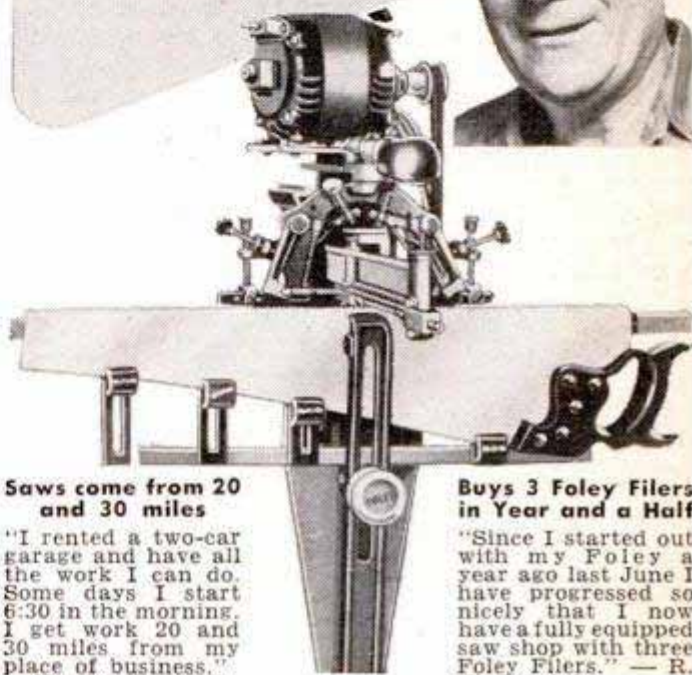
ALL
METAL

SPRUNGER BROS. INC. TOPEKA, IND.

FREE PLAN

Tells How to Start
Your Own Business

FILING SAWS



Saws come from 20
and 30 miles

Buys 3 Foley Filers
in Year and a Half

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."
—Charles H. Smith.

"Since I started out with my Foley a year ago last June I have progressed so nicely that I now have a fully equipped saw shop with three Foley Filers."
—R. W. Persinke.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and cross-cut circular saws on the Foley Saw Filer. The adjustments are simple — there is no eyestrain — and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Filer came out 100%. I think it is a marvel of perfection."
—writes Clarence E. Parsons.

FREE BOOK Shows How to Start

"INDEPENDENCE AFTER 40"

explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think — with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Start now — send coupon today. No salesman will call.



Send For **FREE BOOK**

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Send me free book "INDEPENDENCE AFTER 40!"

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WITH KLEAN-STRIP

**Amazing new-type remover
is fast, safe, easy-to-use**

Klean-Strip changes any finish into loose, wrinkled film. Use only a brush or putty-knife to peel off all layers of the old finish at one time.

Klean-Strip leaves the surface clean, smooth and dry. No sticky mess to wash off, no waxy residue to scrape. And Klean-Strip is absolutely safe: will neither burn nor explode.

Klean-Strip is brand new . . . not like any paint remover you've ever used. Takes all the danger and drudgery out of refinishing. Buy Klean-Strip whenever you buy paint. Available at better paint, hardware and department stores, everywhere.

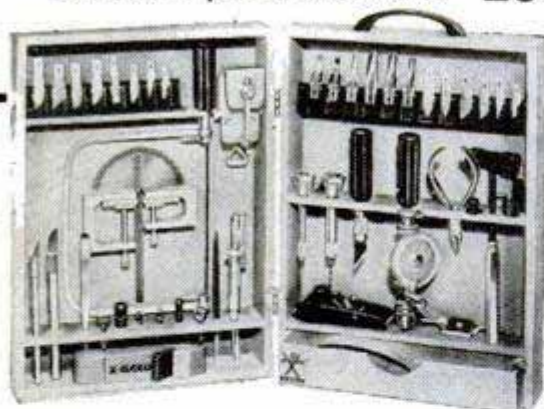
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W. M. BARR & CO.
2352 S. Lauderdale
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Non-Inflammable!**

Great Gift! Great Buy! "FORTY-NINER"

Complete set of X-acto Hobby Knives
and Tools in portable wooden chest **\$25**



Every knife, tool and blade in the famous X-acto line. Precision made, easy to handle, joy of amateur and expert hobbycrafters in every field. X-acto knives and tools sell singly and in sets, 50¢ to \$50 at hobby, gift, hardware and department stores. (Prices slightly higher in Canada.)

x-acto 

X-acto Crescent Prod. Co., Inc., 440—4th Ave., N.Y. 16
In Canada: Handicraft Tools, Ltd., Hermant Bldg., Toronto

On Permanent Alert

(Continued from page 94)

Normally, it would be much simpler to first fly the bombers to an advanced base and make the attacks from there. Eight days from the time the 22nd Bomb Wing left California it had arrived in Japan, established a new base and had dropped its first bombs on targets in North Korea.

The bombers attached to the Strategic Air Command are B-29s, B-50s that resemble the 29s in appearance but that have greater power, range and bomb capacity, and huge new B-36s that are just now going into service.

Standard equipment on all the operational types includes facilities for bombing by radar, remote-controlled defensive-gun batteries and, in the case of the B-50s, a pair of streamlined external tanks that adds 1400 gallons to the plane's supply. The tanks may be dropped when empty or their fittings may be used to carry a pair of 4000-pound bombs.

The B-50s, too, are all equipped with mid-air refueling apparatus of the hose or of the newer flying-boom type. One squadron of tankers is attached to each group of bombers. The tankers can top off a bomber's fuel tanks after it has climbed away from the field with a maximum load of bombs and partly filled tanks, or they can give a final refueling deep in enemy territory.

Lt. Gen. Curtis LeMay, commanding the Strategic Air Command, has given his heavy and medium bombers a new job in addition to their traditional role of destroying the sources of an enemy's strength. Now they can be used for retaliation. It isn't true that the Air Force could be dropping atom bombs on an enemy capital an hour after we were attacked, but it is true that our bombers could be on their way within a few hours.

Equipment and procedures both have been redesigned so that most of the aircraft in a group are always ready for action. Instead of being grounded for days when one of its 3500-horsepower engines needs repairs, a B-50 needs to be tied up for no more than an hour. In that time, four men can remove an entire powerpack and replace it with a pretested unit.

Each bomber can carry a "fly away kit" in its bomb bay, complete enough to maintain the aircraft for 30 days. Mechanics to service the plane are carried as passengers to the new base. Meanwhile a larger stock of tools, supplies and parts is flown to the new base by Military Air Transport Service. In theory and pretty much in practice, the bombers are always ready for action.

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U-MAK-IT BOAT KITS 8 FT. PRAMS ROWBOATS
 OUTBOARDS INBOARDS & CRUISERS

BUILD THE BEST U-MAK-IT KITS

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AMAZING 12 1/4-IN. PLANER Does All Ordinary Planing Mill Jobs. Provides attachments for Jointing, Rabbeting, Tongue, Groove, Matching. 12 1/4 x 6-in. capacity, 3-knife solid round all-steel cutterhead. Power feeds at 24 feet per minute, 42 cuts per inch. Provides for full line of accessory attachments—Grind and Joint knives IN THE CUTTERHEAD WITHOUT REMOVING.

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AIR RIFLES BENJAMIN AIR PISTOLS
SHOOT WITH SAFETY

BE SAFE—SHOOT WITH COMPRESSED AIR—ALWAYS READY
 No Cartridges or Tanks to Replace or Recharge. If you want the most **PRACTICAL GUN** to use anywhere—inside or outdoors—get a **SAFE—CLEAN—ECONOMICAL BENJAMIN** with Adjustable Power and Amazing Accuracy. Send for Free Folder of Latest Models Today. **BENJAMIN AIR RIFLE CO., 890 MARION ST., ST. LOUIS 4, MO.**

SAY YOU SAW IT IN POPULAR MECHANICS

12-VOLT Delta Power-King Electric Lantern

\$5.95 less batteries

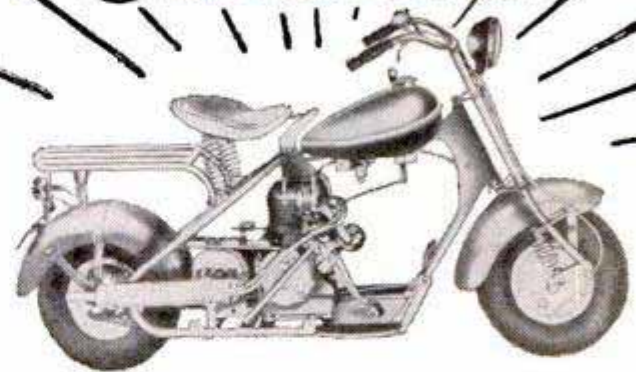
NEW!

Same Delta quality as the world-famous **POWER-LITE** — with **twice the light!** **POWER-KING** shoots light 1/4 mile. Adjustable, all-chrome head. Uses two 6-volt lantern batteries. See your hardware, sport or electrical dealer.

DELTA ELECTRIC COMPANY
 Marion, Indiana

Delta POWER-KING

Announcing the New CUSHMAN
EAGLE



The sensational New Cushman **EAGLE** is ready! And, Boy! O Boy!—how you'll enjoy this entirely new thrill in motoring pleasure! It's big, husky, powerful, speedy! Has you moving at high speed within yards! Cruises up to 50 miles an hour out on the open road! Amazing fuel economy—up to 75 miles to the gallon! Luxurious comfort—big motor-bike saddle seat mounted on double coil springs . . . shock-absorbing springs on front wheel . . . big balloon tires designed for comfortable riding as well as easy steering and long life. Powerful 2-wheel brakes. 2-gallon (plus) fuel tank. Brilliant headlight, tail-light. Nothing else like it—and it's yours for only **\$282.50** f.o.b. factory.

Cushman
 MOTOR SCOOTER

85 MILES PER GALLON

Long-time favorite for lowest cost motoring! Thousands in use. Cheaper than bus fare or operating your car. Handles easy. Slips through traffic, parks anywhere. Wonderful for getting to work, school or market—making deliveries. Famous Husky engine.



WRITE
 See your Cushman dealer for the New **EAGLE** and regular **Cushman Scooter**. Or send for Folder M11.

Rider Agent Plan Available

DEALER INQUIRIES INVITED

CUSHMAN MOTOR WORKS, Inc
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Exhibit this thrilling model Douglas SKYROCKET

Realistic Jet-Rocket solid-wood model, all parts ready-shaped for quick assembly. Complete with full-color decals, plastic canopy, and display stand, 59¢. At your hobby dealer.

Wingspan, 4 1/4"
 Fuselage, 8 1/2"

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Send for free circular describing all models.
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You own the BEST money can buy... when it's P&C

Square Opening
Movable jaw has full bearing surface on channel with any nut for greatest strength. Both chrome and semi-finish forged from tough alloy steel. Square opening grips square or hex nuts better.

There is a P&C tool for every job. Ask your hardware dealer for P&C punches, pliers, sockets, wrenches and screwdrivers—the BEST tools money can buy. **FREE TOOL BOOKLET** gives valuable information for every tool user. Send for your *free copy!*

P&C P&C HAND FORGED TOOL COMPANY
PORTLAND 22, OREGON

The Navy's Chamber of Horrors

(Continued from page 137)

so intricate that a 21-jewel watch movement seems almost crude by comparison. Yet these things must withstand interminable jouncing of trucks, the steady vibration of heavy airplanes, the heaving, jiggling decks of big ships under full speed. The lab's vibration tables test equipment for these hazards. Here, pieces of ordnance are put on platforms that can simulate any kind of jiggle known to man—from the slow, heavy thump of a trailer truck on a shell-pocked road, to the shivering tingle of a speeding plane. Vibrations can be increased to such a high frequency that the tables sometimes squeal like radios.

As for the careless handlers, there's a rough-handling machine that looks something like one of those rowing exercisers used in gymnasiums. A piece of ordnance, usually a live fuse, is fastened in the machine's claw, and gets pushed, pulled, yanked, twisted, jiggled, jogged and pounded in exactly 1024 different, accurately controlled directions at a rate of about one blow per second. An unsafe fuse doesn't stand a chance. Recently, the rough handler was incapacitated. It yanked so furiously it dislocated one of its own joints.

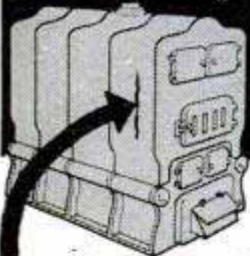
What happens to delicate mechanisms of mines and depth charges under the staggering pressures deep in the ocean? Big pressure vessels give Navy designers the answers. Pride of the new lab is the king-sized vessel recently completed. Its four-inch forged-steel walls measure eight feet in diameter and 30 feet long. Its yawning maw will accommodate anything up to a midget submarine and subject it to water pressures equal to a half-mile depth in the big briny. The torpedo, mine or whatever is to be tested, is rolled in on tracks and lashed to the monstrous walls. A gigantic hydraulic piston pushes the 39-ton door up into place. Then pneumatically controlled rubber gaskets squeeze against it and seal it. Valves open, pumps grind away and 15,000 gallons of water surge into the big tank. That fills it. Another 75 gallons, pumped in under pressure, raise the pressure inside the tank to 1000 pounds per square inch, or just what you'll find half a mile down. The water itself compresses about 45 of those extra gallons. The other 30 are taken up by—believe it or not—stretch in the 150-ton, four-inch steel-tank walls.

If the marine weapon stands up under all this, there still are a few more tortures. It can spend days in the salt-spray room, where it is doused and corroded within an

(Continued to page 266)

STOP FURNACE LEAKS

Save Fuel Costs



Seal up every heat-wasting crack, opened seam and other leak in your furnace, boiler, tank, radiators and piping **tight**—as professional repair men do—with **Smooth-On No. 1 Iron Cement**. Do it yourself—now—and cut this winter's fuel bills. You apply Smooth-On like putty, it hardens like metal, and *stays tight*, because it expands slightly as it sets. Buy Smooth-On No. 1 in 1 3/4-oz., 7-oz. or 1-lb. size at your hardware store. If they haven't it, write us.

FREE Repair Handbook

40 pages of ingenious, tested, short-cut repairs. Simple directions. 170 illustrations. Write today for YOUR free copy of the Smooth-On Handbook.

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THE IRON CEMENT OF 1 000 USES



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ALL BRAND NEW—UNCONDITIONALLY GUARANTEED

DIRECT CURRENT GENERATORS



For welders, plating, truck and marine use, D.C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

- ITEM #89—Type M-2, rated 50 Amps.—24 Volts. Mfd. by Leeco-Neville Co. Shpg. wt. 32 lbs. Gov't. Acq. Cost \$176.00. F.O.B. Chicago **16.50**
 - NOW ONLY
 - ITEM #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 70 lbs. F.O.B. Chicago **22.50**
 - ITEM #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost \$380.00. Shpg. wt. 70 lbs. F.O.B. Chicago **35.00**
- Each individually packed in wooden box.

UTILITY PUMP ROTARY VANE TYPE

Perfect For Water, Oil or Insecticides

Sprays DDT, 2-4D, sulphur compounds, etc. Pressure to 150 lbs., 15 gals. per min. at 1200 RPM using 2 HP. As vacuum pump for milking machines, lab use, etc., delivers 26" vacuum, 4.5 cu. ft. per min. at 1500 RPM using 3/4 HP. Rotate either direction, 1/2" pipe thread ports, 1/2" standard shaft, 4 ball bearings. Easy to mount—Ready to run. Shpg. wt. 13 lbs. (ITEM #51) F.O.B. Chicago **16.50**



(ITEM #51)

D.C. GENERATOR FOR 12 VOLT SYSTEMS

BRAND NEW. Rated 15 Volts at 50 Amps. Use on 12 Volt circuits on trucks, tractors, ships, planes, battery chargers, auxiliary lights, etc. Base mounting with 4 bolt holes. 3/4" threaded shaft with keyway. Mfd. by Bendix-Ellipse Gov't. Acq. Cost \$136.00. Shpg. wt. 53 lbs. F.O.B. Chicago **21.50**



(Item #99)

HYDRAULIC CONTROL VALVES

- ITEM #24. Four-way control valve with built-in relief valve, for use with one double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Ship. wt. 8 lbs. A \$38.00 value **7.95** postpaid
- ITEM #26. Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A \$60 value. **10.95** postpaid



(ITEM #24)

Hydraulic Cylinders—Air or Oil

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 #4—All steel double action hydraulic cylinder, 1 1/2" bore, 2 1/2" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. F.O.B. Chicago **4.95**
 - ITEM #33C—Double action hydraulic cylinder, 1 1/2" bore, 4 1/2" stroke. Clevis mountings at both ends. Uses 1/2" pipe fittings. Postpaid **8.95**
 - ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A \$45.00 value. Postpaid **10.95**
 - ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Overall length closed 12 1/2". Has 3/4" stainless steel shaft, uses 1/2" tubing fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 lbs. Postpaid **12.50**
 - ITEM #6—Double acting cylinder, 1 1/2" bore, 27" stroke. Will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 8 lbs. A \$55.00 hydraulic cylinder value for only Postpaid **12.95**
 - ITEM #15—Double acting cylinder, 3" bore 10 1/2" stroke. All steel hydraulic cylinder, will lift up to 7000 lbs. with 1000 P.S.I. line pressure. Wt. 12 lbs. A \$78.00 value, Postpaid **19.50**
 - ITEM #42—ITEM #31C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/2" diameter 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. Shpg. wt. 11 lbs. F.O.B. Chicago **22.50**
 - ITEM #26A—Double action hydraulic cylinder, 3" bore, 25" stroke, will lift 7070 lbs. with 1000 P.S.I. line pressure. Steel barrel, 1 1/2" stainless steel shaft. Gov't. acq. cost, \$176.00. Shpg. wt. 26 lbs. F.O.B. Chicago **28.00**
 - ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,560 lbs. Ship. wt. 30 lbs. AN EXCELLENT BUY **32.50** F.O.B. Chicago
- HI-PRESSURE FITTINGS for cylinders and valves available at 50c ea. for 3/4" pipe and 65c ea. for 1/2" size.

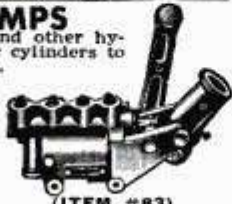


(ITEM #42)

HAND HYDRAULIC PUMPS

Used for hydraulic jacks, presses, hoists and other hydraulic applications. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure.

- ITEM #11—Hand pump has built in check valve and is capable of delivering 1000 lbs. of pressure. Has alloy aluminum housing. Dimen.: 8" long x 3 1/2" high x 2 3/4" wide. Ship. wt. 3 lbs. A \$45.00 value Complete with handle **8.95** Postpaid
- ITEM #82—Hand hydraulic pump with built-in transfer valve. **12.95** Postpaid



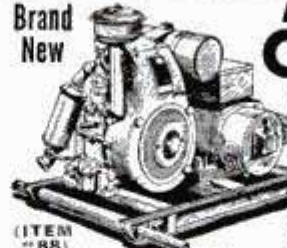
(ITEM #83)

AUXILIARY ELECTRIC A.C. GENERATING PLANT

FOR GENERAL UTILITY AND EMERGENCY USE 2500 WATTS - 115 VOLTS A.C. 60 CYCLES

Plenty of current to operate your: Oil Burner, Sump Pump, Refrigerator, Home Freezer, Power Saw, Lights, Radio and Television, Home Water System Pumps.

Complete integrated heavy duty electric power plant. Signal Corps Model PE-75, driven by Briggs & Stratton, one cylinder 6 1/2 H.P. Model ZZ, 4-cycle engine with killer button, oil bath air cleaner, governor, muffler, starting motor, and radio interference filter. The self-excited Leonard of Westinghouse generator is rated 2500 Watts, 115 Volts, 60 Cycle A.C. single phase, belt driven, with guard and duplex receptacle. When generator is not in use, you can use the engine separately to power other equipment. Mounted on adjustable steel skids, notched for carrying poles. Net wt. 310 lbs. Shpg. wt. 440 lbs. Dimen. 36"x19 1/2"x24". 12 month guarantee. \$726.00 value. **295.00** NOW F.O.B. Chicago



(ITEM #88)

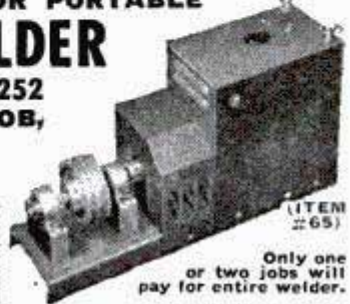
NEW! STATIONARY OR PORTABLE D.C. ARC WELDER

250 AMP. MODEL 252 FOR ANY WELDING JOB, LIGHT OR HEAVY Stop Costly Repair Bills, Weld It Yourself and Save

Designed for many years of trouble-free service. This precision engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly where and when you need it. Has dial type rheostat for easy pinpoint control and a high-low range switch. Run welder at 2500 RPM from drive pulley or power take-off of tractor, a 7 1/2 HP electric motor or a 10 HP gas engine. Use two V belts or flat belt (on pulley). Now...AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book, Shipping wt. 107 lbs. F.O.B. Chicago **99.50**

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp and 5 lbs. of assorted welding rods. (ITEM #66) Shpg. wt. 17 lbs. F.O.B. Chicago **10.50**

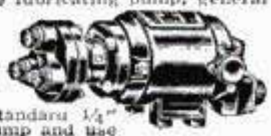
IF MORE INFORMATION IS DESIRED, write for WELDER CIRCULAR.



(ITEM #65)

SELF-PRIMING ELECTRIC PUMP

APPLICATIONS: Oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc. Motor Mfd. by Black & Decker: Double Ball bearing, series wound, continuous duty 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 V AC current. Also applicable for 24-32 V DC. Pump Mfd. by Weidon Tool Co. with standard 1/4" tubing ports; rated 2 G.P.H.; remove pump and use motor as high speed grinder. Overall Dimensions: 7 3/4" long x 3 1/4" wide x 3 1/4" high. Approx. wt. 5 lbs. \$31.00 value. (ITEM #1) postpaid **12.95**



G-1 STAINLESS STEEL TANK

Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light, shatter-proof. 450 P.S.I. Aviator's Breath- ing Oxygen bottles, type G-1, 2100 cu. in. (approx. 9 gallons) int. vol. 24"x12", 1/4" threaded openings at ea. end. Wt. 19 lbs. F.O.B. Chicago **5.95**



(ITEM #63)

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, 1/2" outlet, 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value. FOR ONLY **22.50** F.O.B. Chicago



(ITEM #29)

PUROLATOR OIL FILTER PERMANENT TYPE

The perfect oil filter to keep your motor oil or hydraulic fluid clean at all times. Protect your pump or engine with this unit. Just turn the handle and the element is clean. Standard 3/4" inlet and outlet ports to accommodate 12 gallons per minute. Shipping wt. 4 lbs. A \$13.00 value. (ITEM #70) Now **4.95** postpaid



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Want to start Fast?



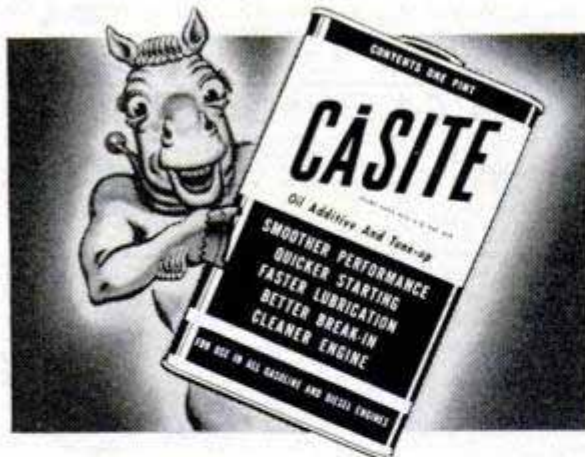
You want Casite. Casite guarantees Quick Starting in Coldest Weather or Double-Your-Money-Back. Casite retards congealing of oil . . . lets the motor spin over and go . . . even in sub-zero temperatures.

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THEN GET CASITE—FOR ONLY 75¢



Whether you have a new car or old car, get Casite for your car today—from your garage, service station or car-dealer. You'll get smoother, happier driving for many miles to come. The Casite Corporation, Hastings, Michigan. Casite Division, Hastings Ltd., Toronto.

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QUICK STARTING IN COLDEST WEATHER
or Double-Your-Money-Back

inch of its steel hide—as it would be on the deck of a ship. In the big temperature rooms it will be subjected to almost any atmospheric condition you'll find on the face of the globe. Here it will run the gamut of temperatures from 100 degrees below zero Fahrenheit to 200 degrees above, in humidity ranging from a dose of tropical rain forest, to the dry frost of the stratosphere.

If you stand near the big sea-water tank, you can see how they test a torpedo's reaction to the warm tropic ocean after it has frosted for hours under the belly of an airplane flying at 35,000 feet. In the environmental lab, men dressed in Arctic clothing roll the torpedo out of the big temperature room where it has been crackling in stratosphere frost, and immediately plunge it into the near-by tank, where the brine has been warming to a tepid 100 degrees. Ice instantly forms around the hulk in a quarter-inch glaze. The propeller is started. If the works jam up, back it goes to the designers for a correction.

Other nooks and crannies in the lab contain strength testers for the parachutes that "let down easy" some of the more delicate implements of war. Row upon row of model-ship hulls, made of metal, permit designers to examine the magnetic fields set up by different ships, so they can be protected against the enemy's magnetic mines.

When a piece of ordnance survives all the ordeals of the Navy's new environmental lab, designers can be pretty sure their brain child will work in the field. The lab scientists love their work, but they love to needle the designers, too. "They make 'em; we break 'em," they say with a malicious grin. "We are devoted to the scientific destruction of our own weapons."

Competition for the Bees

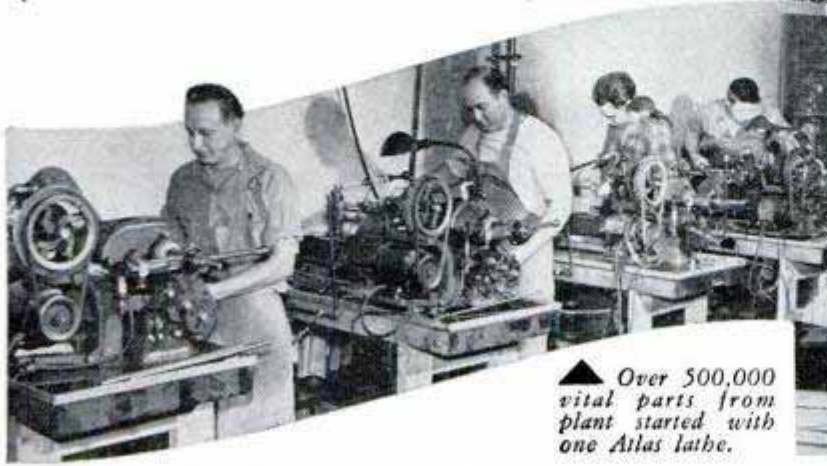
Two former waste products now are yielding high-grade commercial wax, which was previously a monopoly of the bee in this country. Wax even harder than beeswax is extracted from Douglas fir bark by a process in which benzene acts as a solvent. Later the benzene is distilled off, leaving the wax. Very similar to the Douglas fir wax is the unusual oil of a little-known desert bush called Simmondsia. The plant, which for centuries has grown wild in Arizona and southern California, has nutlike seeds which yield a liquid wax. The treated wax is nearly as hard as carnauba, the hardest wax known.

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▲ Over 500,000 vital parts from plant started with one Atlas lathe.



◀ From garage shop to modern plant in three years.



▲ From 2 lathes and 1 drill press to 30 busy machines.



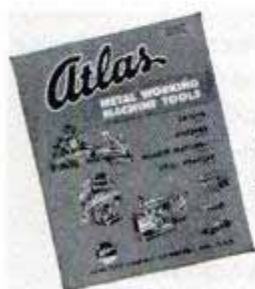
◀ From 2 Atlas tools in 10' x 18' shop to 65 Atlas tools in 50' x 135' plant — and all busy.



Perhaps you remember these pictures. Published during World War II, they showed how men with machining skill, and vision, and Atlas tools developed plants to handle war production.

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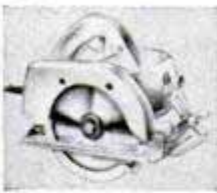
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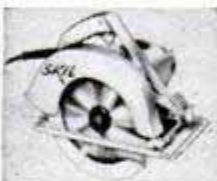
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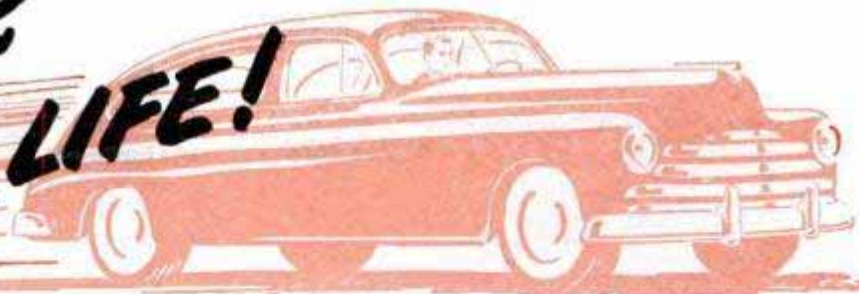
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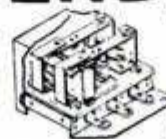
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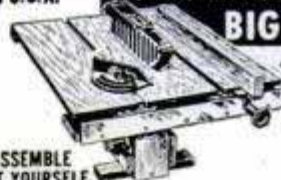


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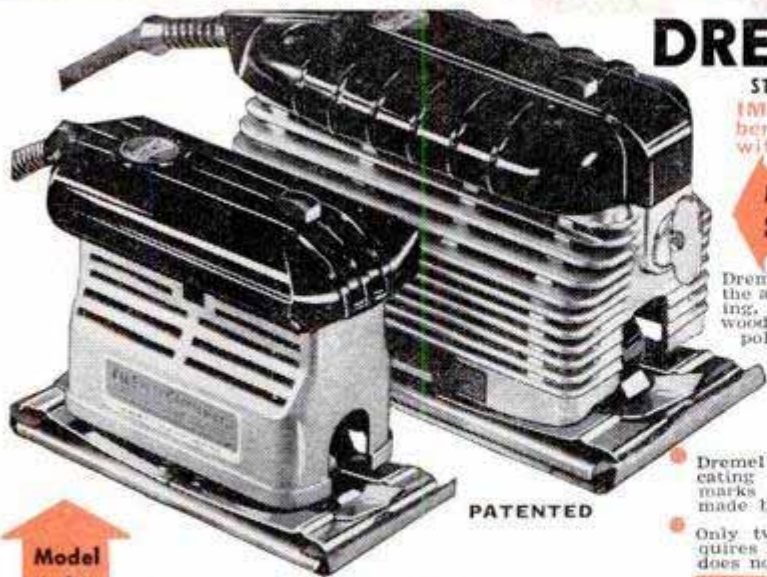
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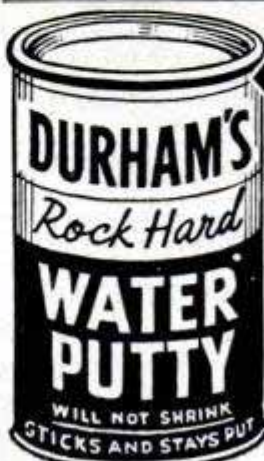
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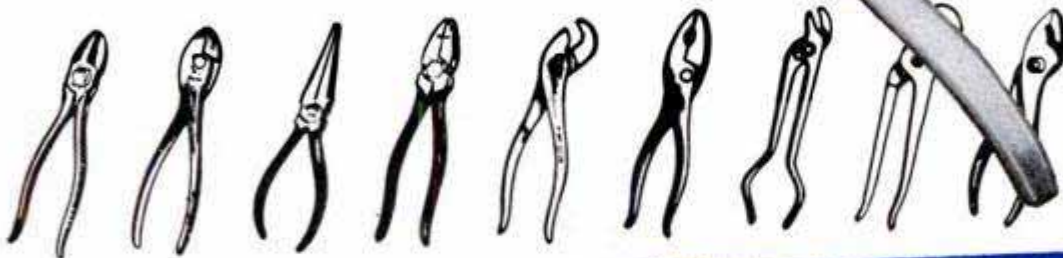
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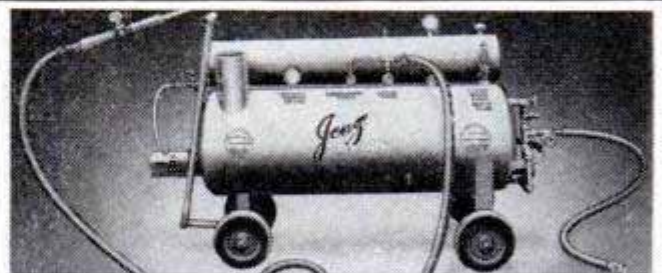
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8-6



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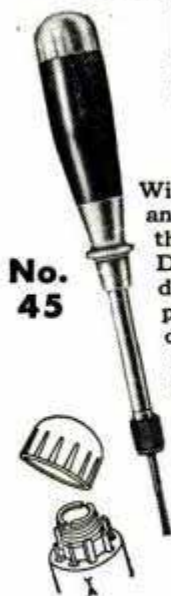
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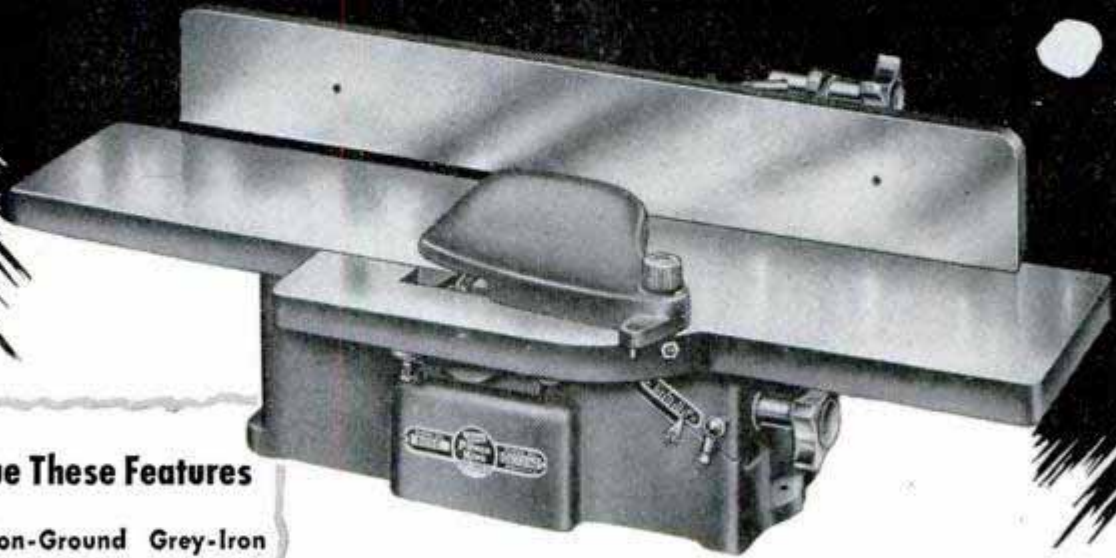
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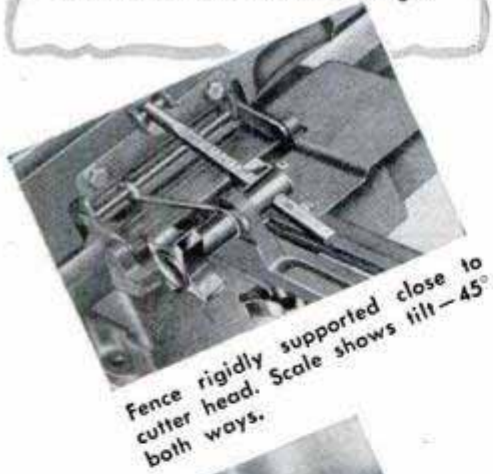
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Completely new in design — tables, fence, bearings, cutter-head-spindle, base, controls — with every feature engineered to give you greater accuracy and efficiency — that's the new Atlas-Power King.

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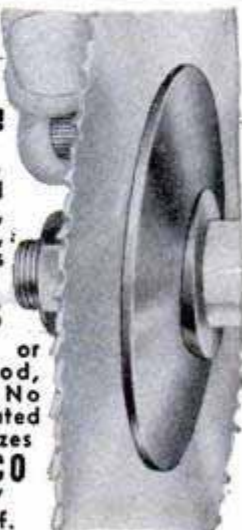
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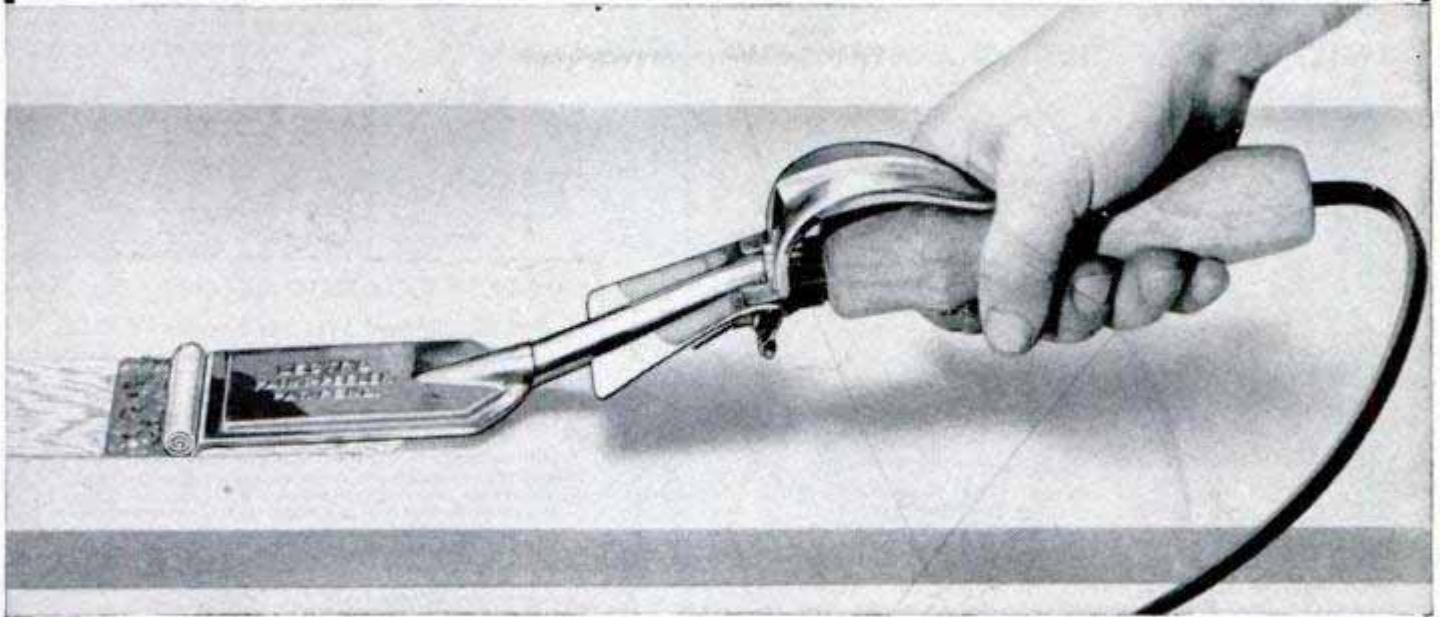
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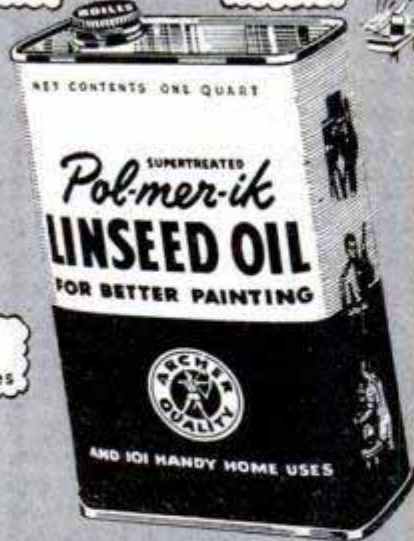
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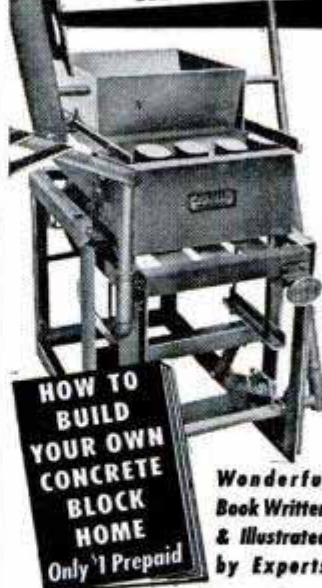
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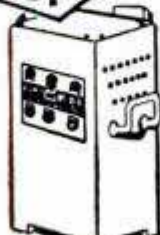
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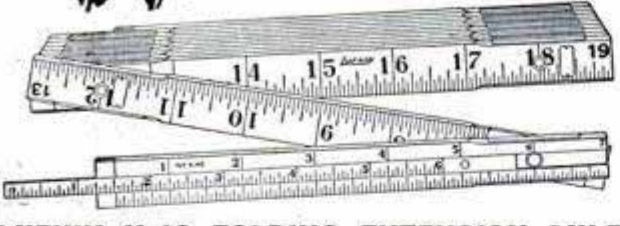
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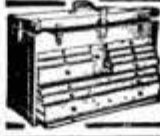


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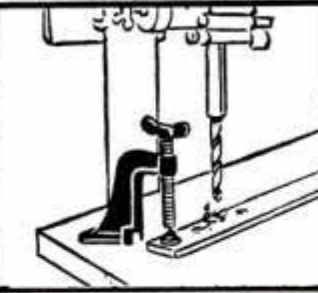
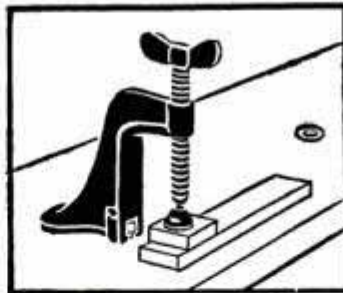
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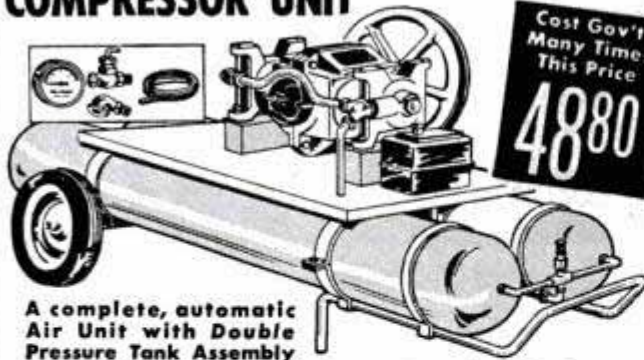
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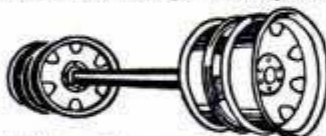
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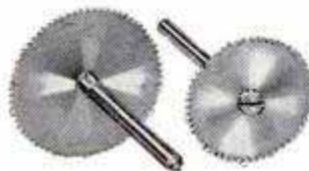
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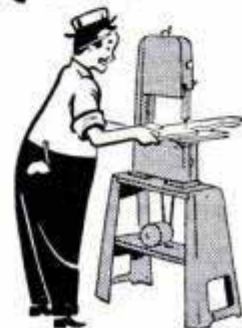


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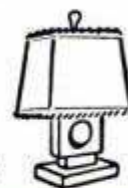
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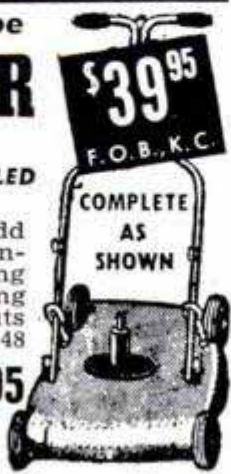
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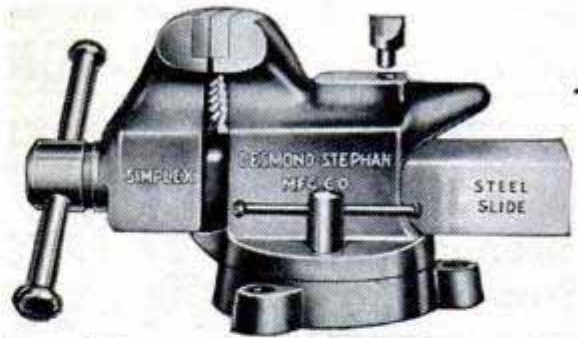
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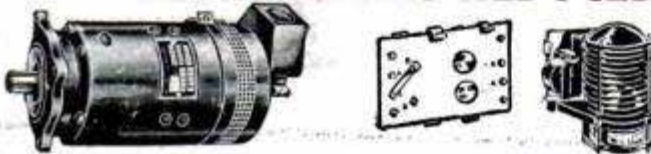
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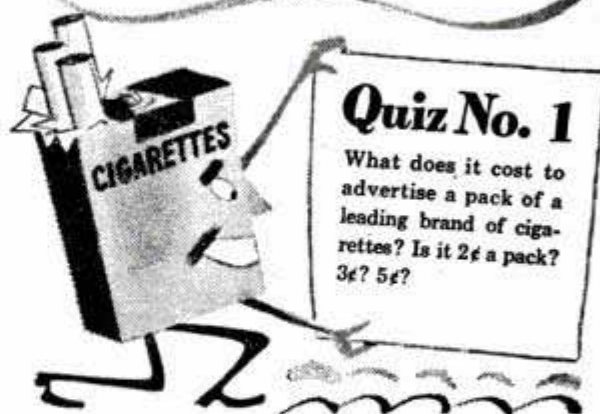
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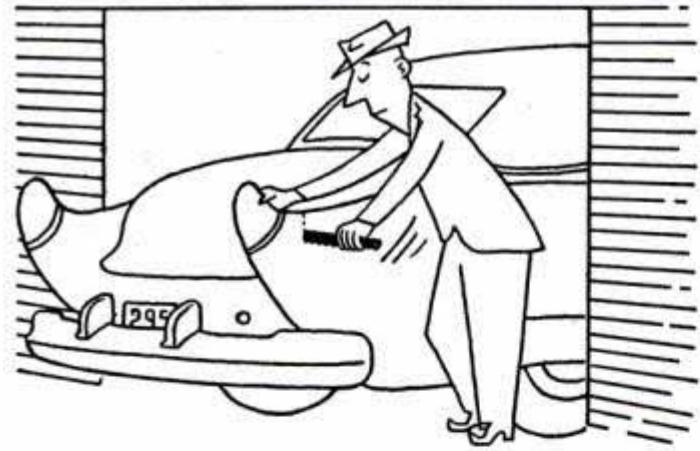
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Gear type, rated 1500 PSI, 2 1/4 G.P.M. at 1500 R.P.M. 5/8" drive spline. No. 1P203 reconditioned guaranteed. Priced at only..... **\$6.49**

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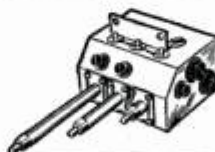


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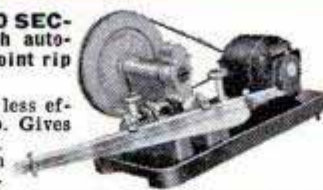
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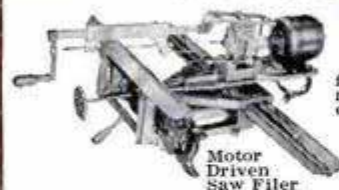
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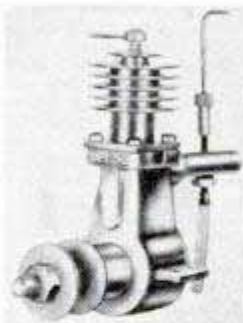
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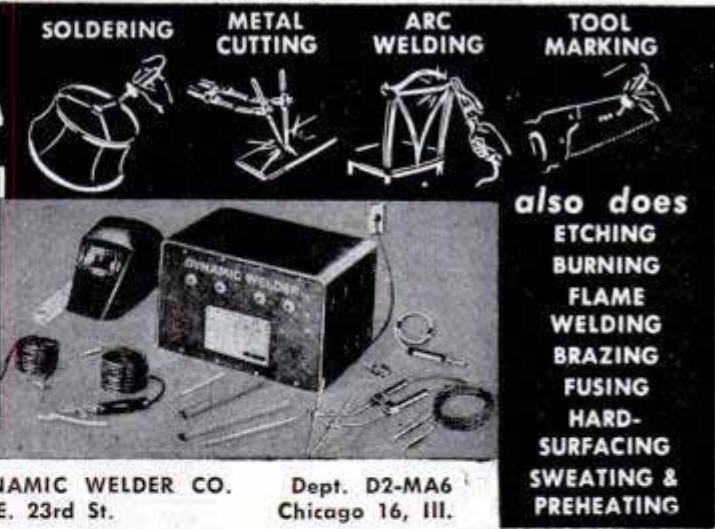
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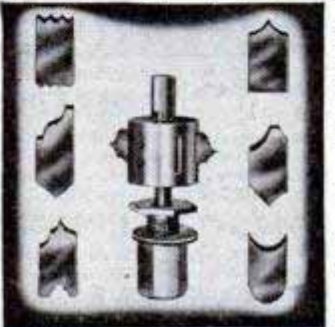
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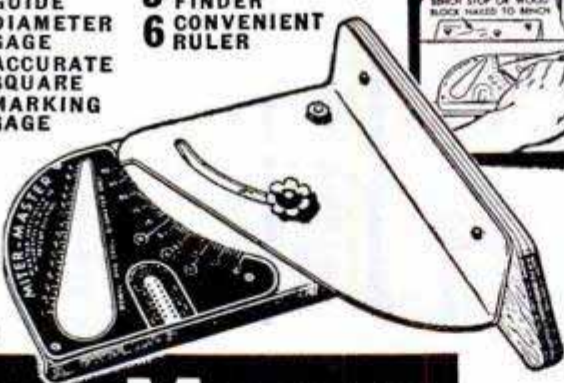
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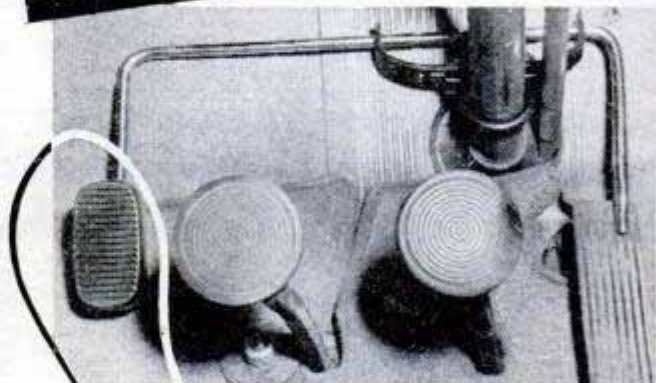
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Same unit NEW \$295.00 with spare parts
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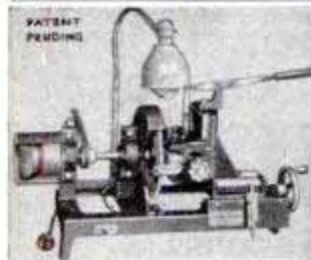
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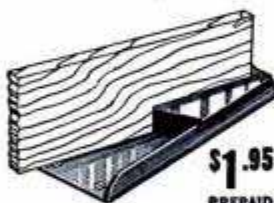
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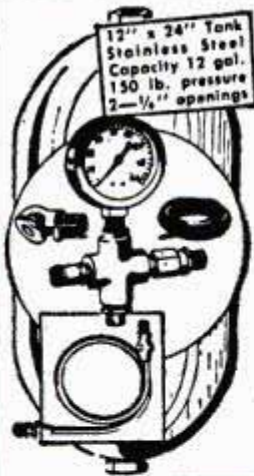
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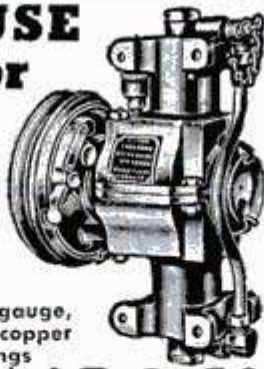
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Capacity up to 6.54 CFM. Size 9" x
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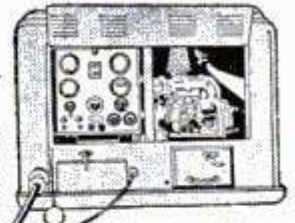


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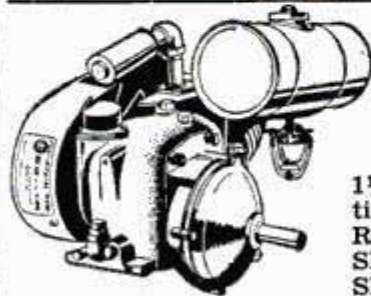
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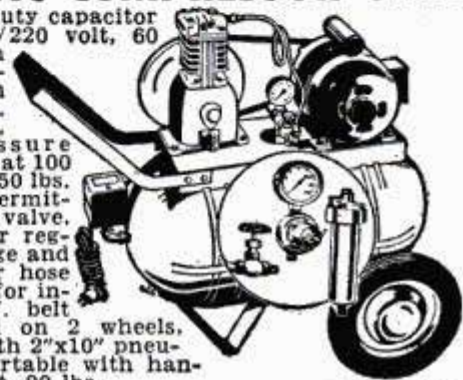
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CTU-4



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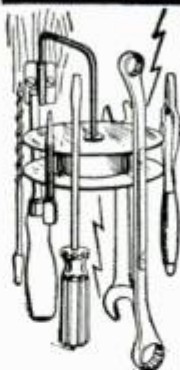
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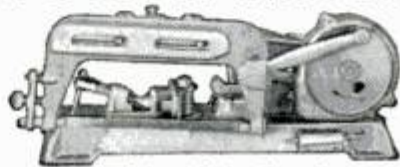
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72 PAGES of BARGAINS in Machine tools
(taps, drills, dies, reamers, etc.) Hydraulic
Cylinders, Valves, Pumps, & Motors. Air
Tools & Bearings. Send 25c to cover handling.

SAVE UP TO 85% IN WAR SURPLUS

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PALLEY FAMOUS MIXES! Prepared especially for the HOME CRAFTSMAN, HOBBYIST, INVENTOR, GADGETEER or SHOP MECHANIC.

GADGET MIX - Rivets, Spacers, Bolts, Screws, Gears, Wheel bearings, Springs and C clamps. No. 106, 5 lbs. **1.19**

BEARING MIX, No. 170A. Approx. 20 needle, Ball & Roller Bearings, New & Used. Sizes: 1/2" to 4". Some of these cost Gov't \$10 a piece. Never such a value! 5 lbs. ONLY **1.59**

HINGE MIX, No. 170H. 12 pairs of Strap and butt hinges, Hasps, 1" x 1" to 7/8" x 10" in length and 8" strap. 2 lbs. **1.09**

ABRASIVE AND GRINDING WHEEL MIX - 50 pieces including honing stone, pencil rolls, wheels, etc. A sharp value. No. 170AG **99c**

SPRING MIX, No. 206 - Tension, Compression & Tension Springs. Ass'd. sizes. A treasure trove for emergencies. Scores of springs. 5 lbs. for ONLY **1.69**

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FILE MIX - Ten assorted Files, 4" to 12", includes 3 Vixens, half rounds bastards, mills, etc., in seconds and used but in good condition. 1 Vixen alone worth our price for entire mix. F-1 **99c**

PULLEY MIX, No. PL-1 - You'll want this one around. 10 micarta & metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made with 100's of uses. **A WONDERFUL BUY!!! 2.95**

COUNTERSINK MIX, No. 168. Wide assortment. Excellent condition. High speed steel. Assortment of ten 1000 and 1100 with pilot sizes ranging from 3/32" to 3/16" No. CM-1 **2.69**

SCREW MIX - 5 lbs. incl. 2 1/2 lbs. wood screws & 2 1/2 lbs. machine screws. All sizes. Save dollars and always have plenty of screws on hand. **1.39**

NUT MIX NM-1-3 lbs. approx. 500 nut. Anchor, Lock, Castle, Hex, Elastic Stop Nuts, etc. You'll always have plenty of Nuts in the shop. NM-1 **1.39**

SUPER COMBO MIX - No. SC2. Here's a real bargain. All eleven above mixes for ONLY **14.95**

REAMER MIX - No. 168. Reamer assortment: Special Taper line finish Reamers. High Speed Steel, Slightly used but in excellent condition. Ten assorted sizes ranging from .168 x .165 & .244 x .215 to .425 x .385 & .432 x .403. One alone worth our selling price of ten. For set of ten Reamers **4.49**

AIRCRAFT CABLE
Rust resistant alloyed steel, extra flexible, pre-formed - 7 x 19 strand-on reels.

1/16" 3 1/2 ft.	7/32" 7 1/2 ft.
5/64" 4 ft.	1/4" 9 ft.
3/32" 4 1/2 ft.	9/32" 10 ft.
1/8" 5 ft.	5/16" 12 ft.
5/32" 5 1/2 ft.	3/8" 13 ft.
3/16" 6 1/2 ft.	1/2" 16 ft.

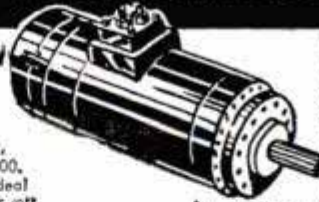
Stainless Steel Cable
1/16" 5 ft. 1/8" 14 ft.
1/4" 24 ft.

PIANO HINGE
Overall Width Length Price Ea.
1 1/2" (5/8" side) 7 1/2" alum. \$1.00
2" (1" side) 9" alum. \$1.75
3 1/2" (1-3/4") 5 1/2" st. steel \$1.69
BRASS HINGE - 1 1/2" (5/8" side), 0.40
Any length at 29c per ft.

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NOW! MAKE YOUR OWN ARC WELDER

Here's a Real Buy! Finest precision built R-1. Generators, used on B-29's, cost the Government approximately \$400.00. Gives from 300 to 400 amps at 27 volts. Ideal for all welding, light and heavy up to 5/8" thickness. FREE complete instructions for conversion of this Generator to welding unit. R-1 NOW AVAILABLE AT



17.95

Other AIRCRAFT GENERATORS

That can be made into Arc Welders.

P-1	27 Volts	200 Amps	15.95	E-5A	12 to 15 Volts	50 Amps	12.95
1273-1A	27 Volts	75 Amps	12.95	03	27 Volts	100 Amps	25.00

ELECTRIC ACTUATOR

CTU-2 Foote Linear Actuator. 24 Volt A.C. or D.C., 8500 R.P.M., 1/6 H.P. Series wound motor, 4 1/2" stroke in 1 1/2 seconds. Compression and tension. Loads up to 750 lbs. Adjustable micro switch for limits of travel. Overall length retracted 11" **Only 6.95**

LEAR ELECTRIC MOTOR, 24 volt, 6 amps, series wound reversible motor with overload clutch. Motor turns 11,000 R.P.M. Has 11 to 1 gear reduction box turning 1000 R.P.M. at take-off. Adjustable to flex or rigid drive. Limit switch box. Size 10" x 4" **\$7.95**

DUMORE ELECTRIC MOTOR. Adaptable to rigid or flex drive, 400 R.P.M. at power take-off. Contains 1/25 H.P., 24 volt, 7 1/2 amp reversible motor for indicating position. Has limit switches, magnetic brake, resistor to coordinate instrument. Overall dimensions 8 1/2" x 4 1/2" long. **ONLY 7.50**

G.E. GEAR HEAD MOTOR
Heavy Duty G.E. Gear Head Motor, 1 1/2 H.P., 24 volt DC, 125 amp reversible motor will drive reduction gear box unit 44.5 to 1, resulting in 168 R.P.M. at 5/8" diameter take-off shaft. Motor contains electro magnetic brake. **UNIT COMPLETE 10.95 MOTOR 4.95 GEAR BOX ALONE 7.95**

REMOTE INDICATING SELSYN MOTOR. Will operate on 115 volt, 60 cycle AC. 2 1/2" diameter, 4" length. Works on simple electrical connection and can be used for any distance. Turn shaft of one unit and the other will follow accurately. Can be used on TV and Ham antennas, lens focus, weather vanes, film footage, liquid levels, etc. **2.95 PAIR**

SAMELL MOTOR. 27 volts, 16 amps, 1/5 H.P. reversible, series wound on motor. 3800 R.P.M., shaft 9/32" diameter, 12-spline, 4-1/8" x 2-3/8". **ONLY 3.95**

TWO HEAT SOLDERING IRON

World's Hottest Iron Value! Two soldering irons in one with buffer, heat control. Push the button—Select 150 or 300 Watt heat for light or heavy work. Complete with tip, bench holder, 5' asbestos cord. 110V AC. A \$15.00 Value For . . . **3.95**

RAWHIDE Mallet For working soft metal, or plastics, driving pins, etc. Weight 2 1/2 lbs., metal collar with rolled leather insert head **1.09**

UTILITY HAMMER For use as masonry chisel, stake driver, sledge, etc. Head special forged steel, sharp cutting edge. Handle is select hardwood. 1 1/2 lbs., 14" handle . . . **79c**
2 lbs., 21" handle . . . **99c**

AUTO PULSE PUMP—Ideal for fuel pump for auto or boat, 24 Volt D.C. Can be adapted to 6 Volt D.C., 1/8" stand. **5.50**

Sperry Aircraft Directional GYRO COMPASS
Dial is 360° swing calibrated 1/10" (6 min.) Panel Mount 4 1/2" square with 3" luminous dial. Can be used in autos, planes, or boats by attaching one tube to intake manifold for required vacuum. Complete with reset caging knob. Gov't. overhauled - **ONLY \$4.49**

AIR COMPRESSOR
High Pressure General Electric, 2 stage AC - DC. Rated pressure 1000 lbs. per sq. in. with 1/3 H.P., 27 volt, 7 AMP series wound motor with fan for cooling. These sands now in use for spraying, inflating, laboratory use, etc. Can be adapted to 110 volt A.C. with transformers. A tremendous value at approx. 5% of original cost **22.50**
We also have transformers for above.

TACHOMETER - Type C-9A. Operates on direct drive with flexible shaft. Range is 0 to 4500 RPM. Ideal for use on single engine planes or boats, autos, etc. Drives direct from camshaft or at 2:1 reduction from crankshaft. **\$4.75**

FIRE EXTINGUISHER
Kiddie Lux CO2 Type. Built to Gov't spec. Shatter-proof, heavy case. Fully re-charged. with horn No. 602A - 7 1/2 lb. \$35 Value. **19.25**
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No. 605-A - 15 lb. New. Break disc Type. A \$75 Value . . . **29.75**
No. 605-B - 15 lb. Wheel Control Type **32.95**
No. 605-C - 15 lb. New. Squeeze Grip Type. \$85 Value. . . **39.95**
Note: Weights listed are capacity extinguisher charge.

NEW HYDRAULIC CYLINDER SPECIAL

Gives 20,000 lb. thrust (push pull) using 1500 PSI line pressure as obtained from our hyd. pumps. Or will produce 40,000 lb. thrust with 3,000 lb. line pressure. CAN ALSO BE OPERATED ON LOW PRESSURE AIR SYSTEMS. 4" Bore, 1 1/2" dia. piston shaft, 18" stroke, length 30 1/2". Equipped with ball bearing loaded clevis type mounting and swivel type high pressure steel pipe bracket for easy use. Ideal for road, farm & shop machinery, presses, etc. Cost Gov't \$390.00 **22.50**

We carry the World's Largest Supply of New Hydraulic Equipment featuring over 20,000 Cylinders in 61 Sizes & Types. Can also supply all accessories such as Pumps, Fittings, Valves, Tanks, Hose Fittings. Let us solve your Hydraulic problems. Write for information.

2 SPEED PORTABLE MOTOR ENERGIZER. Used as auxiliary power source, to actuate starters or as principal power source, 1001 uses as high speed drill motor, power booster, etc. Has governor, 50 ft. electrical cable, Length 34". Power - 110-115V - 60 cycle A.C. or D.C. **27.50**

Vickers Hydraulic Transmission
Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output R.P.M. - 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Dupli-cator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. Includes 2-4" Spline Shafts for input & power take-off. Cost Gov't, approx. \$400. **25.00**

Hydraulic PUMPS
Logan Gerator type. For operating hydraulic systems on trucks, tractors, etc. Delivers 8 GPM at 1200 RPM, at 1000 PSI with 5 HP. Can also be used as Hydraulic Fluid Motor. Has 3/8" stand pipe ports, 1/2" splined shaft for pulley or direct attachment. 5 1/2" dia. by 7" long. Used, but condition guaranteed. **ONLY 17.50**

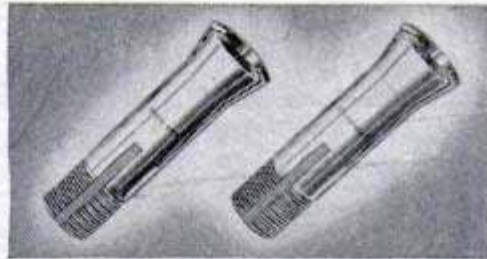
VALUABLE GEAR BARGAINS
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85 to 1 (can be used for radio, antennae, etc.) **\$3.95**

GEAR BOXES VTG-1 - 90° bevel gear 1 1/2 to 1 reduction, size 7" x 6". A Life-time Value. **\$3.95**
VTG-2 - Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4 1/2" dia, 26 tooth, 1/2" Alum. spur gear. . . **\$6.49**
Both above gear boxes have lever control for engaging & disengaging positive clutch. Dust proof housing. Lubricated bearings. Both can be adapted to Vickers Transmission.

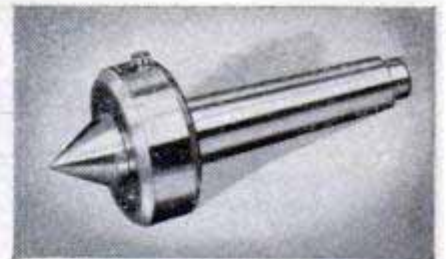
ELECTRONIC TRANSMISSION GEAR TRAIN
GT-1, approx. 50 Bronze Spur & Pinion Gears - 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm and worm gear drive sets, 40 N.D. ball bearings 1/2" to 1 1/2" dia., watch springs, bushings posts, face plates, housings-Micro Switches, 2 miniature controlled clutches, etc. Gears in multiple size & sequence, identical teeth ratio, giving 100's of gear reduction combinations. **\$8.49**
Wt. 19 lbs.



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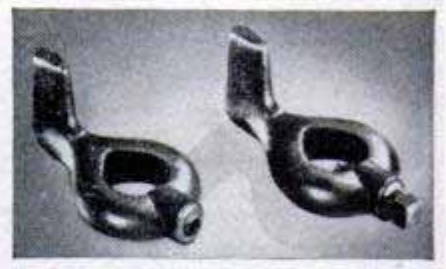


BALL BEARING LIVE CENTER

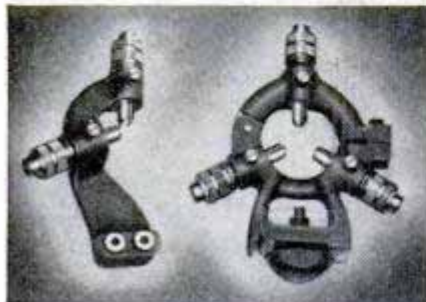


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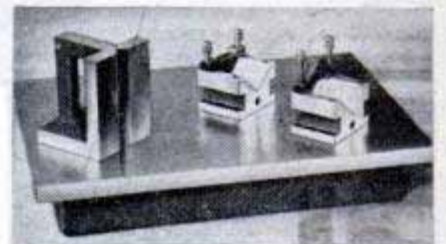


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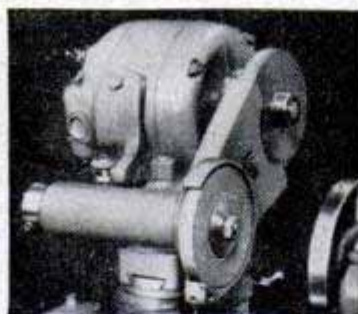
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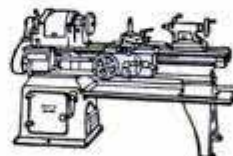


CATALOG 77-U

LATHE TOOLS, ATTACHMENTS



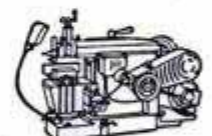
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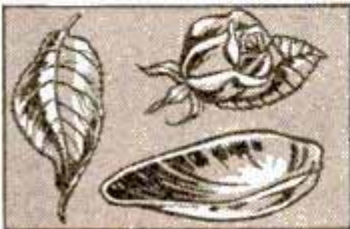
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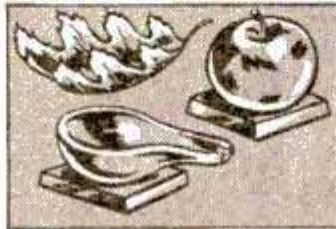
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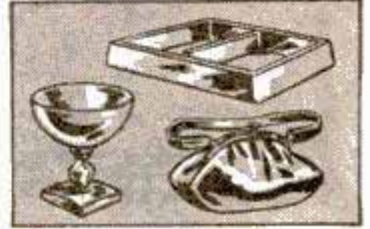
Costume Jewelry from flowers, insects, shells, and leaves.



Ash trays, paper weights, from leaves, fruit, vegetables.



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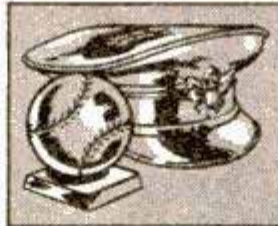
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HOW to do the work—how to get customers coming to you—how to set up the simple equipment—how and where to buy the materials—what to charge—how to start in spare time—how to expand into a full time business whenever you wish. Shows you in pictures and words how to put a coating of pure metal on such things as flowers, leaves, insects, shells, wood carvings, plaster castings, busts, statues, religious figures, buttons, baskets, feathers, base balls, golf balls, mementoes of all kinds, such as, baby shoes, party and wedding favors and decorations. Operating a home metalizing business is one of the greatest insurance policies a man could ask for his future. Read about it without risking a penny.

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Think of turning 56 cents worth of materials into a profit of \$5.00 and over for just a few minutes of easily learned handiwork. Sounds fantastic? . . . Yet it is absolutely true . . . **AS YOU CAN QUICKLY PROVE TO YOURSELF.**

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Just at a time when hundreds of men and women would like to make an extra \$35.00 to \$50.00 a week in spare time home work, the old—established—and highly profitable Metalizing Business has been turned into a home-work money-maker. Where in the past a few big companies have been making fortunes, now hundreds of smaller home operators can become independent. I have ready to send you a complete set of simple instructions by which anyone—regardless of age or education—can learn the fascinating art of metalizing.

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