

ANC



POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

MADE IN GREAT BRITAIN, NO. 410825



BEACHHEAD FLYING BOAT

Page 133

TELEVISION INTERFERENCE

In many areas, a car with the motor running can ruin a television program. Ordinary spark plugs broadcast a signal which interferes with television reception. A switch to Auto-Lite Resistor Spark Plugs will check this annoyance.



Checked b

British Bill Would Curb Spark Plug Interference With Television

London—The Government announced tonight that it is enacting legislation making persons subject to \$400 fine and possible jail sentence of three months for causing interference during peak radio and television periods. For example, motorists will be asked to fit suppressors to their motors.

HERE'S THE PROBLEM

Few people realize that a major cause of faint television reception, particularly in areas where the television signal is weak, originates not at the set itself but from ordinary spark plugs on nearby automobiles. This poor reception, justifying and wobbling in the image, comes from the radiation of the electrical discharge in passing vehicles—your car, your neighbor's, or delivery cars or traffic on your street. The ordinary automobile spark plug acts as a miniature broadcasting station that frequently spoils what would otherwise be clear, sharp television images.

It can happen here!

Read What Television Experts Say:

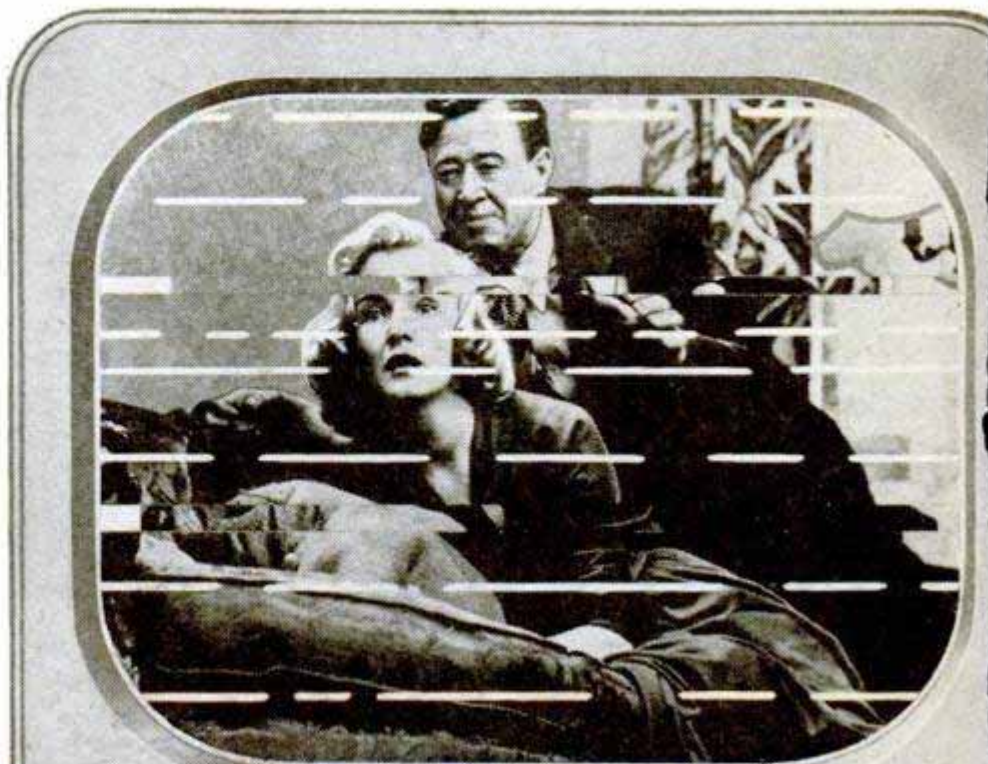
FRANK STANTON, President, Columbia Broadcasting System: "There is no question in my mind that ignition interference is a contributory cause to poor television reception. The resistor type spark plug appears to be the answer."



J. R. POPPELE, President, Television Broadcasters Association of America: "Interference by automobile ignition systems to television is quite common and is often very severe in outlying areas. I have witnessed tests in which the new Auto-Lite Resistor Spark Plug was very effective in reducing interference to television receivers under such conditions."



W. R. MacDONALD, President, Radio-Television Institute: "The sooner every car and truck in America is equipped with the new Auto-Lite Resistor Spark Plug, the better it will be for the television industry and everyone who owns a television set."



An authoritative article, "Television Brings Change in Car Ignition Behavior," reprinted from the S.A.E. JOURNAL published by the Society of Automotive Engineers, is available without charge.

The effect of ordinary spark plugs on the TV image is shown in this scene from Auto-Lite's "Suspense!" show, "The Creeper" starring Nina Foch and Anthony Ross.

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

A TWIN-HULLED giant of the skies swoops down on the water and rams up against the enemy beach. Ramps pivot down from the huge fuselages and men and armored equipment pour ashore. That's the way the beachhead of the future will be taken, according to a man who should know. He's Ernest G. Stout, head of naval aircraft research for the Consolidated-Vultee Aircraft Corporation, and therefore a top expert on huge flying boats. Stout believes that such planes may be the ships of the future. He points out that in the event of war, submarine packs may well eliminate ordinary shipping. In order to discover the behavior patterns of such huge planes, Convair has built complete miniature aircraft powered by their own tiny engines and controlled by radio. It takes a hot pilot to bring them in for a landing. This important research is described by Ewart Thomas, who visited the Convair research laboratory, in a feature on page 133

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A PRICELESS GIFT TO SEND TO
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Farm Home Improvement

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Forty pages of illustrated practical ideas, short cuts, etc., that will save time, labor and money around every farm and city home.



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**Use This Book to Step up Farm Efficiency—
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Every department of the farm is covered in the Farm Manual. Every member of the family will find in it something that he or she can use to tremendous advantage in farm operation, maintenance and improvement, from the building and care of equipment to painting the farm home and fast freezing fruits and vegetables. It covers all farm buildings, the farmhouse and other homes and is of interest equally to the woman looking for home improvement, beauty and convenience and the man striving for easier and more profitable operation.

ORDER TODAY — FOR YOURSELF — FOR A GIFT

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MAIL COUPON • Money Back if Not Satisfied

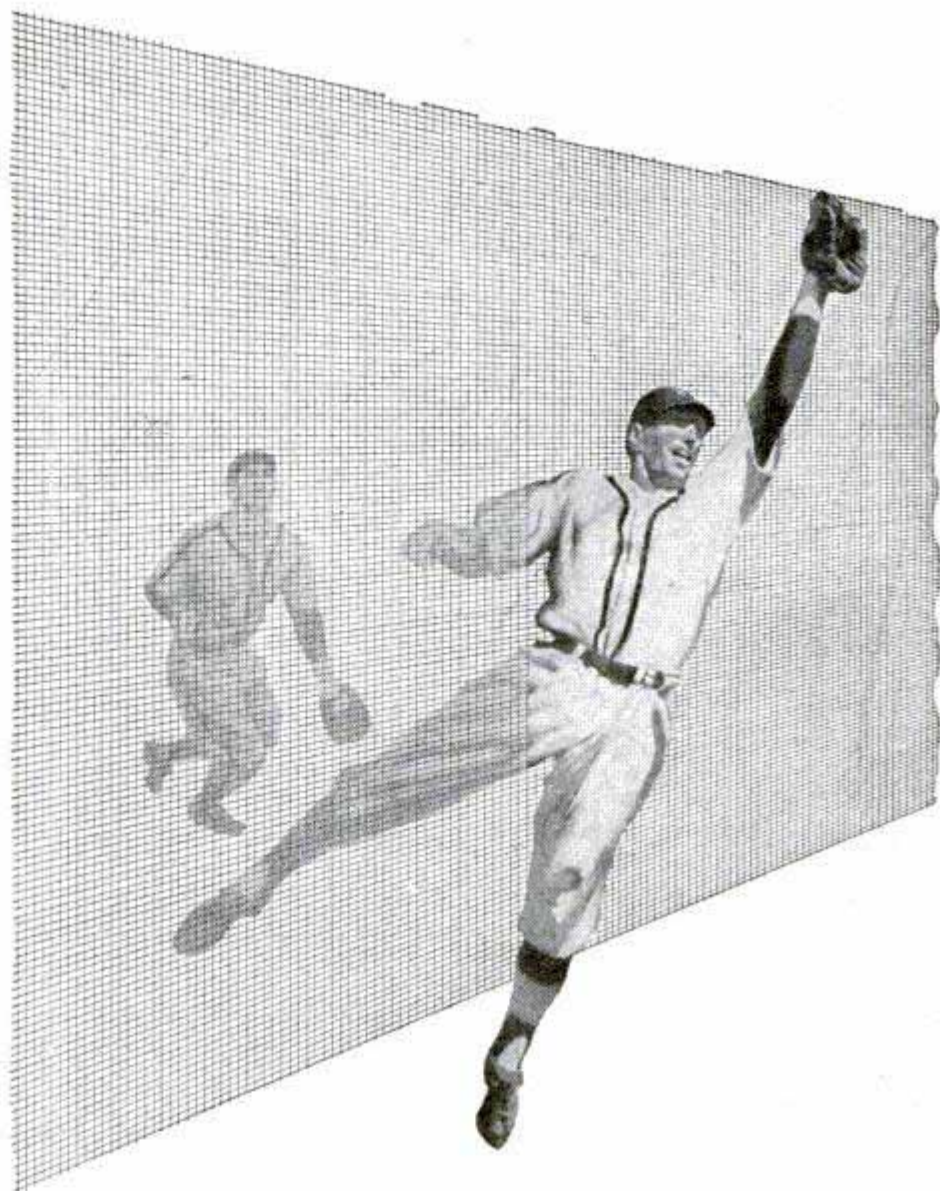
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200 East Ontario St., Chicago 11, Ill.

Send _____ copies of the Farm Manual at once.
 Remittance (\$3.00 each) enclosed. Send postpaid. Add 15% if outside U.S.A.
 Send C.O.D. (\$3.00 each) plus delivery charges. U.S.A. only.
(If sent as a gift to another, send name and address on separate sheet.)

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RCA Laboratories developed a copper mesh with 2,250,000 tiny openings to the square inch for the television camera "eye."



You get finer television pictures through this super-fine mesh

In RCA Image Orthicon television cameras you will find a super-fine copper mesh. Until a new technique for making this type of screen was discovered at RCA Laboratories, only coarse and irregular mesh—which obstructed 60% of the picture—was available.

Today, through RCA research, such mesh can be made with 1500 gossamer wires to

the linear inch. An ordinary pinhead will cover about 7000 of its tiny openings.

By RCA's technique—now producing commercial quantities of 200- and 500-mesh screens—the mesh is so fine, so regular in structure, that it is invisible on home television receivers . . . and as much as 85% more television picture passes through.

You benefit—many times

This new type of super-fine wire mesh, like most major

developments in all-electronic television, is another RCA Laboratories first. Leadership in science and engineering adds *value beyond price* to any product or service of RCA and RCA Victor.

* * *

The newest developments in radio, television, and electronics may be seen in action at RCA Exhibition Hall, 36 West 49th Street, N. Y. Admission is free, and you are cordially invited. Radio Corporation of America, Radio City, N. Y. 20.



RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television

This One





Shift gears as in a car



**2-SPEED MAGIC
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It works like a gear shift on a car—*low speed* for quicker getaway, easier pedaling on the hills, better control in traffic; *high speed* for making time on level stretches.

Your bicycle dealer will fit the "Speed Changer" right into the New Departure Coaster Brake on your bike. Ask him about it today!

On your new bike insist on America's favorite

New Departure COASTER BRAKES

FREE! Have fun mystifying your friends! Guess their ages, read their minds! Send a postcard for Magic Packet P5. Address:

**NEW DEPARTURE • DIVISION OF GENERAL MOTORS
BRISTOL, CONNECTICUT**

1868

in this corner.....

THE EDITORS



Portrait in Popotes

When one of our executives opened a parcel from Mexico and found therein a portrait of himself done in bits of colored straw, we detected a story. So Thomas E. Stimson, Jr., was dispatched from Los Angeles (formerly known as La Ciudad de Nuestra Señora la Reina de los Angeles) to Mexico, D. F., to see how this ultra-painstaking art is achieved. His story appears in full color starting on page 97 in this issue. . . . The executive's portrait, by the way, was an amazing likeness copied from a black-and-white photograph. His blue eyes turned out to be brown, however, in the Mexican version.

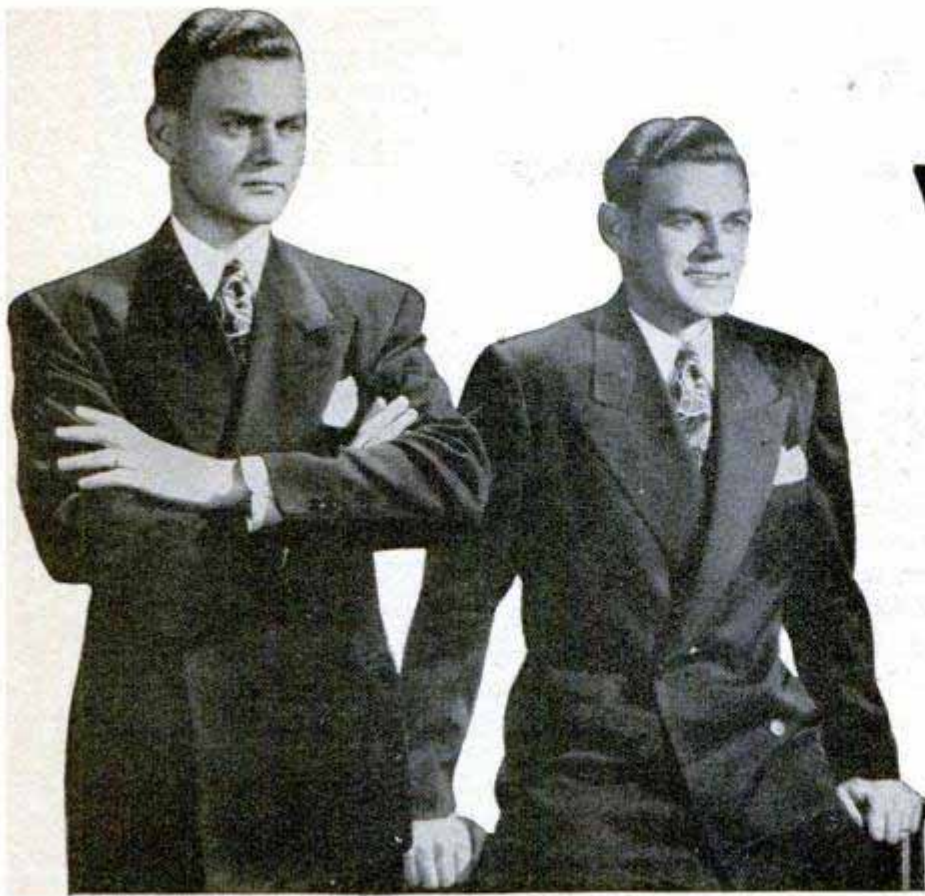
* * *

Cargador Plays Rondador

In case you don't recognize it, the accompanying picture is of a cargador playing his rondador. The photograph was sent in by one of our many South American readers in Quito, Ecuador. He explains that a cargador is a native who carries

(Continued to page 8)





If YOU were Boss would YOU promote "YOU"?

Business is always willing to pay the man who knows—and pay him well. The man who is ready and will-

Be honest now—

suppose that a better job had opened up in your company—carrying with it promotion and more money—could you qualify?

If you were boss, would you select "YOU" for that better job?

Consider before you answer.

First of all, could you *fill* the job? Has your experience fitted you for the step forward—have you been preparing for promotion apart from experience gained on the job?

Or have you just been filling a niche, doing daily tasks well but making no real and intelligent effort to learn and qualify for the job ahead so that if an opening should occur you would be ready to fill it?

The man who gets real promotion is the one who makes his own breaks—the man who slaves in the ordinary job at low pay just wishes and dreams of promotion and more money. Which are you?

ing to take responsibilities—and capable of directing the efforts of other men is a valuable asset to any business organization. He never wants for a good job and above average earnings. He gets ahead.

We have helped thousands of men achieve promotion and more money—success sometimes beyond their dreams—a success that was started by a coupon similar to the one below.

Get out of that rut—don't be satisfied with a mediocre job at small pay—be a success in business—this coupon may be your first step.

Mail the coupon and we'll include "Ten Years' Promotion in One"—a book which has helped many men. Do it today—tomorrow never comes for the man who consistently puts things off.

LASALLE EXTENSION UNIVERSITY A Correspondence Institution

Dept. 964-R, 417 S. Dearborn, Chicago 5, Ill.

Please send me your free 48-page booklet telling how I can succeed in the field I have checked below—plus "Ten Years' Promotion in One" without obligation.

- | | |
|--|--|
| <input type="checkbox"/> Higher Accountancy | <input type="checkbox"/> Traffic Management |
| <input type="checkbox"/> C.P.A. Coaching | <input type="checkbox"/> Foremanship |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Industrial Management |
| <input type="checkbox"/> Law: LL.B. Degree | <input type="checkbox"/> Stenotypy |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> (Machine Shorthand) |
| <input type="checkbox"/> Salesmanship | |

Name..... Age.....

Address.....

City, Zone, State.....

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A Correspondence Institution

Dept. 964-R

Chicago 5, Illinois

PYROIL WINS AGAIN! 8 out of 10 Winners in the 500 Mile Memorial Day Race at Indianapolis used Pyroil

The going's rough on the Indianapolis Speedway—where performance, endurance, dependability and top lubrication count most. That's why year after year, the professional drivers who are the winners in the famous 500 mile Memorial Day Classic insist on Pyroil.

On the speedway or highway—Pyroil improves lubrication by providing a protective film of oil on cylinder walls. Pyroil prevents sludge and gum formation, assuring your car a free flow of lubrication at all times.

To win miles of added driving comfort—add Pyroil—add miles to your car.

Pyroil for Aircraft Engines

Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

GIVEN! An attractive Pyroil metal savings bank—takes coins up to 50c pieces. **MOTORISTS**, it's yours for the asking—sent postage paid.

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Canadian Distributors: Central Purchasing Agencies, Ltd. Toronto, Ontario



PYROIL COMPANY

95 Pyroil Bldg., La Crosse, Wisconsin

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name _____

Address _____

City or Town _____ State _____



(Continued from page 6)

anything from a basket of groceries up to a 200-pound sack of rice. Most cargadores are small men of Quichua blood, the race of the once-proud Inca Empire. The rondador is a popular homemade musical instrument, a sort of bamboo flute made from different lengths of small bamboo tied together by two half strips of the same material. You do not blow into a rondador, but purse the lips and blow over the open tubes as the instrument is moved back and forth like a mouth organ. The music, says our correspondent, Pancho Vega, is soft and mellow and the length of a tune is determined only by the player's wind.

* * *

Our Ads Have a Long Pull

It doesn't naturally follow that an advertisement in *Popular Mechanics* will always bring you an invitation to a wedding in India, but it has happened. Back in November 1947 the Belsaw Machinery Company of Kansas City, Mo., advertised a multi-duty planer. Not long ago an answer came from Bombay, traced by a key number to that 1947 ad. It was addressed to the Belsaw Company and contained the following invitation:

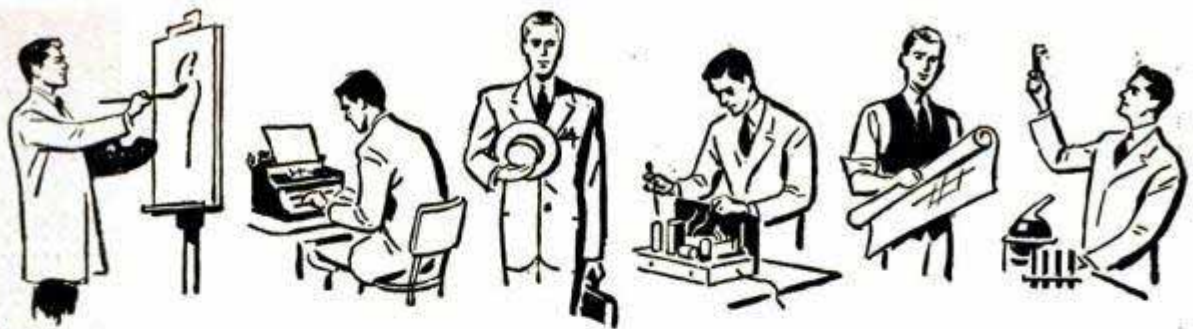
"The General Manager and Partners of the firm of Messrs. P. Desai Corporation request the pleasure of the company of the Manager and Staff Members at the Wedding Ceremony of Shri Prataprai Desai (Partner and Sales Manager) with Kumari Mira, daughter of Shri Kanaiyalal Venilal Desai on Thursday the 3rd of February 1949."

Unfortunately, the Messrs. Belsaw could not attend. The invitation arrived a month after the ceremony. But E. S. Field, Jr., general manager of Belsaw, was glad to see his company's advertisement was still pulling, 15 months later.

* * *

Next Month

Next month's color feature describes the new Eastman Flexichrome process by which vividly real color pictures are produced by a simple, all but foolproof, method starting with an ordinary black-and-white photograph. Here is a process that may soon revolutionize the art of color printing—even that of the amateur camera fan, when Flexichrome becomes more readily available to him.



CASH IN on your HIDDEN TALENTS

Locked in your mind may be the germ of a valuable idea . . . an undeveloped aptitude . . . a hidden talent. And the key that can help unlock those capabilities of yours is *training*—sound, practical, down-to-earth training!

Helping men and women bring out the best that's in them has been the job of I. C. S. for more than 57 years. In every field of industry, you'll find leaders whose skills were developed through study with I. C. S.

They are the ones who sensed a latent ability within themselves—and who proceeded to do something about it. While others (equally gifted, perhaps) plodded along in routine jobs, they mastered I. C. S. Courses . . . qualified themselves for rich rewards.

You can develop your hidden talents the same way they did. Start *today* and be ready for tomorrow's opportunities. Here's the coupon to mail:

INTERNATIONAL CORRESPONDENCE SCHOOLS

APPROVED
under the
G. I. BILL

BOX 5659-K, SCRANTON 9, PENNA.

Without cost or obligation, please send me full particulars about the course BEFORE which I have marked X:

- | | | | |
|---|---|---|---|
| <ul style="list-style-type: none"> <input type="checkbox"/> Air Conditioning and Plumbing Courses <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Heating <input type="checkbox"/> Refrigeration <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting Chemical Courses <input type="checkbox"/> Chemical Engineering <input type="checkbox"/> Chemistry, Analytical <input type="checkbox"/> Chemistry, Industrial <input type="checkbox"/> Chemistry, Mfg. Iron & Steel <input type="checkbox"/> Petroleum Refining <input type="checkbox"/> Pulp and Paper Making <input type="checkbox"/> Plastics Civil Engineering, Architectural and Mining Courses <input type="checkbox"/> Architecture <input type="checkbox"/> Architectural Drafting <input type="checkbox"/> Bridge and Building Foreman <input type="checkbox"/> Building Estimating <input type="checkbox"/> Civil Engineering <input type="checkbox"/> Coal Mining <input type="checkbox"/> Contracting and Building <input type="checkbox"/> Highway Engineering <input type="checkbox"/> Lumber Dealer <input type="checkbox"/> Reading Structural Blueprints <input type="checkbox"/> Sanitary Engineering <input type="checkbox"/> Structural Drafting | <ul style="list-style-type: none"> <input type="checkbox"/> Structural Engineering <input type="checkbox"/> Surveying and Mapping Communications Courses <input type="checkbox"/> Electronics <input type="checkbox"/> Practical Telephony <input type="checkbox"/> Radio, General <input type="checkbox"/> Radio Operating <input type="checkbox"/> Radio Servicing <input type="checkbox"/> Television <input type="checkbox"/> Telegraph Engineering Electrical Courses <input type="checkbox"/> Electrical Drafting <input type="checkbox"/> Electrical Engineering <input type="checkbox"/> Electric Light and Power <input type="checkbox"/> Lighting Technician <input type="checkbox"/> Practical Electrician Internal Combustion Engines Courses <input type="checkbox"/> Auto Technician <input type="checkbox"/> Aviation <input type="checkbox"/> Diesel-Electric <input type="checkbox"/> Diesel Engines <input type="checkbox"/> Gas Engines Mechanical Courses <input type="checkbox"/> Aeronautical Engineer's, Jr. <input type="checkbox"/> Aircraft Drafting <input type="checkbox"/> Flight Engineer <input type="checkbox"/> Forging <input type="checkbox"/> Foundry Work <input type="checkbox"/> Heat Treatment of Metals <input type="checkbox"/> Industrial Engineering <input type="checkbox"/> Industrial Instrumentation | <ul style="list-style-type: none"> <input type="checkbox"/> Industrial Metallurgy <input type="checkbox"/> Machine Shop <input type="checkbox"/> Mech. Drafting <input type="checkbox"/> Mechanical Engineering <input type="checkbox"/> Mold-Loft Work <input type="checkbox"/> Patternmaking—Wood, Metal <input type="checkbox"/> Reading Shop Blueprints <input type="checkbox"/> Sheet-Metal Drafting <input type="checkbox"/> Sheet-Metal Worker <input type="checkbox"/> Ship Drafting <input type="checkbox"/> Ship Fitting <input type="checkbox"/> Tool Designing <input type="checkbox"/> Toolmaking <input type="checkbox"/> Welding Engineering <input type="checkbox"/> Welding—Gas and Electric Railroad Courses <input type="checkbox"/> Air Brake <input type="checkbox"/> Car Inspector <input type="checkbox"/> Diesel Locomotive <input type="checkbox"/> Locomotive Engineer <input type="checkbox"/> Locomotive Fireman <input type="checkbox"/> Locomotive Machinist <input type="checkbox"/> Railroad Section Foreman <input type="checkbox"/> Steam-Diesel Loco. Eng. 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Law <input type="checkbox"/> Certified Public Accounting <input type="checkbox"/> Commercial <input type="checkbox"/> Commercial Art <input type="checkbox"/> Cost Accounting <input type="checkbox"/> Federal Tax <input type="checkbox"/> First Year College <input type="checkbox"/> Foremanship <input type="checkbox"/> French <input type="checkbox"/> Good English <input type="checkbox"/> High School <input type="checkbox"/> Higher Mathematics <input type="checkbox"/> Illustration <input type="checkbox"/> Industrial Supervision <input type="checkbox"/> Motor Traffic <input type="checkbox"/> Postal Civil Service <input type="checkbox"/> Retailing <input type="checkbox"/> Retail Bus. Management <input type="checkbox"/> Salesmanship <input type="checkbox"/> Secretarial <input type="checkbox"/> Sign Lettering <input type="checkbox"/> Spanish <input type="checkbox"/> Stenography <input type="checkbox"/> Traffic Management |
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Check One Veteran Non-Veteran

TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

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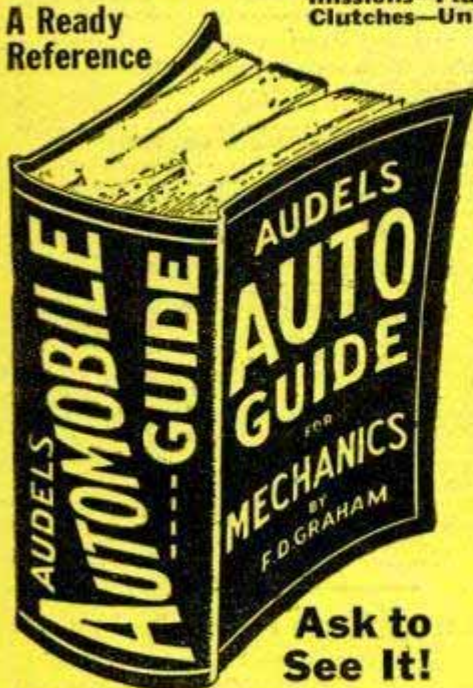
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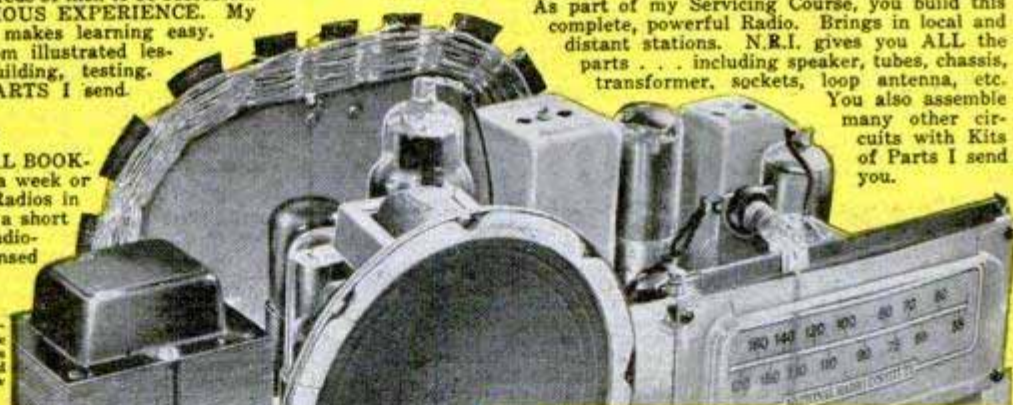
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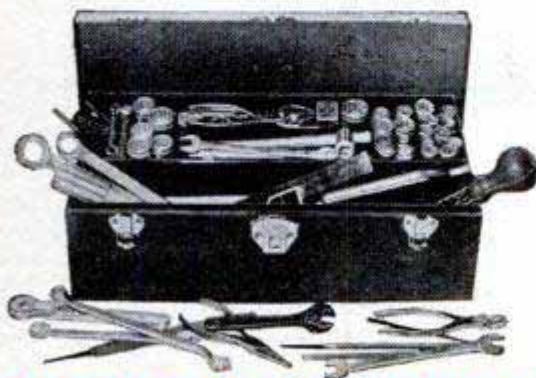
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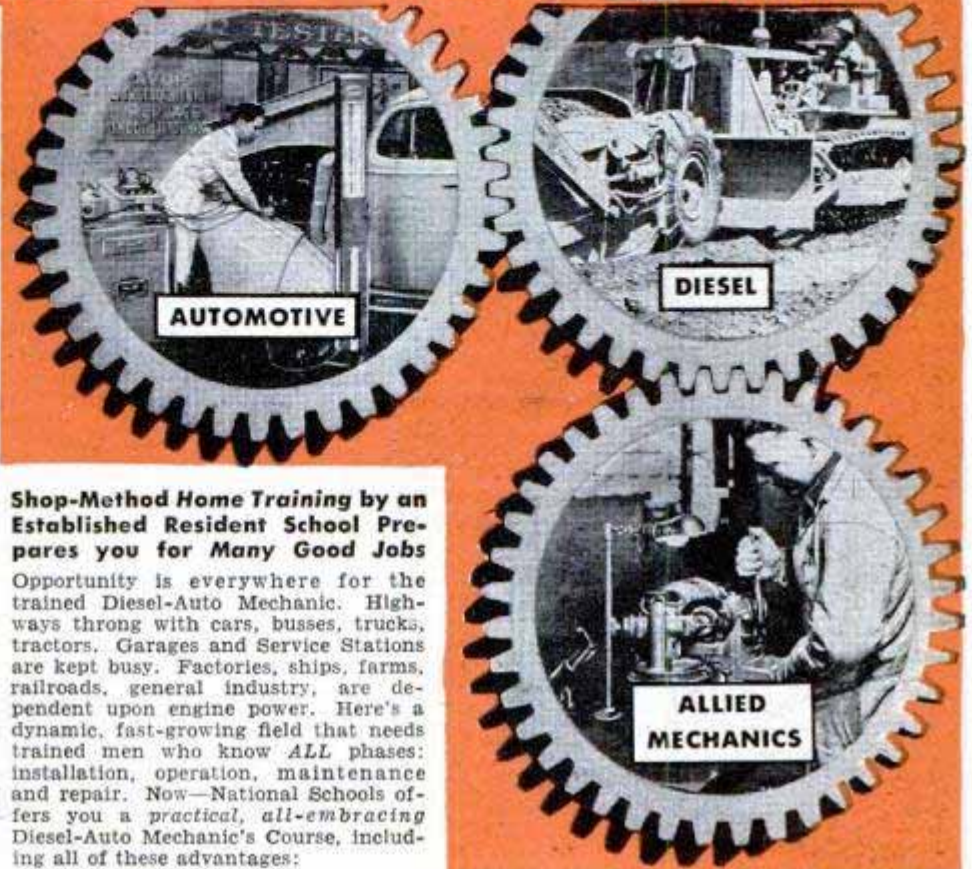
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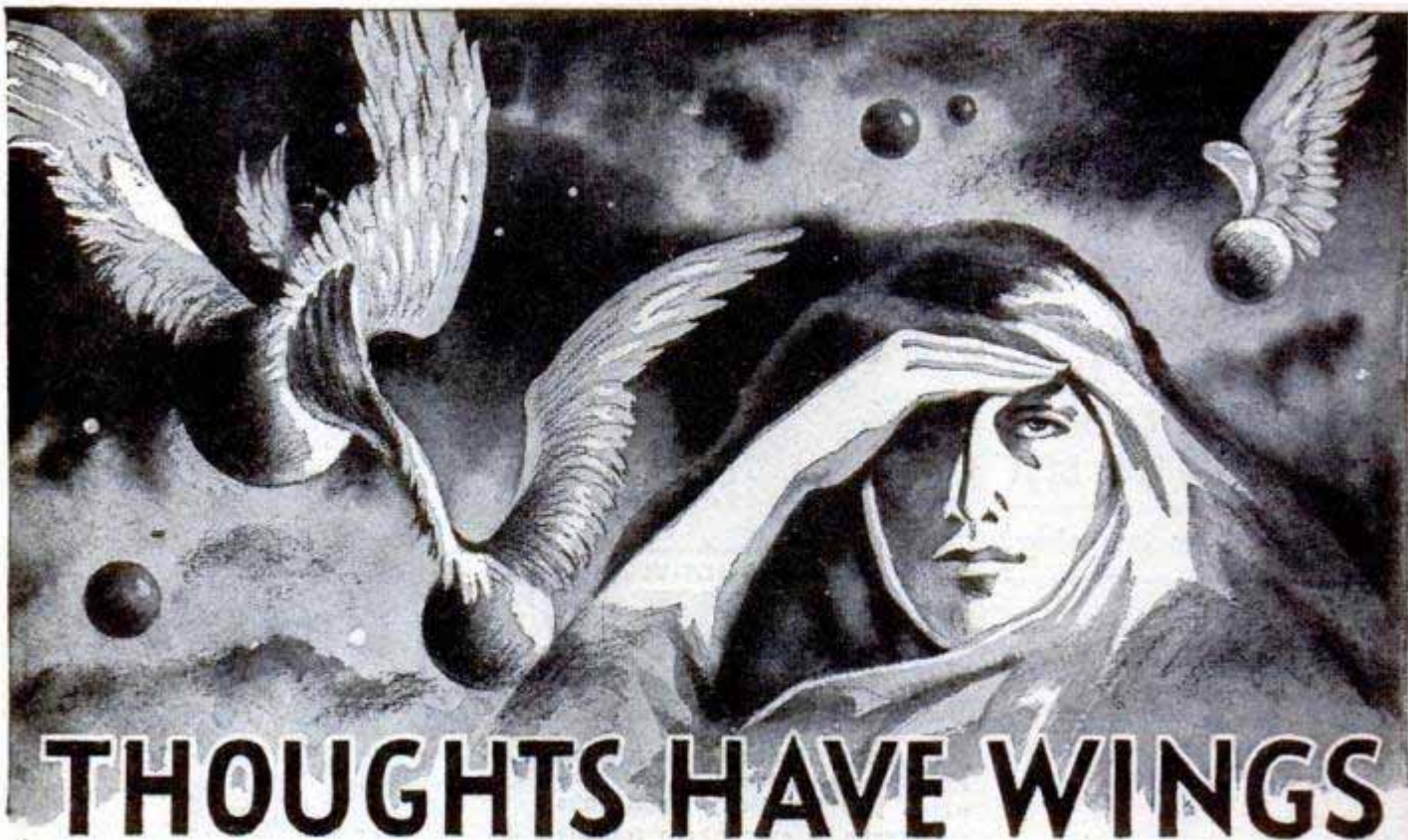
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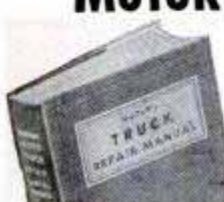


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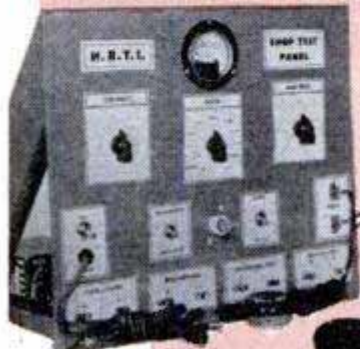
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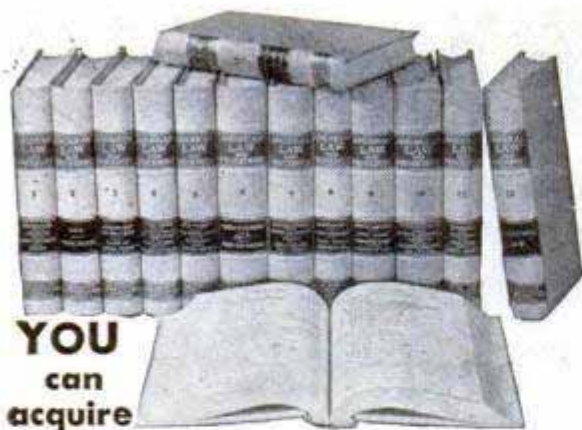
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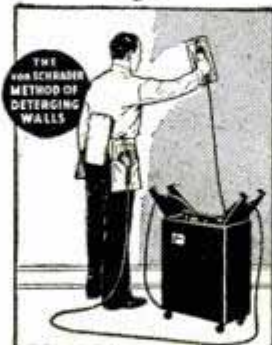
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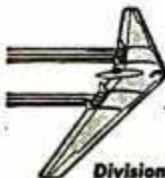
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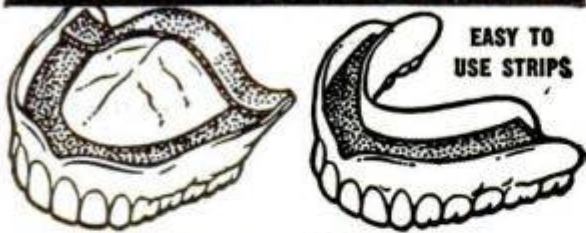
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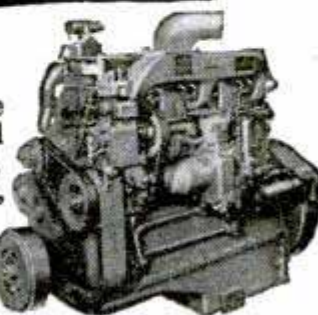
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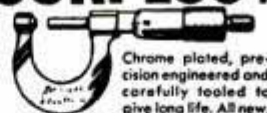
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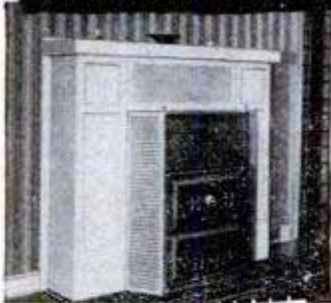


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MAKE Over \$100 week, at home, renewing small auto part for wholesale trade. Exclusive, non-competitive. No machinery or skill required. No sales calls to make. Complete data and sample, 25c. Xcello Co., 921 Walnut, Kansas City, Mo.

MONEYMAKING OPPORTUNITIES

IT'S New-Beautiful-Sensational. 9 out of 10 homes use coffee and will welcome our new Meas-U-Rite coffee dispenser for that perfect cup of coffee everytime. Keeps coffee fresh. No waste. No guessing. Measures accurate. Saves coffee. Territories now being assigned. Mel-Gauge Company, East Haven, Conn.

SELL Proven revolutionary wood awl. For home or woodworkers. Details and sample 50c. Metal Items, 820 - 6th Street, Racine, Wis.

LIFETIME Repeat orders! Sell our business cards by mail, your territory. Small "starter" plan. Lynn Products, 5711 Bankfield, Culver City, California.

1000-\$2.85! SELL \$3.85 up! "Raised-print" Business Cards, 8307 $\frac{3}{4}$ San Pedro, Los Angeles 3.

FREE Book "372 Unusual Worldwide Businesses." Successful! Australia, South America! Not hokum. Work home (U.S.A.). "Different" plans. Prepare for surprise! Publishers-F9, Carlsbad, Calif.

400% PROFIT Making signs, posters, etc., for business places. Simple process. Folder free. Ryane's, Box 16, Buffalo 15-M, New York.

OPERATE Profitable mail order business. Free details. Edkap Service, 5115 New Hampshire Avenue, N.W., Washington 11, D. C.

CAN The boss! Make strange plastic of waste. Makes attractive floors, walls, roofs, built-ins. Build durable homes \$150.00 room. Bays Laboratory, Oklahoma City 9.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. 40% commission. Outsell all others. Free sample kit. Printercraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

PAINT—New type, plastic, Christmas cards, 18 with envelopes \$1. Van Delinda, 1562 Main St., Springfield, Mass.

MAKE Money at home as renewal headquarters for all magazines. Big profit in Christmas gift sales. Liberal commissions. Supplies furnished. Catalog free. Write McGregor Magazine Agency, Dept. 509C, Mount Morris, Ill.

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

15 MINUTES Masters advertising and sign lettering; complete system; sign painters' secrets; cartooning book; all three, \$1; free circular. Abentierprizes, Box 875, Peoria, Illinois.

\$100.00 PLUS 24 card tables. Churches-organizations write for particulars. Box 392, Clementon, New Jersey.

MAKE Money with easily installed weatherstripping. Double Seal Co., 2725 Ross, Waco, Texas.

BRONZING Shows profits. Consultation, materials, instruction supplied. Free literature. Luther Jones, Box 7283, Ft. Worth, Texas.

EXCEPTIONAL Money-making opportunity making life-like dwarf trees. Tremendous market! Big profit! Complete sample kit \$3.95. Oriental Gardens, 1491 E. Colorado, Pasadena, California.

HOW To look ahead and make money. No one ever made money or advanced in his job, unless he knew how to look ahead. Our books, as low as \$1.00, teaches you how. Send for free money-making literature. Granite House, Book Publishers, 675 Congress Street, Portland, Maine.

YOUR Mail order business now ready. A. S. Spencer, Mokena 2, Ill.

\$50 WEEKLY While learning watch repairing. See ad page 46.

HOME Mfg. enterprises. 70 projects, large variety, 500% profit. 100 illustrations. 56 pages, \$1.00. Home Industries, Omaha 5, Nebr.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 30, Illinois.

MONEY-Making opportunities galore including magazines, 10c. Wilbur Erickson, Englishtown 12, New Jersey.

DOLLARFUL Ideas for you every month in advance—"Voice of Mail Order." Leads the field in exclusive supply sources. Plans for mail order operation; new products, etc. Details free. Advance Publishing Company, Suite 350, 313 East 21st Street, New York 10.

POPCORN Poppers, vendors, peanut roasters, copper kettles, bottled gas, gasoline burners; new, used. Northside Sales, Indianola, Iowa.

UNUSUAL Back yard money-making opportunities! Fully outlined! Write: Pickett's, 62-A Sanders, Florence, Kentucky.

START Profitable home business in spare time. Make extra money raising Golden Hamsters. Small, clean, odorless. New. Unlimited market. Literature free. Golden Gate Hamstery, 631-H Richmond Street, El Cerrito, California.

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

PROFIT With Larson Leathercraft. Belts, purses, 100 other ideas. Largest supply in U. S. Catalog 10c. Larson, Dept. C, 824 S. Tripp, Chicago 24.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609 $\frac{1}{2}$ East 5th, Duluth, Minn.

PUBLISH Your own magazine. Handsome 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord. Nebr.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

RUSH Card—Five profitable small capital mail sales propositions free. Schenck, 717-P W. Penn, Butler, Penna.

FORMULAS, PLANS, ETC.

AMAZING New products. Write Dr. Hertstein, 519 Sheldon, Grand Rapids, Michigan.

FREE Formula catalog. Anything analyzed \$20.00. Western Chemical, Salem, Oregon.

UNUSUAL Formulas with moneymaking sales appeal. 15 only \$1.00. Jacobs, 620 East 20, New York 9, N. Y.

FAMOUS Formulas. Large folio free. D. Moore, Route 3, Box 568, Orlando, Fla.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

24 MONEYMAKERS—Tested formulas for home manufacturing, 25c. Satisfaction guaranteed. Details free. Nelson, Howel, Kentucky.

PRODUCTS Analyzed. Duplicated. Improved. Formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

FORMULAS For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

PLASTICS

CASTING Plastics: Cold curing, transparent and colors. Information 10c. Alan Plastics, Box 3564, Cleveland 18, Ohio.

SENSATIONAL— $\frac{1}{4}$ " 12" x 12" prime plexiglas \$1.75, include 10% postage. Free catalogue. Craft Plastics, Somerville, New Jersey.

FREE Catalog—Plastic materials, cements, jewelry and hobby supplies. Crescent Engineering, 1130D Fair Oaks, South Pasadena, California.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", 96c; $\frac{1}{8}$ ", \$1.25; 3/16", \$1.52; $\frac{1}{4}$ ", \$1.80. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

INTERNAL Carved roses, orchids, swans, goldfish, butterflies, etc. Jewelry and gifts. Crystal Floral Novelty Co., Bound Brook, New Jersey.

"PLASTIC Engineer and Consultant" will solve your plastic problems. Fee reasonable. 65 E. Rich St., Columbus 15, Ohio.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

BOOKS, Equipment, catalog 10c. Atlantic Laboratory Supply, 21 Wenham, Boston, JP, Mass.

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Ill.

HANDBOOK For chemical experimenters, illustrated, hundreds of experiments, 50c. Experiment booklet, 15c. Reading Scientific Company, Reading, Penna.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

NEW Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester, 7, N. Y.

HELP WANTED

BIG Money making plan for individuals, clubs, churches, schools, selling Christmas cards to friends, others. Feature box, plastics, personals 50 for \$1.00 up, stationery, everyday wrappings. Special offer. Bonus. Request samples. Heather Greetings, B-49, Springfield, Mass.

BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 52, National Engravers, 214 Summer, Boston, Mass.

BOYS Make \$3.00 per hour showing Pedaling Pete the tight-rope riding clown. Send \$1.00 for sample. Western Arts Company, Box 2124, Reno, Nevada.

AGENTS WANTED

SHOW Our tailored plastic raincoats to friends, strangers, and you are in business. Classiest garments introduced this year. Durable, yet fold into handbag or pocket. Priced for family buying. Terrific seller. Long profit. Secure territory now. Carson Products, 15-A East 8th St., Kansas City 6, Mo.

EXTRA Money yours—easy! Profits to 100%. Sell thrilling value plastic Christmas cards, 50 for \$1.00 personals, everyday, religious, children's, gift wrap assortments. Request deluxe 21-card \$1.00 Christmas assortment, name imprinted Christmas cards, stationery samples on approval. Holiday Card Co., 463 Congress St., Dept. C, Portland, Maine.

QUICK, Easy, cash for you! Sell amazing variety new Christmas cards. Profits to 100%. Novel plastic, 3-dimension "Stage Set," metallic, Christmas carol cards. Gift wraps, animated books, table settings, 8 special offers. Bonus. Write for feature samples on approval and free samples 4 different name imprinted Christmas card lines, floral and personal stationery. Elmira Greeting Card Co., MC-109 Elmira, N. Y.

BIG Extra income! Sell friends nylon hosiery, lingerie, blouses. Values supreme! Free sample displays, Christmas, everyday greeting cards, gift wraps, Christmas samples on approval. Special outfit offers. Wear Wright, 1709 Arch St., Dept. B, Philadelphia, Pennsylvania.

DEVELOP Your own business in Venetian blinds. Simple procedure. Write for particulars. Mohawk Venetian Blind Mfg. Co., 207 Bridge St., Cambridge, Mass.

\$1.00 STARTS You in business. Sell men's neckwear full or part-time. Low investment, big profits. Send \$1.00, receive two sample ties, plus free catalog, color pictures, selling plan. Radio City Neckwear, Dept. M-2, 112 W. 50th, New York City.

EXTRA Money! Sell friends Christmas cards—including fascinating plastics. 100% profit. Request free samples exclusive name-imprinted Christmas cards, stationery unobtainable elsewhere with Christmas and everyday assortments on approval. Regal Greetings, Dept. PM-9, Hazel Park, Mich.

AMAZING Offer—\$40 is yours for selling only 50 boxes Christmas cards. Also 50 and 25 for \$1.00 with or without name. Free samples. Other boxes on approval, including entirely new, different deluxe assortment with feature television card. Cute plastic assortments. Write today. It costs nothing to try. Cheerful Card Co., 911, White Plains, N. Y.

AT Last! Something new and sensational in Christmas cards. Show gorgeous satins, velours and plastics never before offered. Gets easy orders fast! Pays big profits. Free samples of Christmas cards with name 50 for \$1, imprinted stationery, floral charmettes, napkins. 50 other assortments 60c to \$1.25. Samples on approval. Write. Puro Co., 2801 Locust, Dept. 940-L, St. Louis, Mo.

NEWEST Money making sensation! Sell hand painted ties with personal initial. Experience unnecessary. Write for free 16 page catalog complete line ties. Philip's Neckwear, 20 West 22nd Street, Dept. K-37, New York 10.

NEW "Sponge" dish cloth. Replaces messy dishrags. Banishes dishwashing drudgery. Lightning seller. Samples sent on trial. Kristee 134, Akron, Ohio.

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

MAKE Money easily. New spare time plan. Up to 100% profit. No experience. Show unusual Christmas, everyday card assortments, plastics, gleam and glo, kiddies cards, wrappings. Attractive gift items. Bonus. Special offers. Send today for free samples 30 different Christmas cards with name 50 for \$1.00 up, stationery, coasters. Thomas Terry Studios, 101 Union Ave., Westfield, Mass.

PLASTIC Tablecloth covers, curtains, drapes, baby pants, bowl covers and other plastic articles selling like wildfire! Make big money now! Free details. Write L & M Co., Dept. 58-J, 510 St. Charles, St. Louis, Mo.

FRIENDLY Social visits bring you big Christmas card profits. Take easy orders wonderful new type plastic, metallic assortments. Send at once for free 48-page catalog, feature samples on approval and free name imprinted Christmas card sample portfolios. Special offers. New England Art Publishers, North Abington 51, Mass.

LOOK Here! Wanted—Men and women 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. I-192-PPM, Freeport, Ill.

CHRISTMAS Cards. Earn \$5.00 with every ten 21 card \$1.00 boxes you sell. Also new \$1.00 plastic cards, personalized cards, and stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-9, Pitman, N. J.

DOUBLE Your income selling sport, dress shirts, pajamas, nylon lingerie, hose, housedresses. Free outfit. Jarod Manufacturing, Rockville Centre 9, New York.

STEADY Profits selling new sensational Lico fountain pens. Liberty International, 8 Bridge St., New York 4, N. Y.

BIG Profits—Taking orders from friends, neighbors. 50 super value Christmas folders \$1.25, with name. America's leading \$1 box 21 French folders. Christmas Holly box—lined envelopes. Also: gift wrappings, plastics, religious, kiddies, napkins, stationery, etc. Samples on approval. No investment. Sunshine Art Studios, Dept. PM-9, 115 Fulton St., New York 8, N. Y.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders for sensational new Christmas cards. Amazing values. Pays up to 100% cash profit. Big line of Christmas, everyday assortments from 60c up. Christmas cards with name 50 for \$1. up. Imprinted stationery, floral charmettes, napkins. Get samples on approval, imprints free. Write North Star, 31 Glenwood, Dept. B-18, Minneapolis, Minn.

CHRISTMAS Cards—Earn selling personals, boxed assortments, novelties, plastics, stationery. Lincoln Press, 949, Fall River, Mass.

A Dress yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. A-435, Cincinnati, Ohio.

CALL On friends with sensational Christmas cards in handy assortments. Sell for \$1.00. Profit up to 50c. Also popular-priced personal Christmas cards, everyday assortments, stationery, imported napkins. Samples on approval. Wallace Brown, Dept. C-4, New York 10, N. Y.

SHINE Shoes without polish. New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 133, Akron, Ohio.

AGENTS. Nothing like it. The Mechanical Bird. A new novelty sensation. Free details. Toy Art Co., 110 Monroeville Ave., Turtle Creek, Penna.

AGENTS Wanted to sell our line of novelties. Behnke Sales, 5721 Leland, Chicago 30, Ill.

SELL Fluorescent plastic signs. Iwano Plastic Products, 9108 Olivet Avenue, Detroit 9, Michigan.

AMAZING Profits—Up to \$600.00 month. Working with churches, civic clubs, legion, money raising organizations. Easy, fascinating, permanent employment. Details free. Kraft, Aurora 3, Mo.

PAINTS-Enamels. Roofing 65c gallon up. Also outdoor toilet cleaners. Certified Products, 812e 38th, Louisville, Ky.

\$100.00 WEEKLY Selling 6 pair Paragon Cushion shoes daily. No investment. Experience unnecessary. Free outfit. Samples. Advance commissions, bonus. Paragon Shoes, 739 Columbus, Boston.

BE Renewal headquarters for all magazines. Big profit in Christmas gift sales now. No experience, no capital needed. Free catalog tells how. Write: McGregor Magazine Agency, Dept. 509A, Mount Morris, Illinois.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Printeraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

BUY Thousands of nationally advertised products direct from manufacturers and distributors. Write for "Buy Direct and Save." Service Publishing, 218-A Investment Bldg., Pittsburgh 22, Penna.

EARN Spare time cash. Sell Christmas, everyday cards, stationery, specialties. Profits to 100%. Bonus. Box sent on approval. Birchard, 27C Lester St., Springfield, Mass.

EXTRA Cash selling Christmas cards, wrappings, stationery. Request catalog, special offer. Atlantic Cards, 3525-M Reisterstown Road, Baltimore 15, Md.

UP To 233% profits selling genuine, guaranteed, "Silver Plating Polish" Rub-on method, apply with cloth. Renews silverplated ware, articles, pieces. Silverplates brass, copper, bronze. Stores, offices, shops, homes. NuSilver, 508-9PMA New York Street, Aurora, Illinois.

IDENTIFICATION Tags for dogs, keys, luggage. Write: DuRaney, Johnstown, Pennsylvania.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235 (L), Pittsburgh 30, Pennsylvania.

SELL New liquid cleaner concentrate. Repeat business, top profits. Every store, home, office a prospect. Glo-Brite Sales Co., 8921 Loomis, Chicago 20.

MUSIC Greeting cards. All occasions. Dorby Music Cards, P.O. Box 738, Morristown, New Jersey.

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

SENSATIONAL 1950 Models. Power mowers. Farm Products, M-2009, Excelsior Springs, Mo.

\$100 WEEKLY—New complete, modern plastic line. Tablecloths, etc.; over 25 items. Every home prospect. 100% profit. Free samples. Carwell, 6828-C South Chicago Avenue, Chicago 37.

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.

NYLON, Poplin, rayon uniforms, white and colors. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P-9, 3936 Market St., Philadelphia 4, Penna.

\$5-\$25 DAILY. Full, sparetime or sideline. Pocket samples free. Embocards, 3333 Neenah, Chicago 34.

AMAZING New plastic paint brush bag keeps paint brushes soft and pliable for months. Sells on sight. Good profit. Send 25c for sample package and details. Baldwin Sales, 20 Herkimer Place, Brooklyn 16, N. Y.

AGENTS Wanted: Sanitary toilet bowl brush holder. Modern household necessity. 50c for sample and details. Upper Midwest Specialties, Mankato, Minn.

GUARANTEED Tire patch. Sell garages, filling stations, etc. Protected territory. Economy Rubber Prod. Co., Riverdale Station, Box 552-O, Dayton 5, Ohio.

BIG Money—Fast! Sell quality plastic tablecloths, (from \$4 doz.), curtains, aprons, etc. Factory prices. Free samples. Durever, 282C Albany Ave., Brooklyn 13, New York.

AMAZING "Dooroscope" protects the home. Sells on sight. See visitors, unseen. Also talk, receive messages—with door locked! Underwriters approval. Vodean Associates, 165 Broadway, New York 6, New York.

AGENTS. Sell finest food products direct to homes. Successfully sold for 25 years. Big profits. Powerful combination sale plans make sales easy. Permanent repeat business. Samples furnished. Live territories open to distributors. Mother Hubbard Products Co., 4139 Grand, Dept. P.M., Chicago.

EASY To sell Bible text pencils, mottoes, charms, direct or to stores. Write, Al Hawkins Company, Sioux City 7, Iowa.

SELL Window streamers to stores. 400% profit. Biggest demand now. Free details. Rogers, 1613a Prospect Place, Brooklyn 33, N. Y.

TOP Year 'round earnings with oldest line of quality bronzed baby shoes and home gift items. No investment. Send for free selling ads. Jane Adams, Inc., PM-1, 108 Massachusetts Avenue, Boston, Mass.

FREE! Win television set and big cash prizes! Sensational offer. Make more money selling plastic Christmas cards, 50 and 25 for \$1.00, imprinted. Fast selling line, bonus. Free contest entry and portfolios. Richar's, 16AT East 18th, New York.

EARN Extra money easily, sell new Christmas cards and gifts-'n-things. 21 folder ass't. sells for \$1.00, sent on approval; no investment. Get \$50 or more selling only 100 boxes. Amazing sample offers. Headquarters for new 3-dimensional Christmas cards. Plastics, genuine engraved etchings. We send free samples of easy-to-sell personal Christmas cards and stationery. Pen 'n Brush Studios, Dept. PM-9, 139 Duane St., New York 13, N. Y.

AMAZING Spare time earnings. Sell Christmas cards, stationery, napkins; 50 with name \$1.00. Complete line Christmas, everyday boxes. Profits to 100%. Write for samples. Empire Card, 135 Fox, Elmira, N. Y.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

A SURE Way to make money. No exp. needed; Christmas cards sell fast! From 50 for \$1.00 with name! Big line box assts; profit up to 100%. Write for samples on approval. Mendler Art Company, 37A Pearl Street, Boston, Mass.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with written guarantee amazing everybody. Mere words could not express unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkins sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Nationally advertised in Life, Ladies Home Journal, Saturday Evening Post, McCall's and Woman's Home Companion. Awarded Seal of Approval by Good Housekeeping. 75 million readers will see Kendex advertising to help you make quick sales and big money. Complete line from sheerest 15 denier 51 gauge to heavy 70 denier service. Sizes 8½ to 11½; lengths 28 to 35 inches; latest fashion colors plus white; full fashioned seamed and seamless. No competition because Kendex nylons are not sold in stores. Also complete line men's hosiery actually guaranteed for one full year or replaced free. Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures etc. All styles, patterns, colors, prices to please everybody. 200,000 pairs constantly in stock for fast delivery. Thousands shipped daily. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Just show free outfits. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or as side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Man or woman, young or old, experienced or beginner, you can make money and friends writing orders. Everything you need is furnished free, including sales books in color, samples of hosiery materials etc. Simply write your name and address on postcard and make money next week with money-making outfits sent free and prepaid. No obligation. Kendex Company, Babylon 93, N. Y.

SELL Dress fabrics to friends, neighbors. Stylish, beautiful materials. Year round profits. No experience needed. Free details. National, 640 Broadway, Dept. M, New York 12.

DON'T Sell junk! The Frawley chair-side coin radio is in America's finest hotels. Proven and accepted! Your local hotels, courts, hospitals, resorts, coin operators, investors, radio men, etc. are all prospects. Splendid commissions! Time payment plan and complete sales helps for easy selling. Write today! Hotel Radio Corporation, 3000 E. Jefferson Ave., Detroit 7, Michigan.

1949 CHRISTMAS Card catalog now ready! Earn more money! Be a wholesale jobber! A large selection of box assortments. Imprint lines, religious, personalized cards and Christmas novelties. Three sample boxes, retailing for \$2.60, only \$1.00 postpaid. Catalog free! Elfko, 440 North Wells, Chicago 10.

INCREASE Your income. Sell for manufacturer. Nylon uniforms to waitresses, beauticians, doctors, dentists, nurses. Sales outfit and extra catalogs with your name and address furnished free. Terrific cash commissions. Medikote, Rockville Centre 2, N. Y.

BLIND Workers need your support. Make more money taking orders for floor brushes, rugs, towels, many other items made by the blind people and also help create work for them. Free catalogue. Pacific Blind Products, 1024-M Santee, Los Angeles 15, Calif.

NEW Sensational money maker. "2-in-1" scissors and knife sharpener. Nothing like it before. Proven success. 100% profit. 30 second demonstration gets order. Special trial offer. Barberdier, 918 Eleventh, Sacramento, Calif.

HOTTEST 39c Item on the market. Write National Sales & Service, Greenville, Penna.

FREE Samples. Big profits showing amazing Glow-in-the-Dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer. Madison Plastics, 203 Fourth Ave., New York 10, N. Y.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 5103, Cincinnati 3, Ohio.

BE First! Clean up selling brilliant new, metal Christmas cards featured in America's greatest box assortment line. Special metal, plastic, foil and novelty assortments. Five portfolios of personal cards. Fast imprint service. Free samples. Elmcraft Chicago, 5930 South Western, Chicago 36, Ill.

LOOK! Make money all year round selling personal initialed individualized belts, buckles, cap badges, western buckles, tie holders, name plates. 2000 emblems to choose. Big profits, whole or part time. Please write today special outfit offer. Hook-Fast Specialties, Box 1425, Dept. 6, Providence, R. I. Established 1926.

SEWING Machine electrification kit. Nationally advertised. Has Good Housekeeping Guaranty Seal. Can be demonstrated and sold in 5 minutes. Make at least \$5 per sale. For complete details write today to Brownell Distributors, Inc., Dept. PM, 308 Canal St., New York 13, N. Y.

FREE Water and our concentrates, make flavors, lotions, shampoos, 125 products, labels, bottles supplied. Quaioco, E20030 Russell, Detroit.

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

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

PHOTO-Salesmen-plastics. Sell beautiful hand-colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

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

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

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania 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.

HIGH-GRADE SALESMEN

AGENTS, Dealers and distributors. Here's the money making item you've been looking for. Acclaimed by users throughout the country. Every housewife, storeowner and janitor a prospective customer. Many states still open (including main cities). Write today. Speed Waxer Company, Dept. PM-4, 4451 Elston Ave., Chicago 30, Ill.

DO You sell to service stations, grocery stores and other soft drink retailers? New, fully patented device makes coin vendor of any soft drink box. Sell and deliver complete unit; make \$5 or more net on every \$12.50 unit sale. Carry as sideline or full time. This machine supported by national advertising. Salesmen and distributors wanted. Write or wire for details on open territories. Pay-Pull Mfg. Co., Dept. P, 720 San Pedro Ave., San Antonio, Texas.

SALESMEN. Earn \$100.00 weekly, selling only six pair shoes daily. Commission and bonus. Wide variety for men, women, children. No investment. Experience unnecessary. Free catalog. Tanners Shoes, 514, Boston, Mass.

SALESMEN—New type lawn tray and other novel appliances. Write for plan. Union Iron Products Co., 1011 East 148th, East Chicago, Indiana.

GOOD Profits selling tooth paste dispensers. A beautiful new invention. Free particulars. Samuelson Specialty Co., 470½, South Mt. Vernon, San Bernardino, California.

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-99, 7530 Greenwood, Chicago.

SELL DuPont nylon uniforms. Complete line famous exclusive Hoover styled nylon uniforms for beauty shops, nurses, doctors, waitresses, others. Best quality, splendid values. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. A-100, New York 11, N. Y.

SALESMEN—(within 1000 miles of Philadelphia) sell printed gummed tape. Part or full time. Good commission. Quaker City Tape, 910 No. 6th, Philadelphia, Penna.

BONUS Suits and big cash profits—Both yours with amazing new plan. Show actual sample woollens, latest styles to friends, neighbors. No money needed. Write for amazing plan. J. C. Field & Son, Harrison and Throop Sts., Dept. W-1817, Chicago 7, Illinois.

DON'T Sell our signs! They sell themselves. Your profit 400% while having fun. Every business waiting to buy. Be first in your town. Rush \$1.00 for generous sample today. All-Ready, 501 Piper, Detroit 15, Michigan.

SELL Calendars now. Be the first in your district. Good sideline or full time. Every business wants them. Few calendar salesmen are on the road now which means more sales for you. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37.

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. PM-949, Rochester, Ind.

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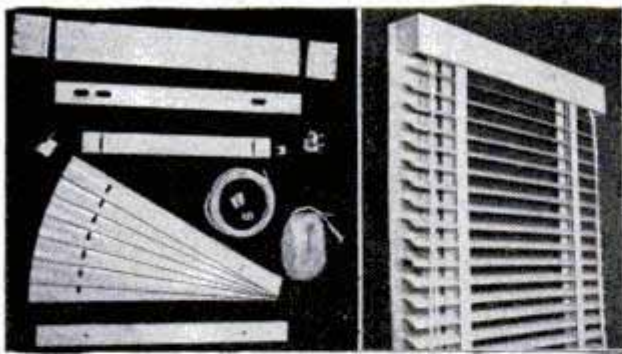
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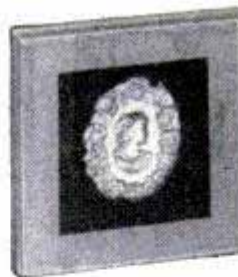
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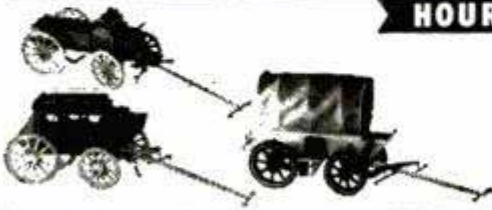
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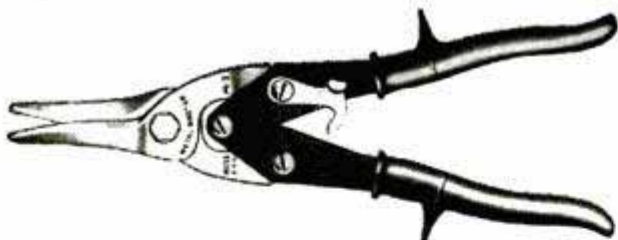
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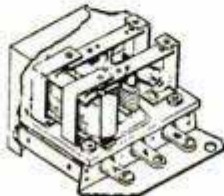
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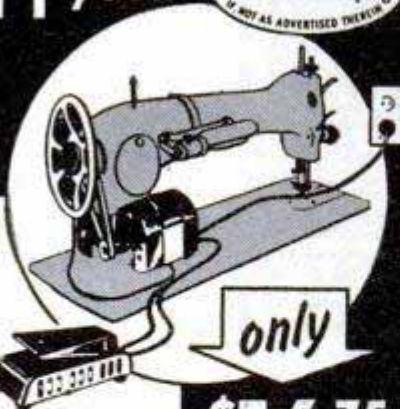
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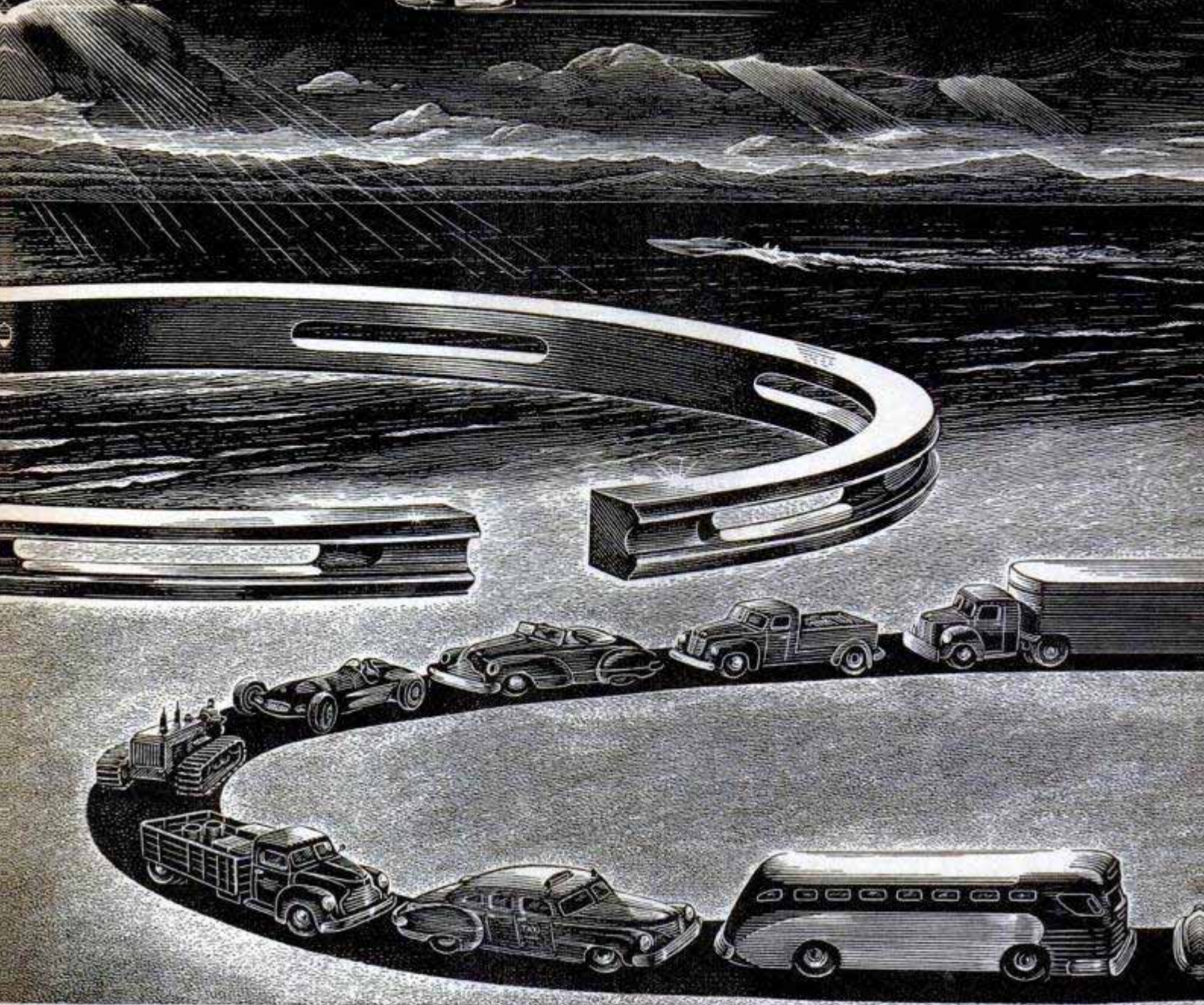
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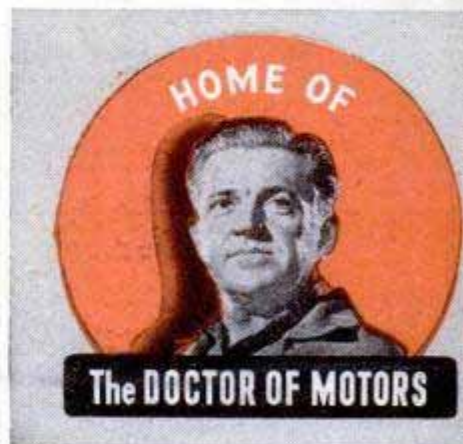
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POPULAR SEPTEMBER 1949 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 92 NO. 3



Spanish doubloons? No, shells dredged from the ocean to learn more about mysterious deep scattering layer

DEEP-SEA MYSTERY STORY

WHAT is the mysterious layer 1000 feet or so below the surface of the ocean that causes "false bottom" readings on ships' fathometers?

Sometimes it leads mariners to think that they have discovered uncharted shoals in areas that are far from land. Because it creates reflections and reverberations of their sound pings, it is a source of confusion to sonar operators who track submarines.

It seems to exist in all deep oceans from the Arctic to the Antarctic. It is 100 feet or more thick.

Oceanographers know very little about this phantom bottom but they are excited by the possibility that it may consist in part of edible fish. If their surmise is correct, the world has found a new and practically

Patrol craft fitted by Navy Electronics Laboratory with latest instruments seeks answer to the mystery
Official U. S. Navy photo



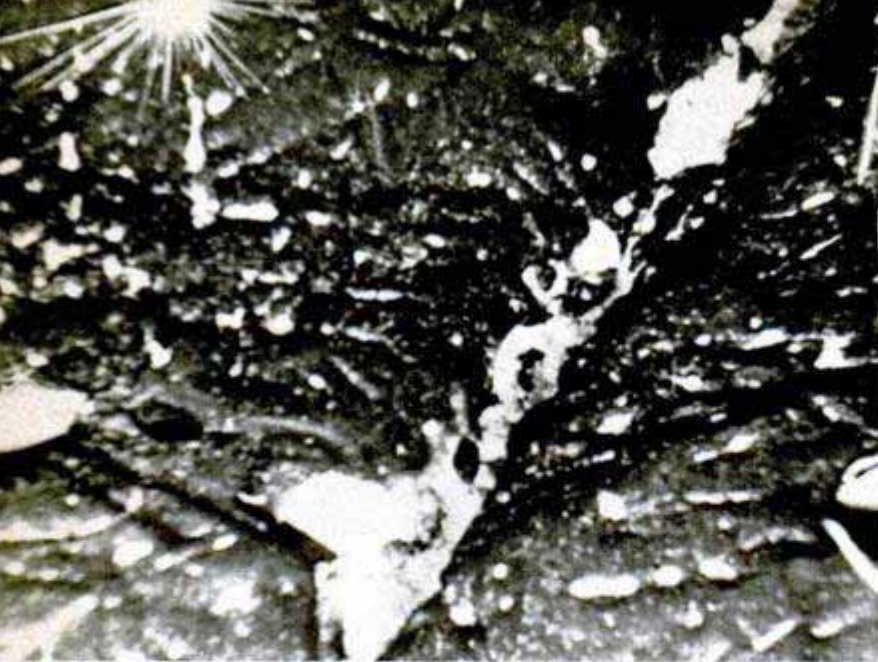


Photo taken on the sea bottom 275 fathoms deep shows a large starlike organism resting on sea ooze atop volcanic rock



Up from the depth of the deep scattering layer came these shrimplike forms and the jellyfish inside the pan. Larger fish also are thought to inhabit the layer. Below, these lobsterlike crustaceans were photographed at 153 fathoms



inexhaustible source of nourishment.

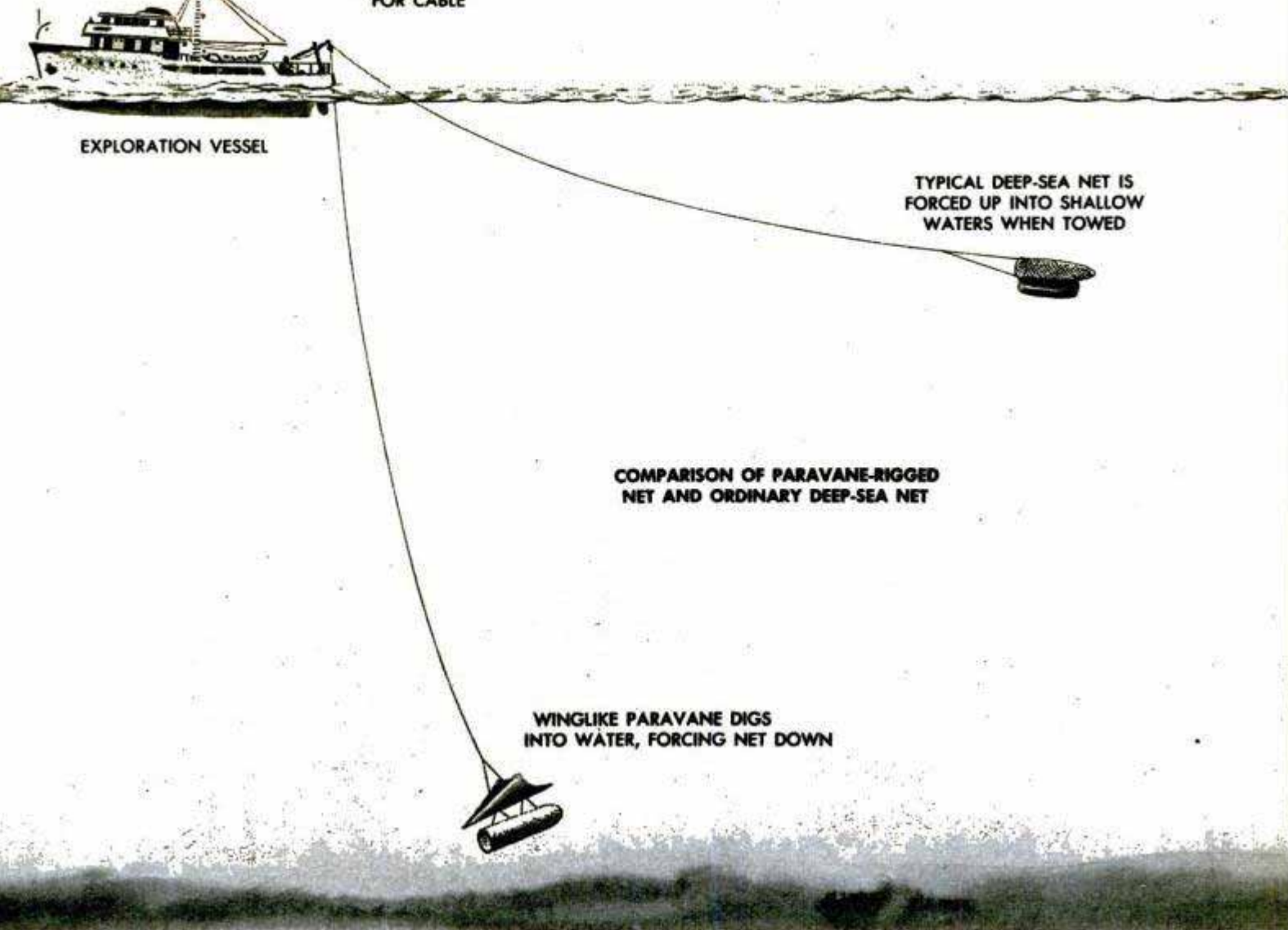
This newest mystery of the deep was first recognized by Drs. Carl F. Eyring, Ralph J. Christensen and Russell W. Raitt while doing naval research off San Diego early in the war. Their project was to measure the reflections and reverberations of the sound beams that are used in underwater echo ranging equipment. Air bubbles, a rough surface on the ocean, suspended matter and the bottom itself all create echoes of the beams.

Day after day, offshore, the scientists were puzzled by echoes that were reflected upward from a depth of about 300 yards. They knew of no physical condition at that depth that might explain the phenomenon, yet all parts of the area in which they worked seemed to have this same reflection stratum. They named it the "deep scattering layer" because of its scattering effect on supersonic signals. Rushed by the war program, they could do little more than speculate on what the layer might be.

Later, Dr. Martin Johnson of the Scripps Institute of Oceanography at La Jolla suggested that the deep scattering layer should be sought after dark and that its nocturnal depth should be compared to its depth in the daytime. He reasoned that if the layer showed any vertical change during a 24-hour period it would be evidence that the layer was composed of living organisms.

Measurements at night, dusk and dawn showed that the layer does indeed migrate. It moves up toward the region of the warm, mixed, surface waters as soon as the sun sets, then descends again with the coming of dawn. Many floating, living organisms such as jellyfish, complete this nightly cycle. Presumably they move upward after dark to feed and then at dawn retreat to depths at which they are safe from predators. When the deep scattering layer proved to have this cycle, the investigators concluded it is made up of living forms.

Studies of trans-Pacific echograms, the records of echo sounding equipment, show strong or weak evidence that the deep scattering layer exists almost unbroken all across that ocean. Comparable records made in the Atlantic also reveal its presence. Echo soundings that have been made up into the



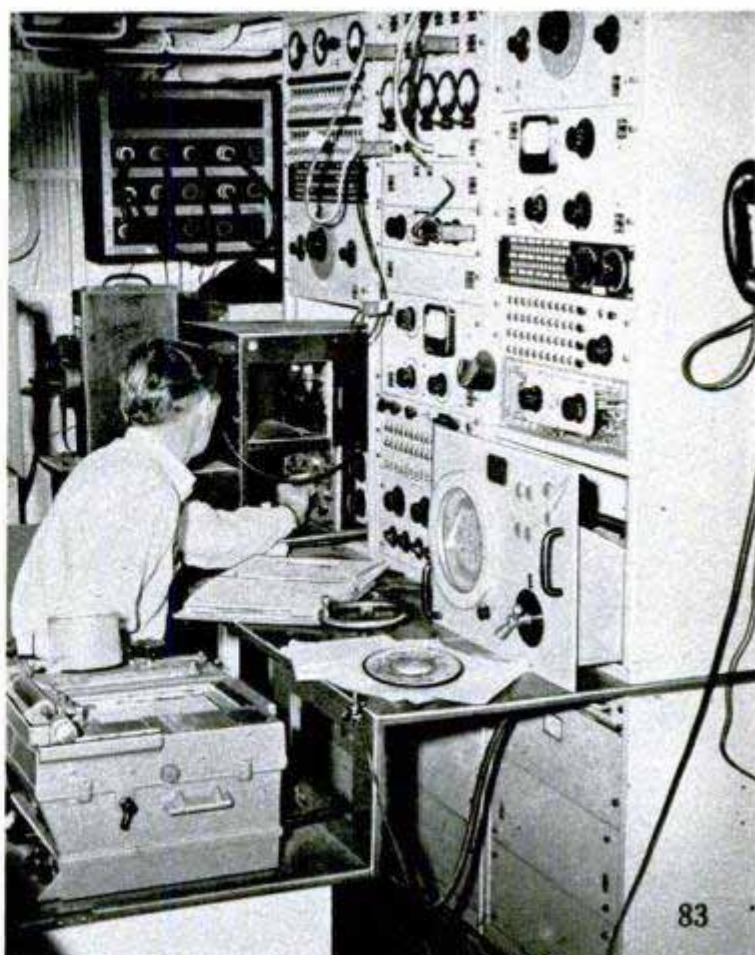
Arctic and down toward the south polar waters likewise almost invariably record its presence.

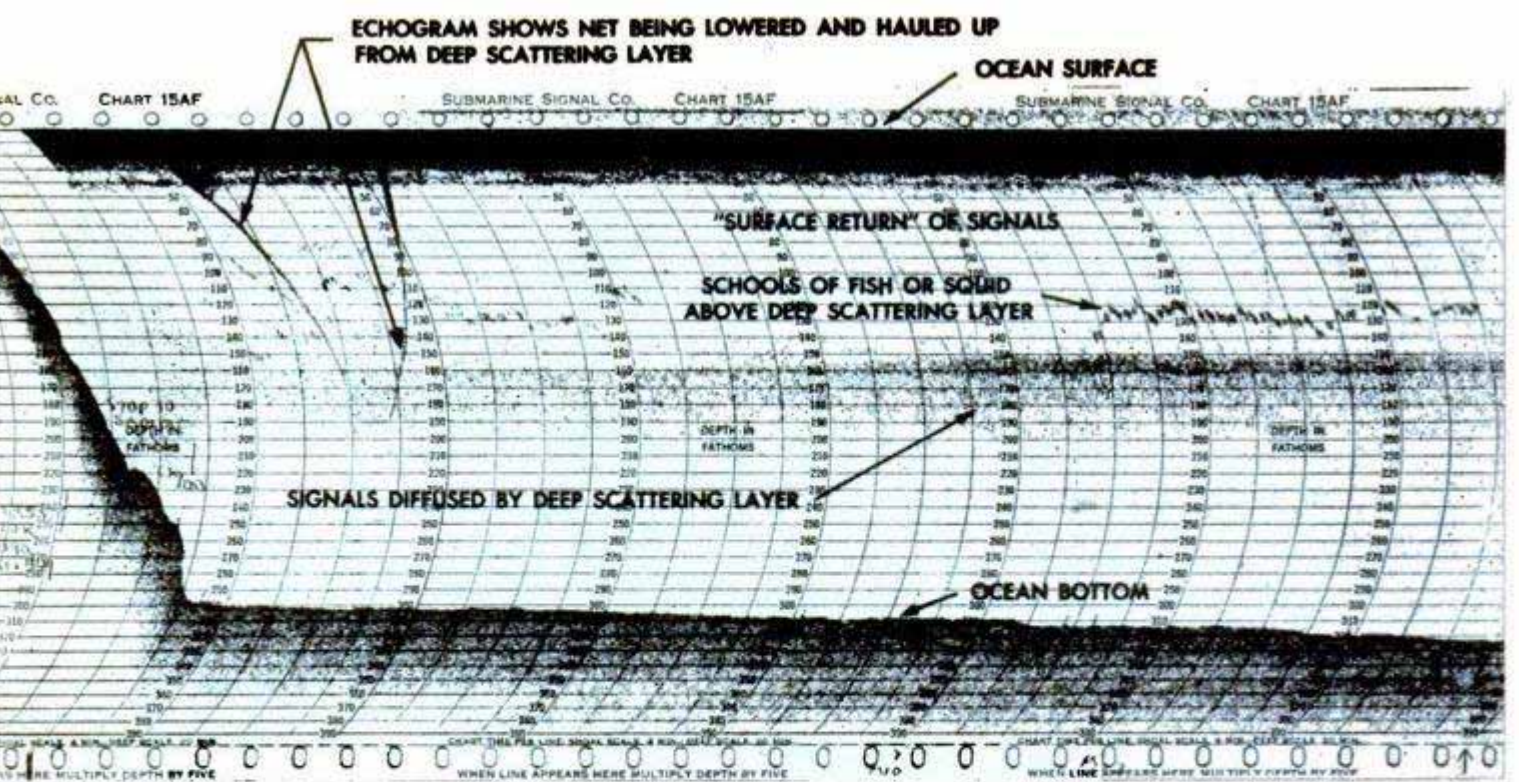
The depth of the layer seems to vary with the distance that light penetrates into the water. In the tropics the deep scattering layer may lie at a depth of 2500 feet below the surface. In the middle latitudes it is found at only half that depth and toward the poles it is shallower still. Occasionally, two separate layers are recorded, each of which migrates vertically at a different speed. Sometimes, too, the presence of large schools of fish or squid that are swimming some distance above the top of the layer is indicated by carbon markings on the charts.

Today numerous research groups including Scripps, the Woods Hole Oceanographic Institution of Massachusetts, the Navy Electronics Laboratory and the University of California's Marine Physical Laboratory at San Diego are exploring the layer.

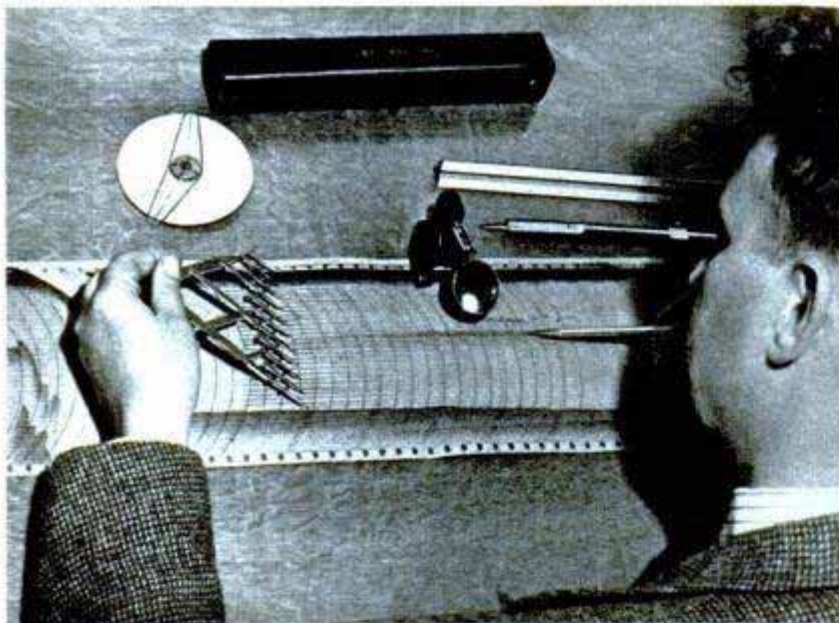
After the war ended these groups sent research vessels out into deep water off both the Atlantic and Pacific coasts to sample the layer. The depth of the layer was ascertained by echo-ranging methods and then nets were

Drawing shows how the paravane forces the net deep into the ocean, whereas an ordinary net, even when weighted, is pulled up into shallow waters. Below, echo-ranging equipment on Navy vessel records the mysterious layer

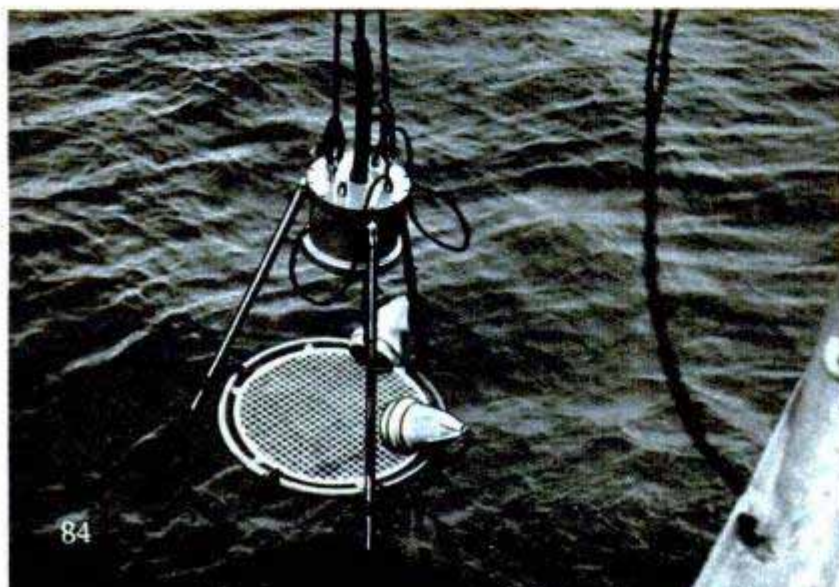




On this echogram are recorded the signals returned by the deep scattering layer as well as the real bottom and schools of fish



Dr. Dietz of the Navy Electronics Laboratory manipulates the instrument which plots the depth of the layer from the echogram. Below, cameras mounted on this special rig take photos at proper depth. Flash equipment gets pictures before sea life scatters



lowered to capture whatever could be picked up at this depth.

All the hauls were successful. In all of the nets the oceanographers found numerous specimens of small shrimps and shrimplike forms of the Euphausia family, as well as numbers of small transparent jellyfish.

That the deep scattering layer contains a concentration of these forms of sea life is important scientific news, but few of the oceanographers are satisfied. They feel that there are other, larger inhabitants of the layer.

In the first place, says Dr. Robert S. Dietz of the Navy Electronics Laboratory, it is unlikely that such small organisms are responsible for the sound-scattering phenomenon that led to their detection. Most of the euphausiids are less than an inch long and may not be large enough to reflect signals of the wave lengths that are used in echo ranging. To reflect the sound pings efficiently, they would need to be at least three or four inches in diameter. Air bubbles such as are contained in the swim bladders of fish are effective scatterers of underwater sound but the euphausiids don't have such bladders.

Too, some of the sea scientists doubt that the shrimplike forms can move at the speed with which the deep scattering layer rises toward the surface at dusk. This rate has been measured at 18 feet



Built like tuna clipper, research craft serves as marine laboratory for University of Southern California

per minute. Another thought is that such a rich belt of life could hardly exist without having attracted larger fish that would live in or adjacent to the layer and feed upon it.

The problem now is to capture specimens of the larger inhabitants of the layer, if such inhabitants exist. New deep-sea equipment is being built for this purpose. The difficulty with the nets and capturing devices that have been used so far is that they can be operated at great depths only when they are motionless or practically motionless. No free-swimming fish is likely to be caught in such a device. If one of the nets is towed behind a vessel at any appreciable speed, it is automatically dragged

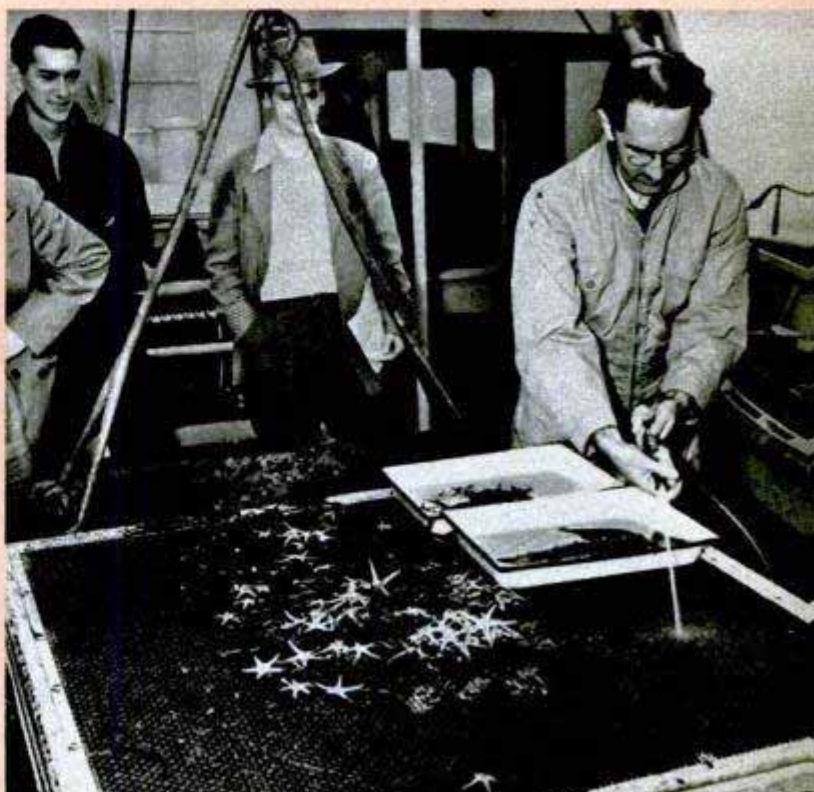
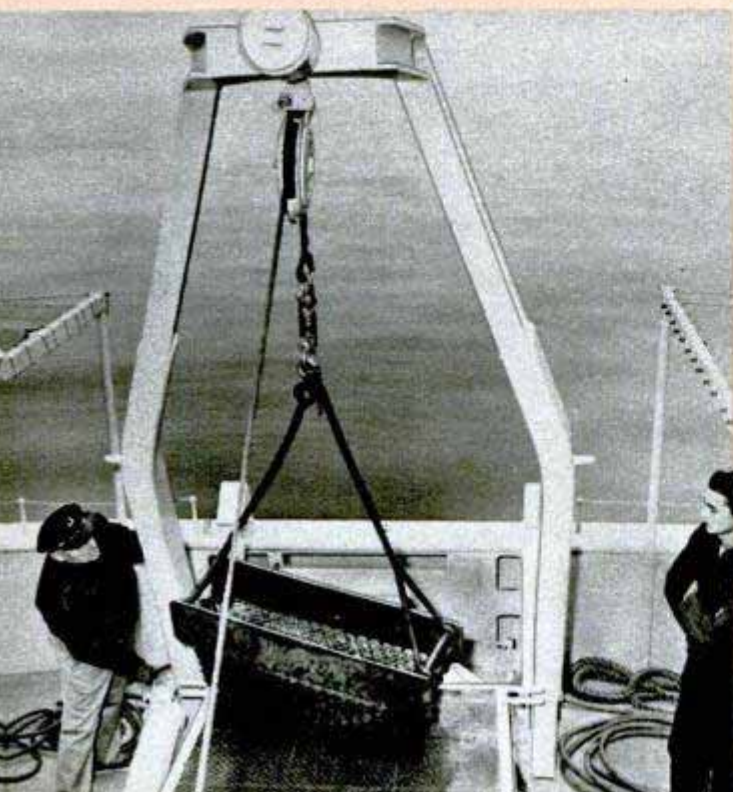
up toward the surface even though as much as a ton of weight is attached to it.

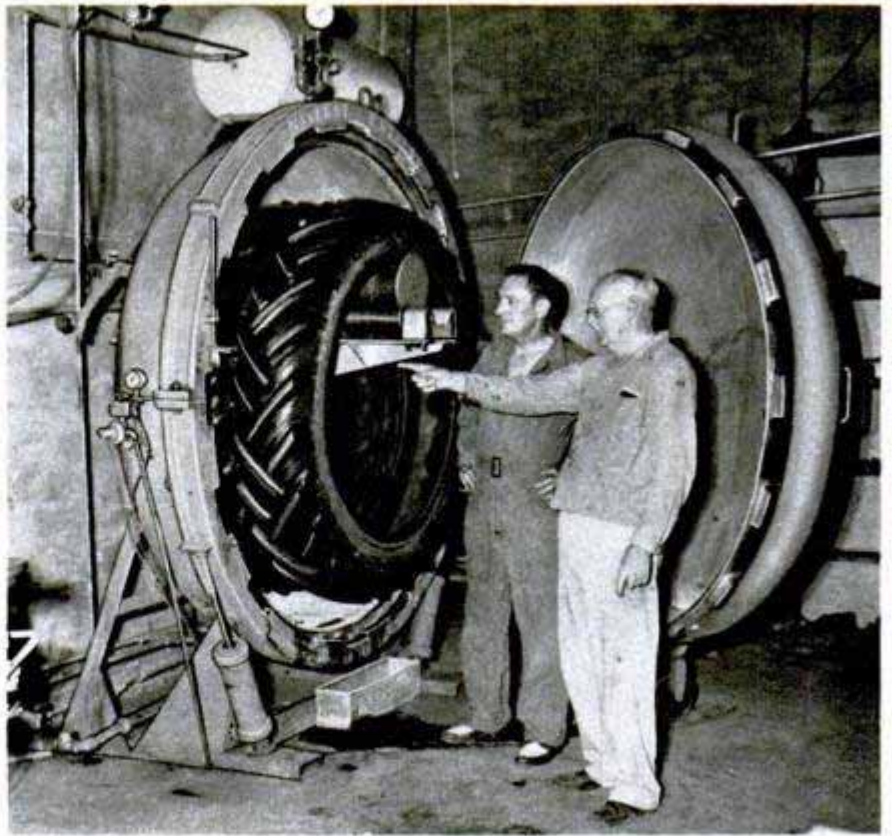
To overcome this difficulty, the oceanographers will use a special deep-sea paravane, an underwater kite with flared surfaces that make it dig down into the water when it is towed behind a boat. Such equipment will force the cable down to the deep scattering layer even when towed at speeds of four or five knots.

New types of nets are also being built. Most specimen nets have a bridle attached at the front, and the disturbance that the bridle sets up in the water acts as an alarm to fish in the vicinity. The new nets are held

(Continued to page 238)

Collecting dredge hauls up sea life specimens. Right, cleaned and classified, they aid in studies of ocean





New Lugs Vulcanized on Tires

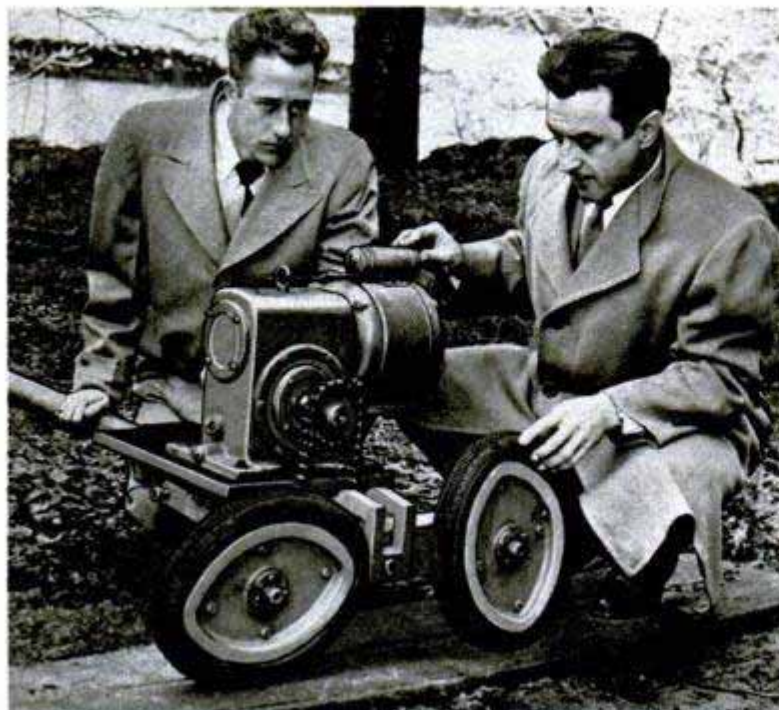
New lugs are applied to worn tractor and off-the-road tires through a vulcanizing system, thereby giving the farmer good vehicle traction at a fraction of the cost of new tires. In many cases, tractor tires are

still in good shape even though the lugs are worn off. The tire is buffed to a smooth, round surface. New lugs are cut, fastened in place with cement and hammered to provide a tight bond with the tire casing. The tire then is baked inside a steam oven to vulcanize the lugs and the casing.

Egg-Shaped Wheels Pull Through Mud Without Chains

Wheels with "corners" on them may seem useless, but a New York inventor believes such "flat" wheels may replace the track-type drive on military vehicles and tractors. Each driving unit is actually a

pair of oval wheels synchronized with their long axles at right angles to each other. This means that the point of one wheel and the flat part of the other are in contact with the ground at the same time. The wheels



are mounted on a rocker arm attached to the axle, thus the wheel unit rocks up and down while the axle remains steady. Tests in mud and deep ruts show that the wheels do not slip or bog down and, according to the inventor, John F. Kopszynski, they outperform continuous treads used on tanks and bulldozers. On smooth roads, the rocker arm enables the unit to travel up to 25 miles an hour with no unusual vibration. All parts are hermetically sealed and maintenance is simpler and cheaper than on tracked vehicles. Still not in production, the wheels are undergoing extensive tests.

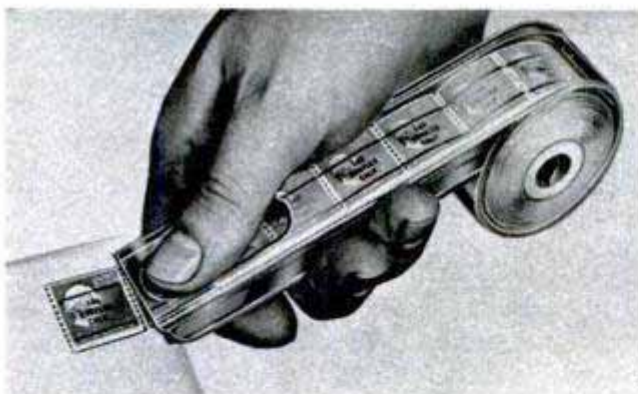
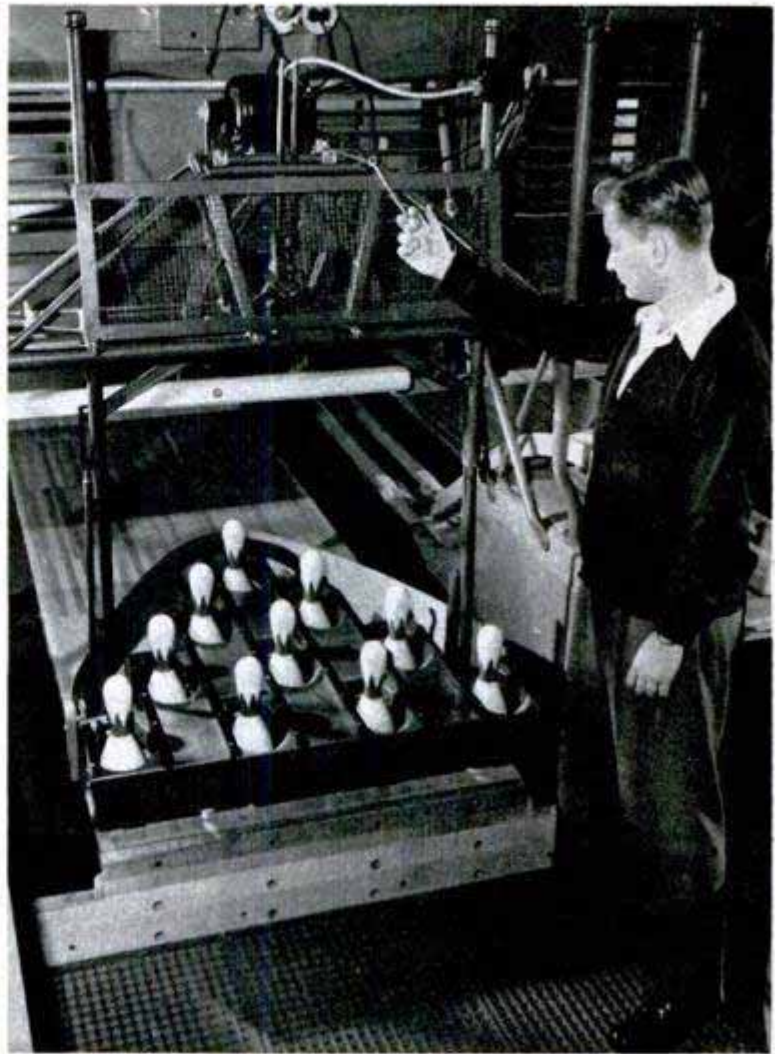
☐ With toll-dialing, the average long-distance phone call is completed in one minute, five times faster than the 1927 average.

Machine Speeds Pin Setting

Pin setting is speeded by a new electric machine that completes the operation without supervision. As soon as the pin boy pulls a lever, he can move to an adjoining alley without waiting to lower the machine and set the pins. Loading is made easier and faster by specially designed pin-spotting collars. A safety release which disengages automatically when there is interference with the downward movement of the pin-setter deck protects the operator and prevents damage to off-spot pins.

Color Computer

How many colors are there? Authorities say that the human eye can see about 10,000,000 colors, but a new automatic instrument is so precise that it can distinguish more than 100,000,000. The machine tells whether a given color matches another color, and describes any differences. The device is a computer that is operated in conjunction with a spectrophotometer, an instrument that measures transmittance.



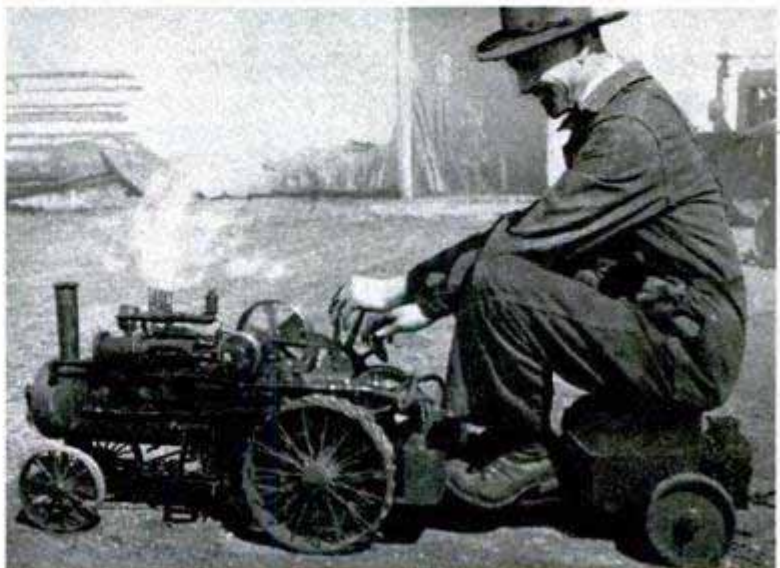
Hand Mailer Moistens Stamps

If you have a large number of letters to mail, you'll save time with a handy mailer that moistens, dispenses and applies stamps to the envelopes. The stamps are pushed across a moistening device with the thumb and then slid onto the envelope. With the mailer you can apply as many as 1500 stamps an hour. It also can be used to moisten the flaps of envelopes without removing the stamps from the holder.

Model Tractor Is Steamer

Burning coal, a model engine built by H. L. Bolton of Reece, Kans., carries 100 pounds of steam and crawls along at one mile per hour. The little power plant weighs 175 pounds. Bolton spent about 1000 hours building it at a cost of \$25 for the valves and fittings.

☐ In 1948, a total of 4,697,405 tons of iron and steel were exported from the United States, of which the largest share went to countries in North and Central America and the West Indies.



The hospital comes to the patient



Outside patient's home, the doctor unloads the basal-metabolism tester from his hospital on wheels

badly needed hospital beds for patients who were seriously ill and required the close supervision of a hospital staff.

So he bought a secondhand laundry truck (the car shortage was very severe at the time), cleaned it up and painted it white. The inside was equipped to serve as an office and laboratory. The rear compartment was made light-tight so it could be sealed off for use as a darkroom for developing X-ray films.

In one corner are specially designed steel tanks for developing the films. The tanks are eight inches higher than normal and capped with a metal lid to keep liquids from sloshing out as the truck rolls around Cincinnati streets. There are racks for the microscope and other fragile equipment. A special cabinet serves as a workbench as well as storage space. A small stove heats the interior of the truck in winter, eliminating any danger of the developing solutions being frozen.

Today his traveling hospital goes all over Cincinnati, seven days a week, serving patients in their own bedrooms at prices that are about the same as would be charged for the same services in a hospital. Among the services that he offers are on-the-spot X-rays, metabolism tests, blood counts, heart tracings and emergency transfusions. He visits a patient only on request of the patient's regular doctor and, with the use of his laboratory, he is usually able to help the doctor diagnose the case.

When Doctor Albert first announced to Cincinnati's 1100 doctors that he had a hospital ready to roll to the patient's bedside,

By George Laycock

WHEN YOU can't go to the hospital in Cincinnati, the hospital will come to you—right to your door, complete with doctor. It's a new idea in medical care that promises to spread rapidly.

The hospital on wheels resulted when Dr. Irwin C. Albert of Cincinnati returned from the war and resumed practicing. The shortage of space made it difficult for him to get patients into hospitals for X-rays, blood checks and other tests that require equipment usually found only in hospitals and clinics.

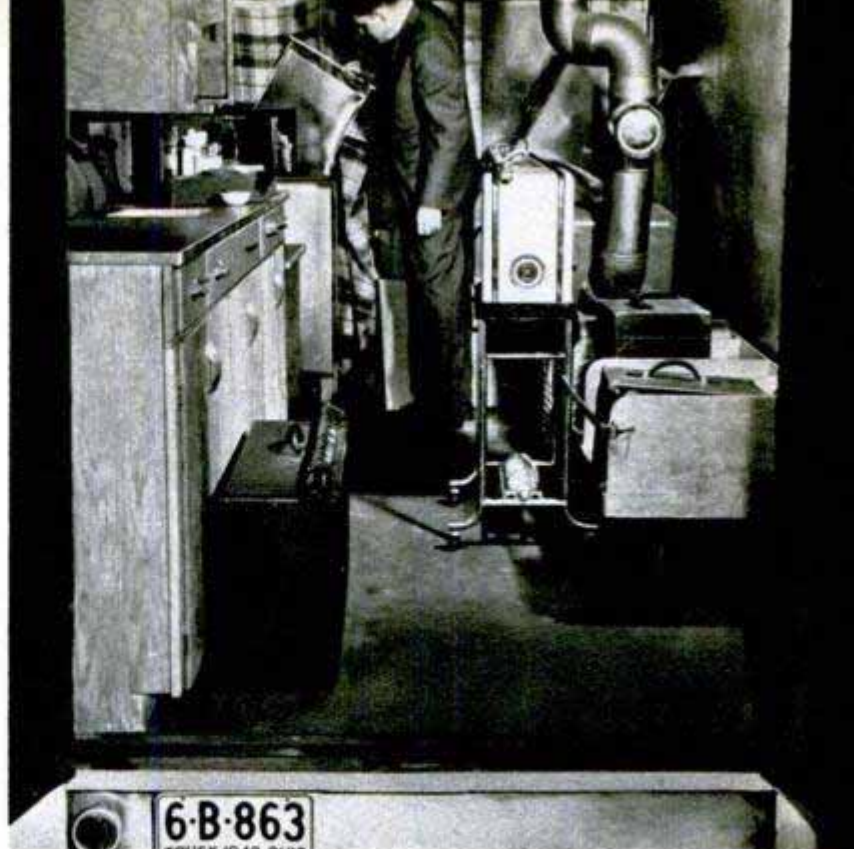
It would be fine, Doctor Albert thought, if he could take this equipment to the patient. It would speed treatment and release



The patient, a youngster, has his basal metabolism checked by Dr. Albert without leaving the bedroom

their reactions were varied. Some of them saw little future in a wheeled hospital, but today, even the older doctors, who warned to the plan slowly, point out that the idea is a good one.

Patients with fractured legs, for instance, can often be treated at home instead of in the hospital if they can get an X-ray to show the location and extent of the break. If sent to the hospital they might occupy a bed for 10 weeks or more. Patients with heart ailments can now get a checkup in their own bedrooms, instead of exerting themselves traveling. A suspected pneumonia victim can have his chest X-rayed without going out in the weather. Children, sometimes frightened when told they are "going to the hospital," are more at ease



The doctor takes his X-ray machine into the house, shoots the pictures and develops them in the truck

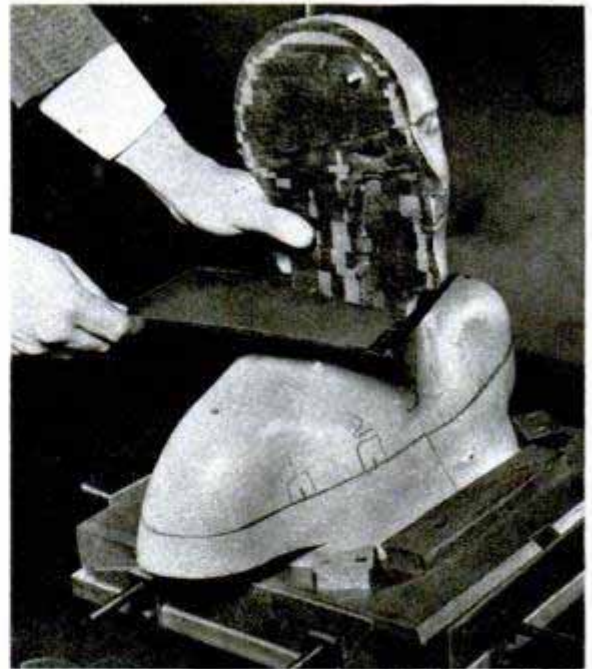
when they are examined in their homes.

Although Doctor Albert gives his report only to the patient's regular doctor, he knows before he leaves the scene what the report will be. He develops his X-rays on the spot and if he finds that he needs another picture he takes it without having to make an additional trip.

The doctor's white truck has become a familiar sight on Cincinnati streets. The demand for its services has grown steadily. It is becoming so popular that the doctor plans to add similar trucks until he has a fleet of traveling hospitals working every part of the city. Because he sees no immediate end to the hospital shortage, he believes his little self-powered hospital is here for a long stay.

With his microscope, Dr. Albert studies a patient's blood. Behind him are tanks for developing X-ray film





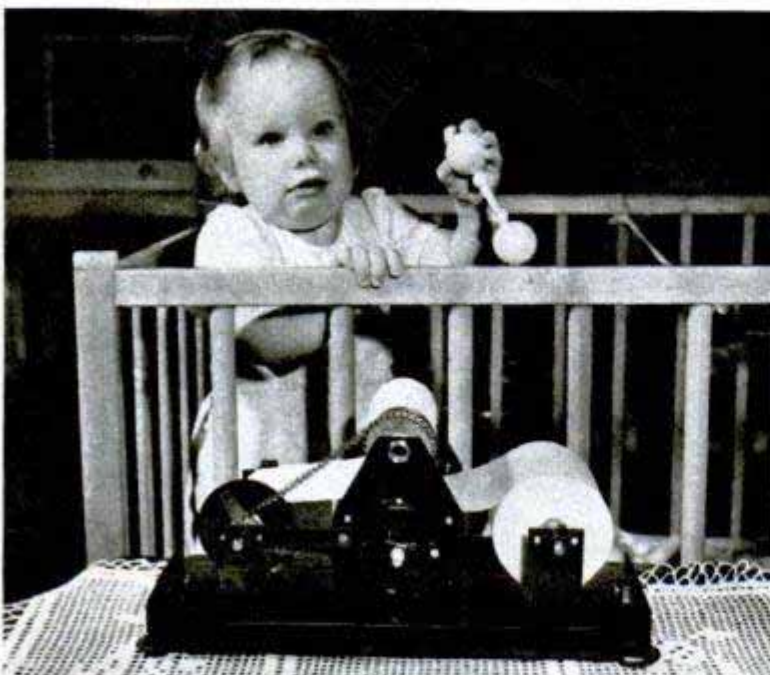
Above, film to record ray penetration goes in the head. Dummy is used to study effectiveness of X-rays in combating diseases of inner body

Wooden Head Is Target For X-Ray Research

Left, M.I.T. scientist adjusts the base of the generator before irradiating the wooden head of "Mr. Cruikshank" with 3-million-volt X-rays

"Mr. Cruikshank's head" probably has been the target of more X-rays than any other human form in the world. Mr. Cruikshank, as he has been dubbed by scientists at the Massachusetts Institute of Technology, is a wooden head and shoulders used as a stand-in for a human being in measuring the penetration of super-voltage X-rays. The dummy head consists of layers

of wood and other porous materials which reproduce the densities of human bones and tissues. X-rays fired at Cruikshank thus can be expected to penetrate about the same distance as they would in a human head. When Cruikshank has been irradiated, films and recording instruments in the wooden head reveal the amount of radiation that reaches various locations.



Glycol-Vapor Dispenser

Glycol vapor, being tested as a cold preventive, is released in the air by a dispenser that heats a roll of glycol-impregnated paper, causing it to give off a germ-killing vapor. The paper is placed in the electric dispenser and is passed over a heated roller at a rate of one revolution an hour. Although there is no definite proof as yet that the technique prevents colds, early tests have produced favorable results.

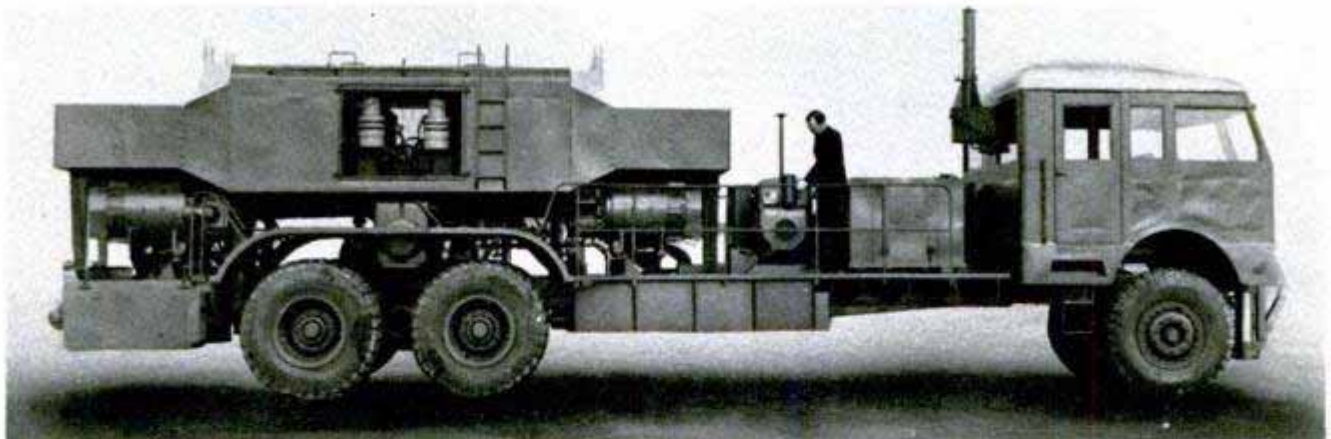
☐ In the 20 years from 1927 to 1947, the percentage of anthracite loaded mechanically in underground mines increased from 2.1 to 43.4 percent.



Collapsible Stretcher on Wheels

Made of aircraft tubing, an all-purpose stretcher carrying up to 400 pounds telescopes into a compact, lightweight unit when not in use. It can be hung on walls or in elevators for emergency use in factories or carried in autos converted into one-patient ambulances. Heavy canvas is sus-

pending hammock fashion over the frame and screws hold the back rest at any angle desired. A collapsing mechanism folds and locks the wheels into position. Twenty inches wide, the stretcher is 75 inches long when fully opened and 48 inches long collapsed. Either swivel-type wheels or crutch-tip uprights can be attached at the foot end of the stretcher.



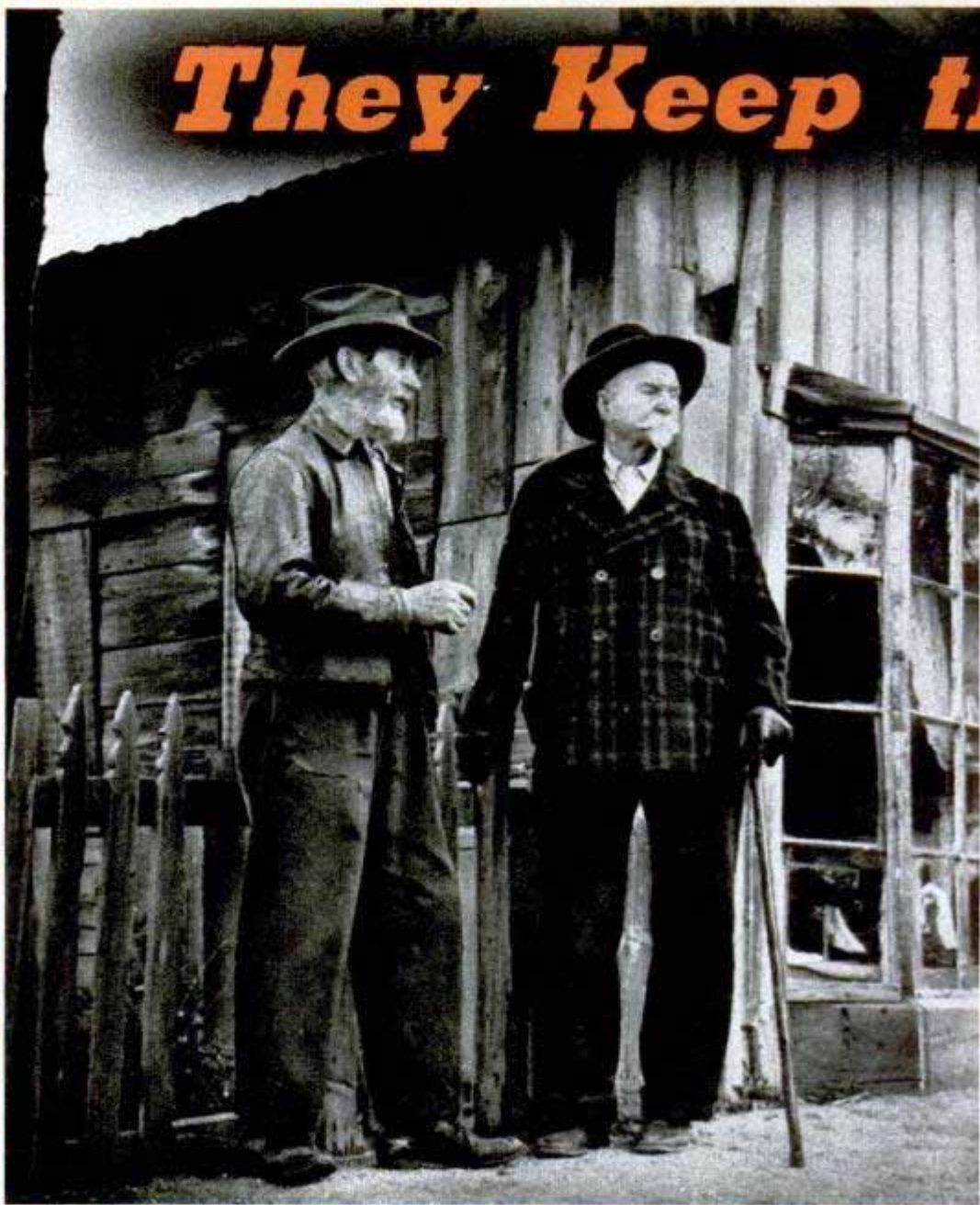
Giant Traction Dynamometer

Big tanks and other military vehicles are tested by the world's largest traction dynamometer, recently put in service by the Army at Aberdeen Proving Ground, Md. The vehicle is nearly 50 feet long, 11 feet wide and 12 feet high and is equipped with 19 electric generators. The new dynamometer can tow test vehicles to the proving ground. There it becomes a towed vehicle, and its electric generators create accurately measured resistance which increases the load on the towing vehicle. Instruments

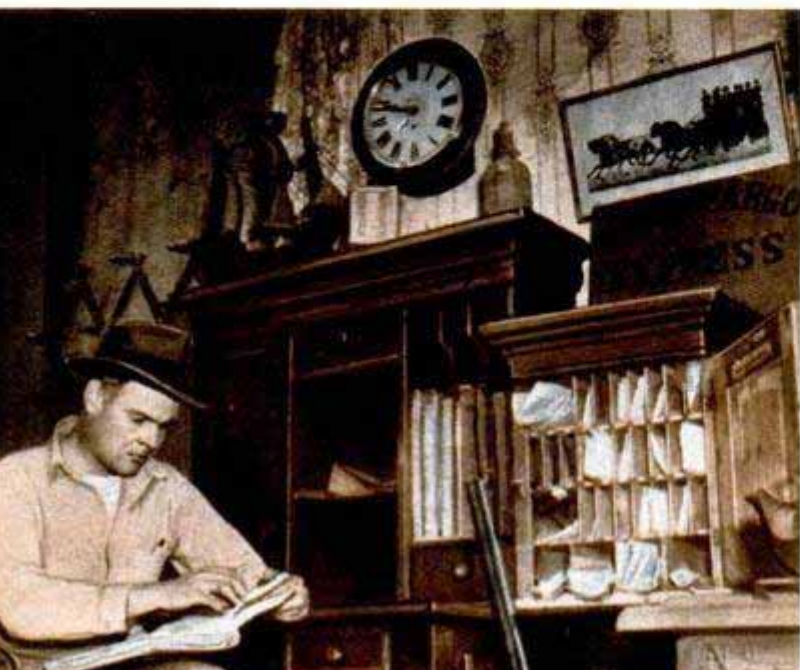
then record the tractive effort and other phases of the test. Cameras inside the nine-foot-square cab record the instrument readings to give engineers an accurate picture of the capabilities of the vehicle that is under test.

Popular Mechanics provides two sources of further information concerning articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT INDEX, available without charge from our Bureau of Information, 200 East Ontario Street, Chicago 11

They Keep the



Two bewhiskered residents of Virginia City fit perfectly into its old-time atmosphere

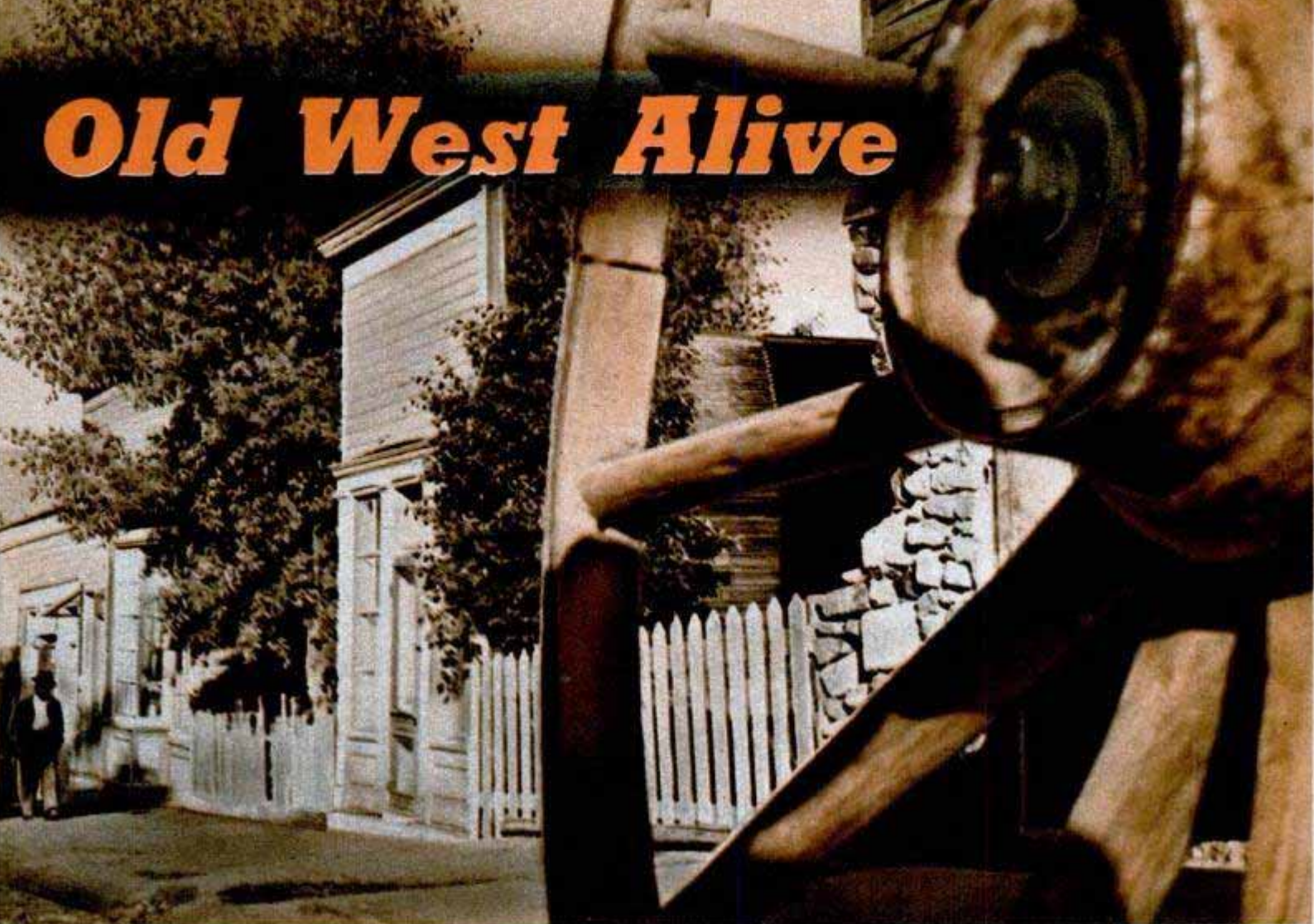


You might call Virginia City, Mont., the Williamsburg of the old frontier. Almost a ghost town when Charlie Bovey first saw it, today, thanks to him, the city is a living museum of hairy-chested Gold-Rush days

This is Charlie Bovey, the man who remade history, looking over the books of the Wells-Fargo Express

POPULAR MECHANICS

Old West Alive



By Rafe Gibbs

Photographs by the Author

ON A Saturday afternoon in 1926, a husky young man was trundling sacks of flour in a mill at Great Falls, Mont. He stopped to inspect a sliver irritating a finger.

"Keep moving!" barked the foreman. "You've got all day Sunday to get that sliver out."

The first inclination of the young man was to quit and leave Montana as far behind as possible. If he had, the state would have lost one of its finest and most unusual historians, for the youth was Charlie Bovey, the man who "brought back alive" the famous old Montana mining town of Virginia City and made it into the Williamsburg of the West.

Virginia City, as dusted off by Charlie, is today one of the most colorful spots on any tourist map. Walk down the wooden sidewalks of the old town and see for yourself.

You will find, for instance, the old Wells-Fargo stage office doing business again with dummies dressed in the clothes of the waning 19th century—a

Above, a section of Main Street in the old western mining town. Below, this well, after years of use by residents, still hasn't run dry. The old oaken bucket on the ground was once used for hauling ore





The "kid at the music box" entertains with a barroom ballad in the saloon, using a one-finger technique

mule skinner in buckskin, a lady in Victorian ruffles, a clerk with collar and mustache to spare. Seems only yesterday that black-bearded, black-booted "Fearless Bill" Fairweather, who made the first gold strike in Virginia City, walked into the Wells-Fargo office to buy a stagecoach ticket to Butte. As he waited for his ticket, he noticed some urchins, white and Indian and Chinese, peering in the doorway.

"Here, kids, scramble!" he said and tossed in the air \$500 worth of gold nuggets.

In the blacksmith shop, shoes are ready for fitting to oxen. At the dressmaker's shop, you can observe the fashionable styles worn by the well-dressed girl of the early West. In the barber shop, with its rows of handsome shaving mugs, a dummy dressed as a prospector waits for the removal of enough beard to nest a couple of flying squirrels.

Historians have described the revived town as a "dyed-in-the-wool, living monument to the frontier West." But Virginia City, with its clocks turned back more than three quarters of a century, is really a monument to the determination of Charlie Bovey, who wanted to be more than a rich man's son.

Charlie's father, C. C. Bovey, a director in General Mills, sent him from Minneapolis to Great Falls in 1926 to study the grass roots of the milling business at the plant there. The idea was that after a brief sojourn in the West, he would return to follow in his father's footsteps at the offices of General Mills.

"But before I had worn out one pair of shoes in Montana," said Charlie, "I had decided to stay."



In gold-rush days, it was fashionable to carry an umbrella, rain or shine, explains the tourist guide

Not only did Charlie stay in Montana, but he married the attractive daughter of a Great Falls banker, left the milling business and struck out on his own as a rancher. A quiet and retiring fellow, he has always been known as a good listener. He listened to Montanans tell about raising wheat and cattle, then went out and raised better and more wheat and cattle.

Charlie's land holdings grew. He became a state senator. While still in his thirties, he was considered to be one of the most successful men in Montana.

But Charlie wanted to accomplish something more. He wanted to do something about Montana's colorful history. He wanted to make that history live again.

Charlie began to look around at ghost towns and semighost towns, and one day in 1945 he drove his station wagon into Virginia City, tooted at a sleeping dog in the street and also disturbed the dozing of an old-timer in a sidewalk chair. Charlie, followed by the curious gaze of the native, proceeded to look over the remains of what was once a gold-happy town.

Back in the spoke-bustin' 90s, Virginia City boasted the richest acre on earth—Bummer Dan's placer gold mine. More than \$150,000,000 in gold was taken from this and other mines that dotted the gulch meandering through the town. Money poured out like water from a rainspout. Flour at one time cost \$150 a 100-pound sack. Dance-hall girls sometimes had difficulty walking because of the gold and silver stuffed in their stockings. But life was cheap. One gang of robbers alone was credited with 102 killings. Prominent citizens organized the Virginia Vigilantes and

strung up 24 of the worst badmen.

In its prime, the town had a population of more than 10,000. Perhaps 2000 were Chinese. The Orientals had their own temple and private tong wars.

No doubt about it. Virginia City's past was colorful, but its future looked drab that day in 1945 when Charlie took his stroll. The town was a ghost—almost. The gold had faded and so had Virginia City. Nine tenths of the buildings still standing were paint-hungry, sway-backed and empty. Population of the town was down to about 300. Only thing that prevented it from curling up completely was the fact that it is the county seat, and a few die-hard prospectors still hoped to find gold the early miners had missed.

Charlie looked mighty pleased with what he saw, however. Ordinarily a man of few words, he became voluble. He talked the Historic Landmark Society of Montana and the Vigilance Club of Virginia City into reviving the old buildings. Then came trouble. Neither the Historic Landmark Society nor the Vigilance Club could round up enough funds to keep the project going and Virginia City was about to turn over and go back to sleep. Charlie wouldn't stand for that. He bought up most of the town, then hired townspeople and folks around to put it back in the shape it was 75 years ago.

Natives shook their heads at the doings of Charlie.

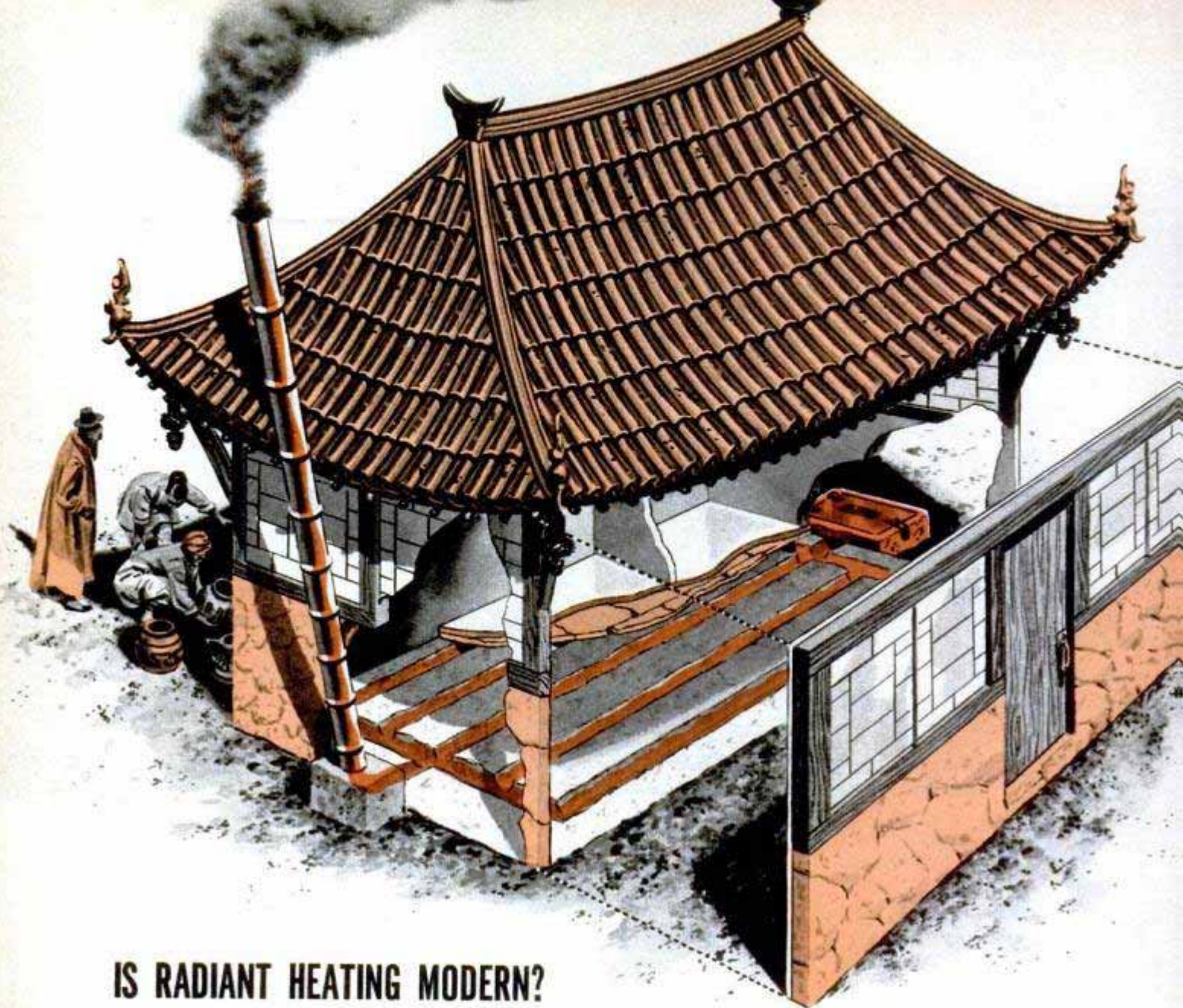
A prospector was tearing down an old shack to supply his wife with firewood during his sojourns in the hills. Charlie raced his car to the shack to halt the destruction. He offered to supply all the

(Continued to page 246)



This is no stage version of "Life With Father." It's a typical scene in the lobby of the Fairweather Inn. Below, the Bale of Hay Saloon is back in business at the same old stand, although it is a lot quieter now than when prospectors came in for their Saturday-night pleasures

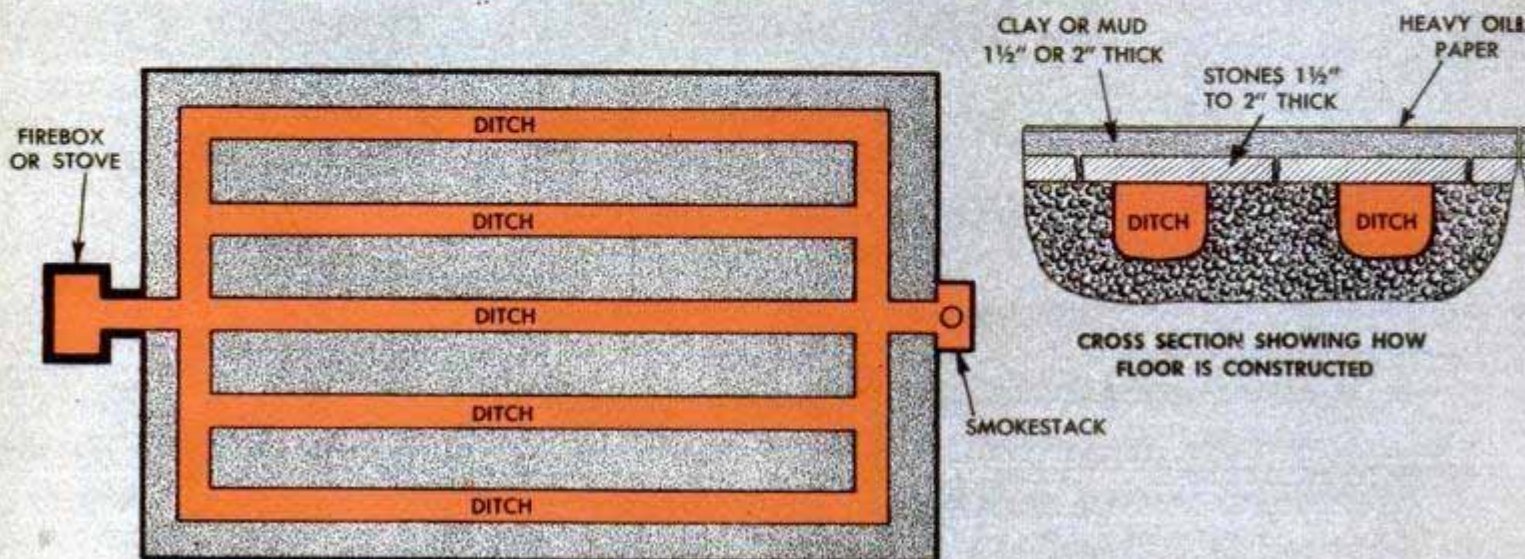




IS RADIANT HEATING MODERN?

Radiant heating—modern by American standards — has been warming Korean homes for more than 2000 years, according to L. G. Nonini, of Wallace, Idaho, who worked in Korea for some time. The home builder first digs ditches along the site of his new home. Over the ditches he lays thin slabs of stone, and over the stone he

smooths a layer of mud. The mud is covered with heavy oiled paper. The ditches are connected to a firebox on one side of the home. Smoke and hot gases pass through the ditches, warming the floor which radiates heat throughout the home. A chimney from 10 to 20 feet high provides sufficient draft to draw heat through the ditches.





Bits of broomstraw are the paints and a sharp knife is the brush of this artist-craftsman of Mexico City

Artists With Straw and Feathers

By Thomas E. Stimson, Jr.

ONE of the world's most unique hand-crafts, the making of beautiful pictures from tiny bits of colored broomstraw, is a booming business in Mexico. Foreign tourists and Mexicans alike are captivated by the colorful pictures and a score of artist-artisans can hardly keep up with the demand.

Observed at a distance, a straw picture has an extraordinary brilliance almost as if it were illuminated by hidden lights. Close inspection shows that this sheen and a slight third-dimensional effect come from rounded surfaces of thousands of straws that make up the picture.

Most of the pictures

Only the finest bits of straw and more than five weeks of painstaking handwork went into this beautiful religious picture



are of typical Mexican scenes such as a tile-roofed village under snow-capped Popocatepetl or a boatman on the floating gardens of Xochimilco. Any of the master craftsmen, however, will prepare a special picture on order, either of a particular scene or of a portrait. All he needs is a photograph as a guide.

A straw picture of good commercial quality may require a full week of painstaking work and may contain as many as 400 separate glued bits of straw per square inch, some 30,000 or more in an 8 by 10-inch picture. Pictures of the very highest quality in which only the finest straws are used may

represent four or five weeks of work. Fifty or more straws may be glued side by side to make up a lineal inch of the design.

In spite of the amount of work that goes into a picture, prices are surprisingly low because of the favorable rate of exchange. Some of the pictures used to illustrate this article were purchased in Mexico City for \$7.50 in United States currency. Pictures that are made to order of the finest straw can be bought for less than \$50.

Tourists sometimes are told that the manufacture of straw pictures is an old lost art and that only a few samples of the early craft are still available. Such remarks are sales talk—the history of straw work is obscure. Some believe that the craft is less than 50 years old, others insist that the early Aztecs were its inventors. Some of the older craftsmen can tell you only that they learned the trade from their fathers, who in turn learned it from their own fathers. One reasonable suggestion is that straw work had its beginnings in the town of Uruapan, near Paricutin volcano, where single straws were embedded in the thick lacquer surfaces of the wooden trays and boxes for which Uruapan is famous. In any event, the art slowly progressed to its present state. Today the making of straw pictures is centered in Mexico City.

One of the artists, Victor Ramirez Valencia, explains that the "popotes" or broomstraws used for the picture mosaics grow as a tall grass in the state of Guanajuato in central Mexico. The central portions of the finest stalks are laid aside for



Here is a magnified view of a small section of the picture at the right. Note how each of the tiny pieces aids in the shading

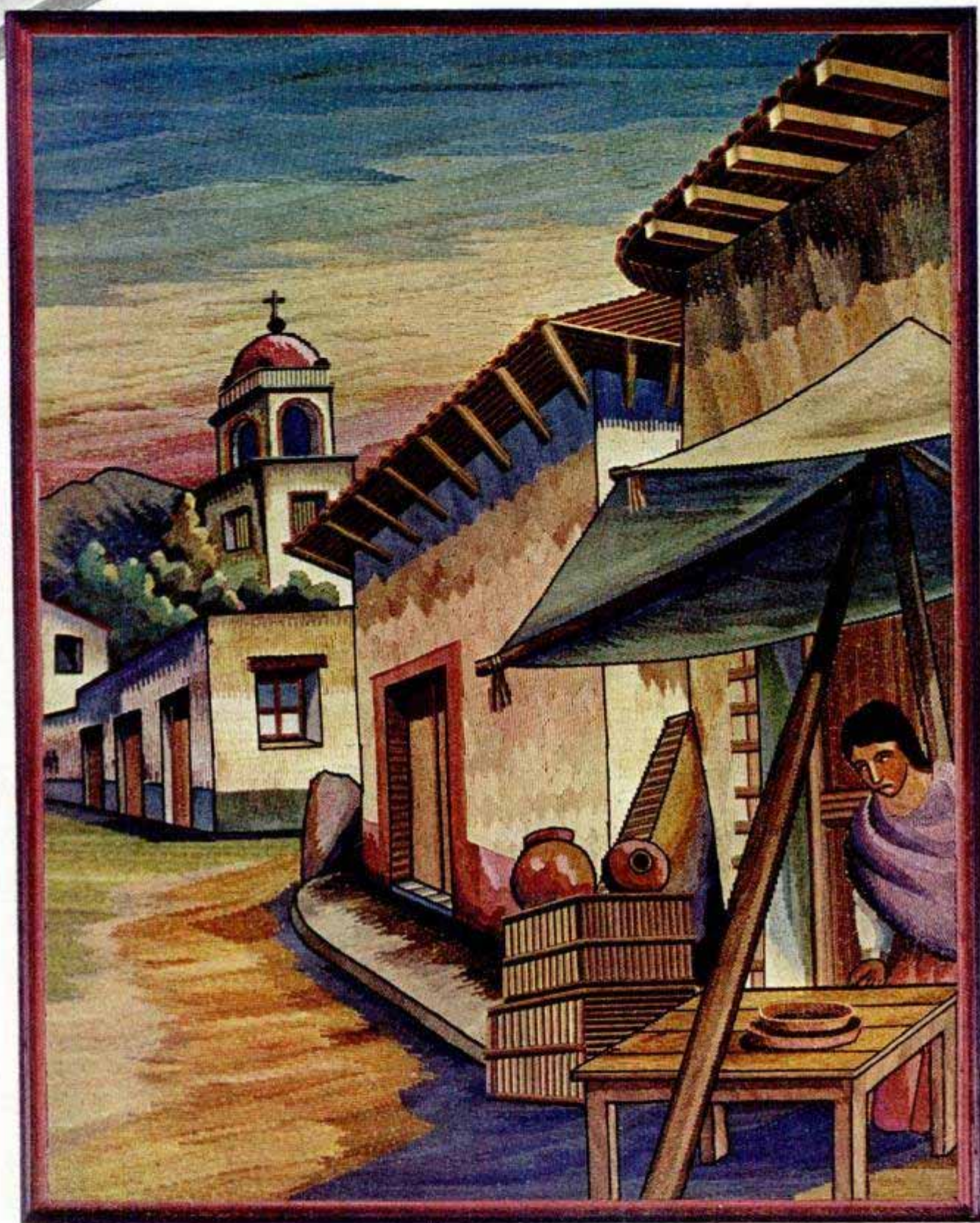
picture-making. Bundles of the selected straws are washed, boiled in aniline dyes, dried in the sun and trimmed. Native dyes have been discarded because the new chemical dyes yield a wider variety of colors and are considered more permanent. Some 100 shades are available of which 30 are most com. only used.

Valencia is an expert in creating straw pictures and his brother, Fernando Ramirez Valencia, excels at the old art of feather work. Both, these days, work as agents for groups of straw and feather craftsmen.

In preparing to make a straw picture, the artist first roughs out the main features of

Left, first step is to outline the major areas. Right, straw is laid on tacky surface and cut with a knife

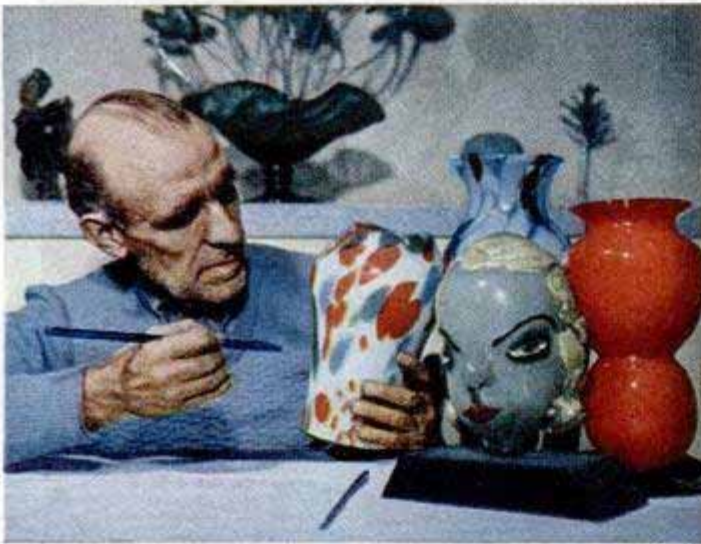




the design in black ink on a sheet of white cardboard, then lays a sheet of transparent paper over the drawing. The sheet has been coated with a mixture of campeche tree wax and beeswax, a combination that forms a tacky, sticky surface to which the bits of straw will adhere permanently.

Usually the artist first fills in some of the main outlines of the picture that are visible through the transparent paper. He selects a straw of the desired shade from the bundles in front of him and lays it down

against the wax-paper surface, cutting off its end cleanly with a sharp knife. Pressed into the wax, the straw sticks in place. A straw of a different color is selected, pressed down and cut off. The preliminary work progresses rapidly. One long straw may serve as the edge of a building but to create the delicate shadings and tones that are common to the best pictures, the artist chops off innumerable short lengths of straw, one at a time. Curved rows of straws each no more than $\frac{1}{16}$ inch long



↑ Feather painter presses bits of plumage on a sticky, waxed surface to form a gaudy bird

← Glass artisan removes flakes from a finished piece. Bottom, most straw pictures show Mexican scenes. A few artists paint portraits

may be used to represent tree leaves.

Detail is carried to an extraordinary degree. Even for a small human face that will appear in the finished picture the artist selects straws of different colors to indicate the eyes and eyebrows. The shading of a dress may require bits of straw of a dozen or more different colors. Sixteen or more shades of blues and grays may be selected for filling in a sky. The artist's ability is reflected by his choice of colors and by his skill in the freehand filling-in of picture details.

It's tedious, exacting work. An apprentice learns by working with coarse straw, creating simple little designs that may be glued to cardboard squares and used as place cards or postal cards. Four years of training and practice usually are required before he becomes a good craftsman.

The finished straw picture remains on its wax and paper backing, which usually is glued to a larger sheet of stiff cardboard and mounted in a frame.

Mexico is still a land of many hand-crafts. Most articles from furniture and shoes to serapes and pottery are largely made by hand. Even on such practical articles as these the Mexican workers place a little extra ornamentation or decoration. This artistic bent also is reflected in such typically Mex-

ican crafts as painting entire landscapes on small pumpkin seeds and dressing tiny fleas in full suits of apparel. Some artists create tiny colored figures of glass and arrange them on the tiered glass seats of a miniature bullfighting ring.

In a glass factory where the equipment and methods have remained unchanged for 100 years the proprietor and some of his workmen, after a day of producing commercial glass objects, may keep working for an extra hour or so for the fun of producing artistic glass objects of their own design. One man sits in front of a group of gas jets and produces miniature figures from bits of colored glass, some of the others draw hot gobs of molten glass from the main furnace and work them up with crude iron tools into oddly shaped vases or pitchers.

Similarly a worker in wrought iron, after he has completed his day's work, remains at his forge to hammer out the scrollwork and massive locks that will decorate a cedar chest of medieval design that he is building.

Some of these crafts are virtually unchanged from the days when they were first created; some, like straw work and feather work, have been modernized to meet the changing demands.

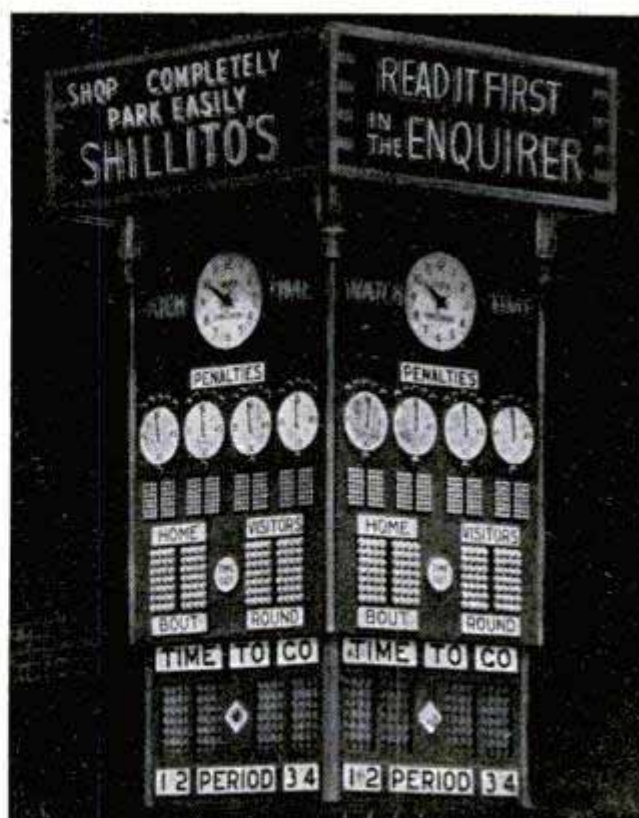
Gaudily colored feather robes and plumed feather headdresses were highly prized by the early Aztecs and when Cortes first visited the Aztec capital in 1519 he found many of the nobility had entire wardrobes made up of feather garments. Manufacturing the feather clothes, in fact, was a major native industry that employed thousands of workers. In most cases, the feathers were stitched one at a time to a backing material of cloth or rabbitskin.

Feather garments can be found only in museums today but the old industry has been revived to fulfill the demand for decorative pictures. Images of gaudily colored tropical birds, worked out in feathers, are used as pictures to be hung on the wall, as scenes under glass fruit or candy trays, or to decorate place cards and postal cards.

In pre-conquistador times the plumage of exotic jungle birds was used but now most of the feathers come from ordinary hens and roosters, turkeys, pigeons and ducks. Pictures made with any of these except duck feathers are imported into the United States.

Feathers that are naturally white, brown, gray or black are used without treatment. Green, red and blue feathers usually are dyed after a preliminary washing in hot soapy water to remove the oils. Occasionally the wing of a bat may be used intact to represent the wing of an imaginary

(Continued to page 238)



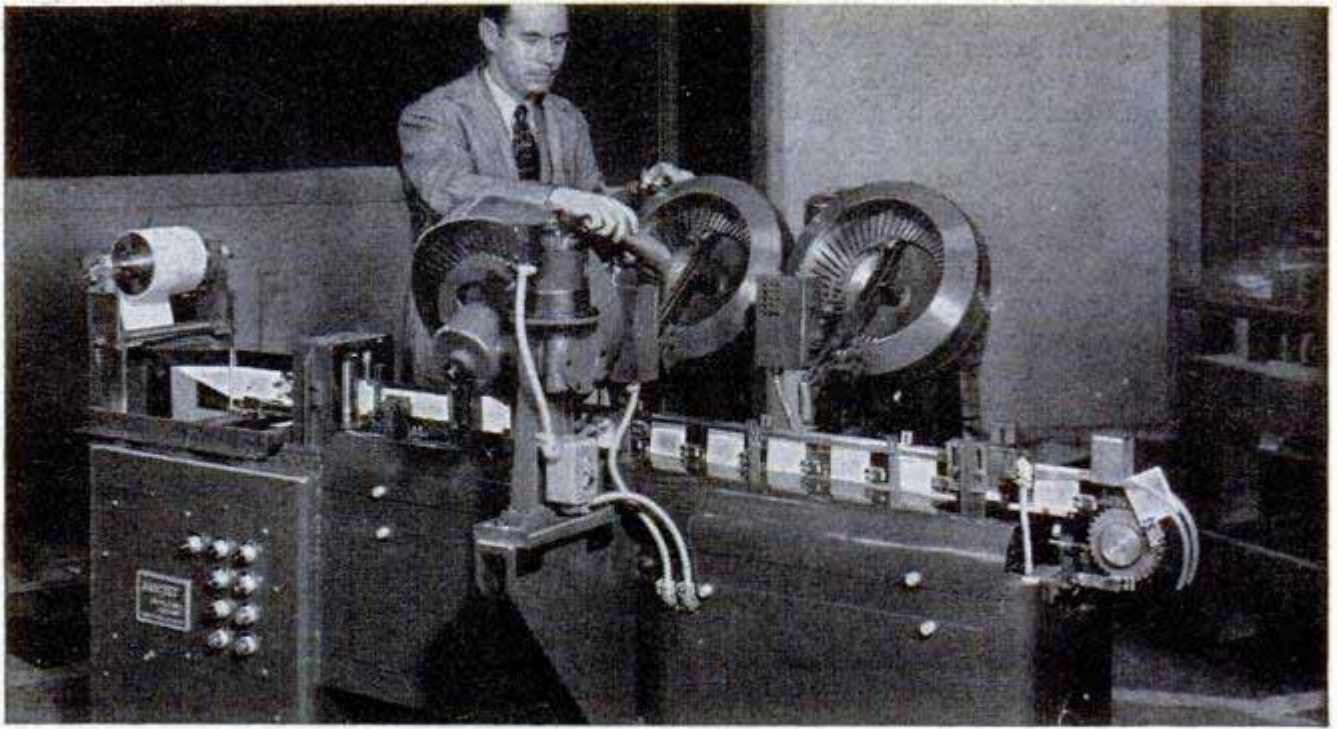
Complete Sports Clock

Hanging in the new Cincinnati (Ohio) Garden is the most complete timing and scoring device ever built for a sports arena. Four-sided and weighing $2\frac{1}{2}$ tons, it cost \$20,000 to build and \$10,000 to assemble. Eleven electrical cables leading into it feed 2200 light bulbs of 6 and 25 watts. It can be raised or lowered by motor or hand-operated crank.

Super-Lubricants From Chemicals?

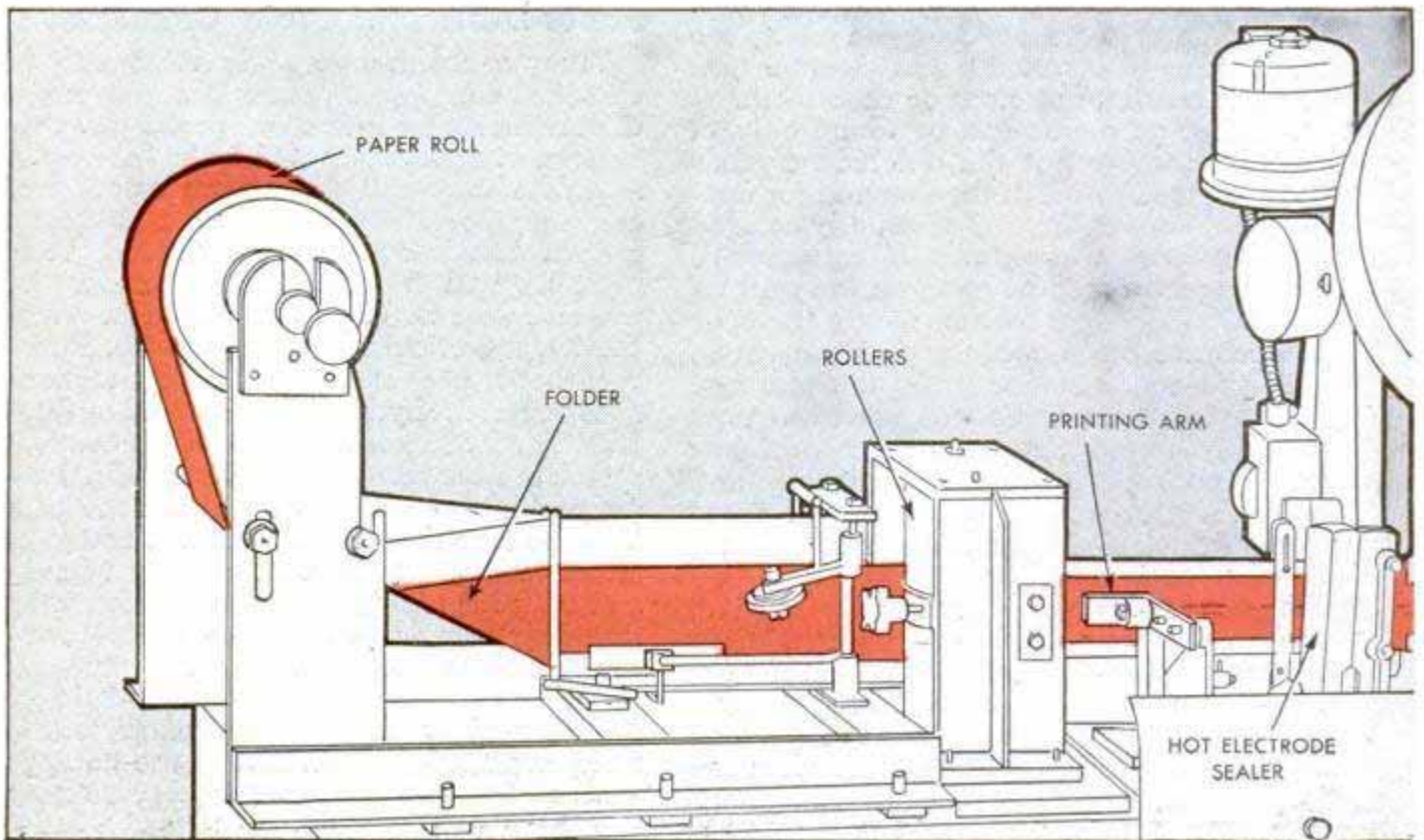
Fluorocarbons, a versatile new family of chemical compounds, show broad promise of solving many industrial problems. One important application will be as lubricants so stable they will permit construction of engines impossible at present because no known lubricant could withstand their pressure and friction. Other members of the chemical family will be used in anesthetics, insecticides and germicides. Fluorocarbons are similar to hydrocarbons except that the hydrogen is replaced by fluorine. The hydrogen is the point of chemical attack in such compounds. It has been dangerous to make fluorocarbons in the past because free fluorine is the most active of all elements. Now the Minnesota Mining and Manufacturing Company is producing fluorocarbons by an electro-chemical process that eliminates the danger.

☛ Cotton, America's most popular textile fiber, supplied 57.4 percent of the nation's textile needs in 1948, a slight decrease from the 1947 figure of 58.4 percent.



Here's the result—envelopes made, printed, filled with small parts and sealed by machine shown at top

NINE-FOOT PRODUCTION LINE

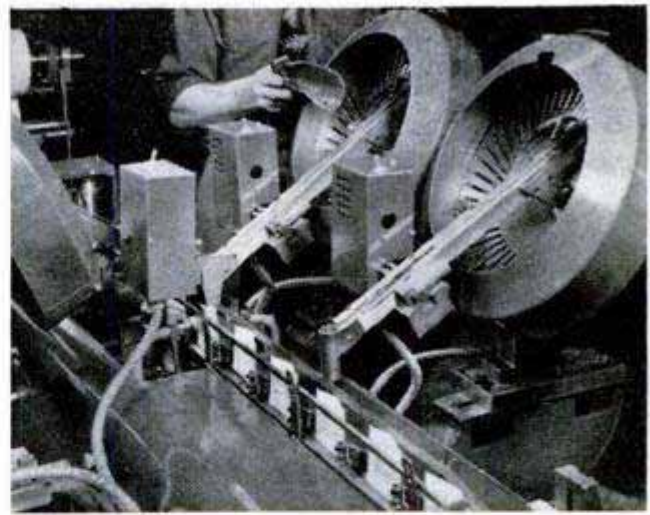


ONLY NINE FEET long, a single new machine performs the following operations precisely and automatically: makes envelopes from a roll of paper; prints addresses, labels or instructions on the envelopes in one or two colors; counts out small items of almost any kind, drops the correct number into the envelopes and then seals the envelopes at a rate of more than 3600 per hour.

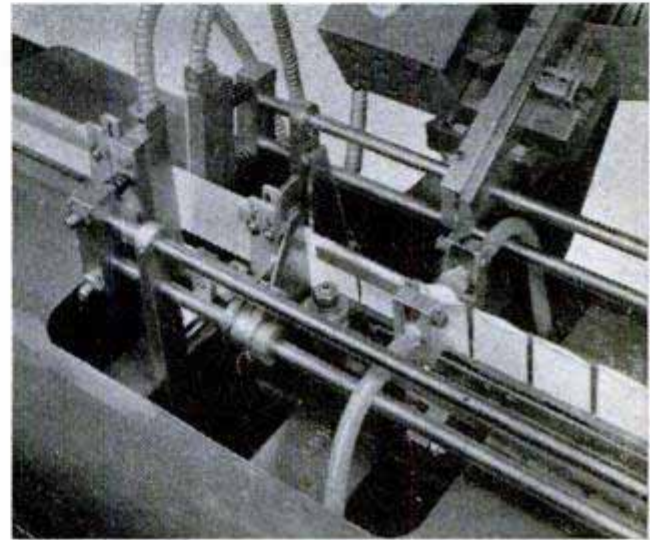
A special type of paper from a roll is drawn into the machine and folded once along the bottom. At regular intervals a printing arm stamps the desired information on the folded strip. A separate small printing press can be used in place of the printing arm if more than one color is desired. A hot electrode sealer squeezes the folded paper strip on each side of the printing matter, forming a 1/4-inch seal in the special paper. A knife then splits each of these seals down the center, forming individual envelopes with open tops.

Small parts such as screws, nuts, washers and piston rings slide down chutes from revolving hoppers and are automatically counted. While suction cups hold each envelope open, the parts drop inside in the desired numbers. Another electrode then seals the tops of the envelopes and they are dropped into a container.

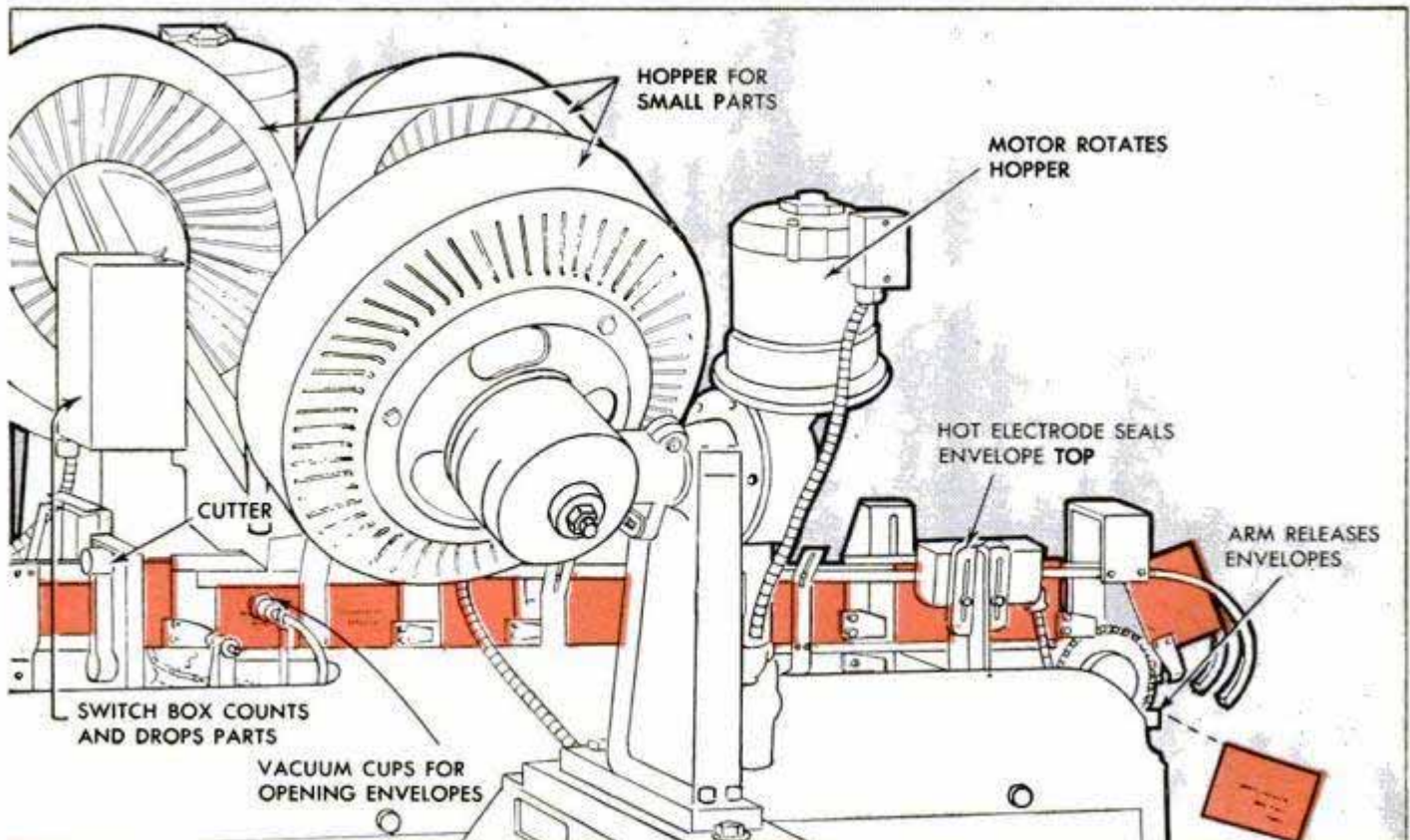
Although the machine moves at high speed, the paper is pulled through in steps, with each operation performed as the envelopes pause. A number of different items can be packaged in the same envelope and the size of the finished envelope can be regulated as required.



Hoppers are filled with parts. As hopper turns, parts slide down chute, are counted and drop in envelopes



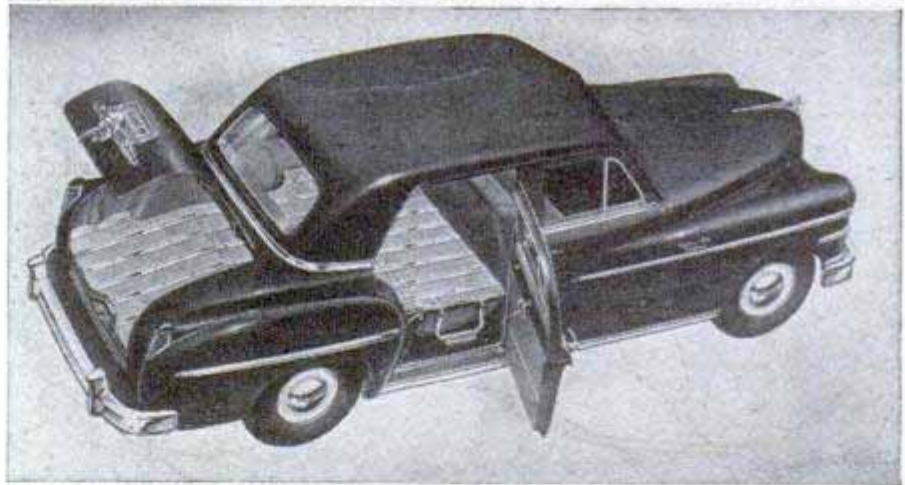
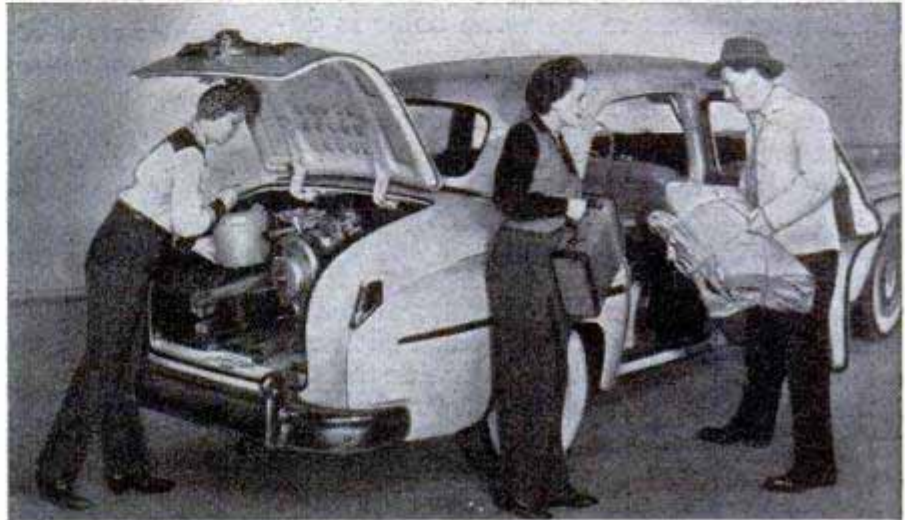
Envelopes at this stage are sealed on three sides. Suction cups hold tops open while the parts drop in





OLDSMOBILE is introducing a new hard-top "convertible" called the Holiday Coupe. In addition to the rigid steel top that provides greater passenger protection, innovations in design include a rear window of curved glass with wide visibility. The support pillars are eliminated between top and lower portion of the body to carry out the convertible design. Holiday Coupes are powered by the Oldsmobile high-compression Rocket engine. Hydra-Matic Drive is standard equipment on this Olds model

DE SOTO'S Carry-All four-door sedan can be converted quickly into a spacious utility car by folding the rear seat down to the floor. The space for luggage then extends all the way from back of the front seat to the rear deck lid. Either rear door, as well as the large luggage compartment opening, can be utilized for loading. The luggage platform, made of wood and fitted with chrome strips, makes it easy for sliding cargo in and out. Almost eight feet of carrying space is available. When the rear seat is up the car looks like a conventional six-passenger sedan. Owners have a choice of long-wearing plastic upholstery designed to harmonize with the special door panels or a combination of plastic and broadcloth. Chrome armrests become the supports for the luggage platform when the rear seat is folded down. The Carry-All was developed in response to the demands of salesmen, businessmen, sportsmen, farmers, suburban residents, vacationists and others who need a car which serves both as family sedan and big cargo carrier. Exterior finish is conventional



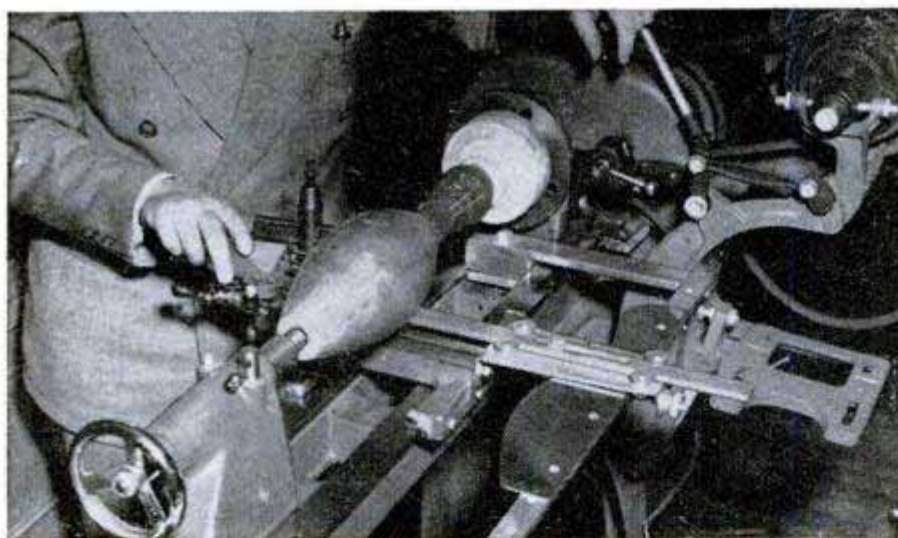
CROSLY Motors calls their new Hotshot the car with a "dual personality" for it doubles as a roadster and racer. The lights, bumper and windshield can be removed for racing and the engine souped up to a high-compression ratio. The car has a low center of gravity and road clearance of seven inches. Seats are aircraft type and comfortable. The Crosley 44-cubic-inch engine with overhead camshaft is the type that powered three motorboats to victory and set two speed records recently. The Hotshot weighs 1000 pounds, goes 35 to 50 miles per gallon



Powered Cradle Launches Lifeboat in Five Seconds

Tested by the U. S. Coast Guard, a new method for lowering and retrieving lifeboats saves time and manpower. A cradle supports the lifeboat aboard ship. When a boat is to be launched, the cradle swings it out and down into the water where it is

released instantly. A winch-powered cable operates the cradle. The conventional method for lowering a lifeboat requires several men and consumes 30 seconds to two minutes. With the new method, the boat hits the water in five seconds.

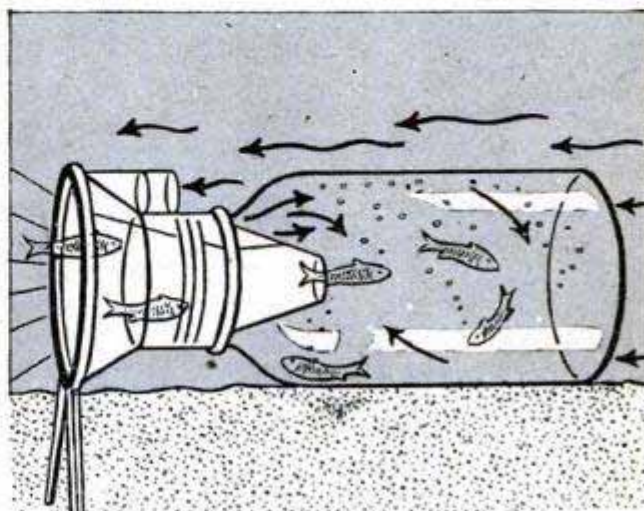


Contour Cutter Speeds Lathe Work

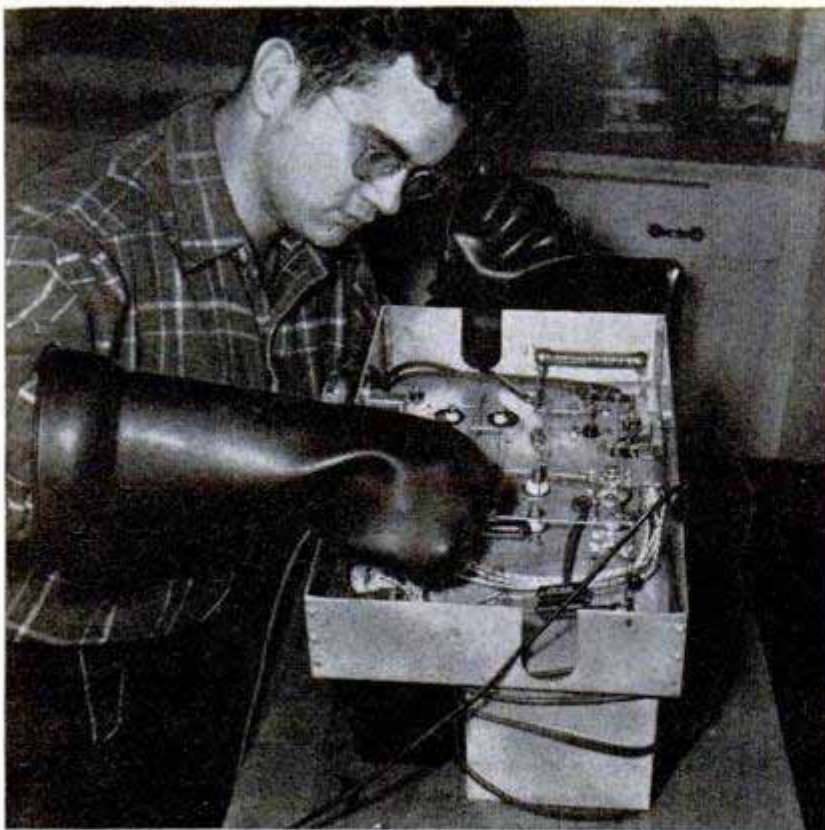
Contours and tapers are cut quickly and accurately when the tool is guided by a contour cutter that is used with any small metal-turning lathe. A follower roller runs along the profile of the pattern, controlling the position of the cutting tools. The cutter handles any diameter within the lathe capacity and is attached in 10 minutes.

Jar Top Catches Minnows

Minnows can be trapped inside an ordinary fruit jar with a funnel-shaped top made of metal and plastic. The jar is placed on the bottom of the stream, where anchor pegs keep it from washing downstream. Cracker crumbs inside the jar attract the minnows, which swim in through the funnel, but can't find their way out.



☛ The bat population of Carlsbad Caverns in New Mexico has dropped from 5,000,000 to about 1,000,000 in recent years due, the National Park Service says, to reduction of their insect food supply by drought.



Tenny's experiments carry him into dangerous fields. Here he tests his high-voltage power supply, which furnishes current for his work. Rubber gloves prevent shock which might kill the youth. Below, he letters diagram for navigational computer before submitting it to Army



HHEIGHT, six feet two inches; weight, 200 pounds; age, 17 years; hobbies, hot rods and ice cream; I.Q., somewhere in the genius class. That's Tenny Lode of St. Paul, Minn.

The fact that Tenny could have entered college when he was 12 years old is not particularly unique. Children frequently pop up in the news with high I.Q.s and an ability to digest textbook knowledge at an astonishing rate. What makes Tenny unusual is his singular ability to understand electronics and use this knowledge to develop electronic instruments. He's as familiar with vacuum tubes as baseballs and can read a circuit diagram faster than a comic book.

Take Tenny's aircraft navigational com-

Hot Rods and Electrons

By Clifford B. Hicks

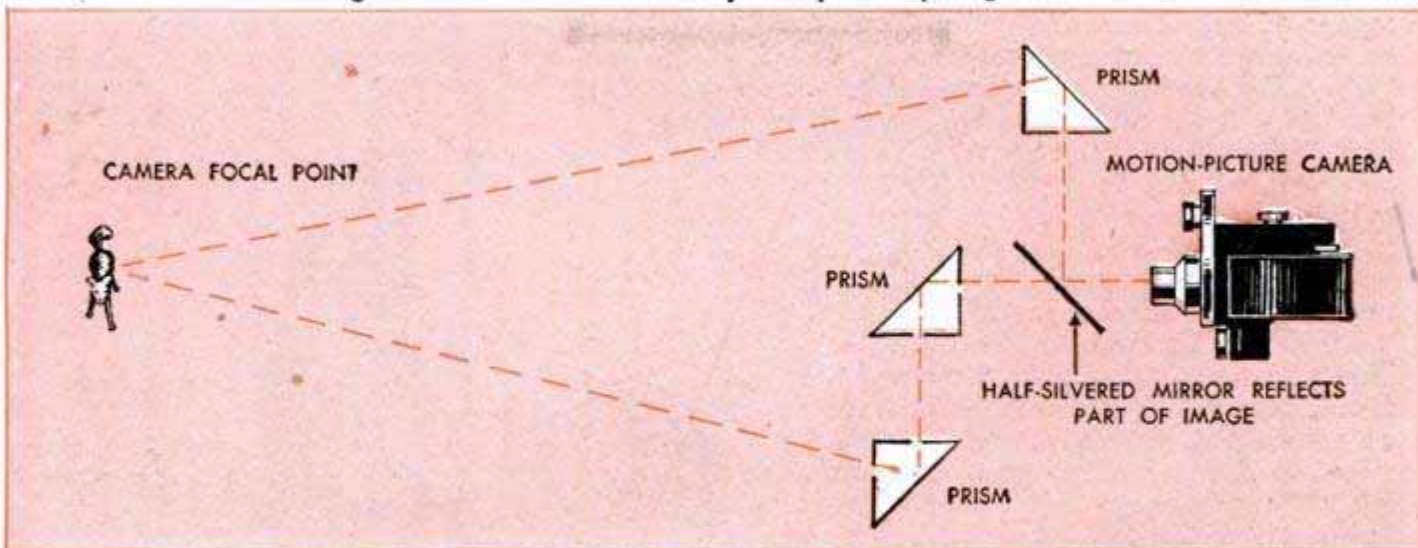
Tenny Lode was an inventor at the age of 10. Today he's the campus genius at the University of Minnesota, with a normal flair for hot rods and an amazing capacity for taming electrons

puter. The 17-year-old senior at the University of Minnesota currently is working on a computer that definitely interests one of the bigger airlines and has attracted the attention of a large manufacturer. The indicator translates ground radio signals into a continuous navigational fix. Not long ago Tenny mailed off preliminary sketches of his computer to the Army Research and Development Board. They shot back a request for further information. As yet, Tenny doesn't know what the board thinks of his latest creation.

"My computer," says Tenny, "compensates automatically for wind and other air disturbances. An instrument now in use for the same purpose is extremely complex and has several tubes, whereas mine is

THREE-DIMENSIONAL MOVIES . . .

Youth has worked out a crude but effective system that requires no special viewing lenses. Diagram at bottom shows, in exaggerated form, how two separate views give us three-dimension sight. Sketch below shows Tenny's setup for exposing two different views on same film



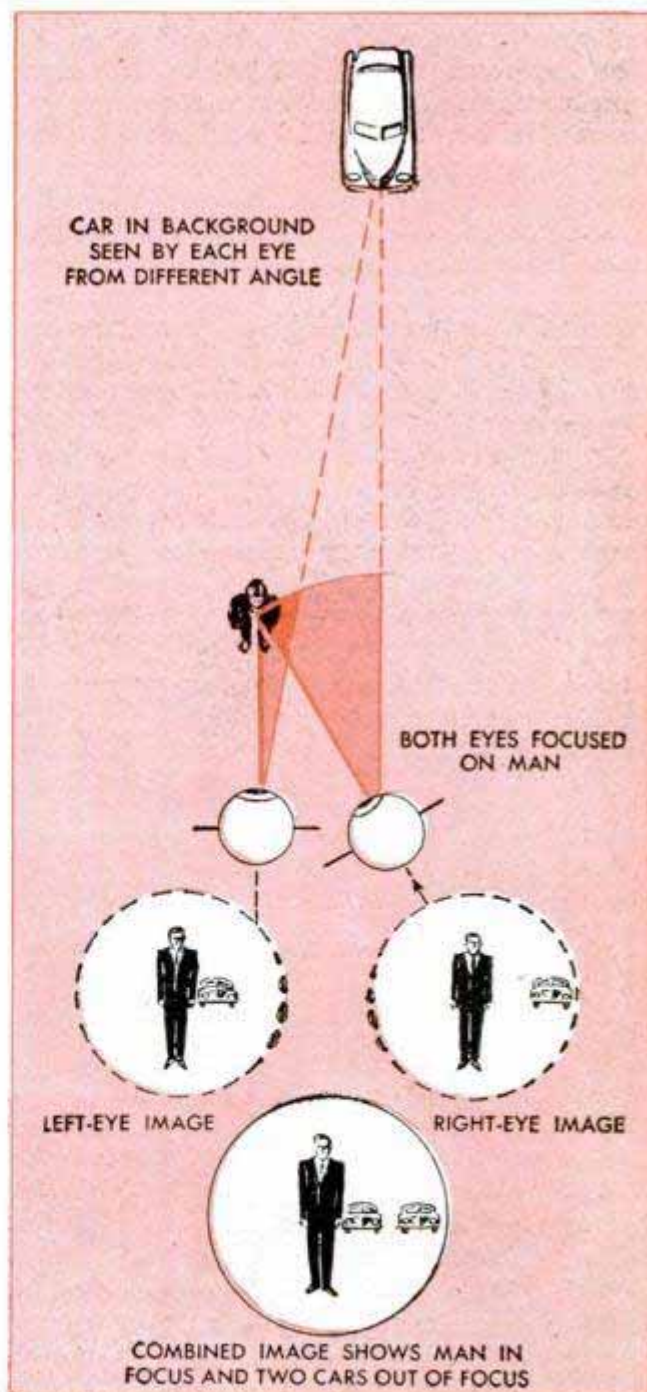
simple and uses no tubes. It performs three jobs: tells the pilot how far he is from his destination; tells him the exact direction to the destination; and operates as an automatic pilot by computing the voltage to be applied to a rudder control."

Last summer the research department of an instrument manufacturing company became interested in the navigational computer and even suggested that Tenny work in the company laboratory. Eventually, though, the legal department of the company turned thumbs down on any business agreement because Tenny is a minor. In Minnesota, a minor can't be bound by a contract.

Tenny has just one complaint in life at present, and it's tied up in the red tape of legal difficulties. "What good do these inventions do me? I'm too young for contracts and too young, according to my patent attorney, to get patents on my instruments without investing a lot of money and a lot of time. I can't afford either."

At the age of 10 Tenny built his first instrument that showed real promise. He was confined to his bed with an attack that combined tuberculosis and a severe case of measles. (The attack left him hard of hearing—he now uses a hearing aid.) He couldn't operate his electric train from the bed except through a conventional remote control, and he figured the control didn't give him enough flexibility of operation. Soon he rigged up his own control on a breadboard—a push-button system that could shuttle the train anywhere on the track.

Visiting railroad fans were so excited about the device that they urged him to submit it to a large company which manufactures model-railroad equipment. The



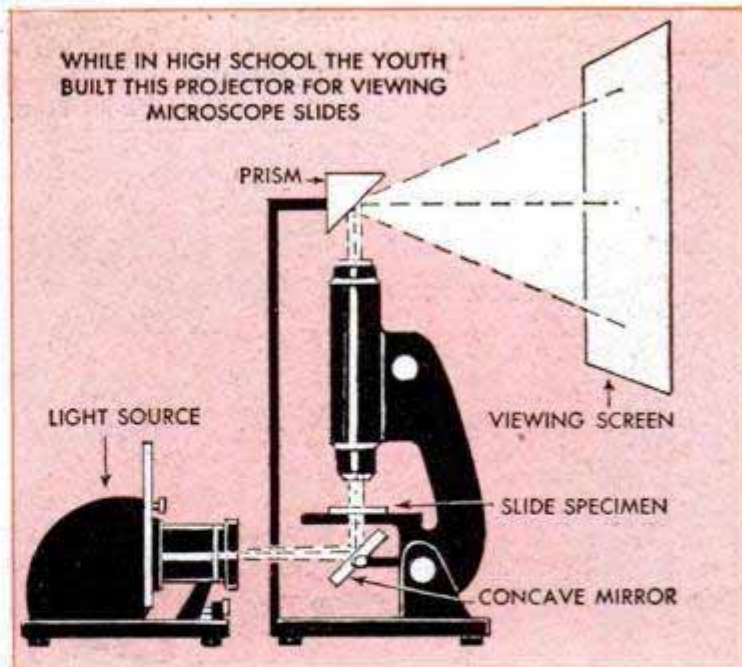
chief of research of the company replied that he had just completed 12 years of work in developing an almost identical control, and that at the time Tenny's suggestion reached his desk he was mailing out the first announcements of the control.

When Tenny was three years old he took his tricycle apart and put it back together again. When he was nine his mother came home one evening to find the 443 parts of the dial telephone scattered across the living-room floor. She was so angry she stalked back out the door, afraid she might say something she would regret. When she returned a half hour later she found Tenny talking to a friend on the phone. Later, when a phone inspector made his visit, he was fascinated by the phone. "The only perfect dial action I've seen in months, lady. Apparently you don't have any kids to tinker with the dial."

At 12 Tenny zipped through a college entrance examination with a score of 99. The examiners were so surprised they gave him another, then told his mother the results. The boy's parents decided their wisest course was to send him through high school on the conventional time schedule, even though college authorities offered to accept the 12-year-old. Even so, Tenny finished high school in three years and entered college at 15. Every time he has taken an I.Q. test he has shot through the ceiling to a height where measurements no longer are valid.

During his high-school days Tenny built a projector for throwing microscope slides on a viewing screen. So efficient was the instrument that his instructor demon-

Youth watches dance of electrons on his oscilloscope. He uses the instrument to observe complex wave forms



strated it before a national group of science teachers. About this time he also developed a low-cost public-address system, a radio circuit demonstrator and a compact a.c.-d.c. radio capable of operating efficiently in spite of the wide variations in voltage often encountered in small towns. He came up with a "magnetic valve"—a means of controlling magnetic forces—and built his own telephone switchboard. He also devised a low-cost radio-phonograph tone control which gives small sets almost the same tone quality as console models.

"Anything I do has to be inexpensive," says Tenny. "I can't afford a lot of special equipment."

When he was 12 he made an effort to

Tenny checks wide-band transformer he developed. It has frequency response much greater than most types



When taking notes cramped his style, Tenny decided he should be able to write with either hand in case the other was busy. Now his left hand is as efficient as his right



solve this financial problem by starting the Lode Electronic Service — a radio repair shop with headquarters in his bedroom. During the next four years he repaired hundreds of radios and built some 20 radio-phonographs. He's especially proud that three of the sets were purchased by music instructors, and that the Iowa State Teachers College ordered two specially designed jobs from him.

Tenny plowed his profits back into his business, investing in such equipment as an oscilloscope. But his chief tools remain an old screwdriver, a pair of pliers and a soldering iron which he wields with the delicate touch of a surgeon over the kitchen table or a battered bench in his bedroom.

Some of the lad's friends once were annoyed by pigeon roosts, so Tenny whipped

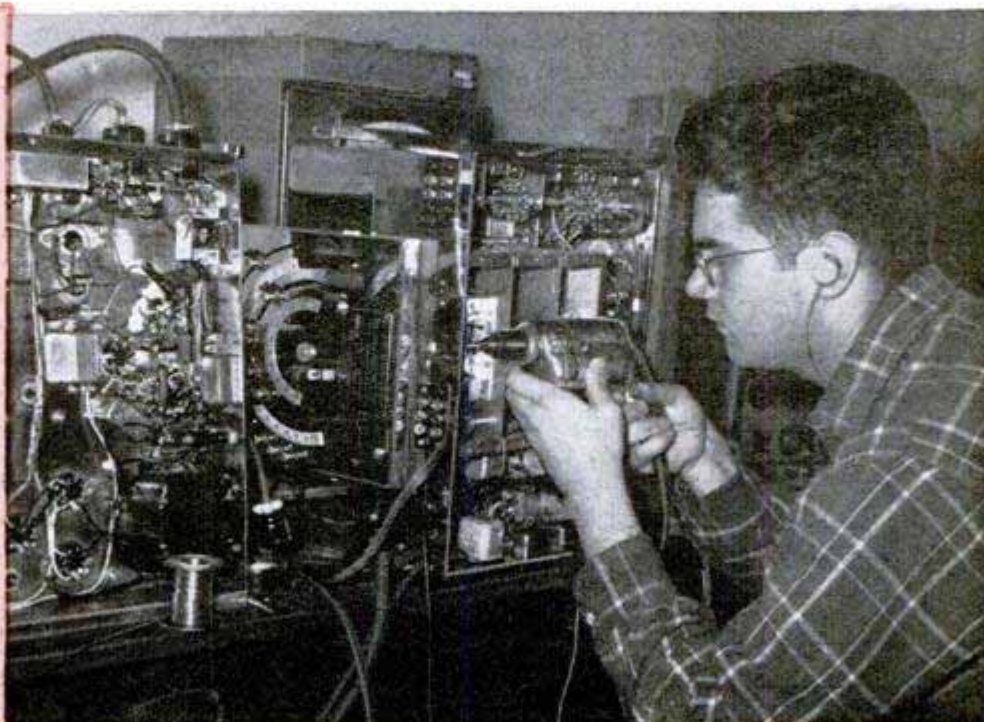
out a pigeon eradicator using high-frequency sound. The noise so disturbed the pigeons that they immediately departed, yet the horn was so high-pitched humans couldn't hear it. Tenny was about to sell this invention when he read of a man out West who had developed a similar instrument. So the pigeon eradicator's parts now are installed in other instruments.

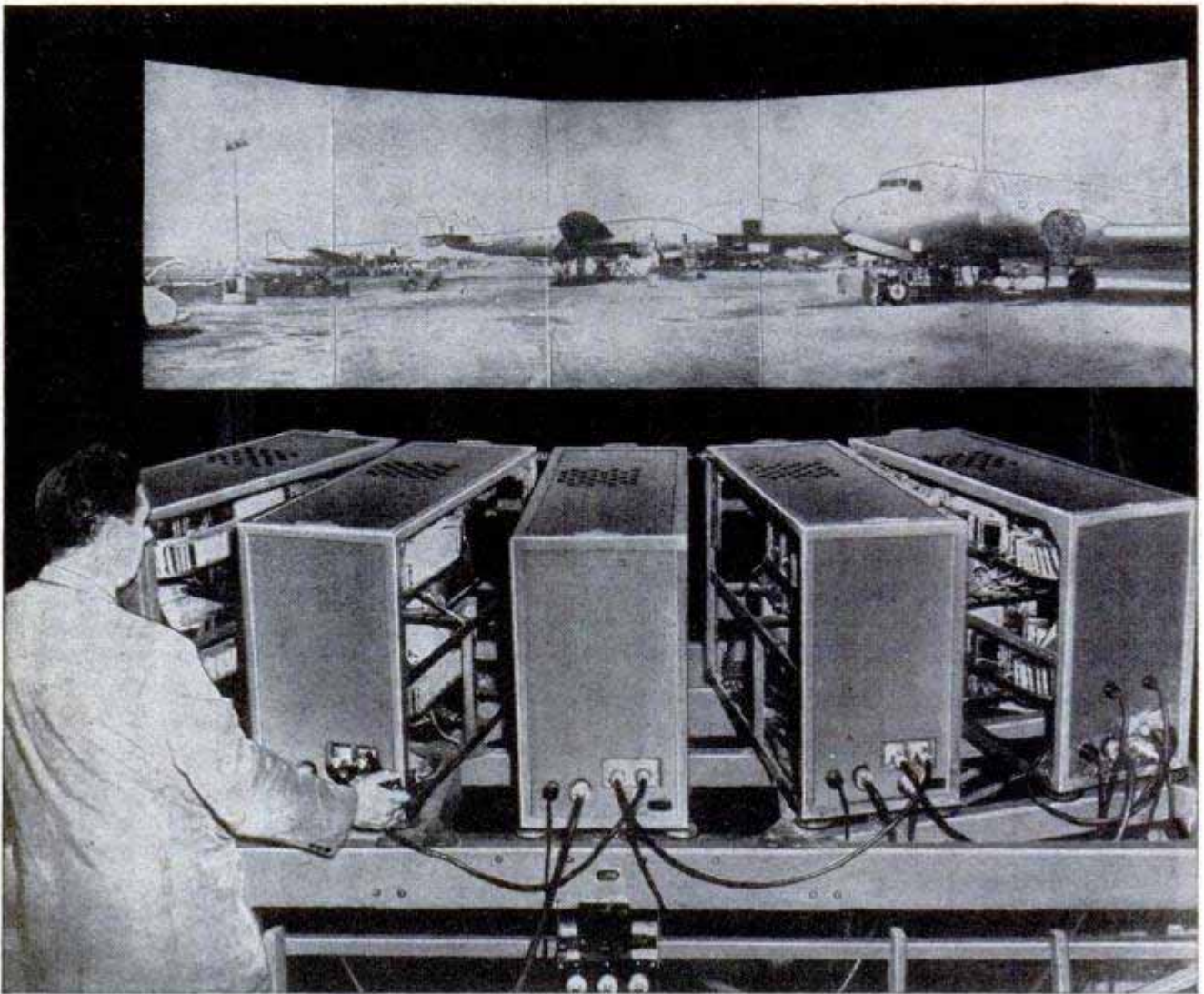
A couple of years ago he worked out a film-developing system, only to discover that the same system had been used 10 years previous.

Tenny's biggest trouble is that frequently he doesn't build a model complete enough to demonstrate to others. Sometimes the reason is lack of funds; often it is because ideas fascinate him but end products hold

(Continued to page 254)

Lode started repairing and building radios to finance his experiments. Here he drills the chassis of a console radio. Headquarters of the Lode Electronic Service is his bedroom





Perfectly aligned, these five separate slides form a giant panorama that is 30 feet wide and 9 feet high

Panorama on a Giant Screen

SIGHTSEEING "trips" to America's beauty spots have been conducted right on the Chicago Railroad Fairground with a projection system that makes color pictures of Niagara Falls seem so real that you wonder why you can't feel the mist on your face. Kodachrome transparencies are projected on the screen five at a time and, so perfectly aligned are the individual pictures, that the effect is of a giant, natural panorama.

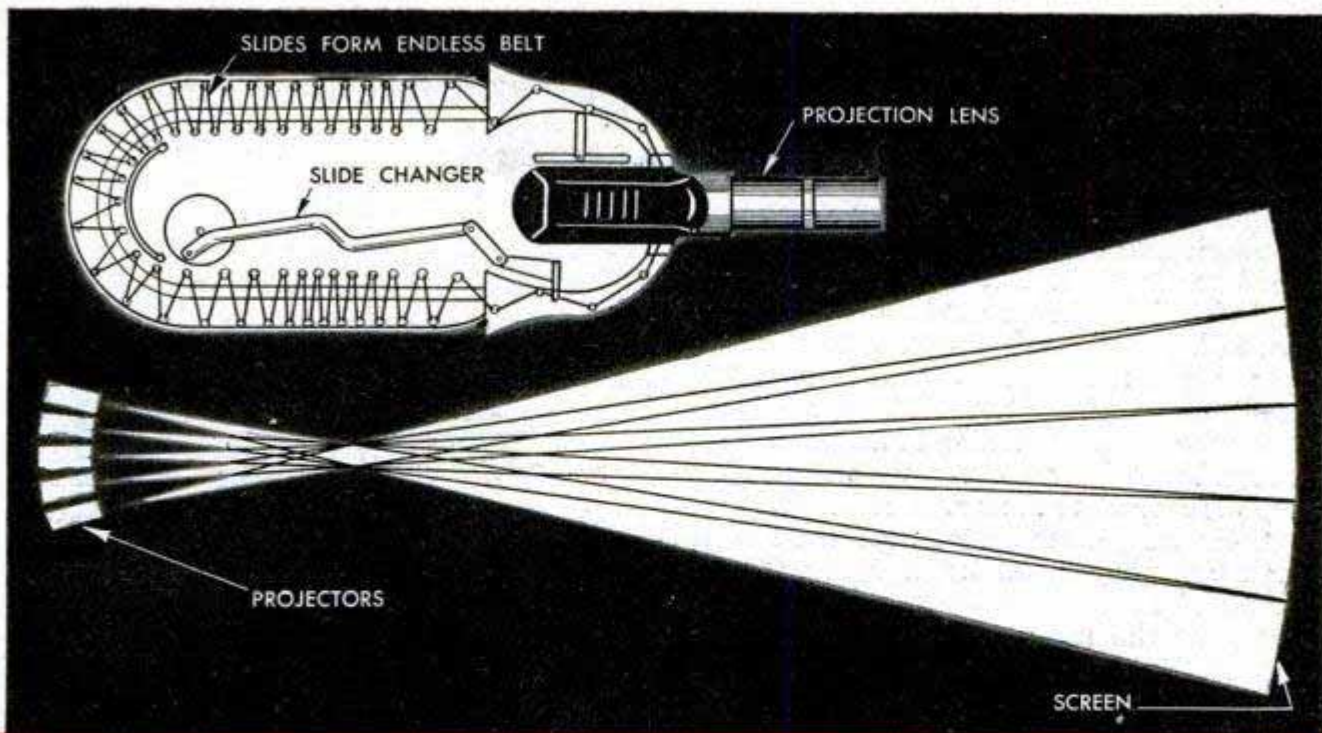
Part of the Eastern Railroads exhibit at the fair, the presentation features the Vitarama system of slide projection. Ten separate projectors are used, two being housed in each of five machines. Carefully aligned and synchronized, the 10 projectors provide a sight-and-sound panorama of the East—its natural beauty and its giant industry.

The huge screen, made up of five joined sections, is more than 30 feet long and 9 feet high and occupies the entire front wall of the theater. The tremendous screen width provides an angle of vision approxi-

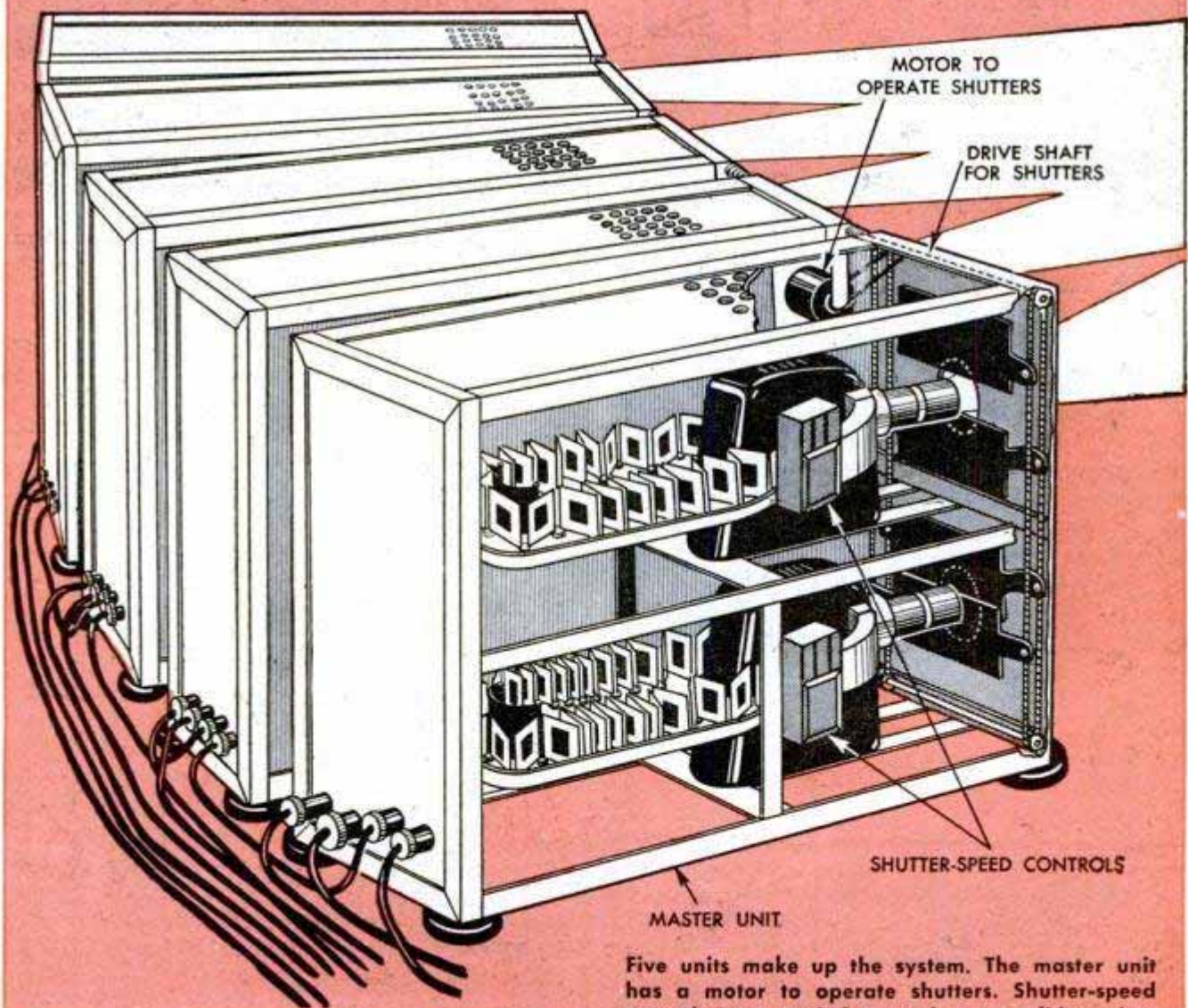
mately equal to that of the human eye, giving such a natural quality to the scene that the audience feels as though it is seeing the real thing.

A complicated system of shutters and film-transport machinery changes one scene to another so smoothly that you are almost unaware of the change. A recorded commentary with music and appropriate sound effects is played with the show. Triggering signals, recorded on the transcription but inaudible to the audience, operate the slide machinery.

The color pictures were taken on a special tripod with a swivel head to provide the exact angle necessary for multiple projection. The slides are mounted in metal frames, linked together to form a continuous belt and pulled through the projection gate by a small electric motor. Another small motor operates the shutters. As the shutters on the top bank of projectors are closing, those on the lower bank open, thus dissolving one scene into another almost imperceptibly.



Top, looking down on one projector unit. Notice that the slides are linked together to form a belt. Lower drawing shows how the projected pictures crisscross to form the giant 30-foot-wide panorama



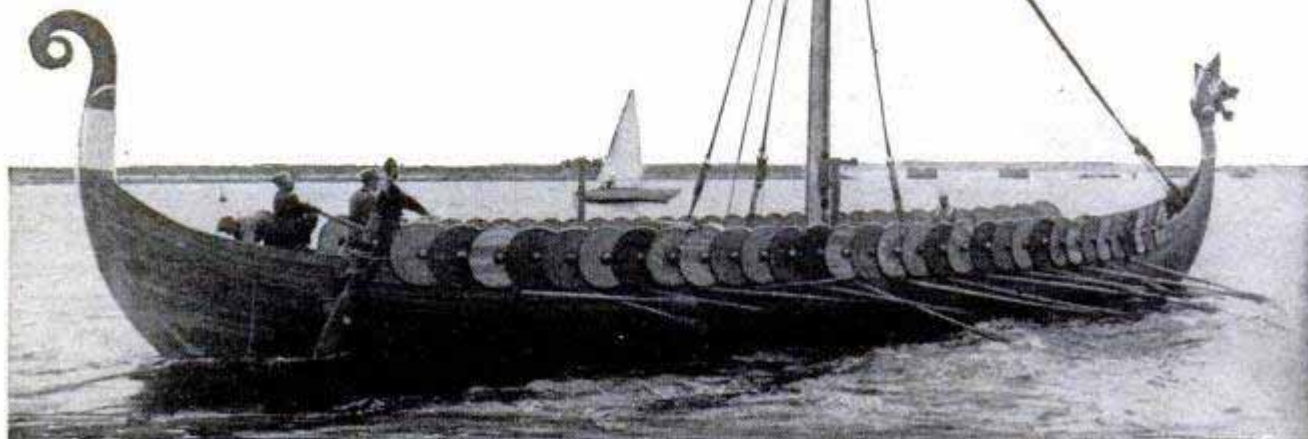
Five units make up the system. The master unit has a motor to operate shutters. Shutter-speed controls, actuated by notches on slides, time the shutter movement for fast or slow dissolves

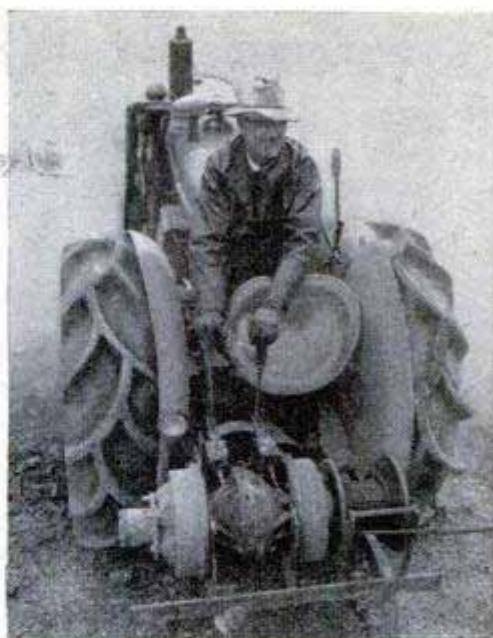
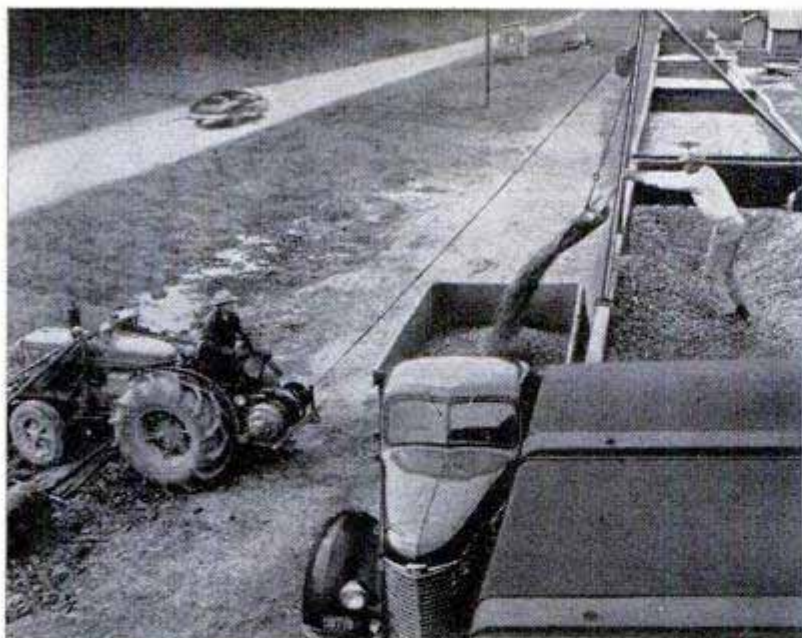
RETURN OF THE VIKINGS

BATHERS at a holiday resort on the south-east coast of England were puzzled and perhaps a little frightened one day last summer when a strange craft bore down on the beach and discharged 50 young giants in odd battle garb. The ship was an exact copy of old Viking vessels and the men were tall, blond and bearded Danes selected to make the trip. Denmark sent the expedition to celebrate the 1500th anniversary of the Viking invasion of England. The modern Vikings wore costumes and carried weapons correct to the smallest detail. During their dangerous cruise over the rough North Sea they lived upon oysters, ham and mead as their forefathers had done. Next year the men may try to cross the Atlantic. Evidence exists that the Vikings landed in America long before Columbus.



Dragon on prow of the ship and the raven on the flag are copied from early Viking designs. Left, the impressive red-bearded leader of the modern Vikings wears clothing designed to duplicate his forefather's garb to the smallest detail. Below, the ship built in Denmark carries war shields fastened to the gunwales to protect crew from "enemy weapons"





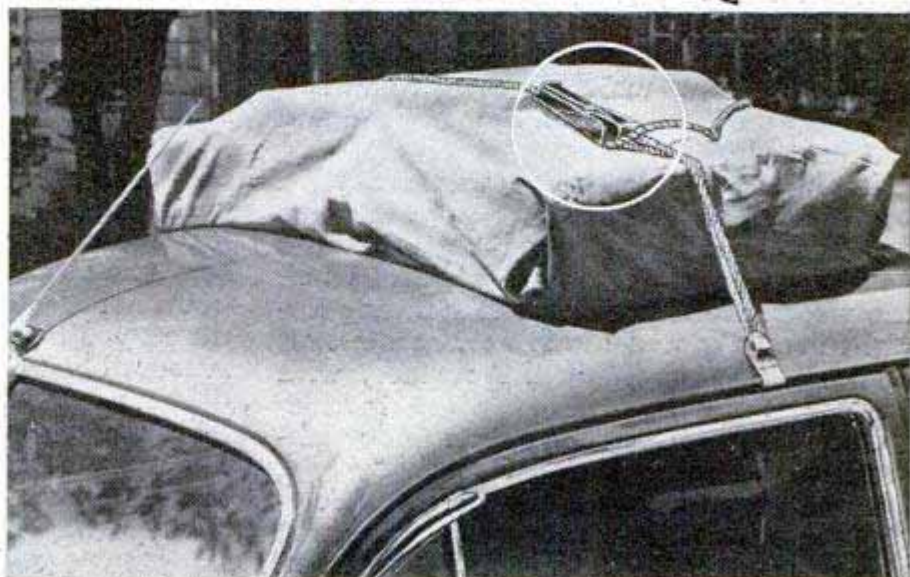
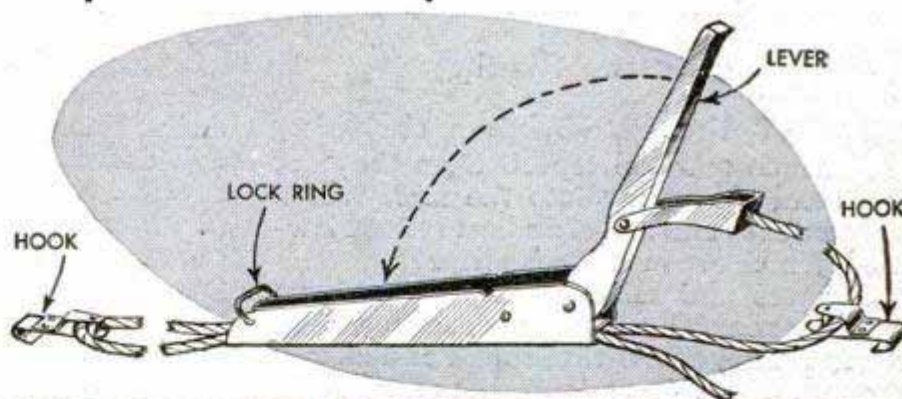
Tractor Winch Unloads Gravel From Gondolas

By adding a truck axle and differential to the power take-off of his tractor, a Texas mechanic adapted the tractor for unloading gravel from gondola cars with a scoop and cable. The cable runs through a pulley mounted on an A-frame that is clamped to the side of the car. Two hydraulic-brake systems, one connected to the cable drum and the other to the idle wheel, control the

winch. When the operator releases both brakes, the scoop can be pulled back, unwinding the cable. When the idle-wheel brake is tightened, the cable winds up on the drum, pulling the scoop forward and up. The cable is locked as the scoop is dumped by applying the brake on the cable drum. The scoop used is an old horse-drawn scraper bucket.

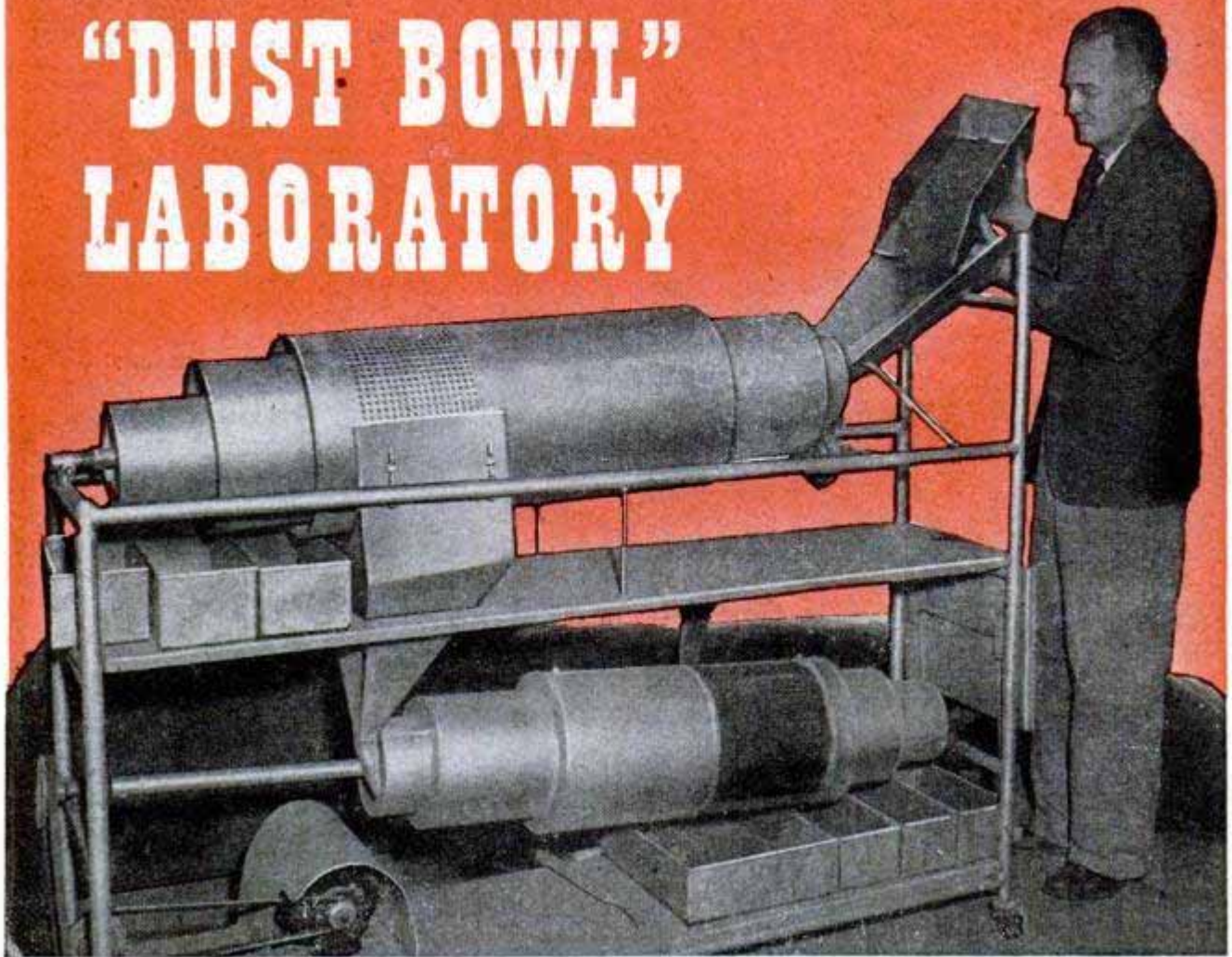
Nonslip Clamp Tightens Rope to Tie Load Atop Car

Tying luggage, ladders or other bulky items to the roof of a car is simplified by a nonslipping device that tightens by means of a metal lever. Two hooks, one on each end of the rope, slip over the rain troughs, holding the load securely in place. The metal lever simultaneously tightens and locks the rope in one quick operation. To release the load, you flip a lock ring back and raise the lever. When not in use, the device fits in the glove compartment.



Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, which is available to readers without charge from the Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

"DUST BOWL" LABORATORY



Soil is graded into seven sizes for blowing tests by this sleeve-action separator at Kansas State College

By Roscoe Fleming

WHAT HAPPENS when shrieking winds tear the topsoil from the land and send it hurtling into the air? Which soil textures and soil sizes best resist blowing? Which are most susceptible?

Farmers and soil-salvage experts have learned general rules by observing dust storms. They know that rough and cloddy ground, with crop residues left on top, best resists the wind. For blowing to start, they know that the wind requires a smooth "runway" along which it can propel soil particles until they reach flying speed and are airborne.

In Saskatchewan, which was bedeviled by wind during the drouth decade as were few regions of the United States, it has been found that the soil resists best when the weeds are killed, but left standing upright firmly rooted—such as when cut off an inch or two under the surface, with horizontal chisels.

To observe dust-storm action under laboratory conditions, at Kansas State College, Manhattan, Kans., a wind tunnel and blower have been built which propel winds up to 40 miles an hour shrieking past soil

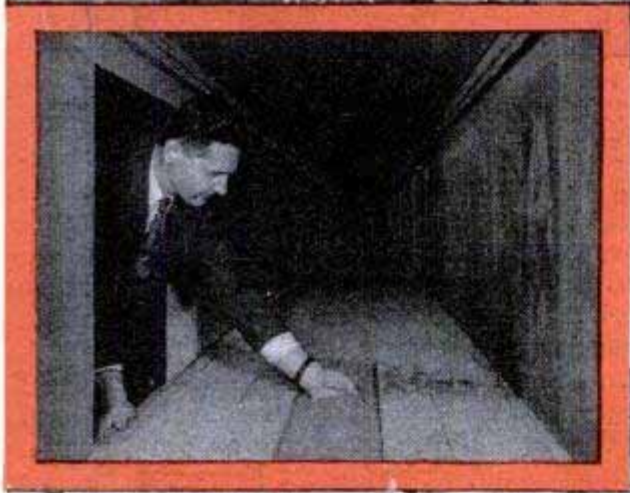
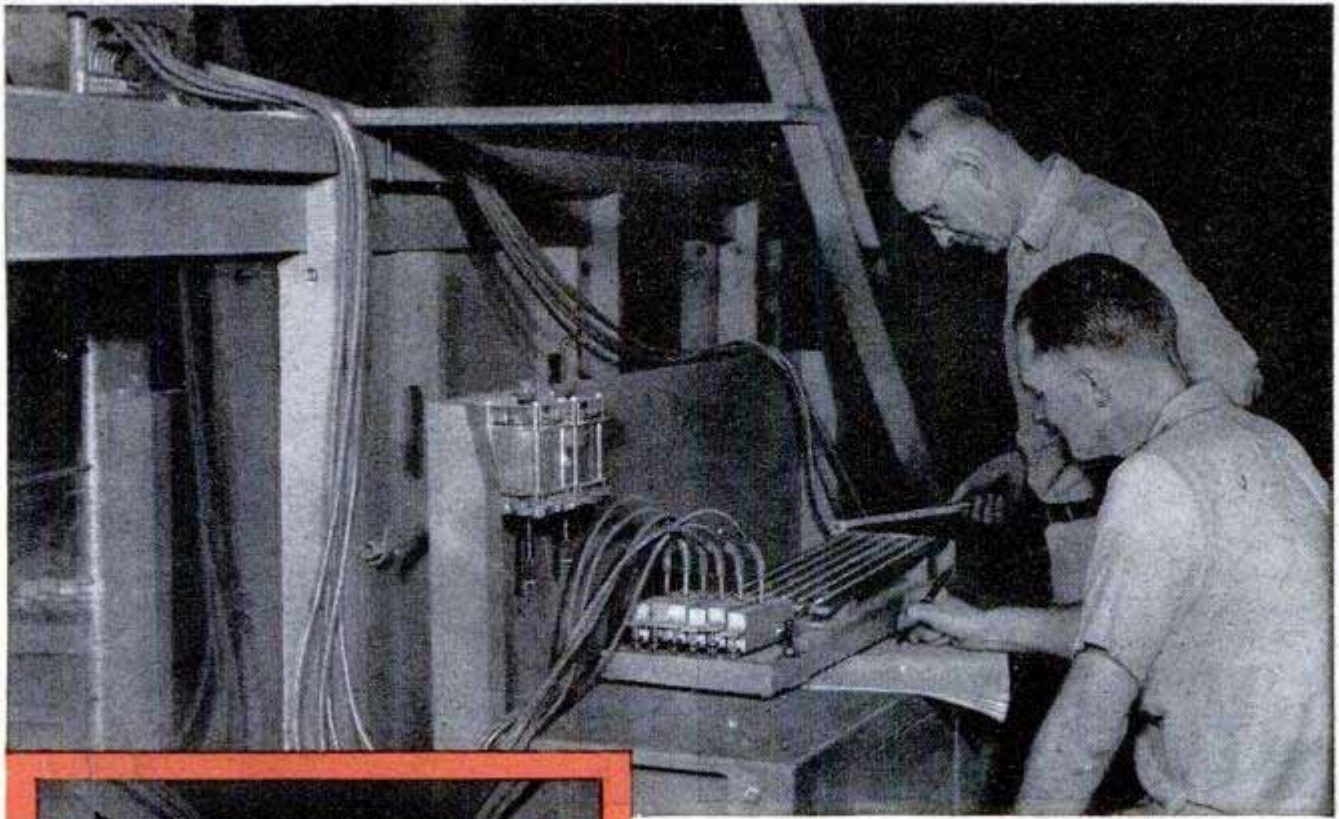
samples placed in the floor of the tunnel. This velocity is equivalent to a gale outdoors, since wind velocity is much slowed down under field conditions at the earth's surface. Soil samples from all over Kansas, of different sizes, different textures and differing moisture content, are being subjected to the torturing blast at the Kansas State laboratory. Careful notes are made of resistance.

Later it is planned to conduct field tests. The motor and blower in the laboratory are movable—mounted on automobile wheels. They can be detached and wheeled anywhere for use in the field with a lightweight aluminum tunnel to simulate storm conditions.

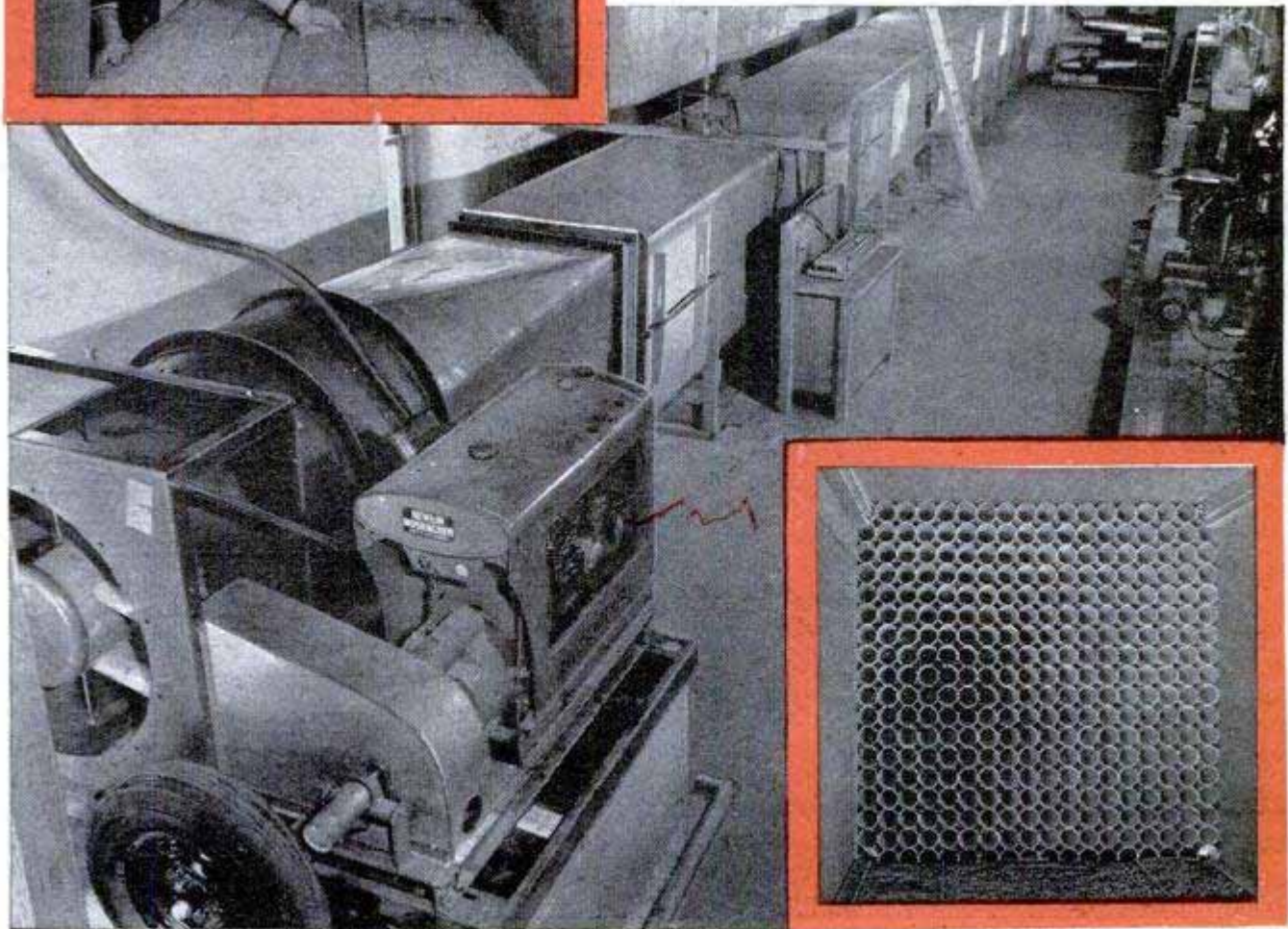
Dr. R. I. Throckmorton, dean of the college's school of agriculture, who has studied semiarid conditions for many years, points out that long years of cultivation have powdered prairie soil finely, making it more susceptible to blowing. How much wind does it take to move such soil? Does a sharp blast or steady blowing do more damage? How should soil be sized for best resistance to blowing?

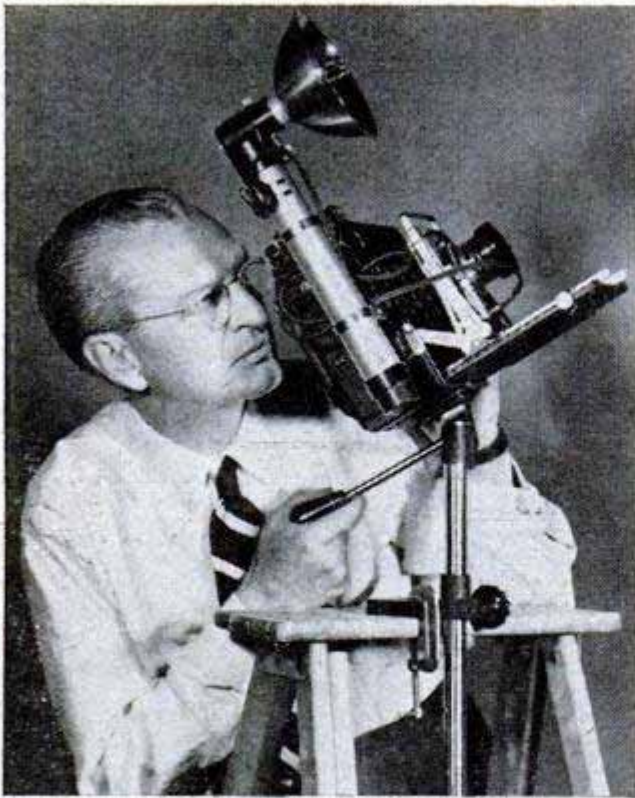
Preparing the conditions and building

(Continued to page 258)



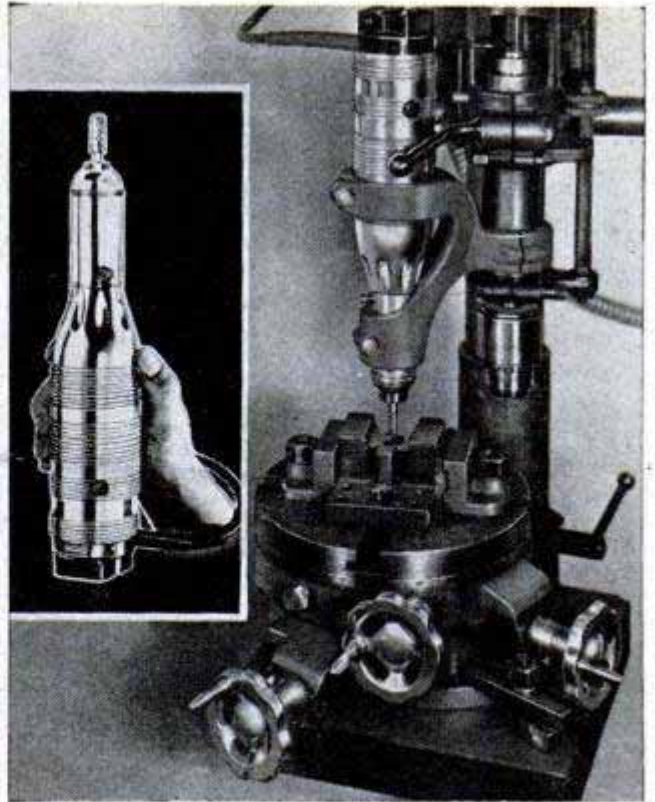
Above, project supervisor A. W. Zingg, sitting, and an agricultural engineer measure tunnel wind velocities by reading fluid levels in six tubes of a manometer. Left, Dr. W. S. Chepil feels the texture of tray of soil placed in tunnel for observation. Below, 56-foot-long "test tube" was built inside laboratory. Both motor and blower, at left, are mounted on auto wheels for use outdoors. Bottom, right, "wind straightener" grille





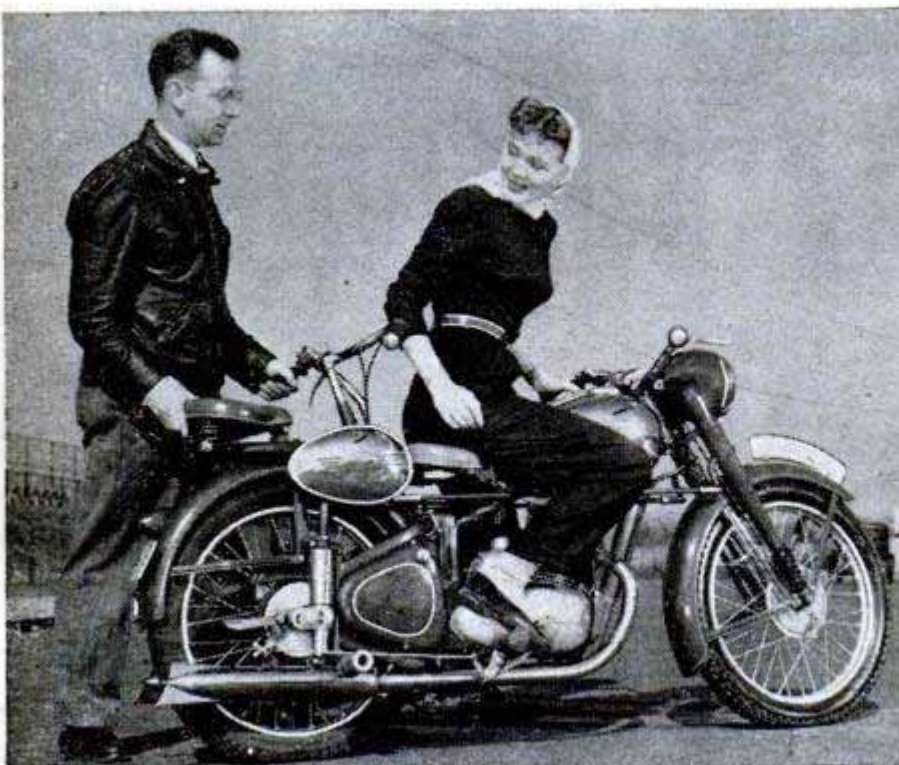
Multi-Purpose Tripod Extension

Mounted on any tripod, an elevating extension enables the photographer to raise or lower his camera without moving the tripod legs. The sliding base of the extension has a standard tripod socket. The extension can also be used without a tripod by clamping it to any convenient support, such as a stepladder, with a C-clamp. It can also be mounted upside down on the tripod so that the camera is held between the legs for low-angle and copying shots. The device permits extension to 18 inches.



Portable Machine Tool

Running at speeds up to 45,000 revolutions per minute, a portable grinder-miller goes through hardened-steel files as though they were soft steel when used with a tungsten-carbide cutting tool. Various mounts, including lathe stands with built-in speed controls, give the tool wide application in machine shops. The speed control regulates the speed of the tool between 15,000 and 45,000 revolutions per minute. The quill develops almost $\frac{1}{4}$ horsepower at top speed.



Dual Controls On Motorcycle

Dual controls on a new motorcycle permit either rider to drive the machine. When used as a trainer the motorcycle permits a novice to learn to drive in 30 minutes, according to the manufacturer. The motorcycle has a second seat over the rear wheel with a complete set of controls for the rider.

☐ Highest waterfall in the world is the 2600-foot Angel Falls in a section of the Venezuelan jungle so remote that it was only recently visited for the first time.



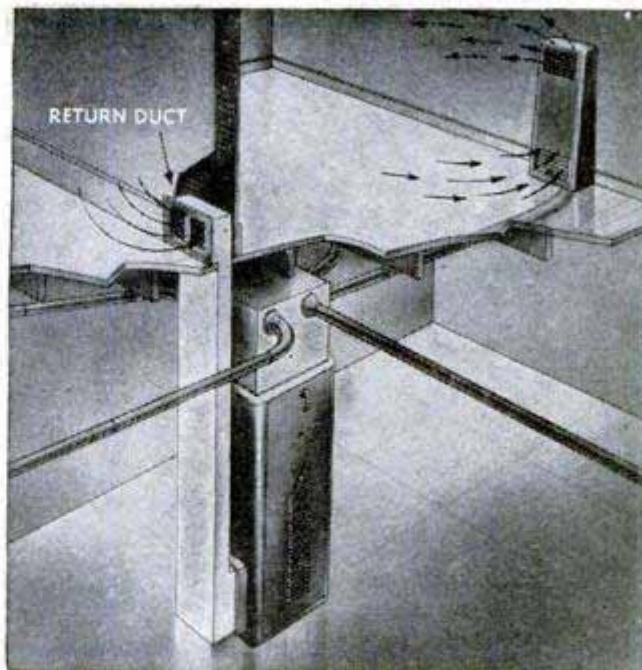
“Homogenized” Heat

JUST AS cream won't separate from the milk so long as you shake the bottle, warm and cold air can't stratify or separate in a room heated by a warm-air system that, in effect, “homogenizes” the air. The new system, which cuts installation costs as much as 40 percent, requires only one cold-air return. Continuous recirculation is provided by blenders that mix room air with heated air from the furnace. High-velocity hot air is forced into the blenders where it mixes with cooler air from the room before leaving the register at decreased velocity. There is no cold-air return from each room.

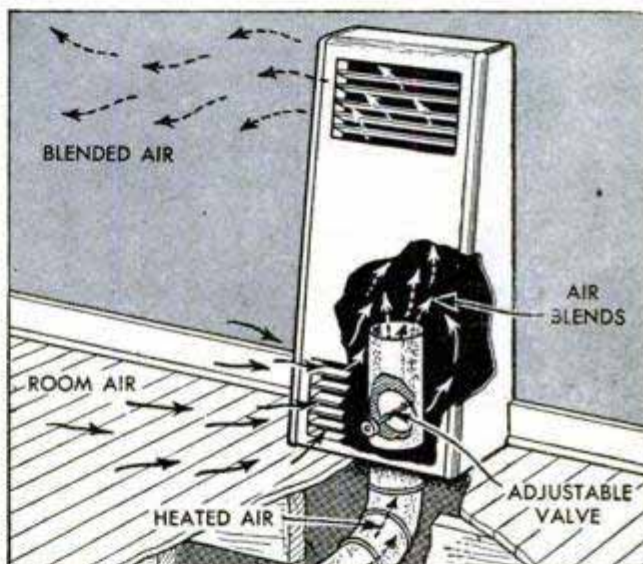
All tailor-made ducts are eliminated. The system uses mass-produced, inexpensive ducts only 3½ inches in diameter, small enough to fit between inside walls. Sections of flexible metal tubing bend around obstacles and a telescopic section eliminates cutting to make precise fits. Concealed blenders between wall studs also telescope to required size. Cabinet blenders can be installed in existing homes without cutting walls.

The single return duct is placed close to the furnace and it provides an ample supply of cold air. There's enough leakage around interior doors to guarantee complete circulation.

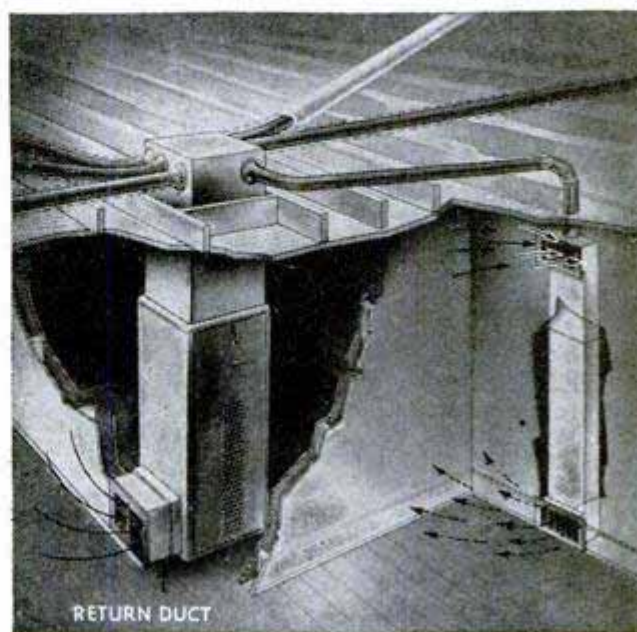
The furnace can be installed in the basement or first-floor utility room. It comes in gas or oil-fired models and has a direct-driven blower.



Cabinet blender shown above requires no cutting of walls. Left, the new and old styles in heating ducts



Above, blender valve controls temperature of each room. Below, ducts run in attic of no-basement home. This concealed blender is installed between studs





The 1950 Studebaker takes another step into the future with a sleek facade shouting "Speed!" in every line

By Wayne Whittaker

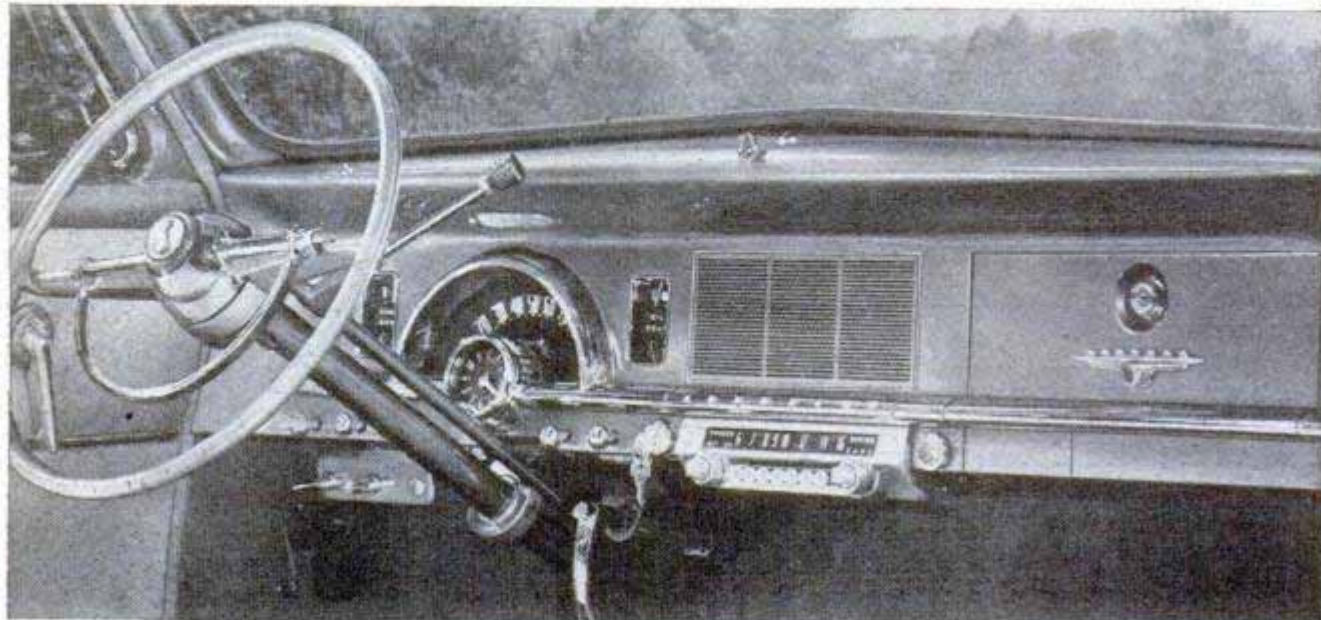
STUDEBAKER AND BUICK are leading the parade of 1950 automobiles with some sleek models that may well be pace-setters for the industry. Studebaker is introducing its complete line for next year and Buick three models of the lower-priced Special, or Series 40.

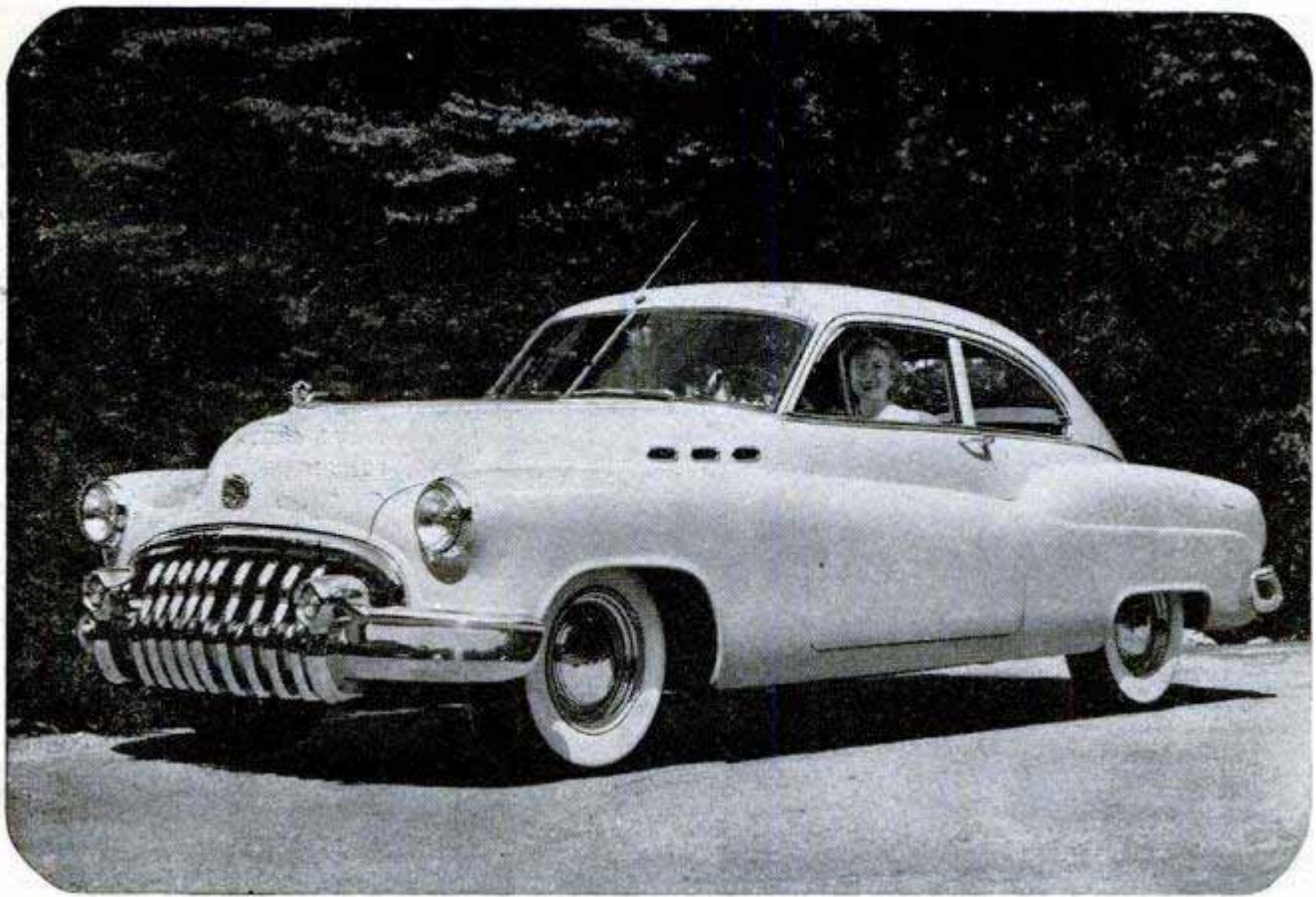
The big news about the Studebaker is

that the '50s will have an optional automatic transmission, although it is improbable that many will be produced this year. Buick's Dynaflo is optional on the Special.

The 1950 Studebaker answers a question which had been uppermost in the public's mind: Would they rest on their laurels as postwar pioneers or plunge ahead another step with daring innovations? When a manufacturer has a model such as the

Recessed instrument panel of the Champion gives front-seat riders more room and presents a neat appearance





Buick unwraps its new six-passenger, two-door sedan in the Special series. Sloping front fenders have returned

postwar Studebaker, which is well received by the public, he risks millions of dollars with a major model change.

This thought was uppermost in the minds of Studebaker executives when they gathered around to study the new sketches for the 1950 cars by Raymond Loewy Associates of New York. It was Loewy who made automobile history by designing the 1947 Studebaker. Some of his '50 sketches were conservative in that they specified slight changes in the '50 as compared with the '49 model. His most dashing design showed a completely new front end of the car.

"That design makes the car look like it's going 40 miles an hour when it's standing still," commented one observer.

After weeks of deliberation, filled with conferences between Loewy and Studebaker executives and engineers, the die was cast—for the major change. One morning last spring the test drivers gathered at a little elevation overlooking the high-speed track. They were waiting to be shown.

Suddenly around the bend came a maroon streak traveling in the low 70s.

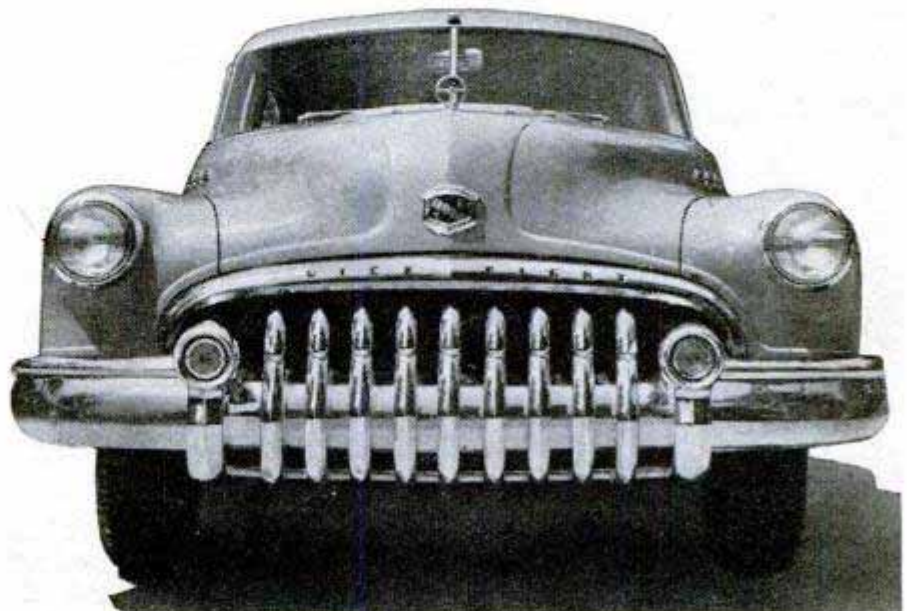
"Gosh, it looks something like a Tucker," said one driver.

"Naw, it's got an airplane nose," said a second.

When the new model was turned over to the drivers, they swarmed over it like bees in the proverbial clover patch.

"Hey, look! It has coil springs in front. Wait till I get her on that corduroy track."

Grille and bumper become a single unit in the new Buick. Vertical grille bars are made of tough metal. Two bumper guards house the parking lights





Studebaker Land Cruiser will be recognizable at a glance. An automatic transmission of the torque-converter type will be optional equipment



"New model looks like it's going 40 miles an hour when it's standing still," commented one observer. This is the four-door Champion. Below, the Commander five-passenger coupe offers a low-slung, racy appearance



"Engine changes are only minor," said a youth from under the hood.

"Phooey," said one disappointed driver. "I was sure it would have an automatic transmission."

This criticism was short-lived, for the drivers soon learned that the new transmission is in the offing. However, all of the first 1950 models will have conventional transmissions with optional overdrive as in the past.

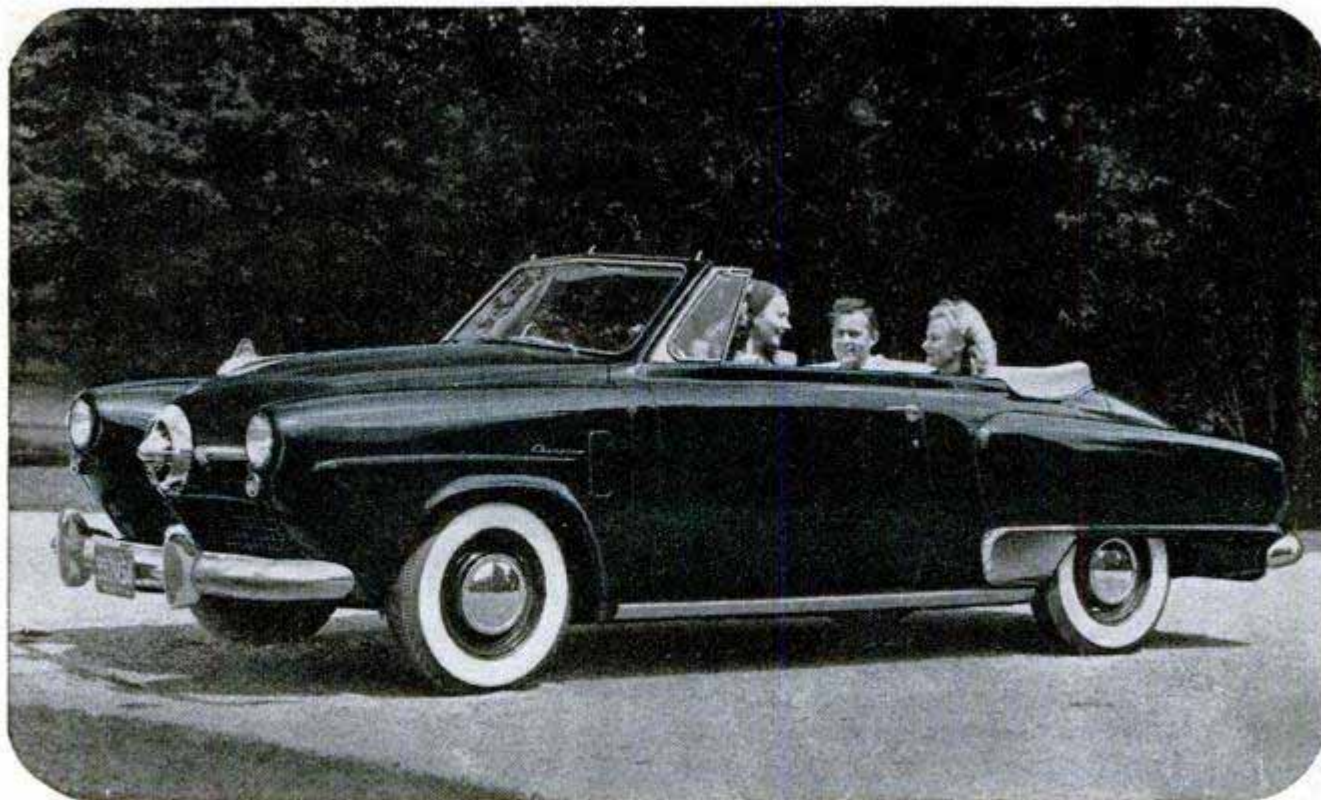
When the transmission is available, it will be combined with a torque-converter unit. The torque converter will operate in first, second and reverse gear. The driver will be able to obtain direct drive through a hydraulically operated friction clutch which bypasses the converter.

The manual switch lever will have five positions: park position (a mechanical lock), neutral, forward high and low ranges and reverse.

Engineers consider the automatic transmission-converter the equivalent of a conventional three-speed transmission plus overdrive.

Refinements on all the cars today are pretty well standardized, the engineers say, and there's reason to believe that transmissions will follow the trend. "I predict that in a few years most of the cars will have transmissions as similar as starters are at present," one authority said recently.

The new Special is Buick's all-out bid for third place in the "American league of motordom." According to rumors around Detroit and Flint, Mich., the car will be advertised below \$2000—without radio and heater or any of the frills which have been close to the purse of postwar dealers.



Here's the new Champion convertible. Note swept-back front end and the distinguishing airplane-type ornament

With this model, Buick is undoubtedly offering a sort of preview of its 1950 Roadmasters and Supers. The Special puts the emphasis on fenders. It has dropped the straight body line and returned to the distinctive full "taper through" sloping front fender. This change was actually dictated by dealer protests. You will be able to recognize the new Buick in one glance.

The engine on the Special will be the conventional Buick Eight with a maximum brake horsepower of 100 at 3600 revolutions per minute. Those with Dynaflo Drive will have a horsepower of 120. The new models are lower with a slightly longer wheelbase and at the same time a 3½-inch decrease in total car length. The rear seat has been moved slightly farther ahead of the rear axle to increase riding comfort and permit the rear roof line to be lowered.

The '48 and '49 Buick owners who have complained of heat in the front seat (during summer driving) will cheer the announcement that several changes have been made in the ventilating system. There has been a 78-percent increase in the area of the left-hand duct which delivers air to the driver's side of the car. Ventilation for the right-hand side is conducted by the same large duct that brings air to the defroster core.

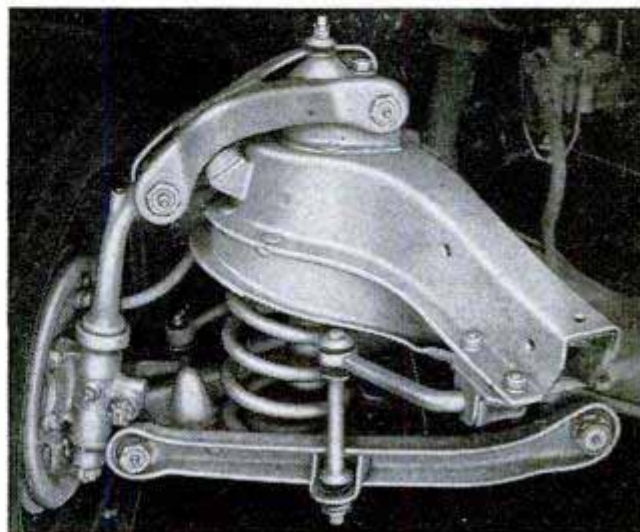
In regard to engine cooling, a change has been made in the radiator-core assembly for the Specials equipped with Dynaflo. The frontal area of the radiator has been increased from 419 to 484 square inches which provides greater cooling capacity.

An innovation on the new Special is a combination front grille and bumper. At first glance this looks alarming and you have a vision of a smashed and broken grille. However, close inspection reveals the grille's vertical bars are made of tough bumper metal.

The '50 models consist of a roomy six-passenger four-door sedan, a six-passenger two-door Sedanet and a three-passenger two-door business coupe with spacious luggage room behind the seat in addition to the conventional luggage compartment.

Buick is either making it difficult for its imitators or having a little quiet fun with another model change. Its famous fender holes have been changed in shape from round to rectangular!

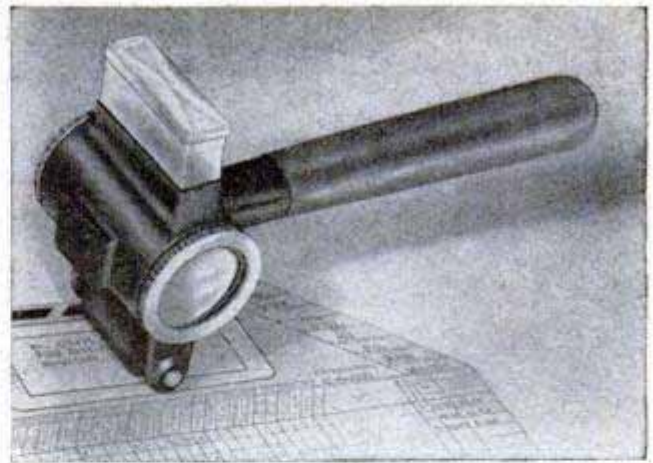
Studebaker offers a new suspension system with coil springs on the front wheels for amazingly smooth ride





Rolling Stool for Mechanic Carries Tools on Tray

Mounted on easy-rolling casters, a mechanic's seat and tool tray combination makes life more comfortable for the repairman. The sturdy seat is 12 inches from the floor and the tool tray, beneath it, is large enough to hold the tools necessary for most repair jobs. The tilted casters are free-rolling and quick-pivoting.



Compact Duplicating Machine

Small enough to be stored in a desk drawer, a new duplicating machine makes as many as 100 imprints from one master copy. The duplicator consists simply of a felt applicator and a small roller mounted on a cylindrical fluid reservoir. The message is typed or written on a master card and, by a carbon backing, the message is printed in reverse on the back of the card. To duplicate the copy, the applicator is drawn over the surface to be imprinted, moistening it with the fluid from the reservoir. When the master card is placed face up on the moistened surface and rolled lightly, the message is transferred from the back of the card to the lower sheet.

Automobiles Climb Hotel Wall and Into Second Floor

Automobiles climb right up the outside wall of an Atlantic City hotel and roll into the second-floor ballroom. Making this possible is an auto-lift elevator that slides upward in two guide-channel uprights fastened to the wall. Power is supplied by an electric motor that drives a chain hoist mounted on top of the guide rails. Controls are located both at ground level and at the second-floor wall opening. The lift was installed for moving automobiles in and out of the hotel ballroom during automobile shows.



Touch Museum for Sightless

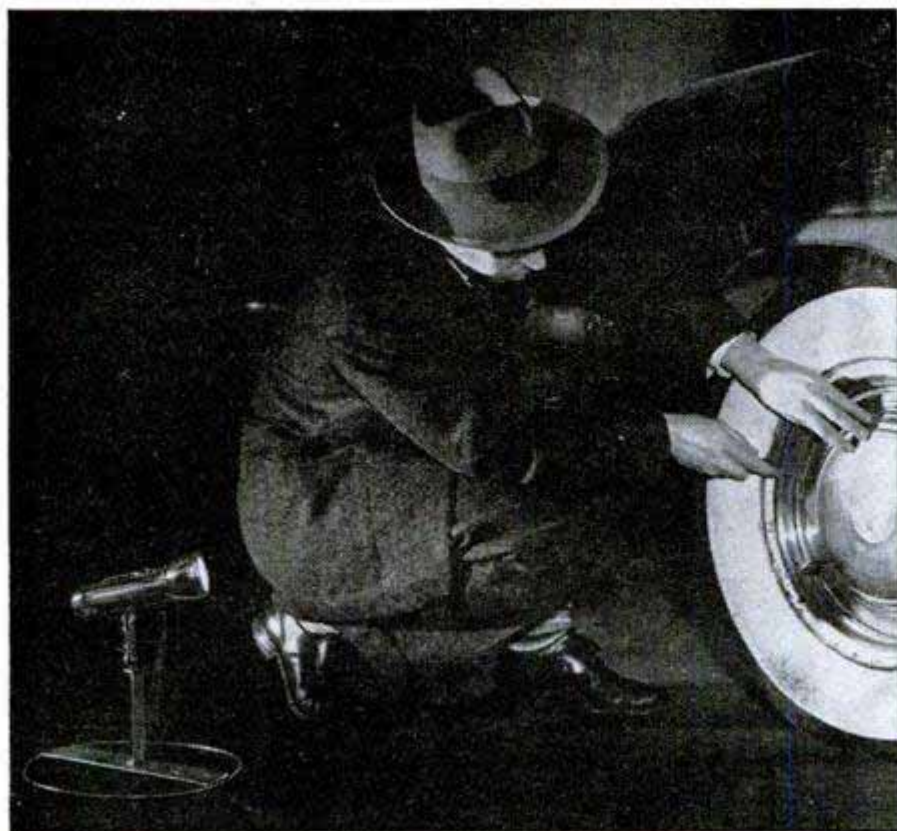
Blind persons can "see" the wonders of science in a London museum where an exhibit, said to be the first of its kind in the world, has been set up especially for them. Sixty displays are mounted on tables about waist high so they can be touched conveniently. Braille posters explain each exhibit for the blind visitors.



Golf Cart Rolls to Your Car

Mobile even when collapsed for storage, a new golf cart need never be picked up and carried. Instead of retracting like an airplane's landing gear, the wheels fold inward to a 10-inch span so the cart can be rolled to the clubhouse or car. Made chiefly

of aluminum tubing and bars, it is rust-proof, weighs only 12 pounds and has ball-bearing steel wheels with semipneumatic rubber tires. The cart is folded or opened in a matter of seconds without pushing springs, levers or turning thumbscrews. There is an auxiliary handle for use when the cart is collapsed.



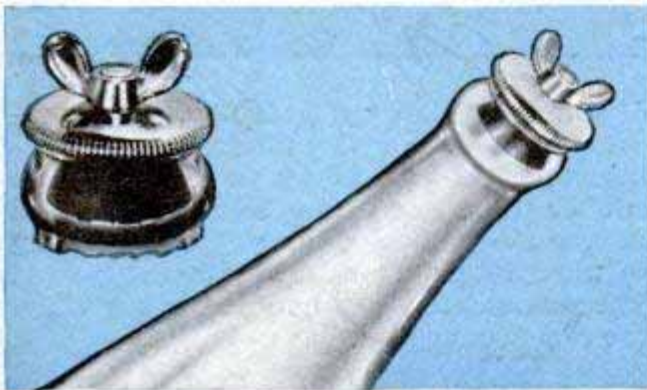
Flashlight Holder

Flashlights are held in any desired position by a clamp that stands on the ground or can be hung from a nail. The clamp is made in the form of a wire circle with a center post that holds the light. Ball-and-socket joints permit the light to be aimed in any direction. The clamp also can be used as a support for a garden hose or as a base for a rifle fired from the prone position.

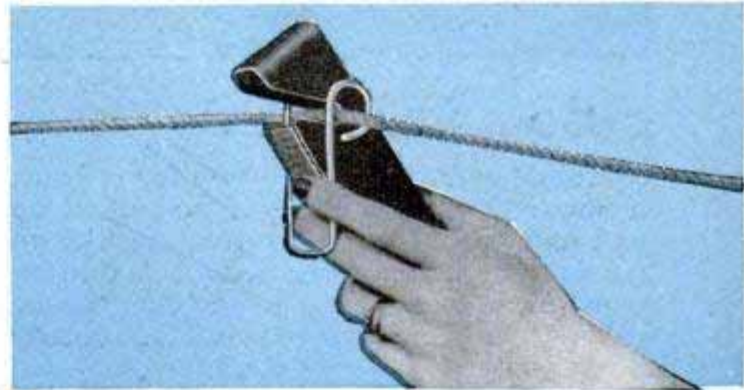
☐ There are now 441,137 numbered motorboats — recreational craft 16 feet or longer—in use on federal waterways in the United States and its possessions, according to the U. S. Coast Guard.



HANDY HANGER that clamps to the end of the ironing board saves the housewife many steps. As many as 12 garments can be hung on the rack without danger of tipping. The hanger comes apart quickly for storage



BOTTLE STOPPER seals mouth tightly with a rubber collar that flares out as the wing nut is tightened

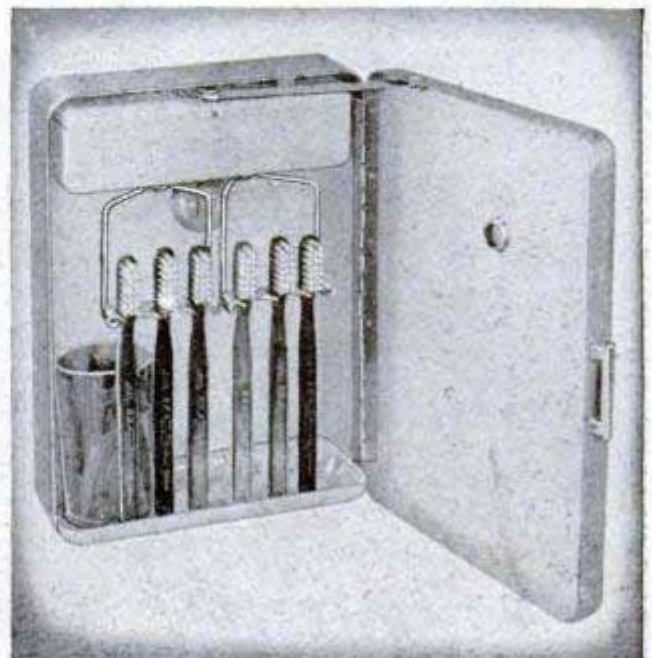


CLOTHESLINE PROP won't topple in the wind if a wire clip is used to keep the line from pulling out

BISCUITS OR WAFFLES, you can bake either on an electric appliance that has interchangeable inserts



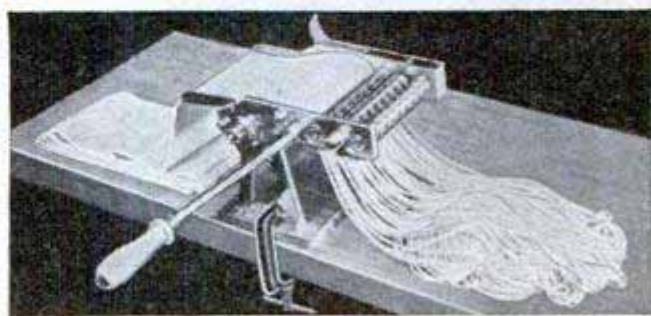
GERM-FREE TOOTHBRUSHES are assured when kept in a cabinet that has a built-in ultraviolet lamp





PACKAGE SEALER prepares food bags for quick freezing, sealing the opening by heat and pressure

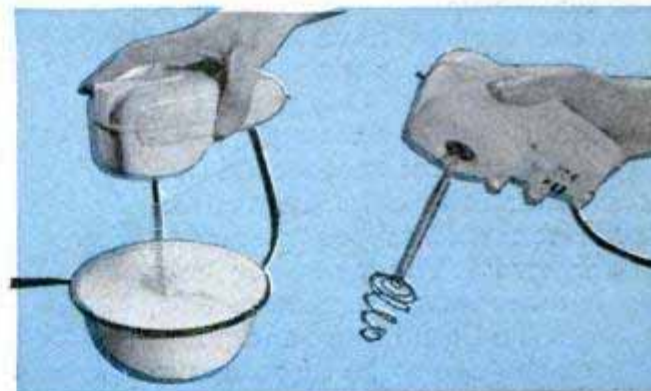
WHAT'S NEW *For Your Home*



NOODLES AND SPAGHETTI are made at home on a machine that kneads the dough and then slices it



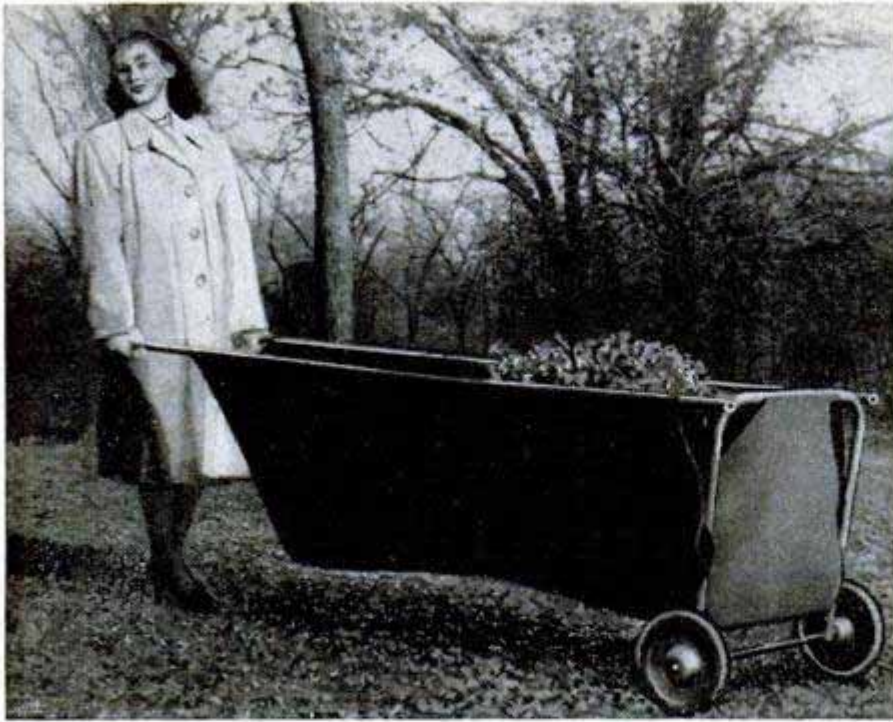
WATERING CAN has a thumb-operated pump so you can water hard-to-reach pots without spilling a drop



SPRING-SPINDLE MIXER has a coiled-spring beater that whips cream and eggs quickly without splatter

MOISTUREPROOF LINING in baby's creepers eliminates need for separate waterproof pants. Lining is soft, lightweight Vinylite plastic. Triangular-shaped front panel has snap fasteners for quick, easy changes



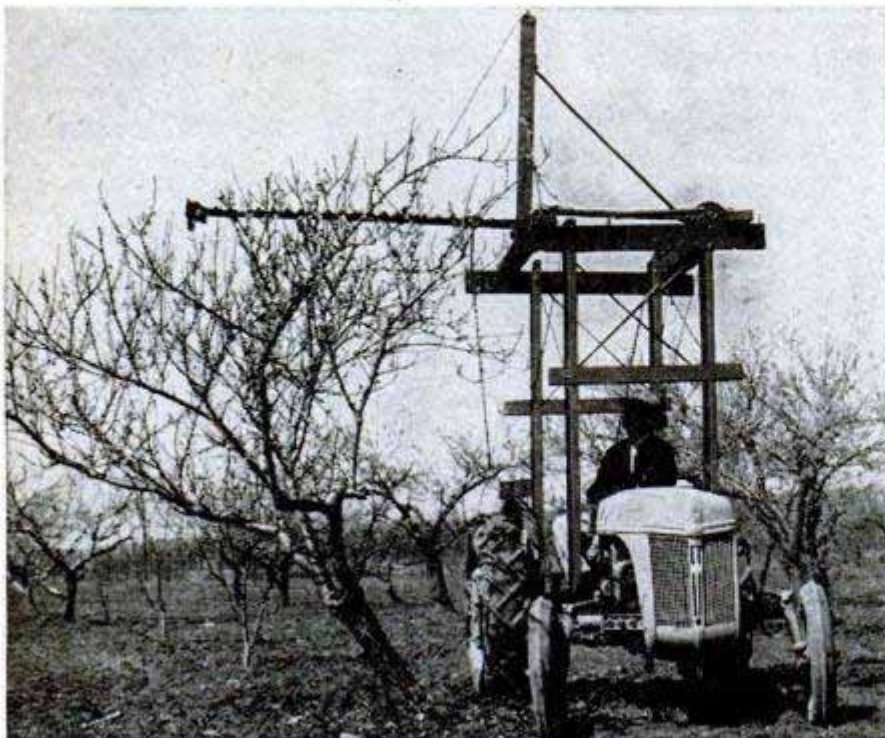


Light Canvas Cart For Garden Chores

Loads three times larger than a wheelbarrow holds are carried in a lightweight, canvas garden cart. Its canvas body, 44 inches long, 18 inches high and 24 inches wide, is supported by metal tubing. One side drops flat for easy loading of leaves or grass clippings to be hauled off the lawn. Oversize wheels protect lawns from marking. The cart can be rolled up and stored flat against the wall of a garage. The front flap unsnaps from the frame for storage.

Bolted Tires, Free Retreads

Down in Ecuador, where there are no tire factories, frugal truck and car owners have developed two systems for getting the most out of their tires. One method is to repair a hole in a casing by bolting in a section of another old tire. The other is to obtain a free retread from wild rubber trees along the highways. The car owner jacks up a wheel, taps a rubber tree, catches the liquid latex and pours it over the tire while he spins the wheel. The retread is usually good for about 1500 miles.



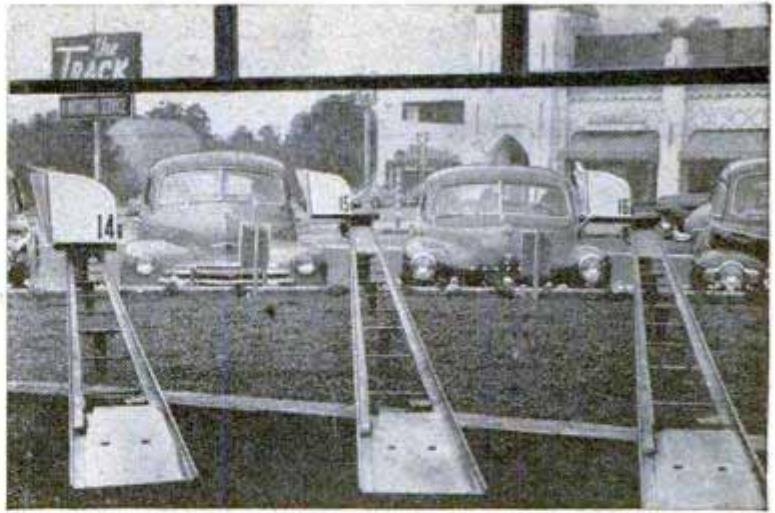
Homemade Cutter "Mows" Treetops

With a Ford sickle bar and a 16-foot belt as the main parts, I. N. Lassiter of Howe, Okla., has invented a machine that "mows" treetops. He says it performs the work of several men in much less time. The machine also cuts trees to a uniform height that permits faster and less costly spraying with a stationary boom.

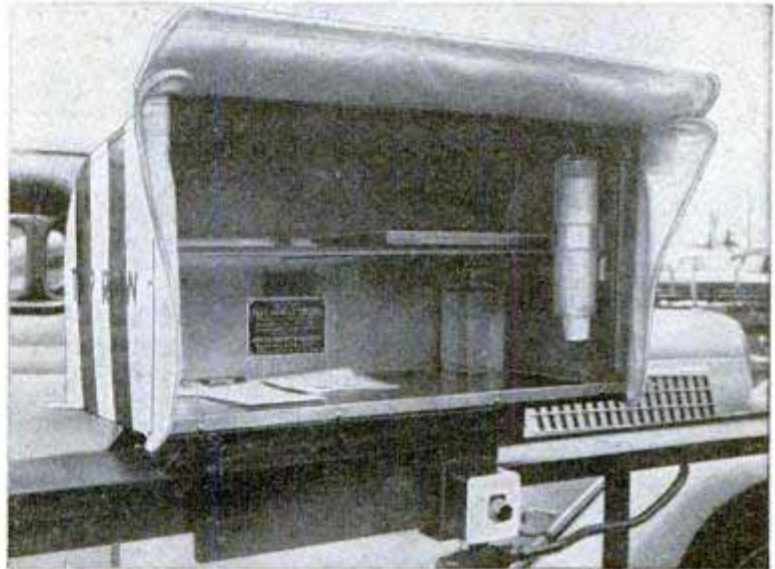
¶ Two thirds of the pedestrians killed on rural roads were walking on the right side of the highway instead of on the left, facing traffic.

Tray on Trestle Serves at Drive-In

DINE AT a new drive-in restaurant in Los Angeles and your food will come rolling out on a powered tray and stop at your car window. It's the world's first automatic "car-hop" and forerunner of others planned for California. The restaurant employs no car-hops, yet speeds service from 20 to 25 percent while saving 25 percent on labor costs, according to its owners. The patron drives into a stall and comes to a stop headed in toward the kitchen. A trestle extends from the parked car to the service room. A stainless-steel box — the serving tray — travels along the track, powered by a small electric motor. The patron makes his selection from the menu, places his order on the tray and pushes a button. The tray then moves to the service room, where a waitress relays the order to the kitchen. She computes the bill and sends it back to the driver, who returns it with the indicated amount. She makes change if necessary, loads the tray with the order and sends it out to the customer. The average diner stays in the stall only about 20 minutes. The novelty quickly attracted crowds.



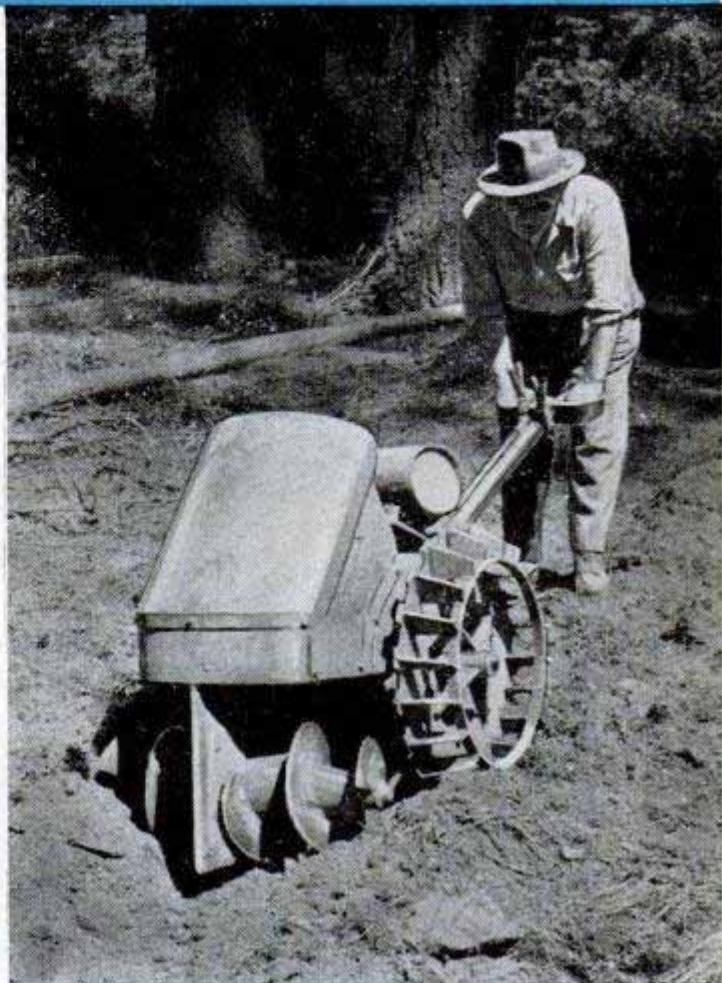
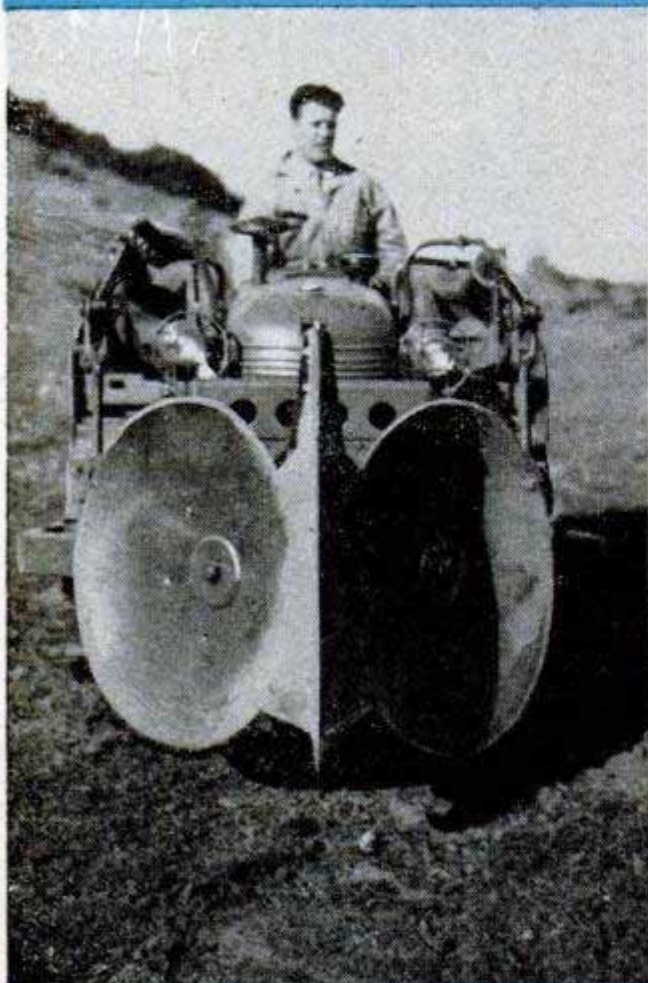
Here's the view the waitress sees as she handles the orders



Box-type tray scoots along trestle to fill orders. It can be pulled laterally toward the car window. Below, when all 20 stalls are filled the trays shuttle along tracks continually



.... Call Out the Mules



Above, left, adapted from the disk harrow, this Disk Trencher rolls out a wide fire trench. Right, the Walk-Behind Trencher is steered by moving the handle from side to side. Below, a powerful midget, the Beetle



and Beetles



Pack horse of the fire fighters, the Mechanical Mule hauls up to 1200 pounds of men and their equipment

By Tom Riley

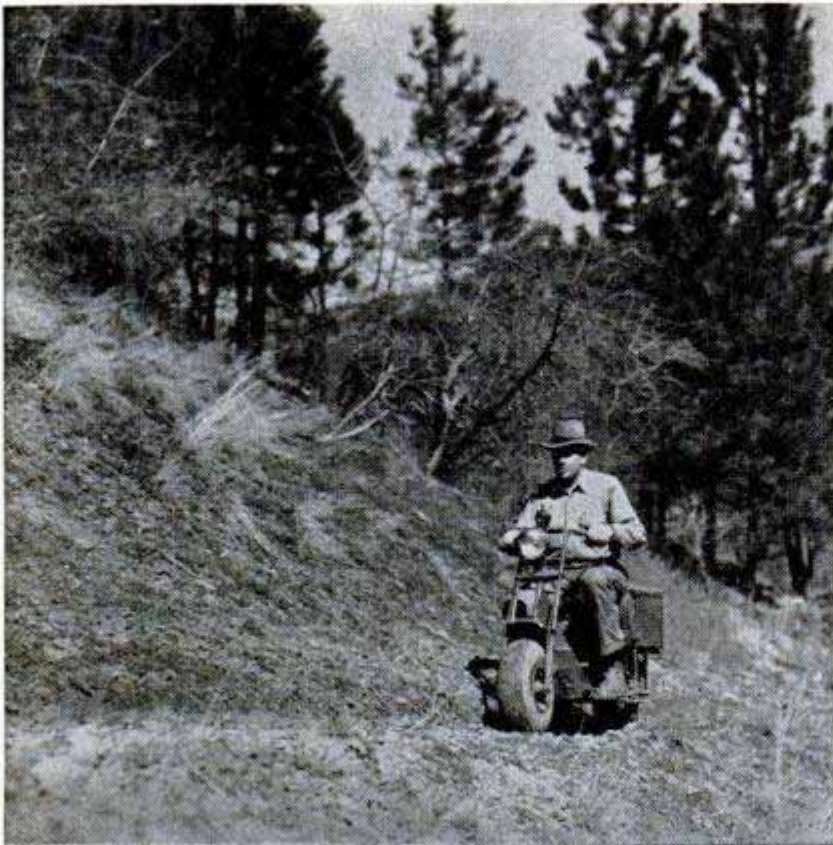
WHEN FIRE breaks out in one of our great forests, the Forest Service calls out a Lilliputian fire brigade with a powerful punch. There are no bright-red hook-and-ladders, no giant pumpers. Instead, an agile fleet of mules, beetles and other tiny fire fighters scamper through the wooded trails like rabbits.

This is the mechanized army of the U. S. Forest Service, a brand-new army with all its equipment in miniature. There are such things as the Mechanical Mule. You might say the Mule is a tiny model of the huge, carryall tractors used in highway construction. But the Mule is more than that; it is a baby tractor built on the principles of a carryall, incorporating the advantages of the tractor with the ease of operation of an automobile. With only one axle on the tractor and one on its trailer, it turns around on a five-foot radius and dodges through the forests with ease. It tows one or two trailers, zips up 20 percent grades with an 800-pound load and will carry up to 1200 pounds. It has a Crosley auto en-

gine, transmission and differential and is the equal of eight pack horses.

The Mechanical Mule has an over-all width of only 36½ inches, a tremendous asset in fire fighting. For decades the Forest Service has needed access roads to speed to fires in our timberlands. But the cost of even rough roads throughout all the forests is too expensive, especially in the steep mountains of the West. Trails are not. A good trail does not require wide cuts into rocky hillsides nor expensive fills and culverts. We can have trails through all our forests. With this in mind, the Regional Equipment Laboratory at Portland, Ore., has been working to develop this army of miniature machines, both for carrying fire fighters over present trails and for building more trails through our forests.

To do this, the Portland laboratory has been inventing new machines, adapting others and combining ideas from several fields. The laboratory is not a large organization: its chief, Theodore P. Flynn, has only two assistants, Tom Caldwell and



Commercial motor scooters are used by the men of the Forest Service. They are adapted for this rugged work by addition of special gears

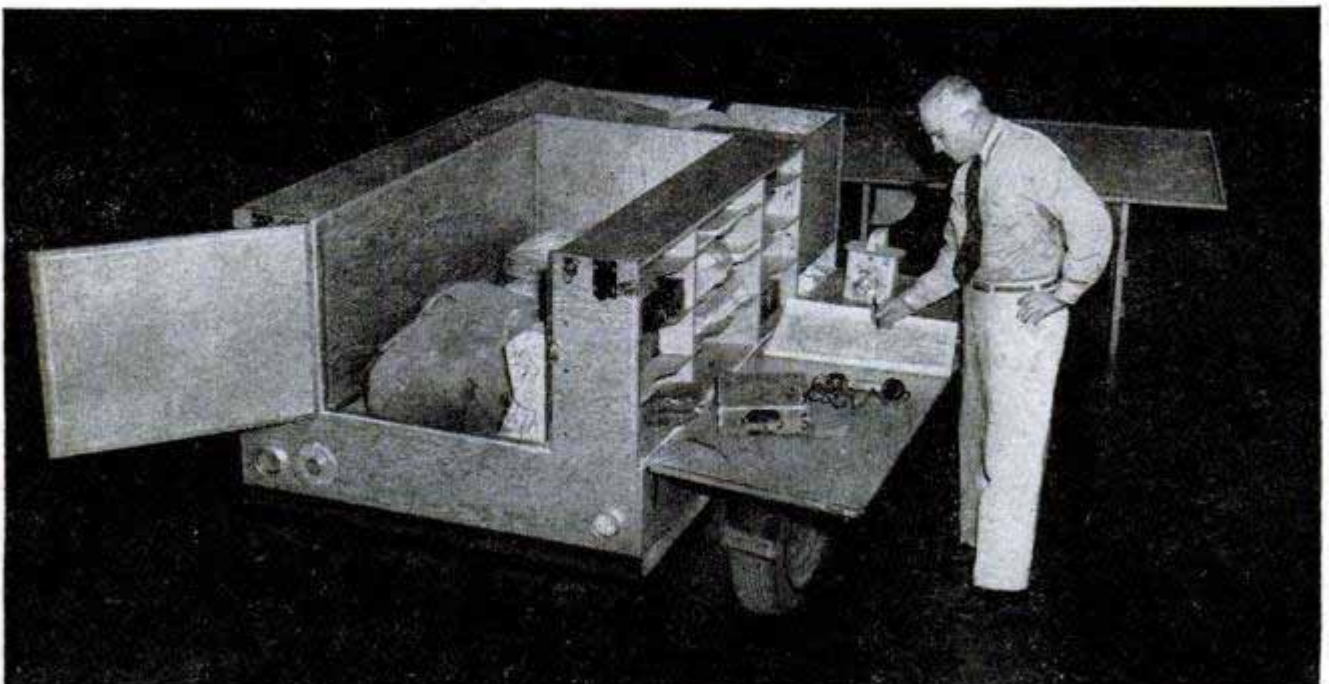
Arthur Kelly. These three men have designed and drafted the whole Lilliputian army. They think of a good possibility or someone in the Forest Service suggests a good idea through the regional office. It is roughed out in blueprint form. Then the workability of the machine and all possible improvements are discussed with forest rangers, lumbermen, manufacturers, anyone who might have a suggestion. Not until then are pilot models built with the help of

any kind of rock and rapidly churns out a 24-inch-wide ditch, not only clearing the ditch but throwing the dirt evenly over the grass to each side to make the effective width of the fire trench almost four feet.

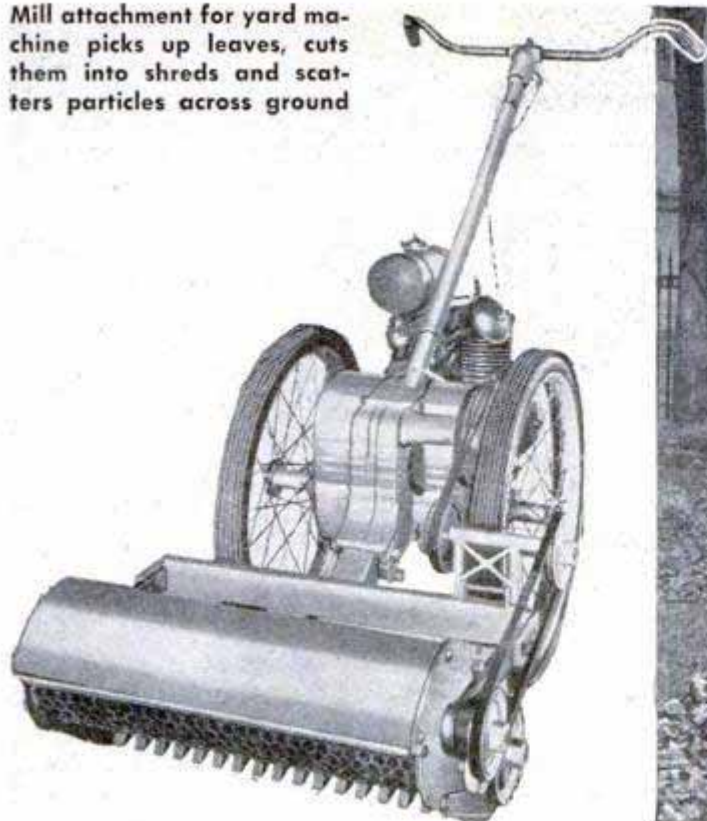
The efficiency of the spiral digger exceeded all expectations, but the men also knew that an ordinary garden cultivator has a clumsy method of steering that would quickly fatigue any man pushing it in

(Continued to page 250)

Fire-fighting crews get their orders from a trailer-office that rolls right up into the thick of the fight



Mill attachment for yard machine picks up leaves, cuts them into shreds and scatters particles across ground



Lawn Machine Grinds Up Dead Leaves to Rebuild Soil

With one of its three attachments a power machine sweeps dead leaves from the lawn, grinds them into particles and drops them back on the grass to rebuild the soil. The machine is mounted on two wheels and powered by a four-cycle air-cooled motor. The leaf attachment automatically ejects

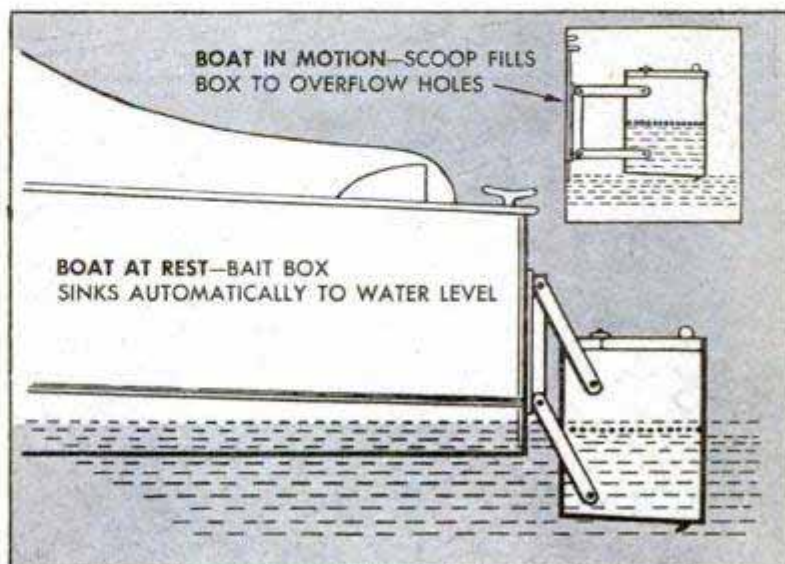
all foreign objects such as stones or pieces of metal that might damage the machine. The other attachments are a lawn mower and a sickle bar. The lawn-mower attachment is available in 20 and 24-inch widths. The basic machine weighs 97 pounds and is operated like a power lawn mower.

Bait Box Skims Surface of Water When Boat Is in Motion

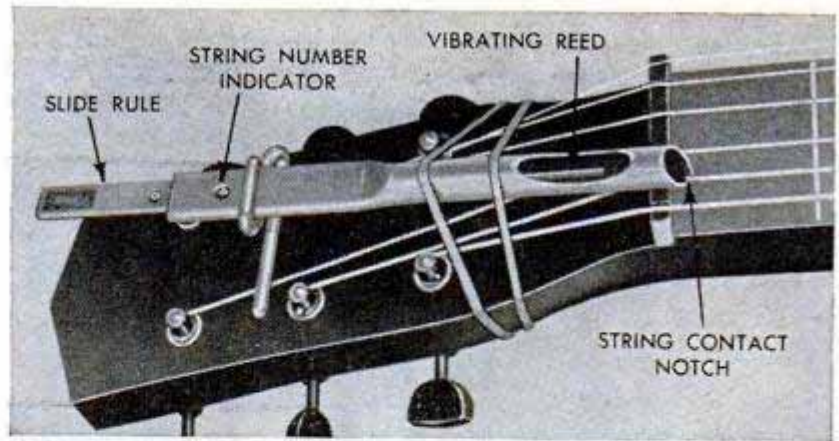
Live fishing bait skims along behind the boat inside a box that scoops up fresh water. The box is held in place by four arms, pivoted both to the boat transom and to the box. When the boat is motionless, the box sinks until the overflow holes are even with the water level. When the boat

is in motion the bait box rises and skims along the surface, with a scoop picking up enough water to keep the box full to the overflow holes. The bait box, which can be painted to match individual boat trim, is available in four sizes, one small enough for outboard motorboats.

Bait box fits on transom of boat. Diagrams show how the craft's forward motion makes box skim the water



↑ correction in address:
Machine & Welding Co.



When reed vibrations are widest, the string is exactly in tune. Held in place by rubber bands, the tuner can be set for six pitches

Reed Makes Tuning Visual

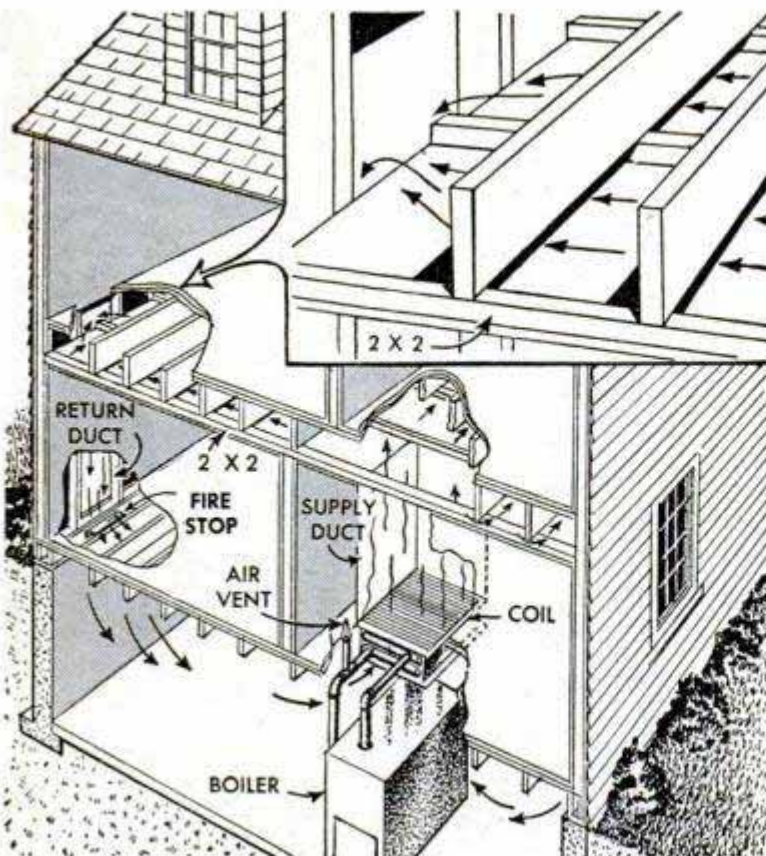
Even tone-deaf persons can tune stringed instruments accurately with a visual tuning device that is attached to the strings by rubber bands. A vibrating reed, housed in a metal tube, can be set for any one of six pitches. When the string is plucked, the

reed vibrates visibly if the string is properly tuned. By adjusting the peg until the reed's oscillation is at its widest point, the musician is assured of being on the exact pitch. A numbered indicator allows the musician to select any of six pitches.

Coilless Radiant Heating Warms Space Between Joists

Radiant heating is possible with a heat-distribution system that eliminates floor coils and heats the spaces between floor joists and wall studs. With certain adaptations, it can be installed in any house, new or old and with or without basement. In a typical two-story house, a heat exchanger, mounted only a few feet from the boiler,

warms air from the basement, causing it to rise in a supply duct to the second floor. It spreads along the entire floor, warming both the floor of the room above and the ceiling of the room beneath. Two-by-two strips, nailed to the undersides of the joists, support the ceiling far enough away from the joists to allow passage of the heated air. As it cools, the air returns to the basement through ducts formed by certain wall studs. These return ducts are spaced around the exterior walls to provide even distribution of heat across the entire floor. Fusible links hold open metal fire doors at slots cut into conventional fire stops. Said to be cheaper to install and operate than any other type of automatic heating, the system uses either steam or hot water to heat the exchanger coil.



"Wick" Stakes Repel Animals

Dogs, cats and rabbits won't approach trees and gardens which are protected by a stake that gives off an odor inoffensive to humans. Each stake protects an area six feet in diameter for about three months. Atop the stake is a tube containing a wick and a vial of chemical repellent. The vial is emptied into the tube where the chemical is absorbed by the wick.

GIANT twin-hull flying boats, weighing 250 tons or more, may be the amphibious craft for beach landings on hostile shores in future wars. Such huge seaplanes could carry 1000 men plus equipment, would fly at speeds approaching the top speeds of the fastest land aircraft, and upon approaching a hostile shore would land in the water, taxi up to the beach and open armored bow doors to discharge their troops.

If submarines make the seas too dangerous for ordinary shipping, the twin-hull flying boats envisioned above will have to be built, says Ernest G. Stout, head of naval aircraft research for the Consolidated-Vultee Aircraft Corporation. In fact, he says, the aircraft industry could start construction of them at any time that the need arises. All major problems in large flying-boat construction have already been given study.

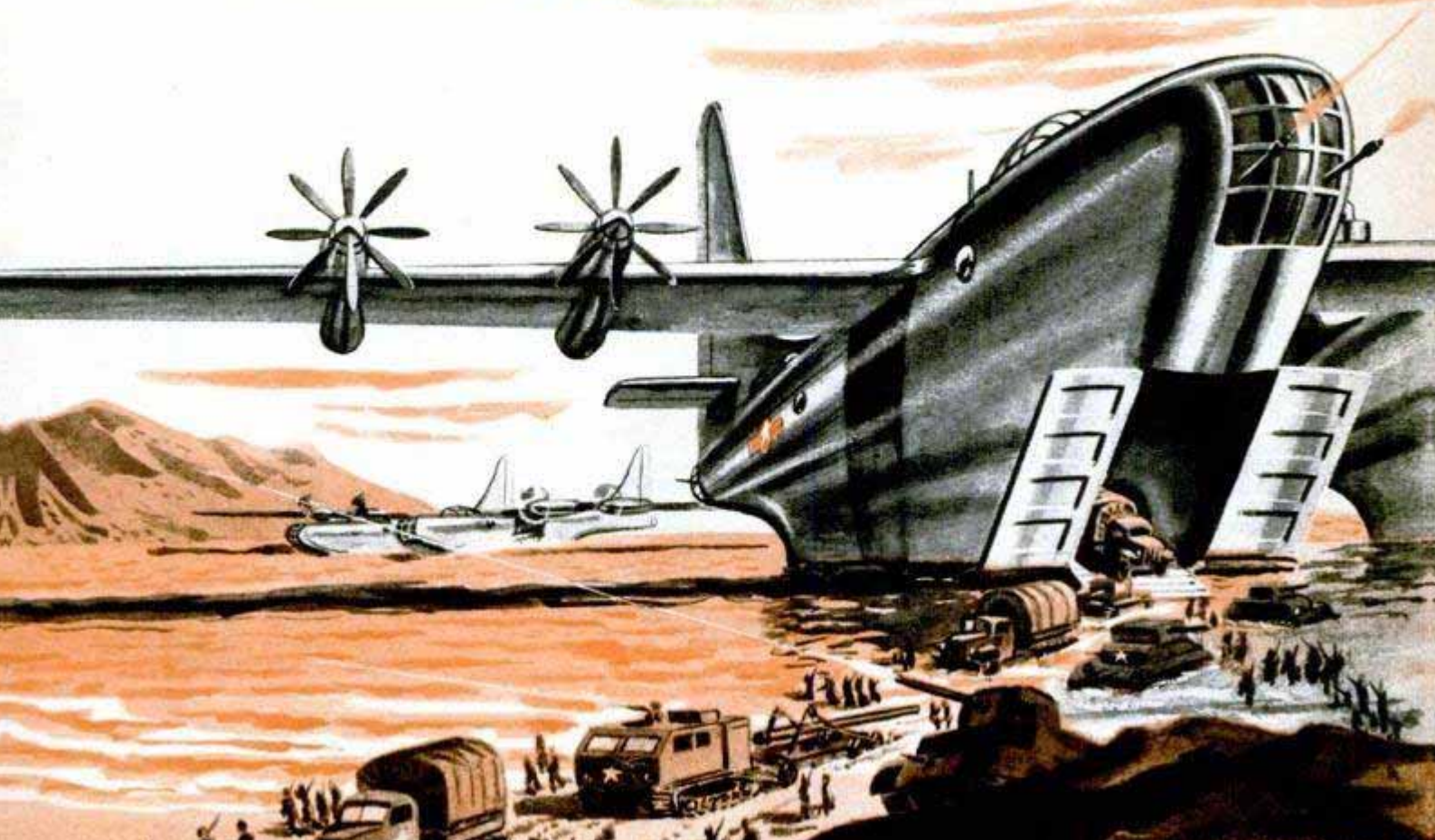
Flying-boat research was practically abandoned during the last war because of the emphasis on land planes. Since then designers have

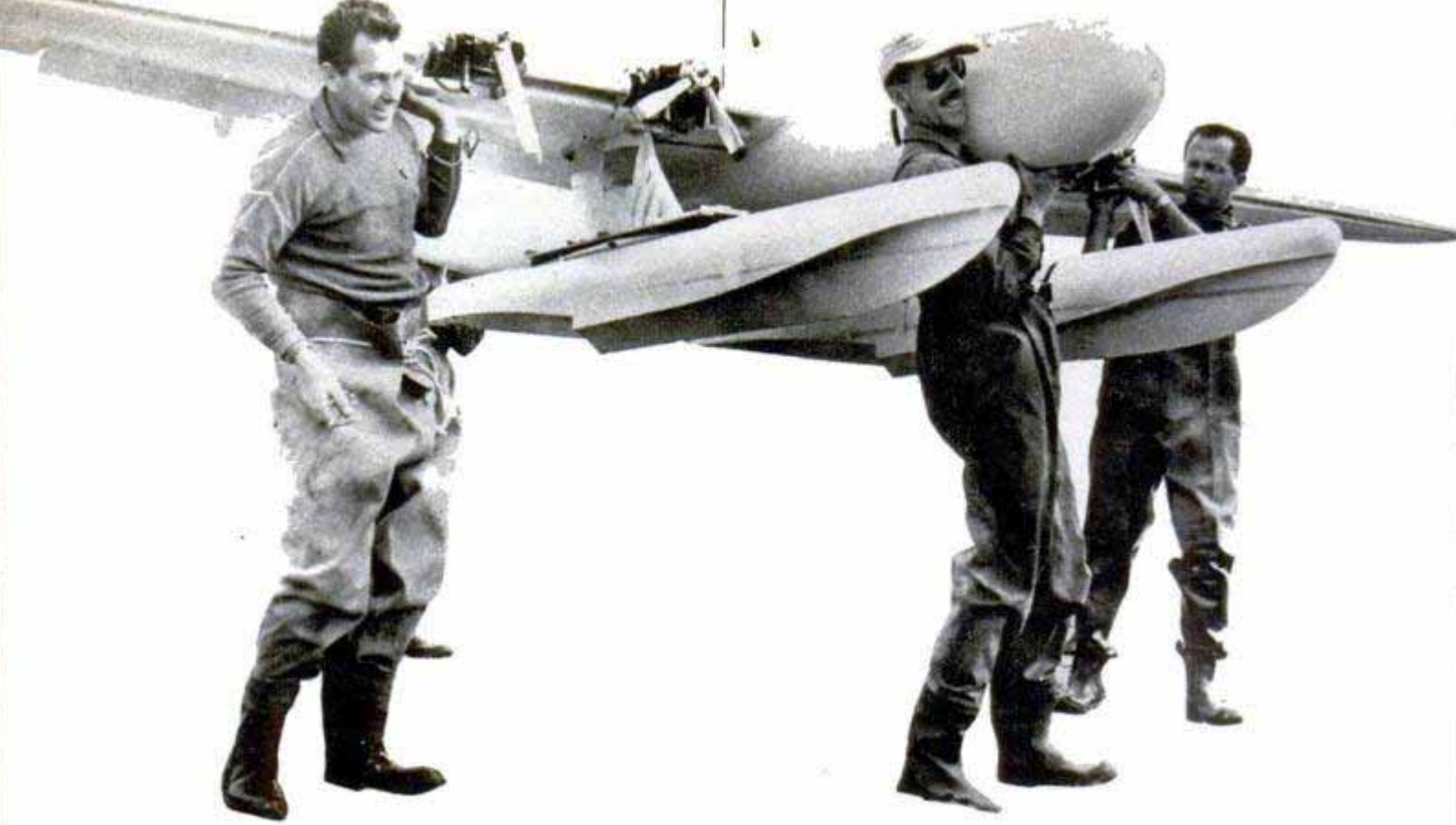


from MODEL to MONSTER

By Ewart Thomas

Research for aerial assault boats that will carry up to 1000 men is being carried on with flying miniatures weighing as little as 123 pounds. Above and below are an artist's idea of how tomorrow's 250-ton amphibians will "hit the beach"





Radio-controlled flying boat being carried to water for test weighs 160 pounds and has a 21-foot wingspan

made considerable progress in refining that type of aircraft. A case in point is the new Convair XP5Y-1 patrol flying boat, powered with four turboprop engines.

Larger than any flying boat previously built by Consolidated-Vultee, the aircraft has twice the seaworthiness and carries 2½ times the load of the Coronado flying boat. The total increase in efficiency amounts to 300 percent, an advance that grew out of a two-year program of flight testing powered models of flying-boat shapes, including numerous different combinations of hull and wing designs.

Convair's model flying boats are not ordinary models. They are complete miniature aircraft that are powered by their own tiny engines and controlled by radio from a ground station. They can be taxied on the water, turned, driven at full power so that they take off and climb into the air for maneuverability tests, and then made to land on the water again exactly as if they had human pilots on board.

Experts of the company's hydrodynamics research laboratory test the small craft on an estuary of San Diego Bay. Motion pictures of the miniature flying boats in action, particularly during water take-offs and landings, provide information that can't be learned theoretically or in wind tunnels or conventional towing basins.

Everything is built precisely to scale. Thus the balance, weight-carrying ability, rate of climb, top speed and other needed information about a huge flying boat can

be learned accurately by flying the models. Changes are made in the models to test new ideas, which then can be adopted or discarded at much less cost than cut-and-try alterations to a full-size experimental craft. At the same time, a model serves to test performance under conditions that



might be hazardous to a human crew.

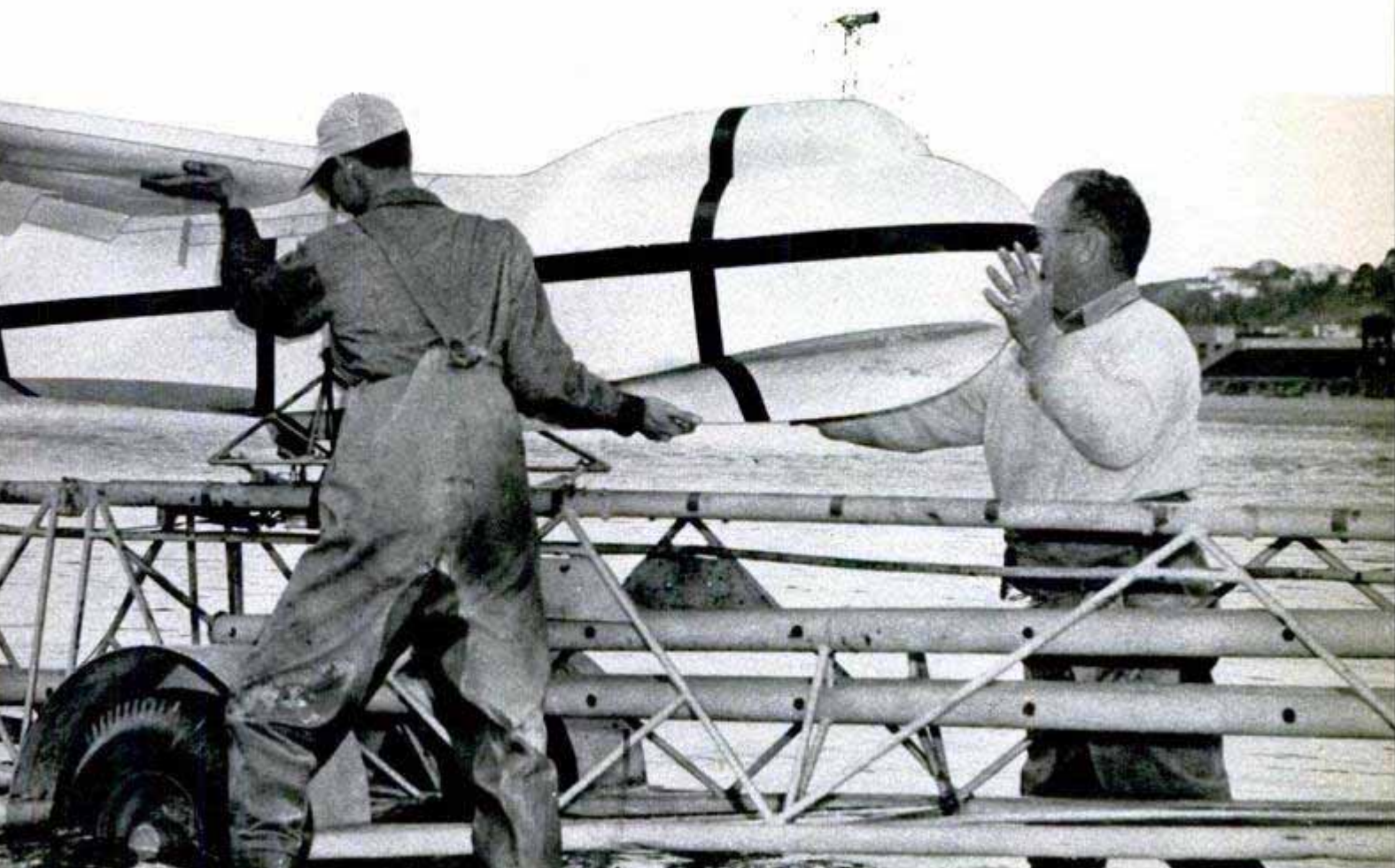
One of the miniature boats is built to $\frac{1}{10}$ full scale and weighs 123 pounds. It is powered by four two-cylinder engines that develop $1\frac{1}{2}$ horsepower each at 5000 revolutions per minute. They swing four-bladed props. A two-motor type built to $\frac{1}{8}$ scale weighs 90 pounds and has a wingspan of almost 14 feet. Still another, a twin-hull four-motored research model, weighs 160 pounds and has a span of 21 feet.

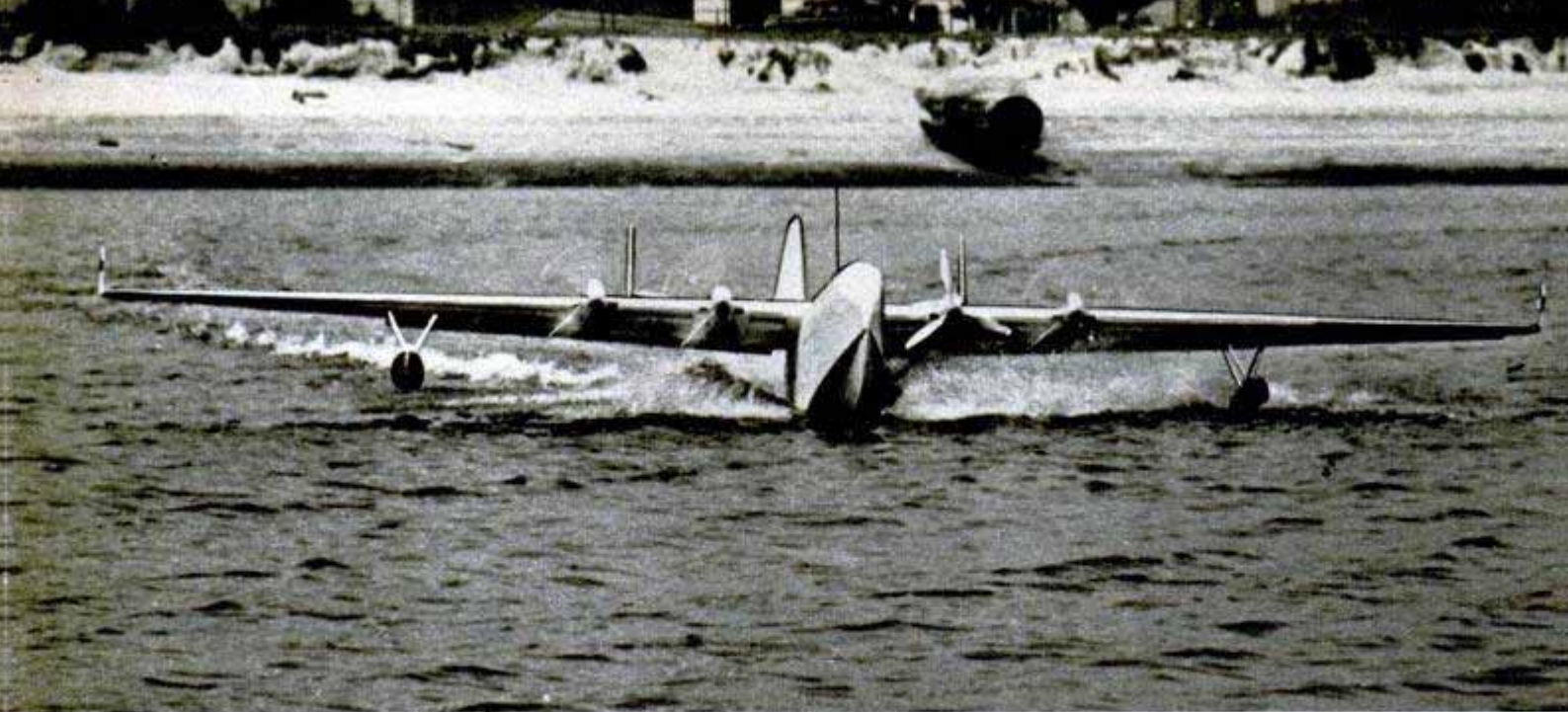
The small engines are of special design and have complete throttle control. They are started from land by a booster battery. Fuel is delivered to the engines under pressure and enough fuel is carried in the model planes for a half hour of flight.

Control surfaces of the models are actuated by tiny electric motors or by nitrogen pressure servo actuators, all radio-controlled. A miniature Gyropilot keeps the model trimmed in flight up to its top speed of around 50 miles per hour when it is not being maneuvered by radio.



Motion-picture cameras record the water-landing characteristics of nonpowered models shot from catapult. The trials are repeated with various flap settings. Below, loading model on a catapult. Built to scale, their performance gives test observers accurate information

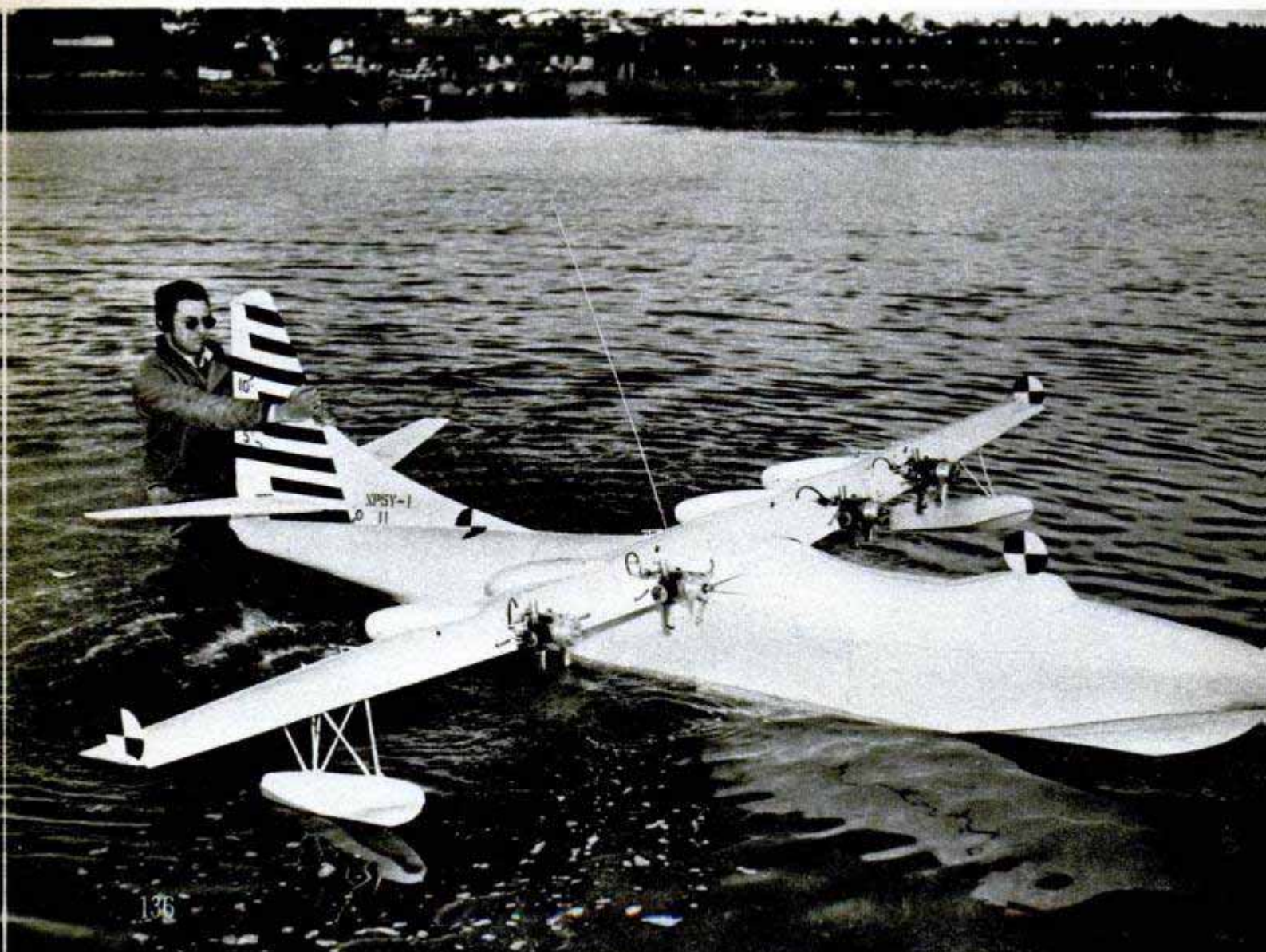


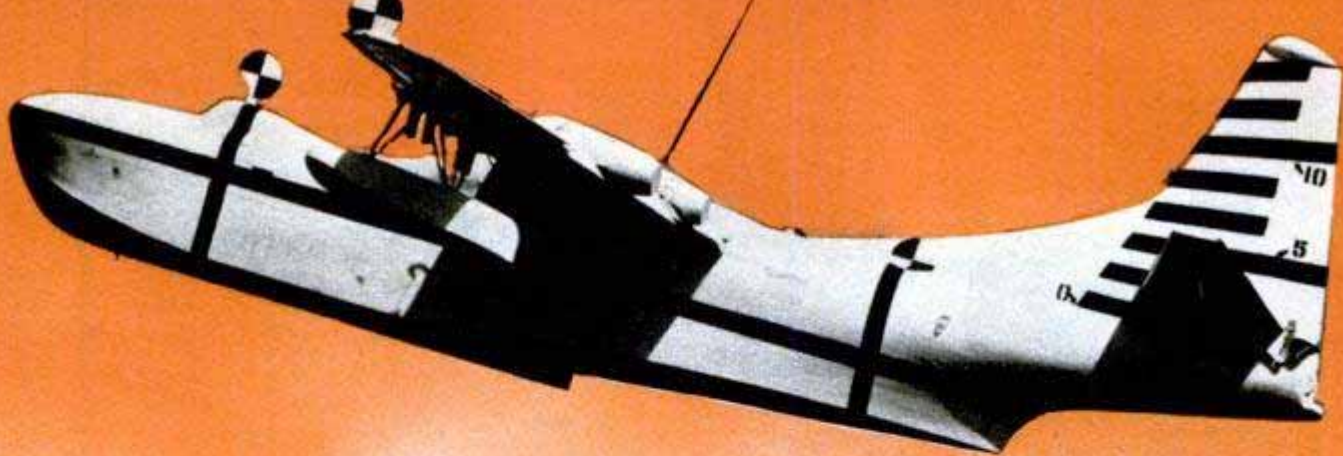


Model cruises back to land after completing test flight. The four two-cylinder gasoline engines each develop $1\frac{1}{2}$ horsepower for the four-bladed props

"Anchor man" holds boat while radio pilot on shore prepares to take over control. The black-and-white markings show attitude of plane during maneuvers

It takes a very hot pilot at the radio cockpit on the beach to fly one of the miniature boats. The scale effect is such that everything happens three times faster than normal. Moderately rough water or rough air is magnified in its effects on the model and take-offs and landings under such conditions require considerable skill.





Flight view of the radio-controlled model for Consolidated's XP5Y-1 patrol plane. Tests that might be hazardous for human crew can be made this way in complete safety

The radio-control cockpit has a typical set of full-size flight controls for operating the model, including flaps, ailerons, elevator, rudder, throttles and ignition. A thumb switch is used to cut in the model's automatic pilot. All the pilot's actions are relayed by a 63-watt six-channel transmitter to a receiver in the model, which in turn actuates the flight and engine controls.

For some experiments an 8-mm. camera placed inside the model's fuselage photographs the dials of a tiny instrument panel on which air speed, trim, hull pressure and time are indicated.

Exteriors of some of the hulls are painted with black grid markings to aid in study of

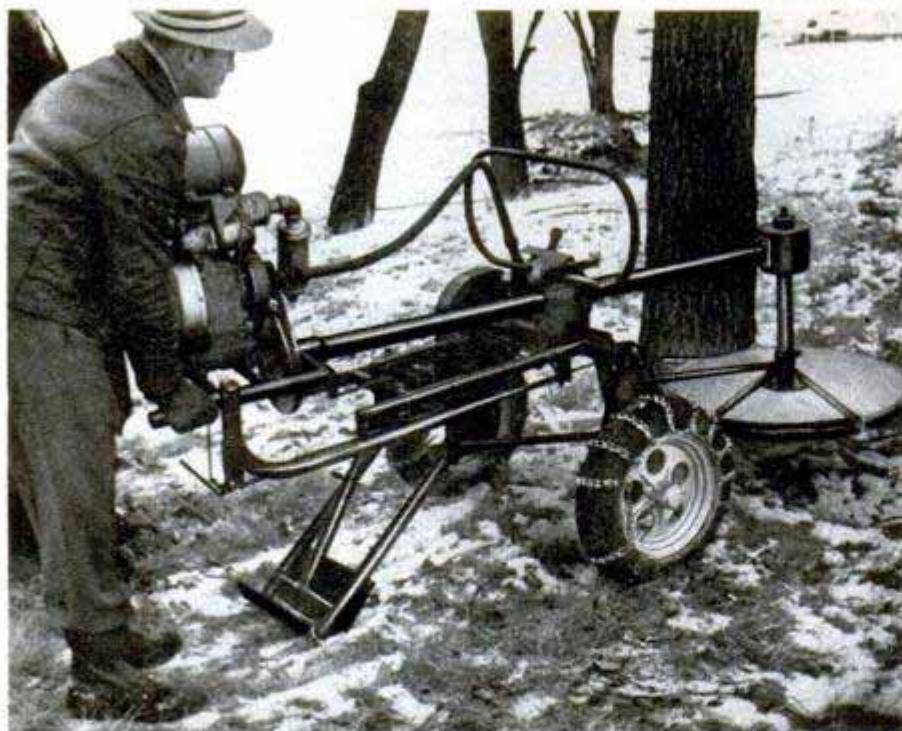
the motion pictures that are made from the beach. Black and white crosses and targets are painted on different parts of the fuselages to show the attitudes of the models in the air during maneuvers.

One nonpowered model, with a wingspan of 14 feet, is thrown from a catapult so that its landing characteristics may be studied under different flap settings.

Virtually any information that is desired concerning a proposed full-size flying boat can be obtained from the "dynamically similar" free-flight models. Convair is continuing its model research program for acquiring basic data on the huge sea-and-aircraft that may be built in the future.

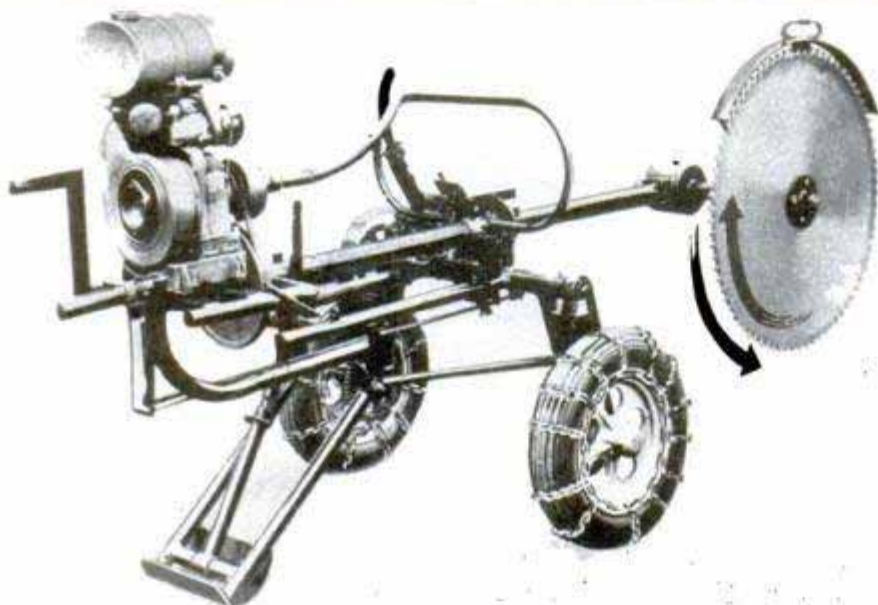
Since scale construction makes things happen three times faster than normal to the models, it takes a "hot pilot" to guide miniature flying boats from landbound cockpit





Double Saw Blades Prevent Bucking

Because its twin blades rotate in opposite directions, a new rotary power saw cuts faster than single-blade saws and without any bucking or jumping. In a demonstration, an eight-inch log was placed on a smooth surface and successive cuts were made without any movement of the log or cutoff sections. The saw can be used horizontally or vertically and has a forward and backward movement independent of the wheels, permitting the operator to move the blades as much as seven feet without disturbing the carriage.



Hardening Steel

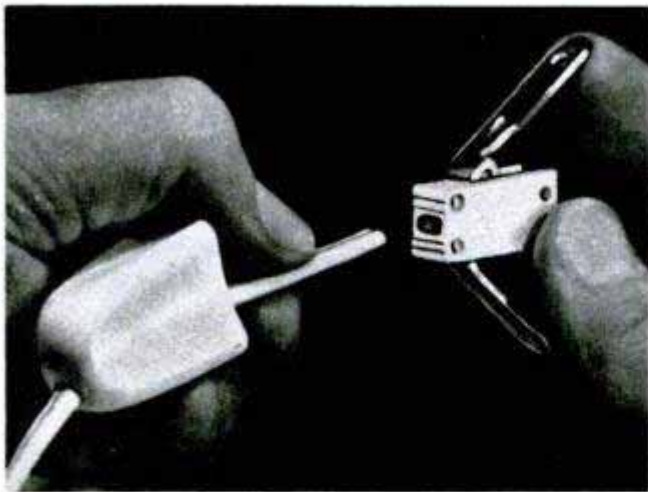
Depth-hardening steel requires no special equipment when a chemical compound is used. The object to be hardened is heated to a cherry red, then dipped or rolled in the powdered compound. Heated again, the metal is quenched in cold water or brine. According to the manufacturer, wire nails hardened by this process will cut into an automobile spring leaf.

Strawberry Wall

Strawberries grow from the wall of a stone barbecue built by Maurice R. Phelps of Santa Ana, Calif. When Phelps built the barbecue he left spaces between the stones. Later he filled these crevices with dirt, sand and leaf mold and planted strawberries. The plants grow on the south wall where they absorb a great deal of the sun's heat, and the rocks retain heat during the night.



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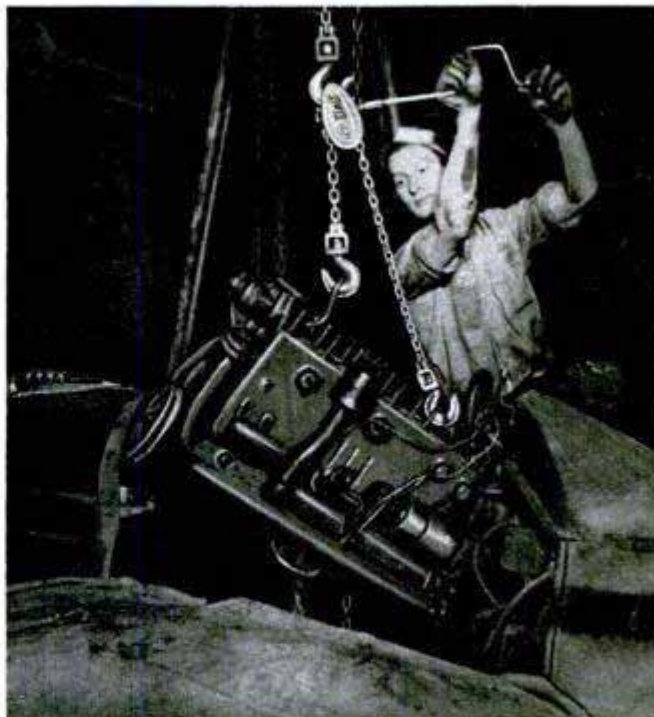


Automatic Electric Plug

You don't have to be an electrician or even a handyman to put a new plug on an electric cord now that an automatic plug is available. The plug comes in two parts, an outer shell and an inner core. When the core is removed, its two prongs pivot outward and the cord is pushed into a center hole without stripping or slitting the insulation. When the prongs are forced back into normal position, two sharp points penetrate the insulation to make the connections. The core is then replaced in the shell.

Fire Extinguisher for Vehicles

Fires that start under the hood of an automobile or truck are put out automatically by the smothering fog that pours from a new extinguisher. The safety device is mounted permanently on the engine side of the car's fire wall. Whenever the temperature under the hood reaches 255 degrees, a fusible clip melts, releasing a coiled spring plunger which shatters a glass grenade filled with carbon tetrachloride. Because the boiling point of this fluid is only 168 degrees, it leaves the container as a vapor which envelops and smothers the flames. The grenade also can be lifted out of the extinguisher and used manually to put out nearby fires.

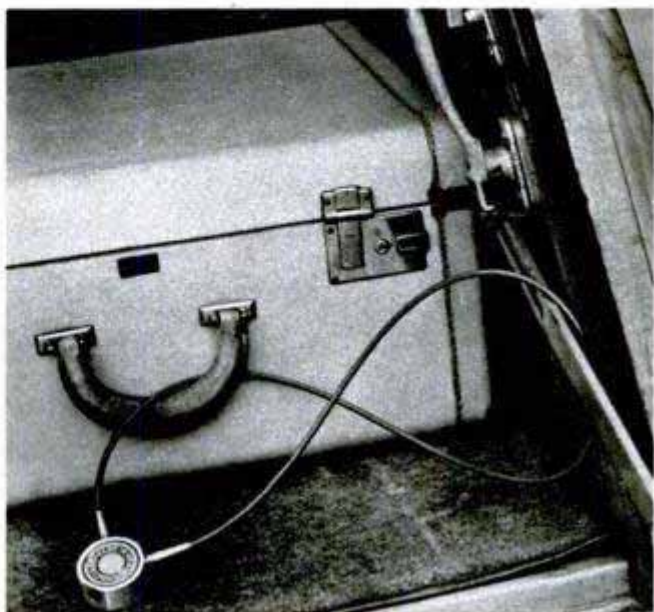


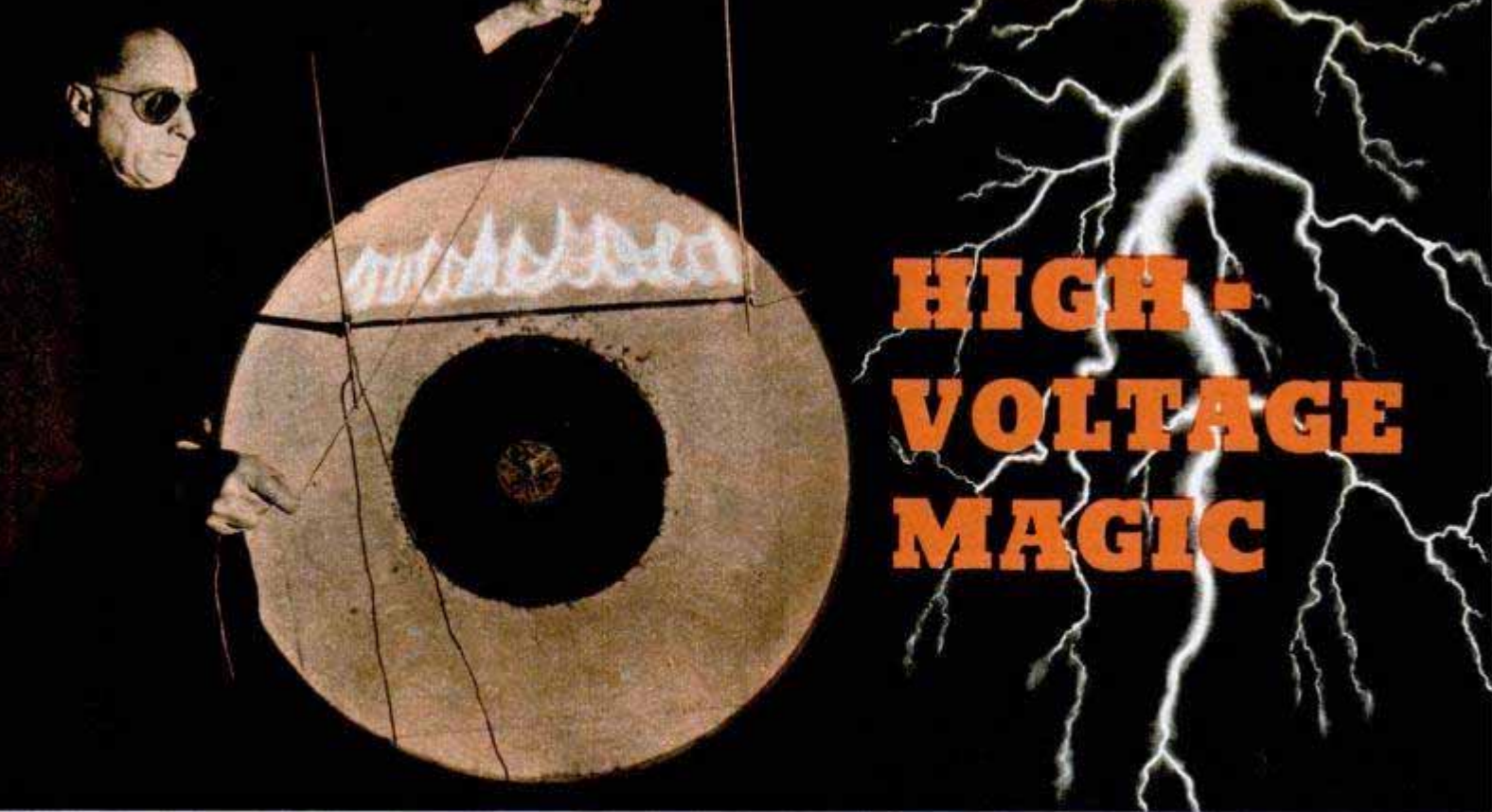
Chain-Hoist Accessory Tips and Holds Load

Heavy loads lifted by chain block or electric hoist are tipped to any desired position and held there by a self-locking worm device attached to the lifting hook. A socket wrench drives the worm gear. With a capacity of 2000 pounds, the device has many applications, although it was designed for auto repair shops where it speeds the pulling and installing of engines.

Cable Lock

Suitcases, bicycles, boats and other movable objects are protected from theft by a new cable lock. The cable, covered with a Vinylite sheath, is 36 inches long. On one end is an aluminum padlock. The other end snaps into the padlock and can be removed by turning a key in the lock.





High-voltage current from the screen leaps between two vertical electrodes, causing this electrical flame

By Eugene M. Hanson

Photographs by the Author

WHEN THE mad scientist in the movies pulls the switch and his fantastic machinery begins to hum and glow, causing flashes of man-made lightning to leap and crackle around the room, you can be fairly certain that Kenneth Strickfaden is somewhere in the picture.

Ever since he created the electrical effects for "Frankenstein," Strickfaden's genius has been in great demand among motion-picture producers when spectacular laboratory trickery can be made to fit into the plot.

Strickfaden not only created the effects for "Frankenstein," but also doubled for Boris Karloff in sequences which called for million-volt sparks playing over his body.

Since then, he has added his wizardry to "Son of Frankenstein," "Bride of Frankenstein," and the other sequels; the "Buck Rogers," "Flash Gordon," "Sherlock Holmes," "Chandu," and "Fu Manchu" features—altogether more than 50 movies in the last 15 years.

Although the movie producers insist that Strickfaden is the only man to be trusted with such high-voltage trickery, he says frankly that there are no mysterious secrets to what he does. It's a matter of combining well-known principles of electricity with principles of showmanship.

He has designed machines for producing and controlling extremely high voltage, extremely high amperage and high-frequency electrical currents. He builds all the machinery in his home workshop.

Merely producing the high voltage or high amperage is fairly simple. Any clever student of high-school science might be able to do it, but keeping the currents under control calls for more knowledge. His own apparatus is relatively safe, but Strickfaden warns that high voltage not kept in proper balance can be dangerous.

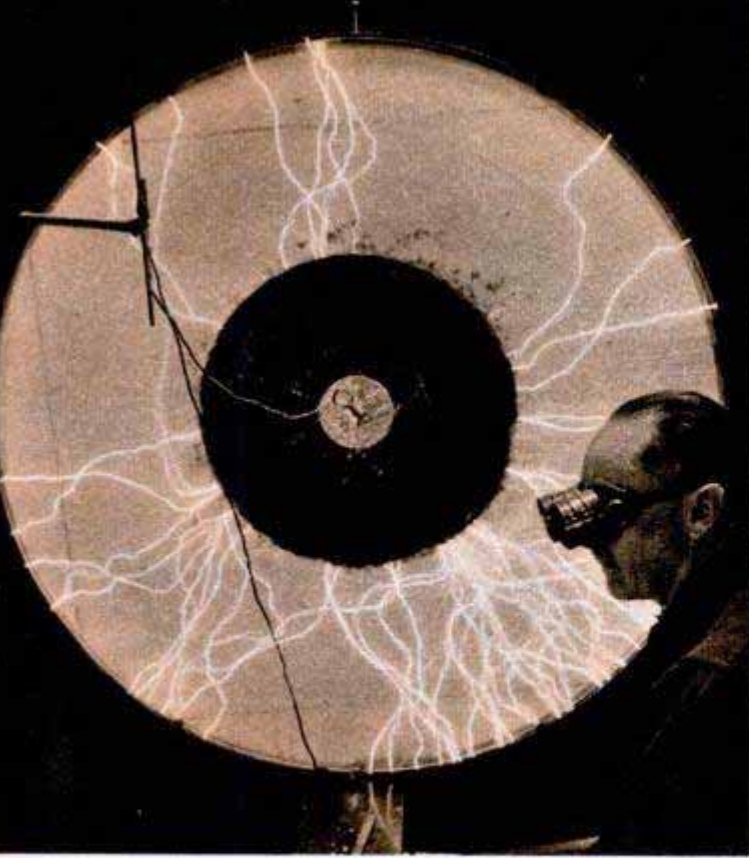
One of the key pieces of equipment which Strickfaden uses is his million-volt generator. This device produces the biggest sparks, fat, blue flames which stab six feet into the air, and is the most complicated in design of his inventions.

This generator operates from regular alternating current of 110 volts.

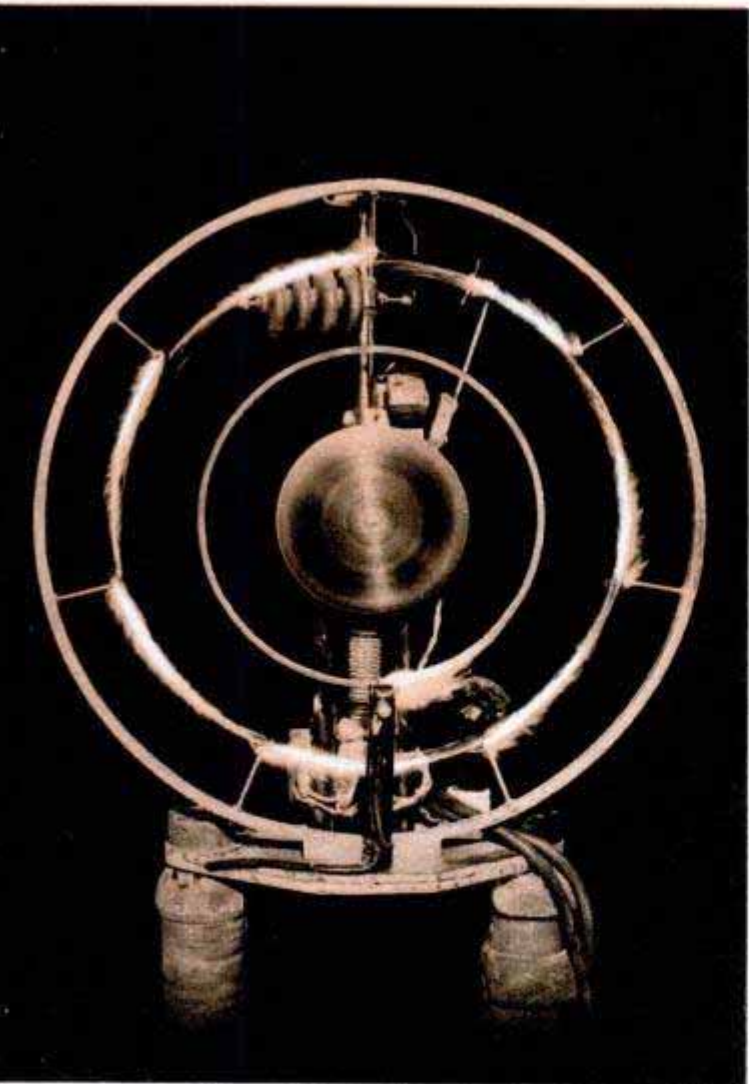
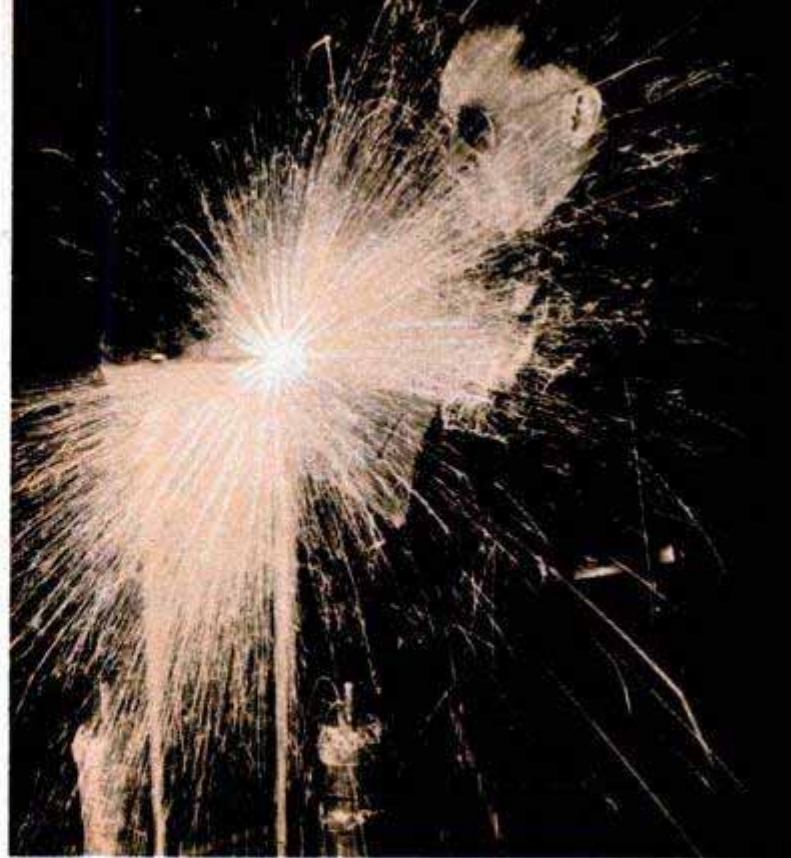
As the first stage in the boost to a million volts, the current passes through a transformer which raises it to 20,000 volts. It then enters his multistributor device, a rotary switch which allows a loaded condenser to discharge into the primary circuit of the million-volt resonator.

The multistributor consists of a motor-driven, whirling electrode with five points. At great speed these points pass another electrode with a set of seven points. As each point of one electrode passes a point of the other, a 20,000-volt spark occurs. These sparks form featherlike flashes between the two rings. The inner electrode spins at a speed of about 1000 revolutions per minute.

The make-and-break effect of these sparking electrodes charges and discharges the high-capacity condenser into the 10-



Above, the circular screen has a radioactive coating that holds an image of the lightning after the current is turned off. Above, right, as many as 10,000 amperes are used to produce these electrical fireworks on the pyro-geyser. Below, the multistributor spins 1000 times a minute to form feathery sparks



turn primary of the resonator, which has a secondary winding of 1000 turns.

Sparks which leap from the resonator, although they will cross a six-foot air gap, have enough amperage to cause acute discomfort, but could not be considered dangerous, Strickfaden says. A shock from the multistributor part of the circuit, however, would certainly be fatal.

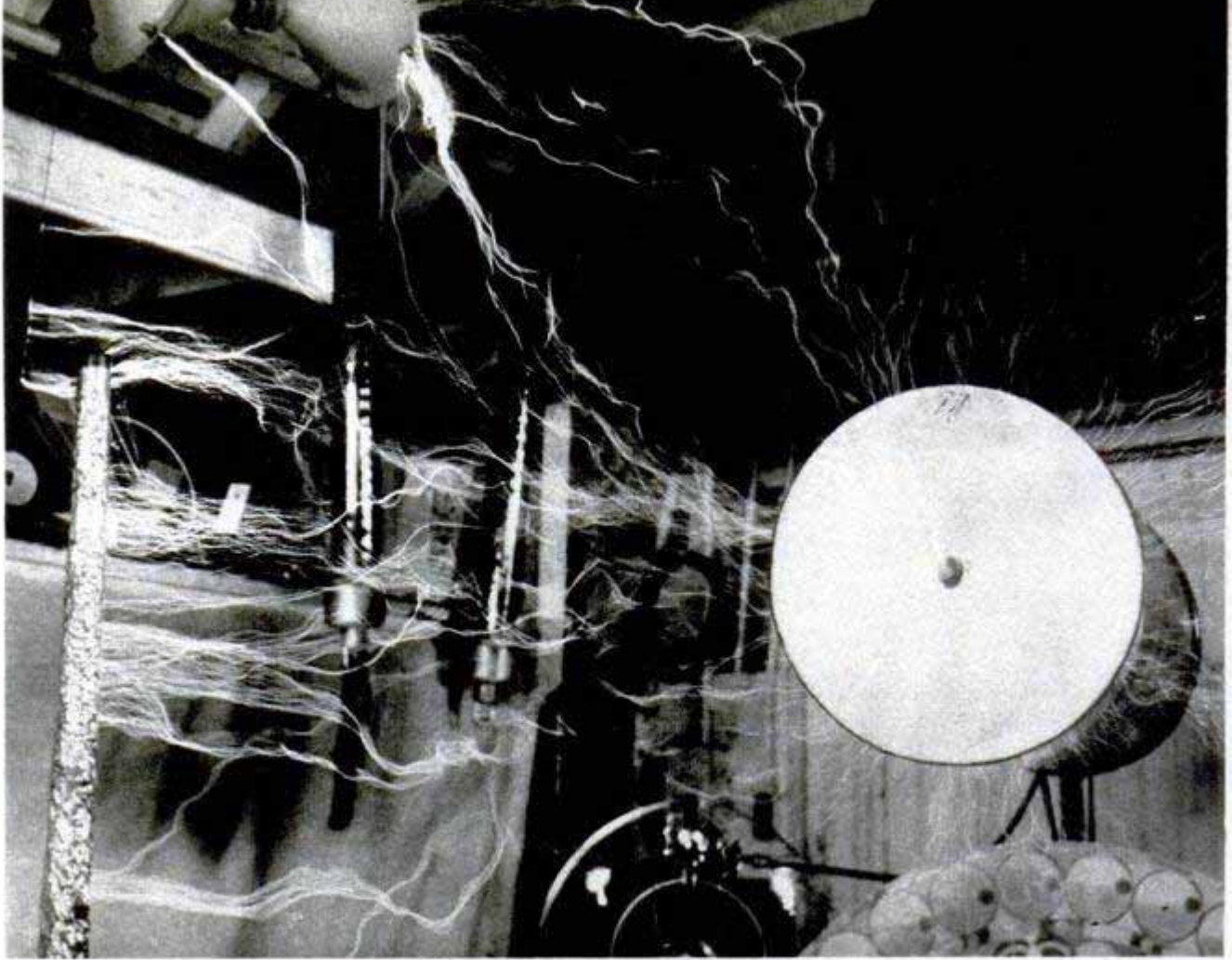
When this huge generator discharges for only a few seconds, the air becomes acrid with the smell of ozone. Radio and television reception is disrupted for blocks.

Actually, the generator is something of a radio station, broadcasting on a frequency of 40 kilocycles. It could be used as a receiving set, if some station were broadcasting on that frequency.

Another device which employs high voltage and which Strickfaden uses for some of his spectacles is called a "lightning screen." This is a high-voltage generator which discharges its sparks across a disk with a radioactive backing. When used on a darkened stage, the radioactive material continues to glow along the path of each spark after the current is turned off.

Current from the same device produces an electrical flame when the current is brought away from the screen to a pair of electrodes. The only connector between the two electrodes is a moistened stick of wood, to provide a path for the spark, which climbs to the top of the upright electrodes.

Extremely high amperage produces sparks in a "pyro-geyser" display that results from the use of a transformer. This particular transformer is somewhat unusual in that there is only one turn in the secondary coil. When the contact is made



The room is filled with sparks, some more than six feet long, when the million-volt generator is operating

between the two iron points of the pyro-geyser, as much as 10,000 amperes of current can flow, with the resulting flash of vaporizing metal as heat is generated.

This device is similar to an arc-welding machine, except that it employs a much heavier current than the amount consumed by either an a.c. or d.c. welding outfit.

Preparing more magical equipment, Strickfaden uses a torch on a piece of tubing in his workshop lathe



The nature of the sparks thrown out by the pyro-geyser varies with the type of alloy used in the electrodes.

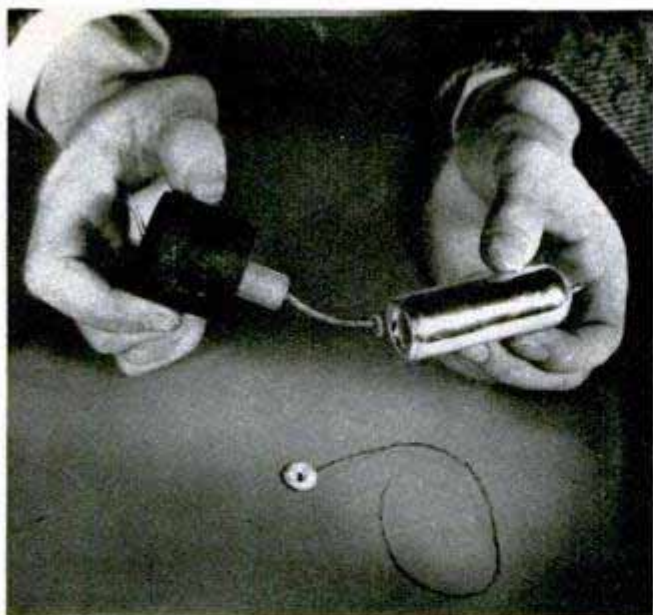
Besides staging electrical phenomena for the movies, Strickfaden designs and builds weird-looking scientific props, such as a Buck Rogers gun for use in the imaginative and futuristic films.

More important to him now than his movie work is his educational career. He presents spectacular science shows for high-school programs throughout the country, explaining each trick in terms linked to the students' own study of physics.

Often, he is called back to repeat his programs, and on those occasions he is pleased when the students can show him small replicas which they have built of his startling machines.

For the school programs, Strickfaden also creates music with electrical instruments of his own design, he demonstrates brilliant lighting effects with ultraviolet light on radioactive materials, baffles the students with his "gravity neutralizer" and broadcasts with a tiny radio station powered by a flashlight battery.

He is planning even more elaborate musical instruments and still more spectacular high-voltage equipment. Most of his spare time now is spent in his home workshop, preparing the various parts which will be used in his coming creations.



Midget Teakettle Measures Altitude

Water boils and freezes at the same time in a midget teakettle that soars to altitudes of 30 miles in Army weather balloons. Called a hypsometer, the tiny teakettle, which looks like a radio tube, broadcasts altitude reports back to earth during the flight. Operation of the hypsometer is based on the principle that the boiling point of a liquid drops as altitude increases. As the water in the vacuum flask of the teakettle boils, the temperature of the resultant steam changes the electrical resistance of a sensitive resistor. This changing resistance is radioed back to earth where it is converted into temperature reading and altitude. When the balloon reaches heights at which the boiling point of the liquid drops below its ground-level freezing point, ice forms even though the liquid is still boiling. The device is accurate to within 100 feet at heights of 20 miles.

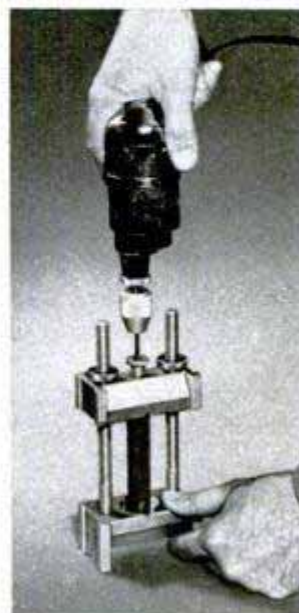
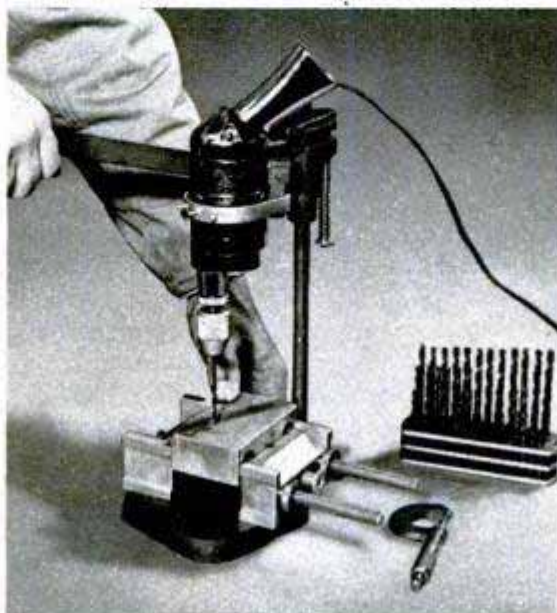


Portable Respirator

Portable and battery-operated in emergencies, a new respirator or iron lung can be adjusted to a baby or an adult and provides a wide range of respiration speeds. Six plastic shells of graduated size are supplied with the respirator. There are no back shields to disturb the patient and the shells cover only a small portion of the body, permitting treatment of the patient. The respirator operates from 110-volt current but in the event of power failure it instantly switches to battery operation. The battery also makes it possible to move the patient by ambulance, train or airplane. As a final safety feature, the unit can be operated by hand if necessary.

Combination Drill Jig and Drill-Press Vise

Small enough to be carried in a tool kit, a versatile tool has many uses ranging from a jig for end-center drilling to a vise for drill-press work. Four sides and one end are milled to assure exact alignment when used with a drill press. Included with the tool are a combination center and centering cone and also a drill-jig bushing. Inner surfaces of the two cross pieces are V-notched for holding square and round stock. The tool also can be used as a clamp for gluing small pieces.





HOSPITAL for sick cars

By Andrew Hamilton

BILL MORGAN is the assistant manager of a chain grocery store in Los Angeles and earns \$3120 a year—pretty close to the average American income. Not long ago he and his pretty wife Marjorie reviewed the family budget to see if they could afford a new car.

Out of the \$60 weekly pay check, income tax, payments on the house, food, utilities, insurance, gasoline, clothing, medical expenses and entertainment came to \$54. That left only \$6 for miscellaneous items.

"Guess we can't buy a new automobile yet," Marjorie said.

"Nope," agreed Bill sadly. "We'll have to make 'Old Betsy' run for a while longer—even though she's 12 years old."

Since the end of World War II, approximately 10,000,000 persons have bought new cars and another 3,000,000 orders are on the books. But what of the remaining 27,000,000 car owners in the United States—about half of them with "over age" vehicles—who can't invest \$1500 to \$2500 in a new automobile? How can they keep their old cars running until they can buy new ones?

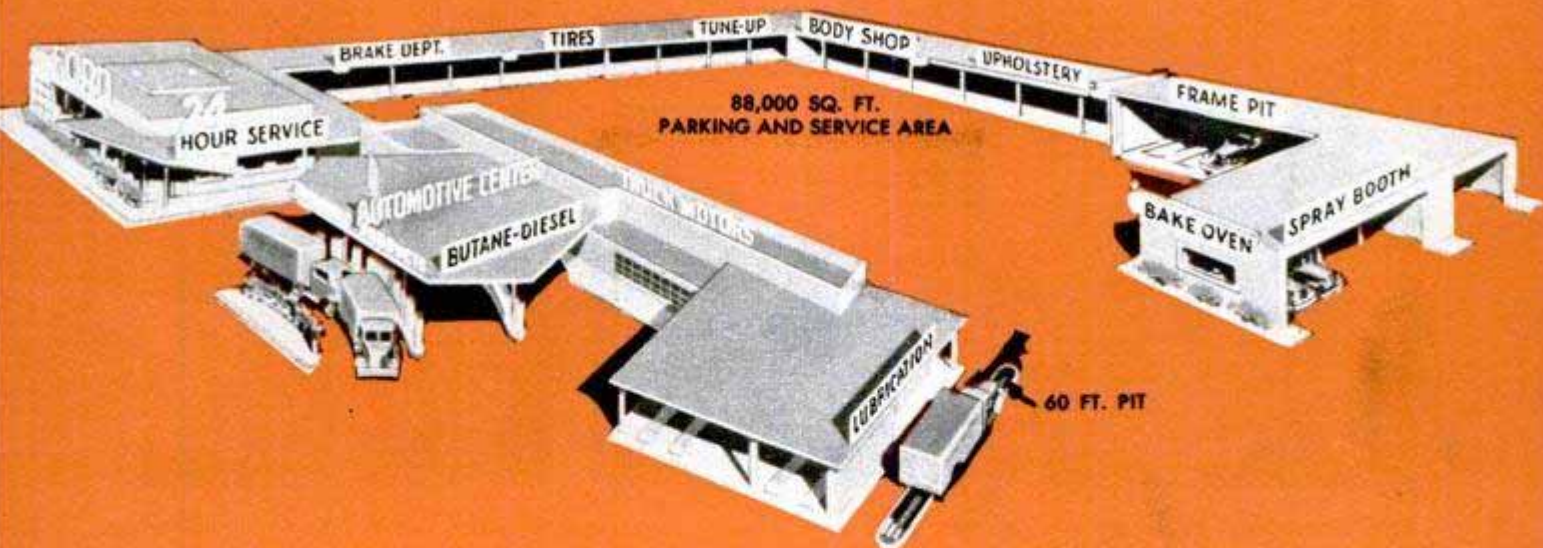
A man who has found an answer to these questions is John P. "Jack" Snyder, president of Snyder-Lynch Motors in Burbank,



Calif. He recently opened the Automotive Center—a \$500,000 assembly-line repair and overhaul establishment said to be the largest and most complete in the world. It is a hospital for sick cars, a modern idea in automotive engineering for rejuvenating the millions of old vehicles on America's highways that otherwise would be heading for the scrap heap.

Snyder is a husky, easy-going gent who wears a pearl-gray Western stockman's hat like President Truman. A veteran Ford dealer, Snyder is now up to his ears in the automotive repair business. He's using the same formula that brought success to scores of American business firms: Give the average or low-income worker a decent product at a price he can afford to pay.

Snyder's mechanics will take your car, install a rebuilt motor, tighten up the steering assembly, reline the brakes, put on four new tires, install seat covers, straighten dents in the fenders, put in new floor



Scientifically designed for assembly-line operation, the Automotive Center spreads out over a city block

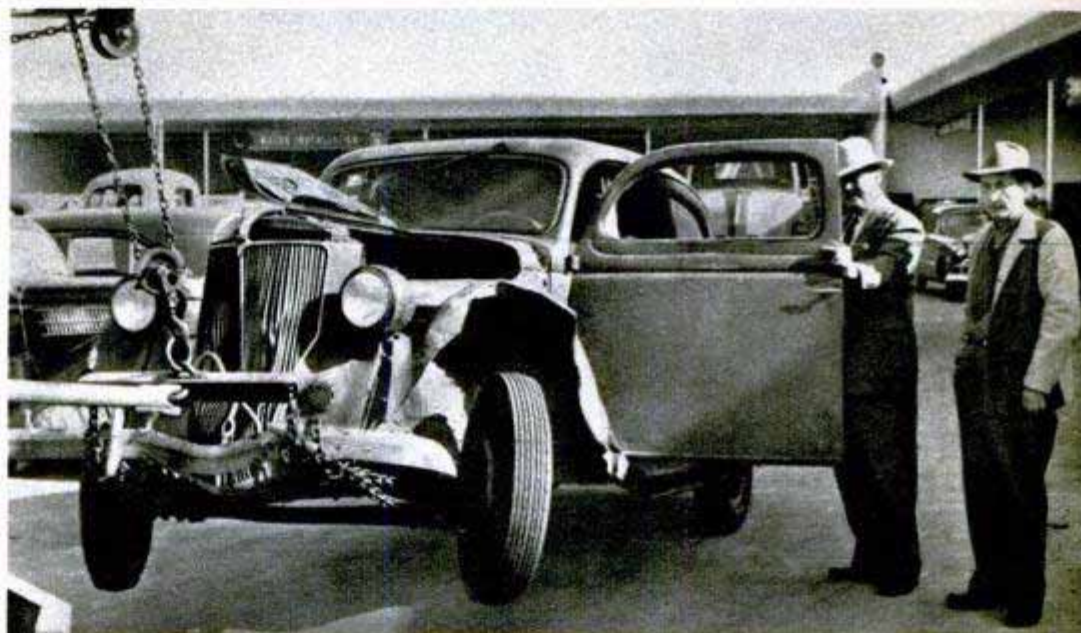
coverings, repair the clutch, steam-clean the chassis and give the body a gleaming coat of paint.

"It won't have all the streamlining and fancy accessories of the 1949 models," he said, "but it will be good, sound transportation that will be dependable for years to come."

The cost? Approximately \$350 for the entire job—and less if your car is in better-than-average condition. The complete overhaul can be paid for at \$3.98 per week, a sum which will not put too much of a strain on the average American budget.

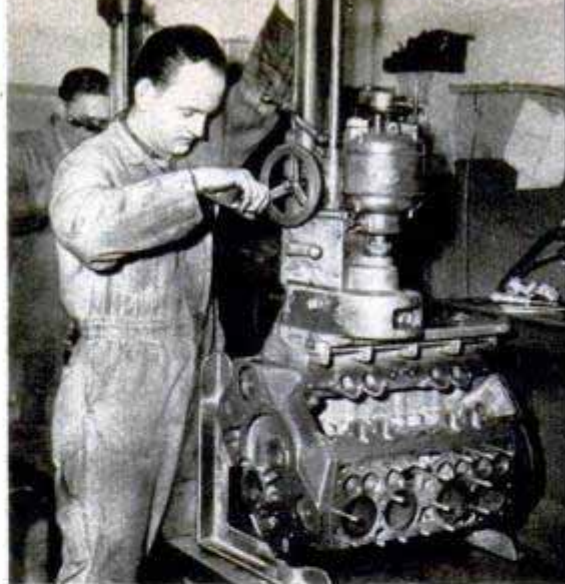
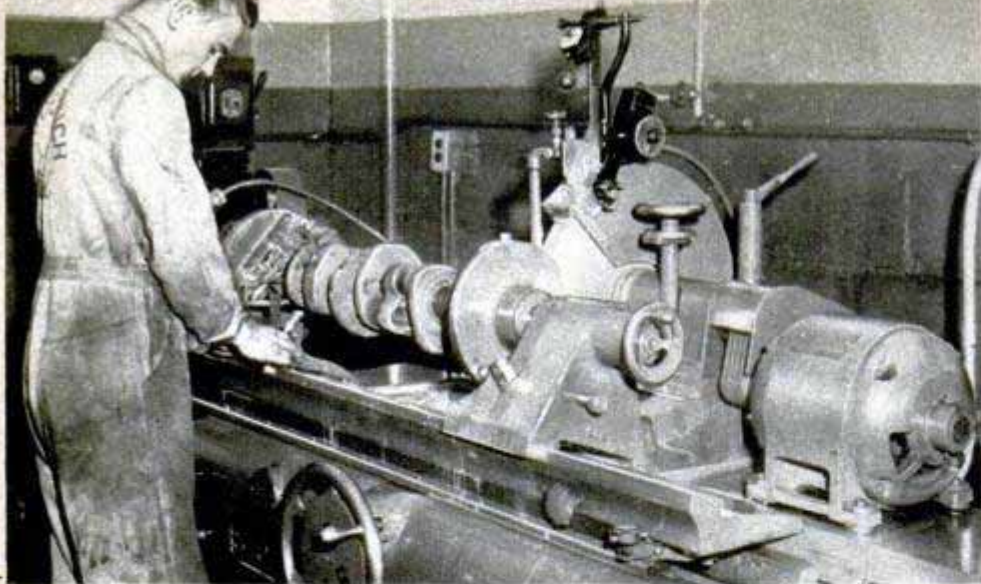
Snyder's new Automotive Center is a far cry from the alley garage run by a jack-of-all-trades mechanic and his youthful helper. Snyder has adapted the assembly-line techniques of Detroit to the overhauling and rebuilding of used automobiles. The idea is attracting nation-wide attention. Automotive experts from Canada, Chicago and New York have made special trips to California to look over "Jack Snyder's baby."

SEPTEMBER 1949



Before and after views of a "patient" offer an amazing study in contrast. Above, a 1936 Ford is towed into the hospital to be rejuvenated. Below, a few hours and \$350 later, the same car starts on its second childhood

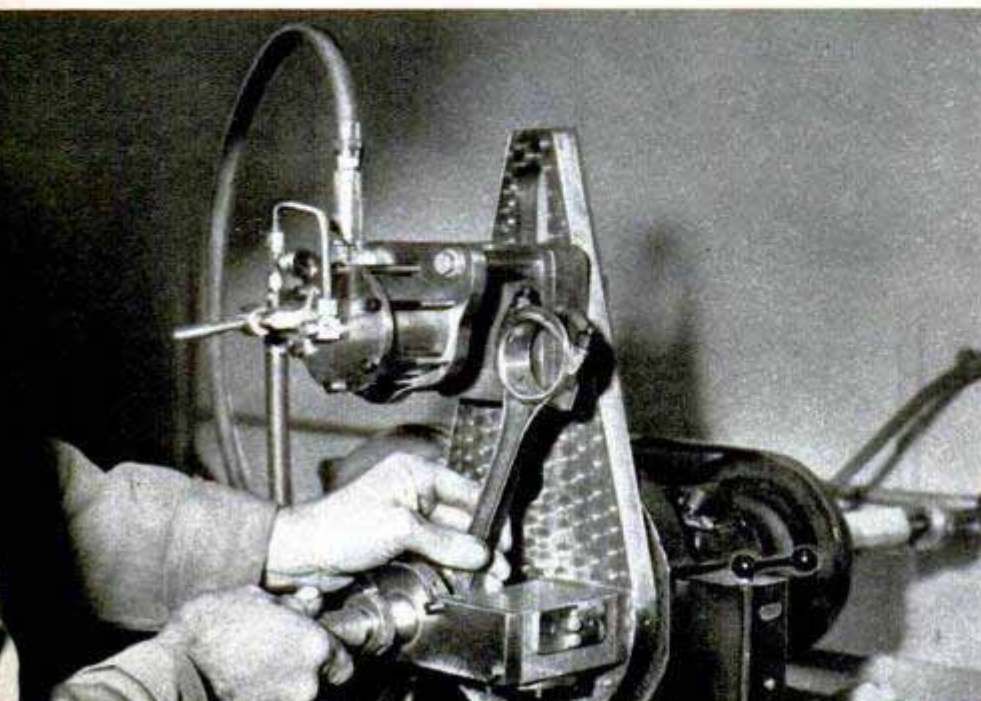




Left, crankshafts come off this grinding machine like new. Right, cylinders are rebored to exact diameters



Above, assembly-line methods are used to speed the reconditioning of engines in the Automotive Center. On wheeled cradles, the motors roll along elevated tracks as parts are added. Below, bushings of connecting rods are reconditioned on a specially designed grinder



Executed in modern architecture, the Automotive Center covers an entire city block on U. S. Highway 99, one of the heaviest traffic arteries in the nation. It services not only passenger cars, but the biggest trucks on the Los Angeles-San Francisco run as well. Used cars are overhauled for a number of other California dealers because Snyder-Lynch can do the job cheaper than the dealers themselves.

Approximately 150 skilled mechanics (many of them veterans who worked on tanks, trucks, planes and ships during the war) are on the staff. "We train men in our own shops to be top-notch experts in one particular operation," Snyder said. "In a few weeks they become more proficient in their specialty than an all-around mechanic who has spent a whole lifetime learning a hundred repair operations."

Although Snyder is a Ford expert (he's had the Burbank dealership for nine years), the Automotive Center is designed to handle Chevrolets, Plymouths, Pontiacs, Dodges, Oldsmobiles, Buicks, DeSotos, Mercurys, Chryslers, Cadillacs and Lincolns as well as Fords. "That's about 90 percent of the cars on the road today," said Snyder.

The Burbank repair center is in operation 24 hours a day, 7 days a week. Theory behind this round-the-clock



It may be hard to believe, but this is the same car, before and after. Even the new-car smell has been added

schedule is that many persons would be severely handicapped if their transportation were tied up during working hours. Under the assembly-line system of making repairs, a motorist can turn his car over to the mechanics at 7 p.m. and take it away at 7 the next morning.

If it's a small repair job, he may wait in the comfortable, redwood-paneled lounge which offers radio, television, reading matter and a snack bar. Truck drivers may even take a shower while waiting for repairs or a grease job.

"During the war," Snyder explained, "we put on a night shift to accommodate workers of the Lockheed Aircraft plant who could not put their cars in a garage during the day. That gave us the idea that the general public would like overnight service.

"And you'd be surprised at the number of men who like to watch their cars being lubricated. They've put a lot of dough into their buggy and they want to see that it receives the best possible care. We're prepared to take care of these people at night or on Saturdays and Sundays."

To get an idea of how the new automobile hospital works, let's follow Bill Morgan through the Automotive Center and watch his 1936 Ford being reconditioned.

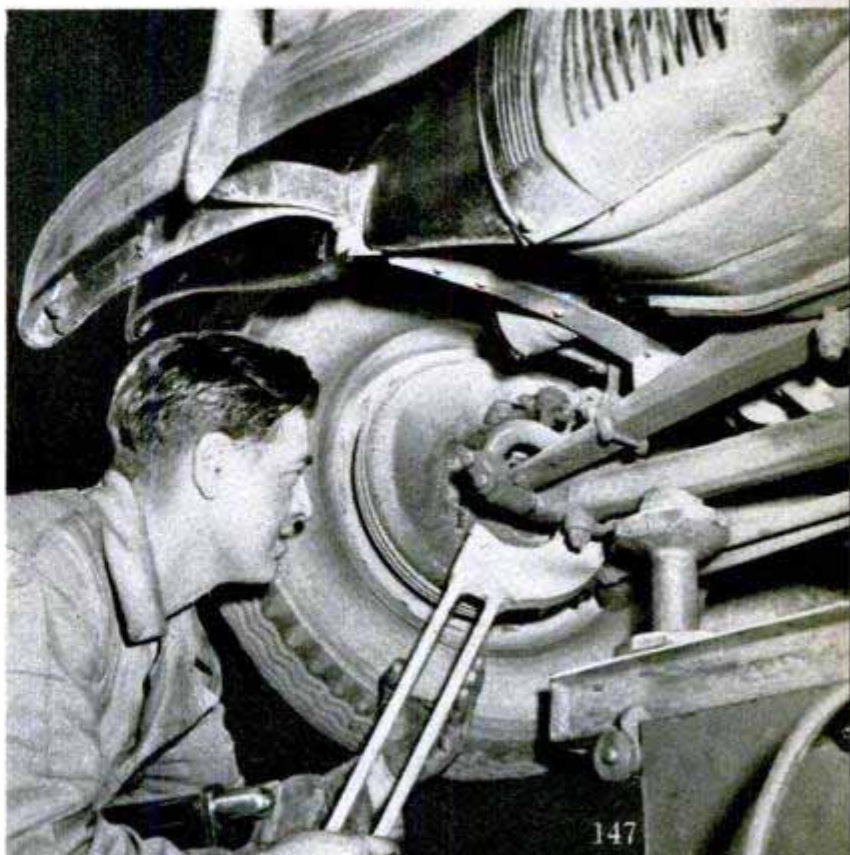
When Bill drove it into the huge establishment, one of the four service managers gave it a careful check-over. He was as thorough as a doctor diagnosing the aches and pains of a sick man. He didn't depend wholly upon his eyes and ears, but used many of the latest mechanical and electrical testing devices.

It was obvious, of course, that Bill's car

needed new tires, upholstery and a paint job. The motor had gone more than 100,000 miles so a rebuilt engine was recommended. The clutch, amazingly enough, was in pretty fair shape and might have lasted for another 15,000 miles. But since the car was in for an overhaul, Bill figured it would be cheaper to get a new clutch now than later.

One of the machines for diagnosing the troubles of a sick automobile is the Weaver

The mechanic is getting ready to straighten a bent axle. A special rack holds the car at working level



mains inside the water jacket. Once this is removed, the cause of the overheating is gone."

From the engine department, Bill's Ford went to the brake department where new, precision-lined shoes were installed and the brake drums ground smooth on a special lathe. Hand and foot brakes were adjusted. Wheel bearings were cleaned and packed.

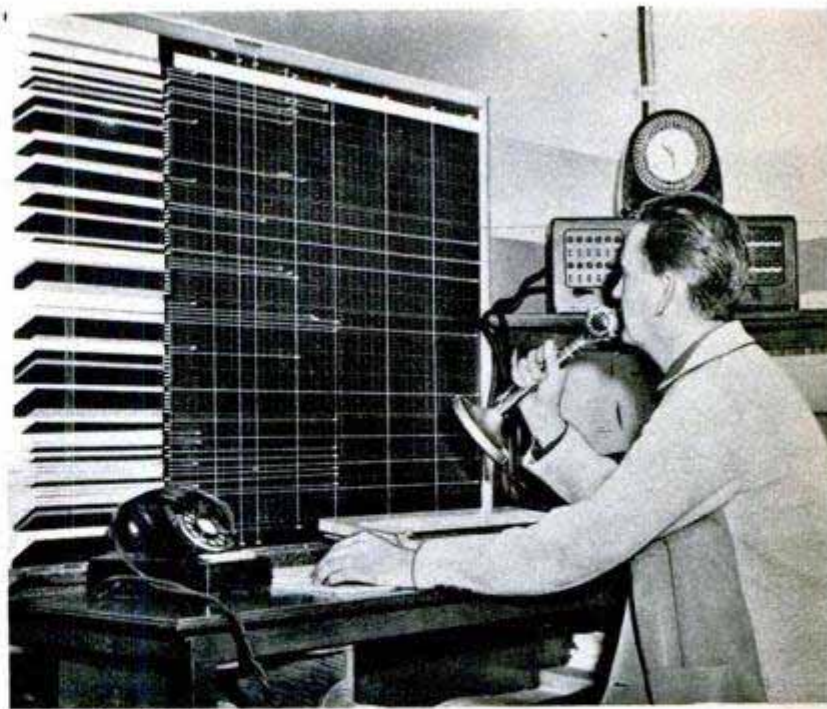
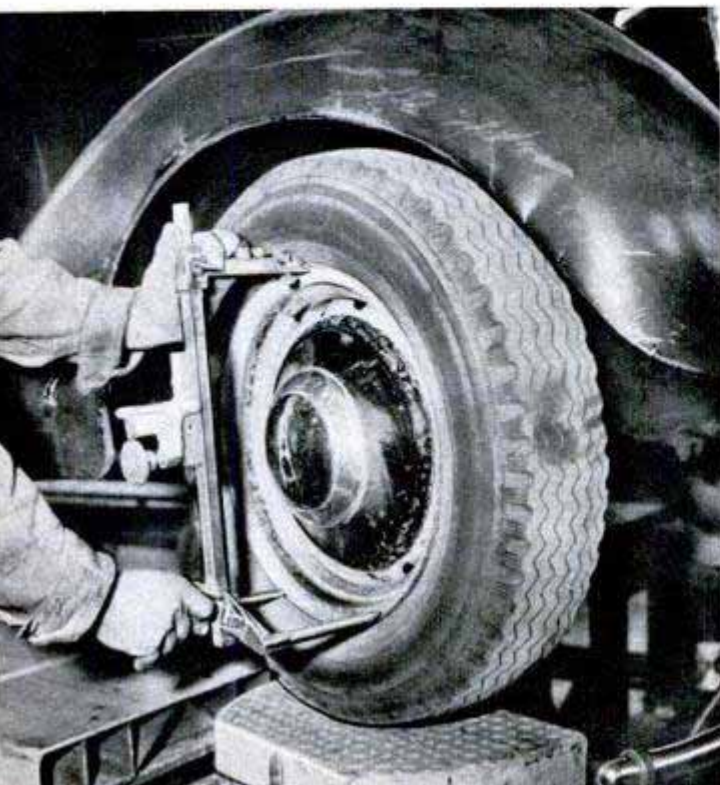
Next was the tune-up department where skilled mechanics install new spark plugs and distributors, tighten battery connections, test coils and generators and install carburetors. But since Bill's car was getting a completely rebuilt motor—already tuned to new-car performance—his Ford skipped this stop.

The body shop and frame pit was next. Here a crooked frame and axle were straightened and dents taken out of the fenders. Skilled mechanics, working with the best tools, made the operation look as easy as rolling wrinkles out of a pie crust.

When it came to tires, seat covers and paint job, Bill had a wide choice. He could select what he wanted from among six makes of tires, a dozen kinds of seat covers and for the paint job he could choose from more colors than there are in a Hawaiian rainbow. He settled for a light gray that wouldn't show the dust. Expert painters gave it the same quality paint job it had when it rolled out of the factory.

When his car was ready to be greased, Bill followed it to the 60-foot lubrication pit—big enough to take three ordinary passenger cars or the biggest truck-and-trailer rig on the highway. This specially designed grease rack, in operation day and

Every operation requires its own special piece of equipment. This mechanic is testing wheel balance



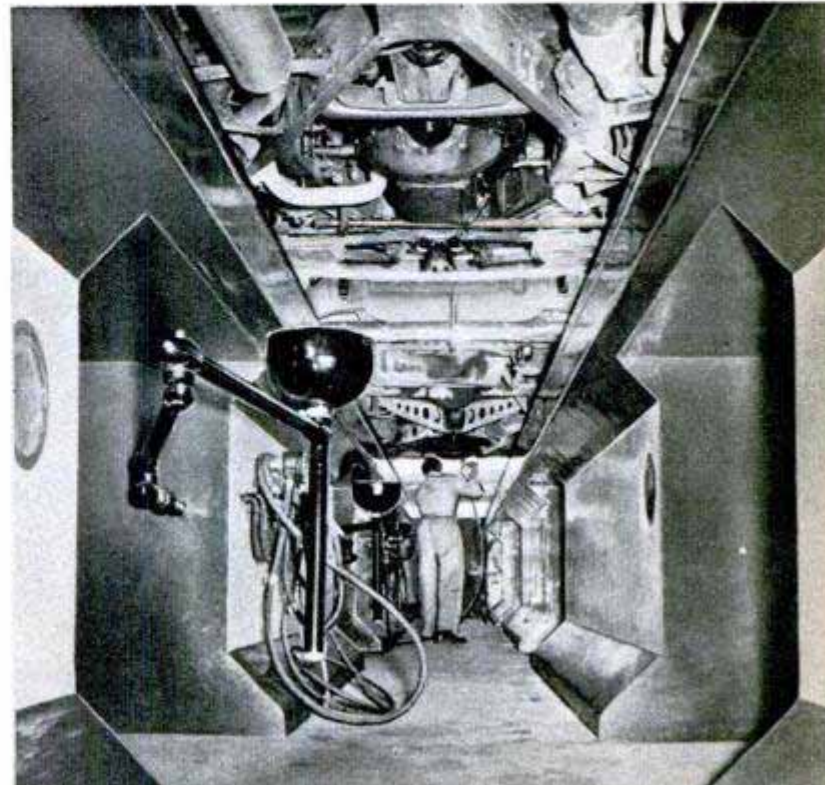
A progress chart is kept on each car. Two-way communications system throughout the shop saves time

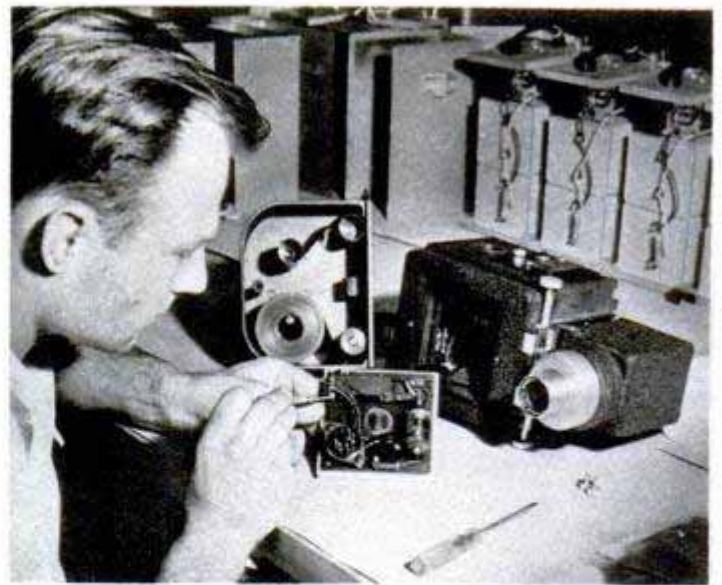
night, is illuminated by fluorescent lights. Water, air, oil and grease outlets are wound around overhead reels—a pull-down type of installation that eliminates hoses, tanks and other obstructions on the floor.

Bill's car was ready for delivery. It gleamed with its new coat of paint. The carefully tuned motor purred smoothly and powerfully. The body had a solid feeling about it now that the squeaks and rattles were gone.

"Even has a new-car smell," he observed as he drove his new-old car down the highway to start its second 100,000 miles.

Sixty feet long, the grease pit will handle three cars at a time. Even huge trucks are serviced here





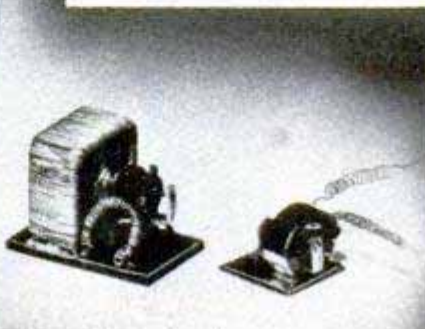
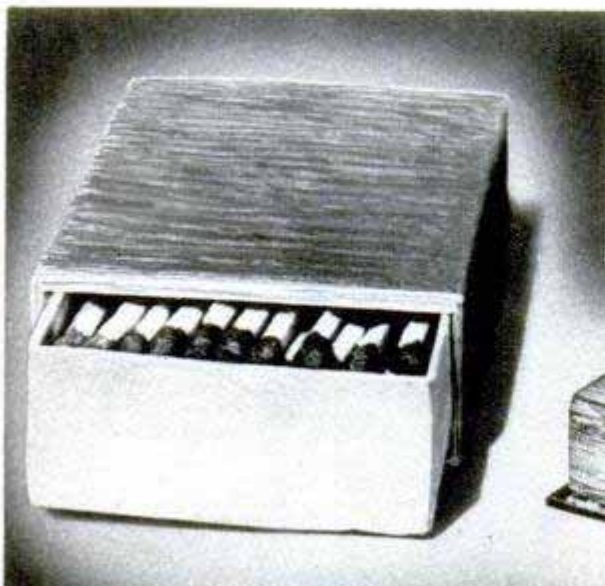
Push-Button Camera Takes Identification Photos

Picture-taking with an electric identification camera is foolproof—all you do is focus and press the trigger. Automatically, the shutter is tripped, flash lamps go off, identification markings are exposed on the negative and fresh film is advanced ready for the next exposure. Especially designed for taking identification photos of large

groups, the camera uses 110-volt current and has a large view finder that is corrected for parallax. In addition, the camera, which takes 70-mm. film in 100-foot rolls, will copy engineering drawings or blueprints up to 34 by 44 inches and will enlarge the negatives up to the original drawing size when used as a projector.

Tiny Electric Motor Makes Matchbox Look Huge

Weighing only .4 gram, a tiny electric motor is said to be the smallest ever built. The magnet of the motor is made of 180 coils of wire, and the entire power plant measures only slightly more than $\frac{1}{4}$ inch high. It makes about 8000 revolutions per minute on $\frac{1}{2}$ -volt, a.c. Johann Schoissengeier of Karlsruhe, Germany, built the motor and another slightly larger model which will operate on either a.c. or d.c. Schoissengeier is an artist who makes the tiny power plants as a hobby.

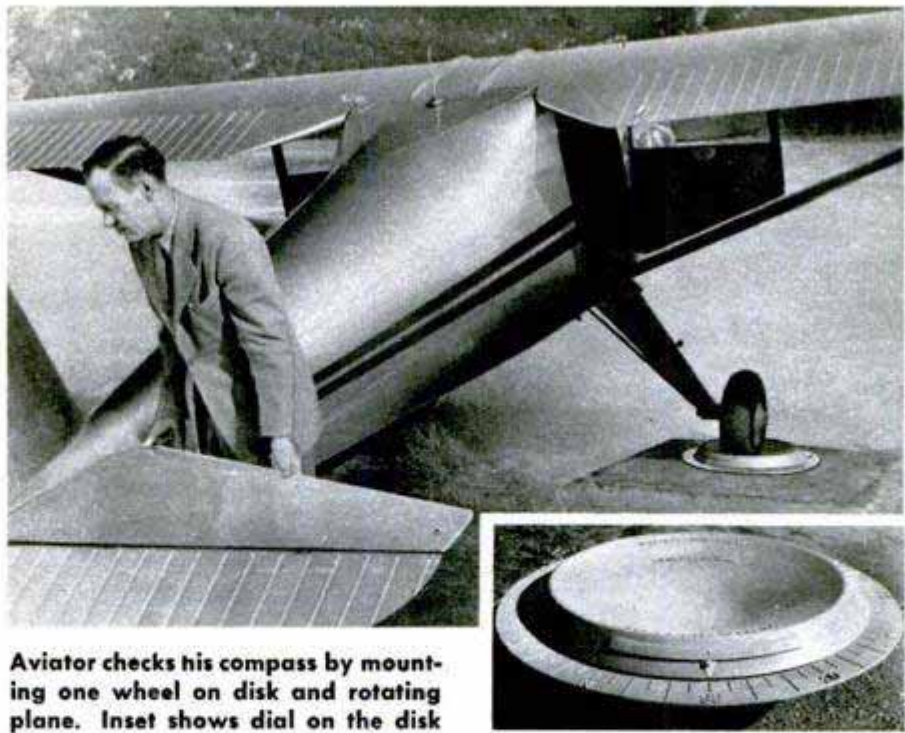


Made by a German artist, this midget electric motor was assembled under strong magnifying glass

Left, a comparison of a matchbox and motors. Three of the motors fit inside a hazelnut shell

Aircraft Turntable Checks Compasses

Aircraft compasses can be quickly checked for accuracy and any errors corrected with a compensator that is embedded in concrete at the airfield. The old method of compensating a compass was to maneuver the plane to definite headings on the ground which were determined by reference lines from a compass rose painted on the field. The new compensator is a bowl-shaped disk free to turn on a base plate which contains a compass rose dial. The aircraft is headed approximately north and one wheel rolled onto the turntable. The plane then is rotated until the heading is magnetic north. With a pointer set at zero, the directions are de-



Aviator checks his compass by mounting one wheel on disk and rotating plane. Inset shows dial on the disk

termined by swinging the plane until the pointer indicates the desired reading. The compass is then compensated for error.

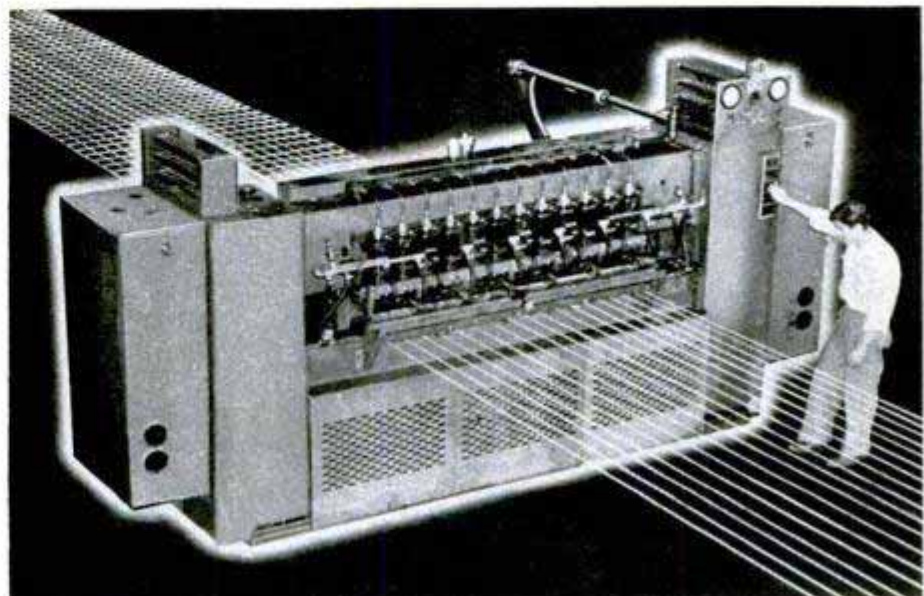


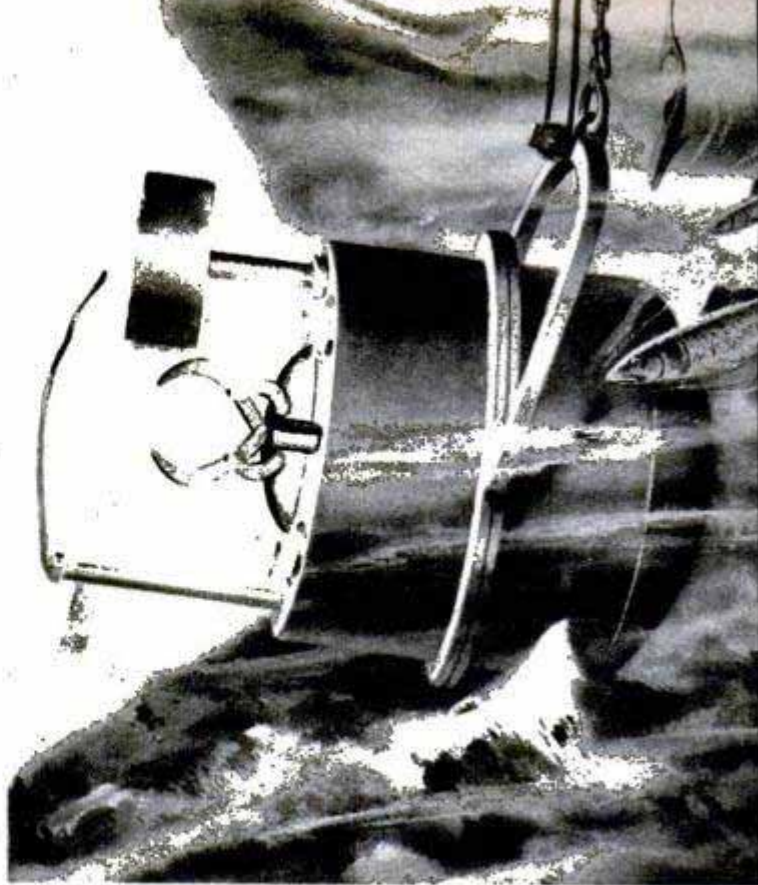
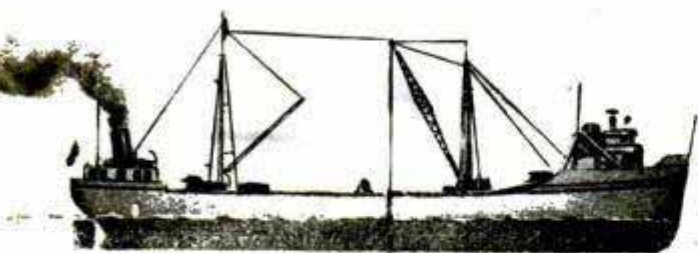
Truck's 12-Ton Load Carried in Sling

Hauling pipe sections that weigh 12 tons, a heavy-duty Hyster carries the pipe in a sling between its wheels at speeds up to 55 miles an hour. From a cab high above the load, the operator has an unobstructed view of both ends of the pipe. Part of a New Orleans water main, the pipe comes in sections 40 feet long.

Multi-Head Welder Makes Wire Mesh

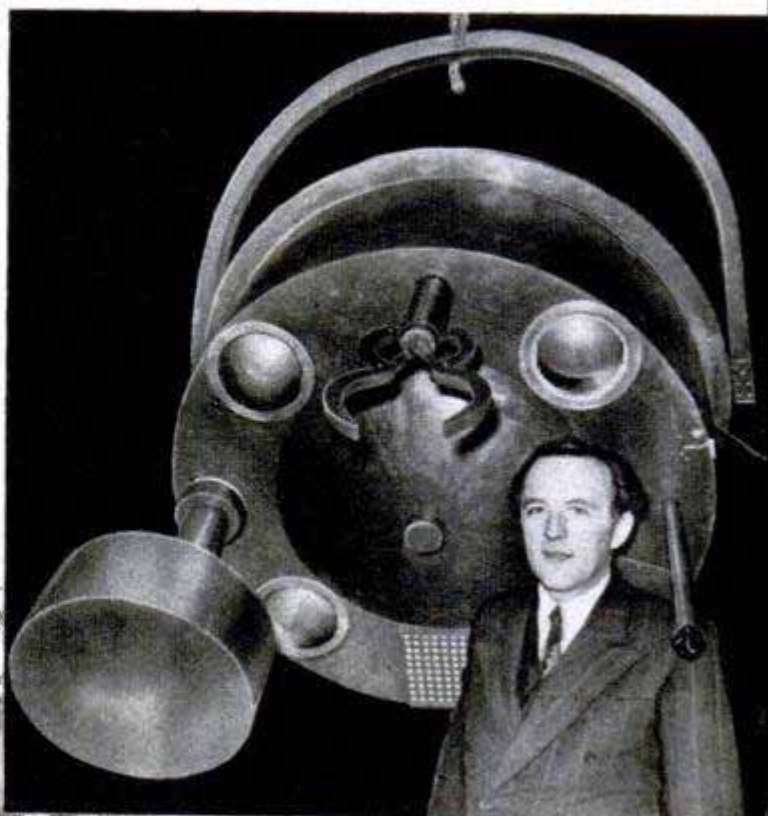
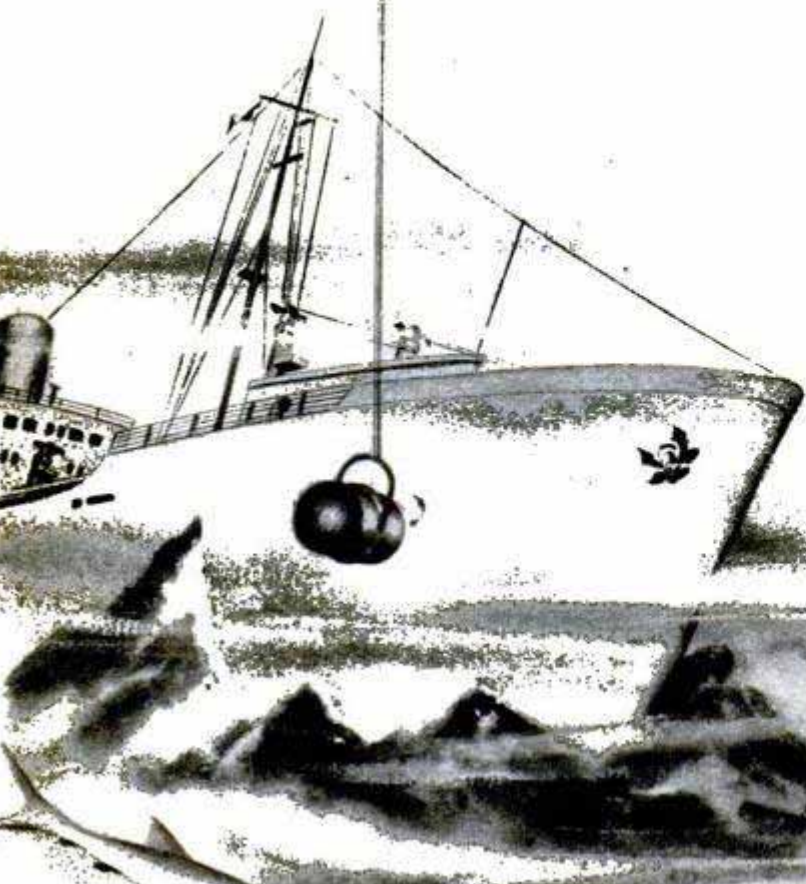
Wire mesh is turned out quickly by a flexible machine that has 12 welding heads. Longitudinal wires are guided through the machine while the transverse wires drop into place and are welded at any desired point. Normally, all the welding heads operate simultaneously, but any combination of heads can be made non-operative to vary the pattern of the mat.





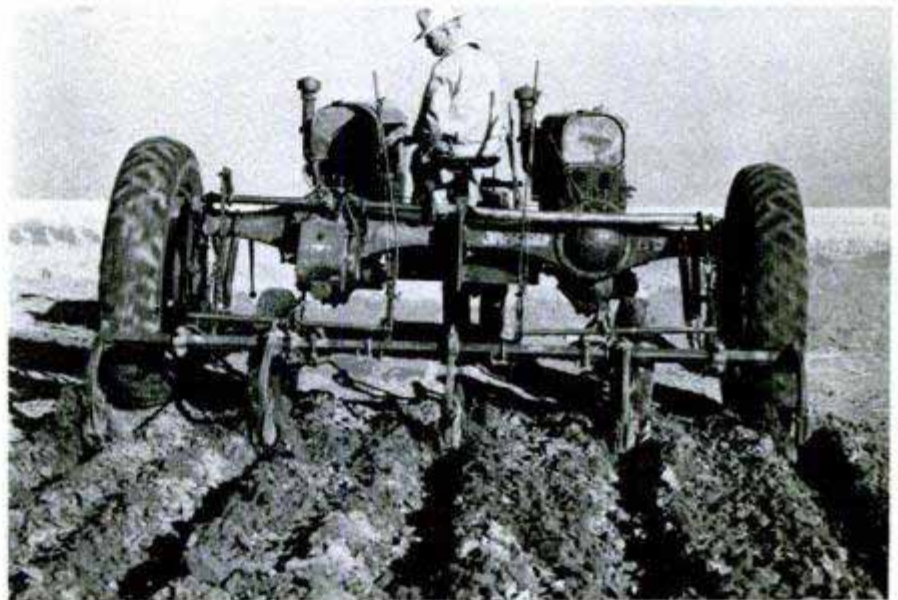
Television in a Diving Suit

Television may soon be going to work dressed in a diving suit, if plans of a German engineer work out. He designed and built a diving bell that can locate and repair ships at depths far below those safe for human divers. A television camera in the bell sends pictures back to the base ship. Four headlights illuminate the work area. A big magnet holds the bell against the sunken ship, above, as the hull is cut open by an electric dissector. All parts of the bell, including the claw, are operated from the base ship. Below, inventor Hans Udo von Schultz poses in front of the bell. The TV "eye" can be seen in the center



Two-Engine Tractor

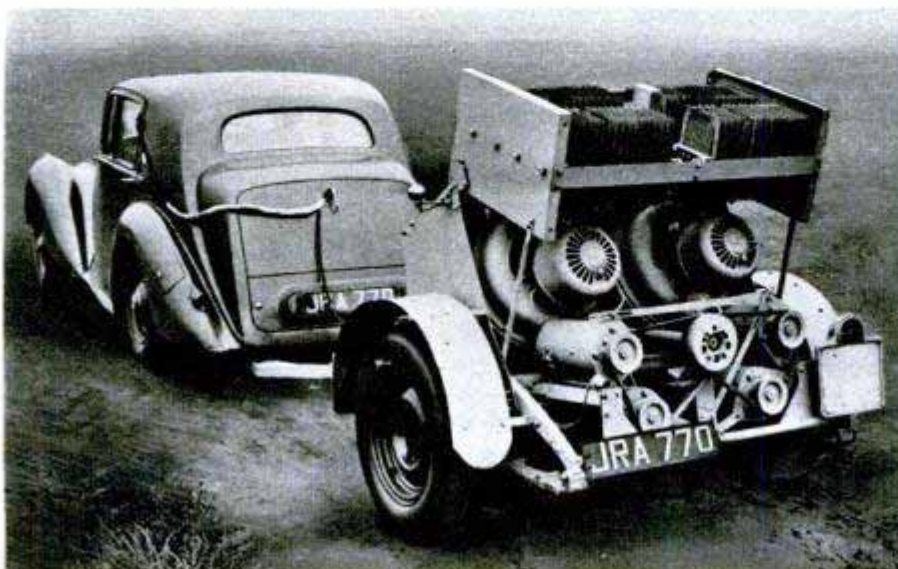
Even though it has no steering wheel, a two-engine tractor can turn around in a circle no greater than its width. The tractor, assembled by a New Mexico farmer, consists of two 20-year-old machines coupled at the rear axle. Synchronized by coupled variable-speed regulators, the motors power one rear wheel each and steering is accomplished by changing the speed of the wheels, thus eliminating the need for a steering wheel. Because the operator sits between the two engines, he has much better visibility than on a conventional tractor. Five plow blades are mounted on the single tool bar, enabling the tractor to plow eight acres an hour.



Underground Steam May Drive Turbines

Italian engineers hope to circumvent that nation's coal shortage by tapping underground hot-water reservoirs that will produce high-pressure steam for turning turbine generators. Drill rigs have been ordered from Westinghouse. The engineers calculate that red-hot lava beds near Milan produce hot water under enough pressure to support a one-inch column a mile high.

At the surface, owing to the reduction in pressure, this water will turn to steam which will be piped into turbines.

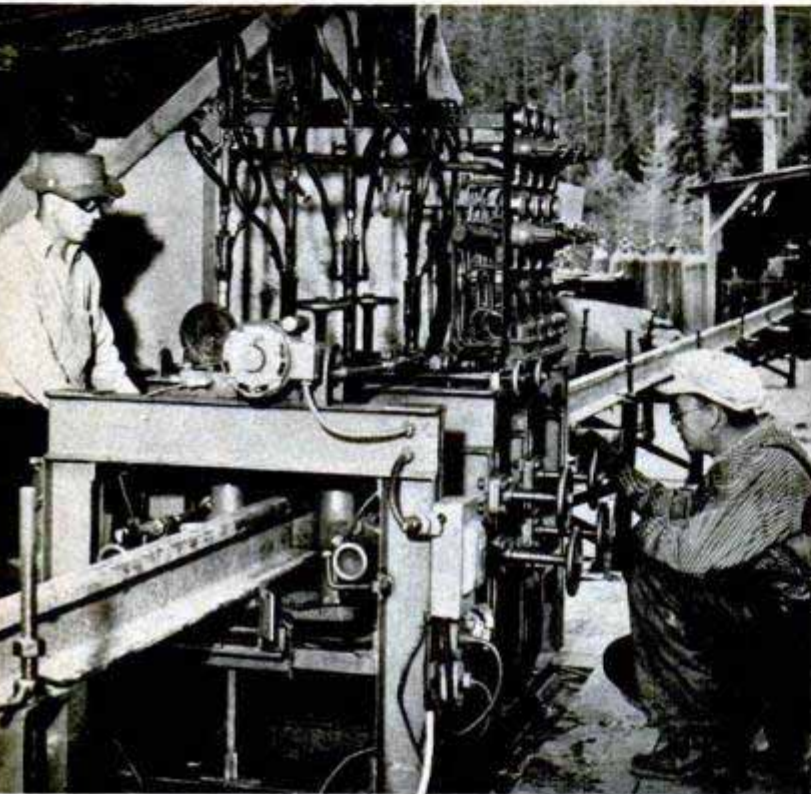


Hill-Test Trailer For Level Ground

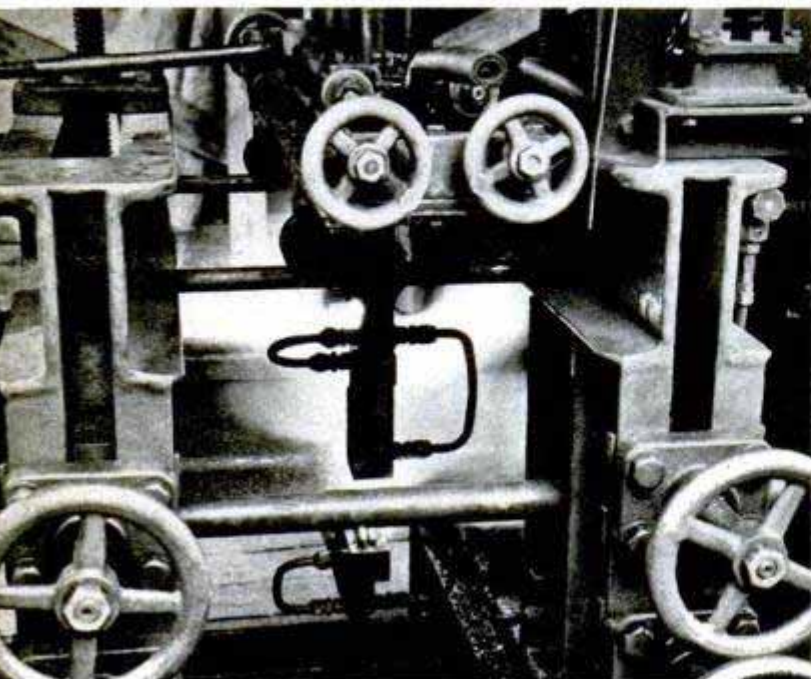
Cars are hill-tested on level ground at a British automobile proving ground in Warwickshire, England. To achieve the trick, the car manufacturers devised a power-absorbing trailer which is attached to the auto being tested. Drag produced by the power-sapping machinery makes it possible to determine hill-climbing performance.

The rails will click no more

in the Cascade Tunnel



Above, carefully squared, the rail ends are lined up in this pressure-welding machine. Forced together by great pressure, the ends are heated to 2300 degrees with 125 welding tips, a few of which can be seen in photo below



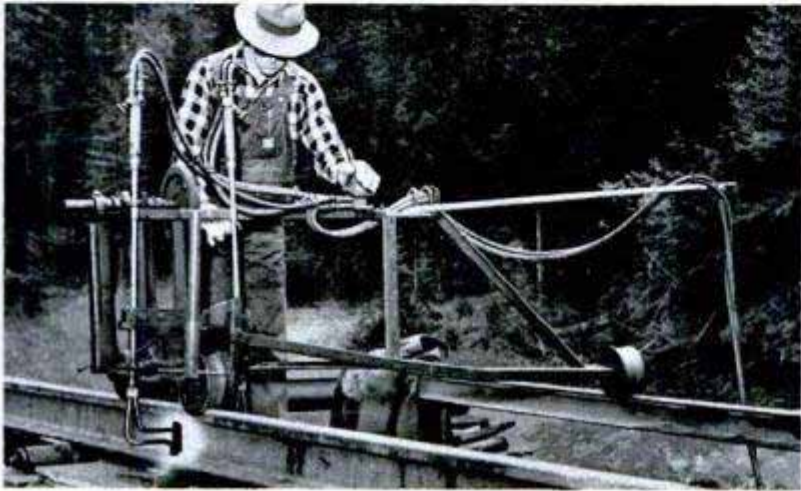
In five minutes, the pressure weld is completed. A hand torch, above, trims excess metal from the weld

SENTIMENTAL rail fans who ride Great Northern trains over the Cascade Mountains of Washington will be nostalgic for an old friend and travel companion — the rhythmic click-click of the rails. The railroad is replacing the track in the eight-mile Cascade Tunnel, the nation's longest railroad bore, with continuous welded track. Open joints between track sections are eliminated and with them has gone the familiar lullaby of the rails, a sound that is music to seasoned travelers.

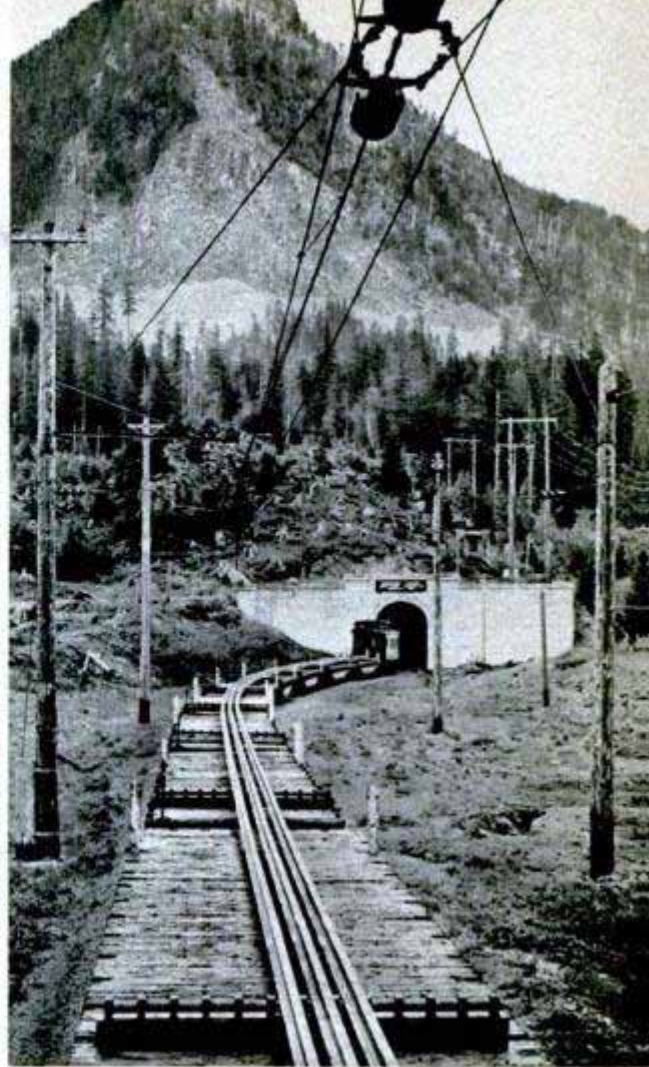
By using an "assembly line" process of pressure-welding and track-laying, railroad workers are making the change without interrupting regular schedules. The new and heavier rail is welded into 1326-foot lengths on a pressure-welding machine before being hauled into the tunnel on flatcars. When the new rail has been spiked down, the joints between the 1326-foot sections are hand-welded. To the railroad, the new track will mean longer service with less maintenance. For passengers, it means a smoother, quieter ride.



Completed welds are checked by magnetism. Pattern of iron filings on weld under electromagnet reveals any invisible flaws in joint



Mill scale is removed from the rail by oxyacetylene flame cleaner. When the rail is spiked down, it is coated with a preservative



On flatcars, the rails flex easily as they're hauled around curve to tunnel

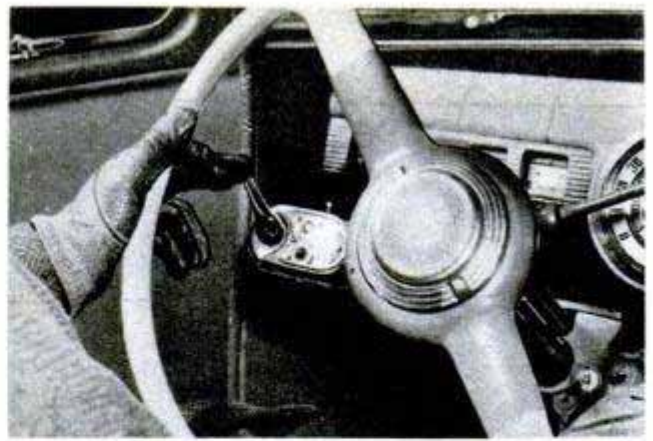
Welded rail is unloaded by anchoring one end with cable. Flatcars are then pulled out from under the rails





Desk-Pad Intercom

"Talking through your desk pad" is possible with an office intercommunication unit that is housed in a pad only $\frac{3}{4}$ inch thick. Up to five units—each a master station—can be quickly attached by plugging in an extension cable. Each unit can be used to receive or send messages. The conversation is private because communication can be established between any two stations without the others listening in. The desk pad measures 19 by 30 inches.



Entire Car Lighting System Serves As Turn Indicator

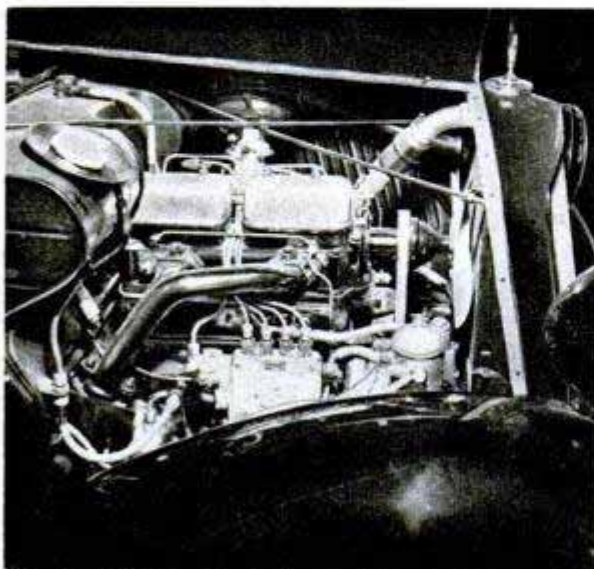
Headlights, stop and warning lights on any kind of car or truck are synchronized to blink at 70 to 80 flashes per minute by a control operated from a steering-column switch. Existing lights merely are wired through the control. When the driver wishes to turn, he flips the switch, which blinks the proper lights to indicate the direction of turn. Another position of the switch operates the proper lights to warn traffic that the driver intends to back up or stop. A third position blinks every light on the vehicle to warn motorists in all directions. The control is designed for school buses, ambulances, police cars and other vehicles requiring positive visual warnings.

Diesel-Powered Car Goes 40 Miles on Gallon of Oil

Powered by a 38-horsepower diesel engine, a Mercedes-Benz automobile, produced in Germany, promises relief for European motorists who do little joy riding in these days of dollar-a-gallon gasoline. The diesel will do 40 miles on a gallon of diesel oil, which costs much less than gaso-

line. The company says it has eliminated the heavy throb, a characteristic of the truck diesel that has plagued automobile designers for many years. Speeds of 60 miles an hour are possible with the diesel-powered automobile, according to the manufacturer.

Left, an under-the-hood view of the diesel engine that drives the German automobile pictured at the right

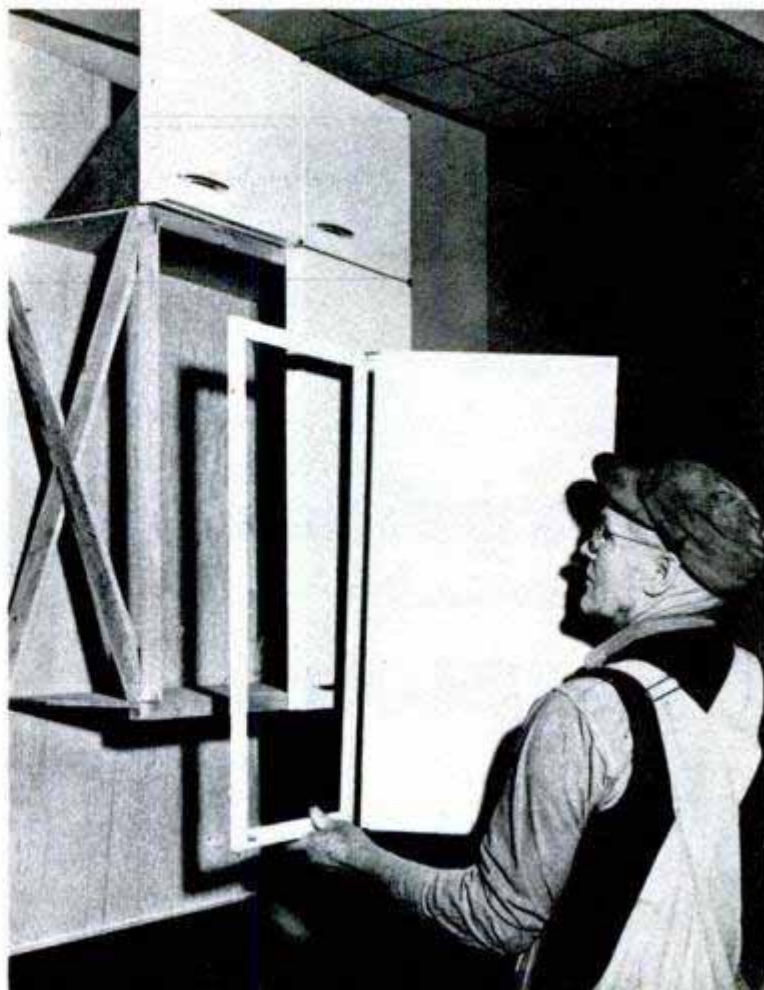


Steel Cabinet Fronts

Home handy men now can build their own kitchen cabinets by using a new line of steel frames and doors. The metal fronts for cabinets are available in a large selection of sizes. The frames are provided with doors or drawers, depending upon whether they are to fit wall or base cabinets. The drawers are suspended on ball bearings and their tracks can be cut with a hacksaw to fit cabinets of any depth. Frames for the doors and drawers are screwed into place. The fronts are available in a white baked-enamel finish or painted with a prime coat.

Dry-Ice Box in Rail Diner

Dry-Ice refrigeration appears on rails for the first time in 17 new dining cars being delivered to the Union Pacific Railroad. The ice compartment holds 100 pounds of Dry Ice. Below the ice are coils which contain $3\frac{1}{2}$ pounds of refrigerant. The Dry Ice chills this liquid, which then passes through a valve. The heat from the food compartment changes the refrigerant into a cold gas which rises upward through pipes, chilling the refrigerator. Having



completed its mission, the gas goes into a condenser and is returned to the coils for another trip.



Computer Cuts Farm Figuring

Farmers who dislike paper work now can solve many types of mathematical farm problems with a computer that shows the desired information at a glance. The computer consists of four metal disks containing arrows, figures and windows. By setting up known information on the disks, the farmer can quickly determine the desired figure. For example, the computer will calculate the price of a given weight of any kind of grain, the value of land and livestock, the number of gallons of milk in a given number of pounds and the value of several cases of eggs when the price per dozen is known.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX which is available without charge from Bureau of Information, 200 E. Ontario St., Chicago

The Tool That Surprised Its Makers

By Alexander Maxwell

Here's a machine that will slice bolts of cloth or blocks of granite, armor plate or fresh bread. It's the contour saw — three-mile-a-minute cousin of the bandsaw

THE YOUNG SALESMAN was highly enthusiastic.

"This file," he said, "is so hard nothing can touch it. It will shave tool steel like a plane cuts wood."

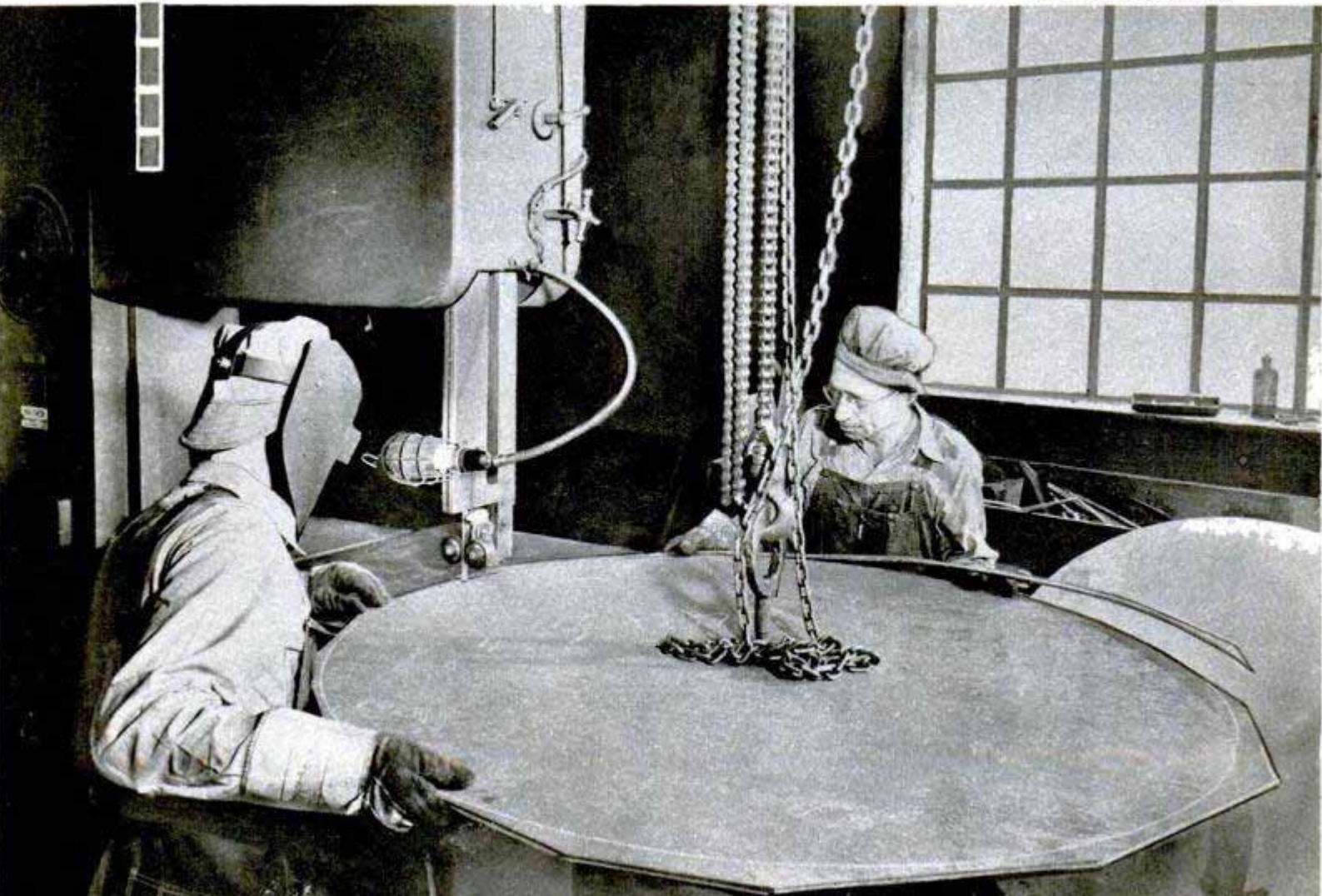
The shop superintendent listened patiently, then without a word stepped over to the contour machine. The file was pushed against the moving blade, a shower of melted metal cascaded over the table and he returned with the file neatly ripped lengthwise.

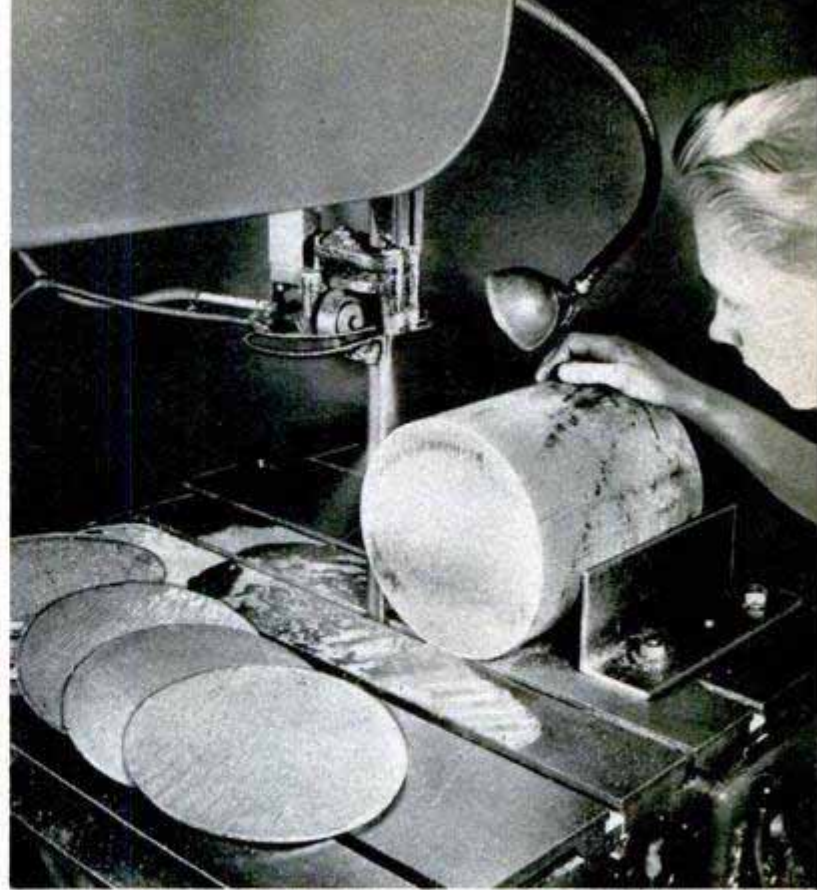
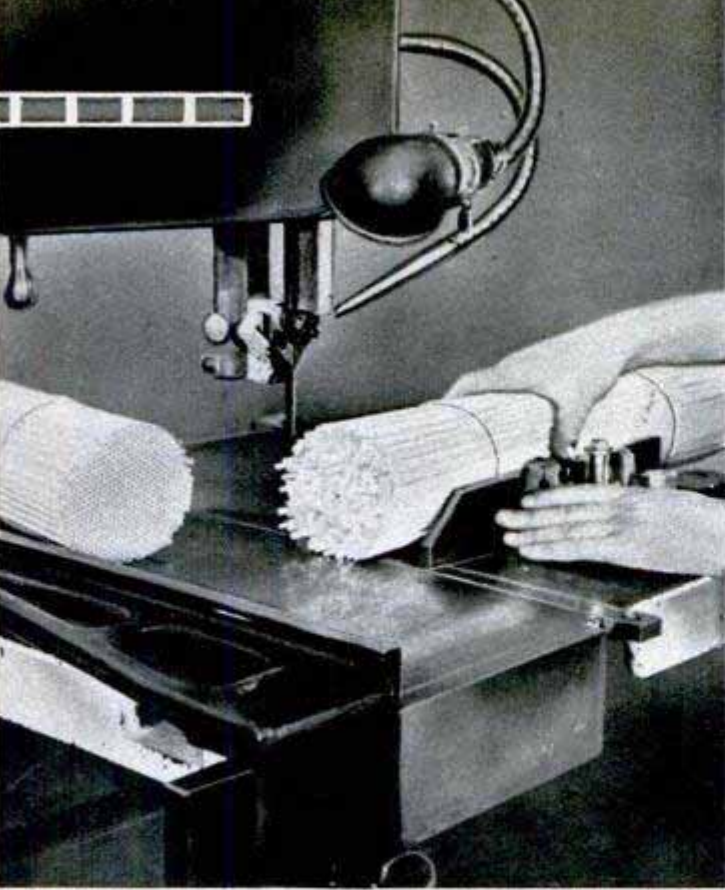
"That file," he announced, "was split lengthwise with a saw blade so soft you could tie it into a bow knot."

For many years machinists have dreamed of a device which would perform any cutting operation. There are today but few materials which cannot be cut on a production basis, but until recently most of the cutting had to be done on specialized, one-purpose machines. This meant that a shop working 10 materials needed at least 6 and possibly a full 10 machines. Now the contour machine has come along to cut steel, bread, rubber, cloth and granite in quick succession. All the operator has to do is

This is no sheet of plywood. It's a slab of boiler plate being cut down to shape by a contour cutter

Photos from the DoAll Co.





Left, soda straws are trimmed smoothly and, right, aluminum billets sliced like bologna by the amazing saw

install the proper blade and set the drive mechanism at the correct speed—an operation that requires five minutes or less.

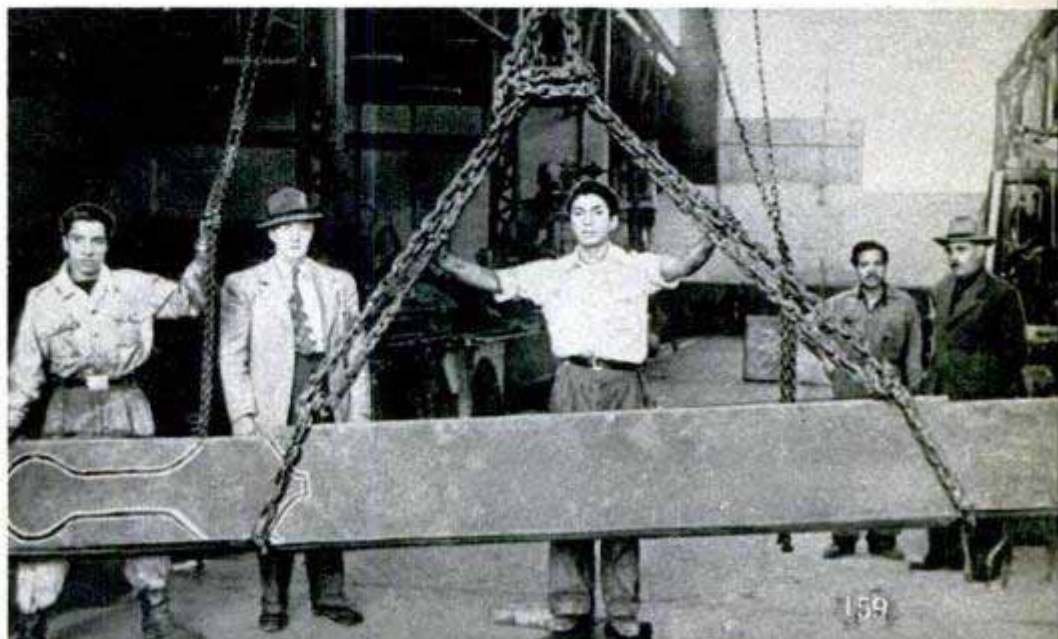
The contour machine is one of those strange paradoxes which surprised everyone, including the designers. Shortly before the war, the government was desperately seeking a device which could fabricate armor plate quickly, accurately and economically. Metal tough enough to stop bullets also resists ordinary machining methods. For a while it looked like the old Civil War hot-punch-and-chisel method was still the most practical. Then it was suggested that the metal be sawed while red hot. Results were promising but not practical. The next step was a radical one. It was observed that when turning hard steel, both the bit and shaving were often at red heat. Why not run a bandsaw so fast it would heat the steel by friction, then cut it while in the semifluid stage? There was great speculation as to what would happen to both saw and blade, but the experiment was made. It worked. At a speed of three miles a minute, a precision wood-working blade plowed through ½-inch armor plate faster than tool steel could be cut by ordinary methods. Strangest of all, the blunter the teeth be-

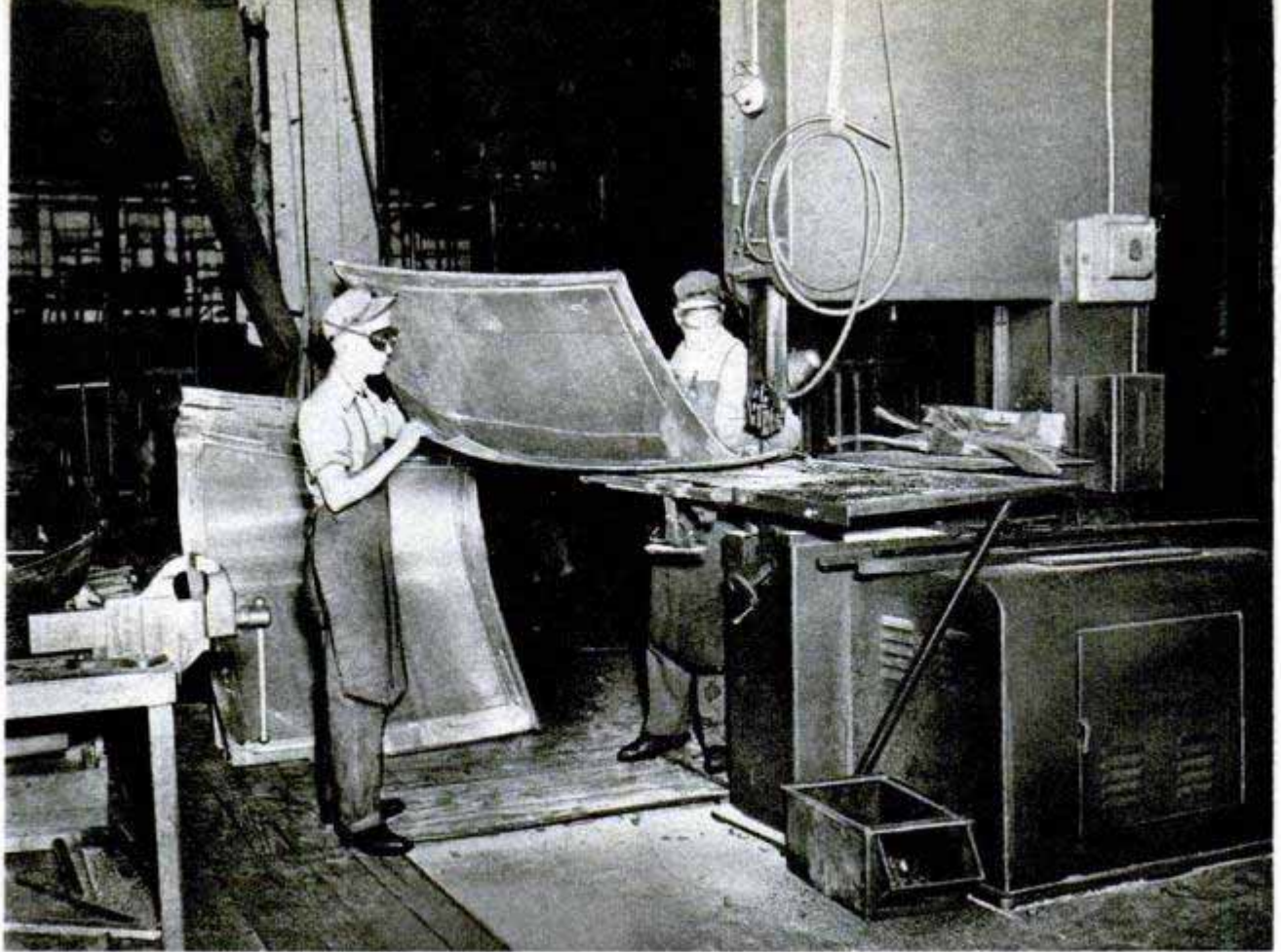
came, the better the band seemed to cut.

Here was the answer. Now to design a machine and a blade for production purposes. The bandsaw has been in common use for almost 70 years, but at best it was a light, rather delicate machine. Even the massive heading saws in the lumber camps, with their foot-wide blades, were on the "gentle" side when it came to plowing into the work.

With the objective already specified, engineers developed a husky, new bandsaw. It had the strength and rigidity of a locomotive. In order to identify the new machine properly, the engineers called it the "Contour" saw. That was originally a trade name like Frigidaire, but it was not long

In Mexico, the saw cut a connecting rod from a billet for ship repairs





Stainless-steel panels are first pressed to shape and then the hard metal is trimmed on a contour cutter

until it passed into public domain and today a contour machine means a rugged, compact, heavy-duty device which does its cutting with an endless blade.

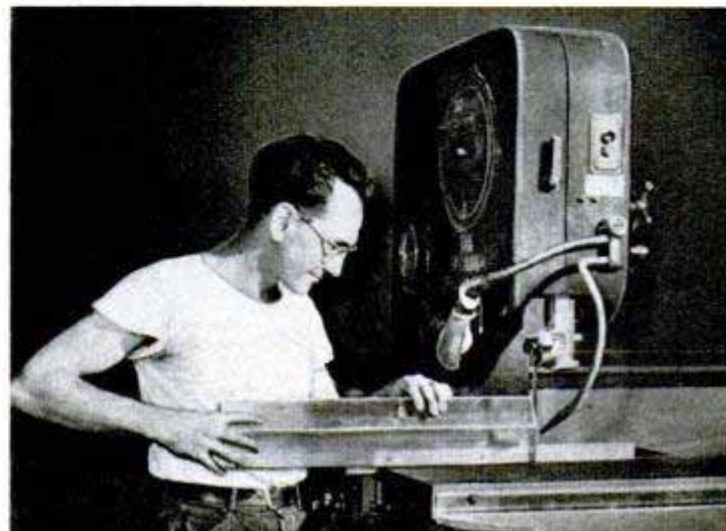
Various blades were tried and discarded because it was discovered that any hard-tooth, soft-back blade would work for friction-sawing if the speed and feed pressure were sufficient. There is still some question as to exactly what happens when the high-velocity blade cuts the steel plate. Some say the blade never touches the melted metal and cutting is done by a cone of highly compressed air built up ahead of the teeth, others say that the heat softens the plate and then each tooth scoops out globules of white-hot metal. Whichever happens, the cut is clean, well defined, narrow and much faster than either forge or torch cutting. The fact that the blade shows no undue heating or ill effects only makes the cutting mystery the deeper.

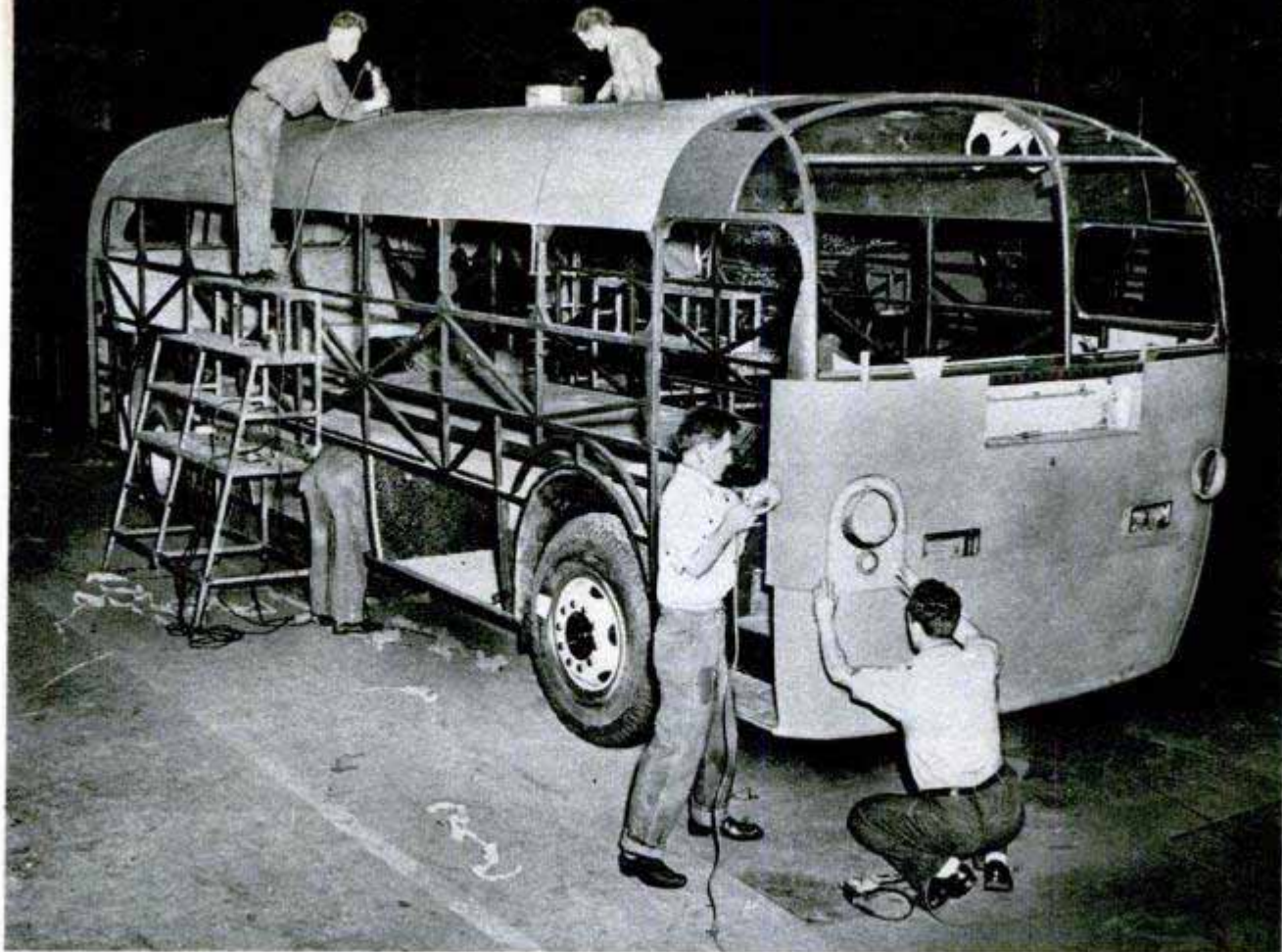
Uses of friction-sawing represent almost a cross section of American industry. A maker of transcontinental motor coaches cuts out both frame members and steel skin units on a bank of contour machines. The harder the metal, the easier it cuts, so making springs, valve stems, crankshafts and tempered machine parts is a natural for the saw. While this sawing calls for a machine capable of airplane speed, the same machine operating at a lower velocity will perform many operations long considered the exclusive field of a machine total-

ly different in appearance and operation.

The strength and rigidity needed for high speed also provided the push and stability for the extra-low velocity required in die-making and billet cutting. Formerly, a billet was heated and pounded into shape under a drop hammer. Now it can be sawed cold out of solid steel much like a child's block puzzle. One shipyard in Mexico makes a practice of cold-sawing the complex shapes of gigantic crank arms and connecting rods required in the repair of both steam and diesel marine engines. One rod may weigh two tons, yet it is cut with a blade only $\frac{1}{2}$ inch wide out of a forged billet 12 inches square and 10 feet long. Where tie-up time is of vital importance, the contour machine has cut out-of-service

Crystals for radio use are blanked out on this saw





All parts of this bus body were cut to size on contour machines, the versatile tool that surprised its makers

periods from months to hours. Many a ship went back to sea during the war with sawed plates welded over shell holes. There was no tie-up time at all. The plates were cut and welded while the ship was being loaded for the return trip.

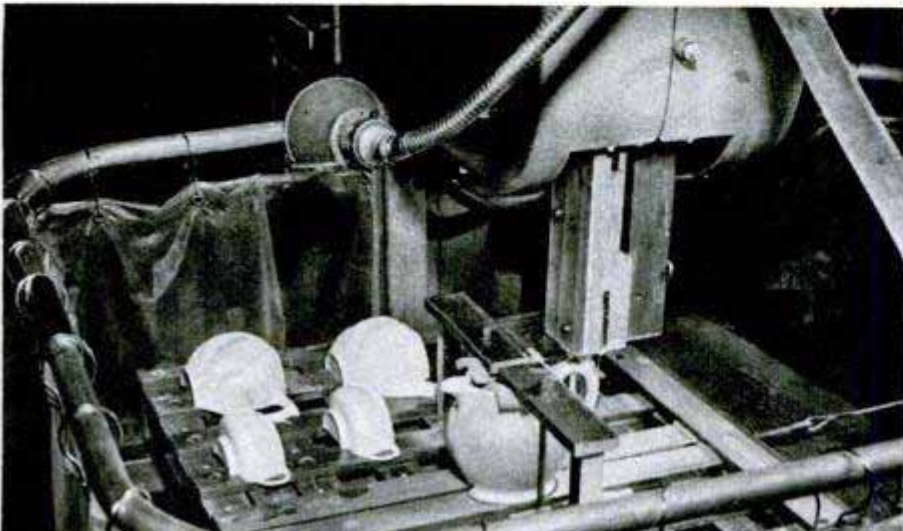
A diemaker frequently spent three days drilling and chiseling the slug out of a blank, then filing it to shape. With a contour saw he can cut the same shape, to exact size and angle, in about three hours. Only an hour or two are needed to band file the most complex blanking die. The slug is often used as the punch, saving still more time and material.

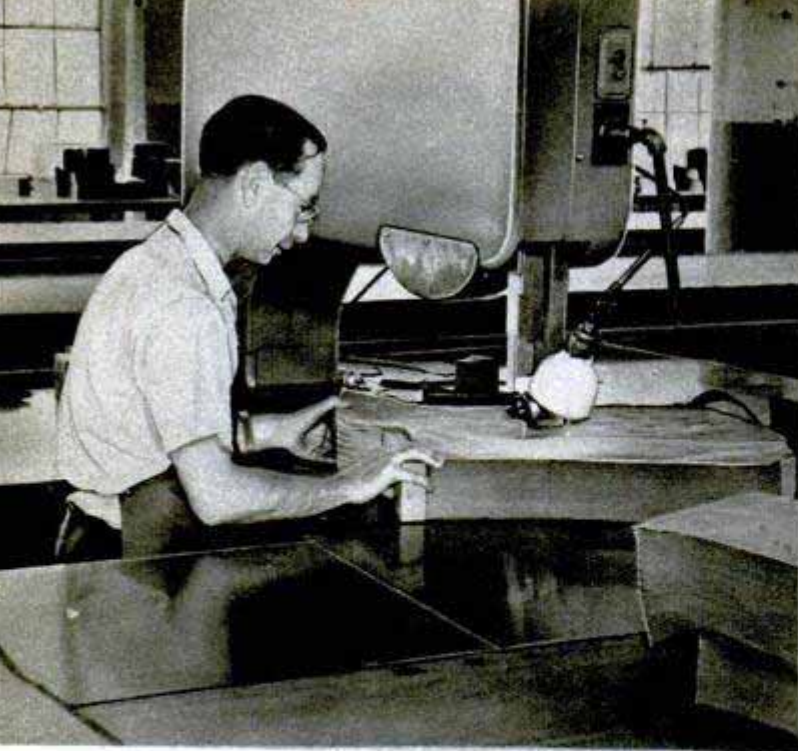
Heavy industry is not the only field that profits by using a bandsaw blade in place of a torch, lathe, miller, shaper, grinder or

drop hammer. The identical machine used to form a die or crankshaft can also do a first-rate job of cutting men's shorts a hundred at a time or splitting elusive and hard-to-handle upholstery fringe.

The garment industry has been using bandsaws for 30 years. This statement will come as a surprise to most people, including many in the clothing business. One firm in Brooklyn has done very well buying up obsolete woodworking bandsaws and completely rebuilding them to meet requirements. A Wisconsin manufacturer of wash dresses urgently needed additional equipment. Finding any type of saw or knife hard to obtain, he settled for a contour machine and to his amazement obtained cleaner and faster cuts in deeper lays of material

Left, diamond chips in the blade cut a pitcher in half for inspection. Right, the saw even cuts meat well





Mounted on a track beside the cutting table, this saw is as necessary as a sewing machine in a clothing factory. It cuts 100 layers of cloth at a time

than ever before. The manufacturers of the contour machine were surprised and after inspecting the installation made the only modification required, an extra large worktable so the cutter could handle 30 by 30-inch cloth blocks, 8 inches deep.

When cutting by hand, the operator had to climb all over the table and his lays of cloth were relatively shallow because of the difficulty of getting a vertical cut when rounding curves. With the contour machine, the only limitation is the ability of the individual material to "stack." In a field where price competition is keen, the more work an operator can do in a single operation, the less the consumer must pay per garment. Output per cutter has been boosted tremendously. A cloth-cutting blade has no teeth. It is either razor-edged or scalloped. The blade is sharpened as it cuts so the edge is always keen.

The same razor-edge blade has eliminated a score of other bottlenecks including the cutting of soda straws without ragging them, the trimming of paper insulation on transformer coils, slicing crude rubber and cutting upholstery fringe. Here we find the mechanical counterpart of the trick Saladin performed during the Crusades, slicing a silk scarf in half with a scimitar as the scarf floated through the air. The secret is to draw the razor-sharp blade rapidly across the nonresisting fabric.

For a machine which will cut anything one would naturally expect to find as many types of blades as a fisherman has lures. There are half a dozen general types of blades and perhaps a dozen sizes of each of the principal metal and woodworking types. There are other less common types

such as a meat cutter, a razor edge, a spiral wire or a diamond saw. Sizes are mainly to provide the proper turning radius. For straight cuts, a ½-inch or one-inch blade is used. All told, anyone who has one each of the principal types can cut any material known to man and do a satisfactory job of it.

There is no great difference between wood and metal saws. Steel can be cut with a razor-sharp claw tooth and wood with a zero-rake buttress. The secret is in the way the blades are made. The teeth are almost as hard as diamonds while the backing is soft as strap iron. This results in a saw capable of flexing repeatedly, absorbing shocks which snap an ordinary type and presenting an unbroken line of teeth harder than any material they are likely to encounter. When cutting wood, striking a nail is no problem at all—the saw cuts off the nail and goes right on. Because different materials do not react alike to impact, speed is much more important than blade type. Some materials cut fastest when the blade is barely moving, others at a medium velocity and still others will take the highest speed possible. In general, the ability to change speeds is more important than having a variety of blades.

Most of the "workable" materials can be cut with an ordinary blade, but then there are the "unworkables," such as glass, pottery, stone, abrasives, petrified wood, meteorites and precious stone. Here a diamond saw band is used. As a diamond is the hardest substance known, and a moving diamond will cut a stationary diamond, this completes the list. Manufacture of a practical diamond-tooth bandsaw blade presented almost unsurmountable obstacles. Ten years were spent in development. The result was a saw completely

(Continued to page 246)

Die cutting is a slow process, but the contour saw saves time here also. One die that took 30 hours to cut is now sawed to exact outline in only 1½ hours





Orchard Crews Work on Hydraulic "Ladders"

Orchard workers prune trees and pick fruit faster from the safety of crow's nests attached to the end of twin hydraulic booms. A four-wheel trailer carries the booms and power plant, an air-cooled gasoline engine. Push buttons on a control panel at the cage enable the workers to di-

rect the booms to any position from 3 feet to 21 feet off the ground. The cages remain level in all positions. During harvesting, special racks attached to the cages hold empty fruit boxes. When a box is full, the picker swings down to ground level, removes the box and picks up an empty.

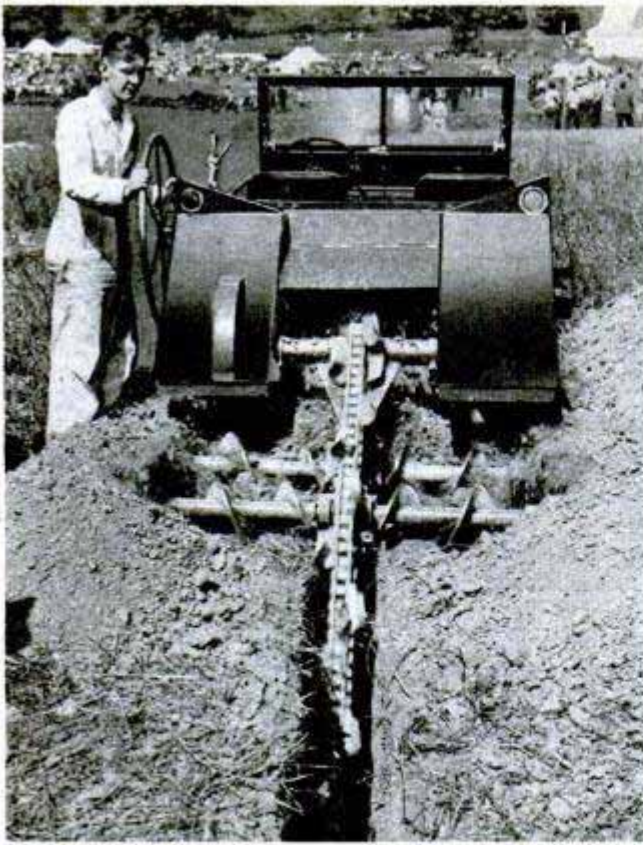
Steel Skid Behind Garden Tractor Hauls Heavy Loads



Owners of small garden tractors can use them for hauling heavy loads with a new steel skid. The attachment carries loads of 250 to 500 pounds with $1\frac{1}{2}$ to 3-horsepower tractors. It attaches to the tractor hitch by chain. Heavy objects need not be lifted but may be rolled or eased onto the skid, making the tractor useful for moving rubbish, cement bags, rock or dirt, feed bags, firewood, hay bales, garbage cans and bushel-basket loads.

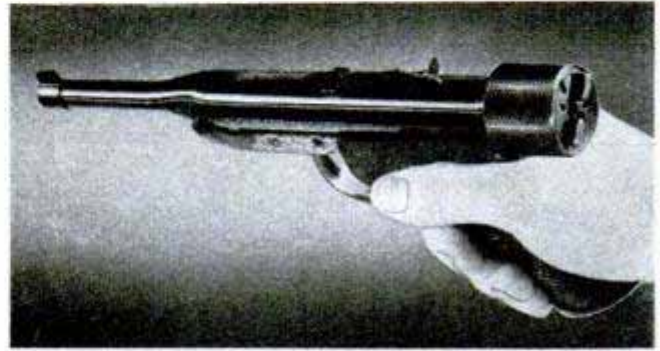
Industrial Accidents Decrease

Industrial accidents decreased 13 percent last year, according to the National Safety Council, with communications the safest of all categories. Lumbering was the highest in frequency; coal mining was next to the highest and had the highest severity rate, with accidents causing 7.61 days lost per 1000 man-hours. The over-all severity rate for industry dropped nine percent.



Jeep Trench Digger

Digging 300 feet of narrow trench an hour, a ditching attachment for the Jeep speeds the task of laying draintile, water pipes and power cables. One man operates both the Jeep and trencher from the rear of the vehicle. The trench digger, driven by the power take-off, comes in several sizes. Twin screws force the soil well away from the trench. When not in use, the trencher swings upright and does not interfere with operation on the highway.



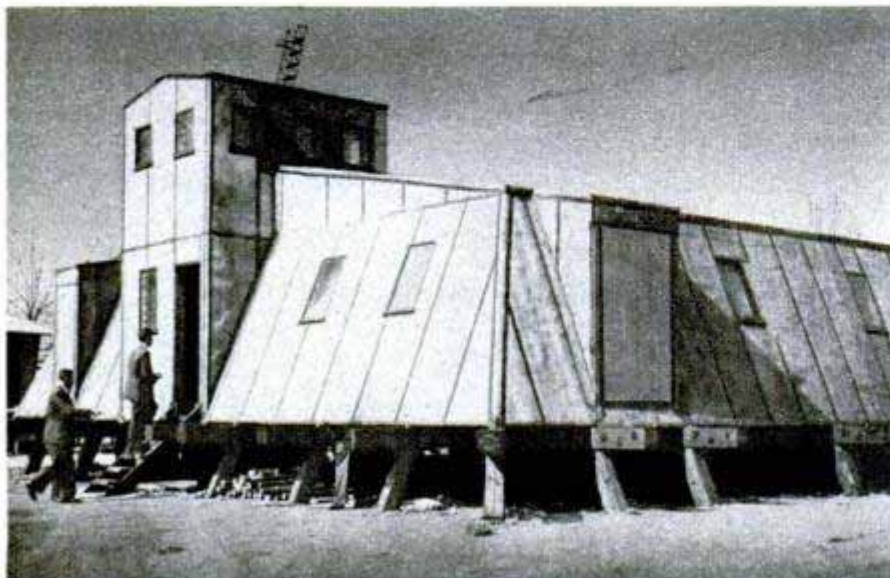
Repeater Pellet Pistol

There is no pumping to a new pellet air pistol. Instead, the shooter merely "breaks" the pistol to cock the gun and move a new pellet into the chamber. The "break" cocks a powerful spring which sets an automatic-type piston. A six-shot magazine eliminates reloading and a yellow indicator shows when the sixth shot has been fired. The bore is rifled for pin-point accuracy at distances up to 30 feet. The gun is available in .177 and .22 calibers as well as BB shot.

Prefab for Use Where Mercury Hits 112 Below Zero

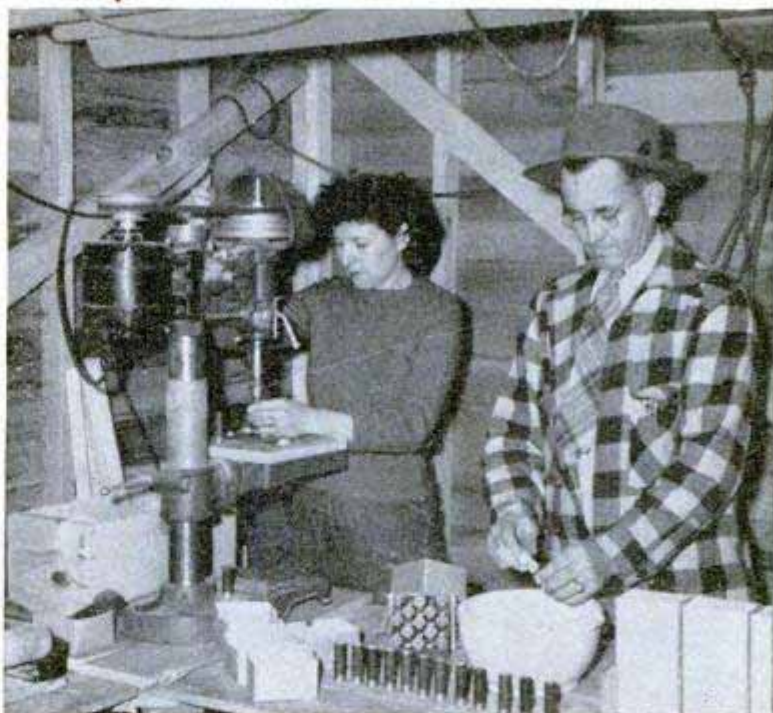
When the temperature reaches 112 degrees below zero it takes quite a building to keep the cold out and the heat in. A struc-

ture built in France is designed to keep out winter colds that reach that temperature in bleak sections of Greenland. The building



ing will serve as a shelter for an exploring expedition to the island. Prefabricated, it will be dropped by parachute in sections. Secret of the cold-resistant building is the construction of the walls. They are made of two layers of Duralumin, separated by two inches of honeycombed tar paper which in turn is filled with powdered cork.

☐ The Empire State Building was struck by lightning nine times in one storm.



Photos by Herbert Jonas

L. J. Farley, who developed the system, fires a cloud of pollen into a tree neglected by the bees. Right, pollen mixed with casein is loaded into the shells. Casein becomes tacky, prevents pollen from blowing away

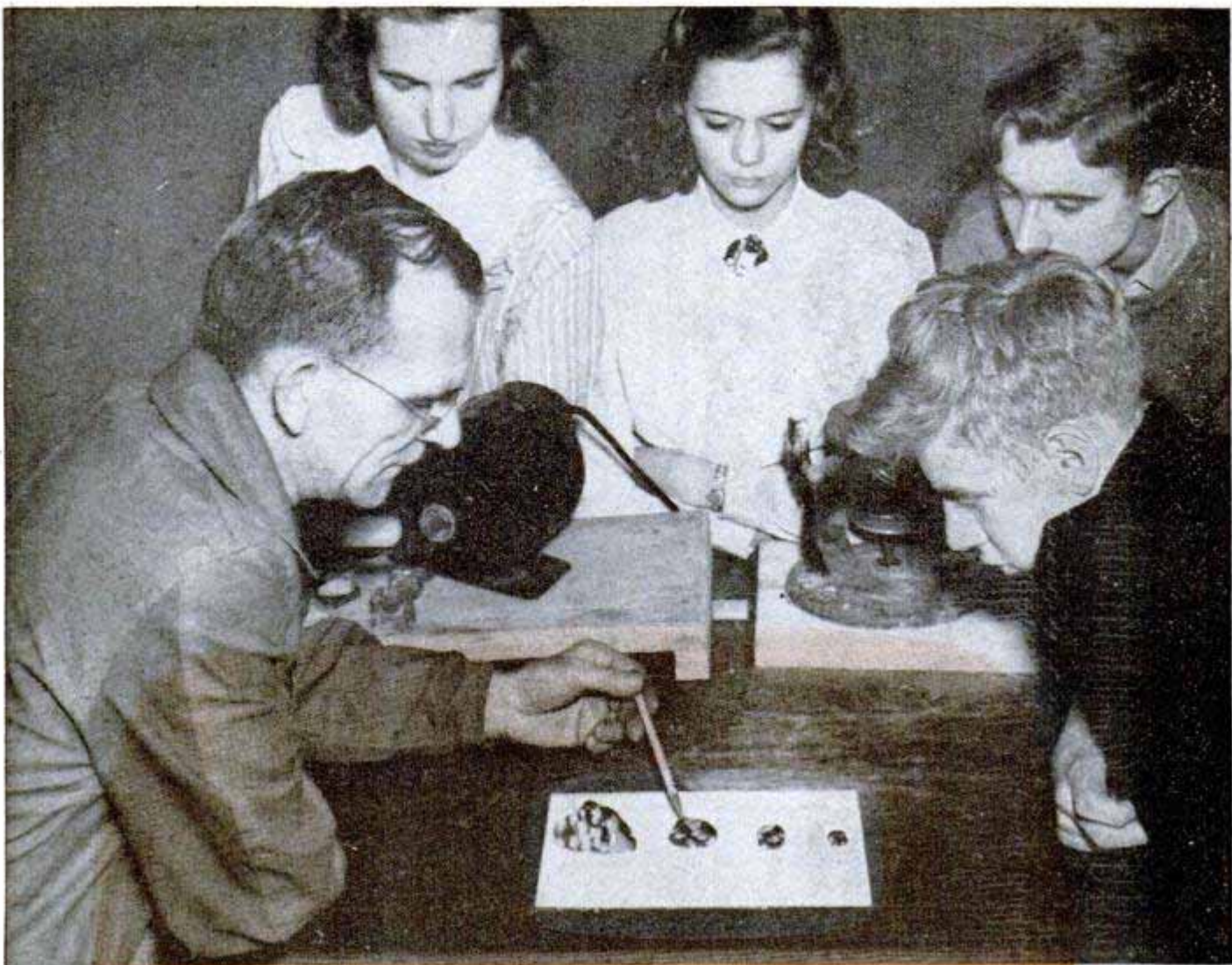
First step in the manufacture of the pollen-filled shells is to pick the blossoms. Right, blossoms then are rubbed over fine screen to separate the pollen-bearing anthers from the remainder of the flowers



Shotguns Blast Pollen Into Western Fruit Trees

What the bees won't do for shaded trees, a shotgun can—with the help of shells charged with pollen. Washington State orchardists are firing special pollen-charged shells at their trees. Discharged from the ground, the shells carry the cloud of pollen to treetop height and are particularly effective in shady areas often neglected by bees. The method of pollinization was developed by L. J. Farley of Wapato, Wash. Blossoms that are to be used for cross-pol-

linization are rubbed over fine screens to separate the anthers from the flower. The green anthers are dried and then vibrated on a 100-mesh screen to yield the pure pollen grains. The pollen then is mixed with casein and packed into shells that have a light charge of slow-burning powder and extra filler pads to protect the pollen from the flash of explosion. After the shell is fired, the casein becomes tacky and keeps the pollen from blowing away.



Chandler, organizer of lapidary club, shows members four stages in developing finished gem from rough stone

GEMS from Turkey Gizzards

By William Gilman

ANY VALUE to that stone in the gizzard of your holiday turkey? Yes, say members of the Springfield, Vt., high-school lapidary club, who turn out lustrous gems from the turkey gobblers.

The young gem cutters also make beautiful rings and brooches from jades to the ordinary pebbles you might find in your driveways.

Using tiger-eye stone and \$5 worth of silver, one of the members produced a matched set of gems which a jeweler quickly appraised at more than \$100. Yet tiger-eye, as geologists know, is a common yellow-brown stone.

The young lapidaries concentrate on turning out cabochons—beautifully polished convex stones. And it won't be long

until they will have enough equipment to cut diamondlike facets on their gems.

Harold L. Chandler, head of the school's science department, directs the activities of the club. Through him the members have learned that the ancient art of gem-making isn't so mysterious after all. The club has invested \$29.50 in a small, three-in-one lapidary wheel which has interchangeable parts: a diamond saw for cutting; a Carborundum wheel for grinding or roughing out; and a felt buffer for polishing. With this equipment the high-school set has learned that it can convert a worthless pebble into a gleaming cabochon within an hour. Five hours at the wheel will finish a piece of jade, one of the hardest stones on the lapidary's list.



Close work! First step in making a gem is to cut a slab off the rough rock with a diamond saw. Dripping compound prevents overheating

As for material—the horizon's the limit. Each state, county and township possesses its own stones of gem quality. For example, the best agates are found most often in western states.

The Vermont club made a rich haul simply by going to local butcher shops at Thanksgiving time and emptying gizzards from 50 western-raised turkeys. Those turks had swallowed enough stones, some larger than a robin's egg, to fill a cigar box. The members converted them into a sparkling display of striped and moss agates.

Vermont itself supplies colored marbles and opaque, reddish-brown quartzes known as jaspers. From glacial deposits in Vermont's gravel beds come pebbles ranging from soft, dense opals to serpentines.

A girl member returned from a Maine vacation with a box of beach pebbles which were fashioned into glowing jaspers. One of Chandler's former geology students sent back fine specimens of Alaska jade. Even the flint from an early flintlock gun became a gleaming ornament.

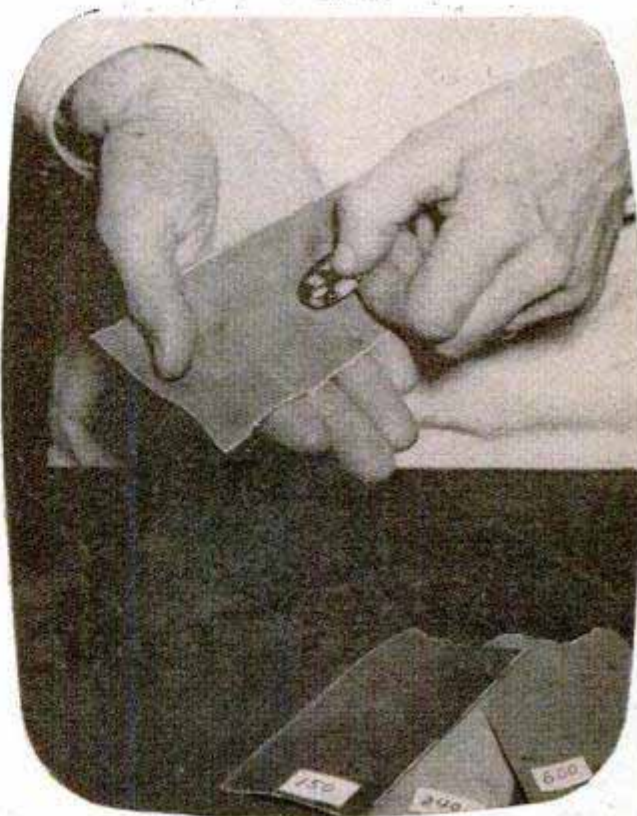
Chandler has taught his young gem cutters that several factors decide a stone's value. Color comes first. Then texture. The harder the stone is, the better polish it will take, although some must be handled very carefully. An example is snowflake obsidian—because of its brittleness it cannot take rough use.

For hard wear, other stones are preferred. Jade is a favorite. Others, in order of hardness, are onyx, agate and petrified wood.

Luster must be judged too, to determine how well the stone will reflect light. Another factor is its structure because density and opaqueness also determine the degree



Club member progresses to the second step in gem work—roughing out the unshaped slab on a Carborundum wheel. Below, in the third step the rough cabochon is further shaped, this time by hand, with various abrasive cloths





Final polish is given the ornamental gem by holding it against a felt buffer. Below, one member polishes a moss agate while another sands black jade by hand

of reflection. Fracture quality must also be studied for it determines how the stone can best be saved and polished.

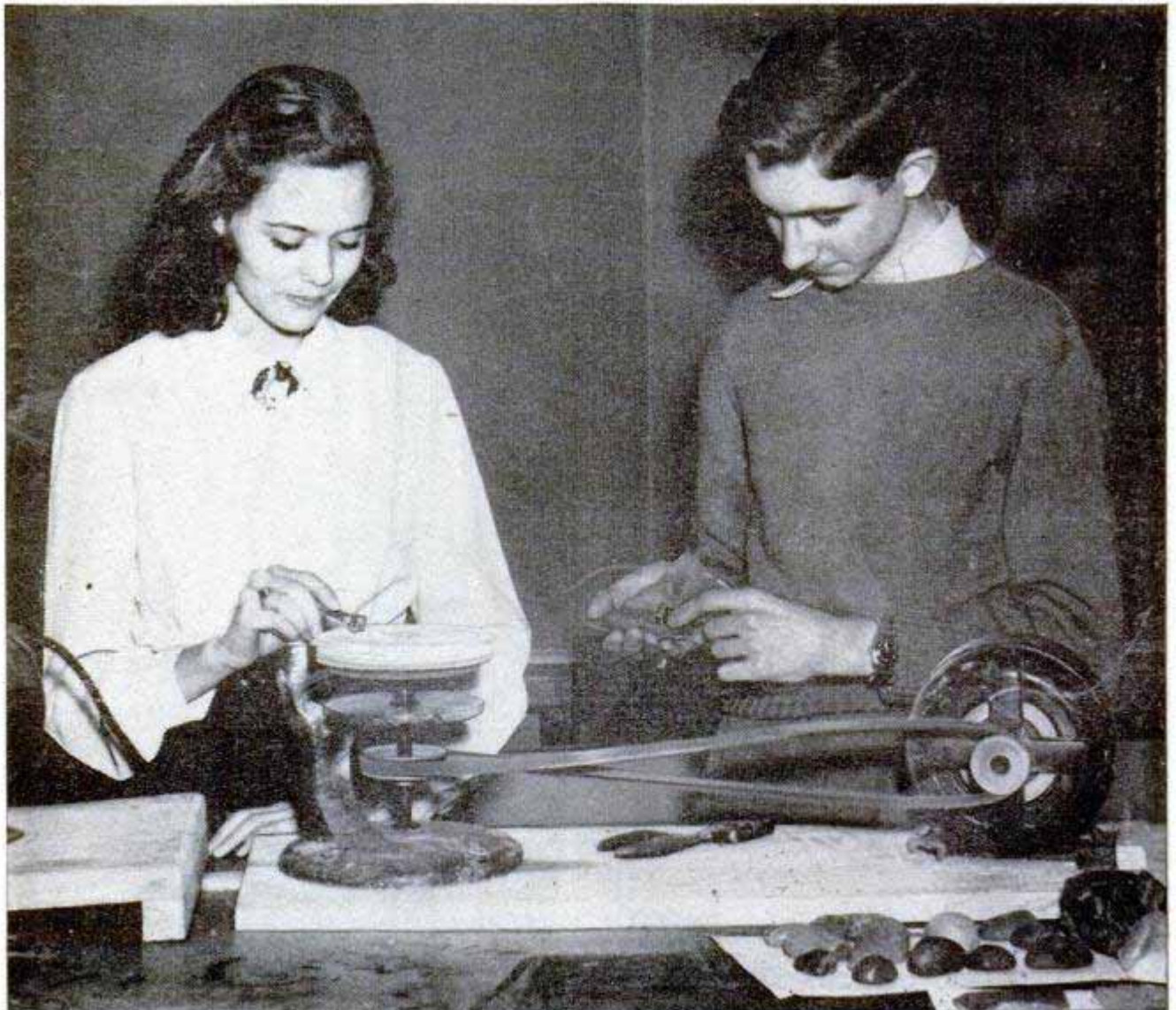
The student's first step in a project is to saw the stone. A carriage holds the stone against the revolving diamond saw. Cutting liquid drips on the wheel to prevent overheating and cracking.

The Carborundum wheel then is substituted for the saw and the roughing-out begins. This grinds the stone to the desired design.

Rough finishing is done with abrasive cloth. The final stage is careful polishing against a revolving felt buffer with a fine abrasive powder used first and then tin-oxide polish.

Although still young, the club has made such beautiful sparklers that many adults are interested, so night sessions for these older hobbyists are planned. Money is carefully put aside to buy a larger gem-maker so that several pairs of hands can work on the machine at the same time.

The supply of raw materials doesn't worry Chandler. He has a collection of more than 8000 stones and there are plenty more in the earth's crust.



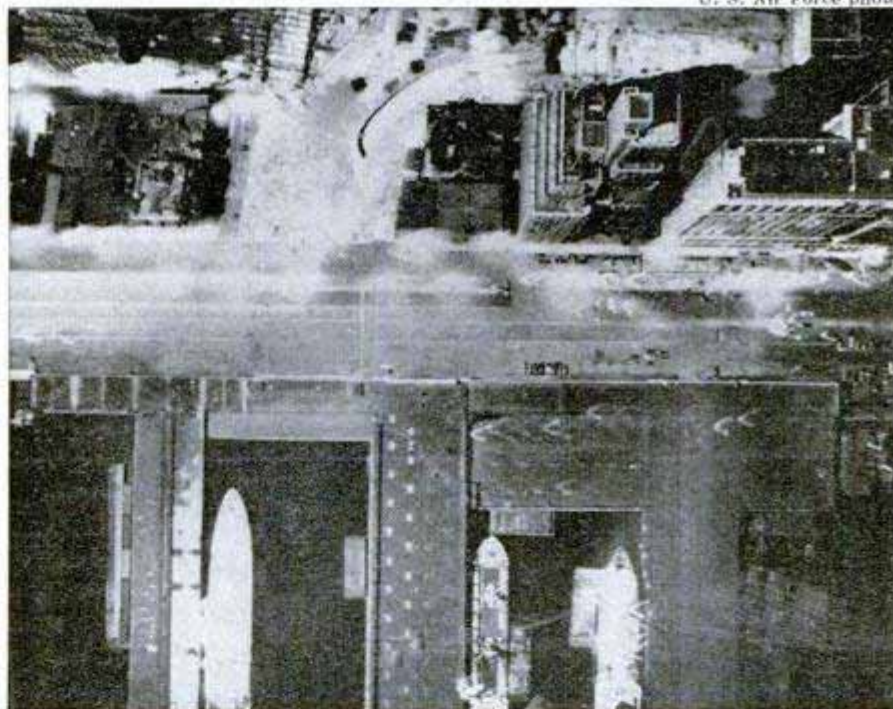


New York "Bombed" For Night Photos

Night aerial photos of New York City, taken through smoky air from 3000 feet with the aid of a series of 50,000,000-candlepower flashes, were so clear that street signs and license numbers in them could be read. It was a test of a new device synchronizing the camera shutter with bright bomb-like bursts of light from 150 instantaneous flashes, dropped at three-second intervals. The equipment is designed to help the U. S. Air Force take pictures over enemy territory in time of war. New Yorkers, forewarned, were not alarmed by test.

Above, looking across New York's East River at chain of flash cartridges set off from plane for night aerial photos. Below, docks, ships, autos and buildings are clearly visible in this view of the Manhattan waterfront

U. S. Air Force photo

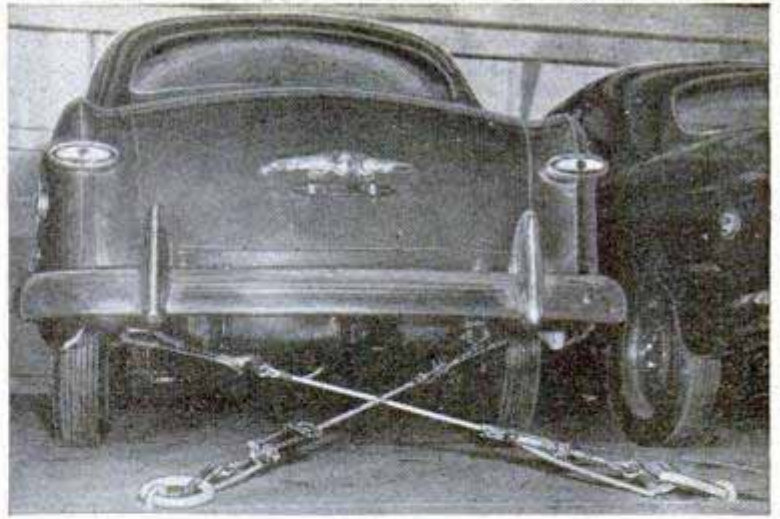
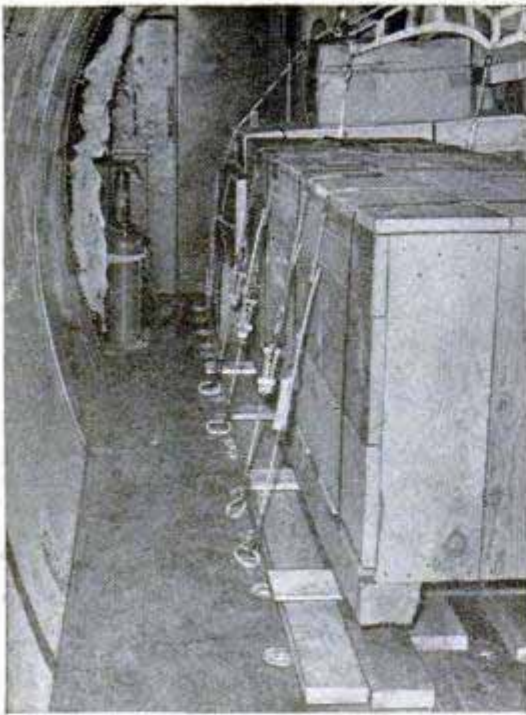


Low-Pressure Oil Burner Consumes Crankcase Drainings

Even crankcase and gearbox drainings can be burned without soot or smoke by a low-pressure oil burner that is said to cut fuel costs at least 30 percent. Mixtures of fuel oil, road oil and water were burned readily in factory tests, the water being introduced in the oil line at the rate of $\frac{1}{4}$ gallon an hour without extinguishing the flame. The burner is especially designed for use with hard-cracked oils and has a

capacity ranging from 2 quarts to $1\frac{1}{2}$ gallons an hour. The oil is thoroughly mixed with air and is kept in this bubbly condition until it is ignited. There are no filters or fine screens to clean and the burner has only two simple adjustments.

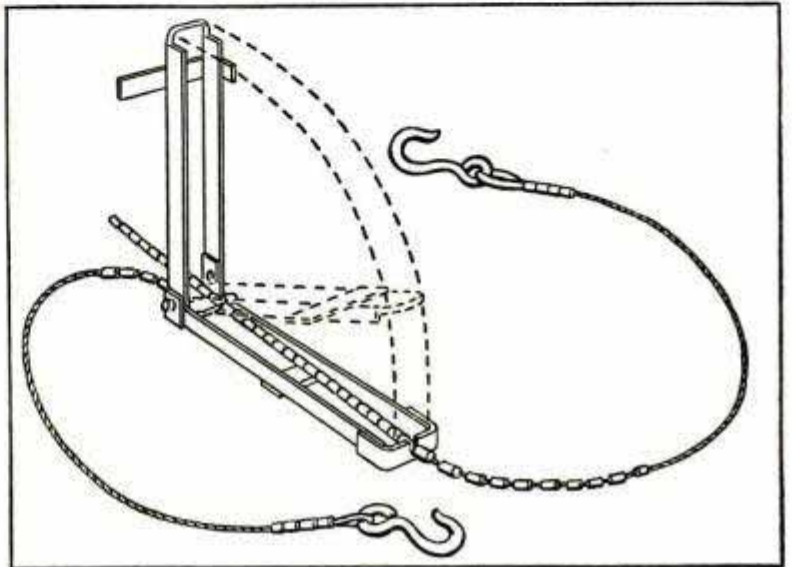
Rayon consumption in the United States for 1948 totaled 1,017,000,000 pounds, an all-time high.



Above and upper right, adjustable cable in use on plane and ship. Right, cable works on beaded key-chain principle, except the beads are movable along a wire-rope core

Adjustable Cargo Cable Locks Like Key Chain

Cargo is lashed securely in planes, ships and trucks by an adjustable cable that works like a beaded key chain—except that the beads are movable along a wire-rope core. In addition to the beaded section, there is another length of unbeaded wire with a toggle lock at the end. After the beaded end is joined to the toggle, the toggle handle is closed, exerting leverage that



tensions the connection. The handle is moved slightly past dead center and will not open under added stress, or because of vibration. Standard hooks or specially designed fittings make it simple to attach.

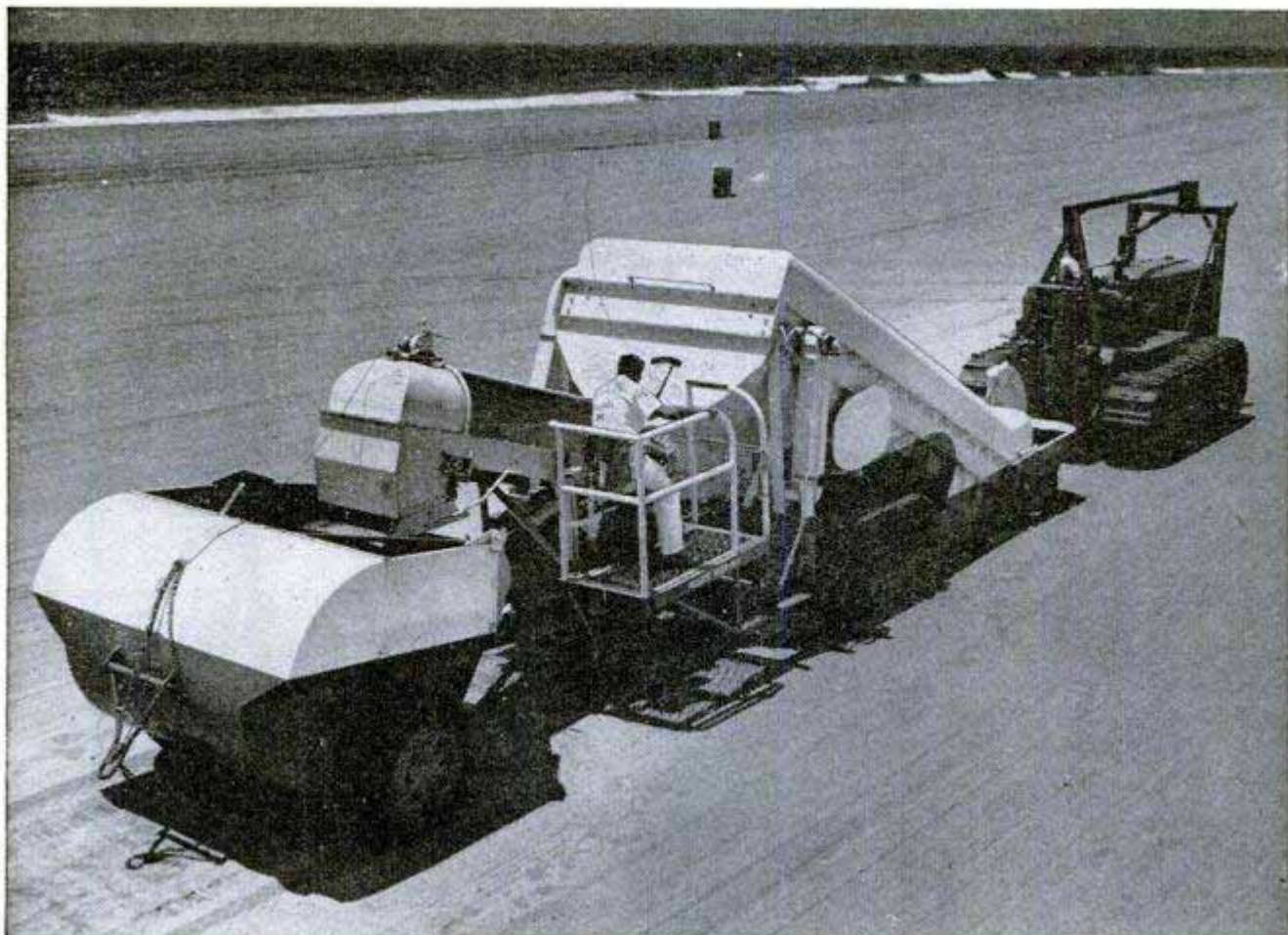
Low-Pressure Chamber Serves as "Flying Kitchen"



Pillsbury Mills photo

"Flights" in an earthbound kitchen helped a flour manufacturer solve problems for bakers and housewives in regions like Denver, Colo., and Butte, Mont. In a low-pressure chamber once used by the U. S. Air Force for simulated high-altitude experiments, home economists checked recipe instructions by baking 200 cakes at various heights up to 7000 feet.

Popular Mechanics provides two sources of further information concerning articles published in each issue: the WHERE-TO-BUY-IT INDEX, starting on page 10, and the WHERE-TO-FIND-IT INDEX, available without charge from our Bureau of Information, 200 East Ontario Street, Chicago 11, Illinois



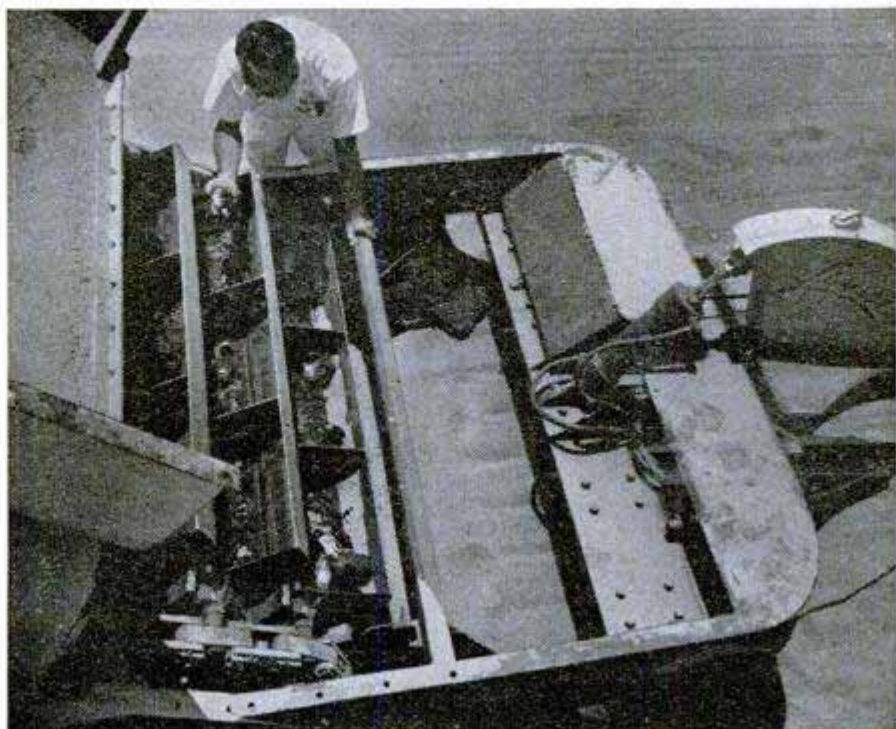
Glass and other foreign matter turned up in sands by nine-ton beachcomber are dumped into trailer at left

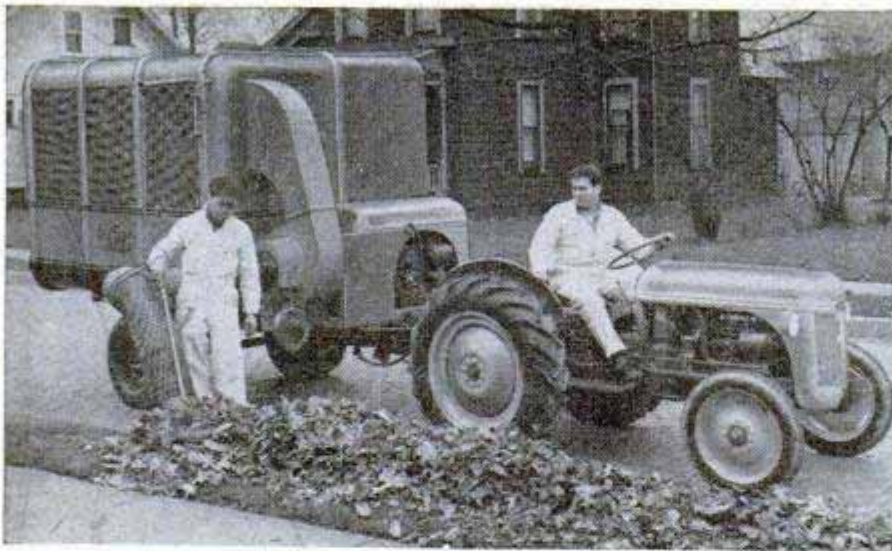
Mechanical Beachcomber

Broken glass, rusty nails and other dangerous debris in beach sands are completely removed by a mechanical beachcomber. The machine screens and processes over 3200 square yards of sand per hour, digging to a depth of nine inches. Foreign matter as small as BB shot is extracted and the cleaned sand is restored to place and smoothed down. The processing machine weighs nine tons and is towed by a track-type tractor at up to 1½ miles per hour. Thirty-eight screen buckets, each five feet wide, scoop up the sand. Cleaned sand falls through the screens back onto the beach while all debris is elevated and dumped onto a traveling belt that discharges into a hopper-trailer that is towed behind the machine. Debris can either be deposited in a pile and then bladed into a deep hole or towed in its trail-

er to a dump. A 36-horsepower engine turns the buckets and belt. Working over a public beach for the first time, the machine collects an average of 25 pounds of broken glass and about \$5.00 in small change in an hour. The pilot machine is now operating on public beaches in Los Angeles county.

Cleaned sand falls down through screen bottoms of digging buckets





"Vacuum Cleaner" Pulverizes Leaves

Leaves are sucked up rapidly and pulverized for compost by a giant "vacuum cleaner" that has its own hydraulic system. A flexible intake hose with a rubber-tired "snout" collects wet or dry leaves from under automobiles, in gutters, around corners and in catch basins. The collector can be drawn by truck, tractor or jeep.

Stick-On Football Cleats

Ordinary shoes can be made into football shoes by attaching rubber-cleated soles. The 11½-inch-long soles can be cut in two at the arch to be cemented on as separate sections. The soles are also useful on hunting, fishing or ski boots and work shoes used on slippery surfaces.

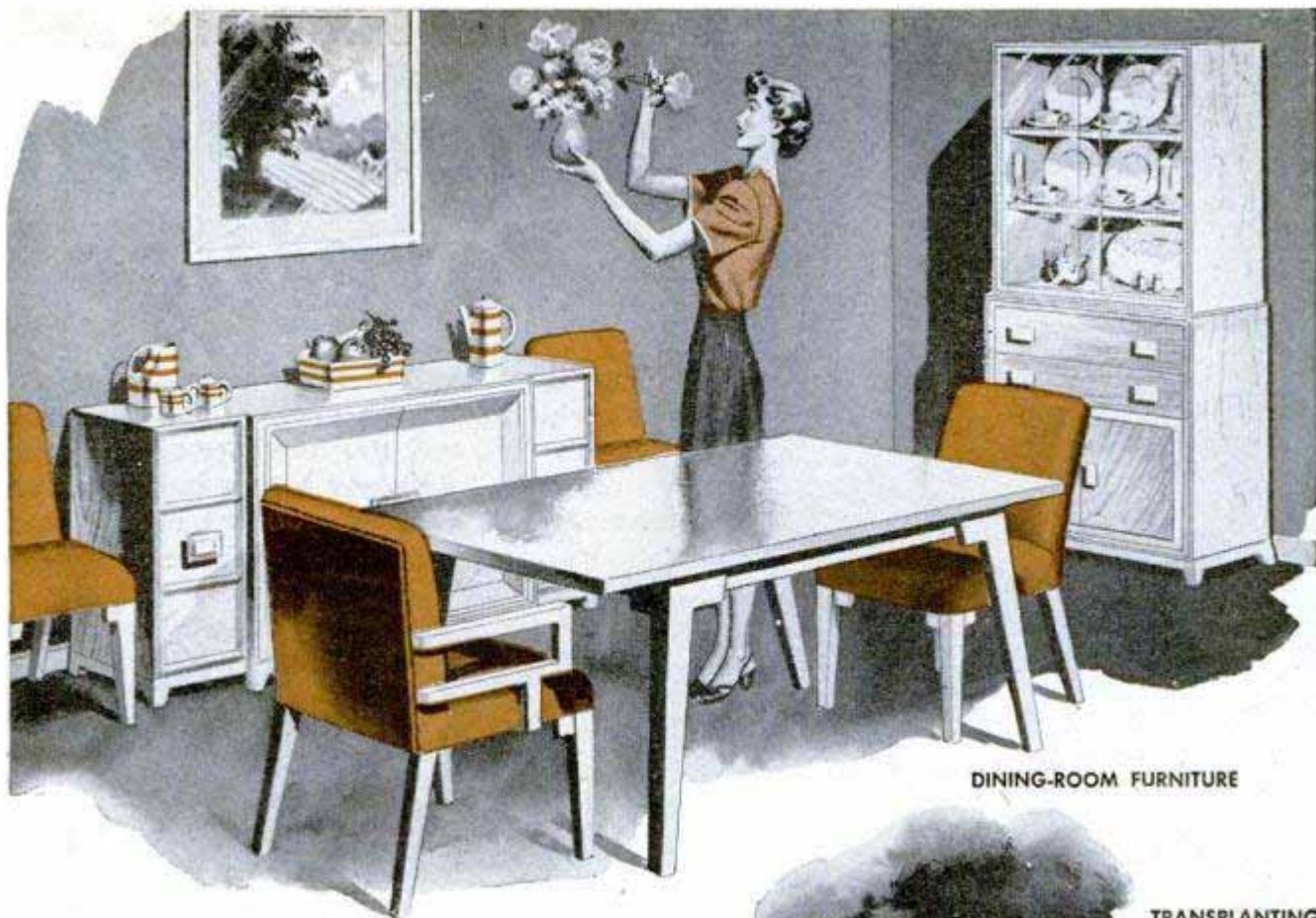
Underground Radio Waves

Radio waves were received 700 feet within the earth recently. William M. Barret, a geophysicist of Shreveport, La., demonstrated the penetration of the waves in a salt mine at Grand Saline, Tex. A portable transmitter on the earth's surface sent waves at a frequency of 1602 kilocycles to a receiver 700 feet within the mine. According to Barret, radio waves may someday be used in searching for valuable oils and minerals.



Gas Under Pressure Operates Lighter

Butane gas under pressure is the fuel used in a new cigarette lighter that yields more than 3000 lights before the tank is empty. A small knob is pushed with the thumb to release the jet of gas before the spark wheel is spun. When the fuel tank is empty, it is replaced with a new unit. The fuel from one tank will burn for three hours. It provides an odor-free flame and a "tasteless" light.



DINING-ROOM FURNITURE

The CRAFTSMAN

★ Want a dining-room suite that's really a "knock-out"? Then build this beautiful seven-piece ensemble from the details given in the full-color story beginning on page 182. It's extremely simple to build, just as the bedroom furniture which appeared in previous issues. Part I of this two-part story covers construction of the table and chairs. Part II will give complete information on building the modern credenza and china cabinet.

★ If a poorly placed tree or shrub is spoiling the looks of your yard, don't chop it down—turn to page 190 and find out how to transplant it to a new location. With a little help and rented equipment you can move the tree in a couple of hours.

★ Regardless of its age, you'll be proud of your home when it's gleaming in a spanking new coat of paint—and you don't have to pay today's high prices. By following the pointers given in the article on page 194, you can easily do the job yourself in your spare time.



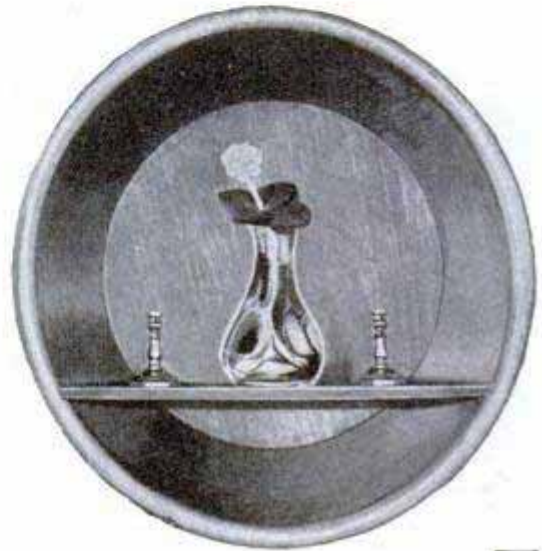
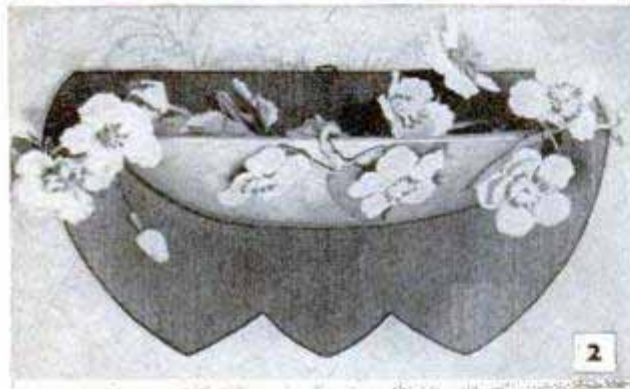
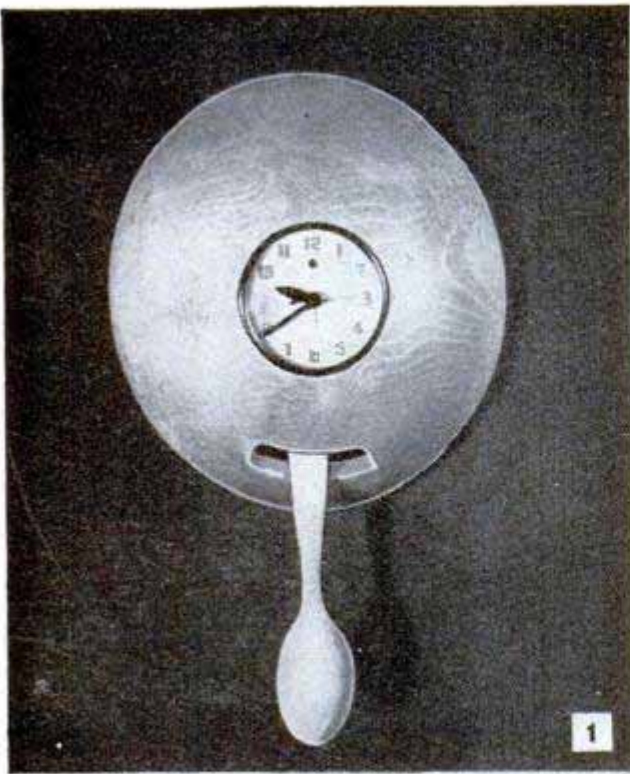
TRANSPLANTING TREES AND SHRUBS



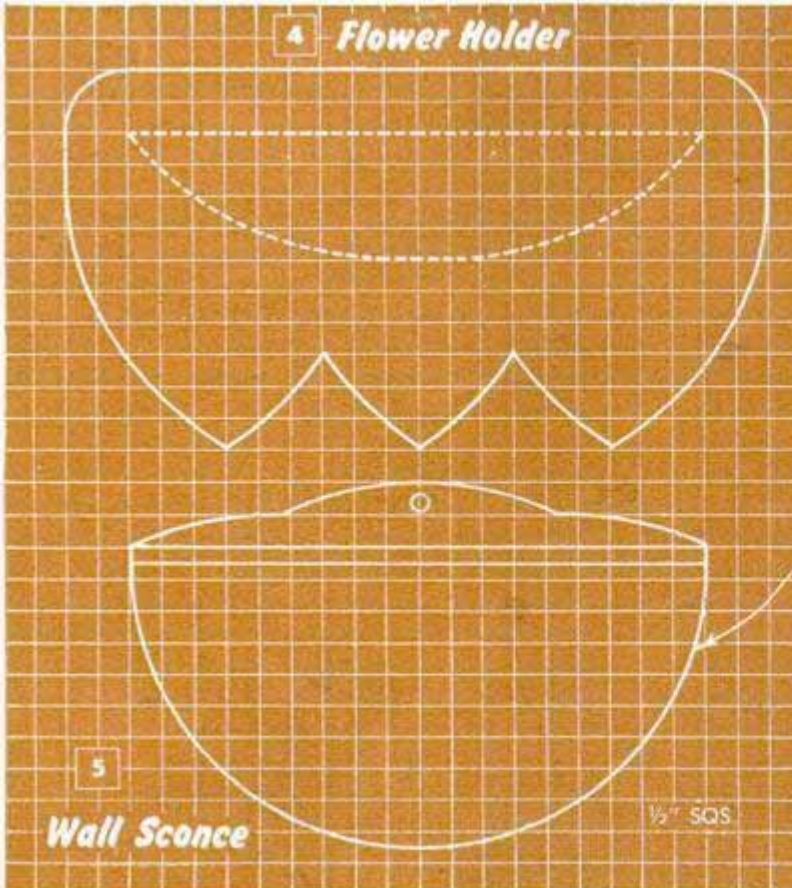
HOUSE PAINTING

THERE'S MONEY IN *Salad-Bowl Novelties*

They'll go like hot cakes if sold in a gift shop at Christmas time — and at a nice profit. You buy the bowls and take over from there. Plywood scraps and common hand tools will set you up in business

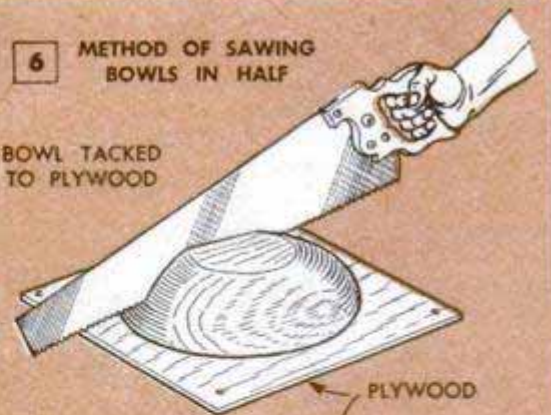


4 *Flower Holder*



6 METHOD OF SAWING BOWLS IN HALF

BOWL TACKED TO PLYWOOD

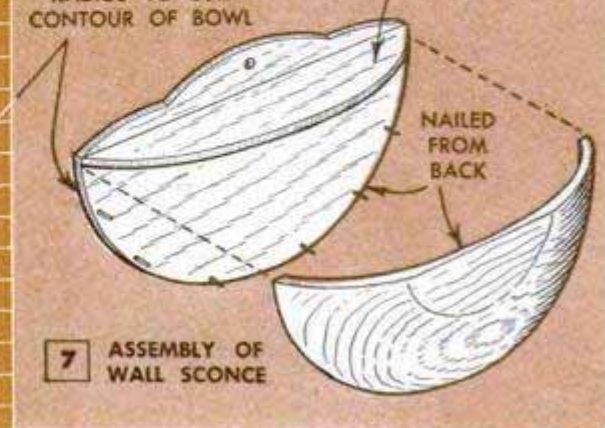


RADIUS TO SUIT CONTOUR OF BOWL

PLYWOOD

NAILED FROM BACK

7 ASSEMBLY OF WALL SCONCE

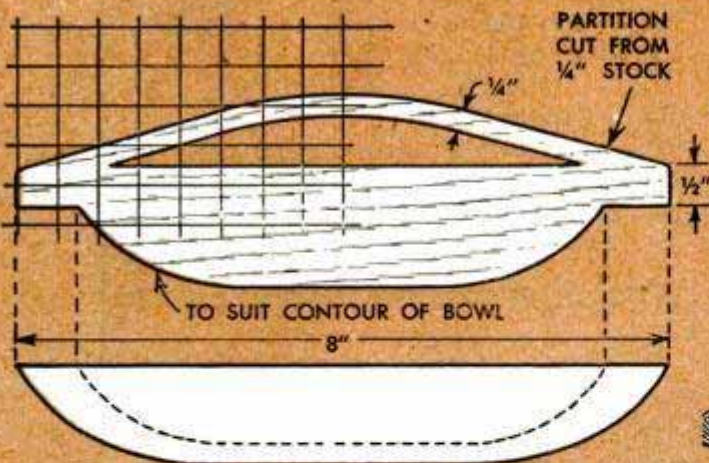
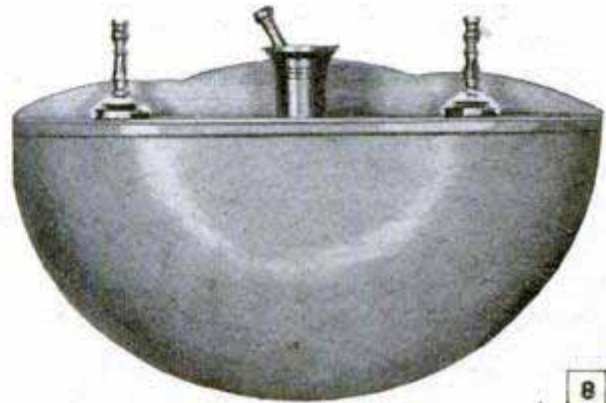
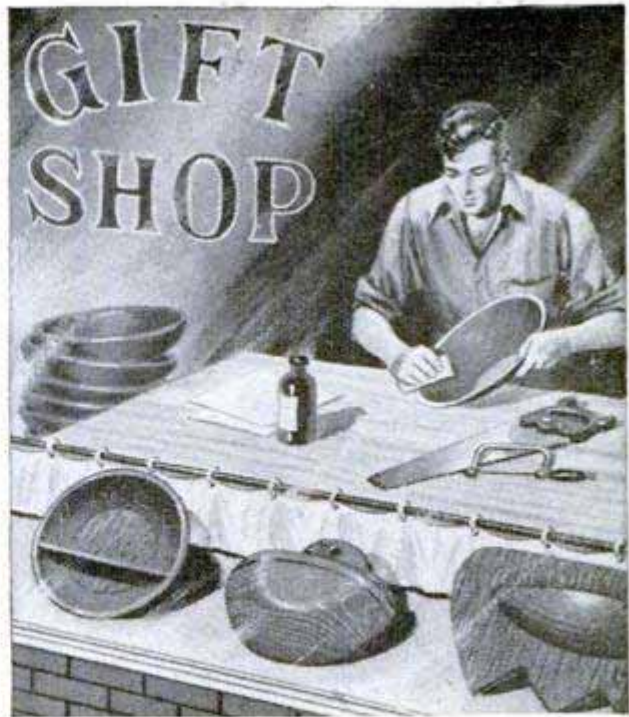


THERE'S spare-time profit galore to be had from the sale of wooden novelties, and sure-fire sellers to add to your line are these novel projects made from wooden salad bowls. The profit is great and the outlay is small for, in addition to the bowls, all you need are a few scraps of plywood and some glue and brads. With a few samples to show, most any gift shop or neighborhood department store will gladly handle them for you on commission.

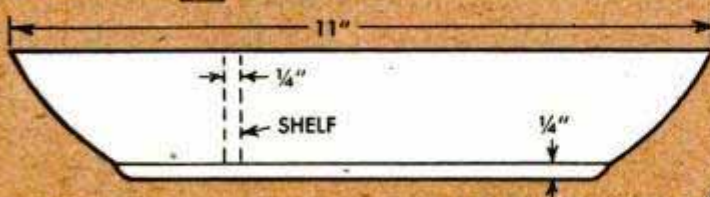
The projects shown here are but a few of the many useful items that can be made. Half the job is done by buying the bowls and there's no waste. Only one bowl is required to make the flower holder, Figs. 2 and 4, and the wall sconce, Figs. 5, 7 and 8. Likewise, one bowl makes the nut dish, Fig. 9, and the wall shelf, Figs. 3 and 10. In the latter case, the shallow bottom section of the bowl is used for the nut dish. The novel kitchen clock, Fig. 1, is made by installing an electric movement in the center of the bowl and slotting it at the bottom to take a dummy salad-spoon pendulum.

While a bandsaw can be used to saw the bowls in half, an easy way to do this by hand is shown in Fig. 6. A bowl is tacked temporarily to a flat piece of plywood which is tacked to the top of the workbench. To make the nut dish and wall shelf, the bowl is supported for sawing in the manner shown in Fig. 11. Fig. 12 shows how the bowls are marked for sawing.

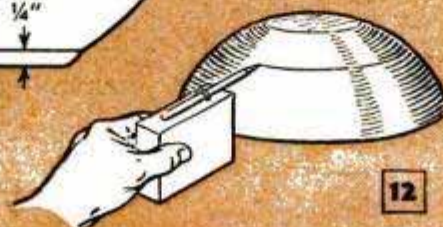
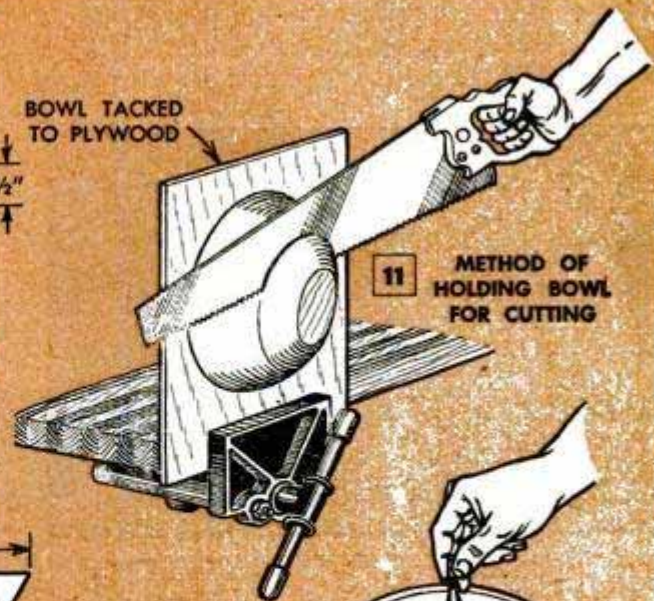
By R. J. DeCristoforo



9 Nut Dish



10 Wall Shelf



12 MARKING BOWLS FOR SAWING

Scored Lines on Saw Clamp Check Proper Filing Angle

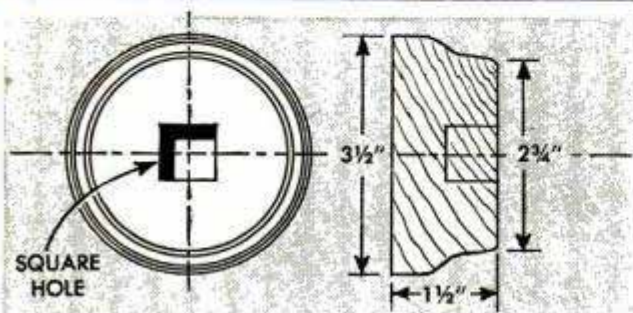


Holding the file at the proper angle when sharpening saws is easy if crisscross guide lines are scored across the top of the saw clamp or vise. The lines are made at the correct filing angle and the position of the file is checked while working merely by glancing downward at the lines.

Ferd J. Haas, Waukesha, Wis.

Wooden Chuck Speeds Lathe Setup When Turning Duplicate Pieces

When turning a number of duplicate parts, such as chair rungs, the setup can be speeded by using a simple wooden chuck. This is turned from a scrap of 1½-in. stock as shown in the detail and a square



hole is formed in the exact center. The hole should be the same size as the stock to be turned. After the chuck has been screwed to the lathe faceplate, the job is set up by inserting one end of the stock in the chuck and clamping the tailstock in place against the other end.

Files Cleaned With Adhesive Tape

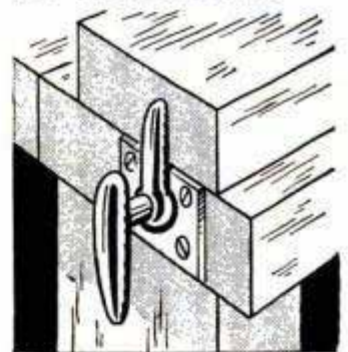
To clean a file, I simply place a strip of adhesive tape lengthwise over the file, rubbing my finger across the tape so the adhesive is pressed between the file teeth, and then pull it loose. This will remove most of the grit and filings from between the teeth but, if necessary, the operation should be repeated until the file is clean.

John R. Hattam, Des Plaines, Ill.



Improved Stop for Workbench

An excellent workbench stop for planing wide boards is obtained by screwing a casement fastener to the end of the bench. The fastener is adjusted to suit the work and, if it is too loose to stay at any set position, the peened end can be hammered to tighten it. The fastener is turned down and out of the way when not in use.



Washer Improves Worn Faucet

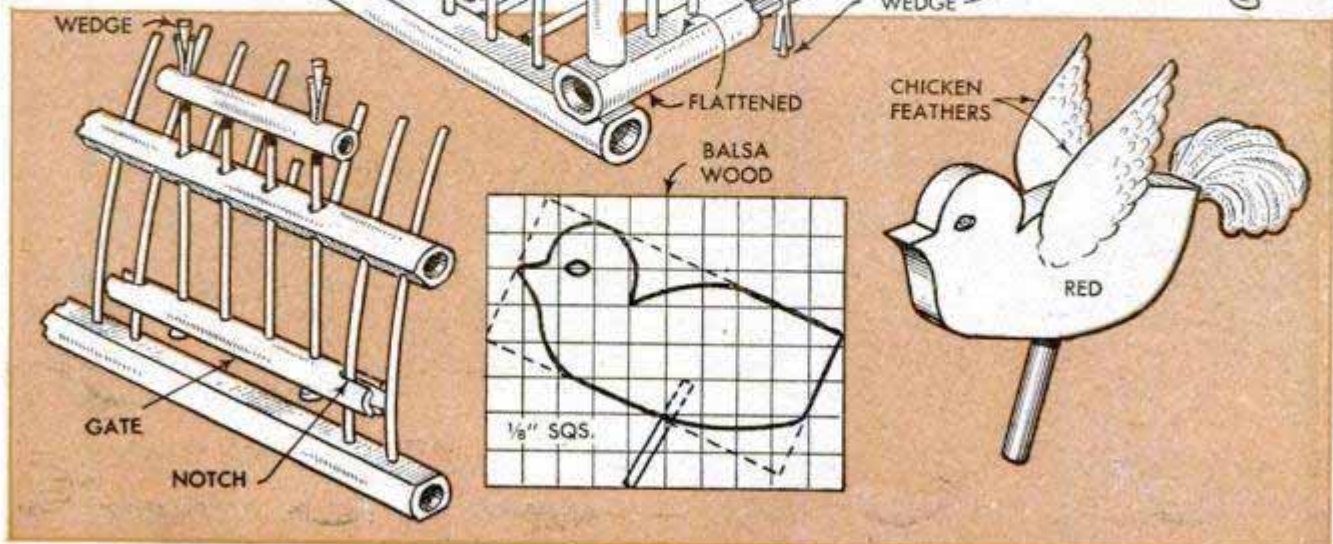
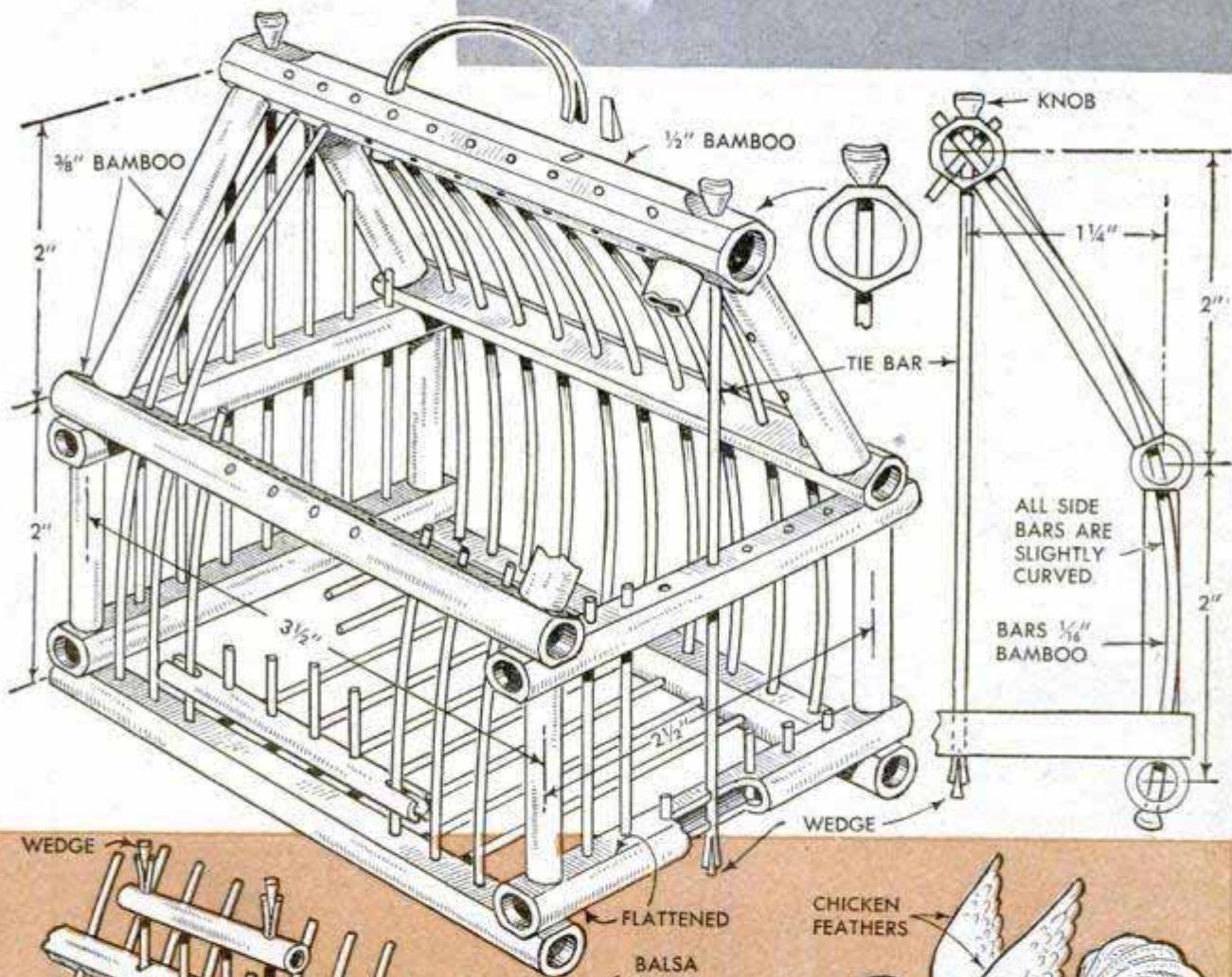
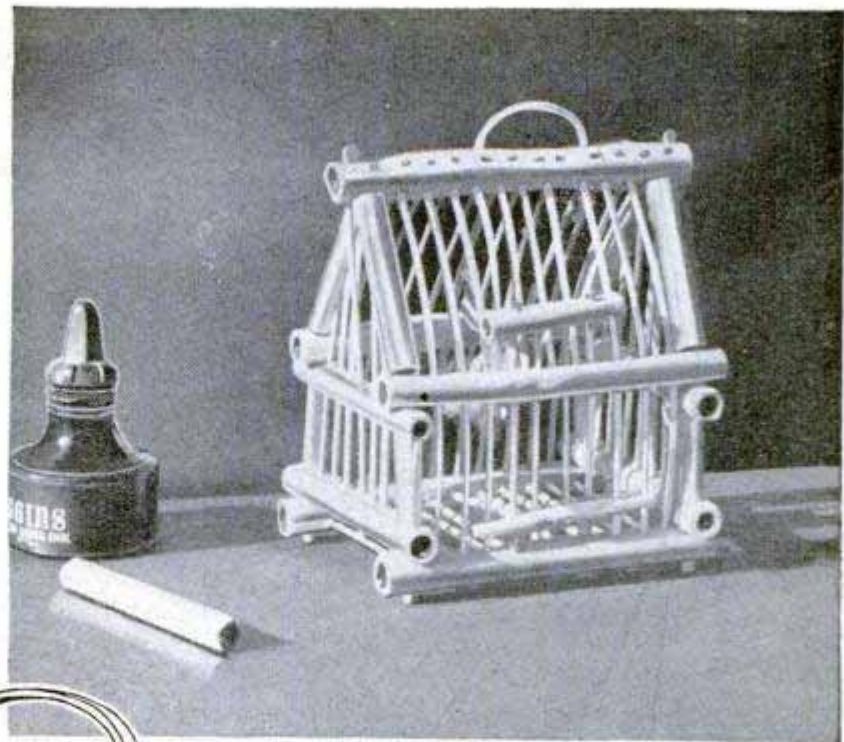
If the threads of a faucet spindle become worn and the washer will not seat properly, the operation of the faucet can be improved by adding an extra washer to shim out the regular compression washer. Just place a flat rubber washer between the compression washer and the end of the spindle and tighten the screw.

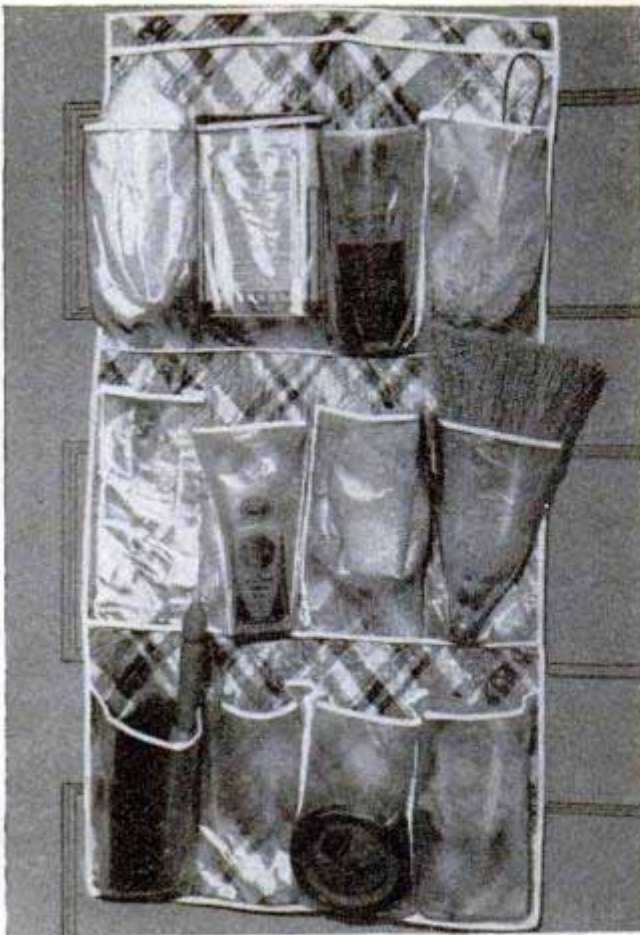
W. H. McClay, Pasadena, Calif.



Bird-Cage Novelty

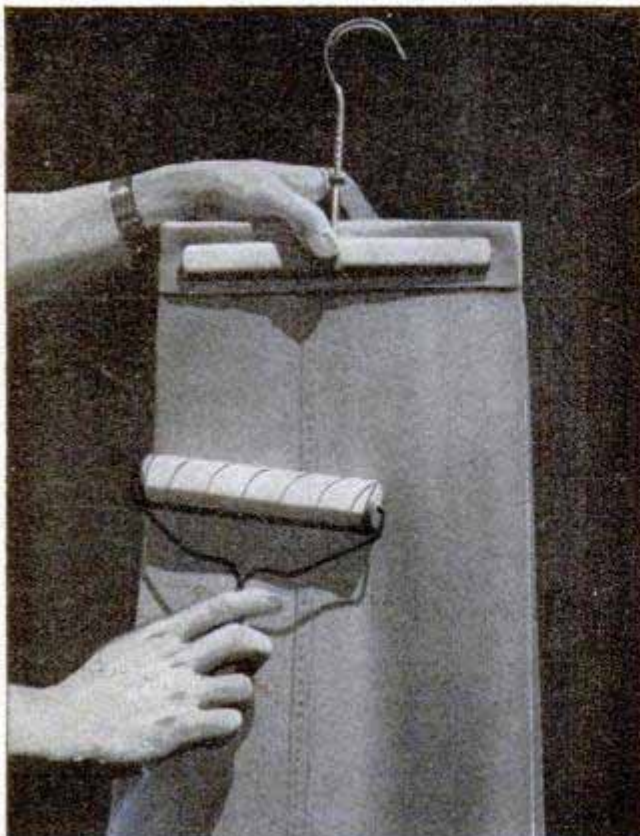
Assembled from strips of bamboo without using glue or nails, this novel bird cage can be made tiny enough to fit in the palm of the hand or proportionately larger. Bowed side strips are passed through the corner frame members to hold them in place. A bamboo perch supports a balsa bird



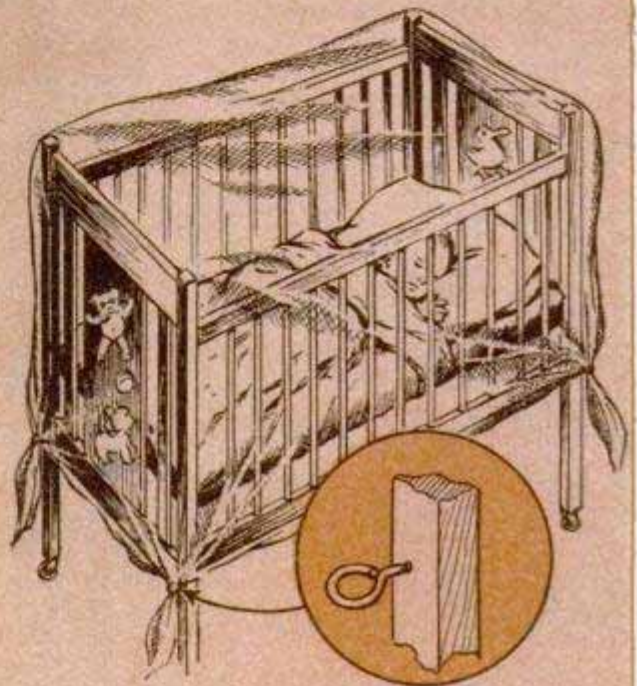


STORING CLEANING ITEMS, such as dustcloths, brushes, wax, etc., in a plastic shoe bag hung on a door solves the problem of inadequate shelf space

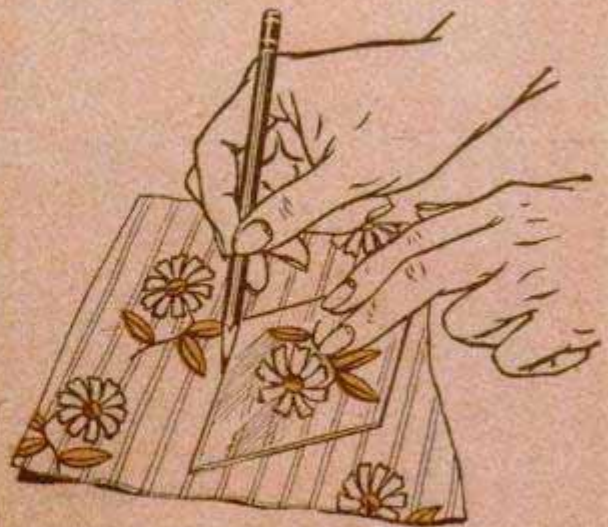
IMPROVED DELINTER for woolen garments is made quickly by wrapping adhesive tape, sticky side out, around a broomstick roller with a wire handle



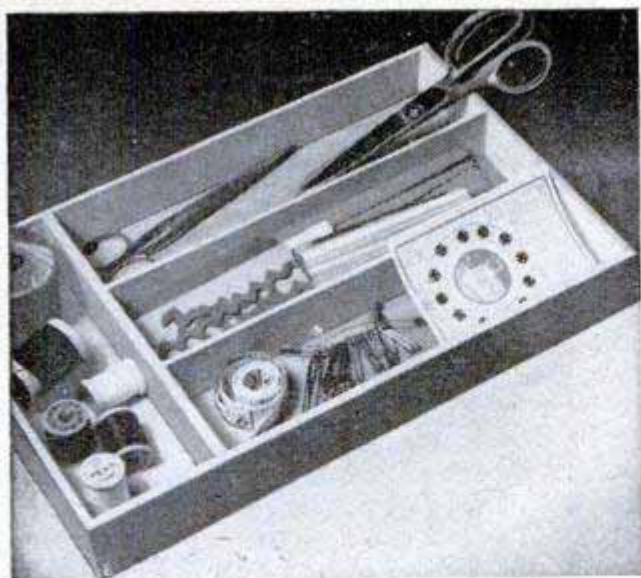
Solving HOME PROBLEMS



NETTING WON'T BLOW OFF a baby crib if the corners of the material are held in place by pulling them through screw eyes turned in the legs



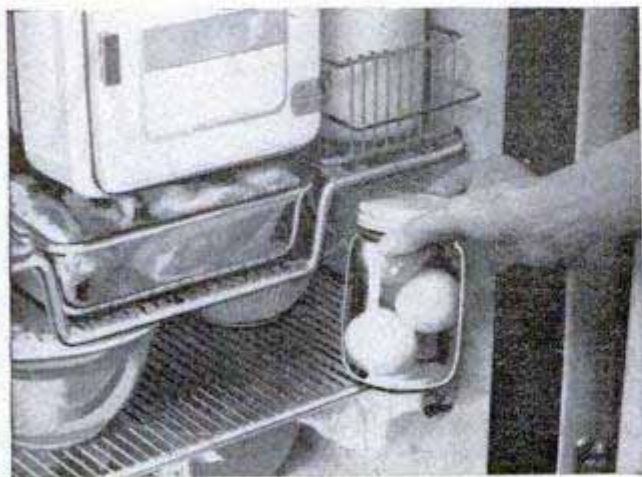
QUILT-BLOCK PATTERN made of clear plastic not only will outlast one of cardboard but facilitates centering over pattern of material



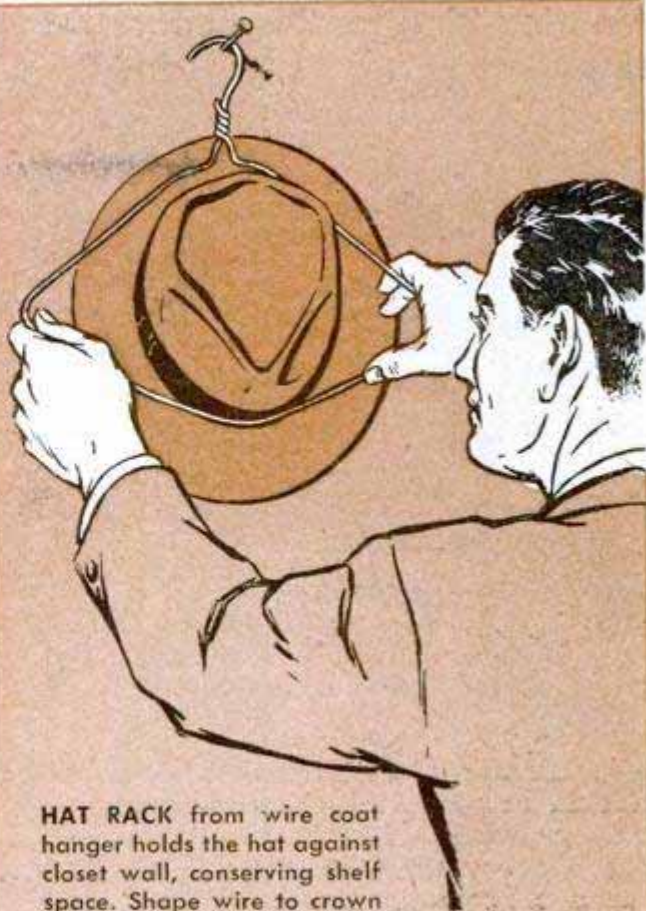
TRAY SEWING KIT with compartments to keep everything in order makes use of wooden or plastic cutlery box. It can be kept in drawer or on shelf



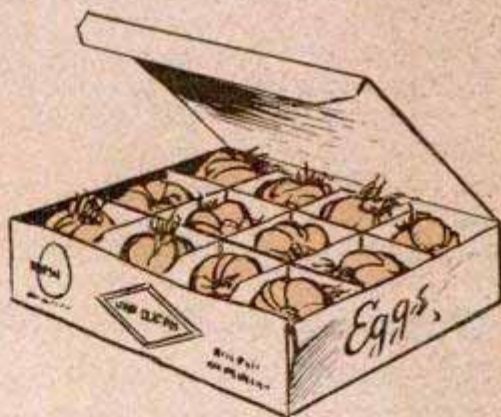
PRESHRINKING RICKRACK by dipping and drying it right on the card will prevent it from puckering the garment when the latter is first laundered



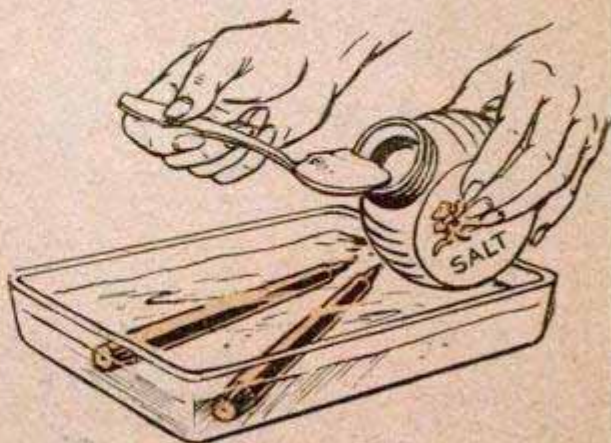
PEELED ONIONS WON'T TAINT other foods in a refrigerator and will stay fresh and crisp for weeks if they are placed in a tightly capped screw-top jar. A pickle or salad-dressing jar is excellent



HAT RACK from wire coat hanger holds the hat against closet wall, conserving shelf space. Shape wire to crown



FLOWER BULBS of various varieties are stored conveniently in egg cartons which can be labeled and stacked safely one on top of another



CANDLES CAN BE MADE DRIPPROOF by soaking them in a strong salt-water solution a few hours. Do not wipe them after removing from solution

Mooring Ring for Rowboat Improved From Piston

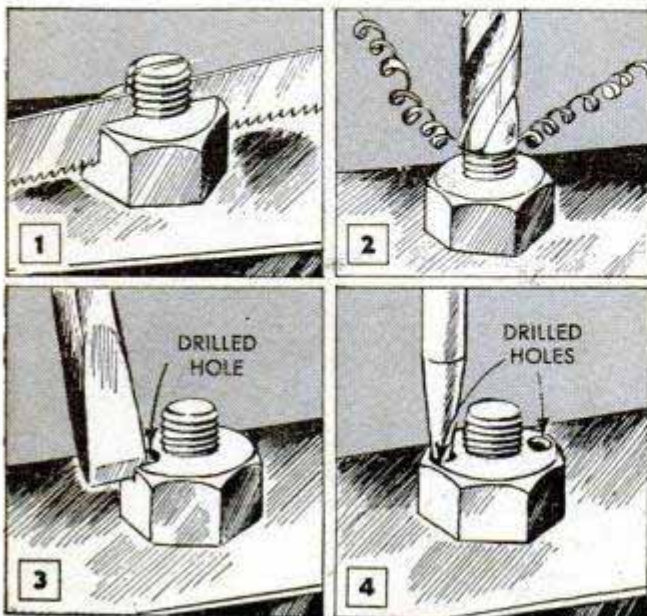


Using auto pistons with connecting rods attached as mooring rings for a boat, one trapper saves pulling his rowboat onto the shore every time he stops to check his traps. At convenient points along the trap line, the pistons are buried in the ground so the end of the connecting rod is exposed, and a line from the boat is secured to the rod. This method, of course, can only be used in very still water. For more permanent installations where there is a strong current, the pistons and rods can be embedded in concrete.

G. E. Hendrickson, Argyle, Wis.

Four Ways to Remove Frozen Nuts Without Using Cutting Torch

Here are four easy ways to remove a frozen nut when a cutting torch is not available or cannot be used because of fire

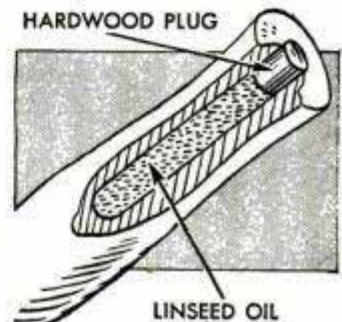


hazard. If there is no objection to damaging the bolt and marring the finish of the work, use a hacksaw to cut down through the bolt and nut as in Fig. 1. Another quick method is shown in Fig. 2. Just select a drill having a diameter slightly larger than that of the bolt and drill out the bolt until the nut falls off. Unless there is a washer under the nut, the work will be marred by this method. If you want to salvage the bolt or stud with less danger of damaging the work, an electric drill and a cold chisel or tapered punch will do the job. Drill a vertical hole through one side of the nut and, using the chisel as a wedge, split open the nut as in Fig. 3. To split the nut with a punch, select a bit of the same diameter as the end of the punch and drill vertical holes on opposite sides of the nut. Then split the nut by driving the punch in one or both of the holes as in Fig. 4. The wedging action will break the thin web easily.

Hammer Handles Kept in Condition

Hammer handles which are permitted to dry out and become brittle are apt to break at the neck. One way to avoid this is to lubricate them with linseed oil. This is done by

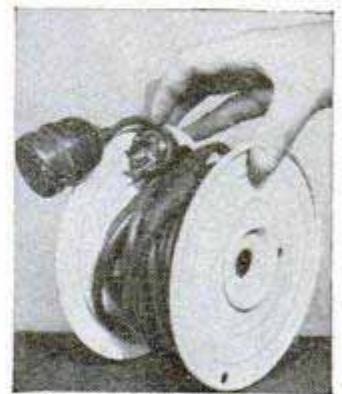
drilling a $\frac{3}{8}$ -in. hole, about 6 in. deep, in the end of the handle. Then, the hole is filled with raw linseed oil and plugged with a hardwood cork. The oil gradually works its way throughout the wooden handle, thus keeping it supple, and the hole is refilled with linseed oil as required.—R. F. Donovan, Jersey City, N. J.



Extension Cords Stored Safely By Winding on Metal Spool

Sharp kinks in extension cords caused by hanging them from hooks or nails are likely to result in broken insulation and dangerous exposure of the wire. The cords can be stored conveniently without kinking or tangling simply

by winding them on discarded metal wire spools. These spools, on which wire is wound for shipment from the manufacturer, can usually be obtained from a local hardware or electrical-supply dealer.

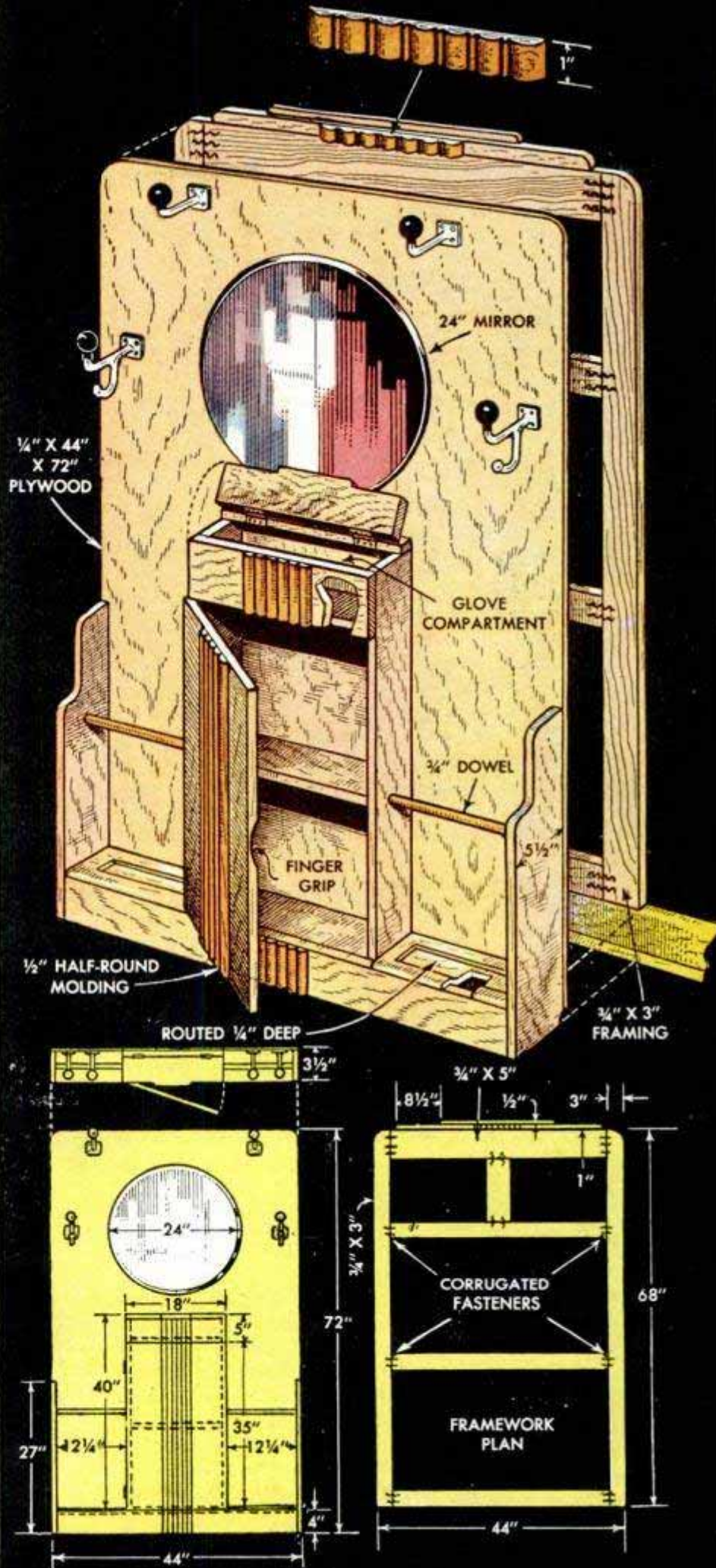




GUEST COSTUMER

RESERVED for guests and last-minute primping, this modern wall costumer is found especially handy when a home is without a hall coat closet. While not intended as a catch-all for members of the family, the costumer incorporates convenient storage space for such items as gloves, rubber footwear, umbrellas and other articles used only occasionally. Painted in a pastel shade to harmonize with the wall, the costumer adds a bright spot of color to an uninviting hallway.

The face panel is cut from a 4 x 6-ft. sheet of $\frac{1}{4}$ -in. plywood and this is nailed to a rough framework assembled with corrugated fasteners. The storage cabinet is assembled as a separate unit and fastened to the plywood covering with flat-headed screws driven from the rear. Coat hooks of the type shown are in keeping with the design. Note that the cross members of the framework are spaced to provide a solid backing for attaching the hooks. A standard 24-in. mirror, beveled or plain, may be hung in place or attached with metal clips made for the purpose. A single screw hidden by the mirror will hold the costumer securely to the wall.



The framework to which the front panel is glued is made shorter than the plywood sheet to permit the costumer to fit over the baseboard and flat against the wall. Each side piece of the unit is notched for the quarter-round



HERE'S YOUR

DINING-ROOM FURNITURE

This smart-looking seven-piece dining-room group—the second in a series of fine furniture for the entire house—is our answer to the tremendous response received for more home-built furniture of good, practical design

By Wayne C. Leckey

Part I

WE ASKED if you wanted more and the answer was overwhelmingly yes—so here is a beautiful modern dining-room suite for your approval. Designed expressly for the basement craftsman working with small home-workshop tools, this group features the same simplicity of line and ease of construction characteristic of the bedroom-furniture series presented in our February, March and April, 1949 issues. The complete ensemble, which is sufficient to furnish a full-size dining room, consists of seven pieces, including an extension table for eight, four chairs, a credenza and a china cabinet. However, if you haven't room for the entire group, you can

eliminate the china cabinet or, in the case of an exceptionally small dinette or dining alcove, the base section of the two-piece china cabinet can be built and used alone as a server to take the place of the large credenza. The table is designed to take an extra leaf which permits serving as many as eight persons, and the seats of the upholstered chairs are spring-filled for real added comfort.

This, the first of a two-part story, details the construction of the table and chairs. Part II, in the next issue, will cover the credenza and china cabinet. For the craftsman who prefers to work from plans larger than magazine size, we have prepared a

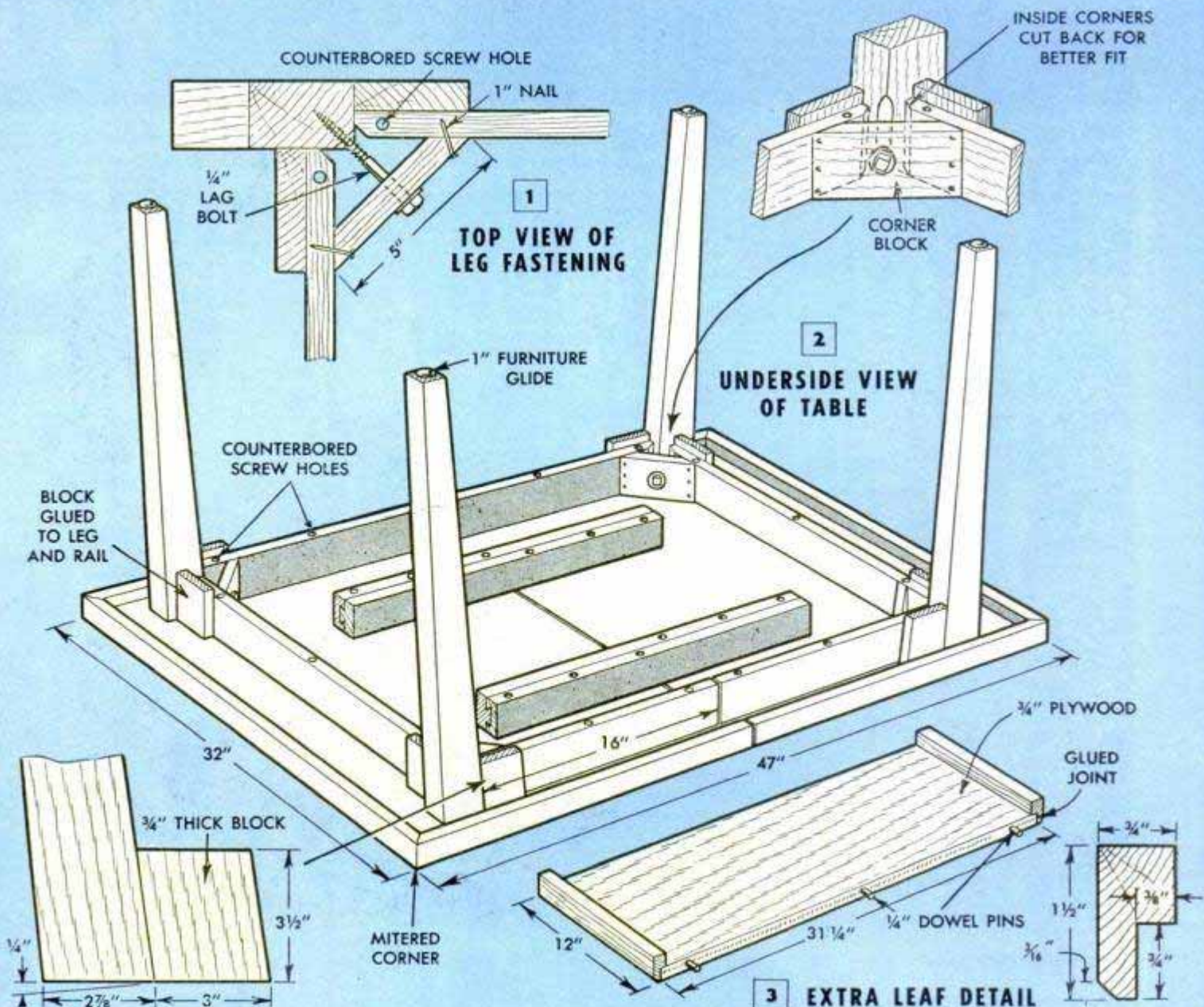


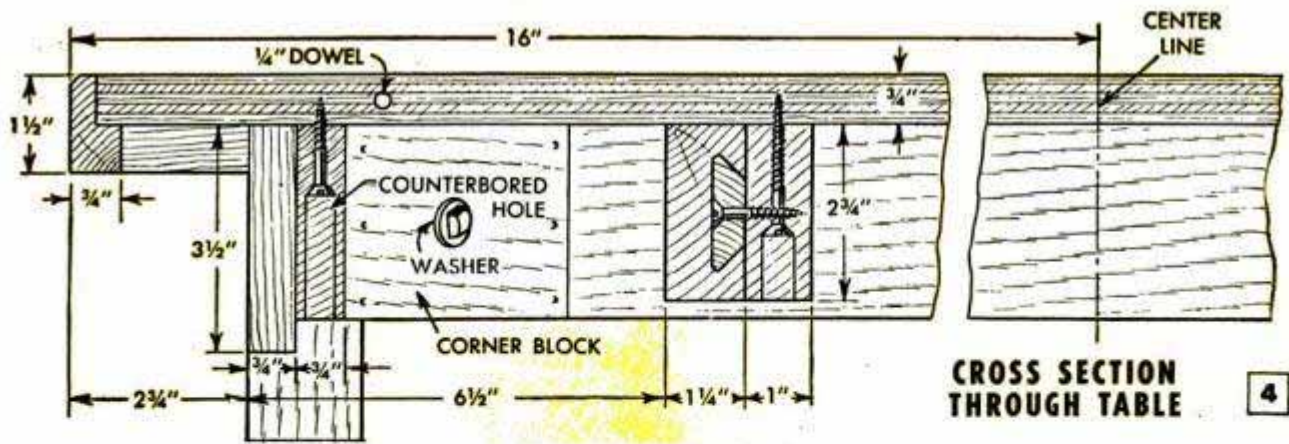
The beautiful credenza shown above provides abundant storage space. Matching end compartments contain shelf area for glassware, while the center opens to reveal two drawers for silver and shelf space for linens





Most of the work is done on circular saw





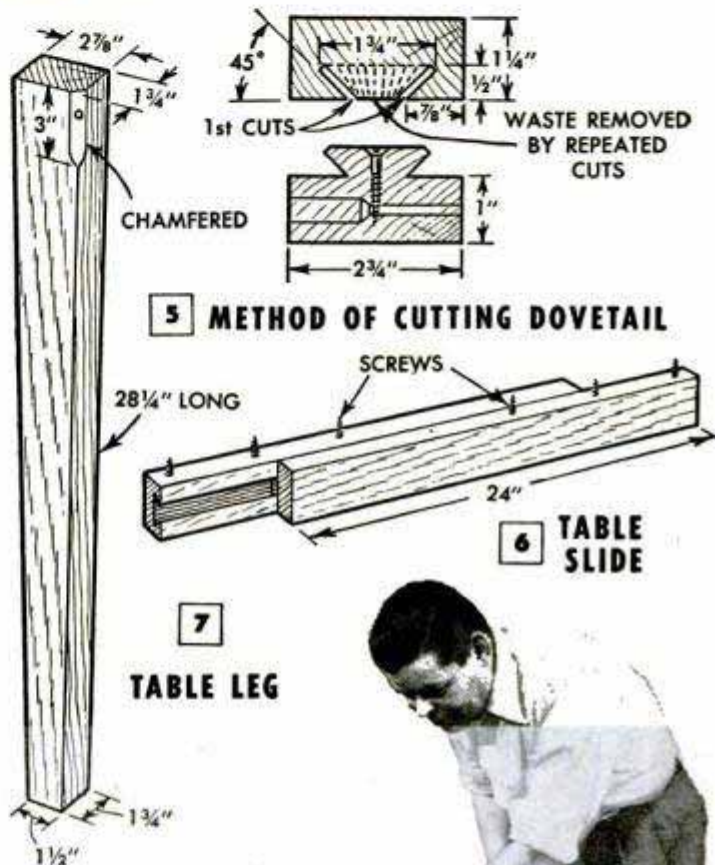
CROSS SECTION THROUGH TABLE 4

set of large blueprints which can be obtained from our book department.

Construction of the table is detailed in Figs. 1 to 7 inclusive. Like the bedroom furniture, which incorporated the use of both plywood and solid stock, the table top and extra leaf are cut from 3/4-in. plywood to save the work of gluing up solid stock. All the rest of the table is made of solid material. A 3/4 x 1 1/2-in. facing or edging strip, mitered at the corners and rabbeted on the back, is glued and nailed to the edge of the plywood to conceal the laminations. The top, of course, consists of two separate sections having the conventional aligning pins and holes in the edges at the joint. The sectional view in Fig. 4 indicates the position of the legs and the slides and also shows how the 3-in. aprons, or rails, are screwed to the underside of the top. The ends of the end aprons are cut off squarely, while the two-piece side ones, which butt together at the joint, are cut at an angle to match the slant of the tapered legs. Locate the side aprons 3 1/2 in. in from the edge of the top and the end ones 6 in. inward. Then glue and screw them securely to the plywood.

The tapered legs, Fig. 7, are cut from 1 3/4-in. stock. Note in the detail at the left of Fig. 3, that the tops of the legs are cut at a 1/4-in. angle. Each leg is placed in the corner formed by the aprons and drawn up rigidly with lag screws. Corner blocks are drilled for the screws and then glued and nailed to the aprons as shown in Fig. 1. The lag screws are the only fastenings the legs require and, if the legs loosen with use, it is easy to make them rigid simply by drawing the lag screws tighter. Additional rigidity is had by the eight overlay blocks which are applied to the face of the aprons at the corners. Note that the blocks at the sides of the table are fitted flush with the face of the legs.

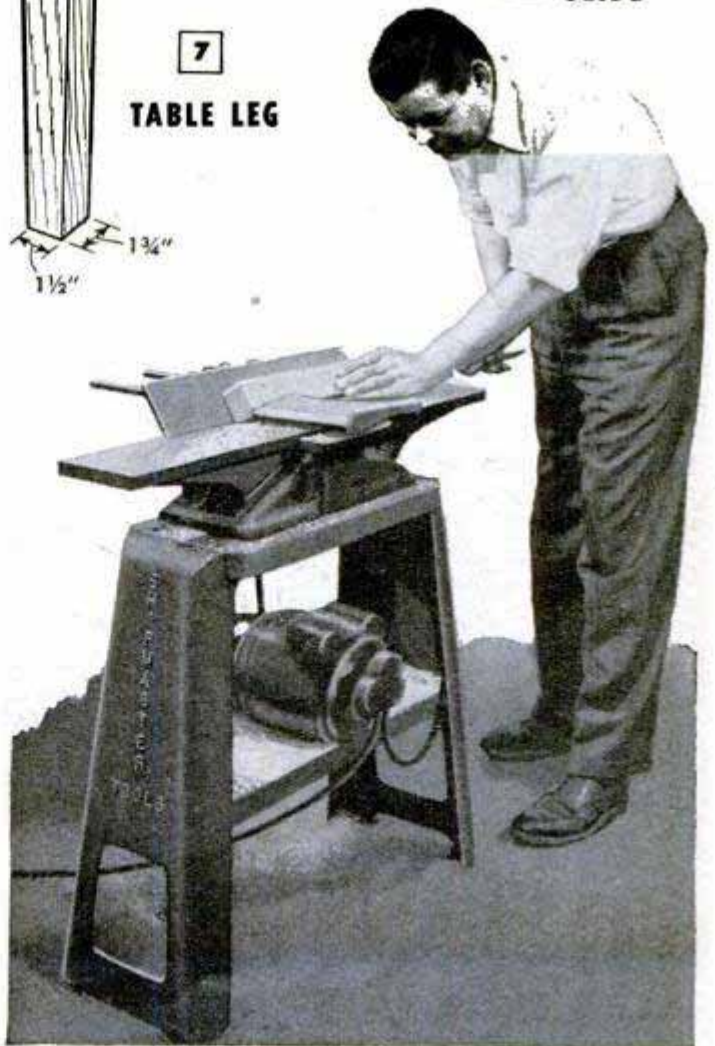
Figs. 4, 5 and 6 show how the dovetail joint is formed in the table slide. The



5 METHOD OF CUTTING DOVETAIL

6 TABLE SLIDE

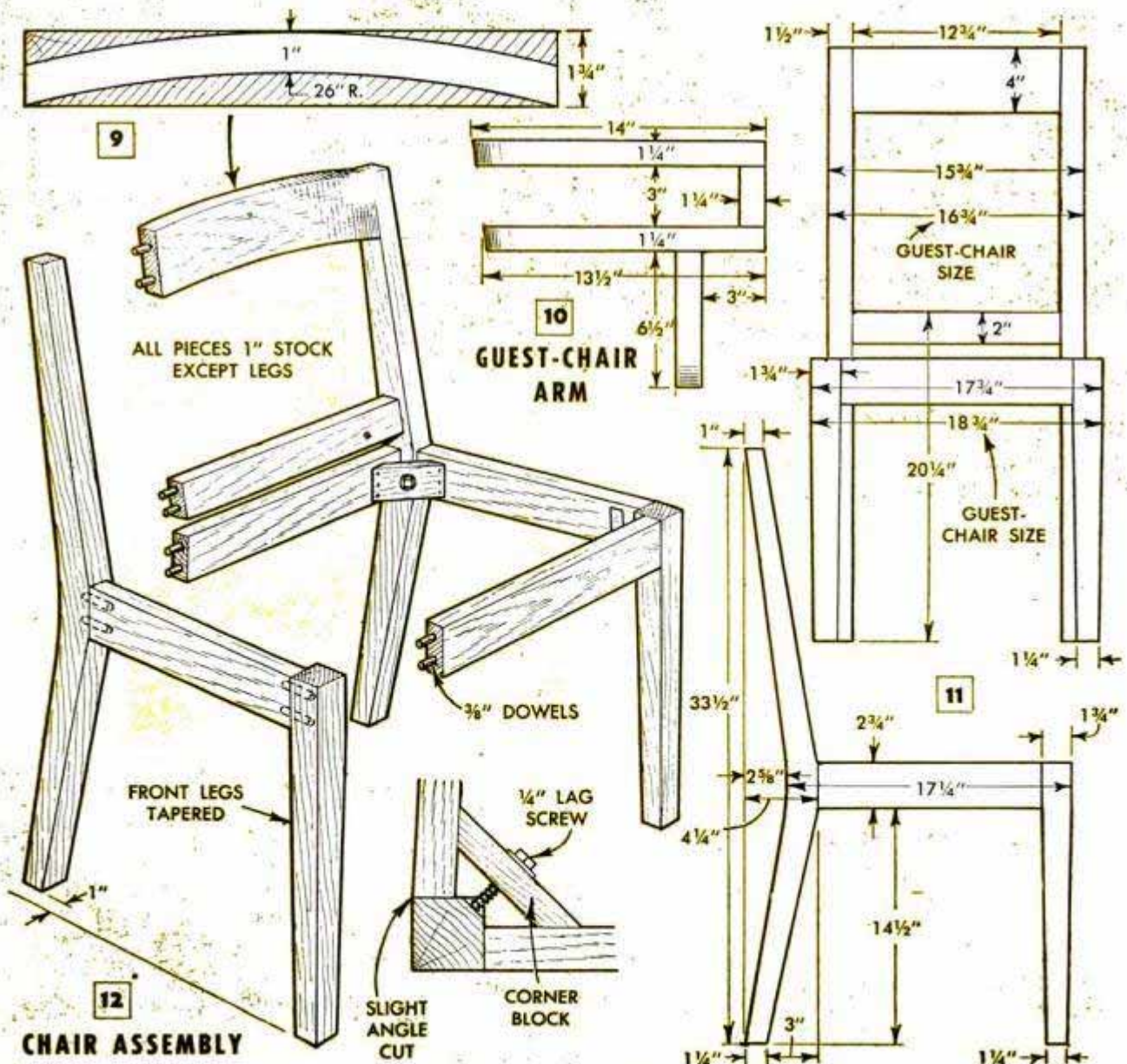
7 TABLE LEG

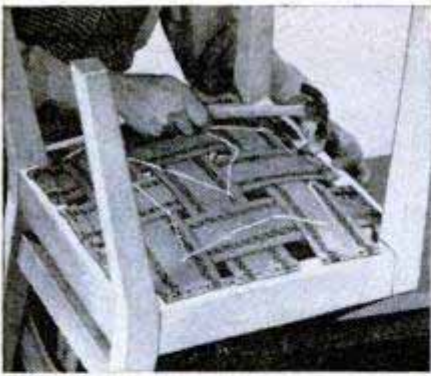




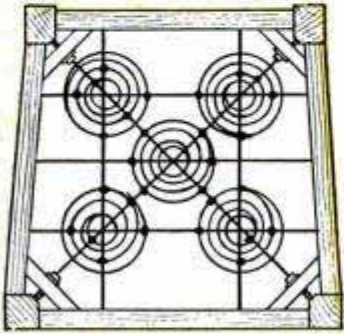
tenon on the male member of the slide consists of a separate strip shaped as shown and screwed to the face of the piece. This strip engages a matching groove in the female member. The groove can be cut on the circular saw by first making the two 45-deg. outside cuts and then removing the waste portion with repeated cuts, varying the angle of the blade slightly each time. The male members of the slide are glued and screwed to one half of the table and the female members to the other, using three screws in counterbored holes. A coating of wax will make the slides work smoothly.

Chair-frame construction is detailed in Figs. 9 to 12 inclusive. Whether four or more chairs are built, at least one should be made a guest, or host, chair by adding arms as shown in Fig. 8 and increasing the width of the front and back, Fig. 11. The over-all height and depth remain the same. Identical parts can be mass-produced to save time by using stops and jigs on the saw. As the legs are the only part of the

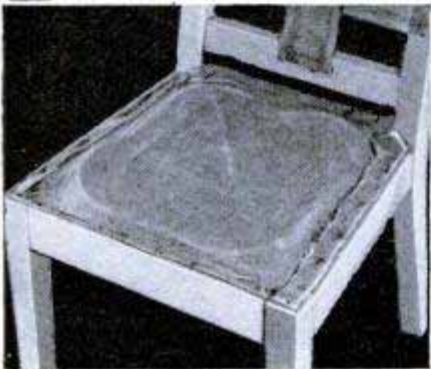
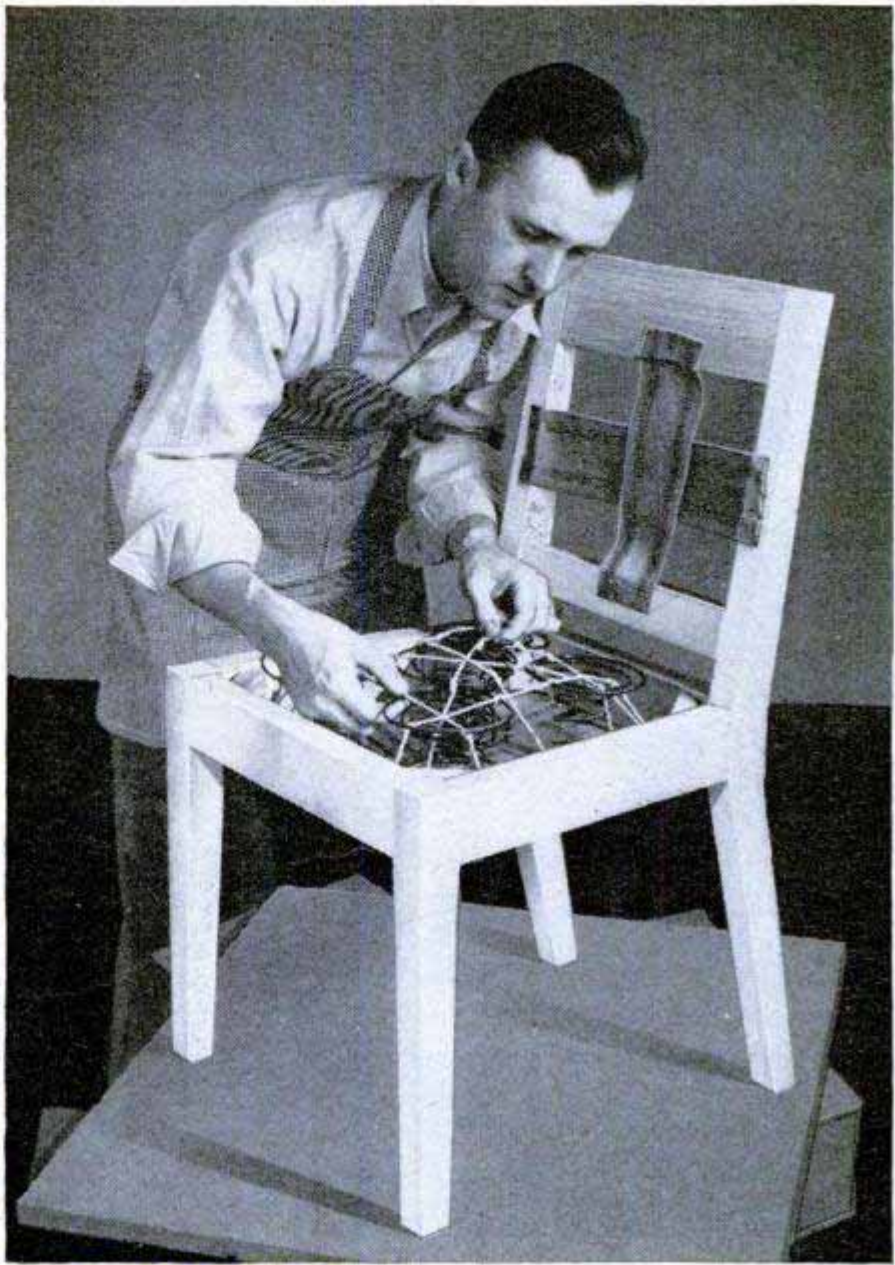




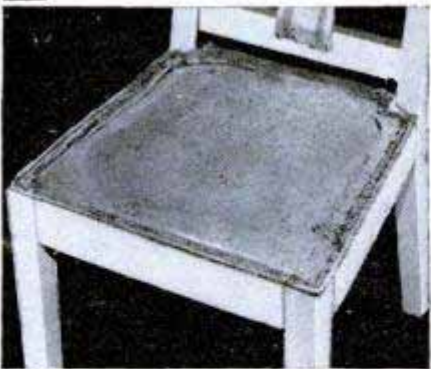
13 WEBBING ENDS DOUBLE-TACKED



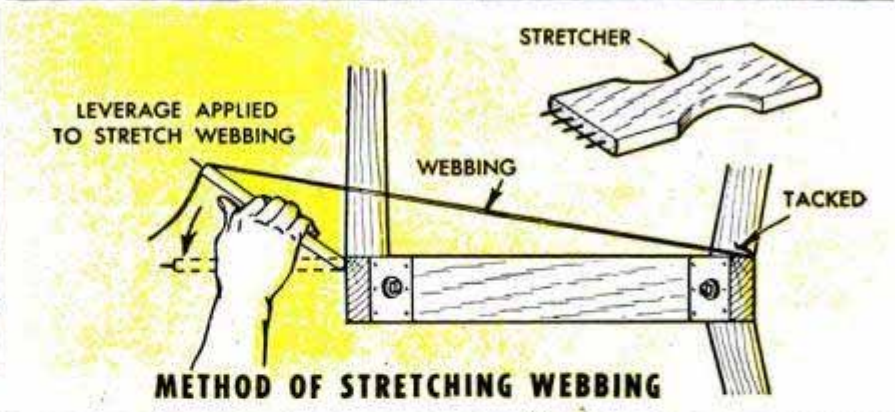
14 SPRINGS CROSSTIED LIKE THIS



15 BURLAP IS TACKED OVER SPRINGS



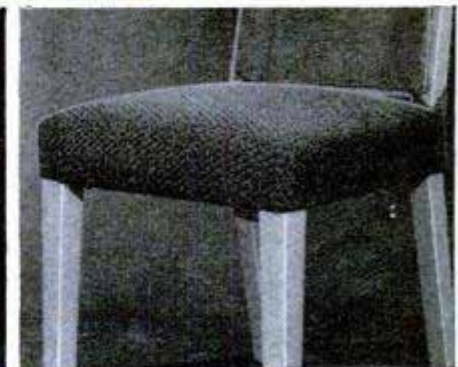
16 THEN FELT IS TACKED TO EDGE



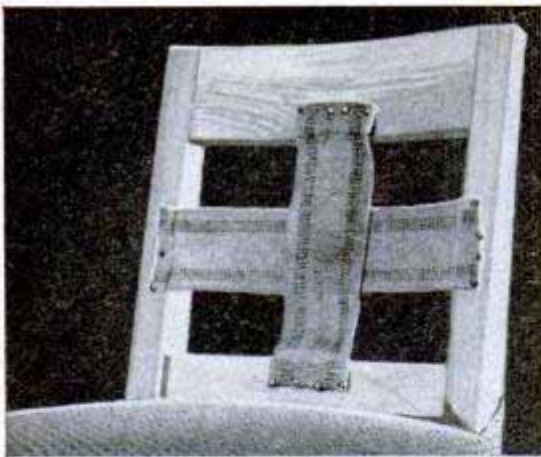
17 MOSS FILLING COMES NEXT



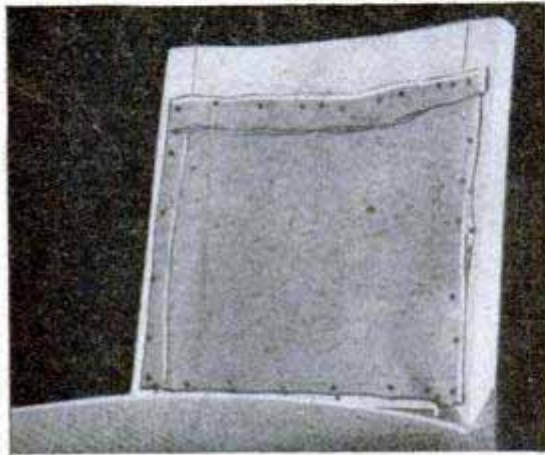
18 THEN IS COVERED WITH COTTON



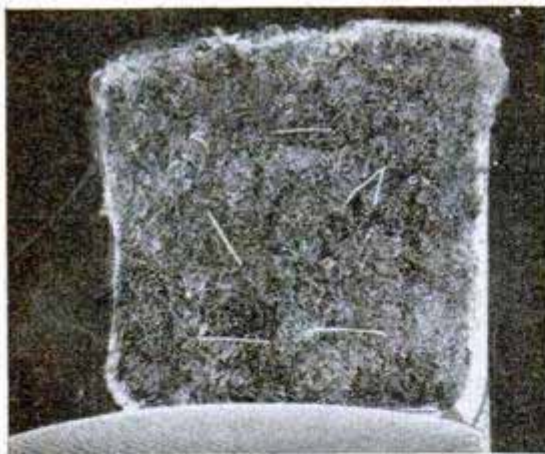
19 AND HERE'S THE COMPLETED SEAT



20 FIRST, WEBBING IS APPLIED TO THE BACK



21 THEN WEBBING IS COVERED WITH BURLAP



22 LAYER OF MOSS IS TACK-SEWED TO BURLAP



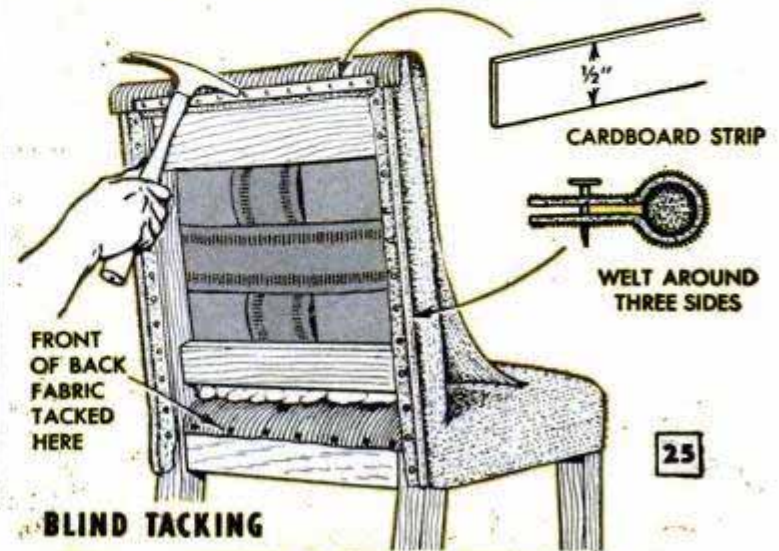
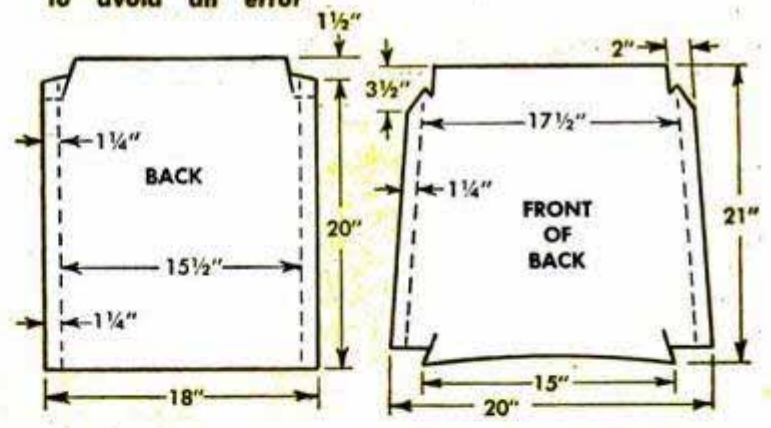
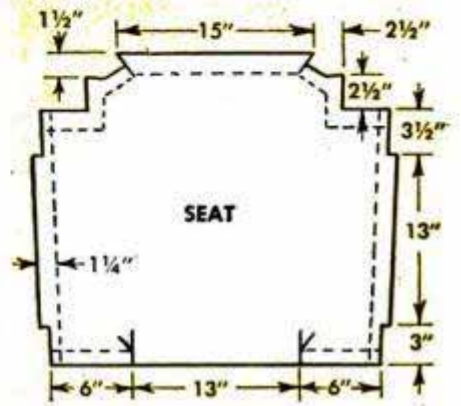
23 COTTON IS ADDED NEXT, THEN THE FABRIC

frame exposed, the rest of the assembly can be rough. The important point is rigidity. Note in Fig. 12 that all members are doweled and each corner of the seat is braced with lag screws the same as the table. The curved back rail is band-sawed from a piece $1\frac{3}{4} \times 4$ in., Fig. 9, while the front legs are tapered on all four faces from a point $2\frac{3}{4}$ in. from the top. The exposed part of the legs should be finished before upholstering.

Upholstering the chairs is a fairly easy job as pictured in the series of photos, Figs. 13 to 23 inclusive. Starting with the seat, the first step is to tack furniture webbing to the bottom, Fig. 13. Six strips are interlaced and stretched tautly in the manner indicated in the detail to the right of Fig. 16. The ends of the webbing are left about 1 in. long for folding back and double-tacking. Five No. 1 plain-end coil springs are used in the seat. These are placed in position, tack-sewed to the

24 PATTERNS

These fabric patterns were taken from the actual covering on one of the chairs and are somewhat approximate in size. While over-all measurements are ample, the various cuts and folds indicated should be made while fitting to avoid an error



BLIND TACKING

webbing, and then tied and crosstied to the bottom of the seat rails as shown in Fig. 14. The dots in the drawing indicate knots and show the points where they are tied on the coil of each spring. The springs are pulled down or compressed so that the center one is about 1½ in. above the top of the seat. The spring twine is brought down through holes punched in the webbing and tacked securely to the underside of the rails. Next, the springs are covered with burlap, Fig. 15. The edges are tacked, folded over and retacked, and then a welt edging is tacked around the outer edge on three sides, Fig. 16. The welt used here is the same as used later on the back, Fig. 25, except that being hidden it can be made up of scrap material wrapped around a length of ¼-in. rope. Hair, tow or moss filling is added next, Fig. 17. This is held in place by tack-sewing it to the burlap. A layer of cotton is applied over the filling so it covers the sides of the seat rails, Fig. 18. After this, the whole job is covered with the finished fabric, and the completed seat should look like Fig. 19. Patterns for the seat covering as well as the rest of the chair are given in Fig. 24. The various cuts and folds indicated by the dotted lines are merely approximate and should be made as the work progresses. The seat fabric is stitched at the front corners before applying to form a box covering and should fit snugly to give a nicely tailored job. When completed, the underside of the seat is covered with black cambric, the edges being folded under.

The back of the chair, while it contains no springs, calls for a similar procedure. Two strips of webbing are tacked to the back, Fig. 20, and then it is covered with burlap, moss and finally cotton. The cotton is brought around the sides and over the top and the lower edge is folded up under the moss. Note in applying the covering to the front of the back that the fabric is first pulled through and tacked to the face of the rear seat rail, Fig. 25. Before the back covering is applied, a welt made of the finished fabric is tacked to three sides. Then a strip of cardboard, ½ in. wide, is cut to fit across the top between the welt at the sides. The fabric is tacked at the top first, driving the tacks through the cardboard strip as in Fig. 25. This method is called blind tacking, and in addition to concealing the tacks, the cardboard strip provides a firm straight edge so that in pulling down on the fabric there are no irregular pleats in the cloth caused by the tacks. With the top tacked, the fabric is brought down over the back, the edges folded under and hand-stitched to the welt. Blued gimp nails are used in tacking the covering where it passes over the exposed surface of the legs.

(To be continued)

Tent Stretched Between Car Seats Confines Dog to Rear Floor

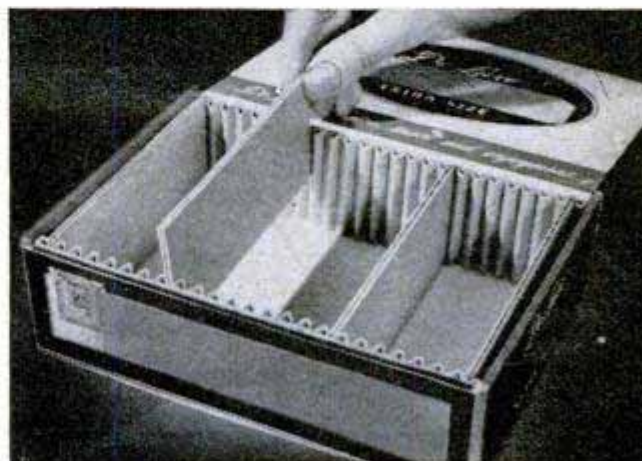


To bring home a wet dog from a hunting trip or just to keep a shedding dog off the rear seat of the car, confine him to the floor by means of a tent stretched between the seats. Using safety pins, fasten a piece of canvas or a blanket between the bottom of the rear seat and the top of the front seat. The tent should be as wide as possible to keep the dog from getting out, while still allowing plenty of ventilation to keep the animal comfortable.

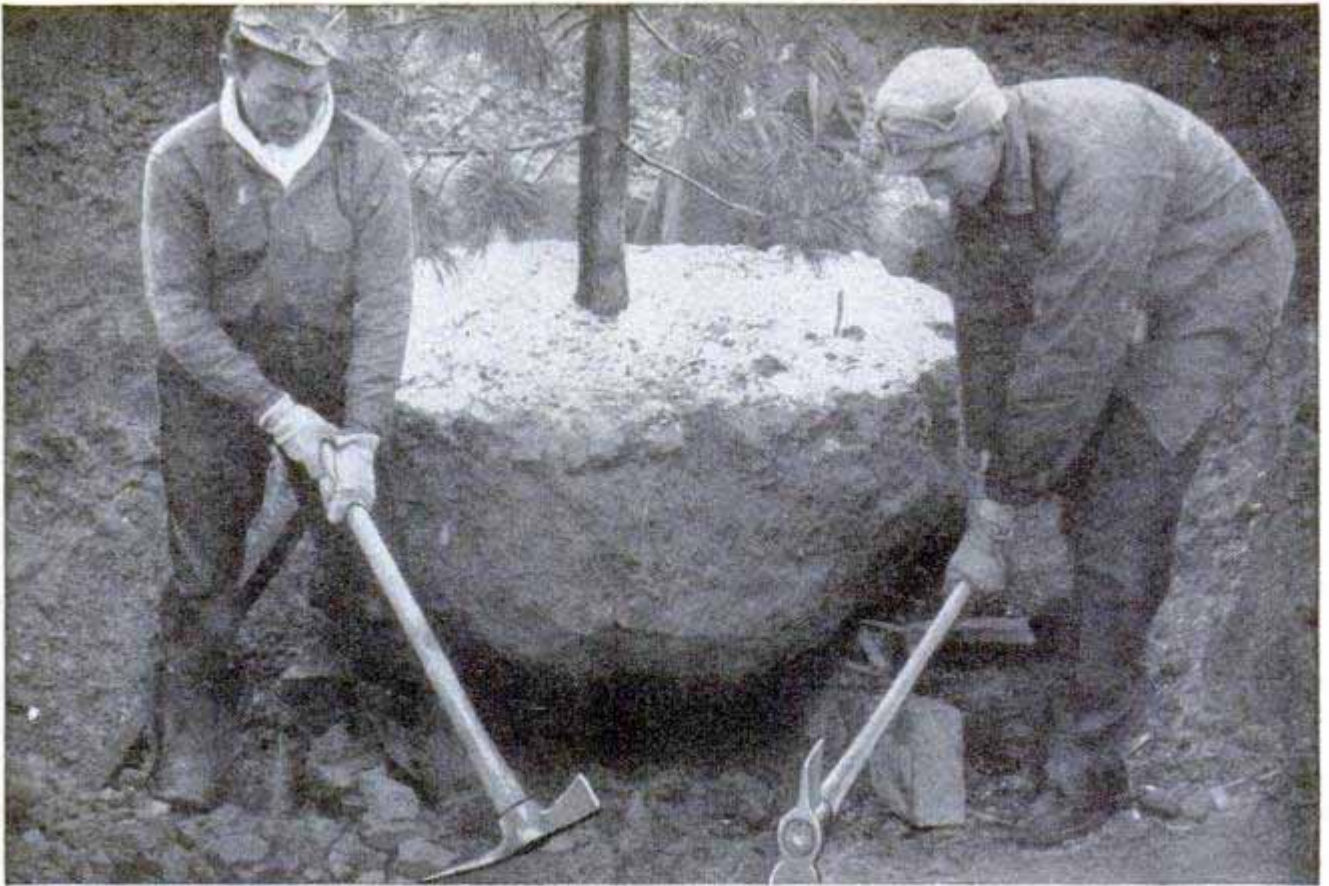
L. W. Lefler, Abilene, Tex.

Partitions Inserted in Cigar Box Divide It Into Separate Sections

Storing different types of small parts in a cigar box without getting them mixed can be done by dividing the box into separate sections with adjustable cardboard partitions. Cement strips of corrugated cardboard to the inside of the front and back of the box. Then, after cutting pieces of thick cardboard to fit tightly across the width of the box, slip them into the corrugations.



#12-31

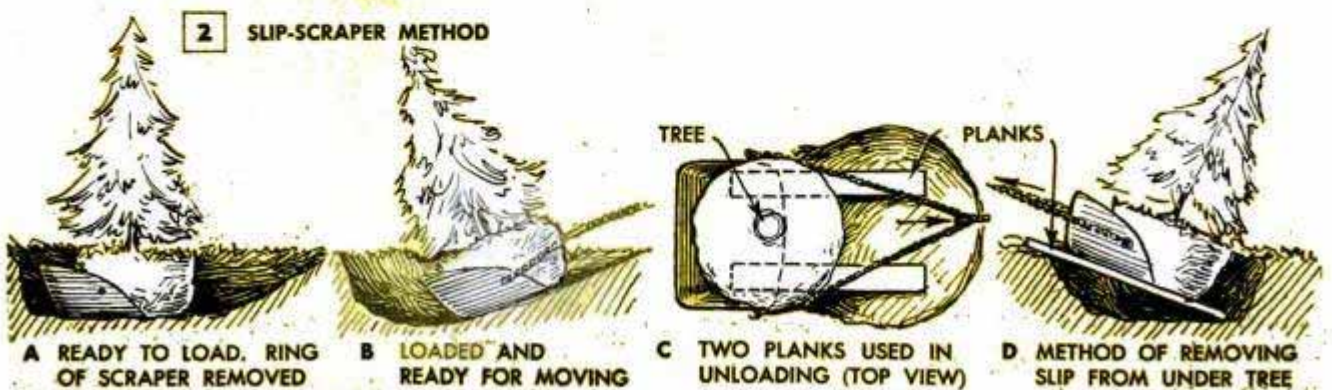


Moving Day for Trees By Robert D. Sawyer

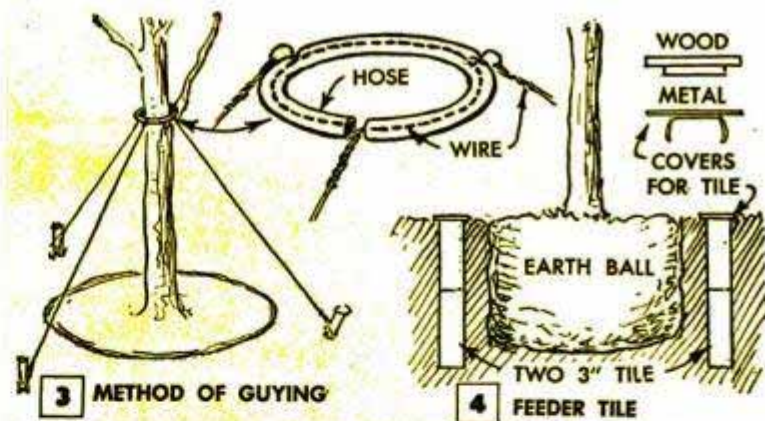
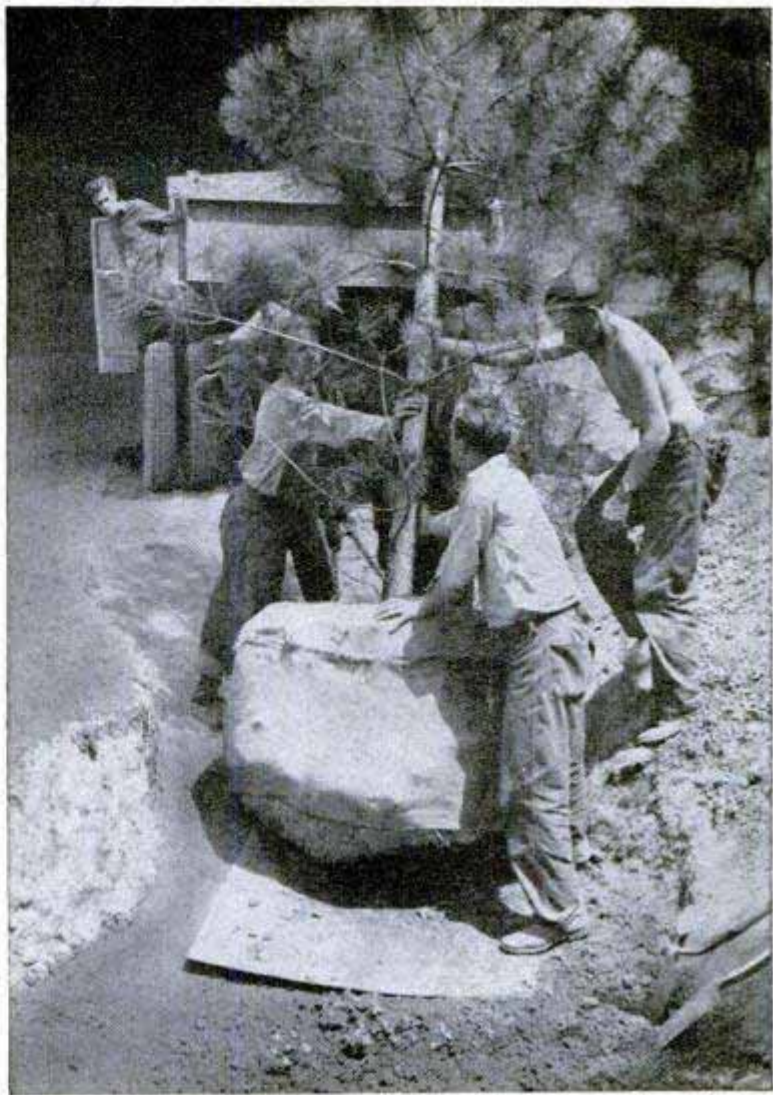
IS THERE a tree or shrub spoiling the looks of your yard—one that you wish were planted elsewhere? Often this is the case, especially around older homes where the landscaping has been neglected. Moving even a fairly large-size tree is a comparatively simple job if done as suggested

by G. W. Longenecker of the University of Wisconsin.

Although deciduous trees and shrubs can be moved at any time, they are more easily handled and are less likely to be damaged if moved while dormant. Evergreens should be moved only during the period of

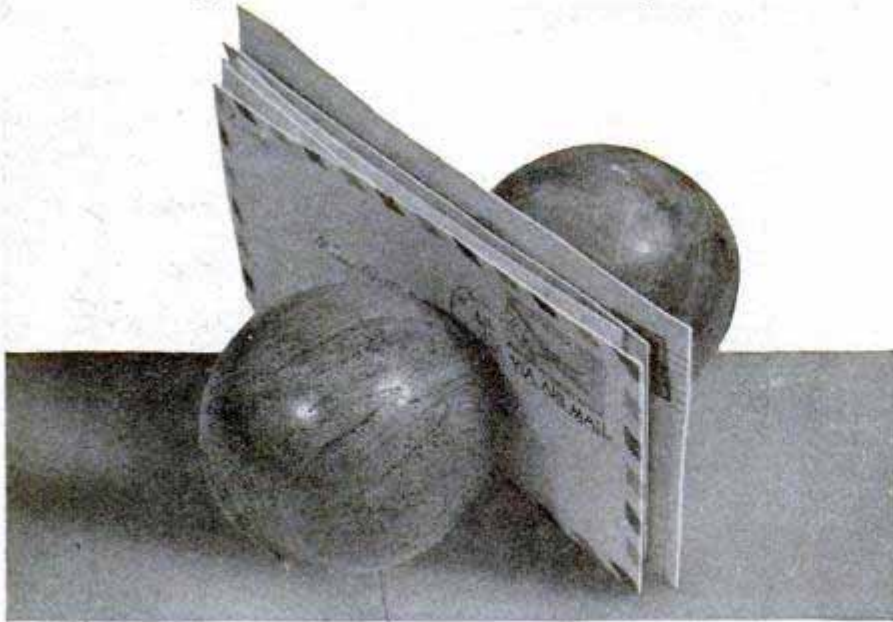


least active growth, that is, in the early spring or, better still in most localities, in August or September. Preparations should be made beforehand. Mulch the area under the tree to prevent deep freezing in winter and retain moisture in spring and summer. This will make digging easier. A good rule for determining the size of the earth ball is to measure the trunk of the tree and for each inch of trunk diameter allow 1 ft. for the diameter of the ball. If the trunk is 4 in. in diameter, the earth ball should be at least 4 ft. in diameter and 30 in. deep. If the tree is one of the evergreen types having a large taproot and is an exceptionally fine specimen, it will be best to go even deeper to include as much of the root system as possible in the earth ball. Surface-rooting trees, such as the maple, require only a shallow ball. In digging the soil away from the ball be careful not to cut the main lateral roots. Dig these up with a spading fork, wrap them in burlap and tie them into the earth ball. The wrappings must be kept moist until the earth ball is cut out completely, wrapped in burlap or canvas and bound ready for moving. When the ball has been prepared, the tree should be moved to its new location and set without delay. Fig. 1, details A, B and C, and Fig. 2, details A to D inclusive, show two acceptable methods of moving small and medium-sized trees. Care must be taken during the operation to prevent breaking the ball of earth. It should be removed and reset intact for best results. The excavation to receive the earth ball should be made beforehand and should be larger than the ball. The top of the ball of earth is set slightly below grade level. After removing the covering, straighten the lateral roots and pack fresh soil around the ball in layers, tamping each layer to eliminate air pockets. If the tree is a fairly large one, it should be guyed, as in Fig. 3, to hold it upright until the lateral roots anchor themselves in the new location. The installation of feeder tile, Fig. 4, is helpful in assuring the rapid recovery of a larger tree after transplanting. Pouring a small quantity of high-nitrogen fertilizer in each tile at regular intervals throughout the first growing season will provide an ample supply of plant food. Add water after placing the fertilizer in the tiles. Mulch an area

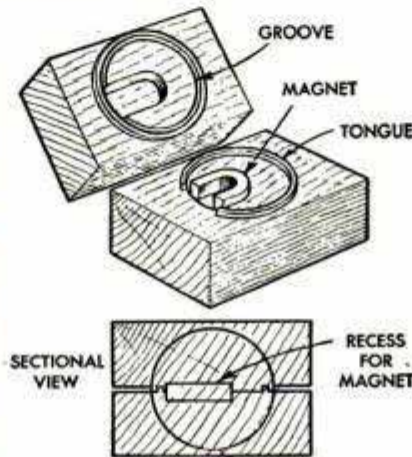


under the tree equal to the spread of the branches and keep this area well watered throughout the first growing season. Shear large arborvitae and juniper after transplanting and restrict new growth of large spruce, pine and fir by pinching out a portion of the lower terminal buds. Remove guy wires after the first growing season and during this time examine the wires occasionally to make sure they are not abrading the bark of the tree. This is quite important for, if the hose pad wears through or breaks, the wires will quickly cut through the bark and leave a wound that will never heal smoothly, especially on large specimens of certain varieties.

Twin Spheres Form Mysterious Letter Holder



Consisting of two identical spheres which are drawn together by magnetic attraction, this unusual letter holder is a constant source of interest. Each sphere is turned from two blocks of selected crotch or burl walnut. A tongue-and-groove joint is first formed in the blocks and matching recesses are cut for a snug fit for a 4-oz. magnet. Note that the magnets are located off-center to bring them closer to the surface of the wood and also to keep the spheres from rolling when they are separated. With the magnet in place, the blocks are glued together and then mounted in the lathe for turning. A cardboard template is used as a guide and care is taken not to cut into the tongue-and-groove joint. Before the sphere is parted from the waste stock, it is sanded and finished with shellac. The ends are finished by hand.



Siphoning Aquarium Facilitated by Strainer Held Over End of Hose

A small tea strainer comes in handy when using a hose to siphon water from a large goldfish aquarium. Holding the strainer over the end of the hose speeds the siphoning operation by preventing plants and fish from being sucked through the hose. Pat Fey, New York City.



Paper Bags Tied to Stovepipe Retain Soot During Removal



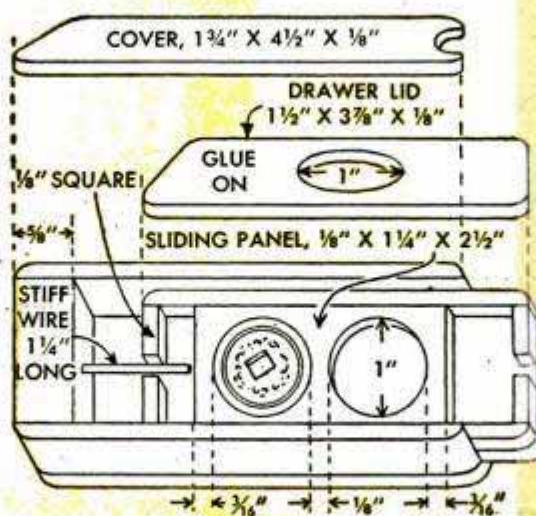
When stovepipes are taken down for cleaning, much extra work is saved if soot is kept from spilling by closing the ends of the pipes before carrying them outside. This is done by fastening large

paper bags over the pipe with rubber bands or string. The bags can also be used to collect the soot as it is loosened.

A simple sleight-of-hand trick that is always entertaining, this "magic" Chinese coin disappears just as fast as you can slip the drawer in and out of its box. The idea of the illusion is that when the coin is placed in the hole in the top of the drawer, it rests in one of two holes in a sliding panel. Then the drawer is slipped into the box and a pin pushes the panel to the other end of the drawer, bringing the empty hole in line with the hole in the lid. To make the coin reappear, the drawer is reversed end-for-end and again slipped into the box. The entire unit is built up of

$\frac{1}{8}$ -in. material except for the block at the back of the box, which is $\frac{3}{8} \times \frac{5}{8} \times 1\frac{1}{2}$ in. A piece of stiff wire is inserted tightly into a small hole in the side face of this block so it projects $1\frac{1}{4}$ in. The drawer consists of a bottom and lid separated by $\frac{1}{8}$ -in.-square strips, a hole for the wire being left between the strips at each end of the drawer. A panel retained within the drawer by the strips fits loosely enough to slide back and forth freely. Two 1-in. holes, spaced to the dimensions given in the detail, are drilled through the center of the panel, and a 1-in. hole is drilled through the exact center of the drawer lid. The edges of this

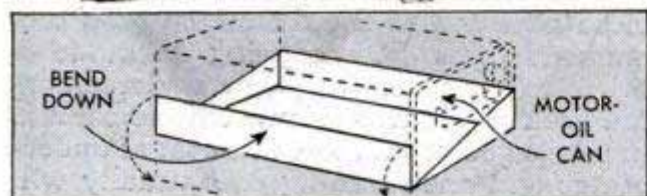
Chinese Coin Disappears Into Wooden Box For Amusement of Both Young and Old



hole must be $1\frac{7}{16}$ in. from each end and $\frac{1}{4}$ in. from each side of the lid. It is important that the holes in the panel and the one in the lid be located very carefully, as one of the holes in the panel must be in exact register with the hole in the lid when the panel is at either end of the drawer. Test the location of the holes before gluing the drawer lid to the spacing strips. The exposed parts of the drawer should be selected for matching grain and the outside sanded carefully so the drawer appears to be a solid block to the audience. Wax applied to the drawer will make it work easily.

Hi Sibley, Nuevo, Calif.

Metal Tray Filled With Linseed Oil Keeps Paintbrushes in Good Condition



Set on a shelf or bench top, this handy tray keeps paintbrushes in sight for convenient selection even though their bristles are immersed in linseed oil. The tray is made from a motor-oil can by cutting it to provide a trough and a side flap. The latter is bent downward to form a leg which causes the bottom of the tray to slope toward the back. The trough is filled with linseed oil and the brushes are laid in a row with the bristles submerged in the oil. In this way, the ends of the handles project over the front edge of the tray.

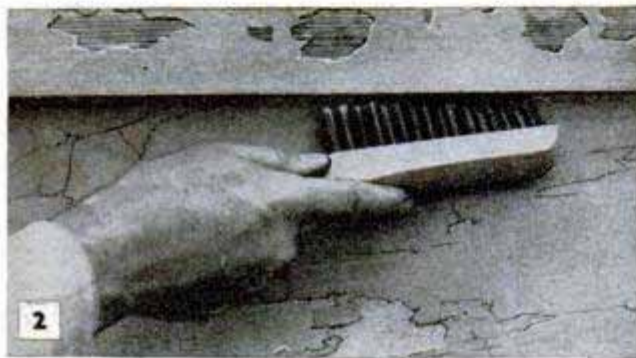
Pearls Strung on Nylon Fishline

To hold a string of pearls tightly together, restring them on nylon fishline. If the string is stretched, the nylon will return to its original shape within a short time. At room temperature, the line is firm so that a needle is not required.

William F. Hunter, Minneapolis, Minn.

REPAINTING the OUTSIDE

By E. R. Haan



Remove all loose, flaking and blistered paint with wire brush and scraper. Exposed wood is then primed



Above, before painting, dust is brushed from corners and horizontal surfaces where it always accumulates. Below, after loose putty has been removed and the bare wood primed, new glazier's putty is applied



REPAINING the exterior of your home regularly every three to five years is the cheapest home repair. An unbroken film of paint protects the surface against weathering and against changes in temperature and variations in moisture content which cause swelling and checking of wood. Paint also discourages various fungus growths that flourish in the presence of moisture and cause rapid decay of siding and framing. A good paint job increases the appraisal value of the property as much as 10 percent by adding the beauty of durable harmonious color to both new and old homes. A little time spent in learning the proper painting procedures and how to wield a paintbrush with professional skill pays off in substantial cash savings to the homeowner who will tackle the job himself.

When to paint: Just when to paint depends on the local weather conditions but, in general, paint can be applied any time when the surface is dry and the temperature is fairly certain to remain above 50 deg. F. until the paint is dry. Avoid painting on hot, humid days or any time when a high wind is blowing as the freshly painted surface may become coated with dust and, in the summer, with small insects. The best time to paint a house is during a period of clear, cool weather, as the humidity usually is low and the drying conditions are ideal.

Selecting the paint: This depends to some extent on whether the building needs a one, two or three-coat job, and whether the first requirement is a full priming or only a spot priming after cleaning and dusting thoroughly. Manufacturers of paints now supply special primers, or undercoaters, for both new and old work which are especially compounded to "build" a suitable surface over which to apply a finishing coat. When preparing ready-mixed paints for use, pay close attention to the manufacturer's recommendations for reducing them to a brushing consistency. When undercoaters are used on old work on which the paint is in fair to good condition, one coat of undercoater and one finishing coat usually will

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This is the first of a series of articles on how to make simple inside and outside home repairs, do regular maintenance jobs on schedule and add minor improvements. Each step is clearly described so the homeowner can do the job himself

produce a first-class job. Master painters seldom use three coats except in some cases where it is necessary to remove all the old paint down to the bare wood or, in rare instances, where the color used makes a three-coat job necessary to build a paint film of sufficient body to hide discolorations or other surface defects. Very often one coat will be sufficient to produce a crisp, neat job over old paint of the same color which is in better than average condition.

How much paint: Although there are many factors which will determine the actual amount required for the job, it's easy to get a rough estimate of the number of gallons needed by figuring the number of square feet to be painted. Just multiply the width in feet by the height on rectangular areas. On the gables, multiply the width by one-half the height. Add the results and do not deduct for windows or doors. On a fair to good surface, a gallon of outside paint, or undercoater, will cover with one coat about 600 sq. ft. However, the coverage will vary from 450 to 750 sq. ft. depending on the condition of the surface. On a good surface, the coverage per gallon of the finish coat over an undercoater will probably average 750, and possibly 800 sq. ft. The undercoaters greatly extend the coverage of the finish coat even on surfaces which are in relatively poor condition.

Preparing the surface: Chalking of paint is a normal weathering process unless, of course, the chalking is excessive. On a surface that is chalking normally, a slight rubbing on a small spot will produce a dull luster. If this condition is uniform all over the building a light dusting will prepare the surfaces for painting. On

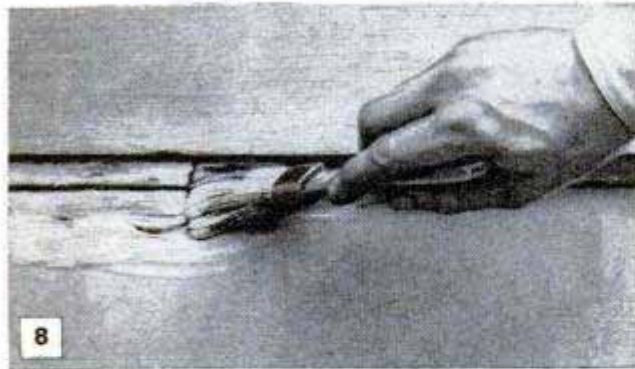




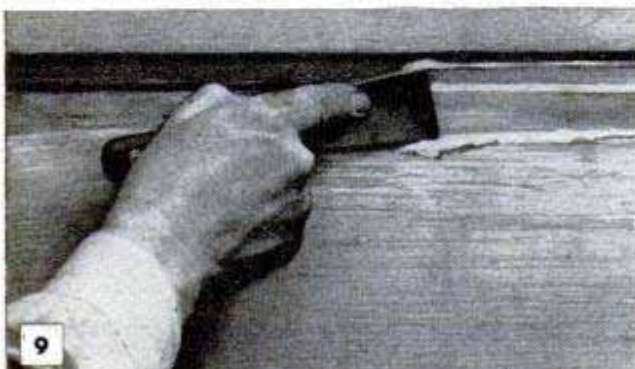
6
Caulking seals open joints where doors and windows join masonry. A gun applies it easily and quickly



7
FIRST BRUSH DUST FROM CRACKS



8
NEXT, APPLY PRIMING COAT



9
THEN FILL WITH "WHITE LEAD" PUTTY

the other hand, if bare patches of wood show here and there and if rubbing the surface fails to produce even a dull luster, wire-brushing will be necessary to clean the surfaces of fine, loose particles and flakes of paint pigment. Two coats will be needed to finish such a surface. If the old paint is broken by fine checks or has blistered and peeled rather badly, then more labor will be required to prepare the building for repainting. All the loose material must be removed by scraping and wire-brushing, Fig. 2. The rough edges of the paint film around the bare spots where blisters have occurred must be leveled by sanding and building up a new film by spot-priming. (Caution: It is advisable to wear a respirator when sanding, scraping or wire-brushing a painted surface.) Areas which are deeply checked by horizontal and vertical cracks—painters refer to this condition as an "alligator" surface—may either be sanded smooth or the paint removed entirely with a paint remover and the paint film rebuilt by prime-coating, followed by the regular undercoater and finish coats applied in the course of painting the whole structure. When preparing the building for repainting, examine the surface closely for the light-brownish discolorations caused by paint mildew. This is more likely to be found on old structures just above the foundation and under a wide cornice, and also on the siding back of large shrubs. The fungi, or molds, which are responsible thrive only in the presence of moisture and the cause should be removed before repainting. The dry mold can be removed by washing with household ammonia or with a solution of trisodium phosphate. Rinse with clear water after washing. All minor structural repairs, such as nailing loose siding, filling cracks and replacing gutters and downspouts which are no longer serviceable, should be made before repainting. Dust window sills as in Fig. 3 and prime and reputty old sash as in Fig. 4. Remove all the loose putty first, then prime the open rabbet before applying new putty. Fill cracks and nail holes, using the procedure pictured in Figs. 7, 8 and 9, with special white-lead putty consisting of 1 part white lead in oil and 2 parts of whiting by volume. This is softened to a working consistency with japan oil. Calk around door and window frames as in Fig. 6, using a gun and caulking compound of gun grade. Spot-prime all areas where the old paint has been removed down to bare wood. Seal any exposed knots and resinous areas with orange shellac.

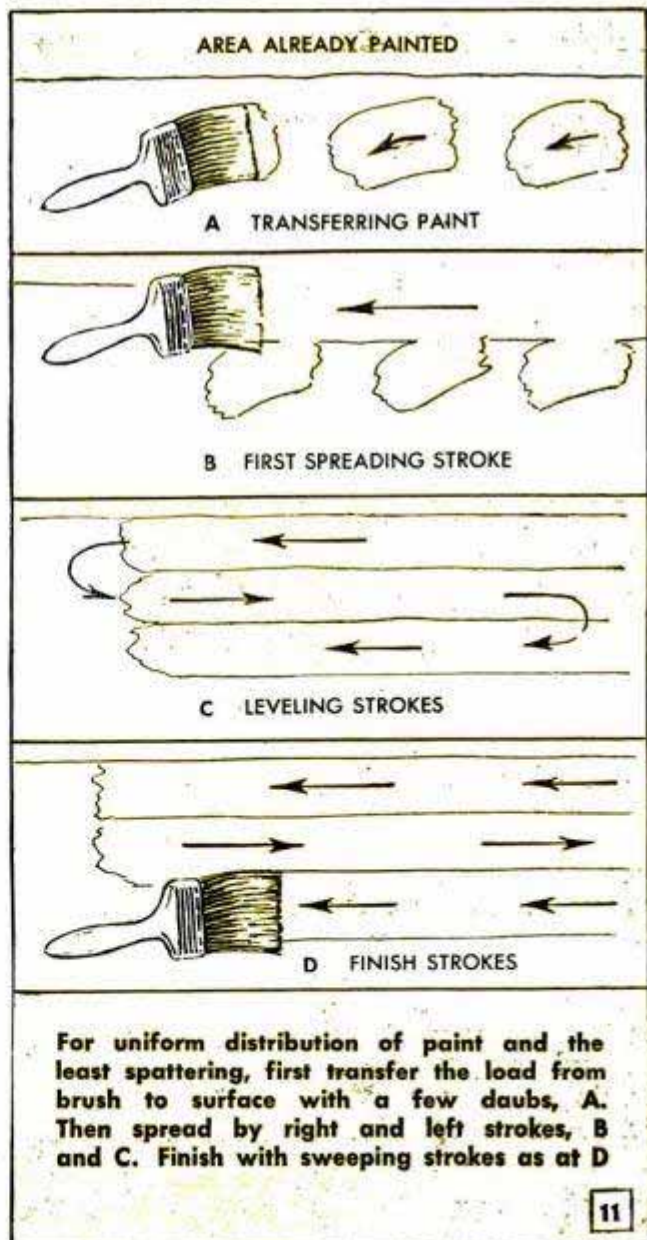
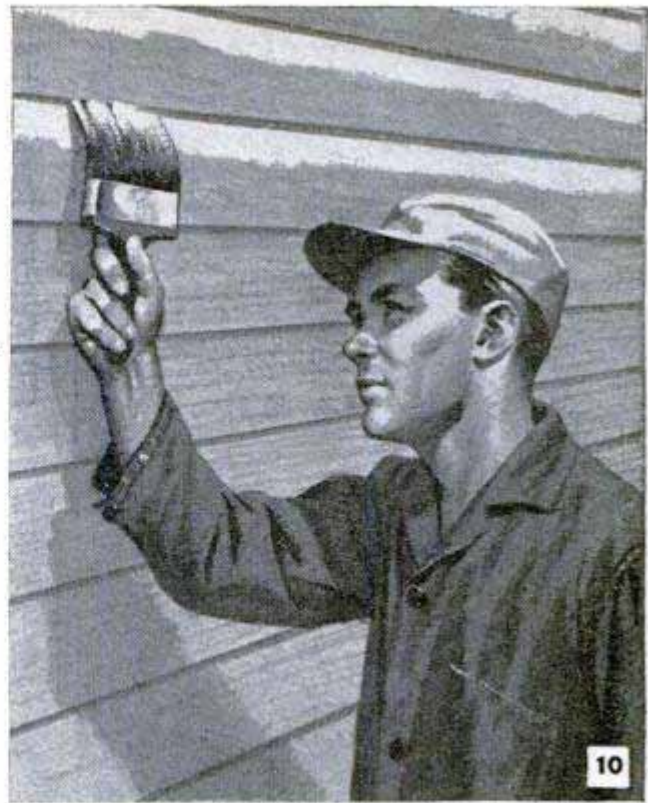
Brushes and equipment: For the average job you'll need a 1-in. sash brush, a 3-in. brush for doors and trim, and a 4 or 5-in. brush for painting the siding. Carry a dust-

ing brush, a putty knife, a wire brush and a scraper. Ladders needed will depend on the size of the house, of course, but a step-ladder is essential and an extension ladder will be needed to reach the high gables. Usually, painting of the walls can be done faster and safer from a scaffold rigged with heavy planks and ladder jacks. The two sections of the extension ladder can be used for this purpose.

Mixing the paint: Both the undercoater and the finishing paint must be thoroughly mixed before using. Pour the paint from the pail into a larger container and stir with a flat paddle, adding reducer in small quantities as the stirring proceeds. To check the consistency, lift the paddle from time to time. When the mixture has been thinned to the proper brushing consistency, the paint on the paddle will run back into the container in a thin, steady stream which finally breaks into a series of drops. If the paint drips slowly into the container, it is too thick and will drag under the brush.

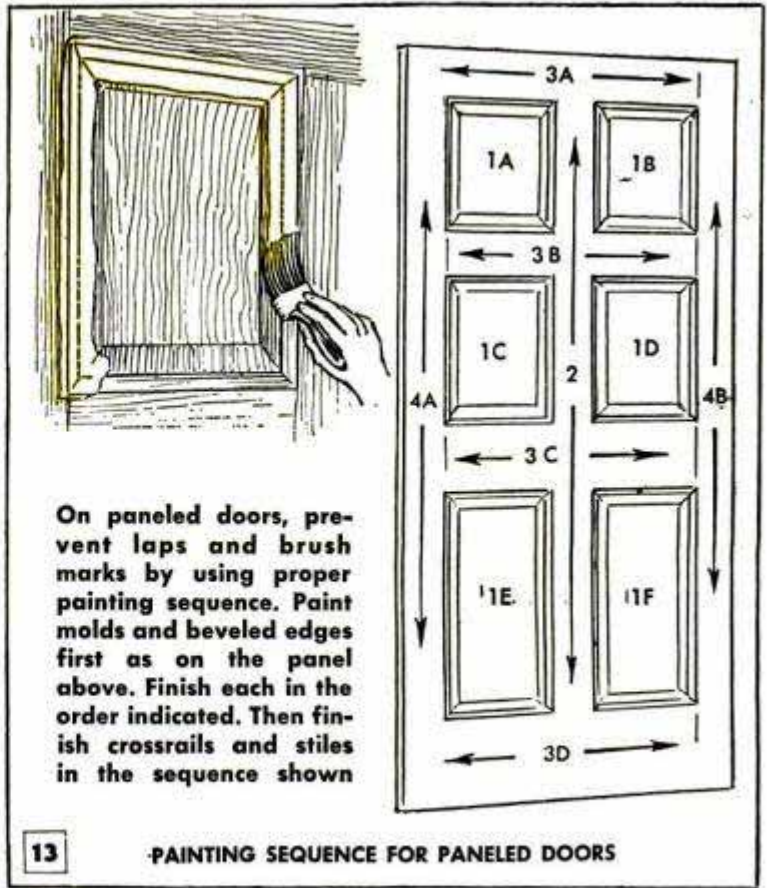
Where to start: As a rule, one should begin painting at the peak of the highest gable and work down as in Fig. 5. When working from a ladder, it usually is more convenient to bring the trim down on the high gables at the same time the siding is painted. Otherwise avoid working with two colors at the same time. When painting siding, begin at the corner board or, on gables, at the frieze board, and paint the lower edges first as in Fig. 10. Then lay the paint on the flat surfaces and brush it out by using the procedure detailed in Fig. 11, A to D inclusive. When painting siding, do not attempt to cover a panel more than five to eight boards in width. Finish this panel across the wall to a corner, or to a door or window before stopping. If you stop anywhere on the wall for more than a few minutes, the paint will set partially, making it impossible to brush out the lap when you begin again. This lap will show under several coats of any light-colored paint. It's a rule always to finish the panel to a corner or other suitable stopping place before you end work for the day or for other reasons.

Handling the brush: When working from a ladder at the higher levels, it's usually handier to paint above the ladder, as you can reach both ways and thus avoid the labor of moving a heavy ladder frequently. In handling the brush on long strokes, use a free and easy motion of the arm and wrist. The trick in lifting the brush off the painted surface without leaving a mark at the end of the stroke is to turn the brush slightly as it is lifted. This movement lifts the bristles with a wiping motion which does not leave a mark on the fresh paint film. Leveling and finishing strokes should overlap, details C and D in Fig. 11. Finishing





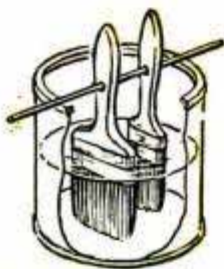
12



On paneled doors, prevent laps and brush marks by using proper painting sequence. Paint molds and beveled edges first as on the panel above. Finish each in the order indicated. Then finish crossrails and stiles in the sequence shown

13

PAINTING SEQUENCE FOR PANELED DOORS



14 A BRISTLES MUST BE SUBMERGED ENTIRELY



B PAINT CLEANED BY STRAINING

strokes should be light to avoid carrying the paint from one area to another, resulting in an uneven coverage. Each time the brush is dipped in the paint, slap the bristles against the side of the pail to remove the excess which may otherwise drip onto the siding below or onto the ground and be wasted. The first coat will require more brushing than the second, or finish, coat. Care must be taken to brush each coat to a uniform thickness. On buildings which have not been painted for a number of years the surface will absorb the oils in the first coat more quickly than will a surface which has been painted recently. Here, special care must be taken to prevent the undercoater from building too fast as it is applied, resulting in a heavy, uneven coating which may wrinkle or break up on drying. One way to avoid trouble under this condition is to cut down on the amount of paint picked up at each dip of the brush. Dust off the surface thoroughly just before applying the undercoat. On a good drying

day, the paint in the pail may tend to thicken somewhat owing to evaporation of a small quantity of its volatile oils, especially toward the end of the day. Add a little reducer and stir occasionally to prevent this. Drying time allowed between coats should never be less than 48 hours. A week to 10 days is better.

Sash, trim and doors: Cutting-in sash, Fig. 1, with a paint either lighter or darker than the trim color requires skillful handling of the sash brush to produce a neat, workmanlike job. It is, of course, much simpler to paint the sash with the trim color, particularly on double-hung wooden sash where otherwise it is essential to cut a sharp color line at the point where the sash stiles and the upper rail meet the stops. When trim color is used this is not necessary. In either case, the first thing to do is lower the upper sash so that you can reach the outer side of the lower-sash check rail. On double-hung sash, this is always painted the outside color as it is exposed to view from the outside when the lower sash is raised. In painting divided-pane sash, cut in the muntins first on both the top and bottom edges. (The muntins are the vertical and horizontal bars which join the stiles and rails of divided, or multiple-pane, sash.) Keep the sash brush well loaded with paint so that it will stroke, or cut, a full-bodied line to an unpainted edge. Paint the sash stiles and rails and the window frames and casings last. If the sash have been scraped and sanded in preparation for repainting, it

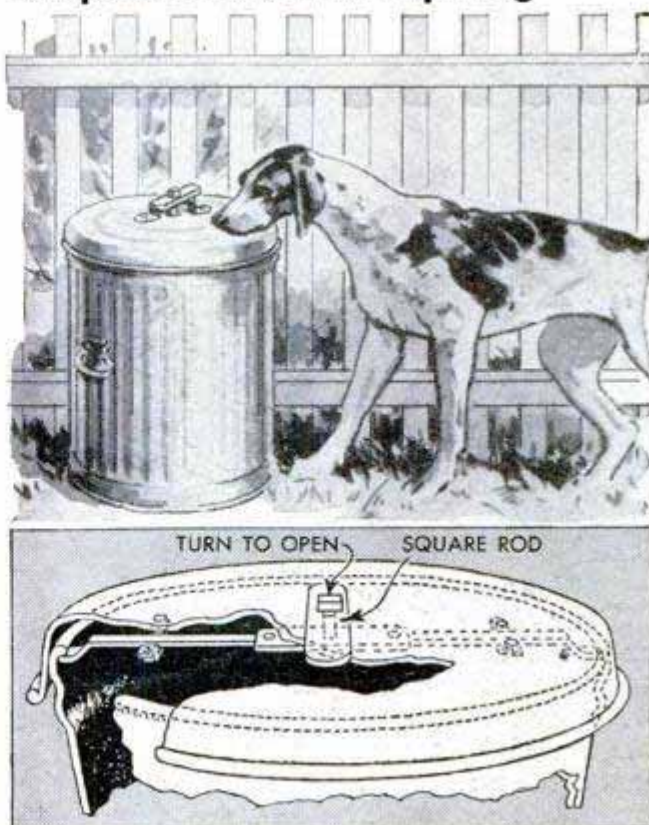
will pay to apply an undercoater. This will build a good base over which to apply the finish coat.

The proper painting sequence on a paneled door is pictured in Figs. 12 and 13. If the door and frame are in good condition, about all that will be needed to prepare for painting is a thorough wire-brushing and dusting. Then proceed as in Fig. 12 and the left-hand detail in Fig. 13, by painting the ovolo molds and the rabbeted portion of the raised panel. The proper sequence is shown in the right-hand detail, Fig. 13. Begin with panel 1A and continue in the order indicated until panel 1F has been finished. Cut-in the molds and rabbets first, then finish the entire panel. Next, take the center stile 2 and follow by painting top rail 3A first, then 3B, 3C and 3D. Finish with the outside stiles 4A and 4B. On an outside door, paint the top and bottom edges. If the door swings out, the edge on the lock side also takes the outside color. The outside color line comes to the outside corner of the doorstep all the way around the frame on doors that swing out. On doors that swing in, only the edge to which the hinges are attached takes the outside color. The outside color comes to the inner corner of the stops. To get a neat, sharply cut line around the hinges and lock plate requires careful work. Often it will save time to remove the hinges and lock plates before painting.

Painting metal: Gutters, downspouts and metal porch rails should be carefully wire-brushed to remove scale and rust. If the gutters have been previously primed and painted and the coating is still in good condition, repriming will not be necessary. New galvanized gutters and downspouts should weather six months before priming and painting. However, iron grillwork and railings should be primed with special primers before painting in the color desired.

Paint and brush care: Keep all paint containers closed tightly when not in use. The paint in the container you use regularly becomes contaminated with dust and particles of dirt. Strain frequently into a clean container through a piece of cheesecloth or silk hosiery as in Fig. 14, B. To prevent paint on brushes from hardening overnight hang them in water with the bristles submerged as in Fig. 14, A. If the brushes are out of use for a longer period, hang them in a solution of turpentine and linseed oil, equal parts. When the painting is finished for the season, clean brushes in two or three changes of turpentine, wash in a trisodium-phosphate solution and then in warm, soapy water. Before storing the brushes, rinse them thoroughly and, after drying, wrap them in oiled paper to protect the bristles from dust.

Turn Button on Garbage-Can Cover Keeps Contents From Spilling



When a garbage can is often upset by stray dogs, the nuisance can be minimized by locking the cover to keep the contents from spilling. This simple locking mechanism, which grips the beading around the inside of the can rim, is operated by a flat-iron turn button. The latter, located on top of the cover handle, is attached with a length of square rod to a flat-iron center-piece located directly under the handle. Square holes to fit the rod are broached in both pieces of flat iron and round holes are drilled through the cover and handle. The ends of the rod are peened to hold it in place. A flat-iron arm is riveted loosely to each end of the center-piece so that turning the latter pulls the arm from under the can beading. Brackets bent from sheet metal or flat iron are riveted to the cover to keep the arms from dropping.

Aurin Warden, Dockton, Wash.

Sugar Deodorizes Teapot



If a teapot is used infrequently, try dropping a lump of sugar into it after washing and drying. Then, even though the teapot is stored on a shelf for weeks at a time, a musty odor will not be apparent.

Reflector on Basement Ceiling Directs Light to Workbench

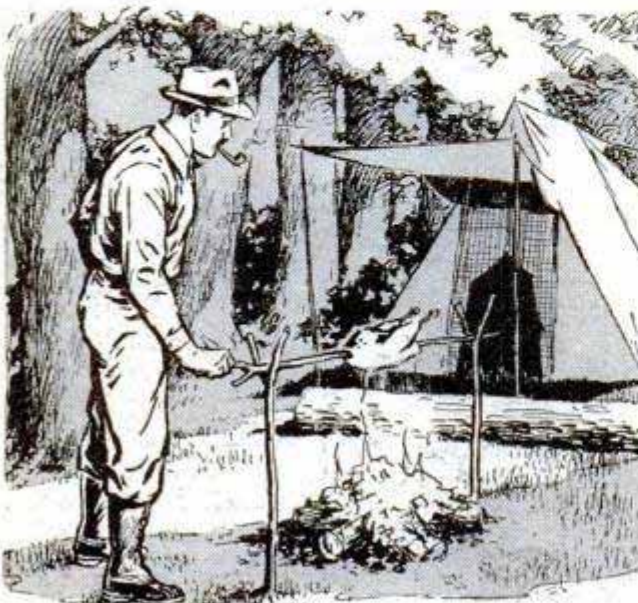


Even though located right under a window, the workbenches in many basements get little, if any, sunlight, requiring artificial light for close work. To permit working at his bench in natural light, one craftsman installed an adjustable reflector on the basement ceiling. The reflector, which can be a mirror or a sheet of cardboard or plywood painted white, is hung directly opposite the window. The top end is hinged to the joists and the bottom is tied with cord or wire so that it can be raised or lowered. In this way, the greatest amount of sunlight can be directed to different positions on the bench top or to the area immediately in front of the bench.

Rudolph G. Kopp, Milwaukee, Wis.

Cooking With Indian Meat Spit

Stretching a green willow pole across two forked sticks forms an Indian meat spit which is excellent for outdoor cooking. Press the forked sticks firmly into the

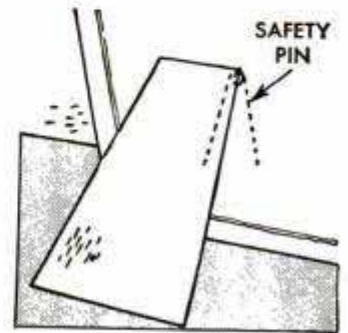


ground on opposite sides of the fire. Then, select a forked willow pole, leaving one arm of the fork longer to serve as a handle, and strip the bark from it. After sharpening the end of the pole opposite the handle, impale the meat on it and lay the pole across the support sticks. First, turn the spit slowly to allow the meat to crisp and seal in the natural juices. While the meat is cooking, rotate the spit every few minutes and baste the meat with bacon grease until done. The upright sticks should hold the spit high enough above the fire so the meat is not burned by the flames.

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

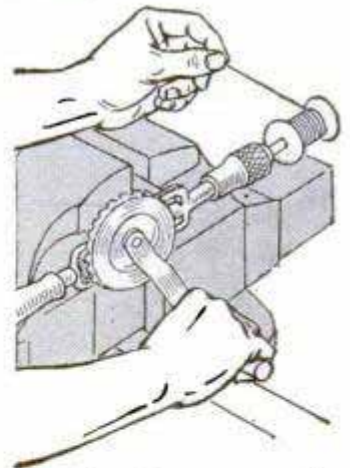
Safety Pin Braces Photo Frame

To keep an easel-type photo frame from falling and possibly breaking when it is placed on a mantel or table top, use a safety-pin brace to hold the leg in the outward position. After cutting off the catch of the pin, insert the pointed arm under the cloth backing of the frame. Then, swing the pin so its other arm holds the easel leg open.—A. Ferreri, Chicago.



Hand Drill Clamped in Vise Aids Winding Trotline

Winding a trotline on a reel or spool is done quickly with the aid of a hand drill. The spool is slipped over a tight-fitting bit which is chucked in the drill and the side handle is clamped in a vise. The winding is done by turning the drill with one hand while the other guides the line onto the spool. String, thread or wire can be wound on spools in the same manner without kinking or becoming tangled. This is also a fast way to wind radio coils, provided the cores have a hole through the center to take the bit.



Herbert E. Fey, New Braunfels, Tex.

☐ After the feathers have been picked from game birds or waterfowl, pinfeathers will come out easily if the bird is soaked in water containing a large amount of salt.



Don't Let This Happen to You

You won't be the fellow who's stalled at the curb when the mercury tumbles if you give your car a complete checkup before cold weather sets in. Start planning now to have a car that's as dependable in winter as it is in summer

By Frank N. Stephany

WHEN IT COMES to smooth cold-weather operation, one of the most important parts of the car is the cooling system with its valuable new filling of antifreeze. If you have a late-model car, all that may be necessary to condition the cooling system for winter driving is to clean the radiator with one of the compounds

made for this purpose and flush it out with a garden hose. Simply allow the compound to remain in the system the length of time specified in the directions on the can. Then, disconnect the outlet hose from the bottom of the radiator and insert the garden-hose nozzle into the filler neck, flushing out the radiator with a gentle spray. Be sure to

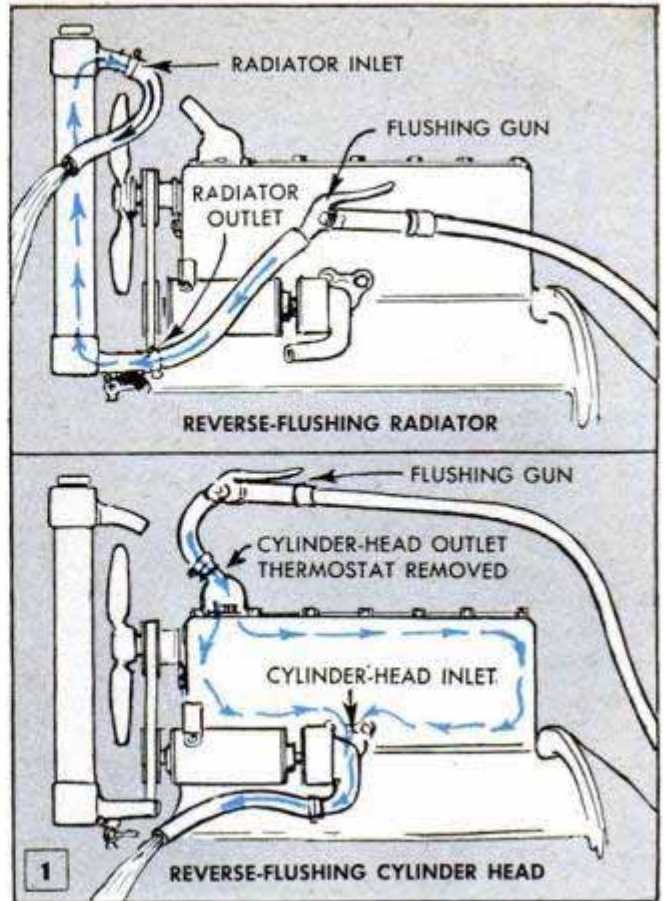
WINTER CHECK LIST

- | | |
|-------------------------------------|-------------------------------------|
| ✓ Flush radiator and cylinder block | ✓ Drain water from fuel tank |
| ✓ Inspect hoses and connections | ✓ Adjust carburetor |
| ✓ Add antifreeze and rust inhibitor | ✓ Check fuel-line connections |
| ✓ Adjust fan-belt tension | ✓ Inspect exhaust system for leaks |
| ✓ Test battery charge | ✓ Change to winter-grade lubricants |
| ✓ Clean battery terminals | ✓ Equalize brakes |
| ✓ Inspect generator | ✓ Cross-switch tires |
| ✓ Check starter motor | ✓ Lubricate hinges, locks, etc. |
| ✓ Inspect distributor | ✓ Check weather stripping |
| ✓ Clean and adjust breaker points | ✓ Touch-up rust spots |
| ✓ Check condenser operation | ✓ Inspect windshield wipers |
| ✓ Inspect and clean spark plugs | ✓ Check defroster and heater |



Radiators on newer cars can be flushed with a garden hose after cleaning compound has had time to do its work. Hose at radiator outlet is disconnected

Radiator hoses are inspected and defective ones replaced. All hose clamps should be tightened carefully to prevent possible leakage of antifreeze solution



disconnect the lower hose, rather than merely open the drain cock, as the latter will not permit a sufficiently fast flow of water to carry away all the rust and scale loosened by the cleaner. For more efficient cooling-system cleaning on all cars, but especially on older models having small-core radiators, reverse-flush the radiator and cylinder-block water jacket separately, as shown in Fig. 1. These parts are flushed individually so that foreign matter from the cylinder block does not enter the radiator. If one is available, use a flushing gun which combines water and air pressure to facilitate loosening and removing rust and scale. Remember to remove the thermostat from the cylinder-head outlet before flushing the water jacket. To determine if a radiator core is clogged prior to flushing it, disconnect the radiator inlet and outlet hoses and plug the connections tightly. Fill the radiator with water, leaving off the filler cap, and then pull the plug from the bottom, or outlet, connection. If the water gushes out of the opening, the core allows a free flow of water but, if the water flows rather slowly, the core is partially clogged and must be cleaned out.

After the cooling system has been cleaned, inspect the hoses and replace defective ones. When connecting the hoses, make sure that all the clamps are sufficiently tight to prevent leakage of the antifreeze. Also check around the shaft of the water pump for indications of leakage between the shaft and the bearing. If leakage is

evident, the worn parts of the pump should be replaced immediately, as this will not only result in a loss of antifreeze but may draw air into the cooling system. The air increases the volume of the coolant so that some of it is lost through the overflow and it also accelerates the formation of rust in the system. When the cooling system is in shape, add water, antifreeze and rust inhibitor. The latter is included in some antifreeze solutions. The liquid level in the radiator should be approximately 1 in. below the bottom of the filler neck so that when the solution becomes warm and expands it will not drain out through the overflow. The freezing point of an antifreeze solution can be determined by using a hydrometer made specifically for this purpose, Fig. 2. Use the correct hydrometer for the type of antifreeze in the system and test the solution at the particular temperature for which the instrument is calibrated. Don't forget that the efficiency of the cooling system, as well as the operation of the generator, depends on the tension and condition of the fan belt. Replace a worn belt and adjust the tension by swinging the generator on its mounting so the slack in the belt is between $\frac{1}{2}$ and $\frac{3}{4}$ in.

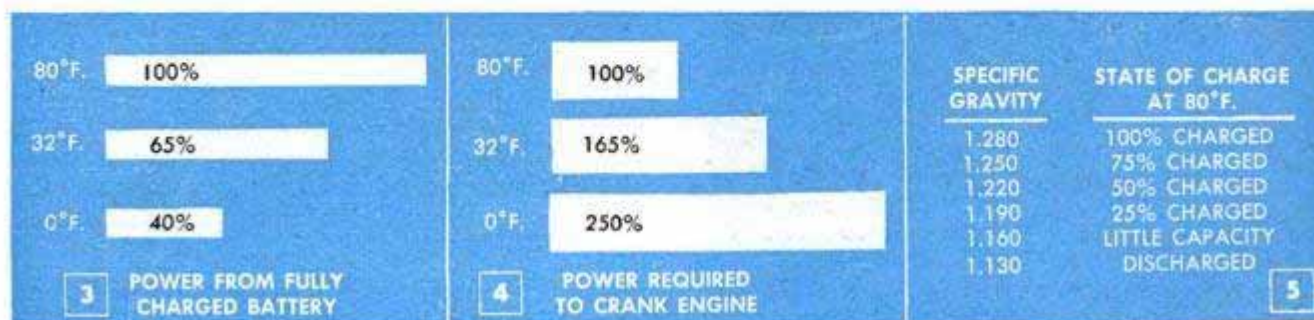
The condition of the battery is the first thing to consider when getting the electrical system in shape for winter driving. Remember that a battery is most efficient at a temperature of about 80 deg. F. and that its efficiency decreases to only 40 percent at a temperature of 0 deg. F. The chart, Fig. 3, graphically illustrates the reduction in cranking power available from a battery as the temperature decreases. Fig. 4 shows the increased power necessary to crank an engine under similar temperature conditions. By comparing these charts, you can realize the necessity for keeping the battery fully charged during the winter months. The battery charge is checked by using a hydrometer to read the specific gravity of the electrolyte solution. Note in the table, Fig. 5, that a fully charged battery cell has a specific gravity of 1.280 at 80 deg. F. However, if you take a hydrometer reading under extreme temperature conditions, be sure to correct it accordingly. Add 4 points (.004) to the reading on the scale for each 10 deg. the tempera-



With a hydrometer made especially for the purpose, check to make sure that the freezing point of the antifreeze solution in the radiator is sufficiently low

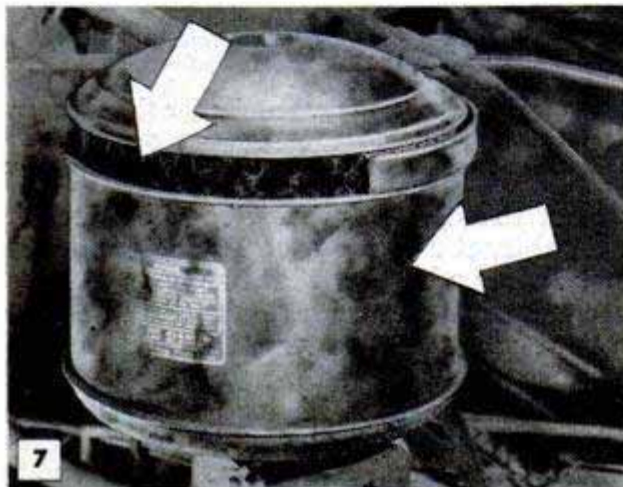
ture of the electrolyte is above 80 deg. F. and subtract .004 for each 10 deg. below 80 deg. Allow a battery that has been rapidly discharged to stand for a while before taking a reading. In this way, the reading will be more accurate, as the solution will have had time to remix. Before checking the battery, be sure that the hydrometer is clean and in good condition. If the paper scale inside the float is wet, the float leaks and the hydrometer will not give an accurate reading. When taking the reading, hold the hydrometer vertically and at eye level. Keep the battery terminals clean and the connections tight and recharge or replace the battery as necessary. The distilled-water level should always be about $\frac{3}{8}$ in. above the top of the battery plates.

A frequent cause of hard starting is dirty or wet spark plugs, wires or distributor cap which permit the current to leak away. See that these units are kept dry and clean and also clean the distributor breaker points. At the same time, check the points for pitting and proper spacing. If they are burned and pitted, they should be replaced, as well as the condenser which is the probable cause of this trouble. The specified





Above, set breaker-point gap by loosening screw on plate and adjusting eccentric. Below, notice dirt accumulation on outside of carburetor air cleaner



Below, solution can be added to gasoline to absorb water condensation and prevent freezing in fuel line



breaker-point gap will range between .018 and .022 in., depending on the make of car, and it should be set carefully according to the manufacturer's instructions. The gap is checked with a thickness gauge and set by loosening the screw which locks the breaker-point plate and adjusting the eccentric screw, Fig. 6. Check the wires in the distributor for breaks and frayed portions. Examine the top of the distributor cap for cracks and be sure that the spark-plug cables and the center cable from the coil make good contact in the socket terminals. Also inspect the rain guards over the cables to see that they fit tightly and are not cracked. These prevent moisture from entering the distributor and, therefore, are important to good winter performance.

To check the operation of the ignition, disconnect the coil cable at the distributor. Then, while cranking the engine, hold the cable $\frac{1}{4}$ in. from the cylinder-head block. If the spark jumps this gap, the ignition coil and its circuit are in good condition. Clean the spark plugs and space the electrodes by bending the side electrode to obtain the gap recommended by the manufacturer. This ordinarily will be from .025 to .029 in. Clean the electrodes with fine sandpaper and inspect the plug gaskets, replacing any that may be scored. When removing or installing the spark plugs, always use a socket wrench of the correct size to avoid damaging the porcelain. To replace the plugs, turn them into the cylinder head by hand as tightly as possible, and then tighten them one half to three quarters turn with the wrench. Be careful not to make them too tight.

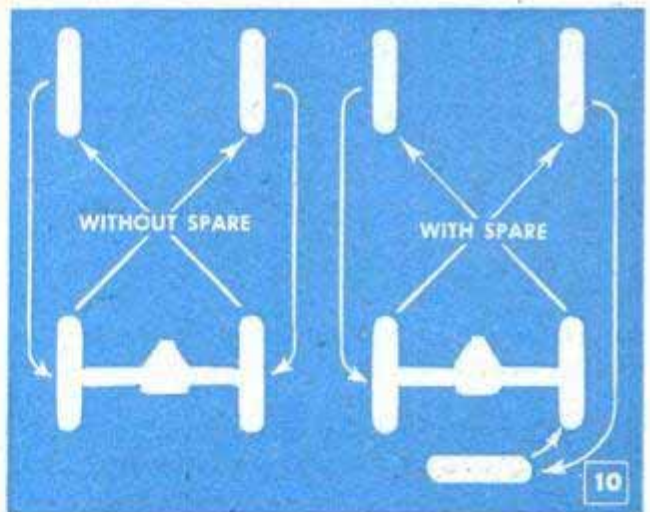
Clean and tighten the generator connections, especially at the cutout, and inspect the brushes. Also see that the contact points on the voltage regulator are clean. Do not overoil the generator. A drop or two of oil on the bearings every thousand miles is sufficient, as too much lubricant coats the commutator with a film which results in arcing and pitting. This film can be removed from the commutator by merely touching the surface with 6/0 sandpaper while the generator is running.

The starter motor must be in good condition for winter driving. If necessary, clean the commutator with sandpaper and replace and align the brushes. Brushes worn to half their original size should be renewed, and they must be replaced parallel with the commutator segments. Polished spots on the armature core or field pieces indicate worn shaft bushings which cause the armature to rub against the field poles. In this case, new bushings should be installed. The starter motor, as well as the generator, is likely to be damaged by excessive oiling. A small amount of light cup grease applied to the bearings, unless they are the self-oiling



type, will furnish satisfactory lubrication.

Carefully check the fuel system to see that it is functioning properly. All the fittings and lines on both the suction and pressure sides of the fuel pump must be tight and in good condition. The carburetor-float level should be set high enough to provide a richer mixture for winter. The automatic choke also is likely to have a winter setting to provide a richer starting mixture. The choke is adjusted by turning the thermostat control slightly, as shown in Fig. 8. Take a look at the carburetor air cleaner. If the outside of the unit is dirty, as indicated by the arrows in Fig. 7, you can be quite sure that the cleaner is no longer operating efficiently and should be removed for a thorough cleaning. Another way to check the cleaner efficiency is to remove it while the engine is running. If the engine speeds up considerably, the cleaner is either dirty or damaged. Should the air cleaner not be dirty after a few thousand miles of service, chances are that it is not working properly because of internal failure or by-passing of the air through a leak in the connection between the cleaner and the carburetor. Drain the fuel tank to remove any water and sediment and, if desired, add a special solution to the gasoline to absorb water condensation. This will prevent accumulated water from freezing in the fuel lines. The crankcase should be drained and flushed to remove sludge and other foreign matter which may clog the oil-filter screen and also cause sticky rings and valves. The crankcase oil should, of course, be changed

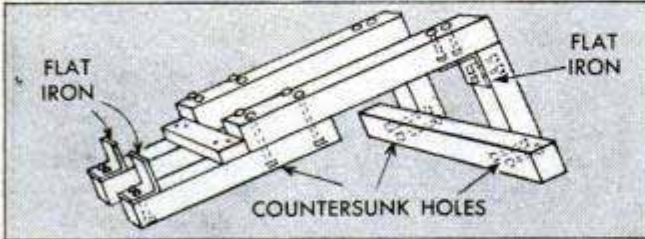
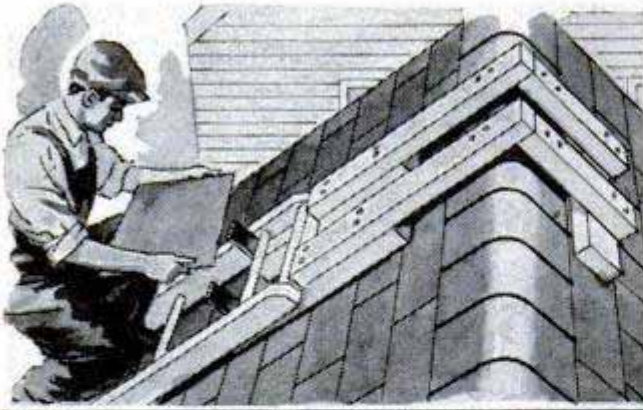


to one of the recommended winter grades.

As even braking is essential for safe driving on slippery pavement, see that the brakes are properly adjusted. Better traction and braking surface can be obtained by cross-switching the tires as shown in Fig. 10. To get maximum wear from your tires, it is a good idea to do this every 3000 to 5000 miles regardless of the season. Check the operation of the heater and defrosters. If you have a hot-water heater, you can increase its efficiency by flushing it out when you are flushing the radiator and cylinder head. Finally, make sure that the windshield wipers will give dependable service during the winter months. On wipers equipped with a water-spray attachment, fill the container with a solution of glycerin, 1 part, and water, 2 parts, as pictured in Fig. 9. This will aid in preventing ice formation on the windshield.

(Certain information and diagrams courtesy Plymouth Motor Corp.)

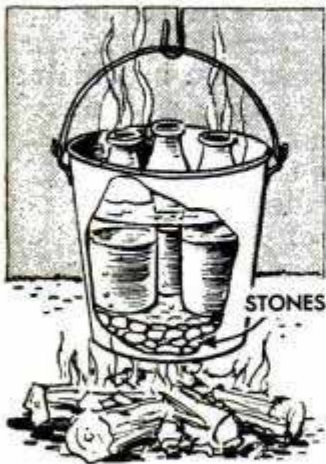
Ridge Hook Holds Ladder Safely on Gable Roof



Repairing a roof, cleaning a chimney or painting dormers is done safely and easily if this ridge hook is used to hold the ladder. The hook fits over the ridge so that the weight of the ladder is exerted against the opposite side of the roof. As the hook can be slid along the ridge, the ladder may be used as a work platform at almost any point on the roof. The hook is made of 2 x 4s bolted together, the nuts being countersunk so they will not damage the shingles. The legs of the hook are braced by two angles bent from flat iron and the top rung of the ladder is slipped over two additional flat-iron angles bolted to the hook.

Anthony J. Mazure, Jr., Crown Point, Ind.

Milk Bottles Set in Pail of Water Provide Handy Camp Cooker



By means of three milk bottles set in a pail of water, an entire meal can be heated simultaneously over a campfire. One of the bottles can be used to heat water for coffee, if the powdered type is used, while the other two contain soup, beans, etc. First, place a 3-in. layer

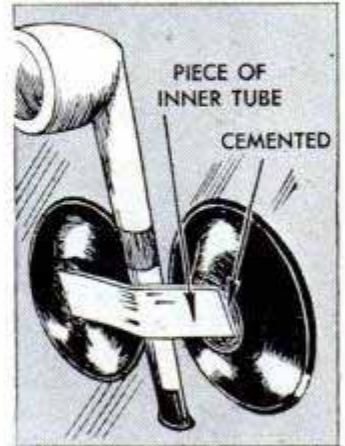
of small stones in the bottom of the pail so the bottles will not rest directly on the bottom and possibly break. After standing the bottles in the pail, fill it about three-

quarters full of cold water and hang it over the fire. Once the water begins to boil, the food will be heated rapidly.

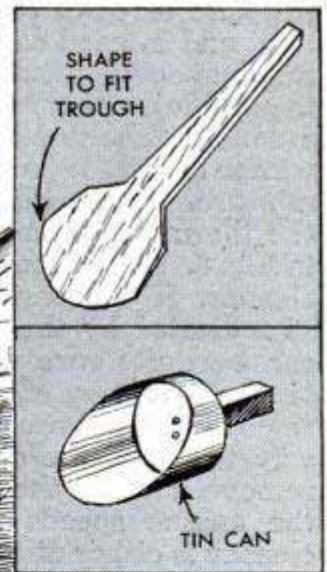
Suction Cups Form Pipe Rack For Car Windshield

Being an avid pipe smoker, I was at a loss as to where to keep a pipe in my car until I made a handy little pipe rack for the windshield. The rack is a piece of inner tube cemented to two suction cups which are stuck to the windshield. The pipe is slipped between the inner tube and the glass. When mounted at a lower corner, the rack does not interfere with the driver's vision.

Chas. H. Pabst, Pittsburg, Kans.



Home Repairs Cleaning Eaves Trough Facilitated By Easily Made Tools



To clean out eaves troughs quickly, one man uses a tin-can scoop and a wooden scraper to loosen the dirt. The scraper is cut from a wooden shingle, the thin end, or blade, being shaped to fit the bottom of the trough. The small scoop is made by cutting off the top and sides of a tin can at an angle and fitting the bottom with a wooden handle. The scraper is especially useful for cleaning under the hangers.

Arthur N. Nelson, Kansas City, Mo.

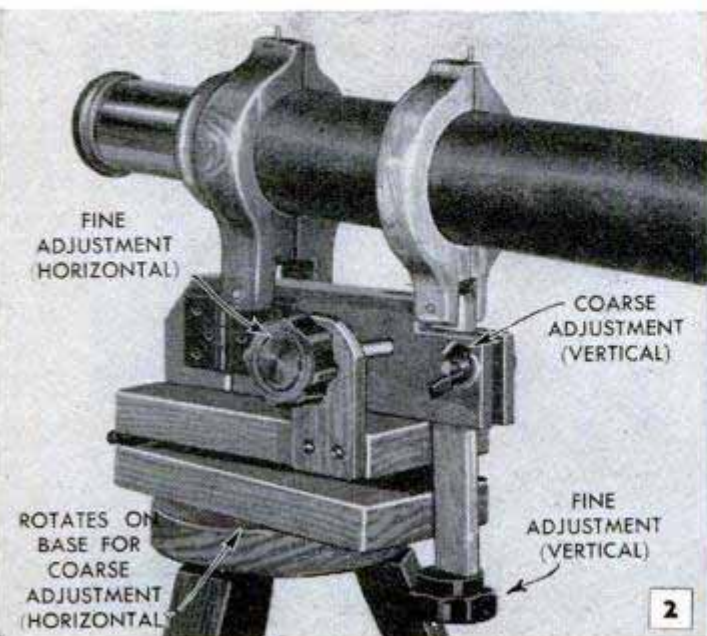
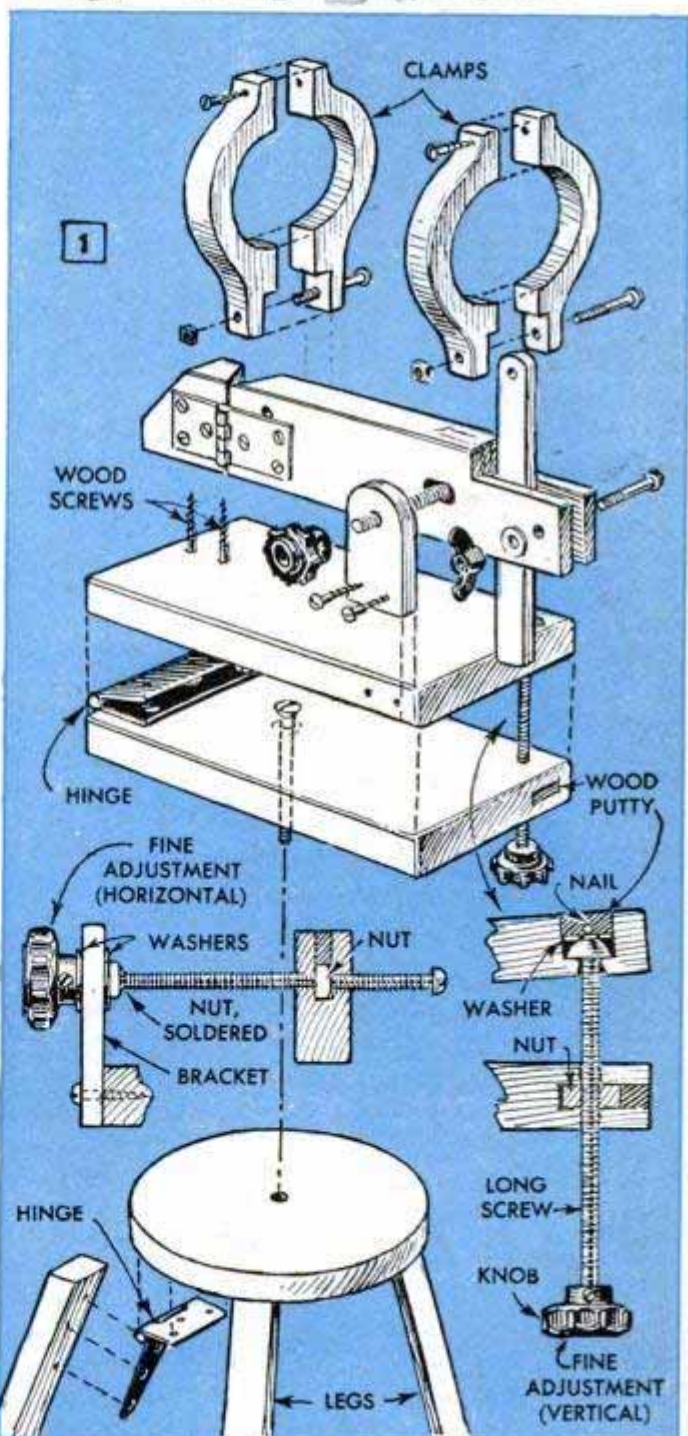
Unworn portions of table oilcloth can be made into waterproof aprons to be worn when doing the laundry or washing dishes.



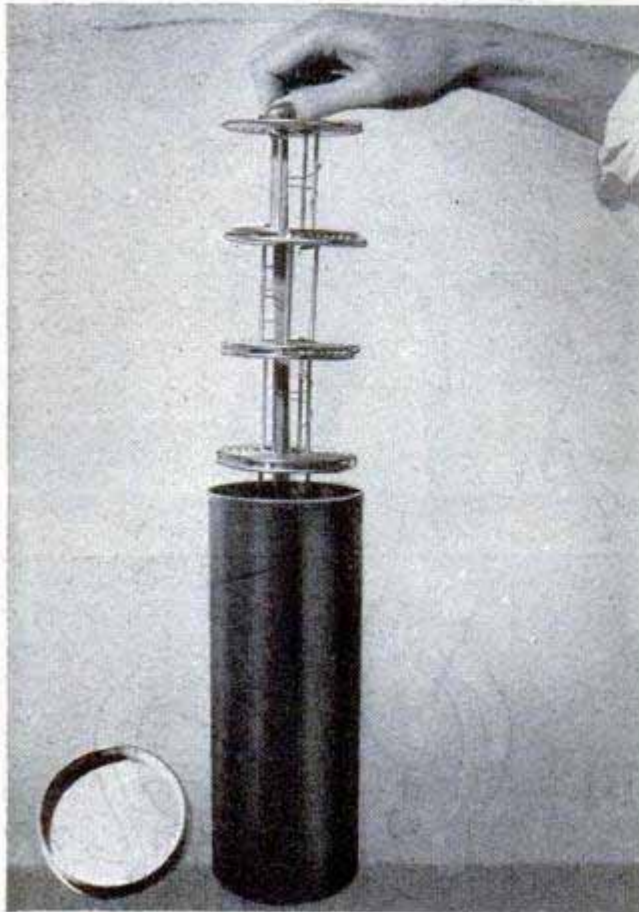
TELESCOPE TRIPOD

BECAUSE of its extreme sensitivity to the slightest body movement, a telescope of 15X or greater must be supported by a steady tripod for the best results. Although simply constructed of hardwood, this tripod features a "pan" head having a micrometer adjustment for both vertical and horizontal movement. These adjustments are attained by means of long machine screws removed from toggle bolts which are turned through fixed nuts. The clamps for the telescope are faceplate-turned in one piece for accuracy on the inner surface and then sawed in half. Contours of the outside of the clamps are jigsawed. The movable base members of the head are hinged together for fine vertical adjustment, the raising and lowering mechanism being shown in the lower right-hand detail, Fig. 1. A hinged mounting bracket for the clamps permits fine horizontal adjustment, using a similar screw arrangement. Coarse adjustments are made by rotating the head on the base and changing the height of the front clamp by loosening the wing nut, Fig. 2. Hardwood legs of the tripod are hinged to a circular toppiece.

Willard Allphin, Danvers, Mass.

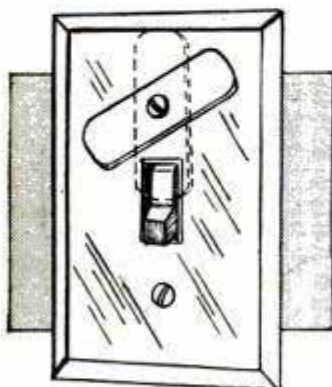


Tank Holds Several Rolls of Film For Simultaneous Developing



To develop three or four rolls of film at the same time, one photographer purchased several extra reels from a film-tank manufacturer and inserted them in a tank made from seamless stainless-steel tubing. The reels are mounted one on top of the other and are tied together with short lengths of wire. In soldering a bottom to the tubing, the joint must be made on the outside so developing solution will not contact the solder. The tank shown holds four reels and requires less than $\frac{1}{2}$ gal. of developer.

Turn Button Locks Wall Switch



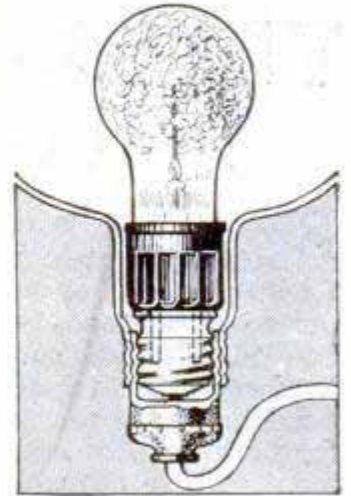
If there is a likelihood of someone snapping on a wall switch in the dark-room, thus spoiling a batch of negatives, guard against this by locking the switch in the "off" position with a turn button. The latter, which can be either a piece of plastic or sheet metal, is held in place by the top screw of the switch plate. The turn button is swung down and against the switch, keeping it from being

pushed up to the "on" position, and is turned to one side when not needed.

Arthur Trauffer, Council Bluffs, Iowa.

Increasing Flash-Bulb Efficiency In Photoflood Reflector

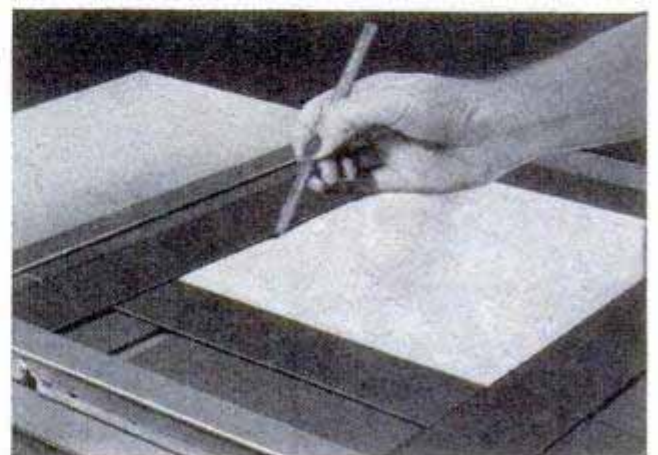
As photoflood reflectors are, of course, designed for photoflood bulbs, considerable efficiency is lost when the shorter flash bulbs are used in them. However, this can be corrected by using an extension to bring the flash bulb out to the approximate length of a photoflood bulb. The extension is simply a plug base and a socket of the type used to plug a lamp bulb into a wall receptacle. These two parts are pressed together and the flash bulb is turned into the extension socket. Then the extension is turned into the reflector socket.

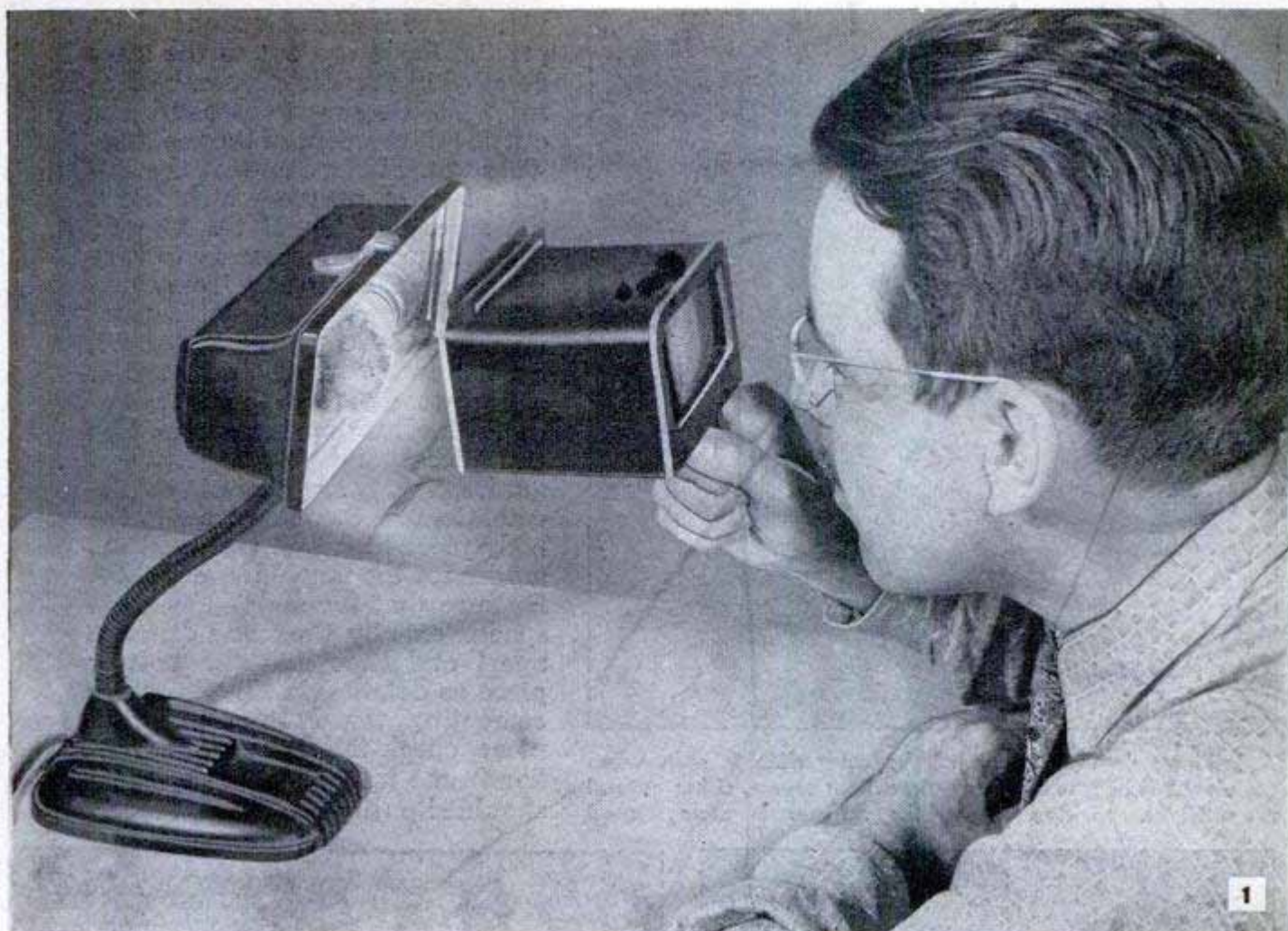


When you want to be sure of having uniform borders on your enlargements without trimming, use the back of an old print to check the positions of the easel masking bands. Select a print of the same over-all size as the ones to be made and place it upside down in the easel. Next, locate the masking bands approximately and draw lines on the back of the print, using the bands as straightedges. This will show you exactly where the border will fall. If the pencil lines indicate that the width of the border is not equal all around, you can adjust the masking bands accordingly.

Old Print Checks Easel Masks To Insure Uniform Border

Virginia Hanson, Santa Monica, Calif.

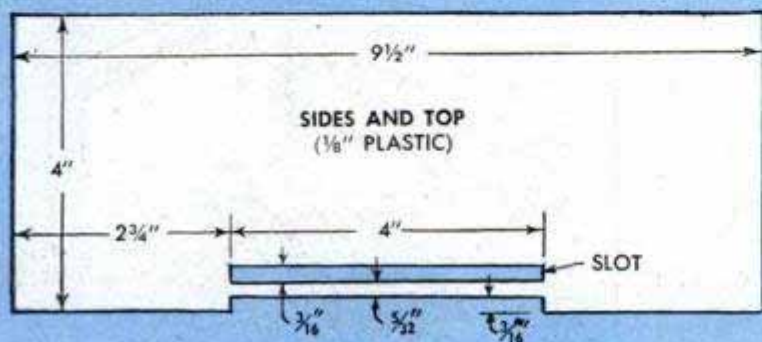
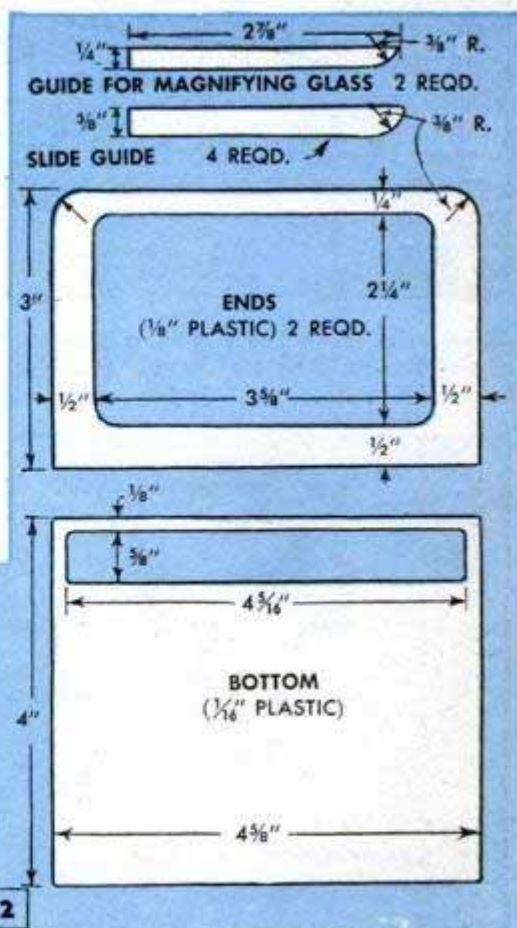


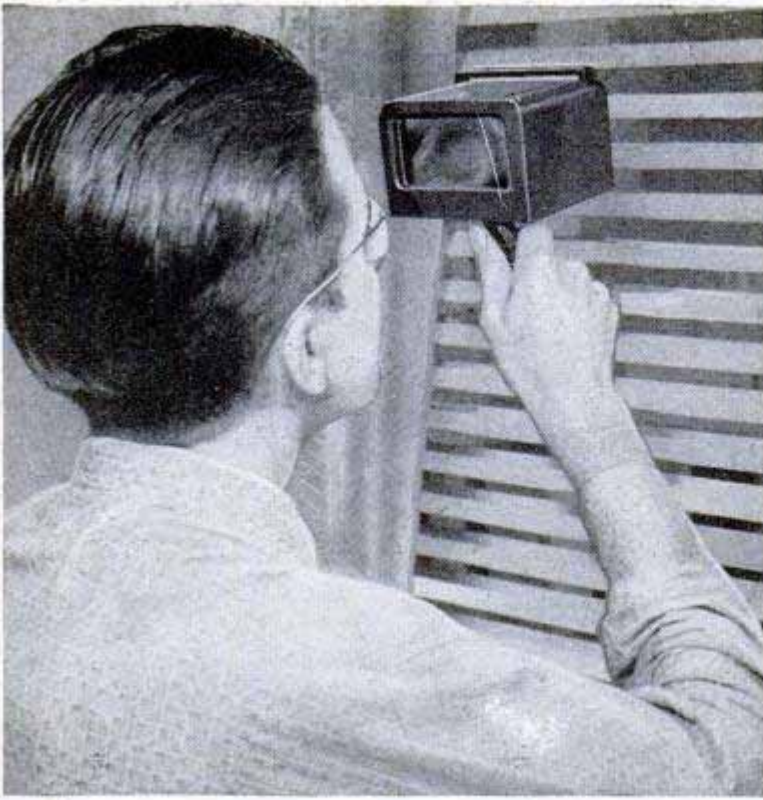


VIEWER FOR LARGE-SIZE COLOR SLIDES

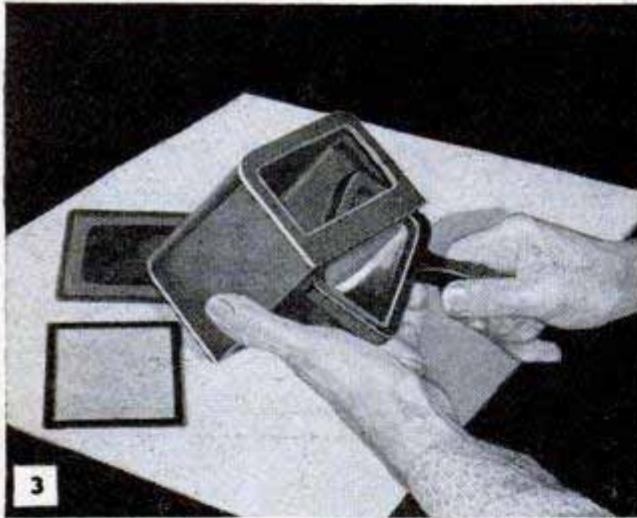
By M. G. Winterton

THIS VIEWER is designed for large color slides, up to $2\frac{1}{4} \times 3\frac{1}{4}$ in., and utilizes an ordinary rectangular reading glass as the magnifier. A removable diffusing glass provides the user with a choice of direct or indirect illumination, a decided advantage when viewing the larger color slides. In use, the viewer is simply held in front of the light source as in Fig. 1 and a magnified image of the color slide appears on the reading glass with exceptional brilliance and clarity of detail. The soft rendering of indirect illumination without need of the diffusing glass is obtained by using the viewer as a table model, placing it over a sheet of white paper so that it picks up reflected light only, Fig. 6. All parts of the

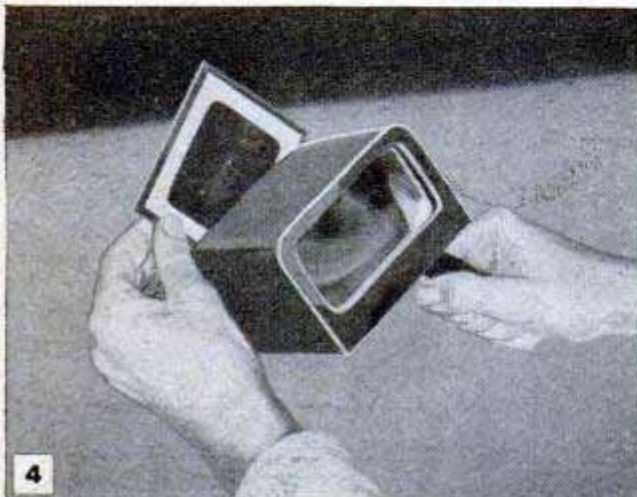




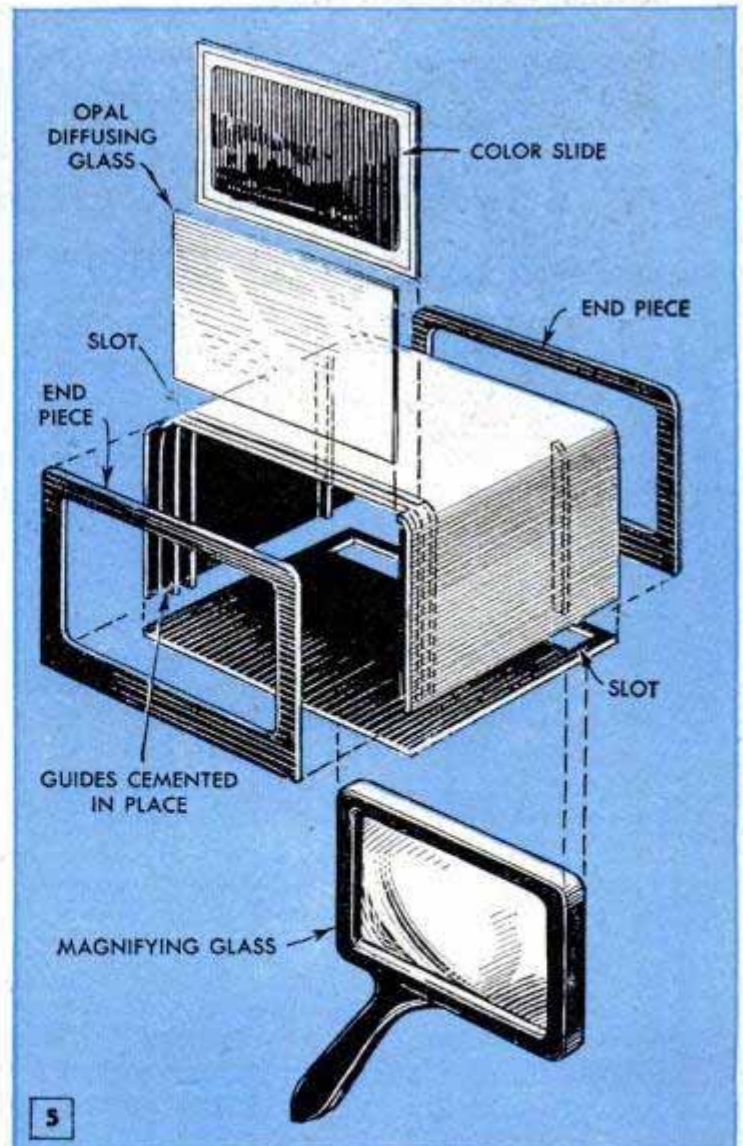
A brilliant, detailed image of the color slide is seen when the viewer is held toward any direct light source, either natural or artificial. In direct light, the diffuser is always used



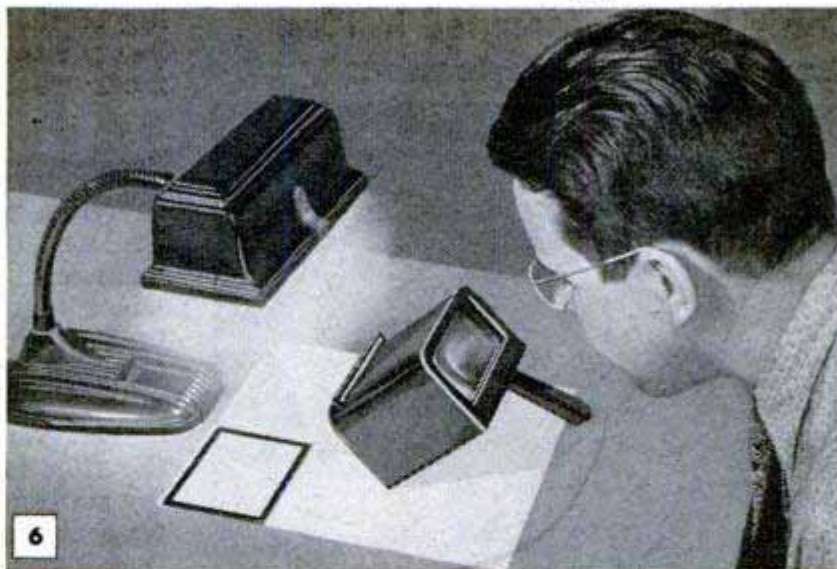
Above, the magnifier fits in a slot cut in bottom of the viewer. Angle of handle provides convenient handhold. Below, slide is inserted in slot at back



viewer are made of opaque sheet plastic. Parts are cut to the sizes detailed in Fig. 2 and assembled as in Fig. 5. Be sure to measure the outside dimensions of the reading-glass frame before cutting the single piece of plastic which forms the sides and top of the viewer, Fig. 2. It may be necessary to vary the dimensions slightly from those given. After notching, slotting and finishing the edges of the piece, heat it in the oven and bend it over a wooden form to get the required radius on the corners. The end pieces and the two sets of guides, Fig. 2, are made in duplicate. Cement the end pieces to the body piece first, and then add the guides for the magnifier and slide. Be sure that the slide guides are spaced exactly the same distance apart and then slot the bottom piece as detailed in Fig. 2. Before cementing the bottom piece in place, check the fit of the magnifier frame in the slot. The frame should slip through the slot easily

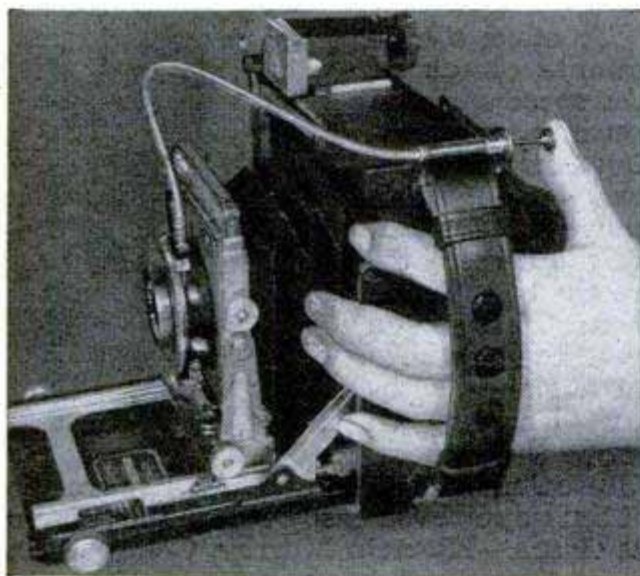


without any side play, Fig. 3. If it binds at any point, remove stock with a fine file either from the magnifier frame or from the slot and polish the edges to remove burrs and file marks. Cement the bottom in place and round over all exposed edges of the assembly by sanding with fine sandpaper. Then buff and polish all the flat surfaces and the edges. This will prevent chipping and scratching of the edges due to handling. The diffuser is cut from ordinary opal glass of the kind sold in photo-supply stores. It should be wide enough so that the top edge can be grasped for easy removal after insertion. Cover the edges of the glass with narrow strips of masking tape. Fig. 4 shows how the slides are in-



The viewer serves equally well as a table model with indirect illumination. Handle supports the viewer at just the right angle

serted in the oversize slot at the back. Clean the reading glass before using as dust will dull the brilliance of the image.



Cable Release Clamped to Camera Is Operated With Left Thumb

Preferring to use the cable release instead of the body release on my Graphic-type camera, I clamped the cable release to the top of the camera so that it can be depressed with the left thumb. This leaves the right hand free to focus the camera and permits the shutter to be released the instant the subject is in focus. The clamp is made from a piece of 1 x 2-in. sheet metal which is bent double at the center. This is done over a piece of rod forming a loop large enough for the cable release to pass through. A hole, drilled through the other end of the clamp, permits bolting it under the top strap hanger. The clamp holds the cable-release button just above the strap.

Meredith T. Thomas, Tucson, Ariz.

Tape on Edge of Paper Cutter Keeps Prints From Slipping

A faster job of trimming prints is had if the paper cutter table has a nonslip surface. This can be obtained by sticking a narrow strip of adhesive tape along the cutting edge of the table.



Handle for Photoflood Reflector

Adjusting a hot photoflood reflector sometimes results in painfully burned fingers. However, the likelihood of being burned can be eliminated by fitting each reflector with a wooden tool handle. The reflector socket is disassembled and the wire removed. Then a hole for the wire is drilled lengthwise through the center of the handle. The metal ferrule at the end of the handle is cut off and the wooden tenon whittled down to fit snugly in the end of the socket. The set-screw will hold it in place. Finally, the wire is passed through the handle and connected to socket terminals.



U.I. '51

Cable Release Mounted in Plug Provides Flash Synchronizer



Inserting the end of a cable release in an attachment plug is a quick way to make an inexpensive passive flash synchronizer. The cable release is wrapped with wire or tape so it is a force fit in the plug, and the prongs of the plug are cut off and bent inward to make contact with the cable-release button. Holes drilled through one side of the plug cover permit the synchronizer wires to be attached to the terminal screws. The length of the plug prongs is adjusted so the cable-release button closes the circuit at the instant the shutter is opened. If desired, the plug may be filled with liquid plastic or sealing wax so the release does not move out of position. However, care must be taken not to interfere with the free movement of the cable-release button.

Enloe C. Crews, Phoenix, Ariz.

Oil Corrects Tripod-Head Slippage

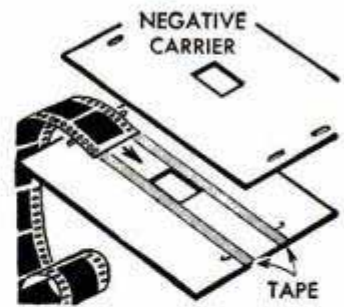


When the tilting action on a friction-type tripod head tends to slip, applying a few drops of oil to the bearing surface will frequently correct the trouble. A film of light machine oil permits positive lock-

ing of the tilting head with considerably less pressure than when the gripping surfaces are dry.

Preventing Scratched Negatives

When making enlargements from roll film, two strips of cellulose tape attached to the bottom of a metal negative carrier will keep the film from being scratched. The tape strips, about 1/2 in. wide, should be positioned as shown so that the film is supported on its edges only. This will not work on the glass-type carrier but only on the type in which the upper plate is lifted when the film is to be advanced.

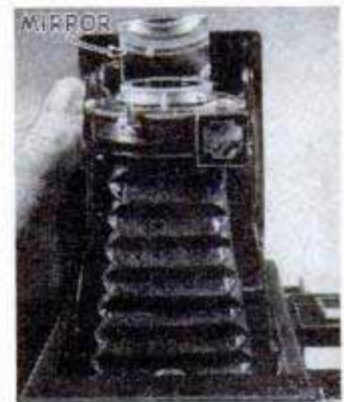


Henry A. Stockert, Pekin, Ill.

U.I. '51

Camera Settings Checked Quickly

To make a last-minute check of the speed and stop settings when using a folding camera, tape a small mirror to the bed of the camera directly below the lens. This gives you the readings at a glance without having to move the camera.

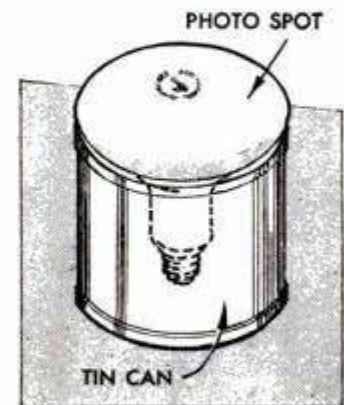


Use cellulose tape to attach the mirror so it can be removed easily before the camera is closed.—Kenneth Murray, Colon, Mich.

U.I. '51

Tin-Can Holder for Photo Spot

A photo spot or reflector-type photoflood can be kept from rolling off a shelf by storing it on end in a shortening can. This type of can is the right size to allow the bulb to rest on the rim.—Harry Aichner, Erie, Pa.



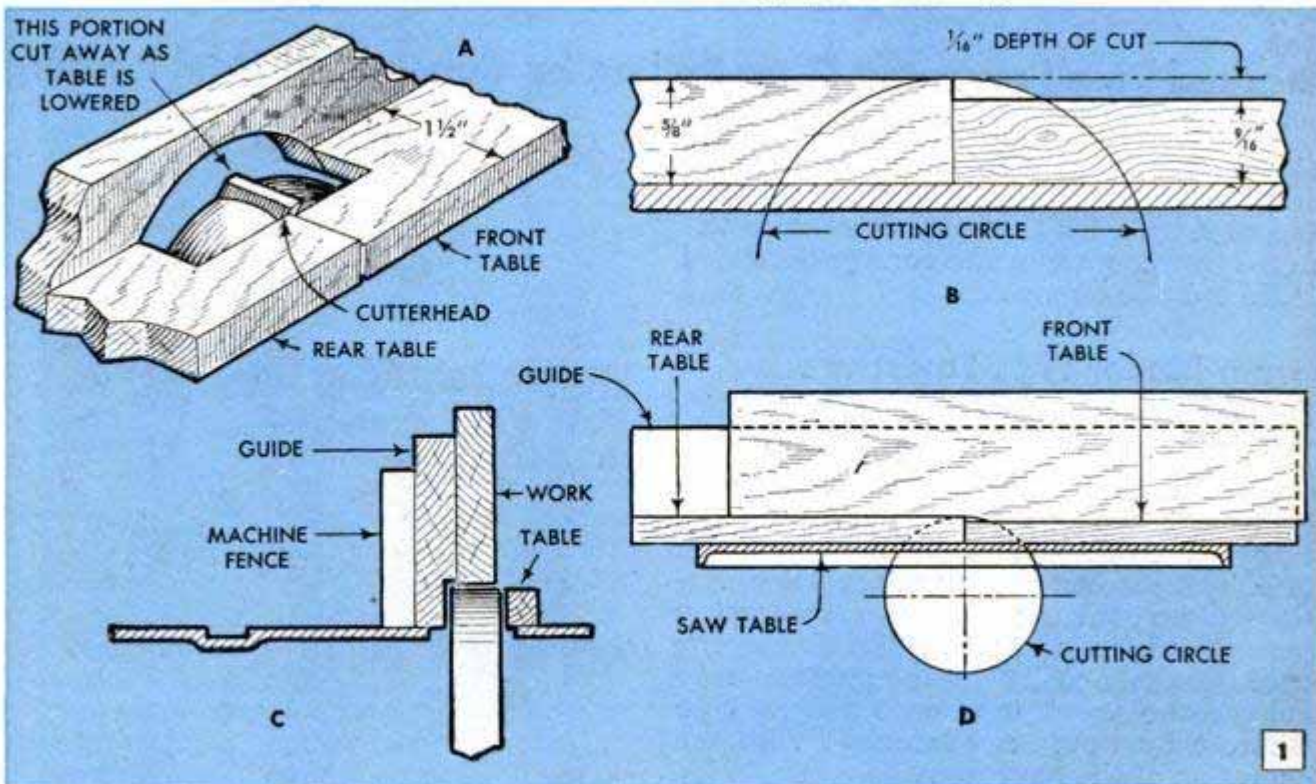
Dark-tinted bleach bottles, which are available in sizes from 1 pt. to 1 gal., provide handy containers for storing dark-room chemicals. Rubber stoppers should be used to replace the metal bottle caps.

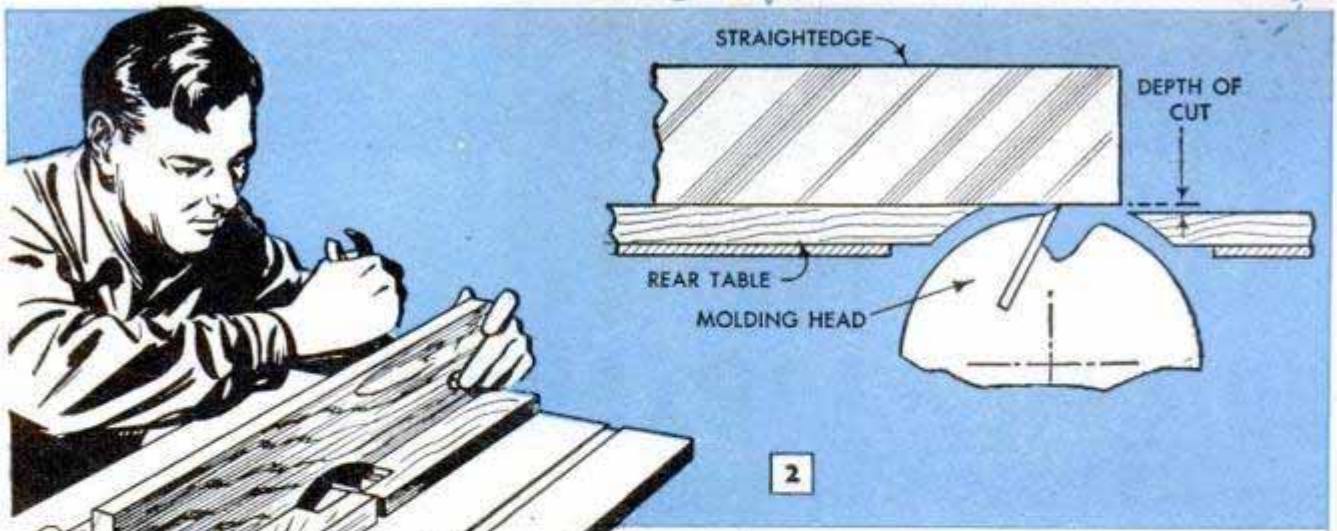


JOINTING on your bench saw

By Roy Rogers

HOME CRAFTSMEN who do not have a jointer can adapt the circular saw to do the work of this machine on stock not more than 1 in. thick. A three-knife molding head fitted with a set of straight-edged cutters and three pieces of selected hardwood are all the parts needed to make the setup. The auxiliary wooden guide, Fig. 1, detail C, and the infeed and outfeed tables can be made any convenient length. On most saw tables, it will be necessary to plane the outfeed table to a thickness of $\frac{5}{8}$ in. and the infeed table to a thickness of $\frac{9}{16}$ in. in order to bring the cutting circle to the proper height, as in Fig. 1, detail B. Attach the two tables to the guide with screws. Then attach the unit to the ripping fence with screws or bolts. The meeting ends of the front and rear tables should be directly over





the center of the saw arbor as in Fig. 1, details B and D. Remove the saw-table insert, place the molding head on the arbor, and raise the saw table to its highest position. Move the ripping fence to the left until the inner edge of the wooden guide is flush with the outer edge of the cutters on the molding head. Then lock the ripping fence at both ends, start the motor, and lower the saw table slowly until the molding head cuts through the tables. Stop the motor and again raise the saw table to its full height. Slide the ripping fence to the left until the corners of the molding cutters will just clear it. Again start the motor and lower the saw table the same distance as before.

In this step, the molding cutters will remove a semicircular section of the wooden guide, leaving an opening like that in Fig. 1, detail A. This opening allows plenty of chip clearance. The width of the opening also permits adjustment of the head when jointing thin stock. Each time the attachment is used for jointing, the cutters must be set for proper height with a straightedge as in Fig. 2. Raise the table to the full height, place the straightedge on the out-feed table and turn the cutterhead until one cutter is in the vertical position as shown. Then lower the table until the straightedge just touches the edge of the cutter. When correctly located, each cutter will catch the straightedge and move it forward about $\frac{1}{8}$ in. when the cutterhead is turned slowly. When jointing, hold the stock firmly against the guide and move it slowly and uniformly over the tables. Be sure the ripping fence is locked securely at both ends of the saw table.

Stacked Pipe Prevented From Rolling by Corrugated-Steel Roofing

Lengths of pipe which are stacked for storage can be kept from rolling by using short pieces cut from corrugated-steel roofing as a base for the pile. Just place the first layer of pipe in the corrugations and build the pile on top of it.

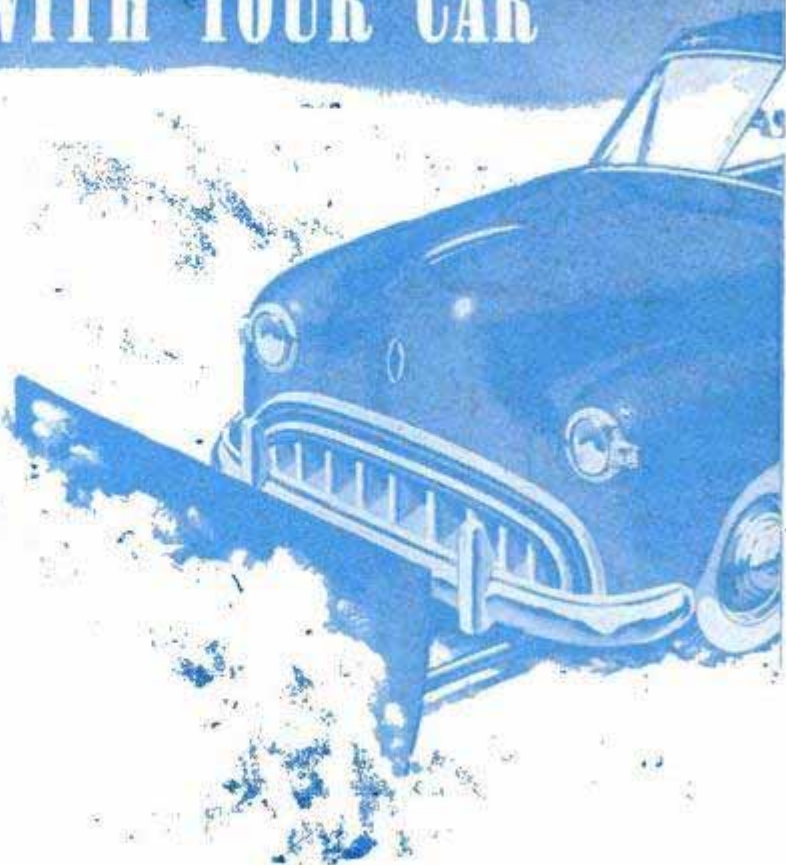
Grain Binder Tops Smartweeds To Aid Harvesting Soybeans

Finding that smartweeds had grown several feet taller than his soybeans, thus preventing the combine from harvesting the crop, one farmer used a grain binder to cut off the weeds just above the soybeans. Although the canvases were mounted on the binder, no twine was used. The binder was operated just ahead of the combine so as to deliver the weed tops onto the stubble where they would not interfere with the operation of the harvester.

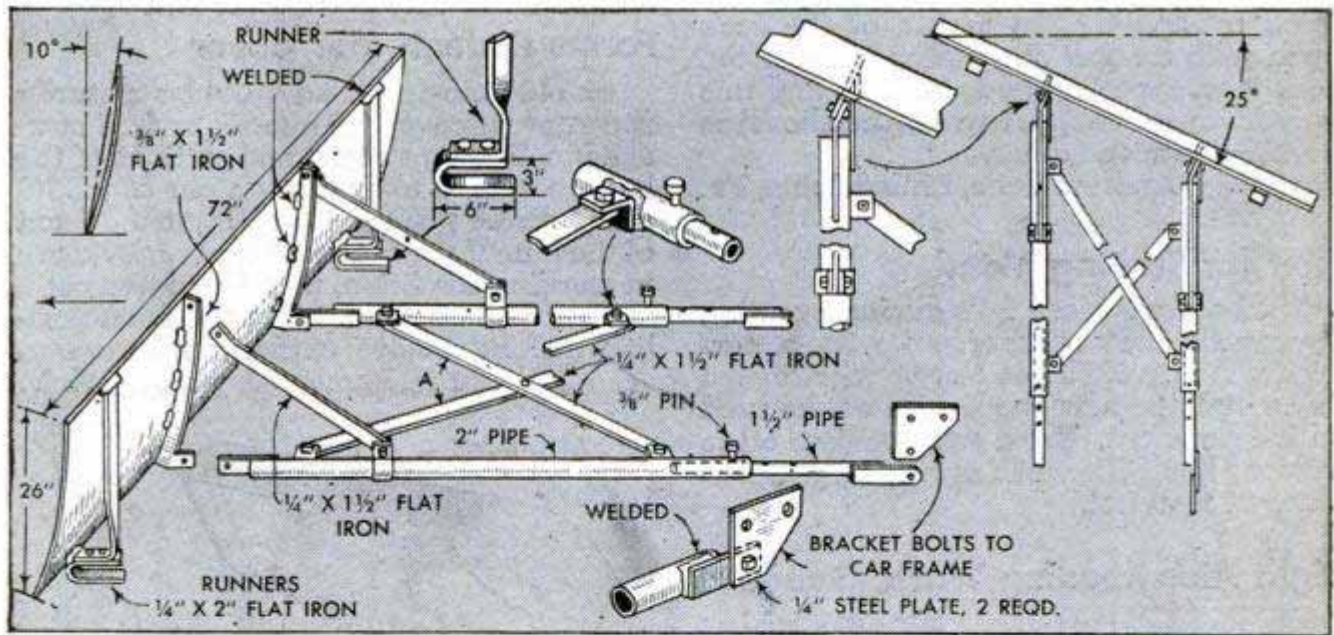


Reported J.M. 51

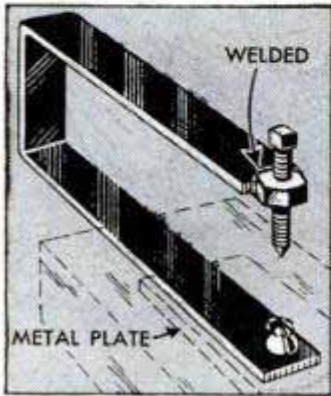
PLOW SNOW WITH YOUR CAR



Farm lanes and private roads are opened in a jiffy by using this snowplow mounted on the front of your car. The plow is made of scrap parts, the blade of the original being fashioned from the sides of an old water tank. The blade rides on flat-iron runners and the unit is attached by bolting adjustable arms to the car frame. The arms are lengths of 2-in. pipe slipped over 1½-in. pipe and held with metal pins



Easily Made Locator Marks Work for Drilling Registering Holes



In some jobs, such as truck-body rebuilding, it is often necessary to drill a hole in exact register with a hole already in another part behind the work. This easily made hole locator is just the thing for such

work. To make it, bend a piece of flat iron or spring steel to a U-shape, one arm being slightly longer than the other. Weld a nut to the end of the shorter arm and turn a pointed setscrew through the nut. Then weld a projection, or pivot, on the other arm directly under the setscrew. To use the locator, slip the projection into the hole already in the part and tap the setscrew with a hammer. This will mark the exact spot for drilling the new hole.

W. D. Darnell, Dallas, Tex.

Sack Held Open With Stick Is Filled Easily



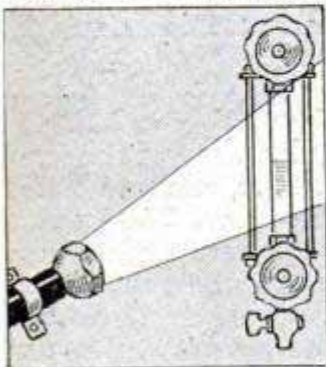
Shoveling sand, cement or other bulk material into a cloth or paper sack is facilitated by holding the mouth of the sack open with a small stick. The edge of the sack is wrapped around the stick and this is held with one hand while the shovel is handled with the other.

Andrew Vena, Philadelphia, Pa.

Hint for Sawing Metal

If a hacksaw blade fails during a cutting operation, start another cut with a new blade. As the old blade has work-hardened the metal, the new one should not be used in the same cut. Use a sulphur-base oil to prolong blade life when sawing large quantities of material.

Light Aids Reading Water Gauge



Steam-boiler water gauges that are difficult to read can be read easily if a flashlight beam is played on the glass. If the flashlight is held below the gauge, a little to one side, and directed on the

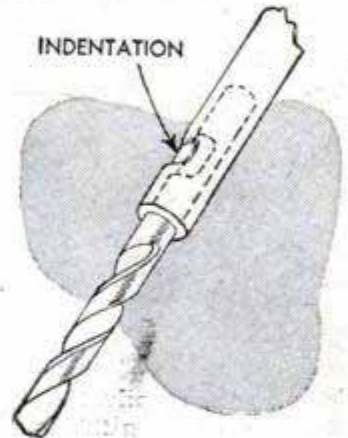
glass, the water level will stand out in the light beam. The light probably will have to be moved somewhat before the correct position is found. If a post, wall or other

means of support is handy, the flashlight can be fastened permanently in this position and simply turned on when the gauge is to be read.

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

Improved Drill-Bit Extension

When drilling up between floor joists or in other hard-to-reach places, a drill-bit extension often is necessary to permit free rotation of the brace handle. A suitable extension is made from a length of round rod, one end of which is drilled



to take the bit. A flat is ground or filed on the bit shank and, after the bit is inserted, the rod is indented to hold it tightly. Use a rod that will leave a wall thickness of about $\frac{1}{16}$ in. after drilling.

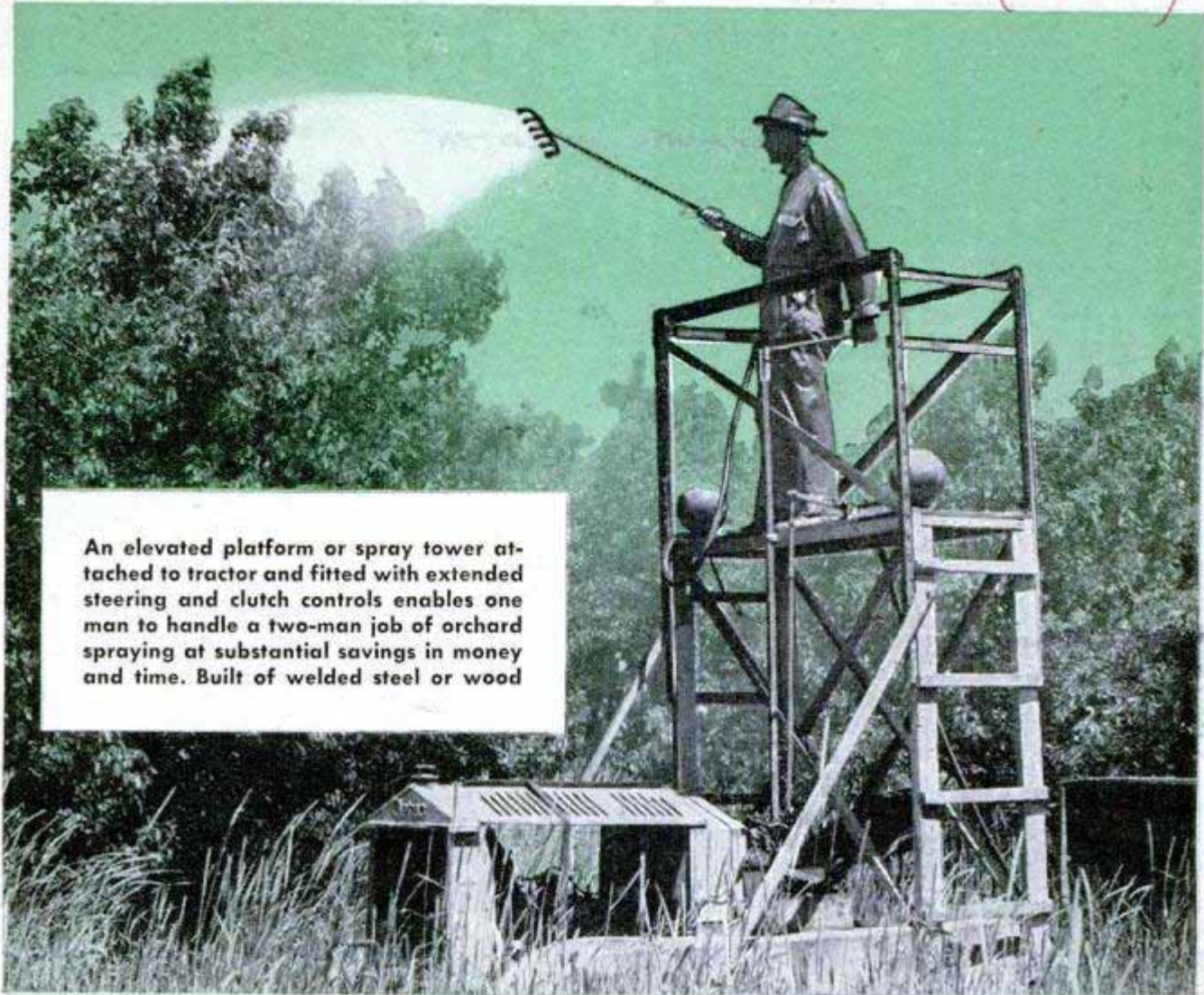
Robert J. Lemp, Woodhaven, N. Y.

Auto-Trunk Lid on Grain Bin Forms Rodentproof Cover

An old auto-trunk lid provides a sturdy rodentproof cover for a grain or feed storage bin. The tops of the end sections of the bin are curved to fit the contour of the lid and a strike plate is installed at the front of the bin. If the braces of the trunk lid are in working condition, they should be used, as they will hold the lid in the open position, making removal of the contents easier.

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



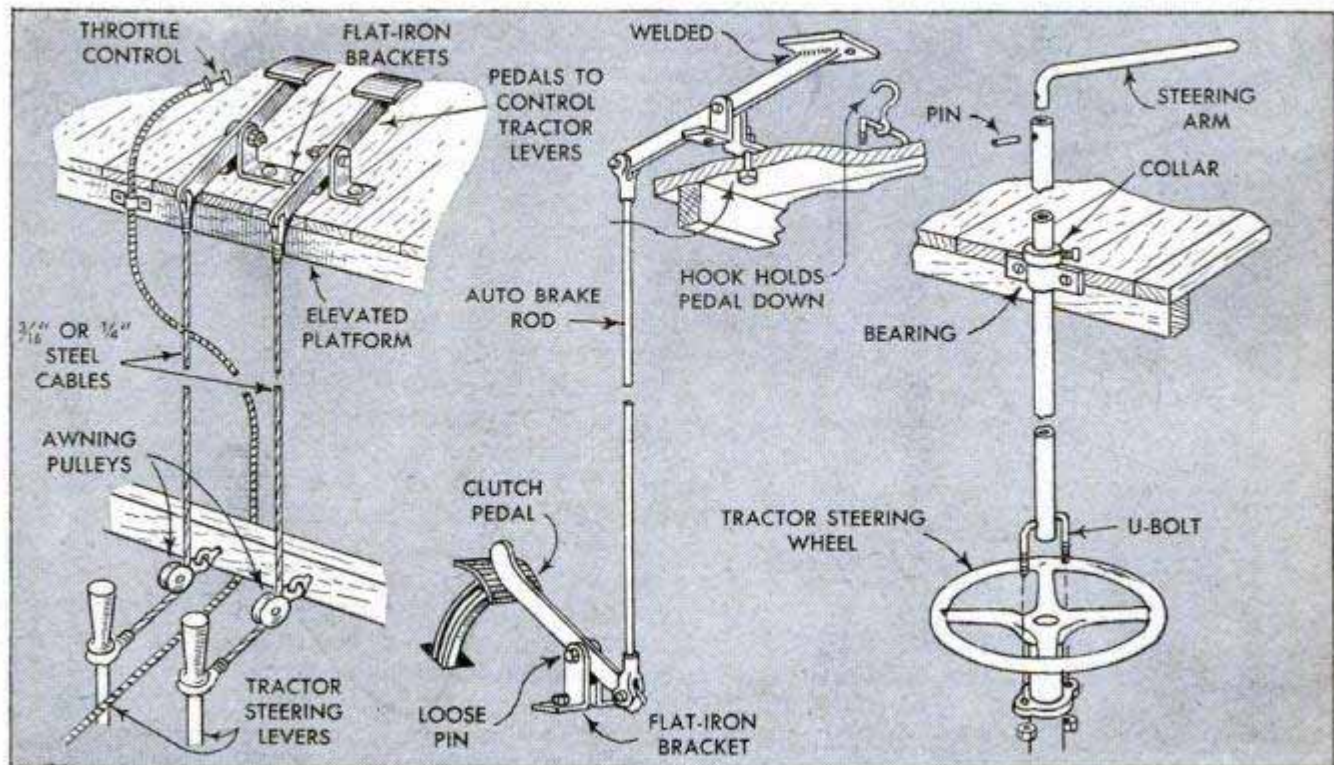


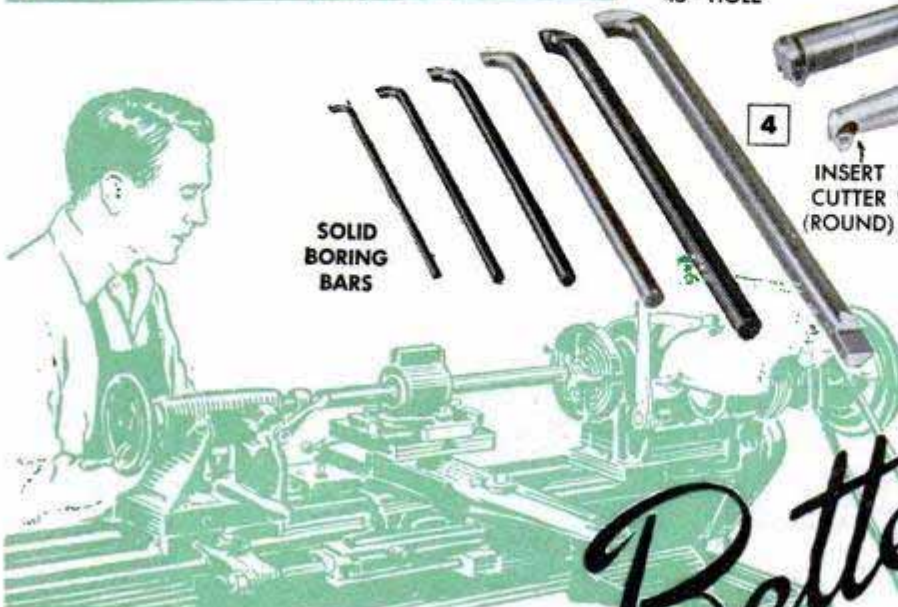
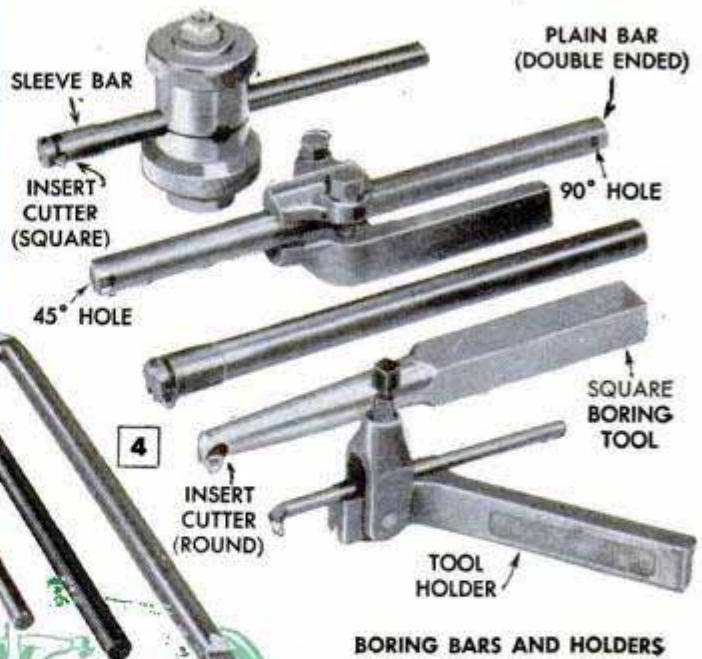
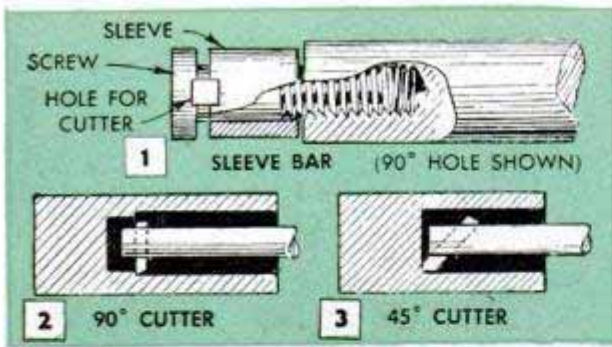
An elevated platform or spray tower attached to tractor and fitted with extended steering and clutch controls enables one man to handle a two-man job of orchard spraying at substantial savings in money and time. Built of welded steel or wood

ONE-MAN SPRAY RIG

By Jack Fletcher

If the tractor is steered by levers, a two-pedal foot control is arranged as detailed below. A third pedal controls the foot-operated clutch. On wheel-steered tractors a steering arm is extended to the platform

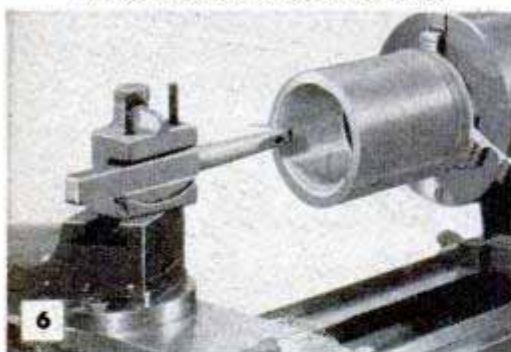
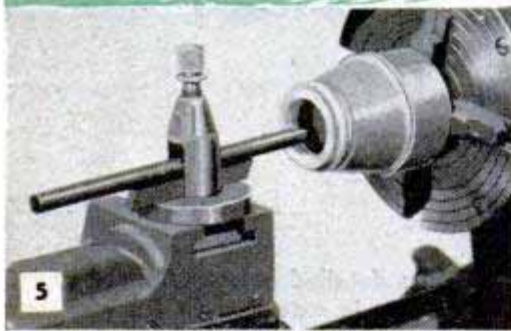




Better Boring

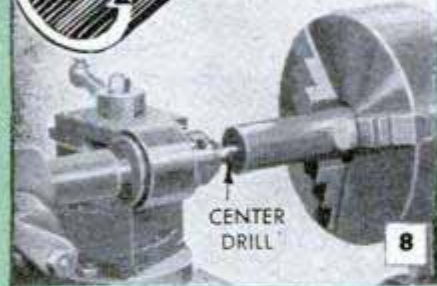
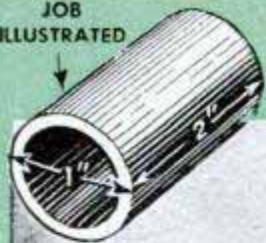
By Sam Brown

ONE SECRET of good boring practice in the metal lathe is in the selection of the right bar for the job. The first rule is to use the largest bar that will fit inside the work, particularly in bores that are longer than their diameter. The large bar is rigid and resists springing on a long overhang. If the bar is too light for the job, it will spring away from the work and you are likely to finish with an undersize hole or one that is slightly tapered. Most lathe operators have at least several of the complete assortment of boring bars shown in Fig. 4. The solid bars are the least expensive, are easy to mount and usually are selected for light work. The bars with inserted cutters are the only choice for boring the larger diameters. These come in the plain type with the cutter held by a setscrew and also in the sleeve type on which the inserted cutter is held by a sleeve and screw, Fig. 1. Note that the drawing shows the hole for the cutter broached 90 deg. but there also is a hole broached 45 deg. in the same setscrew for bottom work. The sleeve-type bar is somewhat more rigid but otherwise it has no particular advantage over the plain bar broached 90 deg. at one end and 45 deg. at the other. The 90-deg. cutter position is always somewhat the stronger and is used for nearly all through boring such as that in rough bushings and in cored holes. However, it will not bore to a corner, Fig. 2. This must be done

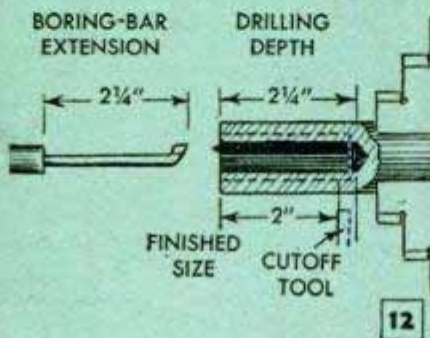
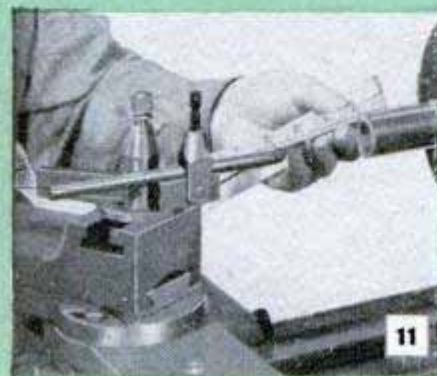


JOB ILLUSTRATED

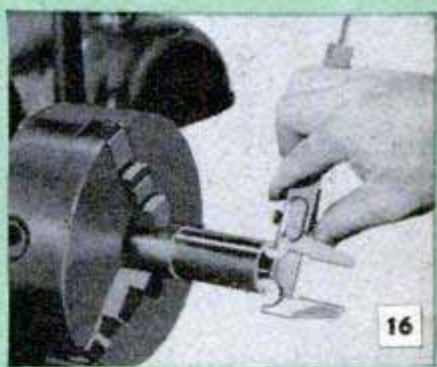
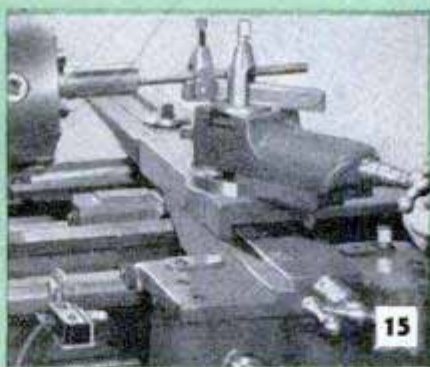
Simple Job Shows Standard Procedure



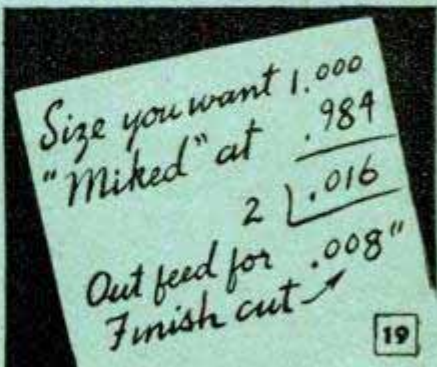
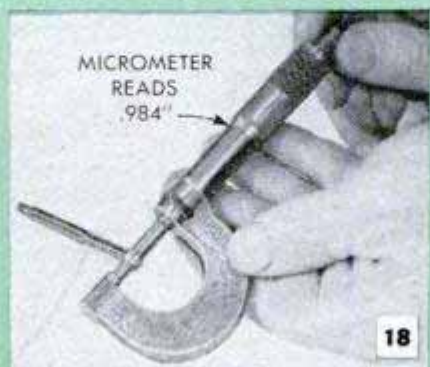
In making a bushing from solid stock, the first step is to spot the end of the work with a center drill so that the drill bit will center accurately. When drilling in the lathe, always maintain a uniform pressure



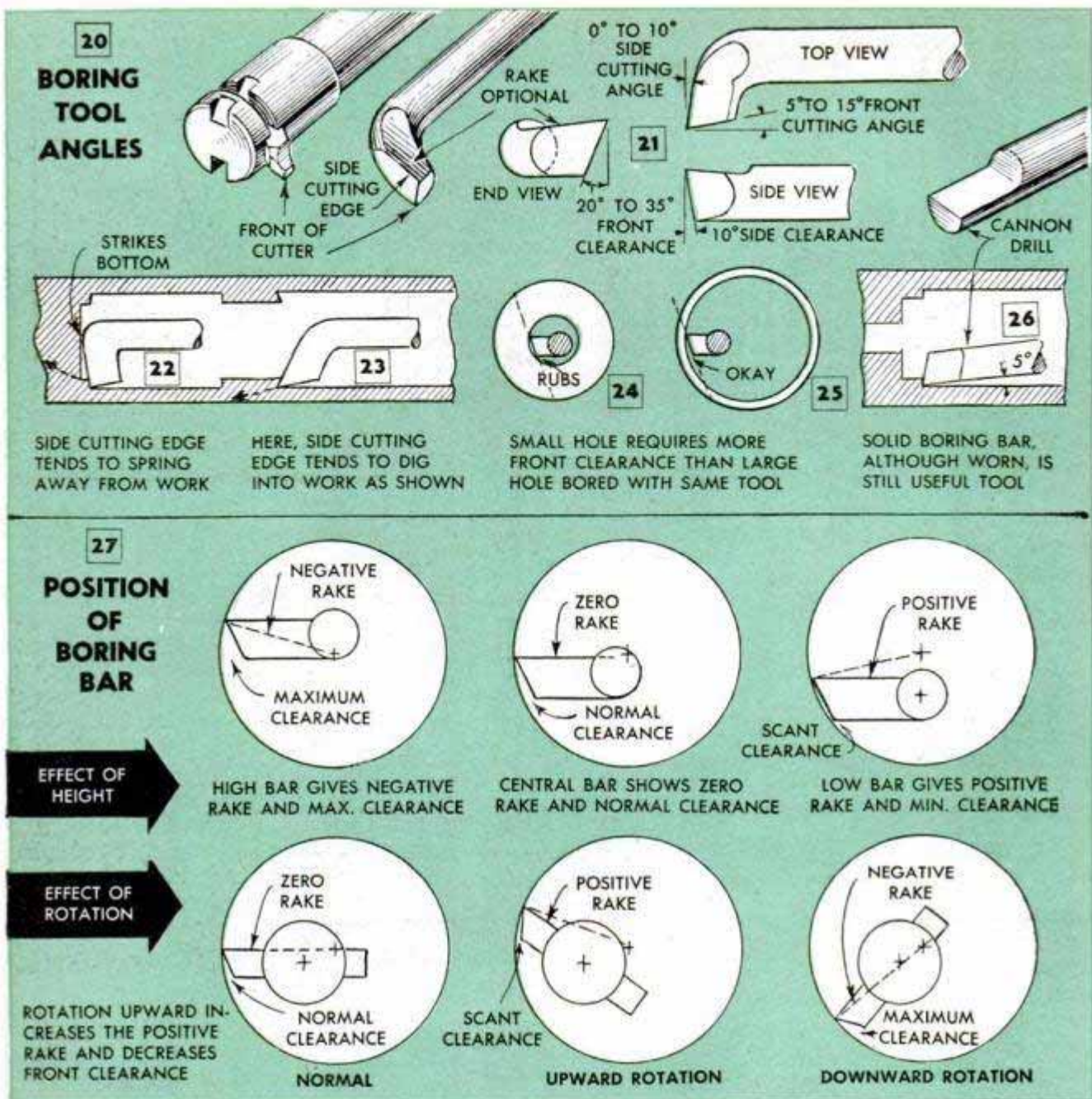
Next, the boring tool is run through in successive passes until the work is near the required finish dimension. Note that allowance is made in the setup for cutting the work to length and for clearance for the bar



When the boring cuts are started, a push-button switch wired into the motor circuit is located on the lathe bed so that it stops the machine when the tool reaches the required depth on each successive pass through work



As the inside diameter of the work nears the finish dimension, careful measurements are taken and the required outfeed setting of the crossfeed sleeve for the finish cut is then calculated from these measurements



with the 45-deg. cutter as shown in Fig. 3.

Boring a hole: A typical boring operation is pictured in Figs. 8 to 19 inclusive. Key points in the procedure are the 1/4-in. allowance for the boring-bar extension, Fig. 12, the use of an electrical stop switch and use of accurate measuring tools combined with a calculated outfeed measured on the micrometer crossfeed screw of the lathe carriage. The stop switch, Figs. 14 and 15, is a big help as it turns off the motor at the precise instant that the tool reaches the required depth on each successive cut. With the mechanical stop, it is necessary to throw out the power feed just before the tool reaches full depth and finish the cut by running the carriage up to the stop by hand. This procedure can result in an inaccuracy when critical work is near the required finish dimension. Use the cross-feed micrometer sleeve to determine the depth of cut. It's easy and fast. It also is

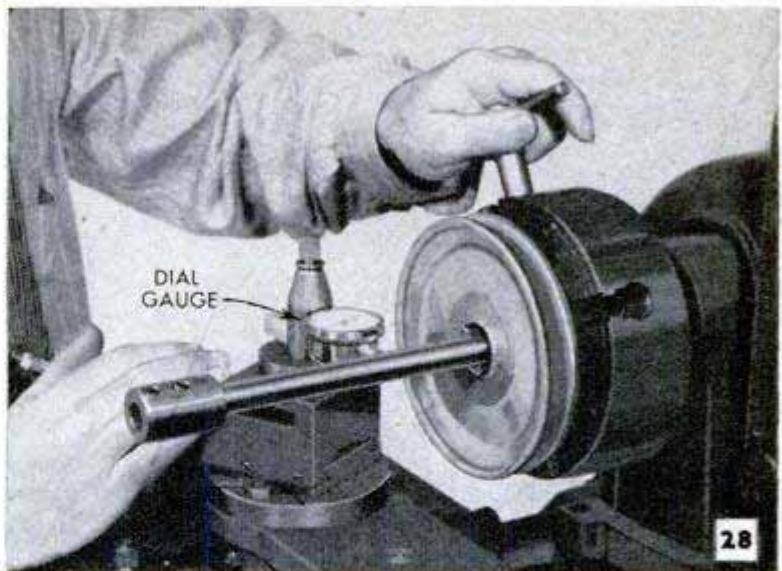
regular practice to reverse the power feed and back the tool out after running in the final cut. This trues the bore and brings the hole to exact size with a finish practically equal to that produced by reaming.

Mounting a boring bar: The simplest method of mounting a boring bar is in the tool post as in Fig. 5. However, this mounting is suitable only for light work where the hole can be bored to the full depth with a minimum overhang of the tool bar. The three holding devices shown in Fig. 4 are now so universally used as to be classified as standard. A square-shank bar mounted in an open-side holder, Fig. 6, makes the most rigid setup. The lathe milling attachment also makes a good, rigid mounting for large bars and the jaw opening provides space for an additional support bar placed under the regular boring bar as in Fig. 7. This arrangement will help prevent chattering and springing when ex-

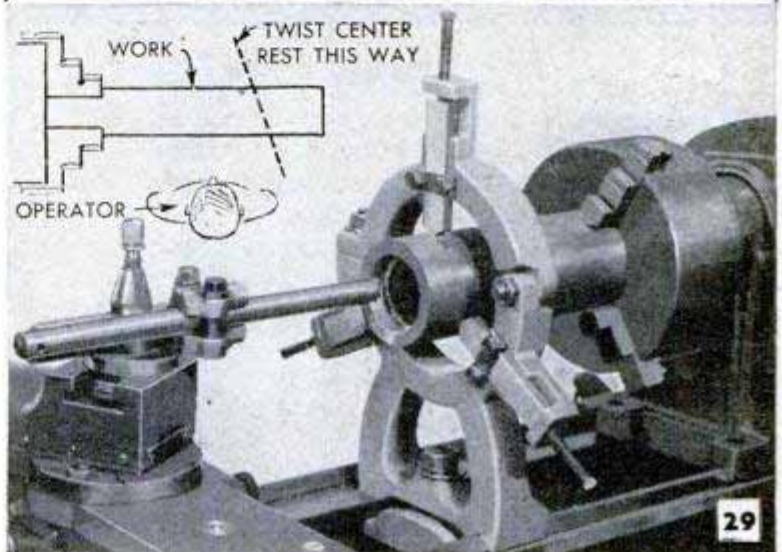
cessive tool overhang is necessary.

Boring-tool angles: Common clearance angles for boring tools are given in Figs. 20 to 26 inclusive. In grinding and honing the cutting edges, keep the side-cutting edge very nearly square to avoid undercutting and riding out, Figs. 22 and 23. The correct angles for most types of work are detailed in Fig. 21. The side clearance angle has a more or less fixed value for the common boring operations but it can vary from 0 deg. to 10 deg. The front clearance ranges from 20 to 35 deg., the sharper angle being required in small holes, Figs. 24 and 25. Some lathe operators run boring tools with a 0-deg. rake but a 5-deg. rake is common practice, especially when boring in ferrous metals. In general, the cutting angles are the same for all types of tools and also apply to solid boring bars worn down to the shank but still usable, Fig. 26. When ground as indicated, these bars are often called "cannon" drills.

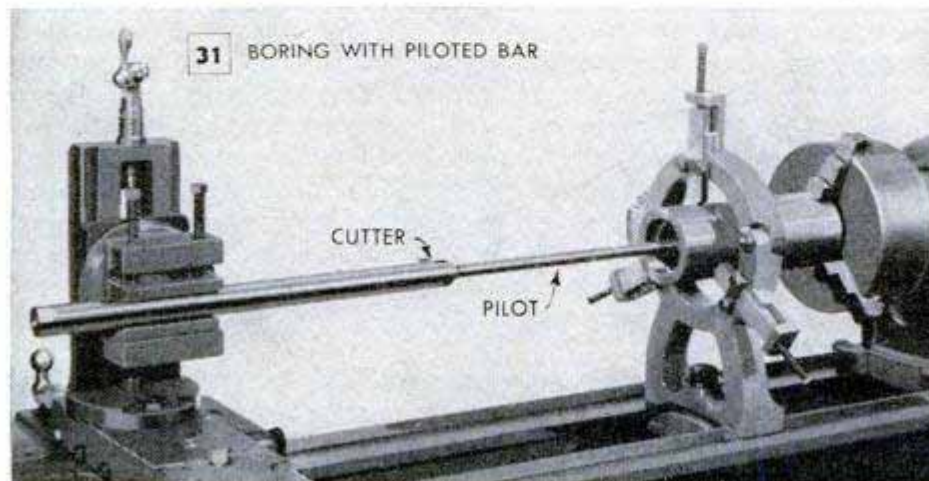
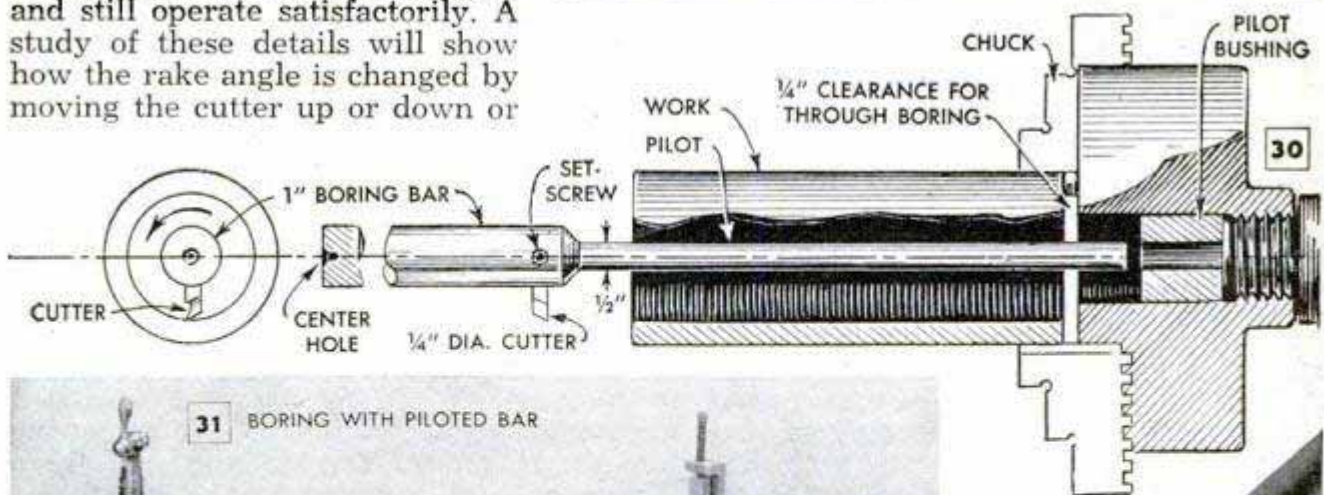
Position of boring tool: Although the boring tool can contact the work at any point, it is regular practice to run it directly on the horizontal center line of the work. This position gives the best visibility and the greatest accuracy of measurement on the crossfeed micrometer sleeve. Fig. 27 pictures the positions a boring bar can take and still operate satisfactorily. A study of these details will show how the rake angle is changed by moving the cutter up or down or



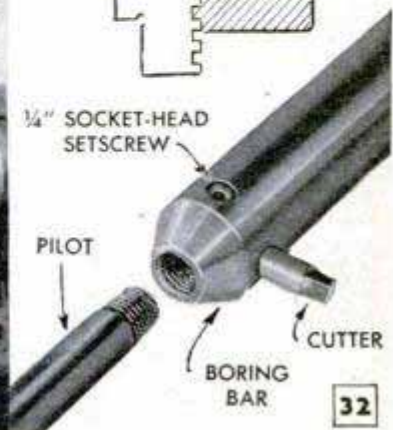
ACCURATE CENTERING IS NEEDED ON REBORING JOBS



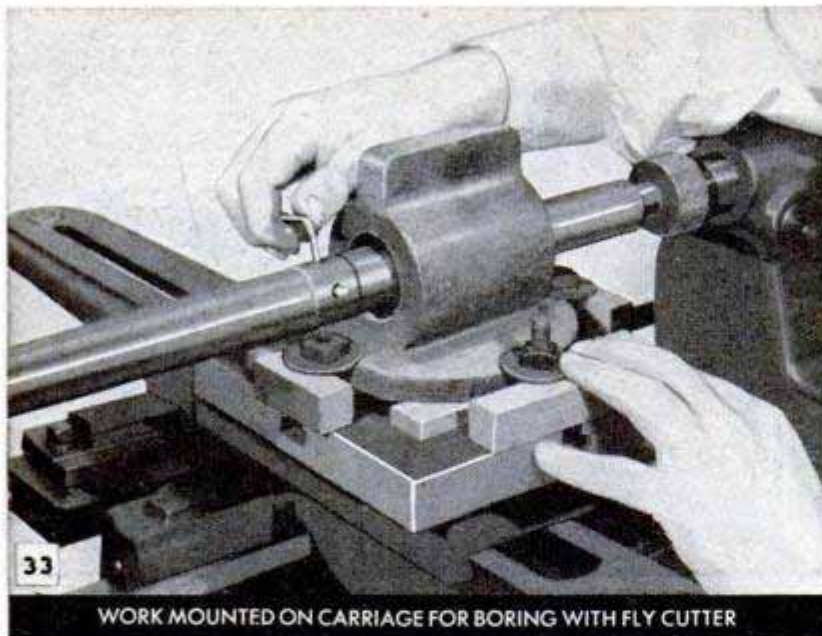
CENTER REST IS ESSENTIAL FOR LONG BORING JOBS



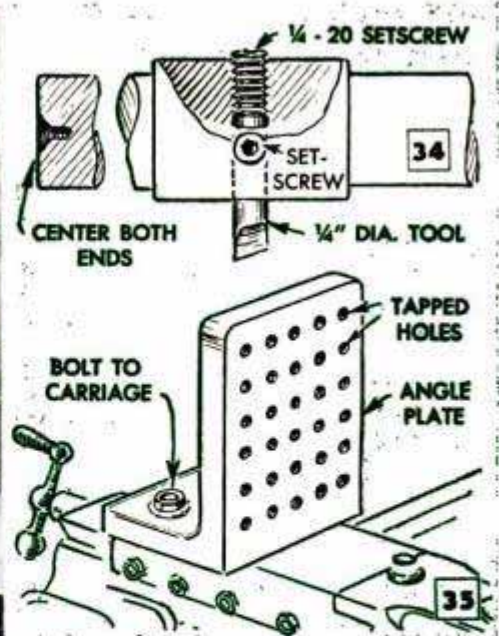
31 BORING WITH PILOTED BAR



32



WORK MOUNTED ON CARRIAGE FOR BORING WITH FLY CUTTER



by rotating the bar. With the proper adjustment, one tool can be made to cut all the common materials. Ordinarily the tool is given a negative rake for such materials as plastics and brass, and positive for steel.

Reboring: A reboring job is one in which an existing hole is to be enlarged while its concentricity is maintained. A pulley hub, Fig. 28, is a typical example. Set up this job in a four-jaw chuck with the jaws gripping the outside of the hub. Use a piece of shafting of the same diameter as the hub bore to true the work. Set up a dial gauge and adjust the work in the chuck until the shaft runs dead true. Much the same setup can be followed for all reboring jobs—fit a shaft or a plug in the existing hole and use this to center the work.

Center-rest support: When making a long bore with the work held in a chuck, Fig. 29, it is essential to support the outer end of the work. That's where the lathe center rest comes in handy. One way of adjusting the rest is to place it close to the chuck after the work has been locked in the chuck jaws. After the rest has been adjusted to the diameter of the work, it is pushed along the lathe bed to a position near the outer end of the work. Another way is to true the work first, then carefully adjust the center-rest jaws with the rest in working position. The two lower jaws are brought up into direct contact with the work. The top jaw should be about .002 in. loose and this setting usually is made by slipping a sheet of paper under the jaw before it is locked in place. Place a few drops of oil on the work so that the jaws do not score it.

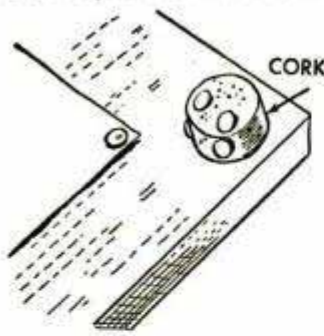
Boring with piloted bar: With any conventional mounting, a heavy boring bar will take light cuts in bores up to 5 in. long. However, in any bore over this length it will be necessary to use additional support. Often this is done by using a pilot working

through a bushing fitted inside the chuck or in the lathe spindle, Figs. 30, 31 and 32. Fig. 31 pictures the setup, and Fig. 30 sections both the work and the lathe chuck to show the position of the pilot bushing. A preliminary centering of the work is made by fitting the pilot in the bushing and supporting the outer end of the bar on the tailstock center. The milling attachment is then adjusted to clamp the bar and the setup is tested by running the lathe carriage back and forth. The pilot should slide freely through the pilot bushing without binding at any point. As the cutter passes centrally through the bore, it can be operated in any position without changing the cutting angles. The best position is shown in Fig. 30, as this puts the load at the point where the center rest gives the most rigid support.

Boring work on lathe carriage: Work of irregular shape often is fastened to the lathe carriage or to a boring table fitted to the carriage, Fig. 33. Sometimes a special angle plate, Fig. 35, is used. A boring bar is made up in the shop for the carriage jobs as in Fig. 34. The bar should be as large in diameter as the rough bore will permit and still allow clearance for the cutting tool. The length of the bar must be calculated from the length of the bore. The cutting tool, or fly cutter, as it is called, is held in place with a setscrew and adjusted for depth by means of a follower screw. In setting up, the work is carefully blocked and shimmed so that the boring bar is centered through the rough bore. When the setup is correctly made, this method produces very accurate work.

☞ To prevent smudging paper with a typewriter eraser, clean the eraser on an emery board before using. The board is kept handy by taping it to the typewriter.

Cork Fastened on Drawing Board Forms Thumbtack "Pincushion"



If you want to save the time often spent in searching for thumbtacks, use an ordinary bottle cork as a "pincushion" for the tacks. Glue the cork to the upper right-hand corner of the board

where it is out of the way, and press the tacks into the cork as a drawing is removed from the board. A large cork will hold a considerable number of spare tacks within easy reach when you need them.

Silencing Fan-Belt Squeak

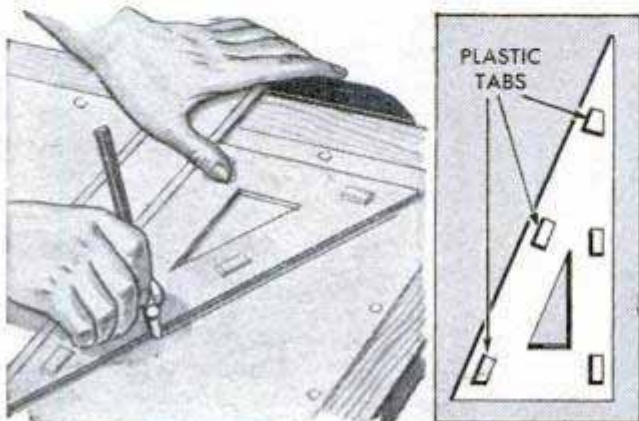
Annoying squeaks that develop in car fan belts can be eliminated quickly by applying hydraulic-brake fluid to the belt. With the motor idling, the fluid is applied to the upper or lower pulley and is absorbed by the belt. This keeps the belt flexible, preventing squeaks, but does not harm it. One application probably will last the lifetime of the belt, although a few additional drops of fluid can be applied occasionally if necessary. When doing this, be careful to avoid the whirling fan blades.

Richard Watkins, Chicago.

Tabs Raise Draftsman's Triangle To Prevent Blotting Work

Small plastic tabs fastened to both sides of a draftsman's triangle hold it above the paper to prevent blotting the work when inking. Strips of $\frac{1}{16}$ -in.-thick plastic, about $\frac{1}{4} \times \frac{3}{4}$ in., are cemented at the corners and at the center points of the legs. These are located about $\frac{1}{8}$ in. in from the edge of the triangle. In addition to facilitating inking, the tabs make it easier to pick up the triangle and also help keep the drawing clean when doing pencil work.

Eldon Schiel, Chicago.



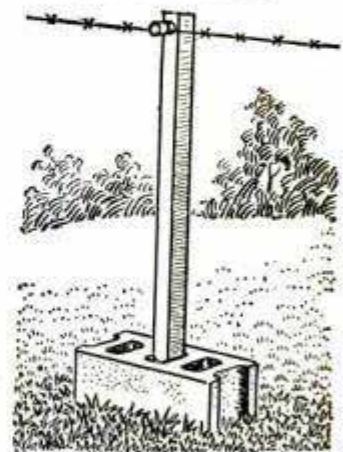
U-Shaped Jig Holds Beaded Ceiling When Nailing Single-Handedly

Nailing long lengths of beaded ceiling can be done single-handedly with the aid of a wooden jig or clamp. It consists simply of two parallel arms joined at one end with a short crosspiece. The arms should be far enough apart to slip over the ceiling and their length should be equal to the width of two lengths of ceiling. As each succeeding strip of ceiling is set in place, the clamp is slipped over its edge. By using the clamp, the preceding length of ceiling supports the weight of the next length until it is nailed in place. Then the clamp is removed and the operation repeated.

Grover Brinkman, Okawville, Ill.

W.T.M. Concrete Portable Posts for Electric Fence Supported With Concrete Blocks

Electric fences can be shifted easily if the posts are supported with concrete blocks instead of being set in the ground. Each post is driven into the center hole of a block, the end of the post being hewn, if necessary, to fit tightly in the hole. Anchored in this way, the entire fence can be moved a short distance or several sections shifted without taking down the wire.

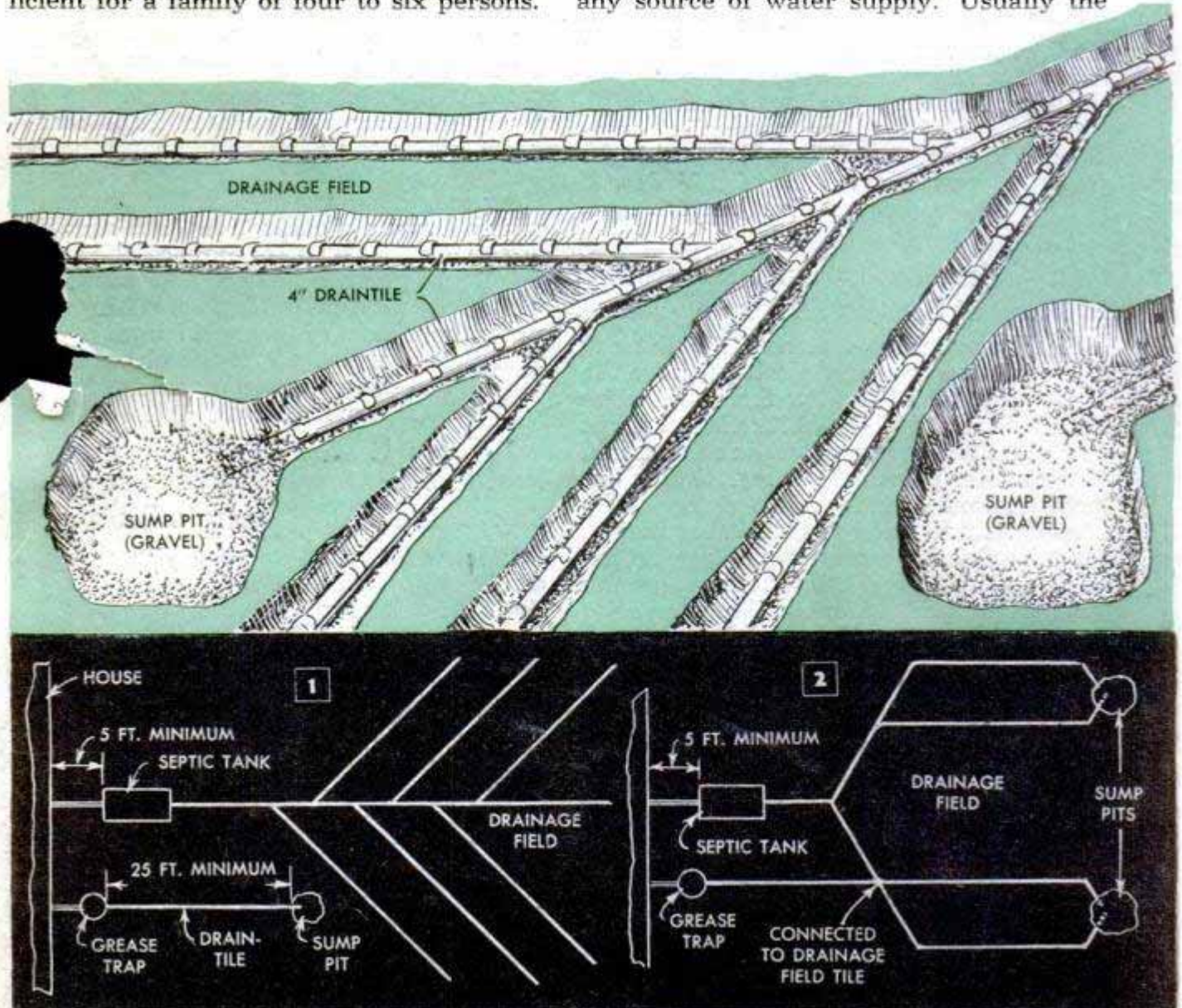


SEWAGE-DISPOSAL SYSTEM for rural homes

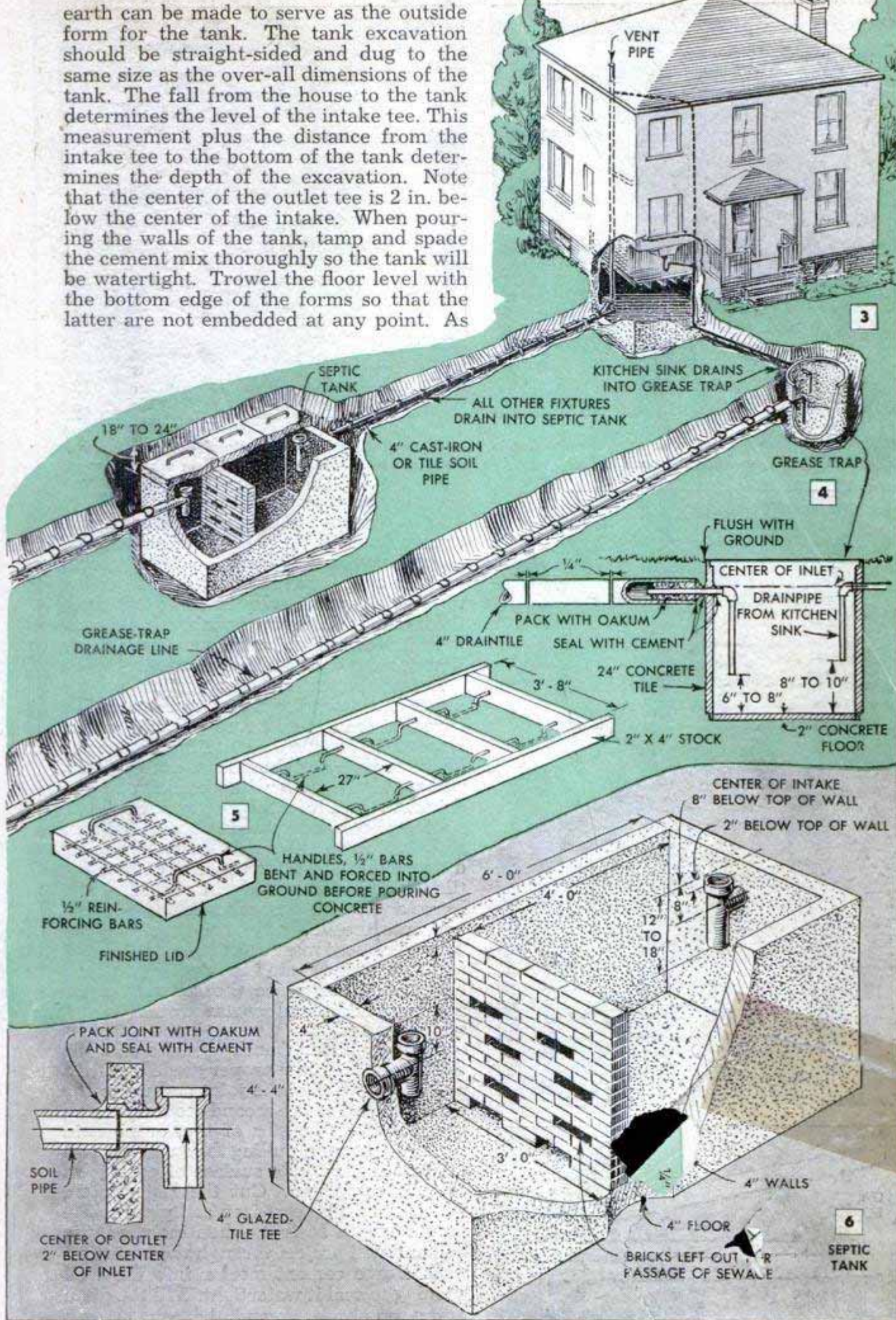
IN BUILDING or modernizing farm homes, lake cottages and suburban homes in areas where public sewers are not available, the septic-tank system provides a safe, reliable and inexpensive installation for the disposal of household wastes. The operation of the tank is almost wholly automatic, as it disposes of bathroom and kitchen wastes by a process of bacterial disintegration and releases only liquid residues, or effluent, to the drainage field. Here, the effluent is dispersed through a system of drainage tile where it is absorbed by the soil and is eventually made harmless by the action of soil bacteria. A two-compartment tank of average size is detailed in Fig. 6. It is of monolithic concrete construction and has a capacity of over 600 gallons, which is sufficient for a family of four to six persons.

By Edward R. Lucas

A typical layout of separate disposal systems for the kitchen and bathroom of a rural home is shown in Fig. 3. Tile in the drainage field can be arranged as a series of branches in alternate directions from a main tile line, as in Figs. 1 and 3, or as a Y-branch connected into parallel lines of dispersal tile, as in Fig. 2. Where it is necessary to install the disposal field on rolling ground or a fairly steep slope, the main outlet tile from the septic tank often is led into a concrete distribution box from which dispersal tile lines are taken off at approximately right angles with the slope. In locating the tank, the minimum distance from the house foundation to the tank is 5 ft., Fig. 1. In most cases, it is better to locate the tank 10 ft. from the foundation and at least 50 ft. from any source of water supply. Usually the



earth can be made to serve as the outside form for the tank. The tank excavation should be straight-sided and dug to the same size as the over-all dimensions of the tank. The fall from the house to the tank determines the level of the intake tee. This measurement plus the distance from the intake tee to the bottom of the tank determines the depth of the excavation. Note that the center of the outlet tee is 2 in. below the center of the intake. When pouring the walls of the tank, tamp and spade the cement mix thoroughly so the tank will be watertight. Trowel the floor level with the bottom edge of the forms so that the latter are not embedded at any point. As

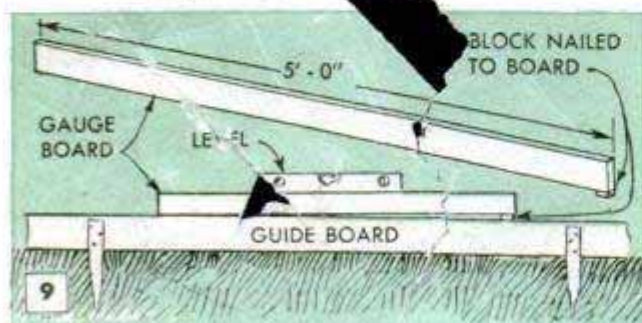




A long guide board fitted with sharpened stakes is an aid in digging a straight trench to correct grade



In heavy soils where the natural drainage is slow, disposal tile should be embedded in washed gravel



soon as the concrete has set (allow 36 to 48 hrs.) remove the forms and cover the excavation and the tank with boards and a light covering of earth. Allow the concrete to cure for at least a week. Then lay up a brick wall inside the tank 4 ft. from the intake end, leaving openings in the wall as indicated in Fig. 6 to allow passage of the liquids from one compartment to the other.

Before beginning construction of the sewer line from the house to the tank, be sure that the trench is dug with the correct slope. Fall for the 5 or 10-ft. run from the house to the tank should not exceed $\frac{1}{4}$ in. per ft. If the sewer line passes under a driveway or if it is likely at any time to be subjected to a heavy weight, use cast-iron soil pipe for the full run. Otherwise use ordinary bell tile. Make the first joint to the tile tee as in the left-hand detail in Fig. 6. Force a tight-fitting swab, such as a burlap bag, into the bell end of the tile, or pipe. Trowel cement mortar (equal parts cement and sharp sand) into the lower part of the bell end. Then place the second section and force additional mortar around the inserted end of the tile until the space is completely filled. Check to make sure the tile section is on the proper grade and then pull the swab past the joint and up to the open bell end of the second section. Install the remaining lengths of tile, or pipe, in the same manner, pulling the swab through to smooth the inside surface of each joint as it is completed. Cut the last section, which should be cast-iron soil pipe, to the proper length so that, when installed, the bell end will project through the basement wall. Force cement mortar into the wall opening to seal it watertight. Fill the ditch to the top of the tile and allow the cement



As the open-end tile are laid, each joint is covered with a rectangular piece of extra-heavy tarred paper

mortar to cure. Then use a small tamping stick to tamp the layer of soil firmly, forcing it under the tile. Add another layer and tamp, and repeat until the trench has been filled. This procedure assures that the soil will not settle unduly in the trench and eliminates the danger of the settling breaking the tile joints.

The outlet sewer line and the disposal lines are laid with open-end tile. The fall of the lines should not exceed $\frac{1}{4}$ in. in 5 ft., Fig. 9. Make a guide board and a gauge board, as shown, for laying out and leveling the trenches, Figs. 7, 8 and 9. Dig the trenches body width so you can work easily at the bottom. Lay the tile with joints spaced about $\frac{1}{8}$ in. and check every 5 ft. to make certain that the grade is uniform. Cover each joint with a rectangular section cut from heavy roofing or asphalt-coated paper, Fig. 11. In heavy soils where drainage is slow, tile should be embedded in washed gravel as in Figs. 10, 12 and 13. In addition, many rural builders install a gravel sump pit at the end of the main disposal line as in Figs. 3 and 4. Where natural drainage is good, the sump pit is neither necessary nor advisable as it may accelerate drainage to lower levels and leave the disposal line "dry." Aggregate length of the disposal lines will vary with the general lay of the land, soil permeability and size of the tank, but in no case should the tile line be less than 100 ft. long, with 40 to 60 ft. of disposal tile per person being the safest average. Never discharge disposal lines into a stream, pond or lake, into old wells or onto the surface of the ground. The kitchen disposal line is installed in the same way as the septic-tank system, using a length of concrete tile for the grease trap,



After laying and leveling to grade, tile line is covered with a layer of gravel as shown above and below

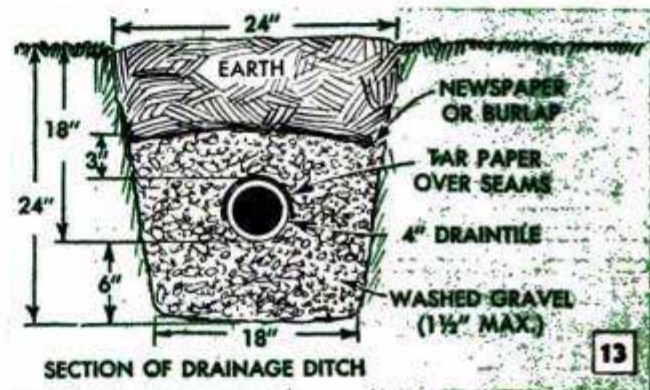


Fig. 4. This is embedded at grade level or a little below and intake and outlet pipes installed as shown. The disposal line should be straight and at least 60 ft. long, Fig. 3. The trap is covered with a cast-iron or cast-concrete lid.

Complete the installation of the system by making the 3-piece cover for the septic tank. This is cast from concrete in a form made as in Fig. 5. Cast two metal handles and reinforcing rods into each unit as indicated. After the castings have cured, place them over the tank and cover with earth to the grade level. Both the grease trap and the septic tank should be vented. If the kitchen sink is some distance from the bathroom, then the grease trap must be vented separately, as long horizontal runs in a vent are not approved. Otherwise both can be vented to a single stack as indicated by the dotted lines in Fig. 3. Inside plumbing must be installed by approved methods and all fixtures should be properly trapped.

Before putting away a garden hose for the winter, protect it by giving it a coating of water-emulsion wax. Then store it in a dark, cool place in the basement.

Headlight Shell Provides Bowl For Inexpensive Fountain

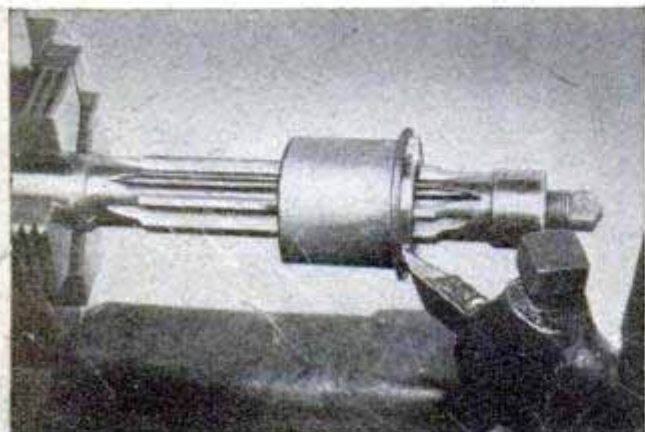


Utilizing a discarded headlight shell and the metal standard from an outdoor sign, one garage owner made an inexpensive and serviceable drinking fountain. The headlight shell is brazed to the top of the sign standard and the water is supplied with $\frac{1}{4}$ -in. pipe. A valve is located at one side of the fountain, and the water drains down through the standard and into a length of $\frac{1}{2}$ -in. pipe near the base.

George T. Hewitt, Salem, Ore.

Expansion Reamer Forms Mandrel

An old expansion reamer forms a satisfactory mandrel for light turning jobs. The reamer is chucked in the lathe and the work is slipped over it. Then the reamer is expanded to grip the work. If the inner surface of the work is highly finished, marring can be prevented by placing a sheet of

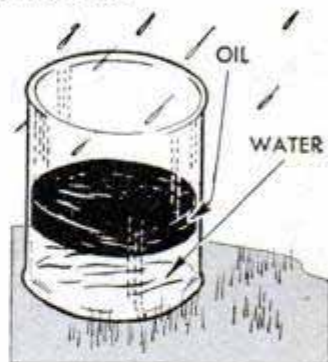


soft brass shim stock over the reamer before it is tightened. In most cases, it is not necessary to support the free end of the reamer.—Ed Packer, Chicago.

Measuring Total Rainfall

To keep a personal record of total rainfall during planting and growing seasons, one farmer collects the water in a glass jar or beaker containing a small amount of motor oil. About $\frac{1}{2}$ in. of oil is poured into a straight-sided jar and this is set in the open where rain can fall into it normally. The oil floats on top of the water, keeping it from evaporating and the depth of the water is easily measured along the outside of the jar. This method, of course, cannot be used during freezing weather.

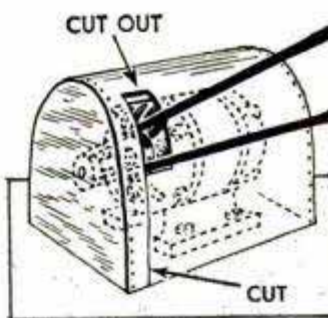
W. R. Black, Contact, Nev.



Cover Protects Small Motor

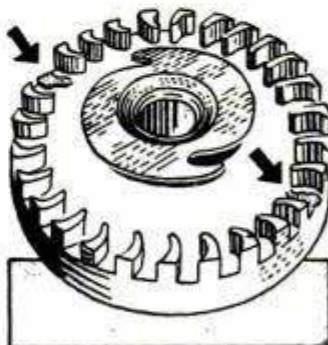
Tacking a piece of linoleum over the edges of two semicircular boards provides a hood which protects a small motor from falling objects. Such is the case where the motor is used to drive a small corn sheller, concrete mixer, fanning mill, etc. The linoleum cover is cut out for the belt and a slit is made from this opening to the bottom edge of the cover. The slot allows the hood to be lifted off the motor for servicing.

Dick Hutchinson, El Monte, Calif.



Balancing Impeller of Scooter Motor

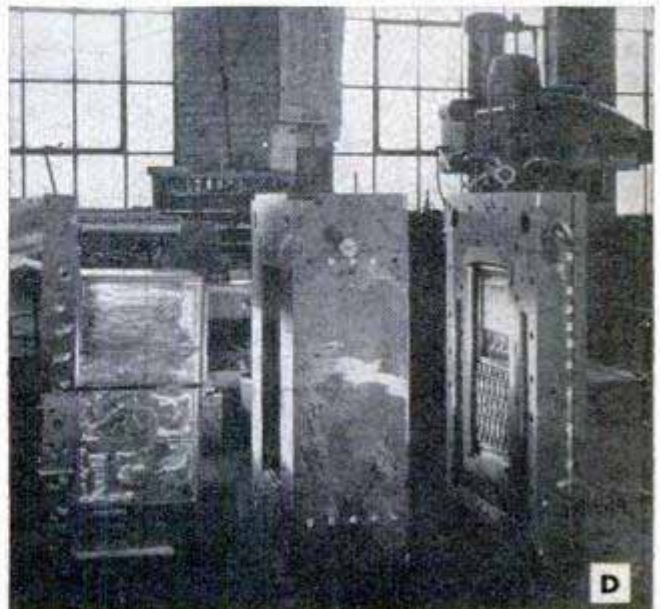
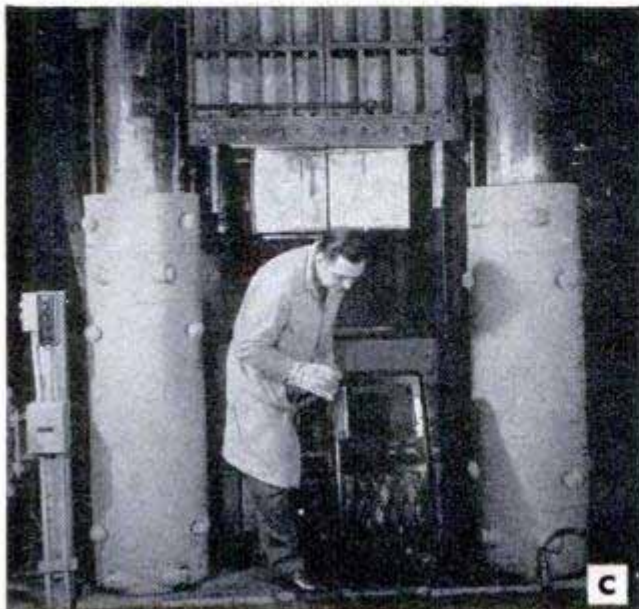
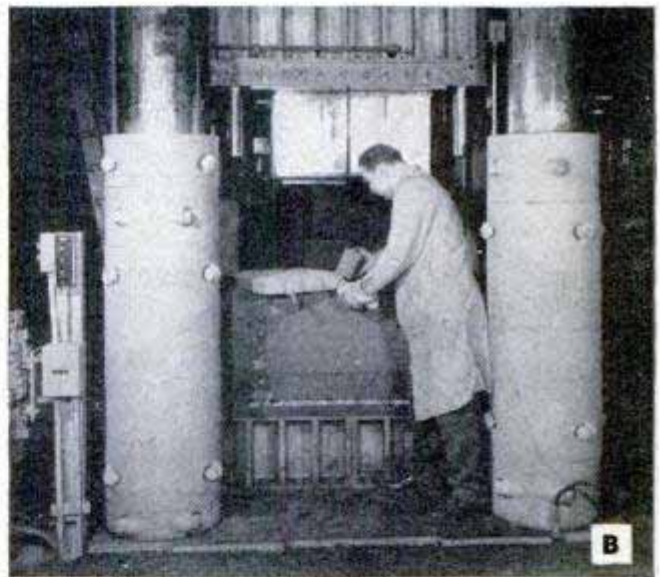
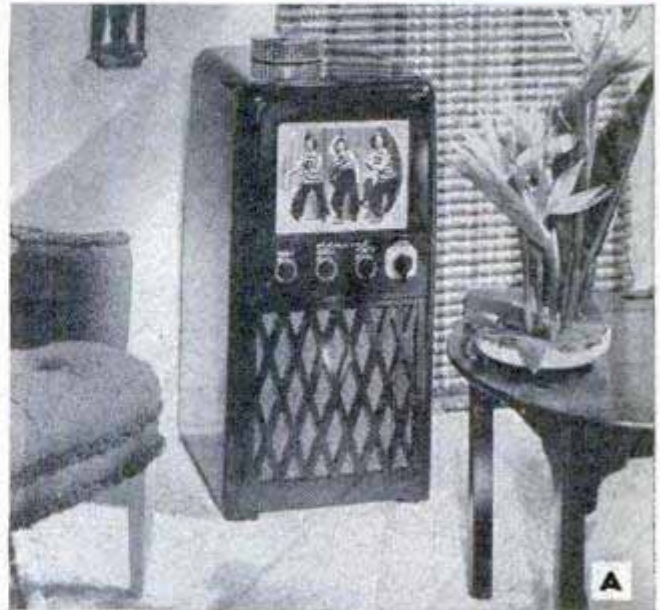
Breakage of one fin on the impeller of an air-cooled scooter motor threw the motor out of balance. As a new impeller was not available, the balance of the old one was restored by breaking off the fin directly opposite the damaged one. The impeller then operated satisfactorily without apparent reduction in cooling effect.



Plastic Console for TV Set

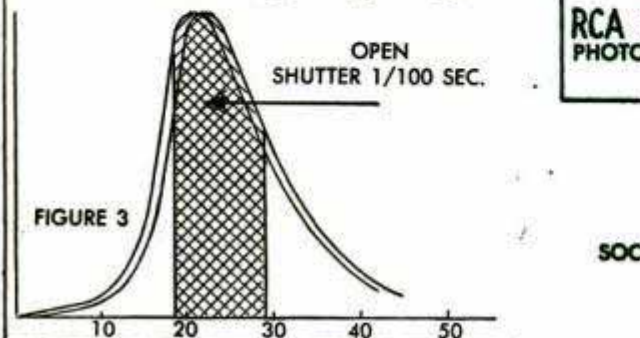
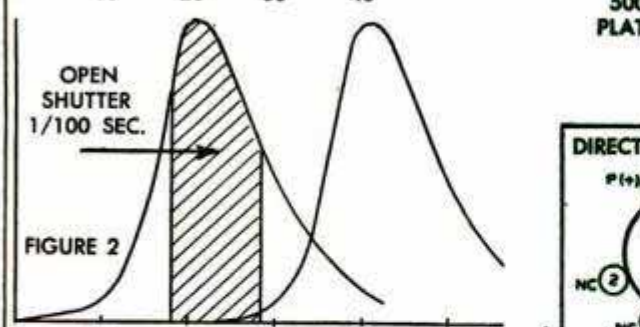
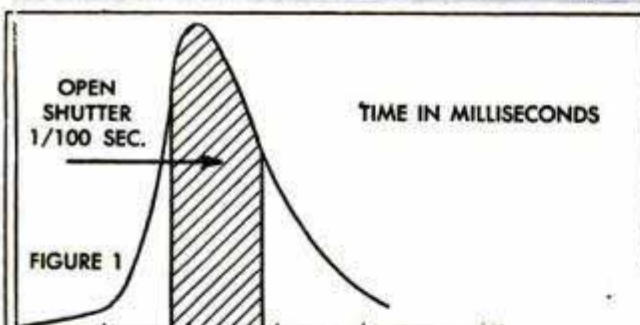
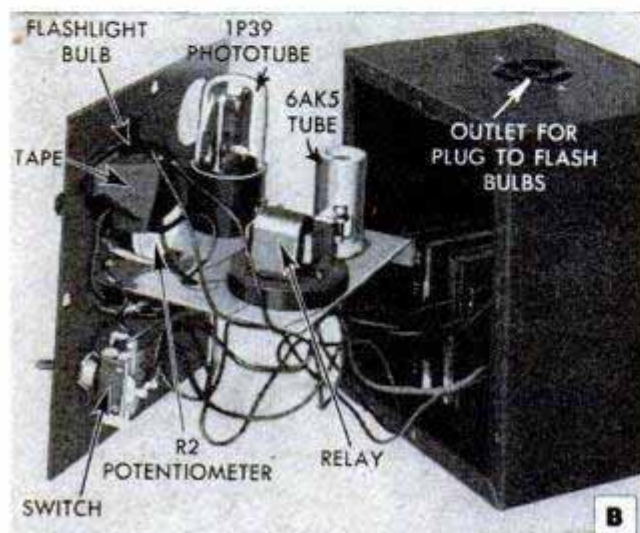
INCORPORATING compound curves (claimed to be impossible with wood), the plastic console cabinet that houses the television receiver illustrated in photo A is a single-piece Bakelite casting weighing 35 pounds. The TV set employs 24 tubes with a 10-in. picture screen covering about 61 square inches.

The special 16,000-pound mold for this unusually large plastic casting and the 2000-ton press used to form it are shown in photos B, C and D. The single 35-pound plastic casting turned out by this combination is said to be about 15 pounds heavier than any achieved before. In photo B the operator is shown laying out the phenolic bricks which must be placed in just the right order to obtain perfect flow and grain. Electronically preheated, the powder bricks are softened so that less pressure per square inch is needed. If cold briquettes were employed, a press of twice the weight would be required. After the phenolic bricks are placed inside, a switch is clicked and the huge press exerts its 2000 tons of pressure. Two men operate the press and turn out one of these Admiral plastic console cabinets every six minutes. The finished product leaves the mold in perfect condition as indicated in photo C. It will resist cigarette burns and is strong enough to support the combined weight of seven husky men. An exploded view of the 16,000-pound mold is shown in photo D.



HOW TO BUILD A

By John C. Wade



MULTIPLE flash photography has always been a problem of long extension cords and insufficient electrical power to set off camera shutter and flash bulbs in perfect synchronization. The remote flash synchronizer very effectively eliminates these problems and minimizes the drain on flash-gun batteries. It does away with the necessity of laying long lengths of cords from the camera position to additional reflectors and the hazards involved when these cords cross the path of groups or milling crowds.

This electronic remote "slave" flash unit is completely self-contained. Acting as a receiver of light, it instantly converts light rays, given off by the master flash on the camera, into enough energy to set off as many as four or five side-lighting flash bulbs in synchronization with the camera shutter. Extremely sensitive to any change in light intensity, this unit may be placed in an inconspicuous location as it does not need to receive direct rays of light from the master flash to react instantly. The extremely bright light of even the smallest flash bulb reflecting off a wall or ceiling is more than enough light to trigger the miniature relay and set off other flash bulbs placed in locations where they will light up dark areas.

The electronic circuit is quite simple; all materials used in making the unit are

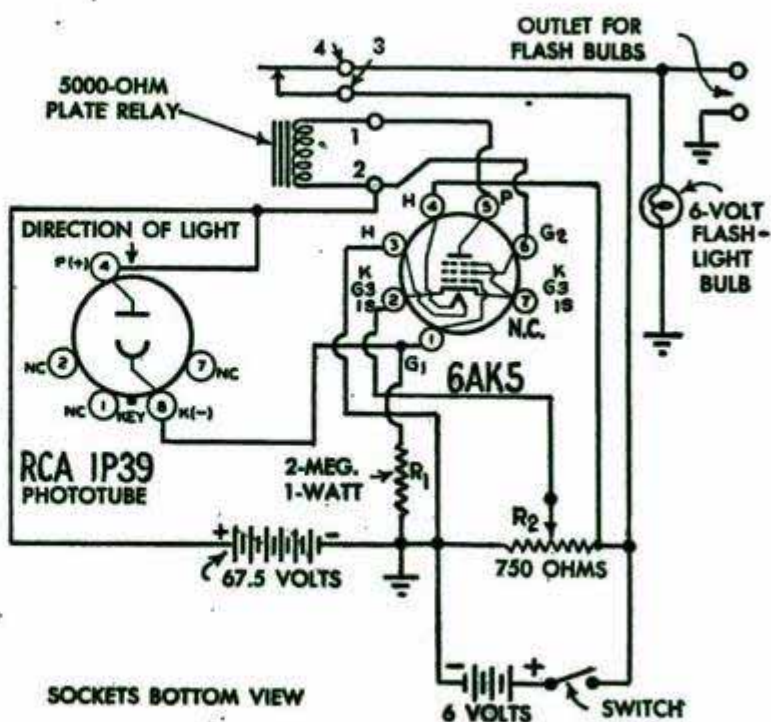
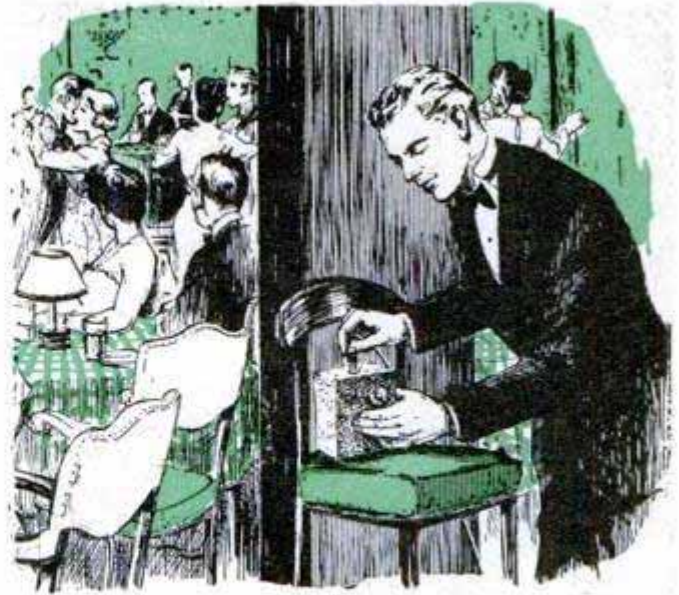


Fig. 4

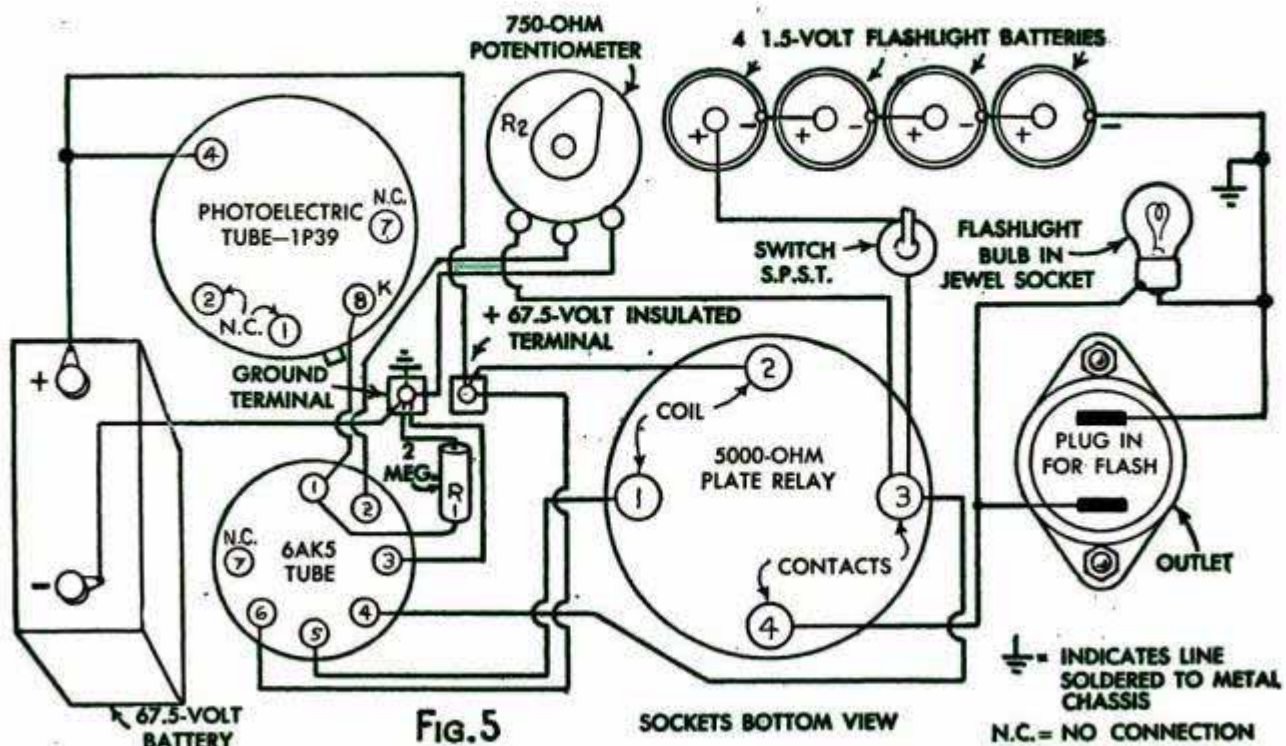
REMOTE "SLAVE" FLASH SYNCHRONIZER

standard and cost less than \$15.00. The result is an amazingly compact instrument in a standard Bud type CU-729 metal cabinet 4 in. deep, 5 in. wide and 6 in. high. All of the component parts are mounted on the rear of the panel and on the 4 x 4½-in. sheet-metal shelf, or chassis base, shown in the photos. This shelf, or base, is fastened to the panel by means of two ½ x ½-in. angle brackets. Photos B, C, D and E show various views of the completed unit. Photo E shows the underside of the chassis base. A schematic circuit diagram is given in Fig. 4, and a pictorial wiring diagram appears in Fig. 5.



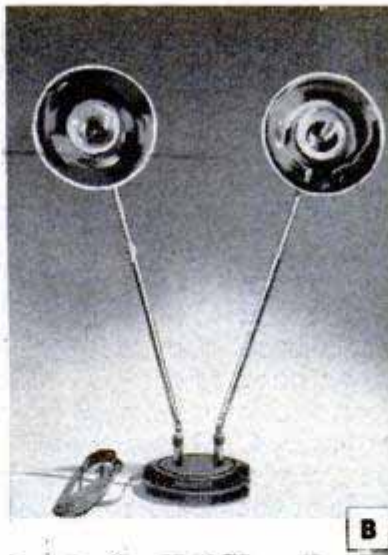
The ultimate object is to make enough current flow through the 6AK5 tube to energize the small relay which is in series with it. When this happens, 6 volts are instantly applied to the flash bulbs. Although a tremendous amount of light is given off by the master flash bulb, the unit must be sensitive enough to react instantly under a very small change. The reason for this can be understood by inspecting diagram Fig. 1. The normal curve of light output versus time of the standard flash bulb shows that this bulb reaches its peak intensity at 20 milliseconds. A shutter, properly synchronized to this bulb, would start to open at around 17 milliseconds, be fully open at 20 milliseconds, and fully closed at 30 milliseconds, when set at 1/100 second. If it required the full peak intensity of the master flash bulb to trigger the remote

(Continued to page 234)

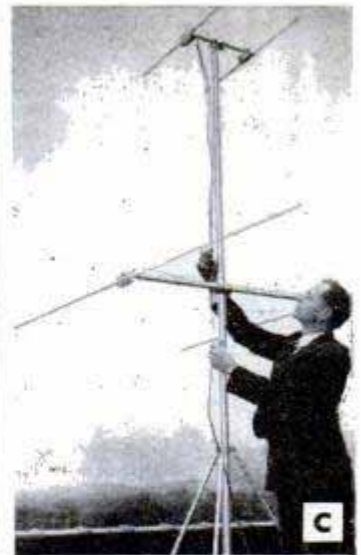




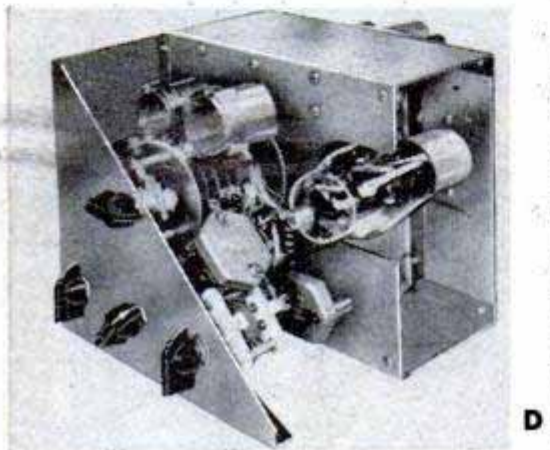
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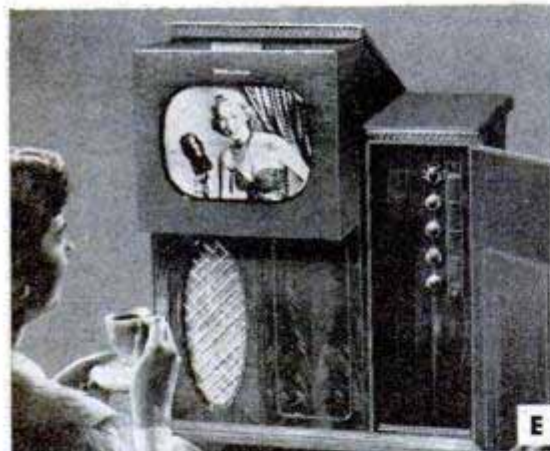
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C



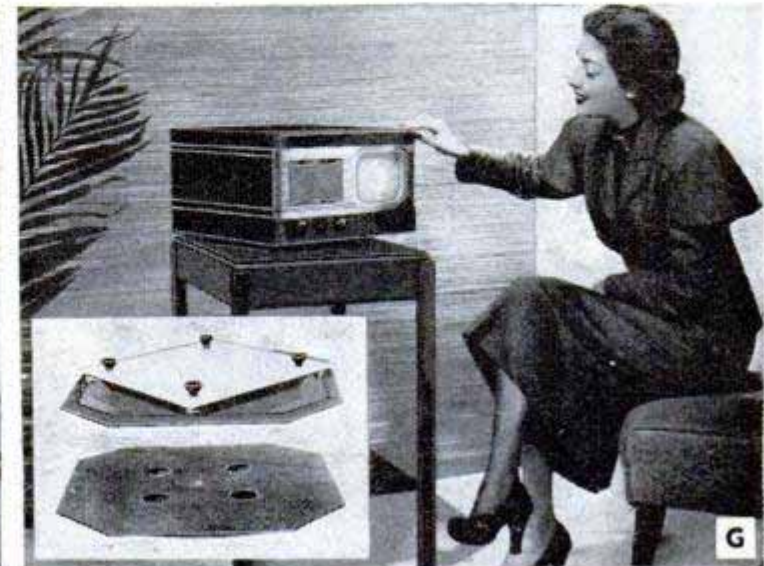
D



E



F



G

RADIO and ELECTRONICS TODAY

A—Twelve-pound self-powered tape recorder swings over the shoulder like a camera case. It is used by newsmen to cover news for the "Mutual Newsreel" programs; the small microphone may be held in the hand, or strapped on wrist

B—All-channel television and FM indoor antenna of unusual design employs parabolic-dipole arrangement on telescoping rods. Swivel joints make numerous adjustments possible

C—TV antenna features interchangeable component parts so that a wide variety of antenna arrays can be constructed to provide the best installation for a particular location

D—Six-band frequency multiplier simplifies developing and constructing the proper frequency setup stages for amateur transmitters. Switches instantly to 80-40-20-15-11 and 10M.

E—Console with 16-in. TV tube features a "rotating elevated mount" for the 22-in.-long picture tube. The tube is installed vertically and is rotated manually into viewing position beyond the front of the console, at proper height

F—"Playtalk" electronic toy for children uses a grooveless paper disk coated with "powdered" iron to record and reproduce magnetically music or voice. Records hold about two minutes of recording; can be "erased" and reused often

G—Turntable for table-model TV sets provides a means for rotating the receiver in any desired direction for viewing

Kodachrome
slides

Kodacolor
snapshots

Kodak
Ektachrome
transparencies

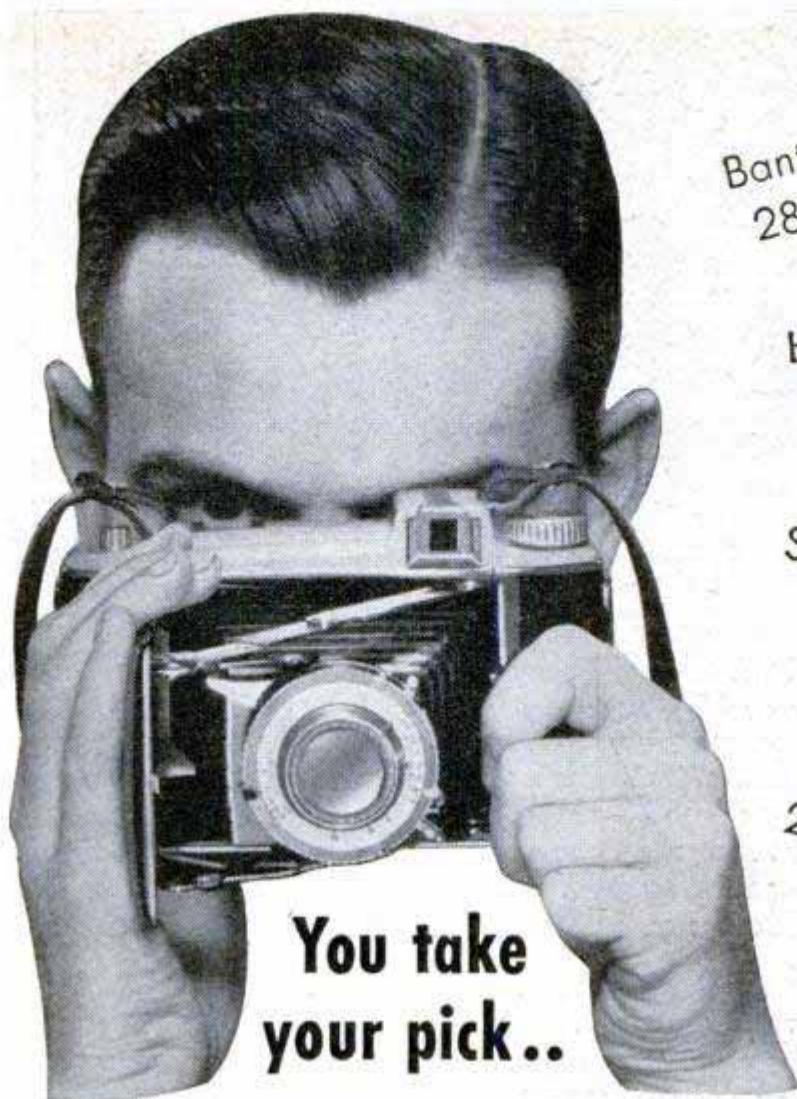
Black-and-
white negatives

Bantam (828)
28 x 40mm.

Half-620
1 5/8 x 2 1/4

Square 620
2 1/4 x 2 1/4

Full 620
2 1/4 x 3 1/4



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2 1/4 x 2 1/4 MASKS . . . 12 shots on black-and-white Kodak 620 Films, 9 on Kodak Ektachrome or Kodacolor Film.

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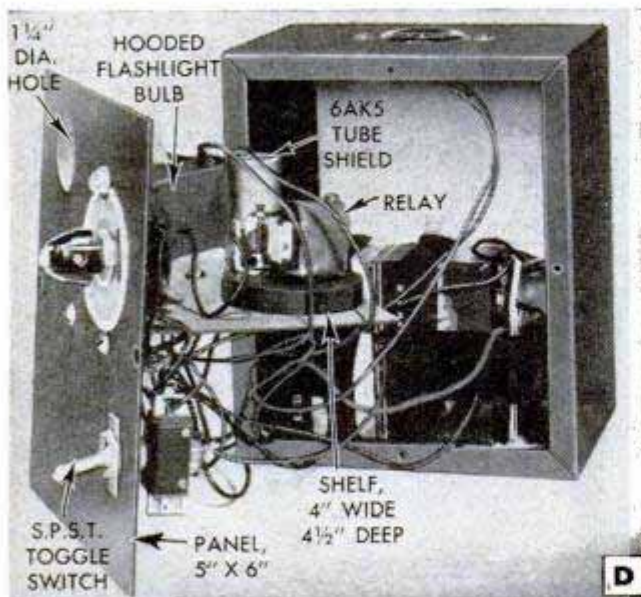
WELDWOOD PLASTIC RESIN GLUE

United States Plywood Corporation, New York 18, N. Y.

How to Build a Remote "Slave" Flash Synchronizer

(Continued from page 231)

"slave" unit, then the resulting curves of the two flashes would be as seen in Fig. 2. The remote flash bulb would reach its peak fully 10 milliseconds after the shutter had



closed. This, of course, would be entirely useless. To be of service, the unit must be triggered by the very first weak output of

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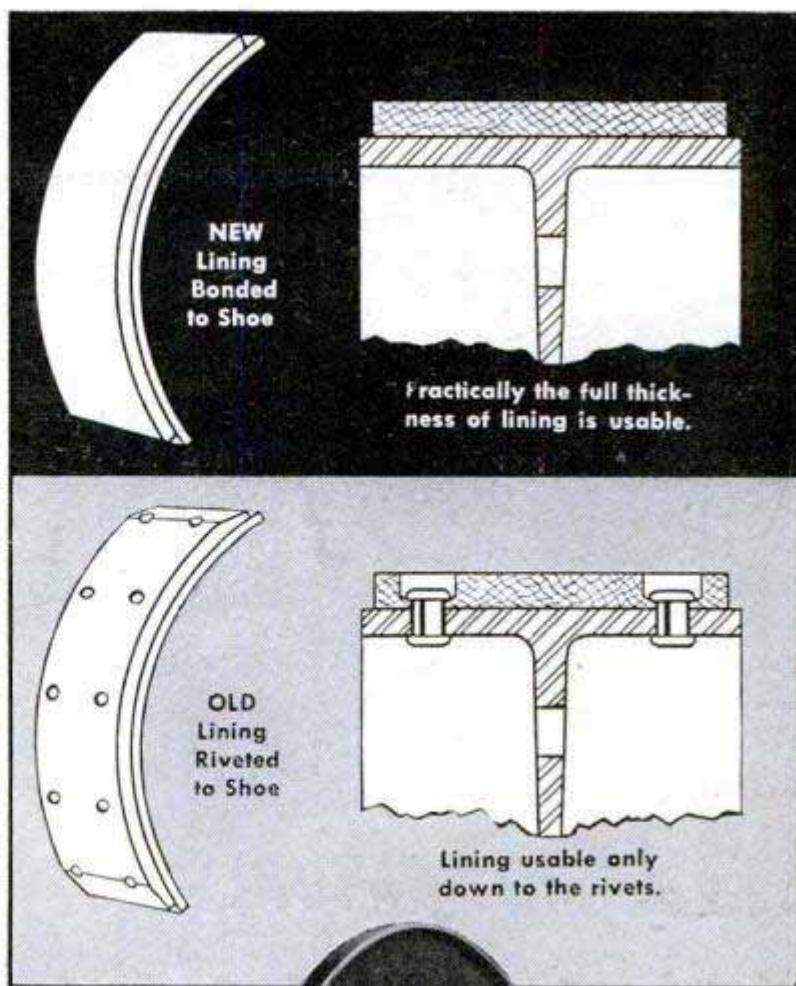
FIRZITE and SATINLAC are available from paint, hardware and lumber dealers. Write us for leaflet on finishing plywood.

light from the master flash as indicated in the diagram, Fig. 3.

In order to obtain the necessary extreme sensitivity, the operating point of the 6AK5 tube is adjusted by the potentiometer R2 so that it is just a fraction under that required to energize the relay. Light striking the photoelectric tube causes a tiny current to flow. This current sets up a voltage drop across the 2-megohm resistor R1, and the voltage drop is applied to the control grid of the 6AK5 tube. This, in turn, is adjusted by means of the potentiometer. As the 6AK5 tube has very high gain, the current flow is increased with a tremendous surge and the relay is energized, setting off the flash bulbs. All this happens in an extremely short length of time. The following would be the sequence of events: set up the remote "slave" synchronizer unit in the position it is going to occupy when the picture is taken (this may be around a corner, back of a post as indicated in the sketch or in any position just so the opening in the box where light reaches the phototube is facing in a direction where it will pick up either direct light from the master flash bulb on the camera or reflected light from a wall or ceiling); turn on the toggle switch so that the 6AK5 tube will heat up; then adjust the potentiometer R2 so the relay

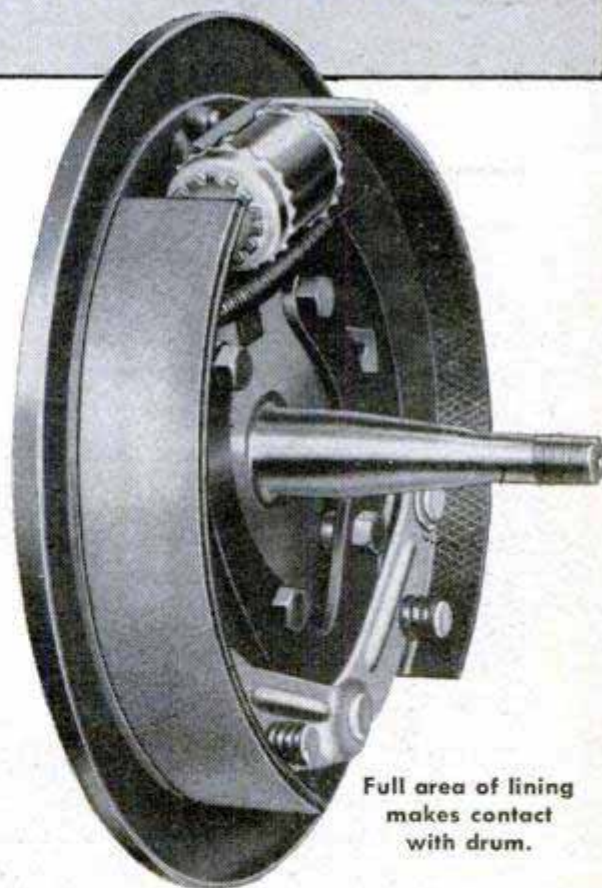
(Continued to page 236)

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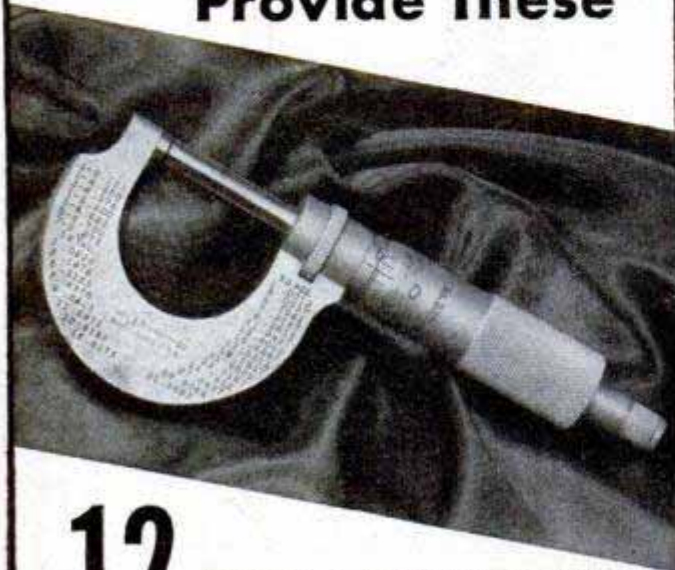


Full area of lining makes contact with drum.



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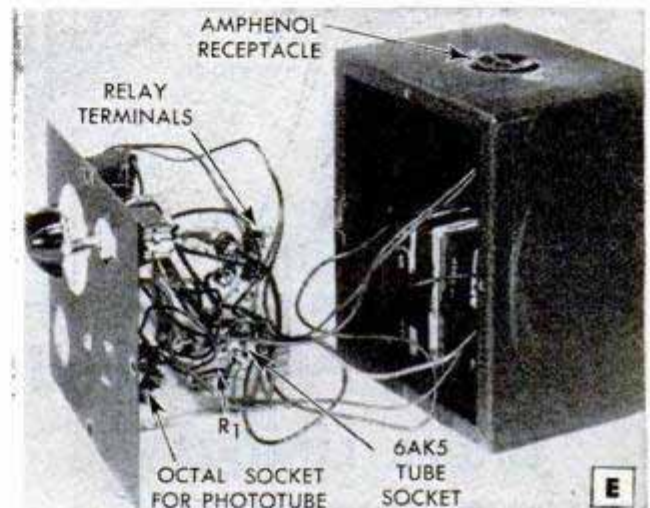
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will just energize, as indicated by the flash-light bulb in the jewel socket lighting up. Note that this bulb is also in the flash-bulb circuit and is hooded with tape so that no light from it reaches the phototube. Now turn back the potentiometer R2 until the flashlight bulb just goes out. The unit is now on the verge of tripping and you are ready to plug in the auxiliary reflectors and flash bulbs. When the flash bulb on the camera begins to fire, the "slave" unit picks up the very first weak output of light and instantly fires the auxiliary flash. So close are the two peaks that a shutter which is open for less than 5 milliseconds will record both peaks. Tests of the original model showed that it could be used effectively at shutter speeds exceeding $\frac{1}{200}$ second, and that it will fire at least four of the largest flash bulbs at one time. Photo A illustrates the results that can be obtained using these

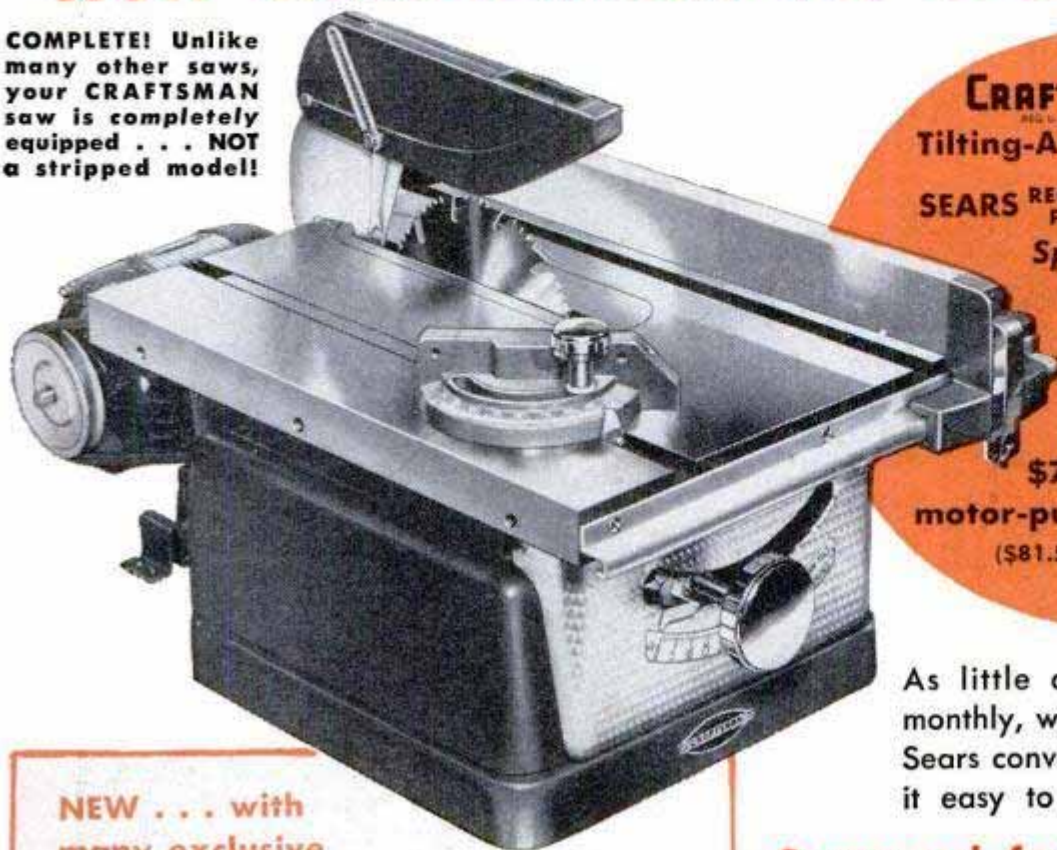


units. Four flash bulbs were employed in taking this photograph in a large dance hall. The room itself was illuminated by ceiling molding lights, entirely insufficient for any type of photograph. Two of the remote units were employed and all were touched off by the master flash which was synchronized to the shutter of the camera. The shutter speed was $\frac{1}{100}$ second.

Any fast-acting relay of the 5000-ohm plate-circuit type may be used if it energizes with from 2 to 7 milliamperes of current. It should have adjustable contacts and the proper setting of these contacts will help reduce any inherent delay. The potentiometer R2 may be either an audio or linear-taper type, the linear being preferred. Special care must be taken to hood the 6-volt bulb in the jewel socket so that no light reaches the inside of the cabinet. Detailed student material list R-381 is available from Popular Mechanics Radio and Electronics department without charge upon receipt of ordinary letter postage.

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COMPLETE! Unlike many other saws, your **CRAFTSMAN** saw is completely equipped . . . NOT a stripped model!



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REG. U.S. PAT. OFF.
Tilting-Arbor Bench Saw

SEARS REGULAR PRICE ~~\$54.50~~

Special 30-day offer

NOW ONLY **\$49.88** Cash

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**\$77.50 with motor,
motor-pulley, and V-belt.**
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As little as \$5.00 down, \$5.00 monthly, will put it in your shop on Sears convenient Easy Terms; make it easy to pay while you use it!

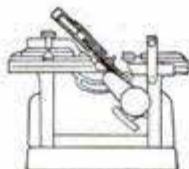
NEW . . . with many exclusive features NO other bench saw has!



NEW! Exclusive! Tilting, raising and lowering of blade all controlled by a **SINGLE** hand wheel at front of saw!



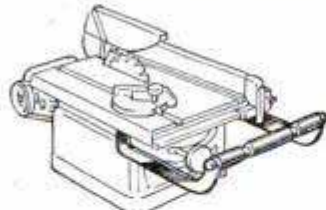
NEW! Floating motor mount fastens to bench for easier tilting. Controls belt tension; reduces saw vibration; lessens the strain on saw.



Work stays level! Blade and guard (NOT table and work) tilt to any angle up to 45° . . . for much more accurate, much easier and faster operation!



Side Table Extension available. Of cast semi-steel. 20x17 in. For either or both sides. One extension will double table working area, increasing it to 34x20 in.



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Extra-value features for more accurate, better work!

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Enclosed is \$_____ for material checked below:

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Address _____

City _____ Zone _____ State _____

THE BORDEN CO. • CHEMICAL DIVISION

Makers of Casco Glues

Artists With Straw and Feathers

(Continued from page 101)

bird, and for larger pictures the artist may use the feathers of an entire duck wing.

In demonstrating how feather pictures are made, Fernando Ramirez Valencia uses a metal stencil that has been cut to the size and shape of the bird that is to be represented. The stencil is laid on the cardboard that will be used as the picture backing and campeche wax is smeared through the stencil onto the paper. After the stencil is removed, a wax surface in the form of the bird remains on the paper.

Next Valencia chooses a few brightly colored bits of feather, trims them down and presses them onto the wax image to represent the bird's tail. Thicker, darker feathers are pressed and smoothed into place to form the body and a small, dark bit of plumage is trimmed and smoothed into the shape of the bird's head. The result is a graceful, flowing image of a bird, vividly colored and with the natural opalescence of the feathers.

Legs and feet, eyes and beak, are represented by bits of thin colored paper that are trimmed to shape and glued on. Branches, flowers and other background decorations usually are drawn in with colored inks. Unlike the making of straw mosaic pictures, feather work progresses rapidly and a skilled artist can finish a colorful bird picture in a few minutes. Each craft, however, requires considerable artistic talent as well as skill.

Deep-Sea Mystery Story

(Continued from page 85)

inside containers with the bridle attached near the middle of the container so that the open end of the net moves through the water with minimum warning.

One of the obvious ways of exploring the deep scattering layer is to lower underwater cameras to the correct depth and make photographs. This has been done and nothing can be found on the negatives.

The explanation is that the population of the layer, from the smallest forms upward, have negative phototropism. They avoid light. When floodlamps are lowered among them, they scurry away.

Presumably they can be photographed, however, by the light of electronic speedlamps that emit instantaneous flashes of light without previous warning. NEL's photo technicians have assembled such an instrument, designed especially for investigating the deep scattering layer.

(Continued to page 244)

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Get ready for cold weather driving! Sharpen up your engine performance with the finest spark plugs ever made . . . AC's with patented CORALOX* Insulator. Instant starting in coldest weather! Steady firing at any engine temperature! Get them from any service dealer who displays the poster with the above picture.

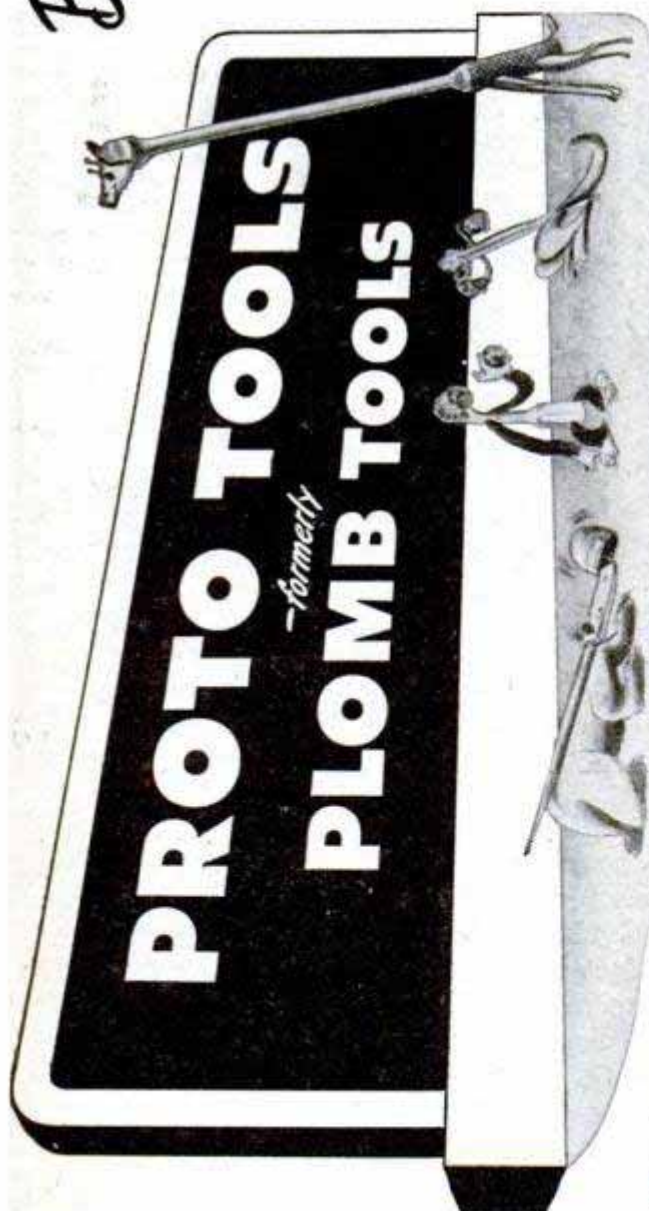
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 You will find **PROTO** tools — formerly **Plomb** tools — everywhere! Over 10,000 better class dealers display them. Since 1907, high quality, superior design and long life have made them the favorites of professionals. Remember, the new name — **PROTO** tools. Buy them from your dealer today.



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Oil-Burner Operation

Q—I am thinking of installing an oil burner in a hot-water boiler and I'm puzzled by some of the terms used in describing the operation of the burner. For example, what is meant by "percent excess air," "combustion reaction time" and "water vapor"?

V.D., Grand Rapids, Mich.

A—In oil-burner operation, fuel oil cannot be burned efficiently with only the theoretical quantity of air required to form a combustible mixture, that is, the quantity of air calculated from the carbon and hydrogen content of the fuel. A certain amount of air in excess of the theoretical quantity is required. The term "percent excess air" simply denotes the amount of air actually used by the burner in excess of that which is theoretically required for complete combustion. This varies with different types and sizes of burners but the excess can range as high as 50 percent. The practical meaning of the term "combustion reaction time" is that the combustion chamber, or firebox, must be large enough to give sufficient time for the oil-air mixture to ignite and burn within the chamber itself. The size required depends to a certain extent on the size and type of the burner. Manufacturers specify the dimensions and shape of the flame chamber, or firebox, in the installation manuals they supply. One of the products of the combustion of fuel oil is water vapor. This is formed when the hydrogen in the oil unites with oxygen and burns. The hydrogen is not destroyed in the burning process; only its form is changed.



Watering Evergreens

Q—I have been told that evergreens maintain a certain rate of growth during the winter months and also that it is necessary to water evergreens just before the ground freezes. Is this correct, and if so, why?

M.B.—Northfield, Minn.

A—Correct, with certain modifications. The native evergreen in both the tree and the low-growing types, does not enter a dormant stage in the same manner as deciduous trees. The rate of growth does vary, however, with extremes of temperature range, soil fertility and the amount of rainfall. Also, evergreen plantings about the average home often are subjected to unnatural conditions which may affect the growth and health of

(Continued to page 242)



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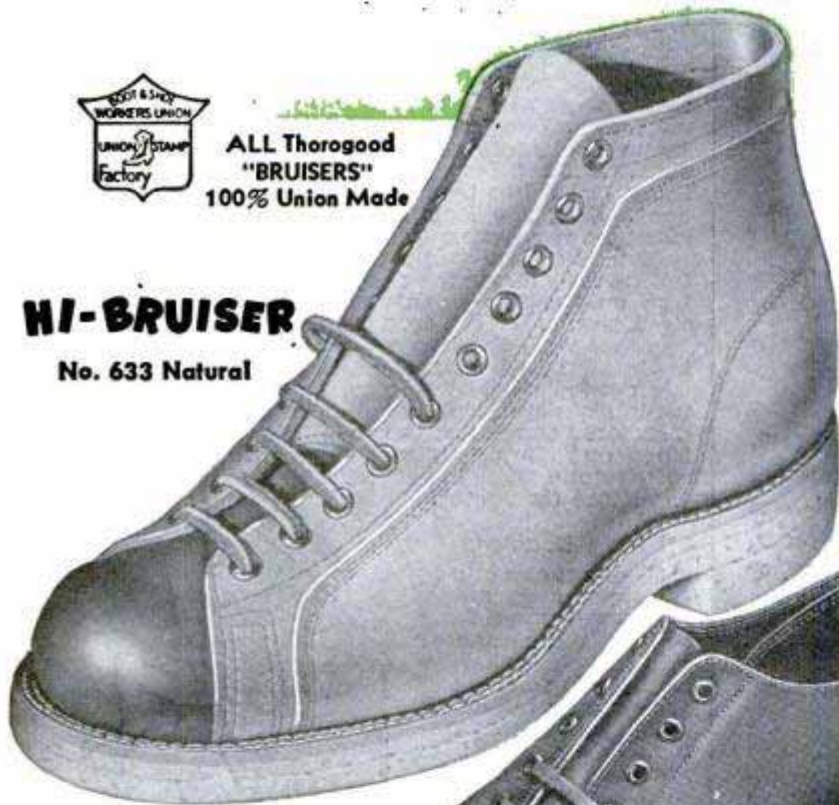
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• There's lots of satisfaction in owning tools which bear a name that has been a synonym for highest quality for generations. You are assured of their dependability . . . of the fine work they'll do for you. You rank such items along with your favorite gun, or rod and reel, or your pet pocket knife in your list of personal belongings. Those are the brands you'll always find at your friendly, independent hardware store. Always go there *FIRST* for what is *FOREMOST* in tools and cutlery.

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the plants. Evergreens planted near the building foundation, under a wide cornice or near a wall painted white may suffer during the growing season from a lack of moisture and from undue exposure both winter and summer. The foliage should be protected from heat reflected from the wall on extremely hot days and, during dry seasons, the ground around the root system should be thoroughly soaked at regular intervals up until the time of freezing temperatures. This will prevent the soil from freezing "dry" around the feeding roots. Wet the foliage frequently during the summer at the end of a hot day, adjusting the hose nozzle to give a fine, spreading spray. Keep a 2-in. layer of grass clippings, peat moss, leaves or other fine material under the tree to prevent the soil from drying out between the watering times.

Dents Removed From Table Top

Q—I have an old-style walnut dining table. There are several shallow dents in the top similar to those resulting from a hammer blow. Is there any practical way to remove these dents without completely refinishing the top?

W.M., Brooklyn, N. Y.



*A—*There are several methods used by furniture refinishers but perhaps the most practical to apply is that of "ironing" out the dents. If care is used, this process will not appreciably damage the original finish. Dampen a small square of felt (the felt should be $\frac{1}{8}$ to $\frac{1}{4}$ in. thick) and lay this over the dent. Allow a few seconds to elapse, then apply the tip of a hot iron to the felt directly over the dent. Hold the iron in place until most of the moisture has evaporated from the felt. The trick in this is to place only the tip of the iron on the felt directly above the dent. Do not merely set the iron on the felt as this will not achieve the desired result. If the iron is placed properly, heat, together with the live steam generated, swells the fibers of the wood in the affected area and causes the dented surface to rise, thus obliterating the unsightly depression. Generally the finish will be discolored somewhat but as a rule this can be polished out simply by mixing a small quantity of rottenstone with lemon oil and rubbing the area to restore the luster.

Sticking Drawers

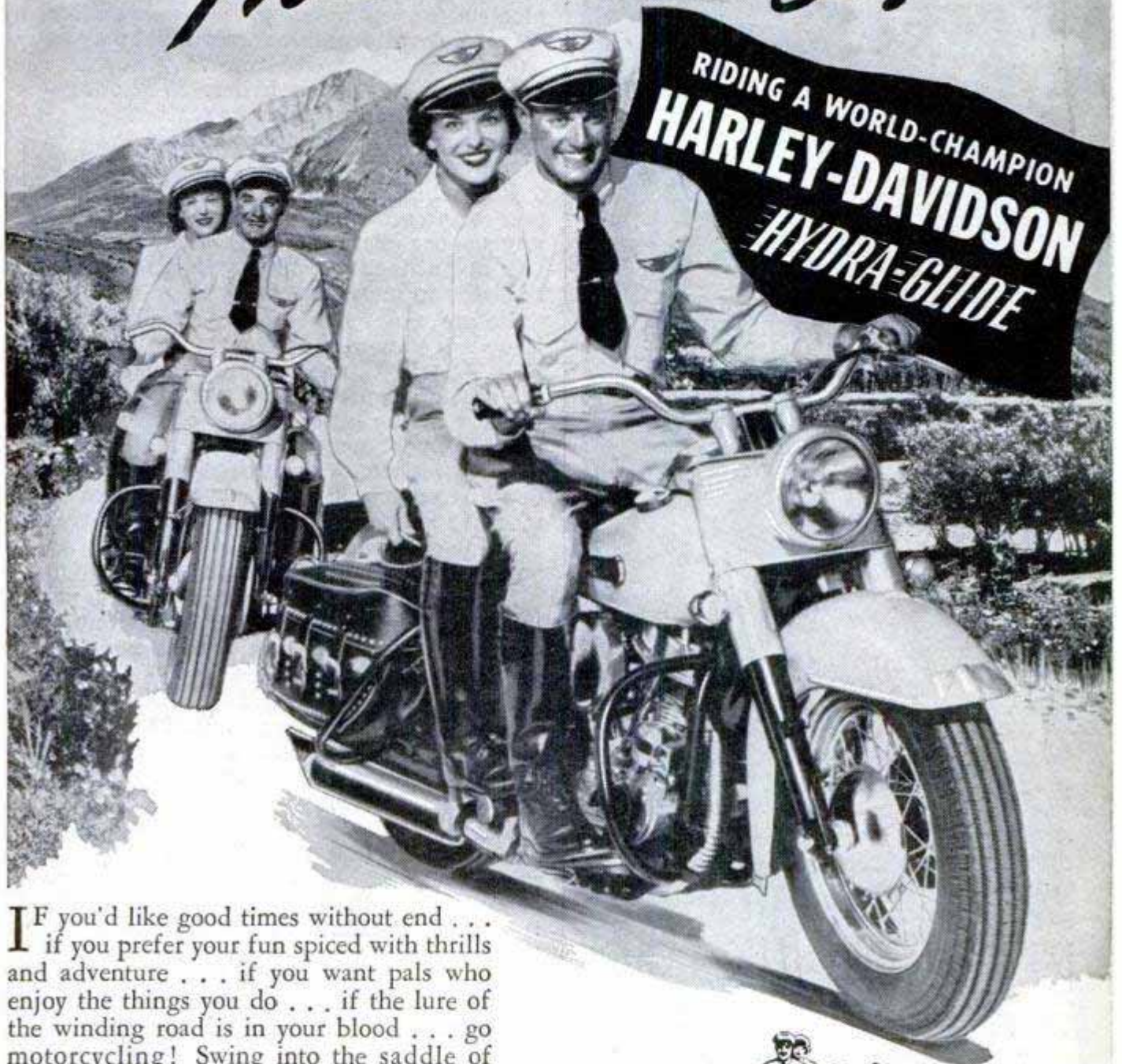
Q—What can one do to prevent furniture drawers from sticking during the summer months when there is no heat in the house? We have an old chest, which gives this trouble. I do not wish to plane off much wood as the drawers then are undersize when the wood dries out.

H.T., Springfield, Mo.



*A—*If the drawers stick so tightly that they cannot be removed without prying, planing off some of the wood will be necessary to make them slide freely. Plane off the bottom edge of the sides and front where it does not show. Often a single plane shaving will do it. It is also possible to scrape the runners and the rail with a cabinet scraper and in this way remove enough stock to ease the operation of the drawer. In your case, it might be well to examine the drawers carefully for loose joints. When these loosen and open up, this may increase the width of the drawer enough to make it stick tightly. Cleaning the old glue out of the joints and regluing or renailling them may free the drawers, thus making removal of wood by planing unnecessary. When the drawers stick lightly, dusting the runners with talcum often is sufficient. Rubbing the lower edges of the drawer sides and also the runners with a cake of paraffin will accomplish the same thing.

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The apparatus consists of a floor or background that is made up of a wire grid painted white. Two speed lamps secured to its frame are pointed at this floor. Four-foot stilts attached to the frame support a watertight and pressurized case containing an electrically operated prefocused aerial camera. An alternative camera that may be used is a single-shot 35-mm. movie camera equipped with a solenoid drive. The equipment is lowered to the deep scattering layer by a special 14-conductor electric cable from a winch on shipboard.

The white wire floor of the apparatus serves as a scale background against which any sea organism that moves into the field will be outlined, permitting its size as well as shape to be recorded.

Before the year is over, possibly, our knowledge about the deep rich belt of marine life will be considerably increased. If the scatterers prove to be fish, it is anticipated that the layer will be of great economic importance when new methods of netting a catch at great depths are developed. It may be that the deep-sea fishermen of the future will lower depth charges into the deeps to stun entire schools, then sweep up the haul in huge nets.

In any event, the discovery of the layer indicates that the amount and distribution of biological life in the oceans is much greater than had been supposed.

One suggestion is that the scattering layer may finally solve the puzzle of the Pacific tuna, an important commercial fish whose life cycle and migration habits are not yet understood.

The quest for tuna, in fact, is considered so important that it is to be one of the prime subjects of research by still another institution, the Allan Hancock Foundation for Scientific Research, an adjunct of the University of Southern California. This year the foundation is preparing a long and varied oceanographic research program for the *Velero IV*, the newest and most complete of the deep-sea research vessels.

Launched last year, the *Velero IV* is a \$600,000 floating laboratory built along tuna clipper lines and equipped for a wide variety of investigations. Now making shakedown cruises in the eastern Pacific, the *Velero IV* is to be equipped with underwater television devices, pressurized traps that will permit the bringing up, alive, of fish from great depths, and coring instruments for taking 60-foot-thick samples of the ocean's floor. This year or next the vessel is to shepherd a new underwater research vehicle named the "benthoscope," a three-ton steel chamber containing two men that can descend 6000 feet and will be towed along the ocean's floor on wheels.

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PLYMOUTH

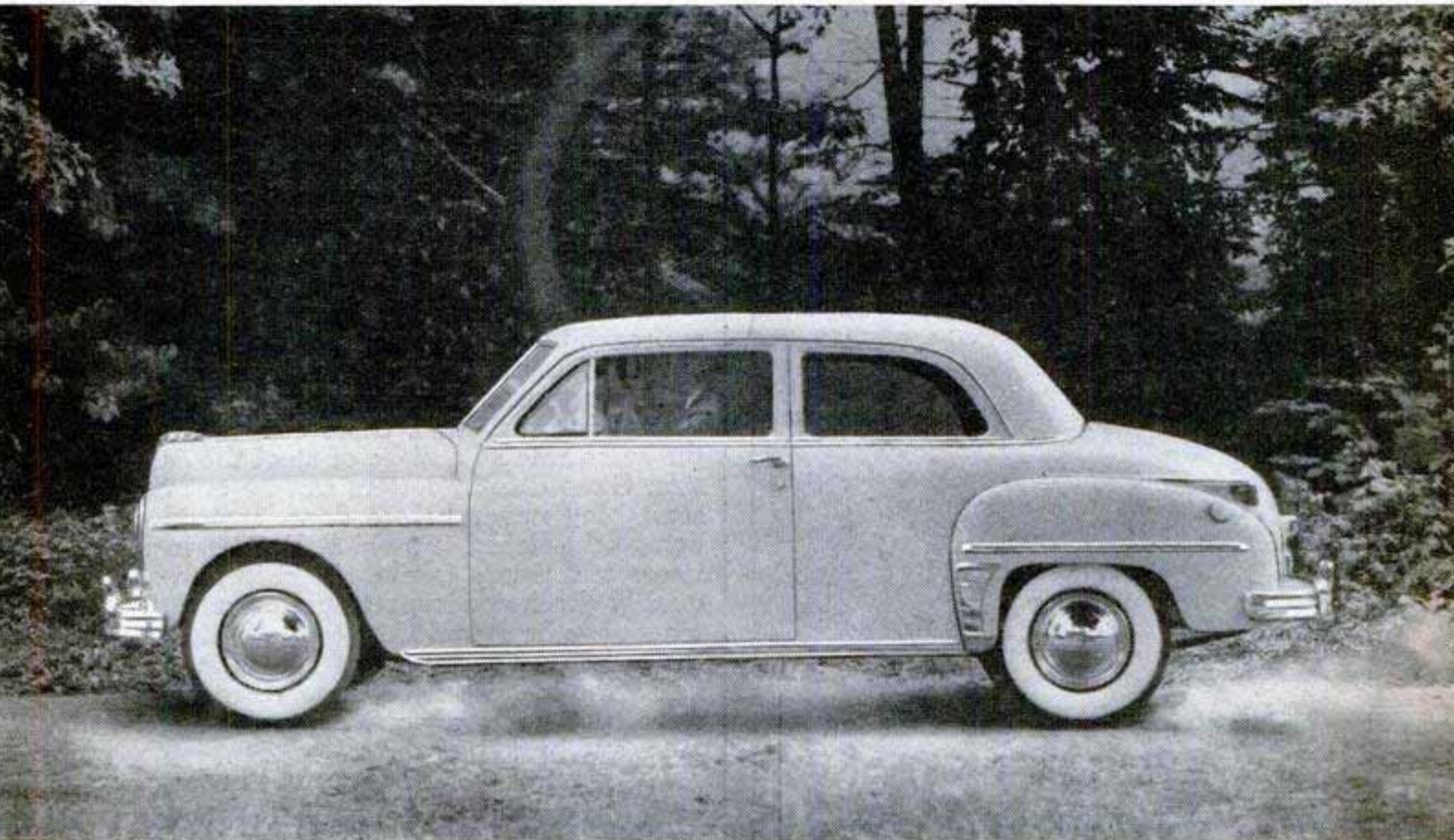
Yes, it likes to be compared
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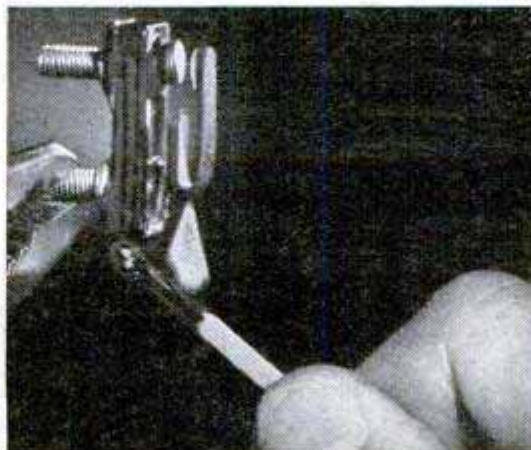
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MUSCLES are huskier. New cylinder head with a compression ratio of 7 to 1 (highest of the leading lowest-priced cars) squeezes more performance from the fuel.



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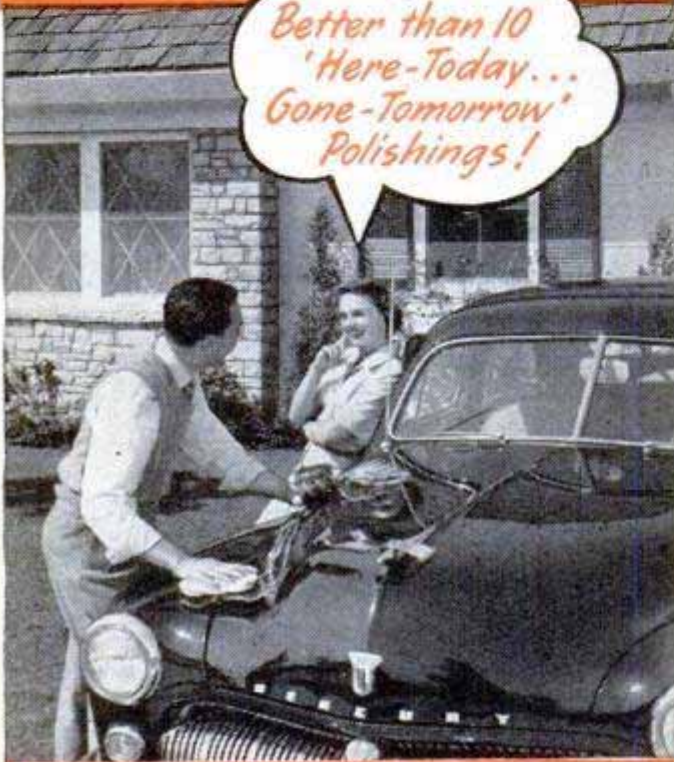


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Use Simoniz Kleener (liquid or paste) to clean finish.
Then Simoniz for lasting beauty. Sold everywhere!

The Tool That Surprised Its Makers

(Continued from page 162)

without precedent. It had no teeth at all. To the edge of a serrated steel band were brazed short lengths of a substance which looked much like broken pencil lead. These were matrices made of a mixture of powdered metal and diamond dust. When baked under pressure they became hard. The matrix was hard enough to prevent the diamonds from sinking under pressure and tough enough to keep them from tearing out and being lost. The structure was so composed that the heat of cutting would not cause the matrix to harden or soften. Matrices are brazed to the backing at odd intervals to prevent any chord or vibration pattern being set up.

Unlike the other saws, the diamond blade works under water. A jet of liquid is turned on the blade, flooding the work. Water is reclaimed, strained and used again. To prevent the coolant from injuring the machinery a quantity of rust preventive is added.

The ability to cut glass opens a brand new approach to an old industry. Thick slabs of optical glass can be sawed to shape instead of being ground down, saving as much as three hours per slab. Glass cuts at about the same rate as a piece of steel the same size. Glass display letters can be cut out, something never before done, instead of being acid-etched or molded. Bottles, insulators and lenses can be sliced in half for quality check and inspection. Now a fragile teapot can be sawed from top to bottom so the maker can check the actual wall thickness. The same can be done with chinaware, pottery, sea shells, mineral specimens and building bricks.

The giant of the bandsaws has become a favorite in industry. If the job is cutting—anything from foam rubber to armor plate—the contour saw will do it, and do it well.

They Keep the Old West Alive

(Continued from page 95)

firewood the prospector's wife would need for two years in exchange for the lumber from the shack, explaining that he wanted it to make repairs in Virginia City.

"But the lumber's no good," puzzled the prospector. "It's old and warped."

"The moss, man. Look at the moss growing on the boards," said Charlie. "They can't even produce historic lumber like that in Hollywood."

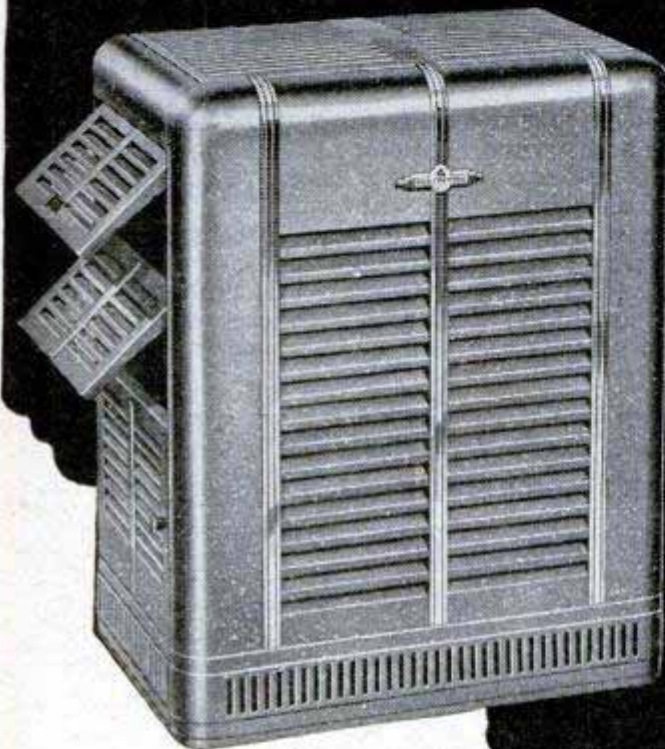
Then there was the matter of the Montana Post. Established in Virginia City in 1864, the Post was the first newspaper to

(Continued to page 248)

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HEATER**

See the Heater that pays for Itself!



PERFECTION 3155 OIL HEATER
55,000 B.T.U. (up to 6 rooms)

Automatic Controls*

The thermostat takes care of the heat, while you relax in comfort. Automatically cuts fire down to money-saving pilot and back to high or low fire as needed. (*optional)

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No other heater has a pilot like this. It runs for hours and hours on a cup of oil, alternates with high or low fire to give just the heat you need. Plenty to keep you cozy on the coldest day, yet never wastes money by overheating on mild days.

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Concealed in the heater, it circulates heated air out across the floor. Does a *better* job of floor warming, distributes heat more evenly over a wide area. You can't see it, you hardly hear it . . . but you sure can feel the extra comfort it distributes. (*optional)

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Prevents dollars from going up the chimney. It traps and uses heat that would otherwise be wasted. Combined with the stainless steel construction that allows hotter burner operation, this makes *more* useful heat from every drop of oil.

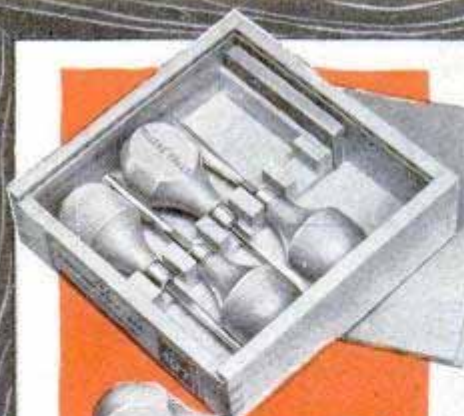
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your Christmas presents early!

This year, delight your friends with gifts you make yourself. It's fun! . . . It's easy! . . . It's profitable! — with a Millers Falls Carving Tool Set.

With these razor-keen, easy-to-handle tools, you can make distinctive bookends and figured cigarette boxes for grown-ups . . . model planes and racing cars for boys . . . costume jewelry and cute animal figures girls will love.

They're perfect, too, for cutting linoleum blocks from which to print your own colorful Christmas cards.

And don't forget, Millers Falls Carving Tool Sets are wonderful gifts themselves — for fellow craftsmen or to start a boy off on a hobby that will give him a lifetime of fun and satisfaction.

MILLERS FALLS COMPANY

GREENFIELD, MASSACHUSETTS

be published in Montana. Although the Post building was still standing in 1945, it had long ago been cleared of its contents.

Charlie wanted authentic type and presses back in the building. He found them in another historic mining town—Virginia City, Nev. There was only one catch. A three-story brick building went with them.

Charlie bought the building, crated up the contents and shipped them from one Virginia City to the other Virginia City. He still owns the building in Nevada, and would listen to a reasonable offer.

Generally, Charlie didn't have to go far afield to find "props" for resetting the stage of Virginia City.

"The dumping ground outside of town assayed pretty rich in relics," said Charlie.

Most important finds were the old, kerosene-burning street lamps. Charlie had them dug out of the frozen earth one winter day. Now renovated, the flickering lamps once more light up the town at night.

Virginia City once boasted the most expensive street-lighting system per lamp in the world, for kerosene sometimes sold for more than \$25 a gallon. It was more expensive than whiskey. Freighters didn't like to haul it over the mountains because if it spilled in a wagon it ruined all the foodstuff.

Some of the old places Charlie actually put back in business. The Bale of Hay Saloon serves drinks across a bar that was hauled over the mountains by ox team. An ancient music box wheezes out ancient tunes. The Saturday-night square dances at the Bale of Hay are something.

At the Wells-Fargo coffee house, you can order from a menu that lists venison, bear, elk and buffalo meat. In the Fair-weather Inn, you can sleep in an old-fashioned four-poster.

A lot of folks wonder how Charlie, who has spent a small fortune in reviving Virginia City, is going to get his money back. Many tourists spend hours in Virginia City and not a dime. There is no charge for visits to any of the historical buildings. Even the Saturday-night old-time dance at the Bale of Hay Saloon is free.

But Charlie isn't worried. He is having a whale of a time reliving the old West, so is all of Virginia City and so are the thousands of tourists who go there.

☐ Here are some weighty facts on the atmosphere: Including its water vapor, it weighs about 5,900,000,000,000 tons; completely dry, it would weigh about 5,000,000,000,000,000 tons; half this mass of air is below an altitude of 3.46 miles above sea level.

What's **NEW**
in Batteries?

AUTO-LITE **Sta-ful** BATTERY...needs water only 3 times a year*

A revolutionary new development, the Auto-Lite "Sta-ful" Battery, protects you against a major cause of battery failure . . . damage to plates due to liquid loss. This new "Sta-ful" Battery design permits a liquid reservoir with 3 times the capacity of ordinary batteries . . . keeps plates fully covered and active months longer in normal car use.

In addition, "Sta-ful" has Fibre-glass mats to hold the power-producing material in the plates for longer battery life. To get more for your battery dollars, replace with an Auto-Lite "Sta-ful". Money cannot buy a better battery.

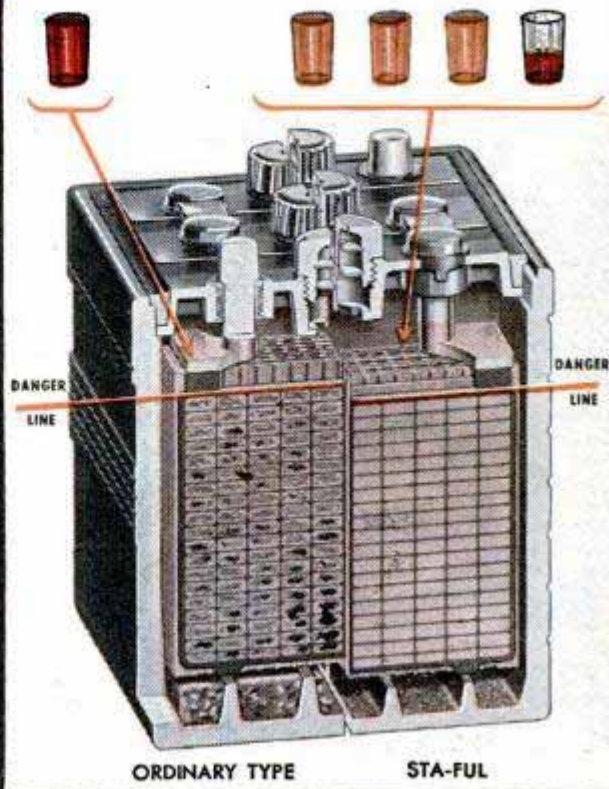
AUTO-LITE BATTERY CORPORATION
Toledo 1 Ohio



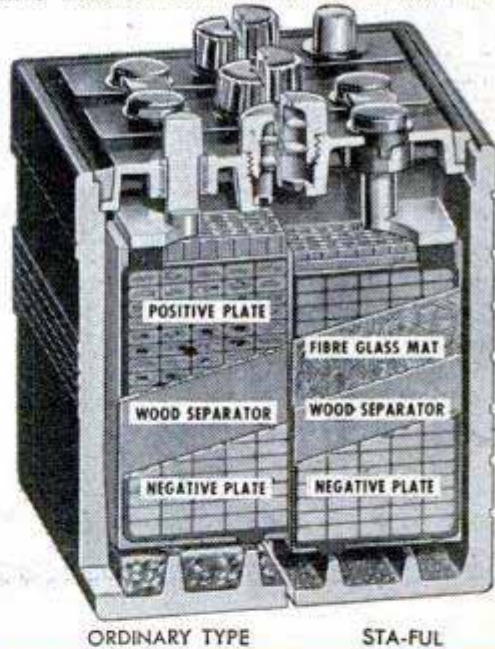
*In normal car use

TUNE IN "SUSPENSE!"
CBS RADIO NETWORK THURSDAYS
CBS TELEVISION TUESDAYS

Because of a unique construction, the new Auto-Lite "Sta-ful" Battery holds more than 3 times the liquid reserve of ordinary batteries.



Note how the protective Fibre-glass mat retains the power-producing material in the positive plate while ordinary battery plates shed the active material until it fills the sediment well.



AUTO-LITE **Sta-ful** BATTERIES



Keen edges quick with **NORTON**® abrasives oil-filled bench stones

You'll be amazed at how rapidly the "coarse" side of a NORTON Abrasives CRYSTOLON® stone will take out nicks—and how few strokes are needed on the "fine" side to give you the kind of edge that makes its use a joy to every craftsman.

Every CRYSTOLON bench stone is impregnated with oil at the factory so that it resists "loading," cuts evenly and gives you continuous good service. Another thing—the grit used is CRYSTOLON silicon carbide—a famous NORTON Abrasive product—practically diamond-hard, lastingly sharp and uniformly sized.

Your hardware dealer has CRYSTOLON stones in sizes and forms for all tools. Look them over, select one, take it home and try it. From that day you will be an "edge-conscious" craftsman.

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BEHR-MANNING
NORTON® abrasives **TROY, N.Y.**

Call Out the Mules and Beetles

(Continued from page 130)

and out among trees. So they invented a powered, fingertip steering. Shifting a control handle to either side changes the gear ratio of the tractor wheels, the more you move the handle the greater the difference in ratio—one wheel slowing down while the other speeds up, all accomplished by an ingenious expanding-diameter pulley and V-belt drive. And it has a reverse gear. One man can easily operate the lab's Walk-Behind Trencher through a full day of forest-fire fighting.

When a machine is proved practical, it is blueprinted and patented in the name of the United States. This means that patent rights are open to anyone. For any person definitely interested in manufacturing one of the inventions—in large quantities for the Forest Service or for use in other fields—the Portland Equipment Laboratory has blueprints available and will give all the help possible.

Take the tiny bulldozer, an important part of the Lilliputian army. Years ago Flynn invented the first dozer blade for a track-laying tractor and just before the war he developed the first practical bulldozer in a small size. The U. S. Army, searching for a dozer that could be transported in a cargo plane adopted it as the Airborne Tractor. Since then the lab has produced the Beetle, a still better bulldozer and one that is half the size of the Airborne Tractor. It weighs only 2200 pounds and is the new love of the men with pick and shovel on a fire line. One company in Seattle is already manufacturing the powerful Beetle for other uses. Today there are Beetles in Canada, French Equatorial Africa and Alaska as well as in our National Forests; and on our East Coast they lower Beetles into coal barges to scrape up the last few tons of coal.

The Beetle is a perfect little trail builder as well as fire fighter and the lab has other equipment to go with it. There's a compact air compressor that is towed behind either the Mule or the Beetle. Its tubular frame is the air tank and it is used with jack hammers to cut trails through rock and along cliffs. For building lookout stations on rock crags, the air compressors can be disassembled into four parts and carried on four horses.

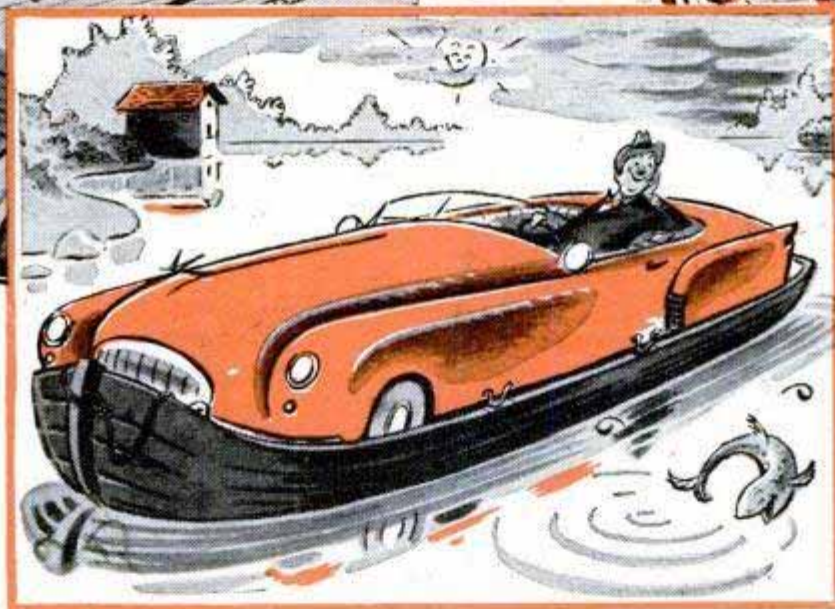
When the air hammers stop and the Beetle has dug a path along the hillside, a tiny road grader moves forward. An exact miniature of the graders used on our highways, it is hooked behind either a Beetle or a Mule to smooth the cuts into a good

(Continued to page 252)

IF YOUR SOLDERING TURNS
OUT LIKE THIS...IT'S TIME
TO CLEAN THE IRON!

and

IF YOUR CAR FEELS LIKE THIS
...IT'S TIME FOR MARFAK
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THAT CUSHIONY FEELING LASTS LONGER WITH MARFAK!

There's a world of difference between *Marfak* chassis lubrication and ordinary grease jobs. Tough, s-t-r-e-t-c-h-y *Marfak* clings to wear points and fights friction for 1,000 miles and *more!* And just notice that "cushiony" driving ease that *lasts!* It's your sign that *Marfak* keeps right on protecting. Applied by chart, never by chance. Stop by for *Marfak* lubrication today at your neighborhood Texaco Dealer, *the best friend your car ever had.*



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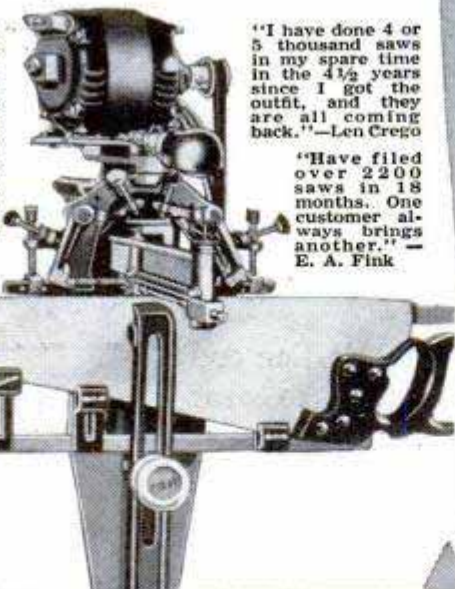
Turn your spare time into CASH — sharpening saws with a Foley Automatic Saw Filer pays up to \$2 or \$3 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

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"Each saw I filed got me six more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer." — William C. Baldwin



"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back." — Len Crego

"Have filed over 2200 saws in 18 months. One customer always brings another." — E. A. Fink



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trail. No gravel or pavement is needed; the weight of the baby vehicles compacts the new trail into a dry-season fire road 40 inches wide.

As long as there are no fires, the Forest Service's construction crews and stand-by fire crews are busy extending the network of motor trails. But when a fire starts, the Beetles and Mules are immediately called out to make fire breaks and to transport supplies. The Beetle and available larger bulldozers are quickly converted into large-size fire trenchers by replacing the conventional bulldozer blade with two large disks that form a "V" (another of the Equipment Lab's inventions). The tractors peel out a trench as fast as a man can trot.

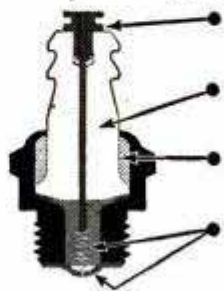
And other equipment comes into play. Motor scooters have been adapted for courier service over the trails. These are purchased from manufacturers and are the biggest and most powerful scooters that can be found. Flynn and his assistants change only the gear ratio, gearing the scooters down for the steep-trail climbing. They are valuable for patrolling fire breaks and for keeping in contact with all the crews. There are folding trailer-offices for fire-control headquarters, an adaptation of the folding camp trailers that sportsmen use. When a large fire breaks, the nearest trailer-office is rushed to the scene. Accurate accounts of the fire-fighting crews can be kept. Phones, radios and maps are available right at the fire line.

A development still in the testing stage is the Wheelbarrow Saw. The lab has installed a very light and powerful, 2½ kilowatt, gasoline-powered electric generator in a small aluminum wheelbarrow. It powers two lightweight, 14-inch chain saws. One man pushes the wheelbarrow through the forest; two men, each carrying one of the chain saws on a 200-foot cable, range out to each side, cutting down the brush and small trees to make a fire break.

(Continued to page 254)

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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.

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Follow recommendations of plug types and fuels approved by engine manufacturer.

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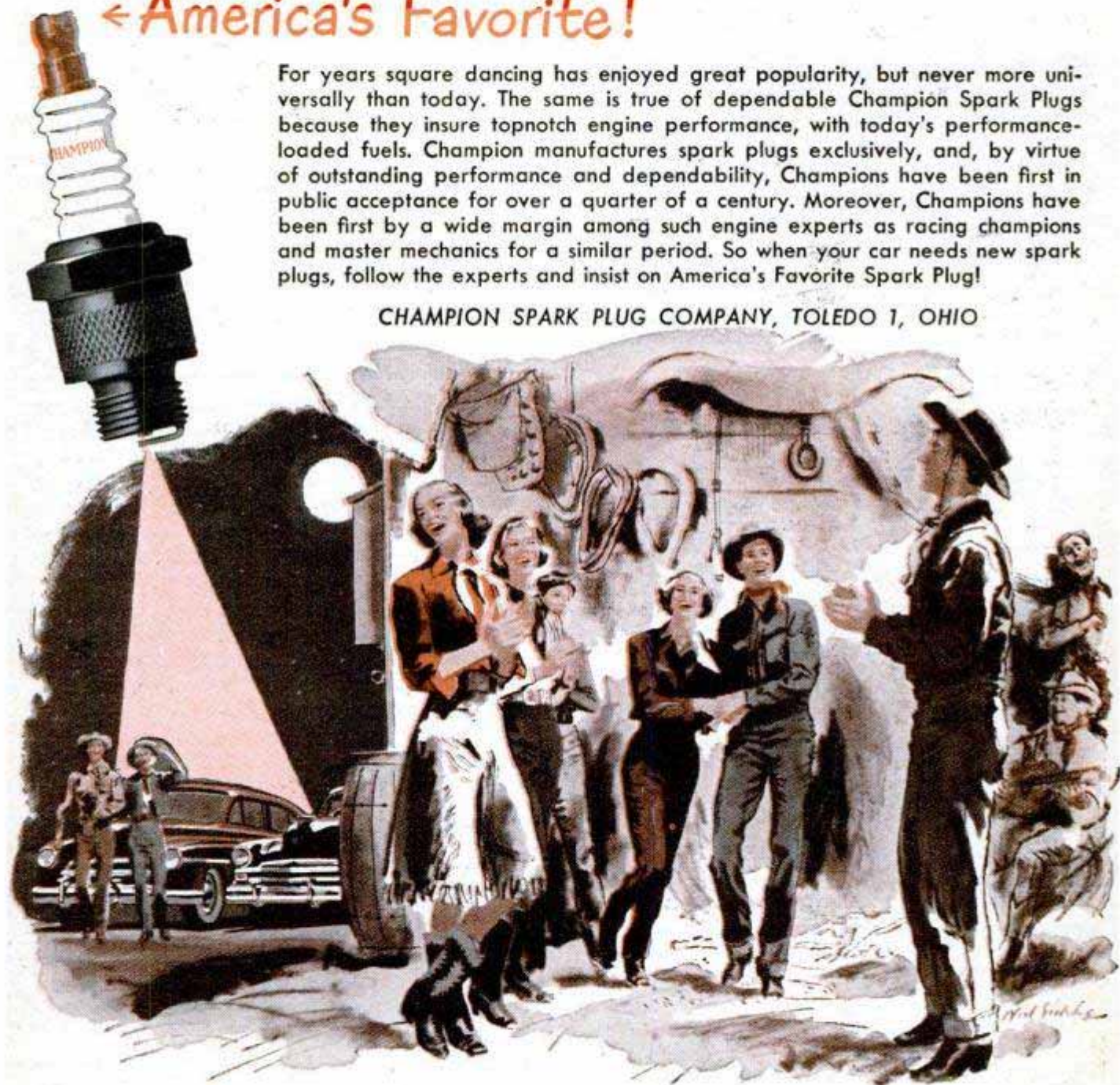
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The Wheelbarrow Saw is also a quick way to keep trails clear of brush.

A combination of many new developments is the Slip-On Tank and Pump. The lab designed this equipment so that it can be easily slipped on a Mule trailer or any truck. On the Mule or truck it can be moved along a fire line, pumping either a stream of water or the new fog spray from its own aluminum-alloy tank. Stopping beside a stream, it will quickly fill its tank or, when a valve is turned, will pump steadily from the stream. It has the latest in lightweight, gas-powered pumps, giving a high-pressure head of 150 pounds. Everything possible is made of aluminum alloys, keeping the total weight (empty) down to less than 600 pounds so that it can be dropped from a plane on one parachute. And the pump and hose reel can be instantly detached at any time to be carried by hand into the fire.

This is an army of midgets that fights the biggest of all conflagrations—forest fires. The Beetles and the Mules are just as much at home in the woods as the wild animals. To them, the wooded trail sounds the call of the open road.

Hot Rods and Electrons

(Continued from page 109)

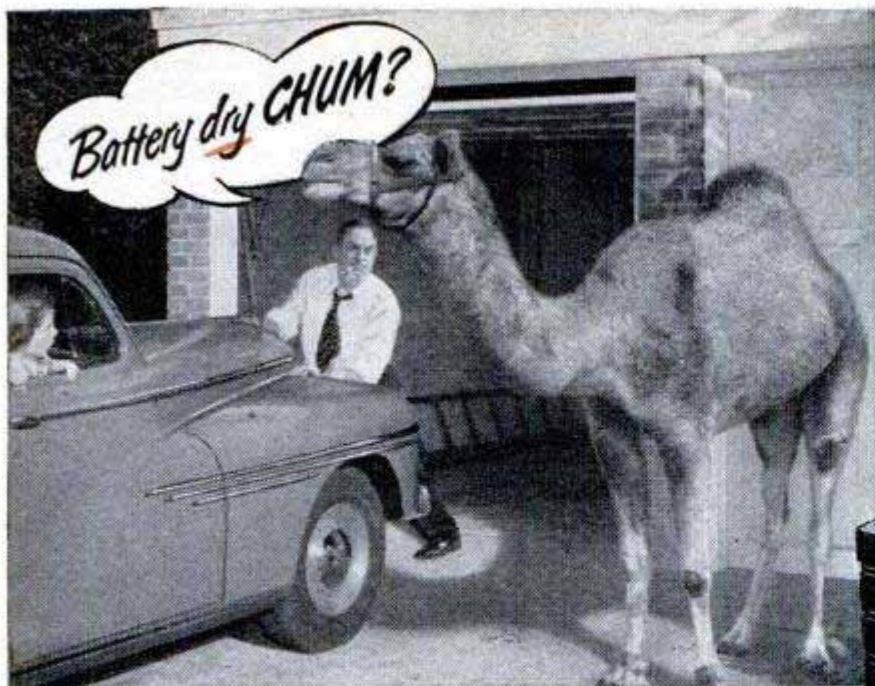
little interest. Once he has determined the validity of an idea, he's off on a new project. If he can prove to his own satisfaction that ultimately the idea will work, he immediately finds something more interesting.

The lad's ideas are not confined to the field of electronics. For example, he's now working on a system for projecting movies in three dimensions without the need for special viewing lenses.

One of the reasons we see in three dimensions, he points out, is that each eye sees a different picture. Actually, when we focus on an object we see two images of every other object within view. If we focus on our forefinger, we see two of everything that appears in the background.

To apply this effect to motion pictures, Tenny has rigged up a mirror and prism arrangement that he places in front of the camera. When the film is exposed and developed, everything on the focal plane of the camera appears in focus, but everything behind or in front of the focal plane appears as two overlapping images, with the distance between the images varying depending upon how far the objects are from the focal plane. When the film strip is run through the projector, there's a definite three-dimension effect. Crude, admits

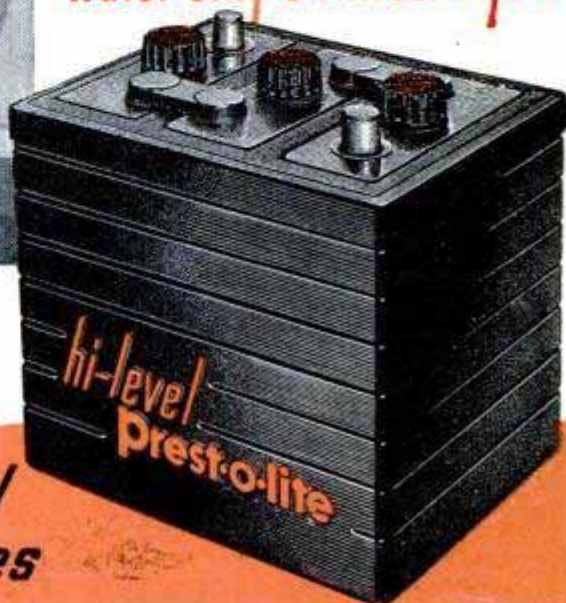
(Continued to page 256)



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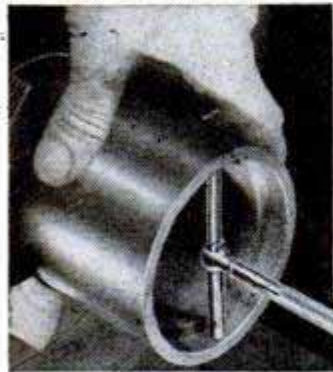
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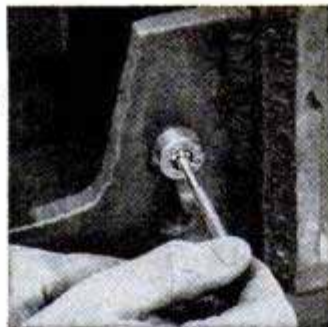
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◀ Measurements down to one thousandth inch or less are taken from the gage with a Micrometer.



Available individually or in sets. Range $\frac{5}{16}$ to 6 inches. Each gage has its own handle sized in direct proportion to its plunger range, assuring perfect balance found in no similar gage.

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Tenny, but he feels that it may lead to something bigger.

Not long ago Tenny worked out a wide-range transformer. He tried testing it in an electronics laboratory but the instruments there weren't sensitive enough to check the complete range. When he submitted it to a manufacturer he was told, "Your transformer works fine; in fact, it is the best transformer we've seen. The trouble is, we don't need a transformer anywhere near that sensitive."

He now is tinkering with binaural sound effects using only one microphone. Other projects include a precision temperature control he hopes will be efficient to one-thousandth of a degree, and a "memory tube" that would operate through an ordinary vacuum tube instead of the larger tubes used for that purpose in modern computers. He's remodeling his oscilloscope to show five, six or even 10 different wave forms simultaneously for purposes of comparison.

Like many other laboratories across the country, the Tenny Lode bedroom lab is working on an electrostatic loudspeaker for producing high-fidelity sound. Tenny's model, unlike some of the more pretentious instruments, works. Its parts include a sheet of carbon paper and a strip of screen wire. He also has developed a high-fidelity, multi-channel communications system and has an idea for a low-voltage television tube that would slash the cost of television projection in theaters.

Except for his interest in physics and other sciences, the youth is just about as normal as any lad could be. He likes hot-rod racing (he just sold his souped-up '35 car) and has a blond girl friend he'd be "proud to have you meet." He's just as interested in the behavior of players on a football field as gases in a high energy field, and when he's not observing wave forms on his oscilloscope you'll likely find him in the center of a bull session with his cronies.

More Powerful Diesels

Three improved types of diesel locomotives are appearing on the nation's railroads—25 percent more powerful than the models they supersede. Built by the Electro-Motive Division of General Motors, the new diesels have greatly increased hauling capacity and higher train-heating capacity despite the use of cheaper grades of fuel oil. The motors and generators utilize a silicon insulating material that permits a higher load factor, producing a stronger pull. A new injector broadens the range of fuels that may be used.

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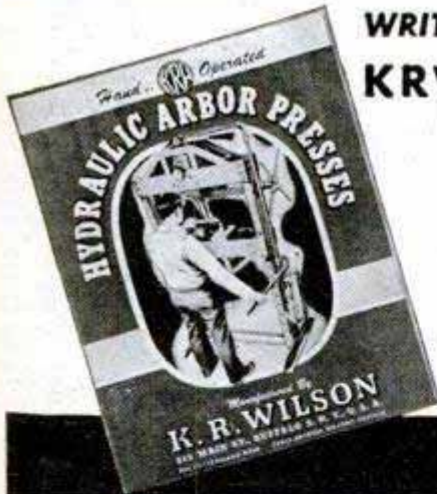
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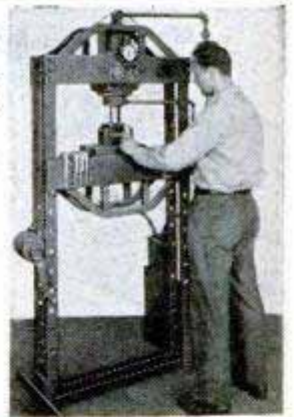
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KEUFFEL & ESSER CO.

"Dust Bowl" Laboratory

(Continued from page 114)

the equipment has been a long, sizable, research project in itself. Funds for it were set aside as one of the numerous research projects authorized and financed under the U. S. Research and Marketing Act of 1946. Cooperating are the Soil Conservation Service, and the Agronomy Department of Kansas State.

In direct charge is A. W. Zingg, of the Soil Conservation Service. Assisting him is Dr. W. S. Chepil, formerly of the Dominion of Canada Experiment Station at Swift Current, Saskatchewan. Because of Saskatchewan's long and bitter experience, Doctor Chepil has had as much contact with the dust evil as any man alive.

Beside the wind tunnel, which is three feet in cross section and 56 feet long, made of wooden and glass sections for observation, with inlet ports and doors for placing and removing trays of samples, the experimenters had to "custom build" virtually all their other equipment. This includes an ingenious separator made of rotating sleeves, which divides soil into seven sizes; an alcohol manometer for measuring wind-tunnel pressures, and a large electric oven for drying soil samples before testing.

Discharge of a circular fan into a square tunnel caused wind currents and eddies, so the experimenters had to devise a way to make the wind blow "straight." They did this by placing a barrier composed of 324 short two-inch aluminum tubes between the fan and the tunnel proper. This straightened out the wind currents.

The Department of Agriculture is allocating approximately \$30,000 yearly to the work.

Ointment for Insect Bites

Bee stings and some other insect bites become practically painless within a minute after application of an ointment containing one of the anti-allergy drugs. The drug is called thephorin. One doctor has reported a particularly effective case to the American Medical Association. A five-year-old boy walked into a swarm of bees and was stung seven times. Within a minute of the time the doctor applied the ointment the boy stopped crying and said all the pain had disappeared. In seven other cases, patients said the pain seemed to vanish as soon as the ointment was applied.

British researchers have developed light-colored asphalt—green, blue, cream, yellow and red—for experiments in highway building.

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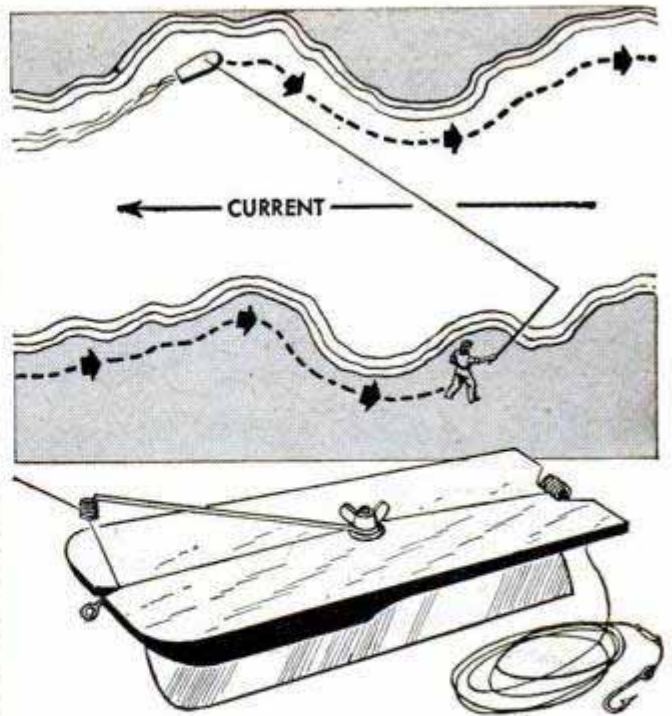
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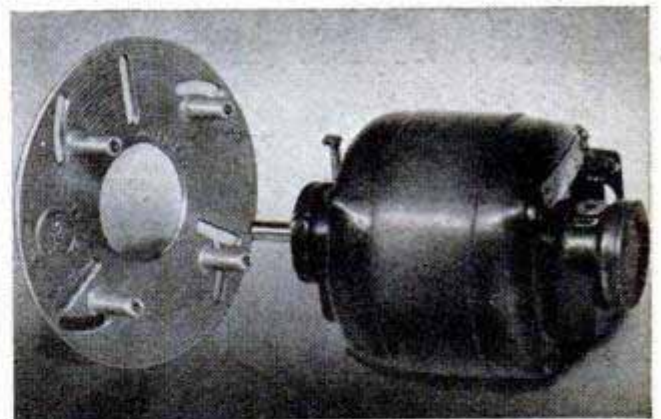
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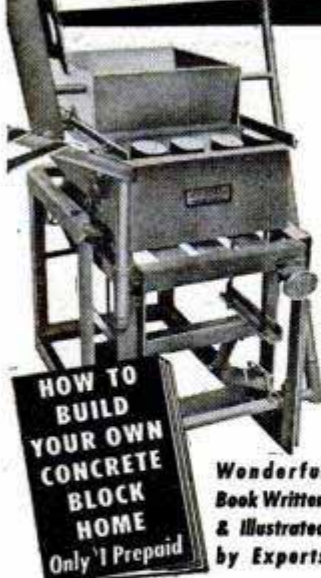


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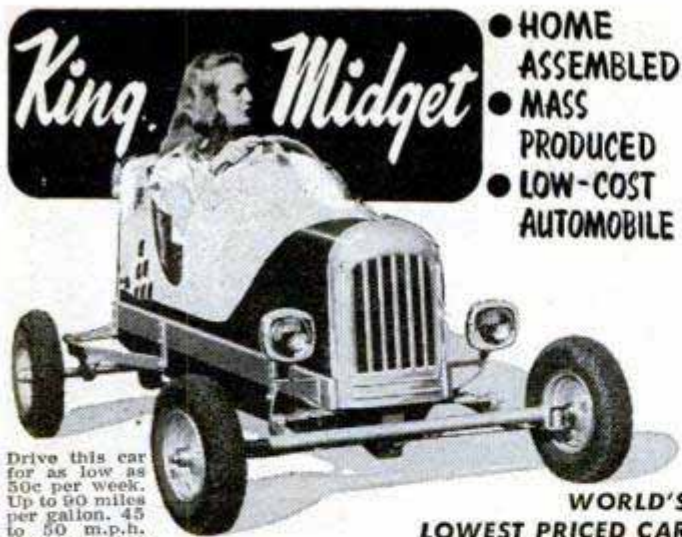
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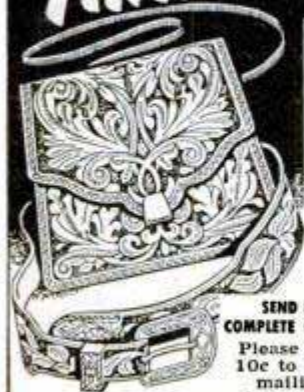
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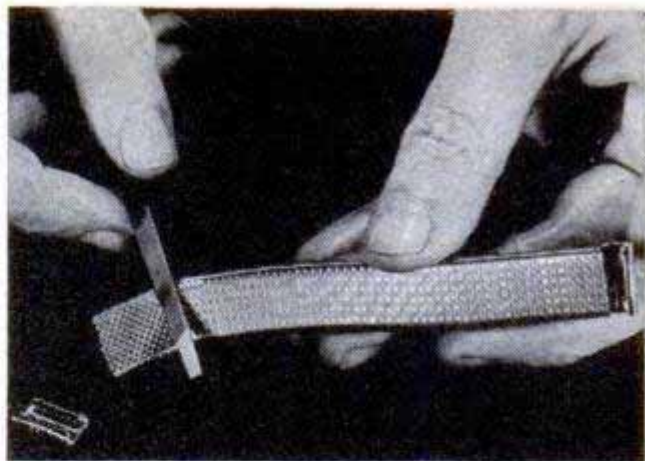
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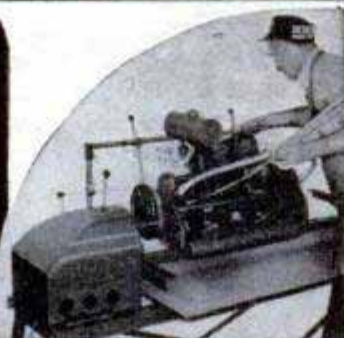
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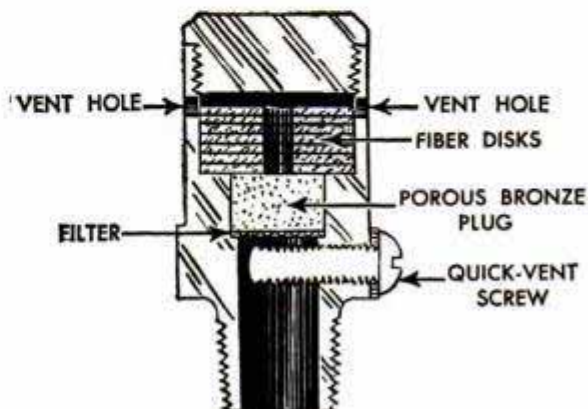
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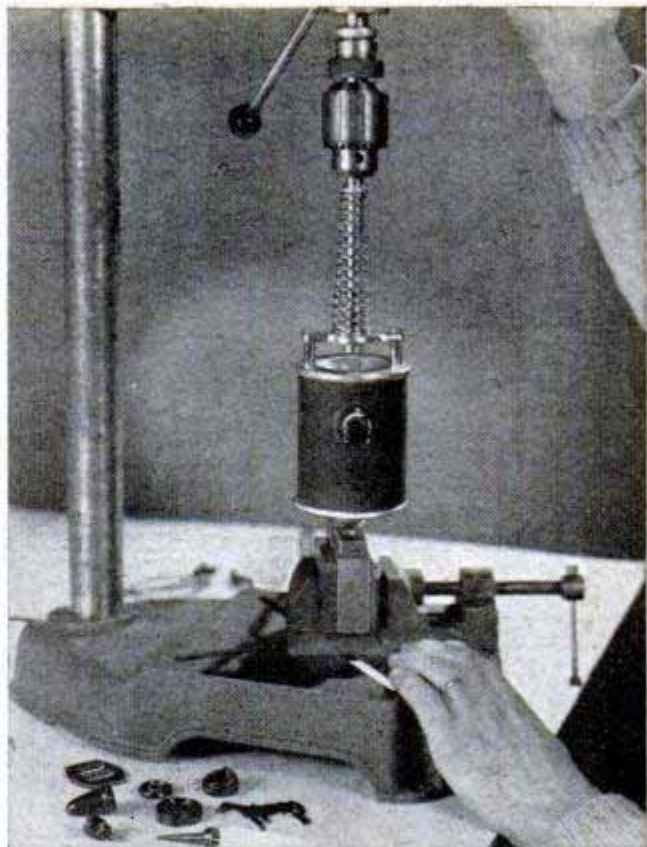
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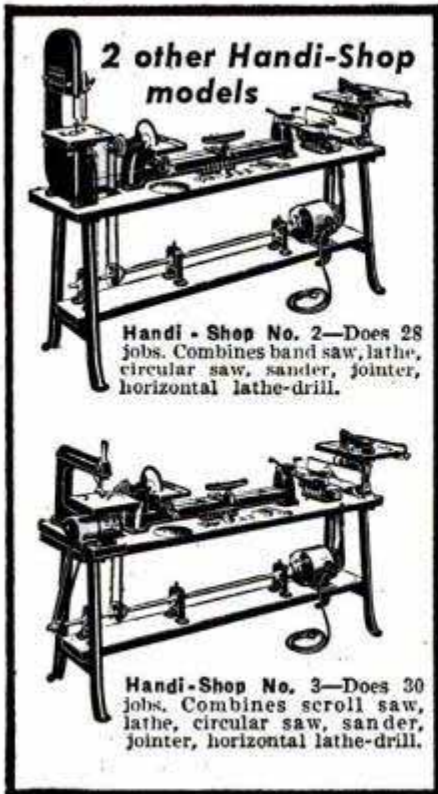
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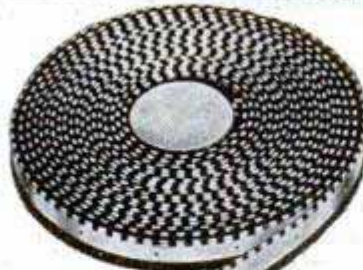
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Drawer Size 1 1/4" Deep 2 3/4" Wide 6" Long	32 drw. \$8.95 64 drw. \$15.95	32 drw. \$5.95 64 drw. \$9.95
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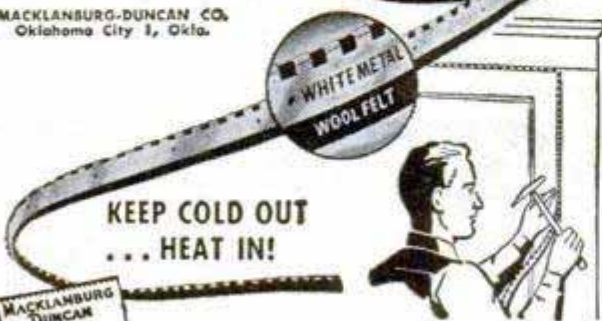
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**Eliminate
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Quick - Easy - Safe
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**Will Remove Without Water
Paint, Tar, Grease, Grime,
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**SELF-PROPELLED - MOVES
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The simple sensible Red-i-Kut way as thousands have—SAVE HALF. SHOP TESTED PLANS "SPIRIT OF THE CENTURY" Narrow waist 83" tall or stately "SPIRIT OF AMERICA" straight side model with pictures. EASY-TO-FOLLOW PLANS tell all—plus BROCHURE of heavy brass weight Westminster tube chime, movements, dials, solid mahogany case kits. Send \$1.00 today—Both Plans \$1.50 NOW. KUEMPEL CHIME CLOCK CO., #5 Kuempel Bldg., Minneapolis 16, Minn.



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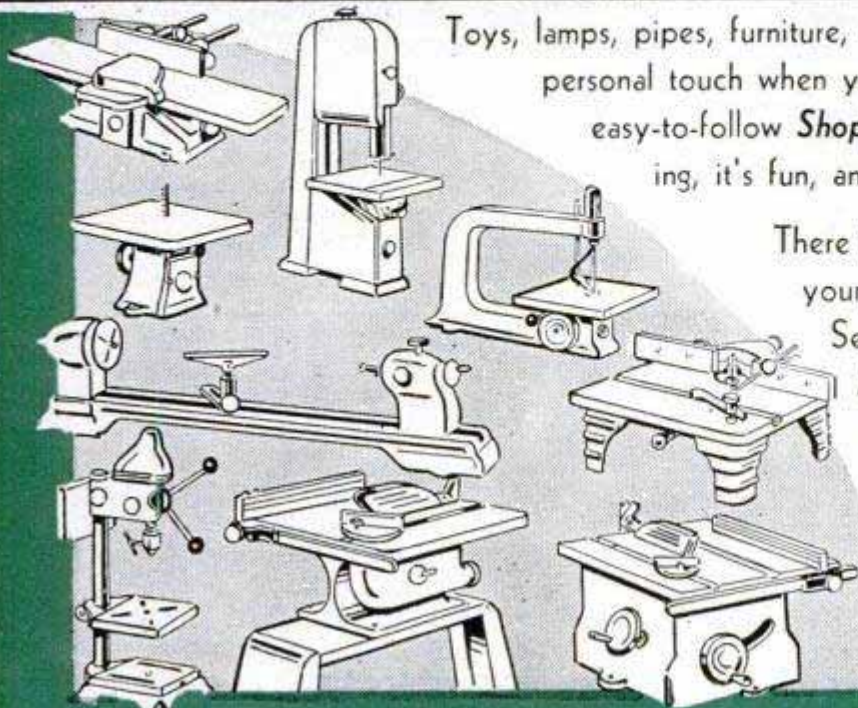
4" Wheel, 1/2" Tire, 5/16 Steel Bearing...	\$0.45 ea.
5" Wheel, 5/8" Tire, 5/16 Shaft Hole.....	0.65 ea.
6" Wheel, 5/8" Tire, 5/16 Shaft Hole.....	0.75 ea.
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10 x 1.75 Wheel, semi-pneu., 7/16 or 1/2 BB	2.75 ea.
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10 x 2.75 Wheel, semi-pneu., 1/2 or 5/8 BB..	4.95 ea.
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| 65 Smoking Pipes | 53 Child's Wagon | 67 Picket Fences |
| 66 Modern Table Lamp | 54 Coaster Set and Rack | 71 Picnic Table |
| 68 Five-in-One Coffee Table | 55 Toy Duck | 72 Silver Chest |
| 69 Lawn Chairs | 56 Broom Holder | 73 Baby's Crib |
| 70 Modern Coffee Table | 57 Novelty Tie Rack | 74 Child's Table and Chairs |
| 25c Plans | 58 Bouncing Dog Toy | 75 Child's Play Pen |
| 51 Nut Bowl and Mallet | 59 Pull Toy Train | 76 Three-in-One Decoy |
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Redemption made by Dealer _____ Plans to be mailed direct to customer _____

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76

This coupon is void if prohibited, licensed, or taxed in your state or locality.

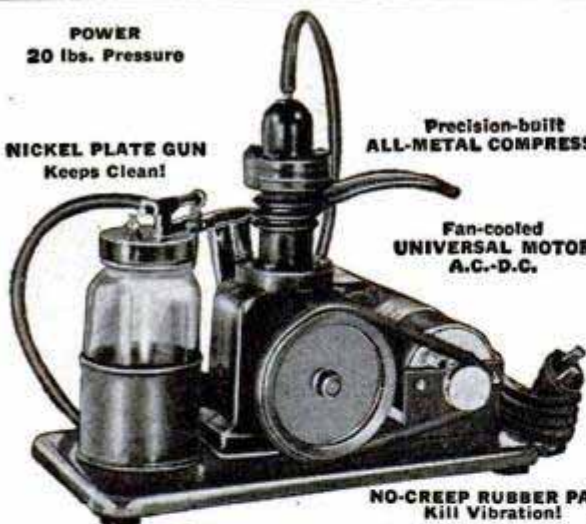
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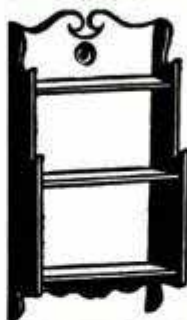
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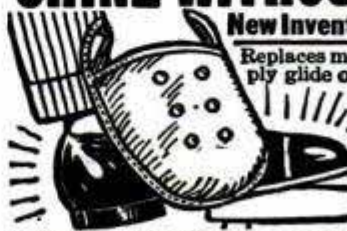
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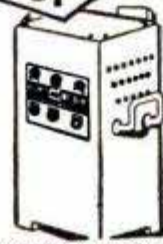
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I need a reliable man in your town to get a fine, made-to-measure, all-wool suit without paying cash, but by taking a few orders from friends. Wear it—show it—to help you take more orders with my line of nearly 100 guaranteed quality fabrics. You can make up to \$12 in a day without experience or investment. I supply everything required FREE. Write for FREE outfit. John Grant, STONE-FIELD Corp., 5325 Throop St., Dept. W-816, Chicago 7, Ill.

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Price includes motor rail, belt, pulley, mitre gauge, fence, splitter, guard — less motor. Extensions \$3.50 each.

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Compare these features and we think you'll agree the new 3001 is today's outstanding circular saw value!

BIG SAW FEATURES!

- ★ TILT/ARBOR CONSTRUCTION — table and work are always flat for safe angle sawing.
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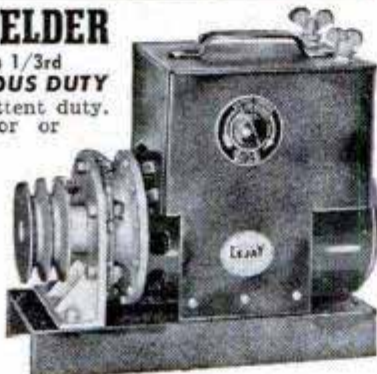
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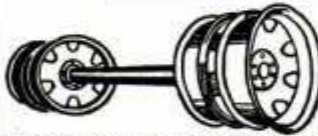
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(Weatherizing Kit), complete top with back curtain and side curtains with zip-in-doors. 5 windows. Waterproof O.D. color, shipping weight 40 lbs. Wonderful \$39.50 value. F.O.B. K.C.

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Heavy duty trailer axle suitable for many types of trailer construction. Also excellent for building of heavy farm trailers and wagons. It is a 12,000 lb. capacity square type straight trailer axle complete with Timken roller bearings, hubs, and 6 hole 750 x 20 Budd Wheels. Without brakes. Axle is 2 inches square and 69 inches between wheel mounting flanges. Std. width. AN EXCELLENT BUY.

With Single Wheels. \$59.50 With Dual Wheels. \$69.50

Save \$30.00 On

JEEP Spare Parts KIT

Originally packed for Amphibious Jeeps. Also adaptable for all military and some civilian jeeps. Offered \$8.95 at our low price of.

KIT CONSISTS OF THE FOLLOWING PARTS:

- 4-1177 Retainer Wheel Grease. 1-#2078 Hose Assy.—Rear Brake
- 1-2079 Hose Assy.—Ft. Brake. 1-#2197B Hose Assy.—Axle—Vent
- 2-3135 Seal—Frt.—Axle—Pivot. 1-#4022B Plug Assy.—Axle Vent
- 1-5666 Belt Capstan. 1-#8620 Belt—Fan. 1-#12405 Spark Plug
- 1-13466 Bulb (Black-Out Marker Lamp).
- 1-15480 Belt—Blige—Pump
- 1-13485 Unit Assy. (Rear Lamp Stop). 1-#1752960 Strap Assy.
- 1-13491 Unit Assy. (Rear Lamp Lower)
- 1-18218 Kit—Cotter Pin (asst)
- 1-13494 Unit Assy. (Rear Lamp Service)
- 1-17008 Container Assy. Spare Parts (Water'roof)
- 1-17058 Tape—Friction (3/4"—8 oz.—Roll)
- 1-17060 Wire—Annealed (No. 22—Ga—1/4 No. Roll)
- 1-18320 Kit Tire Valve Core (S-B-1725)
- 1-18322 Kit Tire Valve Cap (S-EPW-1720)
- 1-1711340B Seal Transfer Case Output Shaft Collar
- 1-1711344 Seal—Drive Shaft Housing Gear
- 1-1711346 Seal—Drive Shaft Housing Front
- 1-1711356 Seal—Front Floor Tunnel Drag Link

WIPER BLADE Brand New, 10" O.D. Windshield Blade, Each 19c

UTILITY GAS TANK 6 quarts — New Surplus. Cylindrical 5 1/2" x 15 1/2". Brackets for mounting. Complete with Filler cap, drain plug and pet-cock. Ideal for small gas engines, stoves, etc. \$1.50

SURPLUS POWER WINCHES All new and suitable for front or rear mounting. GARWOOD OR HEIL—15,000 lb. capacity. \$150.00

Surplus WINCH CABLE WHILE THEY LAST

200 ft. length 1/2" cable.	\$25.00	300 ft. length 1/2" cable.	\$35.00
250 ft. length 1/2" cable.	\$30.00	300 ft. length 3/8" cable.	\$40.00

HUNDREDS OF OTHER TRUCK PARTS AND SUPPLIES

All prices quoted good 30 days FOB, Kansas City. 25% deposit required on COD orders.

American AUTO PARTS CO.
1830 LOCUST — DEPT. PM
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SAY YOU SAW IT IN POPULAR MECHANICS

MONEY BACK GUAR.



7x50
\$36
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7x50 PRISM BINOCULARS
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*20% Federal Tax

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MULTI-USE TRUCK



Only \$8.95

Hundreds of uses around Home, Shop or Farm. Easily moves up to 600 pounds. Saves back-breaking effort in moving heavy boxes, barrels, ashcans, feed, cement, etc. Sturdy, lightweight, with 6 x 2 solid rubber, roller-bearing wheels. Fully guaranteed. Nationally advertised at \$14.75. Now Factory-to-You only \$8.95 f.o.b. Cincinnati.

Orders 3 or more shipped prepaid.

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BUILD YOUR POWER TOOLS

WITH OUR GUARANTEED INDUSTRIAL POLY BALL BEARING ARBORS



New Departure Self Lubricating Bearings

10,000 R.P.M.



(No extra charge for left hand threads)

C4-1/2" Pictured

- B33—\$5.45 PP. C4-1/2x12 1/2 spindle, housing 2x8... \$7.95 PP.
- 5/8 x 4 1/2 Spindle C5-5/8x12 1/2 spindle, housing 2x8... \$8.45 PP.
- B15 Plain Spindle C6-3/4x12 1/2 spindle, housing 2 1/4x8... \$9.45 PP.
- \$3.95 PP. D8-1x17 1/2 spindle, housing 2 3/4x11... \$18.75 PP.

1 INCH BETWEEN WASHER AND COLLAR SHAPER ARBORS—Free literature on request.

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MAKE MONEY AT HOME

MAKE Greaseless Doughnuts at home. New amazing electric machine. You'll coin money selling to grocers, drug stores, cafes, hamburger stands. Low cost will surprise you. Experience unnecessary. Send for free recipes and plans.

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\$2.95 EACH

NOW! FILE YOUR OWN SAWS

Do expert saw filing at home. Precision filing easy without experience. Two simple adjustments. Keeps any hand saw extra sharp and true-cutting. Complete with file. Money back guarantee. Cash with order, prepaid. (COD postage extra.) Order today. \$2.95.

SPEEDCOR PRODUCTS, Dept. PM
512 N.E. 73 Ave., Portland 16, Oregon

Pioneers

Leaders

AIR RIFLES WITH SAFETY LOCK BENJAMIN AIR PISTOLS

SEND FOR FREE FOLDER OF LATEST MODELS TODAY

If you want a REAL GUN for PRACTICAL USE inside or outdoors, get a SAFE—CLEAN—ECONOMICAL—BENJAMIN with Adjustable Power and Amazing Accuracy. Use BENJAMIN H-C PELLETS for BEST RESULTS in all rifled models. WRITE AT ONCE.

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BUILD and repair 'em YOURSELF

with PEMCO wheels Unconditionally Guaranteed

COMPARE THESE REDUCED PRICES!

SEMI-PNEUMATIC—LOAD TESTED
SEND CHECK OR MONEY ORDER TODAY.

Size	Axle	Bearing	Price Ea.
6" x 1.50"	1/2"	Oilite	\$1.35
8" x 1.75"	5/8"	Ball	1.85
8" x 1.75"	5/8"	"	2.00
8" x 2.00"	1 1/8"	"	2.00
8" x 2.00"	5/8"	"	2.15
10" x 1.75"	1 1/2"	"	2.30
10" x 1.75"	5/8"	"	2.40
10" x 2.00"	1 1/2"	"	2.50
10" x 2.00"	5/8"	"	2.70

Postage Collect on delivery

DEALERS AND QUANTITY BUYERS—WRITE FOR SPECIAL PRICES!



PARAMOUNT ENGINEERING & MFG. CO.
1874 RAVINE ROAD, KALAMAZOO, MICHIGAN

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Pneumatic pressure sprays plastic-like Colorcrete to give enduring beauty and water-resistant values. Range of 30 gleaming colors; many textures. Easy to wash. Smartly modern. Write or wire today for Opportunity Portfolio.



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15 ESSENTIAL WORKSHOP OPERATIONS ON YOUR DRILL PRESS

Barron Precision Drill Press Tools and Accessories—Planers, Rotary and Drum Sanders, Auxiliary Tables, Hi-Speed Router Bits, Shaper Fences, Molding Cutters, Dovetail Cutters—a host of other useful drill press items give complete workshop facilities at 1/4 the cost. Over 200,000 Barron owners. Get the facts on these popular, versatile drill press tools today. Sold on 10 day money back guarantee.

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10^H PORTABLE POWER PLANT from any CAR or TRUCK

Line up with rear wheel, drive on to unit—that's all! Unfailing power where you want it—when you want it! No demounting, no jacking-up! Suitable for any belt-driven, power operation. **NEW, LOW PRICE! ACCESSORIES AVAILABLE:** Generator, Grinder, Centrifugal pump. Illustrated circular on request.

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ASPEGREN MFG. CO.
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Drive a **FORD** and **Feel** the DIFFERENCE!

FREE!
SAMPLE!

That **GLOWS IN THE DARK!**

AN EASY WAY TO MAKE BIG MONEY

Be the first to sell sensational luminous house numbers, light switch plates, wall protectors, cord pulls, novelties, etc. Also luminous pictures, statues, decals, and a host of religious, nursery and other objects **THAT GLOW IN THE DARK.** Sell on sight. Get into this new and growing industry. **ENORMOUS DEMAND... NO COMPETITION... BIG PROFITS.** Represent a large manufacturer, established over 35 years. Write **AT ONCE** for liberal **MONEY-MAKING** offer and **free sample** to show you how they **GLOW IN THE DARK.**
Madison Mills, 303 Fourth Ave., Dept. A-4. New York 10, N.Y.

CARBURETOR YELLO BOLE

REG. U. S. PAT. OFF.

Honey-treated

For the man with a sensitive tongue
CARBURETOR
cools your smoke,
makes it mild

\$2.50

1. Smoke from tobacco

2. Cool air is drawn in through Carburetor

3. Smoke is cooled by mixing with air from Carburetor

Cool air drawn through the patented* Carburetor keeps the bottom of the bowl dry, so there is never a "wet heel". Bowl is treated with honey, helps when "breaking-in" the pipe. A pipe that beginners can enjoy without having to accustom themselves to it. Ask for Carburetor Yello-Bole at dealers, \$2.50. Kaufmann Bros. & Bondy, Inc., Estab. 1851, 630 Fifth Avenue, New York 20.

*U. S. PAT. NO. 2,082,106



This picture of Honey Girl is displayed wherever Yello-Boles are sold.



Identify Yello-Bole pipes by the honey-seal in the bowl. It keeps the honey fresh.

SAY YOU SAW IT IN POPULAR MECHANICS

2 Pages of GROBAN'S WAR SURPLUS SPECIALS!

Model 202 **ARC WELDER**

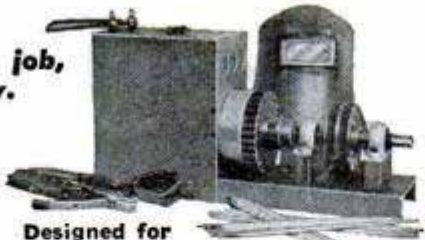
200 Amp.

For any welding job, light or heavy.

AN EXCELLENT BUY FOR:

- Farmers
- Factories
- Machine Shops
- Home Work
- Shops
- Servicemen
- Repairmen
- Ship yards
- Construction work
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WHEREVER YOU NEED WELDING



Designed for years of trouble-free service! Handles anything from light gauge sheet metal to 1/4" plate. Precision-engineered direct current ARC WELDER offered at a fraction of value. Can be mounted permanently or easily transported for portable use. Does the job where and when you need it.

War surplus generators, built by General Electric, Westinghouse, and Delco-Remy cost over \$300.00. Is lightweight; for continuous or intermittent work; has oversized grease-sealed ball bearings; no oiling, air-cooled commutator; 4 long life brushes; rheostat for easy control-reactor coil for even arc; handles 1/16 to 1/4" rods. Turn welder at 2500 R.P.M. from drive pulley of tractor, or a 7 1/2 H.P. electric motor or a 10 H.P. gas engine. Use one or two V-belts (on pulley). Continuous welding rating—200; intermittent rating—250 amps. AT A FRACTION OF VALUE . . . with double V pulley and instruction book . . . Ship. wt. 95 lbs. (ITEM #65)

\$99.50

F.O.B. Chicago

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of ass'td. F.O.B. Chicago welding rods. (ITEM #66) **\$10.50**

Be Prepared with an Auxiliary AC LIGHT PLANT GENERATOR

IDEAL FOR: • Home Lighting • Hunting Lodges • Stand-by electricity • Running all AC electrical appliances incl. fans, motors, electric razors, refrigerators, incubators, etc. Protection for emergencies to operate oil burner, stoker, freezer, water pump and lights. These units built to exacting Signal Corps specifications are the answer to your lighting needs. Drive it with a 2 1/2 H.P. gasoline engine at 1800 R.P.M. • 800 watts • 0-150 voltmeter with regulator • 110 volts-60 cycle, AC. Ship. wt. 60 lbs.



(ITEM #67). AN OUTSTANDING VALUE for **\$59.50** F.O.B. Chicago

PUMPS for every need

Brand New Gear Type INSECTICIDE PUMP



All Manganese Bronze for spraying D.D.T., 2-4D, Sulphur Compounds, etc. Pressures up to 150 lbs. to 14 gallons per minute—1500 R.P.M. Will not rust, pit, foul or freeze up. Use rubber hose inlet, pipe or tubing outlet. Equipped with 1/2" standard pipe thread port. Wt. 10 lbs. Dimen.: 8" x 5" x 6 1/2". Standard 1" manganese bronze shaft with keyway. U.S. Gov't. Acquisition Cost \$62.00 NOW ONLY (ITEM #50)

\$15.00 F.O.B. Chicago

CENTRIFUGAL PUMP BELT DRIVEN

Ready for use on any Liquid Pumping Need

- Use it for DRAINING BASEMENTS
- HOME WATER SYSTEMS
- IRRIGATION
- STOCK WATERING
- FIRE PROTECTION
- DRAINING PONDS, TANKS, etc.
- INDUSTRIAL PUMPING

A super value for all types of intermittent service in pumping large volumes of liquid in home, farm and industrial service. Ideal for home water systems, draining basements, fire protection, etc. On the farm for watering stock, draining ponds, sprinkling, etc. In shops and factories for all types of pumping service.



Brand New

MOVE LARGE VOLUME QUICKLY When operated at 1750 R.P.M. will pump 42 gallons per minute on a 23 foot head; at 3600 R.P.M. on 52 foot head will pump 83 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3/4" V belt pulley. Shaft rotates on sealed ball bearings with grease gun fitting. Has 1 1/2" threaded intake flange, two 1 inch outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines. GREATEST PUMP VALUE IN YEARS Shipping weight 23 lbs. You can't beat this value at anywhere near this price. Satisfaction guaranteed. Original Cost Approx. \$147.00. (ITEM #64)

\$29.75 F.O.B. Chicago

PNEUMATIC SPECIALS!

HANNA AIR CYLINDER



Brand New Used for heavy duty industrial applications on shop air lines or with low pressure systems. With 100 lbs. of air pressure, will deliver 1900 lbs. pressure at the ram shaft. All steel construction. Adjustable cushions at both ends of cylinder. Shaft dia. 1 1/2". Foot mounting with clevis on ram shaft. 2 5/8" double-acting stroke; 5" bore, 40 1/2" overall length closed, 7" overall width. 89 1/2 lbs. net wt. Gov't. acq. cost \$101.85.

AN EXCELLENT VALUE for **\$39.50** (ITEM #61) F.O.B. Chicago

Brand New PNEUMATIC COMPRESSION RIVETER

MODEL CP 625-T8112



Made by Chicago Pneumatic Tool Co. Equipped with built-in control valves for use with cable operated remote control. Has 6" dia. actuating cylinder with right angle head. Base is 27 1/2" x 4". Height 40". Ram assembly adjustable for height. Approx. wt. 1300 lbs. A \$1200.00 value. (ITEM #62) NOW

\$169.50 F.O.B. Chicago

ROSS 4-Way Foot Operated AIR VALVE Model 398



BRAND NEW. For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for 1/2" pipe. Dimensions of valve body: 7 3/4" L x 4 1/4" W x 7 1/2" H. Net wt. 28 lbs. A \$64.00 value for only

\$19.50 F.O.B. Chicago

LOGAN 4-Way Foot Operated AIR VALVE—Model 6520



BRAND NEW. For double acting pneumatic devices. Fine for operating air vises, presses, air machinery of many types. Heavy cast construction. Threaded for 1/2" pipe. Dimensions of valve body: 8 1/2" L x 5 3/4" W x 7 1/2" H. Net Wt. 28 lbs. Gov't acquisition cost \$42.00. AN OUTSTANDING BUY AT

\$15.00 F.O.B. Chicago

G-1 STAINLESS TANK



Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light, 450 lbs. P.S.I. Aviators Breathing Oxygen bottles, type G1. 2100 cu. in. (approx. 9 gallons) int. vol. 24" x 12". 1/4" threaded openings at ea. end. Wt. 19 lbs. .051" thick. (ITEM #63)

\$4.95 F.O.B. Chicago

Low Priced-High Quality

MINIATURE High Speed ELECTRIC MOTOR

IDEAL FOR MODEL BUILDERS, MODEL RAILROADERS, EXPERIMENTERS, HOBBYISTS. AC or DC. Reversible, speed may be regulated by varying voltage. Has miniature Klaxon thermostatic switch. All connections are external and accessible. Has 3 mounting feet for easy installation. Double-end ball bearing supported shaft with small gear on one end. Die-cast housing with laminated field. Overall Dimen.: 3 1/4" long x 2 3/4" wide x 1 3/8" high. Net wt. 12 oz. A \$22.00 value. (ITEM #5)



Brand New

\$2.95 postpaid

BRAND NEW GENERAL ELECTRIC 8" SEALED BEAM FLOODLIGHTS 300 Watts, 110 Volts, A.C. - D.C.

Has countless uses for: • Homes • Garages • Workshops • Driveways • Outdoor advertising • Displays • Beach lighting • Private air ports • Photography Wherever you need flood-lighting! Bought by the U. S. Army for signal use. This is the greatest surplus bargain ever offered. Lens, reflector and electrode vacuum sealed in one dustproof, air tight unit. 300 Watts, 110 Volts. Weighs only 2 1/2 lbs. List price \$10.50. A TREMENDOUS VALUE for (ITEM #8) 12 or more \$2.50 ea. postpaid



\$2.75 EA.

SCREW JACK

Ideal for raising, lowering, leveling and adjusting. Use on tables, machine tools, toys, etc. Overall length closed 9 inches, open 14 inches. Worm gear box with 54 to 1 reduction, with double end drive shaft. Use either end or both. Extension screw shaft 30 to 1 reduction. \$35.00 value. AN OUTSTANDING BUY. (ITEM #45)



Brand New

\$3.95 postpaid

All Merchandise Brand New - Order Today - Satisfaction Guaranteed!

SHOP by MAIL - SAVE at GROBAN'S - Buy Direct from ad!

Hydraulic Cylinders-Air or Oil

- ITEM #4**-Double action, 1" bore, 3" stroke, will lift 770 lbs. in 1/10 of a second using Logan Pump. All steel barrel. Ideal for controls, door openers, positioning, etc. **\$4.95**
An \$18.00 value. postpaid
- ITEM #33**-Double action, 1 1/2" bore, 5" stroke, will lift 1760 lbs. in one second with Logan Pump. Wt. 3 lbs. **\$8.95**
A \$35.00 value. postpaid
- ITEM #32**-Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. in one second with Logan Pump. Wt. 4 lbs. **\$10.95**
A \$45.00 value. postpaid
- ITEM #16**-Use these cylinders on farm trucks, bulldozers, hay lifts, manure loaders, etc. Double action, 1 1/2" bore, 27" stroke, (will lift 1760 lbs. in 2 seconds with Logan Pump). Wt. 8 lbs. A \$55.00 hydraulic cylinder value for **\$12.95**
only. postpaid
- ITEM #17**-Double action, 2 3/4" bore, 8" stroke. (Will lift 4400 lbs. in one second with Logan Pump). Will withstand 1500 P.S.I. against wall. Wt. 7 lbs. **\$14.50**
A \$65.00 value. postpaid

Use hydraulics on arbor presses, hydraulic presses, hay lifts, manure loaders, lift trucks—push or pull, tilt or turn, press or squeeze, open or close, lift or lower—and other hydraulic and industrial applications. Use with either air or oil . . . of finest precision workmanship.



- ITEM #20**-Double action 2 3/4" bore, 4" stroke, two-way solid 3/4" alloy steel shaft (will lift 4400 lbs. in one second with Logan Pump). A \$73.00 value. **\$16.50**
postpaid
- ITEM #15**-Double action, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder, will lift up to 12,000 lbs. (7000 lbs. in 3 seconds with Logan Pump). Complete with fittings. Wt. 12 lbs. **\$19.50**
A \$78.00 value. postpaid
- ITEM #31**-Double action, 3 1/2" bore, 11" stroke. (Will lift 9600 lbs. in 7 seconds using Logan Pump.) Complete with fittings. Wt. 15 lbs. A \$92.00 value. **\$22.50**
postpaid
- ITEM #6**-Double action, 3" bore, 23" stroke, hydraulic cylinder will lift 7070 lbs. in 5 1/2 seconds using Logan Hydraulic Pump. Especially suited for farm and construction machinery. Clevis mounting for easy use. Wt. 22 lbs. A \$145.00 value. **\$27.50**
F.O.B. Chicago
- HI-PRESSURE FITTINGS** for cylinders and valves available at 35c ea. for 3/4" pipe and 50c ea. for 1/2" pipe.

HYDRAULIC CONTROL VALVES



LOGAN Heavy Duty Oil HYDRAULIC CONTROL VALVE

BRAND NEW control valve with built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, 3/4" pipe thread connections. Overall dimen.: 12 1/2" H x 8 1/2" D x 8" W. Ship. Wt. 17 lbs. Govt. Acquisition Cost over \$100.00. **\$21.95**
(ITEM #37) AN EXCELLENT BUY FOR. F.O.B. Chicago



Brand New

- ITEM #24**-Four way control valve for use with double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Brand New. Ship. Wt. 4 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. Brand New. Ship. Wt. 6 lbs. A \$60.00 Value. **\$10.95**
postpaid
- ITEM #28**-A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Ship Wt. 8 lbs. A \$75.00 value. **\$14.95**
postpaid

HYDRAULIC PUMPS

LOGAN Heavy Duty Oil HYDRAULIC PUMP

BRAND NEW . . . for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 H.P. Has 1/2" pipe thread inlet, 3/4" pipe thread 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)



HAND HYDRAULIC PUMP Brand New

Used for hydraulic jacks, presses, hoists and other hydraulic applications. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure. 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. (Item #11) **\$8.95**
postpaid

Vickers MF9 Hydraulic PUMP or MOTOR

complete with mounting kit ready to install **\$19.90**
\$75.00 value POST-PAID

Pump is compact, powerful, rated 1,000 P.S.I., .507 cu. in. per revolution. 8 gal. per min. at 3750 RPM. Change rotation by reversing flow. Delivers up to 6 H.P. Requires 1/3 to 6 H.P. to drive directly or by pulley. **BRAND NEW.** Mounting kit has been especially designed to provide maximum utility and ease of mounting MF Series Vickers Pumps. Brackets are constructed of heavy steel plate; shaft is made of 1/2" steel with one end splined to fit pump; other end of shaft has machined flat for mounting a standard pulley with 1/2" hole. Shaft runs in oilite bronze bearings. **PUMP ONLY (ITEM #18) \$14.95 postpaid**
MOUNTING KIT ONLY (ITEM #38) \$ 4.95 postpaid
BOTH AS COMPLETE UNIT (ITEM #39) \$19.90 postpaid

Brand New 18" Wire Spoke WHEEL

For use on motorcycle or adaptable for midget cars, trailers, small trucks, any wheeled vehicle. With bearings, races and gear. Takes 18" tire. Wt. 19 lbs. A REAL VALUE at. **\$3.95**
ea. (ITEM #57) F.O.B. Chicago

FREE: Write for free copy of our 40 page catalog including Hydraulic Manual featuring diagrams, photographs and instructions. Catalog lists excellent war surplus values: pumps, valves, hydraulics, lights, motors, etc.

Excellent Hydraulic VALUES!

BRAND NEW Logan Double-Action Pneumatic — Hydraulic PRESS

\$300.00 value offered at a fraction of original cost

Using air or oil, this device is ideal as a punch press, vise, arbor press, etc. An excellent tool for industrial and shop use. Use 150 lbs. of air pressure or 250 lbs. of oil pressure. Cushioned double action "Logan" Model AC ram, 6" bore and 6" stroke. Capable of up to 4200 lbs. of pressure using air. Has 3" throat. Lubricated ribs provide perfect alignment. Has adjustable work space. Hardened alloy steel piston rod 1" diameter. Frame constructed of cast steel with 3/4" base plate. Manufactured by Sipp-Eastwood Co. Unit is 49" high. Base is 9 1/2" wide by 18" deep. Wt. approx. 360 lbs. AN OUTSTANDING BUY at. **\$79.50**
(ITEM #7) F.O.B. Chicago



- ADJUSTABLE RELIEF VALVE.** (ITEM #34) **\$2.95** postpaid
- HYDRAULIC FLUID.** (ITEM #53.) Per gallon F.O.B. Chicago **\$1.75**
- 10 ft. length of Hi-Pressure HYDRAULIC HOSE,** with 1/4" female pipe thread fittings. (ITEM #27). F.O.B. Chicago **\$3.95**
- Brand New HYDRAULIC TANK,** 3 gallon capacity with oil-indicator cap. 4" x 12" x 13 1/2". Ship. wt. 13 lbs. NOW AT THIS **\$4.95**
LOWEST PRICE. (ITEM #58.) F.O.B. Chicago.

BRAND NEW FIN-COOLED HIGH PRESSURE AIR COMPRESSOR

For pneumatic tools, filling hi-pressure vessels, paint spraying, insecticide vaporizing and other uses. Rated 450 P.S.I. at 1200 R.P.M. Used on Packard Merlin Engine, this aluminum air pump with air filter intake weighs only 4 1/2 lbs. 9" x 5" x 3 1/2". Gov't. Acq. Cost \$185.00. NOW ONLY **\$15.00**
(ITEM #56) postpaid



GENERAL ELECTRIC DC GENERATOR

For Farm—Home—Factory Welding—Light Plants

Delivers 30 volts, 267 amps. at 4000 RPM. Rated 8 Kilowatts, ball-bearing supported. Fan cooled armature. Drive it off of farm tractor, gas engine of 10 H.P. or more. Ship. wt. 65 lbs. U. S. Government acquisition cost—\$277.00. **\$28.50** F.O.B. Chicago (ITEM #51)



SHOCK ABSORBERS

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low-priced
electric
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Complete

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Built-In-Head Motor and Compressor Unit



Now! An electric sprayer as easy to handle as a brush—and twice as fast! Sprays household enamel, lacquer, varnish, shellac, light oils and insecticides. No extras to buy! 25 oz. jar. 8 ft. cord. Mail the coupon for full information.



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vibro-sprayer
Pat. Applied For
Just Plug Into Any 110 Volt
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10% discount on 2 or more tires if you send this ad with order

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All good tires with a
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550-16 \$3.54	30-5 \$ 7.98	1200-20 \$18.78
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Will fit 650 x 20	700 x 20 (8 & 10 ply)	34 x 7 (8 & 10 ply)
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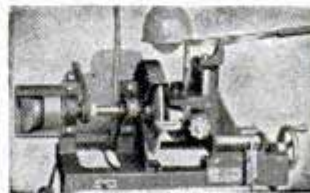
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DUAL OR SINGLE STRAIGHT-THRU

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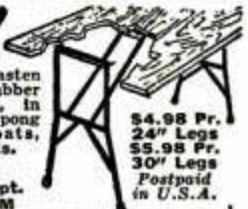


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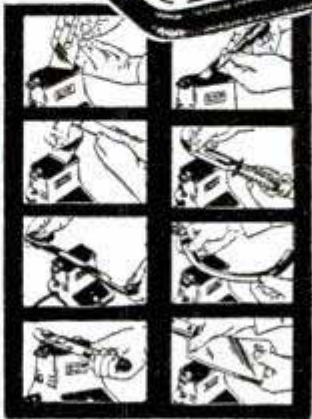
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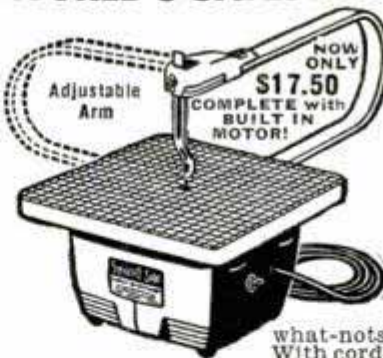
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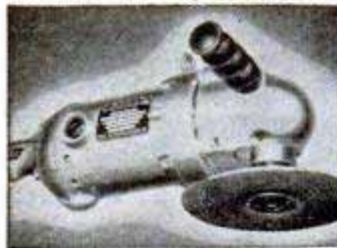
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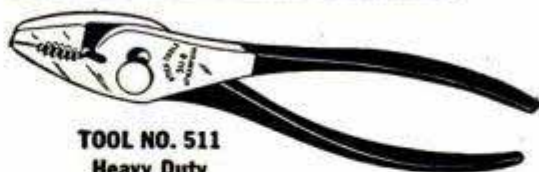
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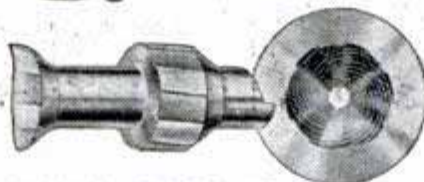
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With 2½ hp air cooled gas engine. Makes cutting lawns a pleasure



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Enclosed \$4.95 for one set of Warren Washers, postpaid. My arbor size is _____

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LINCOLN ARC WELDER of Industrial Construction

- Plugs into the light socket.
- Easy to weld, cut, braze or solder.
- Approved by Underwriters Laboratories.
- Built by The Lincoln Electric Company, world leader in arc welding.



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- Ship me the "Lincwelder 60" with accessories \$45.00
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Engineers All Metal Army Type Hand-Sighting

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20 POWER FOUNTAIN PEN TYPE
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40 POWER,

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- 5" Disc Wheel $\frac{5}{8}$ " Tire $\frac{5}{16}$ " or $\frac{3}{8}$ " Sleeve 30c ea.
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All bronze corrosion resistant gear pump. Lifts water 25'. Delivers 1020 gal. per min. at 1200 RPM. Develops 110 lbs. pressure or 250' head. Self locking packing nuts, drain cock, reversible head. Will pump brine, salt water, oil, vinegar, gasoline, etc. Dimensions: 10 $\frac{1}{2}$ " x 7 $\frac{1}{2}$ " x 5 $\frac{1}{2}$ " W. Base holes 1 $\frac{3}{4}$ " x 3". Shaft 1 $\frac{1}{8}$ " x 1 $\frac{1}{8}$ " x 1" inlet & outlet. Wt. 24 lbs. Mfg. by Sherwood Brass Works. All pumps belt driven. All bronze gear pump with 8" V pulley.
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\$80 value
Same pump as above, with motors, (electric). Stock #549.
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The MORE HP the more PRESSURE.

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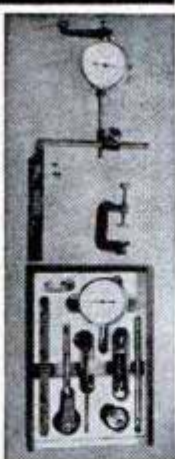
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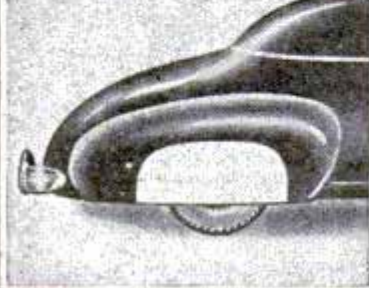
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FOR FORD, CHEV., MERC., PLYM., DeSOTO, CHRY., DODGE, KAISER-FRAZER AND BUICK

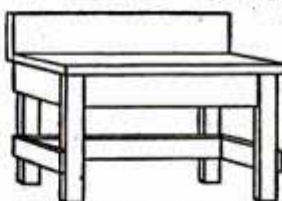


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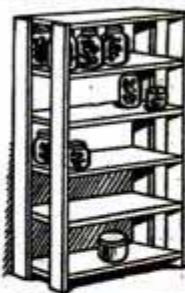
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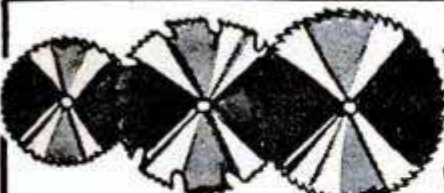
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Rip and Cross cut Blades, same price as combination, 1/2", 5/8", 3/4" Bores. Allow 15c per blade for postage and handling.

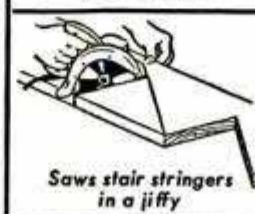
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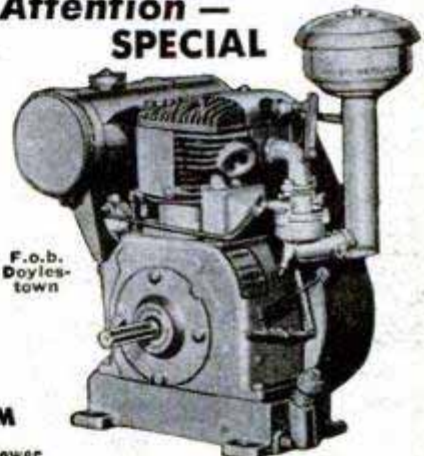
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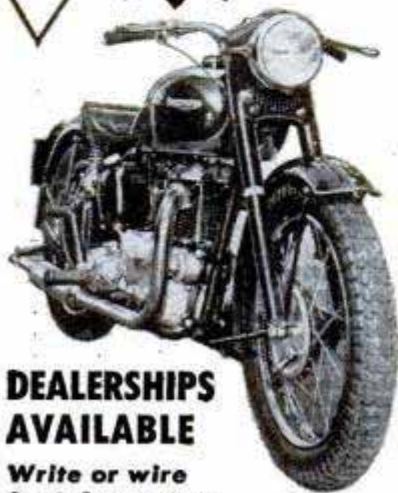
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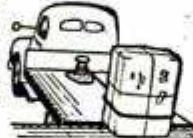
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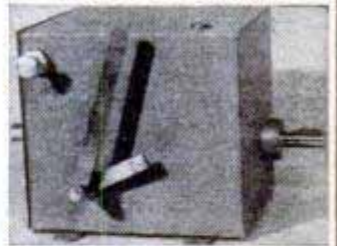
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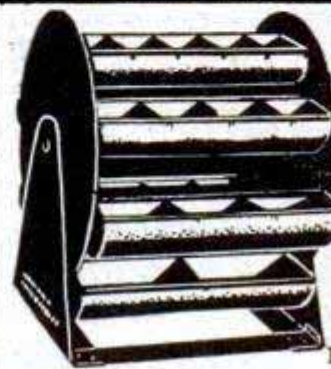
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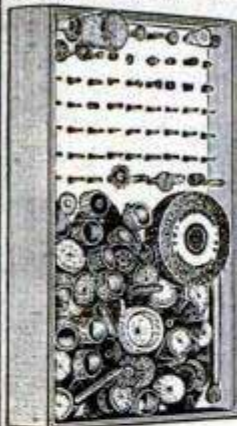
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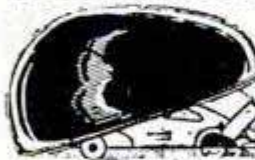
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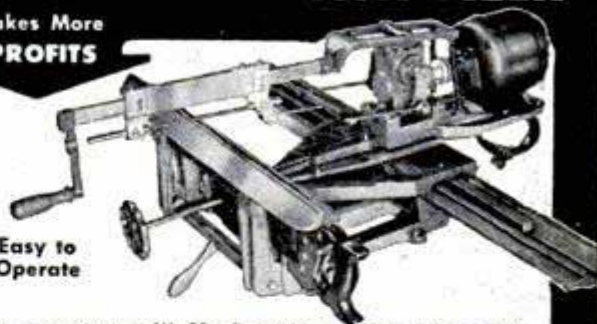
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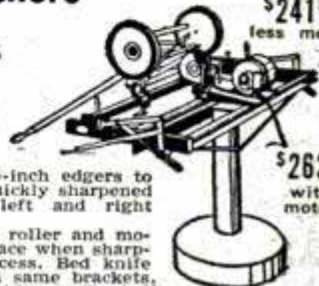
GOLF COURSES • PARKS
101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang • 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed.

All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist blades.

Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets. Grinding head rides on five ball bearing races. Easy to operate.

Also sharpens chisels, joiner knives, planer blades, Big profit maker. Own your own business. Send Today for FREE Illustrated Bulletin No. 10-C



PRICE \$241.50

less motor

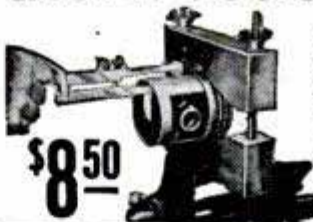
\$263.00 with motor

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Immediate Delivery

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\$8.50

A bargain for mechanics

Sealed Power Piston Resizer equals work of machines costing hundreds of dollars. Simple to operate. Results permanent. Thousands now in use. Uses swaging action inside piston skirt, compressing action outside. Resizes steel, cast iron, aluminum pistons. Wood vice included. Satisfaction guaranteed. Send \$8.50, check or M. O. to Sealed Power Corporation, Muskegon 61, Mich.

Say You Saw It in POPULAR MECHANICS

WESTINGHOUSE

Air Compressor

WITH 20 FT. AIR HOSE
AND
DETACHABLE TIRE CHUCK **\$22.95**

2-CYLINDER PISTON TYPE

Spray paint your buildings, cars, trucks, machinery, etc.

Inflate tires, grease machinery, spray insecticides.

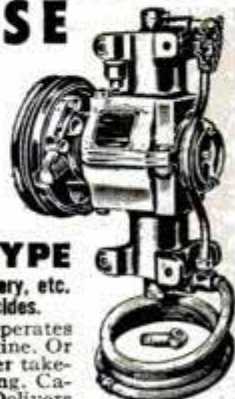
Built to sell for 3 times our low price. Operates from 1/4 h.p. motor or equivalent gas engine. Or may be run from truck, tractor, jeep power take-off or fan belt; designed for easy mounting. Capacity up to 6 1/2 cu. ft. 100 lb. pressure. Delivers filtered "Oil free air". Air output double that of similar compressors. Rugged, super-efficient, portable.

Special \$22.95 price F.O.B. Chicago area includes compressor, 20 ft. double braid heavy duty air hose, Schrader Air Chuck. You save over 1/2. Act now! Money back guarantee. Send check or money order to:

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Read What Others Are DOING!

"Enclosed you will find 56 orders representing 9½ hours' work on Monday and Tuesday."

"Enclosed are twelve orders secured after supper this p.m."

Housewives are Enthusiastic

Everyone that sees this outstanding Cell-U-Mop immediately wants one . . . That's the reason why our distributors are so successful . . . You also have the advantage of our other QUICK SELLING PRODUCTS that step up your Volume Sales and Profits.

Hands Never Touch the Water—Can be put in Boiling Water. Housewives Like It.

48" Long Handle

Sales QUICK, EASY Every Locality

SALES ARE EVERYWHERE . . . Sells quick to Taverns, Clubs, Hotels, Hospitals, Stores, Restaurants, Large and Small Buildings and the Homes . . . Scores can be sold on a single street . . . Note the Drain Bracket in the illustration . . . This squeezes out the water so thoroughly that HANDS NEVER TOUCH THE WATER . . . Makes no difference what you ever sold, you will like this proposition . . . Your name on a Post Card will bring you FREE PARTICULARS. GET CHOICE TERRITORY NOW.

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Gets down under and around for MOPPING, DUSTING or WASHING

DOES THE WORK OF 6 TOOLS IN 1

Cell-U-Mop is made of DuPont Cellulose Sponge. It is not rubber.

Holds 20 times its weight in water.



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 ¼ H.P. 1725 RPM. Fob. **\$11.95**
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 Westinghouse . . . Leland . . . G.E. & Sunbeam, etc. ½-110V. A.C. 60 cy., 1 phase, 1750 RPM. Capacitor & Repulsion Induction types. Like New. Fully Guaranteed. **\$19.75**

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BUILD YOUR OWN Window Fan, Attic Fan or Night Air Cooler . . . All parts Torrington; Deep Pitch Blade. Shaft Bearings, Pulleys, Belt, etc. #F-20. \$12.50
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16" 3 Speed Oscillating Fans . . . Gen'l Electric, Robbins & Myers Makes; Like New . . . List Price \$45.00. Only \$22.50 Fob. Same As Above.
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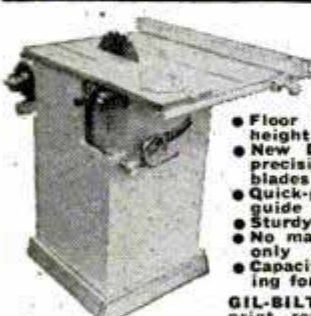
SAVE UP TO 90%—You can build, using read plans, all kinds of machines, for home, farm or shop—scooters, portable sawmills, metal working machines, concrete machinery of all kinds, printing equipment, woodworking machines, midget autos, dish washers, farm equipment, freezers, tractors.

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• 27x28 in. table stays level. Blade tilts full 45 degrees
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SAVE \$50 OR MORE

- Floor model, 34 in. table height
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Returns in 10 days for full refund if not satisfied. (Prices include postage up to 600 miles.)

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DRAINS CELLARS, WASH TRAYS CIRCULATES OIL

Pumps 1800 GPH 300 gal. 30' high, use ¼ to ½ HP motor. Will not clog. **\$6.50**

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Complete Step-by-Step Directions for making Every Type of Furniture —Including Built-in Conveniences and Home-remodeling Jobs

Here, in a great new handbook is everything you want to know about furniture making; cabinet work, repair jobs, and remodeling projects. Accurate drawings and practical instructions show you all the tricks of the trade and the real professional methods of repairing, refinishing and reupholstering worn or broken pieces. And there are complete directions for every type of home-remodeling project. Every job is explained in careful detail by a master craftsman who gives you authentic instructions on exactly how to carry out each step in the work—from obtaining the materials to the final finishing operations; staining, varnishing, waxing, etc.

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BIG 10" POWER SAW



\$9.95
LESS GUARD AND WOOD

POST PAID ANYWHERE IN U.S.A.

FULL \$9.95 REFUND IF NOT SATISFIED WITHIN 10 DAYS



ASSEMBLE IT YOURSELF WITH SIMPLE HOUSEHOLD TOOLS!

TABLE 24" x 20" • TILTS TO 45°
CUTS 0" TO 3/4" DEEP • TAKES 10" BLADE

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Here's a real time and temper saving wrench that solves the problem of getting at those "hard-to-reach" nuts on radios, electric appliances, automobile bodies, other sheet metal products.

If you've ever fumbled a nut in the tight spots (and who hasn't!), here's your answer. No more unnecessary disassembly of confining parts in working areas either! This wrench slips on your finger and lets you get right at those nuts and bolts with your finger tip. Strong. Sturdy. Flanges adjust for snug fit on any size finger.

For a set of 4 wrenches that fit the 4 most popular hex nut sizes. — 1/4", 5/16", 11/32", 3/8" across the face.

Ask your hardware dealer. If he can't supply you, order direct. Send 39¢ plus 1¢ for postage—coin, check or money order. No C.O.D.'s, please.



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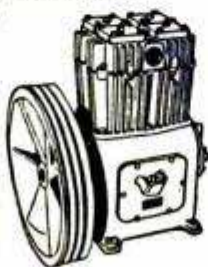
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F. E. REDFIELD
31 Colonial Drive, Dumont, N.J.

"Wellworth" COMPRESSORS SINGLE-STAGE DUPLEX CYLINDER

Build your own compressor unit. Sizes 12, 17.3, 30 and 45.7 c.f.m. at 100 lbs. per sq. inch. Timken bearings, splash lubrication, automatic unloading and idling. Built-in loadless starting for automatic stop and start operation, or constant speed suction unloader for continuous operation.

Size	C.F.M.	Price	Shp. Wt.	Motor Required
2 1/2 x 2 1/2	12	\$102.05	140	2 HP
3 x 3	17.3	113.75	160	3 HP
3 1/2 x 3	30	153.85	210	5 HP
4 x 3 1/2	45.7	246.55	310	7 1/2 HP

Two Stage Compressors for 200 lbs. Pressure				
3 x 4 1/4	2 1/2	5	110.35	140 1 HP
3 1/2 x 4 1/4	2 1/2	10	124.45	160 2 HP
4 x 4 1/4	3	19.8	152.60	235 5 HP
4 1/2 x 4 1/4	3 1/2	30	302.55	310 7 1/2 HP
5 1/4 x 4 1/4	3 1/2	36	328.00	350 10 HP
7 1/2 x 4 1/4	4	78	653.10	575 15 HP
7 1/2 x 4 1/4	4	92	653.10	575 20 HP



State if desired for automatic stop and start or continuous operation with constant speed unloader. Belts, pulleys, motors and gasoline engines available. Prices upon request.

WELLWORTH TRADING CO. • 1831 S. State St. • Dept. D-9 • Chicago 16, Ill.

G.E. MOTORS

• 1/2 hp • 60 cycles A.C.
• 115 volts • 1725 rpm

This G.E. ball-bearing motor is especially suited for home workshop use on power saws, grinders, buffers, edgers, sanders, joiners, planers, lathes, drill presses, paint sprayers and many similar devices. It has a double shaft and comes complete with switch cord and plug. Thermal overload. Order yours now. Postpaid in \$29.95 U.S.A.



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LINEMAN'S TOOL & SAFETY BELT
Brand new web type belts in the original package. ONLY \$3.95

POLE AND TREE CLIMBERS
Without straps ONLY \$1.50
Used, good Per Pair

SEND 10c for our jam-packed catalog! Enclose full amount with order.

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BARGAIN!

HIGH SPEED ROTARY FILES

Set of 5 Assorted.....\$ 2.00
" " 10 " 3.75
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" " 30 " 10.00
1/4" shank



WE BUY SURPLUS TOOLS

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SHARPEN CIRCULAR SAWS LIKE AN EXPERT



No experience needed. Two simple adjustments. Gets hollow-ground, cross-cut or combination saw blades true and sharp. Fits 6" to 12" blades with 1/2" to 1 1/16" centers. Includes file and complete instructions. \$6.95 postpaid. (Check or money order) C.O.D.s postage extra. Guaranteed—Money back if not satisfied after 10 day trial. A money maker for fix-it shops. Soon pays for itself. Order today.

\$6.25 SURE SHARP MFG. CO., Dept. M-99, P. O. Box 24, Santa Ana, Calif.

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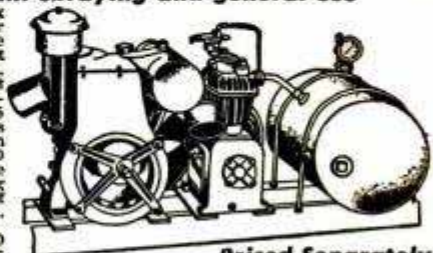
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"WELLWORTH" TWO STAGE COMPRESSOR UNIT

Ideal for paint spraying and general use

Compressor: Size 3 1/2 x 2 x 2 1/2 with unloader for continuous pressure service; displacement 10 C.F.M. at 200 lbs. pressure. Unloader set at 150 to 165 lbs. Compressor idles when 165 lbs. is reached, starts pumping again when pressure is down to 150 lbs. Wisconsin Gasoline air cooled, easy starting engine, 3 1/2 H.P. at 1800 R.P.M. 4.1 H.P. at 2400.



Priced Separately

Air Tank: A.S.M.E. 200 lbs. working pressure; size 16" x 20" with safety valve, drain, two 3/8" globe valves and pressure gauge. 2 "V" belts and pulley. 40 ft. air hose and fittings. Reg. price \$409 less mounting base Shipping wt. 350 lbs.

Compressor with unloader, wt. 160 lbs. \$124.00
Engine only, wt. 90 lbs. 87.50
Tank only, wt. 110 lbs. 52.50

Price F.O.B. Chicago. Sold on money back guarantee. Send check or money order today. Prompt shipment. Catalog free.

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"Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

2-CYLINDER PISTON TYPE

Operates with 1/2 H.P. Motor or equivalent gas engine.

Complete outfit consisting of compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. Complete outfit of 7 items..... ONLY

\$29.95
SHIPPING
WT.
40 LBS.

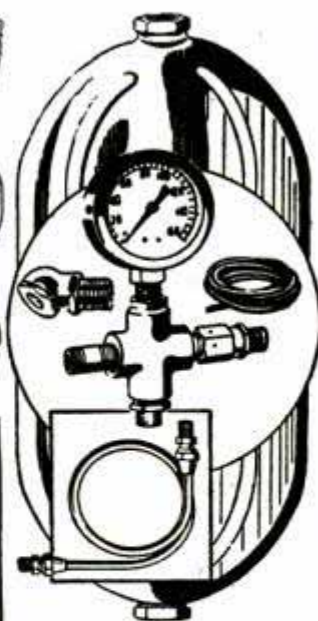
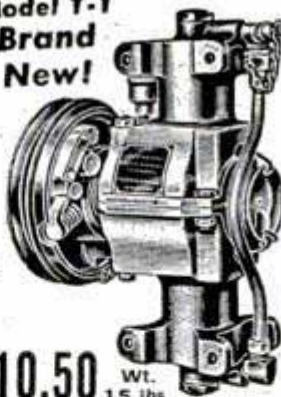
COMPRESSOR SEPARATELY..... **\$21.50**

IDEAL for HOME • FARM • FACTORY
Wherever Compressed Air is Needed

For spraying paints, insecticides, etc.; inflating tires, operating air tools and many more uses. Automatic clutch makes it suitable for mounting and operating from trucks, tractors, etc. Instructions furnished. A fortunate purchase from the government enables us to offer you this amazing buy. All brand new equipment. Replacement parts available.

This low price is but a fraction of the price of manufacturer and of leading mail order houses.

Model T-1
Brand
New!



Equipment less compressor.... **\$10.50** Wt. 15 lbs.

THE COMPRESSOR

Piston Type, 2-cylinder, 2 inch bore, 1 1/4" Stroke Ball Bearing, 3.27 C.F.M. at 600 R.P.M. Capacity up to 6.54 C.F.M. Suggested operating pressure 75 P.S.I. DIMENSIONS: 9" wide, 11 1/2" high, 6 3/4" deep. Wt. 26 lbs.

TANK and ACCESSORIES

6" x 24" stainless steel tank suitable for 150 lb. pressure. Two 1/2" openings. Air gauge, pop valve, air chuck, 20 ft. hose, Copper tubing and fittings as shown. Wt. 15 lbs.

PORTABLE SPRAY OUTFIT

Best Buy of the Year

1/4 H.P. Heavy
Duty External
Atomizing Gun



None Better
at Double
This Price

Paint Sprayer mounted on 6 x 24 inch tank, 1/4 H.P. 110 V. 60 cy. Heavy duty motor with overload relay, 10 ft. cord and plug, V Belt drive, Piston type Compressor with 2 Compression rings, 1 oil ring, 2 inch Bore, 1 3/4 inch stroke, displacement 2.88 C.F.M. at 60 lbs. pressure, Safety Valve. Gun external atomizing. Flat and round spray, quart cup; maintains 35 to 40 lbs. working pressure. Oil and water extractor, 1 air gauge, 20 ft. heavy duty 2-braid air hose with leak proof fittings, complete with carrying handle. Net weight 54 lbs., ship. wt. 60 lbs.....

\$57.50

Outfit less motor. Wt. 30 lbs..... **\$47.50**
Compressor only. Wt. 14 lbs..... **17.50**
Spray gun and 20 ft. hose. Wt. 7 lbs... **12.95**

140 CFM "WELLWORTH" BLOWER



Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 5 1/2 x 4" mounting flange with 2 1/2" square discharge. 3 1/2" dia. blower wheel powered by direct-connected 1/15 H.P., 110V., 60C., A.C. motor with conduit box and 20" leads. 7 1/2" wide less flange by 7 1/4" H. x 6 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 6 lbs.....

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USED, GUARANTEED LIKE NEW.



CHICAGO PNEUMATIC RIVETER & CHIPPING HAMMER

CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 8 lbs. List price \$73.00.

SPECIAL PRICE..... **\$14.50**

Same as above, brand new..... **\$22.50**

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5/32" Rivet.....

Chicago Pneumatic Lever Type AIR DRILL



With 1/4" Jacob Chuck. Wt. 2 lbs. List price **\$17.50** \$55.00. Only.....



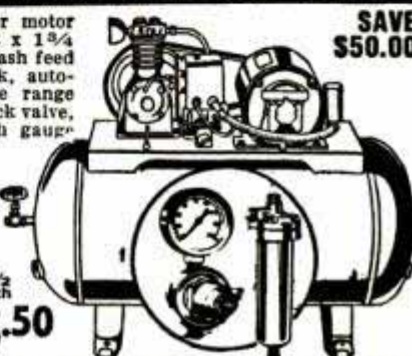
Ingersoll Rand AIR DRILL
With 1/4" Jacob Chuck. Wt. 2 lbs. List price **\$17.50** \$55.00. Only.....

AUTOMATIC COMPRESSOR UNIT

1/3 H.P. heavy duty capacitor motor AC 110/220 volt 60 cycle, 2 x 1 3/4 inch piston type compressor, splash feed lubrication, 12 x 24 inch tank, automatic pressure switch, pressure range 100 to 125 lbs., CFM 2.2, check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Shipping wt. 90 lbs.

Special **\$79.50**
Price

Same unit as above with 1/2 H.P. motor, furnished with 13" x 24" tank. CFM 2.8 at 125 lb. pressure. Shipping wt. 125 lbs..... **\$98.50**



SAVE **\$50.00**

300 GAL. COOLANT PUMP

A HEAVY-DUTY PUMP AT 40% LESS

You pay less and get a larger, higher pressure, higher capacity, heavy duty coolant-type, recirculating pump. Also extensively used on evaporative coolers. Will deliver 60 gal. per hr. at 8 ft. head and 300 GPH at no head. Heavy duty 1/30 H.P. totally enclosed, 110V., 60C. motor with long life oiling. Noncorrosive shaft and pump. 10 1/2" high, 3/8" I.P.T. Ship. wt. 12 lbs.

\$19.50



AUTOMATIC PRESSURE SWITCH WITH UNLOADER

Double pole, with 2 way release valve. Set at 125 to 150 lbs. pressure. Wt. 4 lbs. Only..... **\$10.25**

Same without unloader..... **\$7.50**

Switch—20 to 40 lb. adjustable to 80 lbs. For air or water **\$5.50**



"Wellworth" Check Valves



Dash pot type Quiet operating
1/4" valve **\$2.75**
1/2" valve **\$4.50**

"Wellworth" 1/4" REDUCING VALVE & GAUGE

Oil resistant, pressure 0-to-200 lb. Reduced pressure 0-to-75 lb.; 3 outlets 1/4". **\$5.75** Wt. 2 lbs.



Reduced Price
Only **\$14.50**

6 FT. STOW FLEXIBLE SHAFT

Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor, rubber covered housing; for 1/2" motor shaft; for 1/2" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$29.00 Value, **\$14.50**. Wt. 8 lbs.

1/30 H.P. MOTOR BARGAIN

12 volt D.C. motor. 2450 R.P.M. 2.0 amps, 1/4" shaft. Size overall 3" x 4". Weight 3 lbs. USE AS 6 VOLT GENERATOR. **\$2.75** ea.



QUANTITY PRICES
4 for... **\$7.50** 24 for... **\$36.00** 100 for... **\$135.00**

Prices f.o.b. Chicago. Immediate delivery. All items sold on money back guarantee. Send check or money order today. Catalog FREE.

WELLWORTH TRADING CO.
1831 S. STATE ST. DEPT. D-9 CHICAGO 16, ILL.

**NOW! USE YOUR ELECTRIC DRILL for
POLISHING!
GRINDING!
SANDING!**

**Work on curved
or flat
surfaces**

You can use it to fix bodies, fenders; wax; polish cars, floors, linoleum; re-finish furniture, wood, metal surfaces; smooth, reduce welds, etc.

**FITS ANY 1/4 IN. CHUCK or DRILL,
FLEXIBLE SHAFT, MOTOR, etc.**

Designed and engineered for high speed sanding, polishing, finishing, etc. Full 6 1/2 inch rubber face plate bends into curved surface. New clamp arrangement mounts sanding discs instantly—no cementing. Draw-string lamb's wool bonnet slips on for high speed polishing, finishing, etc. Outfit includes 6 1/2" flexible rubber disc with 1/4" metal shank, fibre backed sanding disc and heavy lamb's wool polisher. Equals \$75.00 outfits in performance. You'll find hundreds of time saving uses for it. Fully guaranteed. Shp. wgt. 2 lbs. F.O.B. Chicago. Shipment in U.S.A. only.

6 1/2 in. heavy \$4.95 5 in. size for light \$2.49
duty type. Each hand drills. Each

At your favorite hardware store or direct.

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Bends To Take Curved Surfaces



On Flat Surface



On Curved Surface



Polishes

War Surplus—DYNAMOTORS



D-2 Converts to 110 V AC in ten minutes, diagram included, contains integral gear box having four 1/4" drive shafts turning simultaneously at the following speeds:
4000 RPM—Grinders, buffers, flexible shaft tools, etc.
150 RPM—Wrapping fishing rods, slow speed tools.

Adv. Disp. Beams, A Thousand Other Uses Around the Work Shop. ONLY \$5.95

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6 V. MOTOR A real beauty, removed from aircraft. Type used for auto fan. Many uses. Ea. \$1.50

PORTABLE FIELD TELEPHONE

An ideal portable field telephone. Complete in a rugged steel case for years of wear. Ringer circuit and TS-13 handset. 5"x8"x9". Simple two wire operation. 15 miles distance and upwards. Can be used for television installation, intercom system, construction companies outside and inside work, etc. 13 lbs. As good as new, each \$9.95 2 for \$18.95

HEADSETS HS-23 and 33... Used... 98c
HS-30 NEW... \$1.59

All prices F.O.B. Chicago. 80% deposit required on all C.O.D. Orders. Write for free catalog.

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**NOW a DYNAMIC
HEAVY DUTY
INDUSTRIAL WELDER**

FOR AUTO—HOME APPLIANCE & FARM IMPLEMENT REPAIRS! \$28.50 ONLY
WORKS ON IRON, STEEL & other metals... does work you'd expect from a larger, costlier machine; portable, easily carried; OPERATES FROM ANY properly wired 110 VOLT LINE. Also available for 220 volt operation at slight additional cost; has 8 metallic & carbon arc welding heat stages. EASY TO OPERATE TRANSFORMER TYPE WELDER—If inexperienced you can learn to do professional work by following the SIMPLIFIED WELDING & OPERATING INSTRUCTIONS FURNISHED—comes complete ready to operate with helmet, rods, cable, instructions. SAVE TIME AND MONEY—Do your own welding—Just a few repair jobs will pay for this machine. A practical and profitable machine tool for any workshop. Make money doing repair work for others. Costs a few cents to operate.



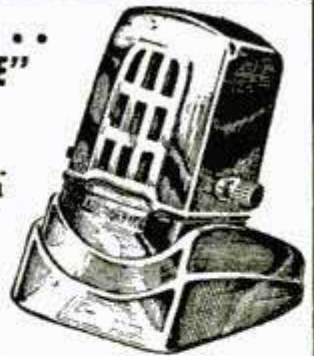
**SPECIAL GIFT OFFER! WORTH \$6.80
ARC TORCH YOURS at NO EXTRA COST!**

write today for FREE DETAILS. ARC TORCH GIFT OFFER and DYNAMIC WELDER 10-Day Trial Offer.
DYNAMIC WELDER CO., Dept. TD-99
15 EAST 23rd STREET CHICAGO 16, ILLINOIS

**MICRO-VOX....
THE WIRELESS "MIKE"**

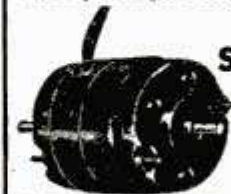
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Here's a fascinating complete miniature transmitting system that will delight everyone! Round table discussions... Baby listener... Practical jokes and dozens of other uses that will astonish one and all! Complete with tube, batteries, tuner and built-in high-fidelity microphone. Clear, Life-like tone. Easy to operate!



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We Pay Postage. C.O.D. Plus Postage.**

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SMALL 6 VOLT D.C. MOTOR

Ideally suited for Buffers, Grinders, Fans, home-built gadgets and small vehicles. Hobbyists, Mechanics: here is the small high powered unit that fits your specific need! 6 volt D.C. 3500 R.P.M. (12 volts A.C.)

\$2.95 each \$2.50 in lots of 10 or more

TRUSOUND, INC. (Dept. PM-8) 630 W. Randolph St. Chicago 6, Ill.

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Cards, stationery, circulars, tags, labels, photo and movie titles, advertising, etc. Save money. Print for Others, Good Profit; easy rules sent. Raised Printing like Engraving, too. Sold direct from factory only. Write for free catalog of outfits and all details. **KELSEY PRESSES, M-37, Meriden, Conn.**



Unbreakable Fire-Safe Amber Hammer Proof Shock Proof
TOOL STEEL PRICED FROM 5c TO \$1.00 EACH

**Ask Your Hardware Store for
FULLER'S
Unbreakable Amber Handle
SCREW DRIVERS**

America's most popular line of moderately-priced screw drivers! Wide range of sizes. FULLER TOOL COMPANY, Inc. 911 Faile St. New York 59
World's largest makers of Amber-Handle Tools

LATHE CUTTER BIT GRINDING GAUGE
For checking clearance and rake angles.
50c postpaid
SOUTH BEND LATHE WORKS
455H E. MADISON ST., SOUTH BEND 22, IND.

SAY YOU SAW IT IN POPULAR MECHANICS

MARCOT KEY MACHINE



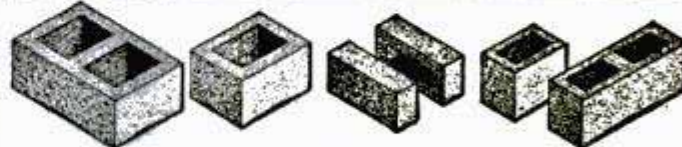
MARCOT No. 8 KEY MACHINE, mounted on Cabinet, less motor, \$98.00
Auto Code Book and Depth Keys. \$12.50
100 Dr. Popular Key Blanks... 60.00
Set—Key File, Follow-Through Rods, Lock Picks, Bit Key Gauge, Thimble, Pins, Springs... 10.50
"Locksmith Trade Books"... 6.75
How to Open Locks without Keys or Picks; Secret of Locksmithing; How to Make Keys by the Impression Method; Master Key Systems.
TOTAL COST \$184.75

A. J. MARCOTTE CO., 1200 N. Kedzie Ave., Dept. PM, Chicago 51, Ill.

EASY-TO-BUILD WORKBENCHES



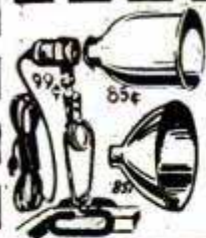
Constructional details on 13 sturdy, easy-to-build benches... large cabinet bench with 18 drawers, tool cabinet with 29 drawers, streamlined cabinet bench, drop-down bench for narrow garage, portable apr. bench, carpenters' fold-in-leg bench, etc. Send dollar bill today.
CRAFTPLANS, Dept. P-144, 1321 S. Michigan Ave., Chicago 5, Ill.



Make Concrete Blocks and Bricks

New superior method makes square, true, easy-to-lay units which will pass any building code. Small investment, high production; big profits. One \$30.00 machine will make four 5"x8"x12" blocks per minute—1000 per day. Pays for itself in a few days. Sell blocks or save 1/3 building cost by making and laying your own.

POST CARD BRINGS FREE FOLDER
Economy Manufacturing Company
Dept. P Stone Mountain, Georgia



CLAMP-ON ANYWHERE LAMP

WITH ADJUSTABLE BALL AND SOCKET SWIVEL HEAD. LONG RUBBER COVERED CORD AND WALL PLUG. The All Purpose Lamp. Wonderful for indoor Photography, Floodlights, Baby Spot or Large Spot, Personal Bed Reading, Workbench, Garage, etc. Lamp Alone **99c**
Highly Polished 9" diameter Parabolic Reflector or 5" diameter Spot Reflector at ONLY **85c ea.**

SAVE UP TO 85% IN WAR SURPLUS AT "GADGETEER'S HEAVEN"



16 POCKET VEST

Sturdy, Yet Light Wt. Satin Lined with Tie Straps, 14 Outside Pockets, Plus Knife, gun, or Tool Leather Holder, 2 large 11" x 8" Pockets

Inside, Wonderful Hunting, Fishing, or Mechanic. A Steal at **\$2.79**



Sperry Aircraft Directional GYRO COMPASS

Precision made for Positive Direction. 360° swing calibrated in 1/10° (6 min). Built in bank indicator, lum.dial. 4 1/2" sq. with 3" dia. face. Vacuum operated. Ideal for autos, planes, boats. Can be used in autos and boats by attaching one tube to intake manifold. Complete with re-set & caging knob. ONLY **\$4.49**



Genuine ARMY AIR FORCES SUNGLASSES THE REAL McCOY!

AAF 6 Base, Precision Polished and Ground, Glare-Free lens with leather case that can be attached to belt. Gold plated adjustable frame. Pearlloid sweat bar and pads. A real Palley **\$3.95**
\$17.50 Value for Only

ARMY AIRFORCE TYPE SUNGLASSES

93% ultra-violet ray free. Polished & Ground 4 base lenses. Gold plated frame, Pearlloid bar and pads. Handsome leatherette case. **\$2.39**
OUR SPECIAL PRICE...

HUNTING KNIFE 6" chrome vanadium

blade, handle, leather grip. In leather sheath

\$5.98 Value for ONLY **\$1.89** (Like Above) 5", polished blade **\$1.69**
With Parkerized blk. Finish **\$1.49**

BOLO KNIFE

10" x 2" Parkerized blade. 5" Gripped Handle. Weight 1 1/2 lbs... Ideal for Hunting, Clearing Brush or Trails. With Case . . . **\$1.19 ea.**

NYLON FISHLINE Special

STRONG - LIGHTWEIGHT - 2 PLY Nylon Fishing Line.. ROTPROOF & WATERPROOF!! Treated for strength & long life. ON SPOOLS 10# TEST, 2500 ft - Black or White **1.69**
25# Test, 1000 ft - Sea Green . . **1.59**
25# Test, 1500 ft - White **1.89**
45# Test, 750 ft - Green **3.19**

Genuine LEATHERETTE to cover Chairs, Patio Furniture, Nooks, Auto Seats, etc. 10 colors at a BARGAIN PRICE.

WIDTH	COLORS	PRICE (per run. yd.)
36"	Grey, Brown, Black	\$1.19
36"	Lt. Green, Dark Green, Blue	1.65
54"	Red, Grey, Lt. Blue, Ivory, Yellow	1.89

FAM RUBBER CUSHIONS Molded and pre-shaped. Cement or cut to fit. For chair auto & truck seats, trailer & boat seats.

17" x 22" x 4" **\$4.89 ea.** 36" x 18" x 4" **\$5.39 ea.**
62" x 2" x 24" **\$8.50**

Loose Leaf BINDER 3 metal post. Cylindrical locking heavy duty 3/16" fabricated hinged cover. End identification window

Ideal for price books, salesmen catalogues, photo albums, students, publications, Reference books, etc. Will hold 500 sheets, 8" x 11". **59c ea.**
A \$5.00 Value

PALLEY SEPTEMBER BARGAINS!

NAVY BATTLE LANTERN

This powerful battle tested lantern complete with 2 standard 1 1/2 volt dry cell batteries. Size 6" x 7" x 4" with a 4" dia. reflector. **\$3.29**

Plexiglas Window 12 1/2" x 9" - 3/8" thick with aluminum piano hinge **\$1.69**

Chronograph WRIST WATCH

17 jewel - One of the finest made anywhere. Cased in Switzerland. Sweep sec. hand, stop & re-set buttons. Measures distance, airspeed, groundspeed. Ideal for the sportsman. **Sept. Only... \$22.50**



PLASTIC KITS

HERE ARE UNSURPASSED VALUES for ARTISTICALLY INCLINED HOME HOBBYIST! Start Planning Novel Xmas Gifts Now! Kit #1 contains 2 lbs. plexiglass & Lucite sheet in various shapes, 1 oz. bottle of clearset cement, and 5 bottles of colors in Orchid, Red, Yellow, Peach, etc. Also a Plastic Handbook of uses & instructions. This set easily worth \$5.50. Our Price . . . **\$2.19**
Kit #2 contains 1 1/2 lbs. of plastic sheet, a 1 oz. bottle of clearset cement, and the Plastic Handbook. A \$2.50 Value for ONLY **99c**

Plexiglass & Nascolite clear plastic shts. NASCOLITE - Full sheets app. 1/8" x 37 1/2" x 49 1/2", app. 10 1/2 lbs. each **\$12.50**

PLEXIGLASS - Full Sheet 5/16" x 36" x 24" . . . Per Sheet.. **\$13.00**
5/16" x 36" x 48" . . . Per Sheet.. **\$25.00**
Fabricators write in for our special quantity prices, all above are new & masked. Also inquire about other large stocks of Plastics.

NEW TARPS - HEAVY CANVAS

Mildew & Flame Resistant 9' x 16' **\$11.95 ea.**
Cheap outside storage!! They are really moving at these prices: **\$3.95**
5 ft. x 7 ft. size **\$3.95**
8 1/2' x 16' **\$8.50** 16' x 22' **20.95** 16' x 32' **29.95**
NEW Rubberized Linen Tarp - 7' x 11' Waterproof, weighs only 3 lbs. **\$5.95**
Ideal for outside car storage.

KLEER-VUE NIGHT DRIVING GLASSES

With 57mm yellow amber - 6 base lenses. PRECISION GROUND & POLISHED to reduce Glare of oncoming headlights. Sharpens 'object focus' more clearly during night driving.

In Men's size or Ladies Harlequin style. A \$16.00 VALUE . . . **\$5.89**

SAME GLASSES but clip-ons. Fit-over style without temple bars **\$4.59**

Hand COMPASSES

#151 - MARCHING - Lensite, with Luminous Dial . . **\$1.59**
#152 - MATCHBOX - both jewel & liquid floating dial **39c**
#153 - NEW!!! JEWEL Watch Pocket Compass **1.59**
#154 - WRIST STRAP Compass **69c**

NAVIGATORS MAGNETIC COMPASS TYPE D-12

Rotating verge range ring, calibrated in 1 degree increments from 0 to 360°. Two parallel grid wires for N-S line alignment. Rubber lined. Fine for Boats, Aircraft, etc. **\$14.95**

HS 33 NEW LOW IMPEDENCE RADIO HEADSET

Latest & most improved style. Currently in use in aircraft. Packed in original boxes. Leather hd. band, sponge rubber ear pads. Includes Card & Jack High-Low Impedence Adapter . . **35c ea.**

Hand Mike Highly Sensitive with thumb control button on handle. Ideal for home recorders, public address systems, etc. Comp. with 2 ft. rub. cd. & phone plug. **\$1.19**

with knobs and rubber pads for non slippage on each section. A must for navigators, mechanics, draftsmen, and engineers . . . You've never seen 'em at **97c ea.**

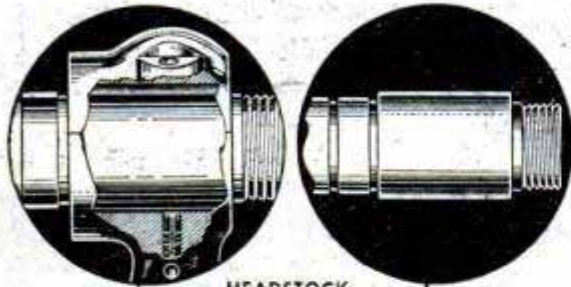
PALLEY SUPPLY COMPANY
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FREE! 1949 CATALOG
10,000 Bargains in War Surplus
92 Page, illustrated with valuable information tables, charts & data. Send 25c to cover handling and postage.

PLASTIC PARALLEL STRAIGHT EDGE
with knobs and rubber pads for non slippage on each section. A must for navigators, mechanics, draftsmen, and engineers . . . You've never seen 'em at **97c ea.**

THE LARGEST FIRM OF ITS TYPE IN THE WORLD ORDER BY MAIL
Order from this Ad. All sales final. All Prices F.O.B. Los Angeles. Pay by M.O. or Check. P.O.'s Acctd. from D & B firms. 1/2 deposit with C.O.D's.

SOUTH BEND 9" LATHES



HEADSTOCK

Bearings are line bored and bearingized for precision fit. Ample lubrication from oil reservoirs. Spindle is carburized, hardened, and ground; with bearing surfaces super-finished to .000005" rms.

BELT RELEASE

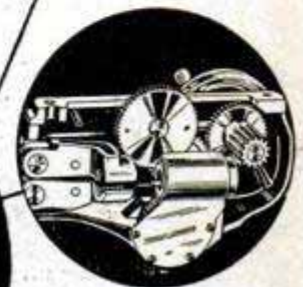
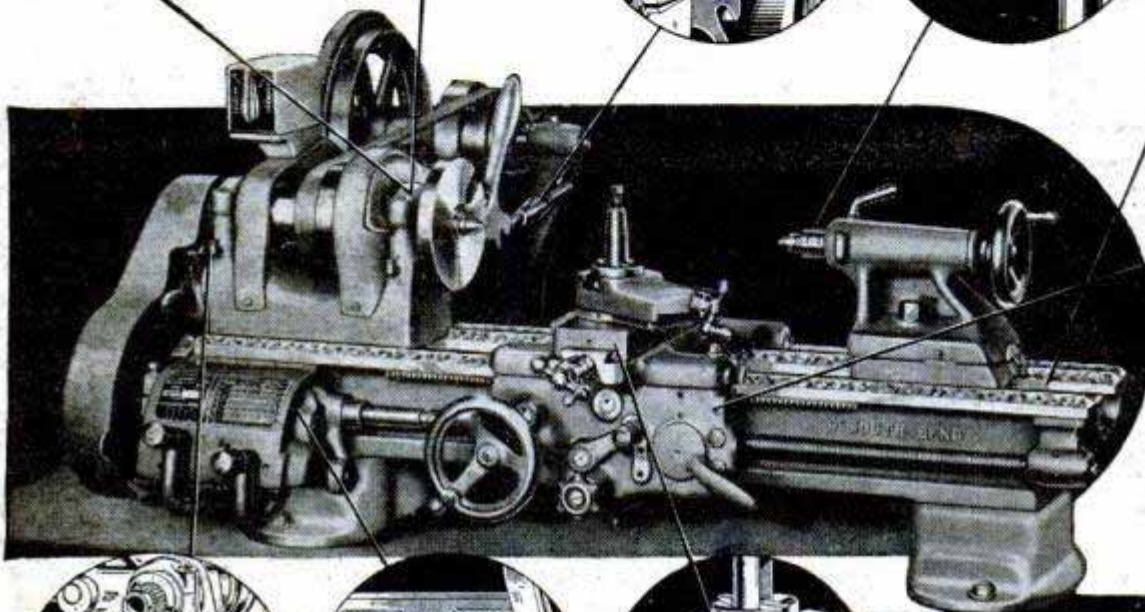
Instant release of belt tension for speed changes. Proper tension of headstock spindle drive belt is easily adjusted.

TAILSTOCK

Has set-over for taper turning. Graduated spindle has witness mark for aligning cutter bit. Hardened center self-ejecting.

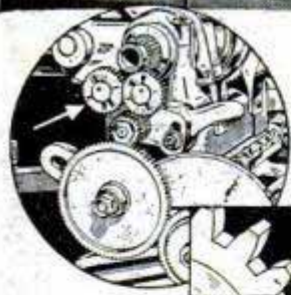
BED

Three V-ways and one flat-way are hand-scraped entire length for precision alignment of headstock, tailstock, and carriage.



APRON

Has powerful friction clutch and large half-nuts. Safety interlock prevents engaging opposing feeds. All gears machine cut.



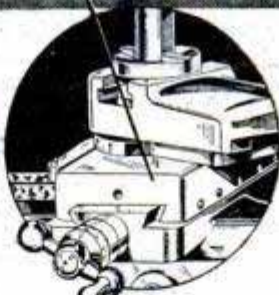
REVERSE GEARS

Easily shifted for reversing lead screw rotation and feeds, positive lock. All the gears used in this lathe are machine cut.



GEAR BOX

Screw threads and power feeds selected by shifting two tumblers as indicated on index chart. All gears machine cut steel.



CARRIAGE

V-ways and dovetails hand-scraped. Engine divided micrometer collars on feed screws. Compound Rest base graduated 180 degrees.

Specifications...

South Bend 9" Model A Lathe

- SWING over bed—9-1/4"
over cross slide—5"
- BED LENGTHS . . . 3, 3-1/2, 4, and 4-1/2 feet
- DISTANCE BETWEEN CENTERS . . 16" to 34"
- SPINDLE SPEEDS (12) . . 41 to 1270 r.p.m.
- POWER FEEDS:
Longitudinal (48)0015" to .0853"
Cross-feed (48)0004" to .0252"
- THREADS (48 pitches) . . . 4 to 224 per inch
- MAXIMUM COLLET CAPACITY . . . 1/2 inch
- SPINDLE BORE 3/4 inch
- TAILSTOCK TOP SET-OVER 5/8 inch

SOUTH BEND LATHE WORKS

435 East Madison Street, South Bend 22, Indiana, U. S. A.

Please send catalog(s) checked:

- Catalog No. 9 — all models of South Bend 9" Lathes.
- Catalog No. 100 — all sizes of South Bend Lathes.
- Catalog No. 400 — South Bend Precision Drill Presses.
- Catalog No. 500 — 7" Bench Shaper.
- Catalog No. 77 — Attachments and Accessories.
- Time Payment Plan.

NAME _____
STREET _____
CITY _____ STATE _____

9" x 3' Model A Bench Lathe, illustrated (Cat. No. 644-Y), with 12-speed horizontal drive, motor, and control — less bench . . . **\$340.45***

Time Payment Terms — \$85.45 down, 12 monthly payments of \$22.52.

Other models of South Bend 9" Lathes, priced from \$187.35* to \$805.45*, may also be purchased on time payment terms of 25% down with balance in 12 monthly payments, small finance charge.

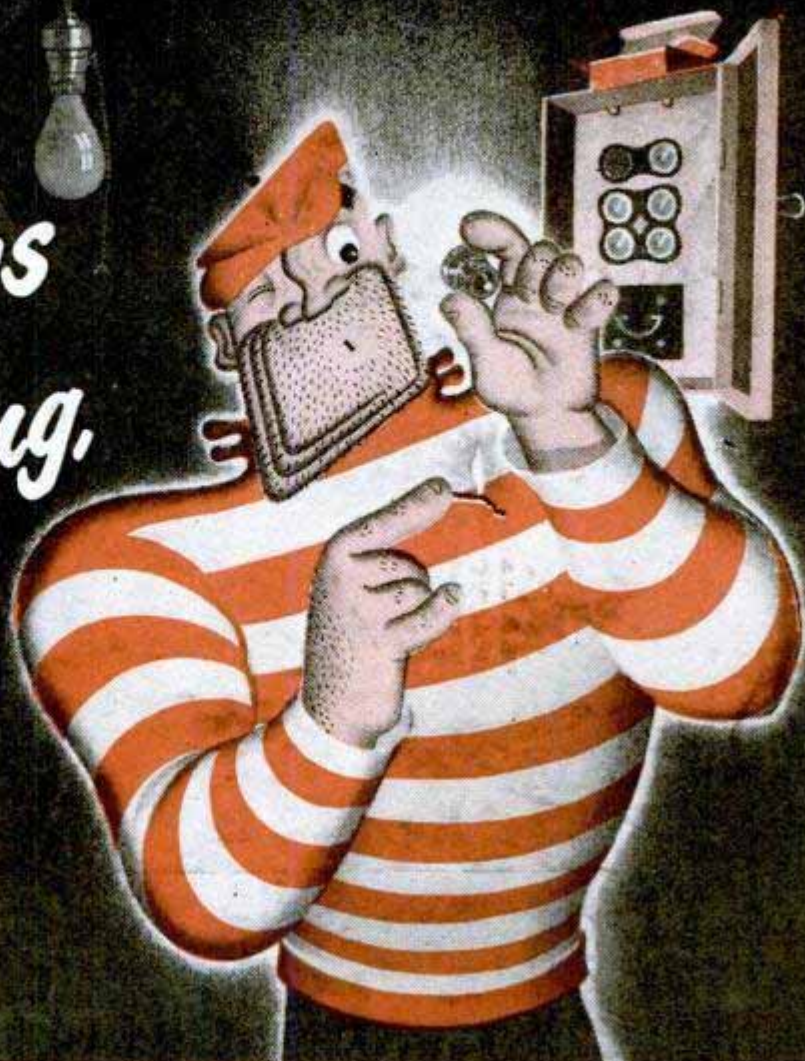
*Prices, f.o.b. factory, include 1 phase, 60 cy., 115-V. motor and control.



SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1906

*Piston Rings
need replacing,
too!*

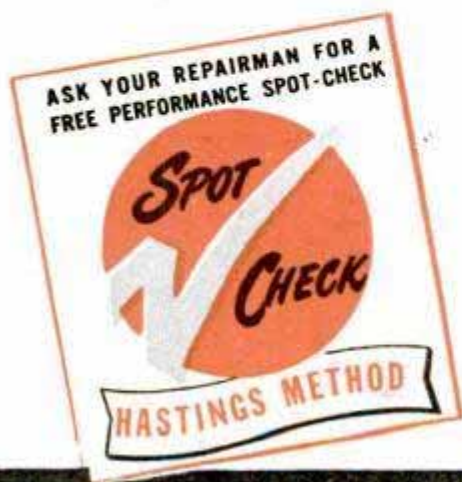


OIL-PUMPING is a symptom of piston ring wear. And by the time you notice it, your rings will be pretty badly worn. They should be replaced immediately.

Hastings Piston Rings are designed especially for replacement service... So ask for

Hastings—the replacement ring that *stops* oil-pumping, *checks* cylinder wear and *restores* performance. It's the best money you can spend on your car.

HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN
Hastings Ltd., Toronto



HASTINGS

STEEL-VENT PISTON RINGS

"TOUGH... BUT OH SO GENTLE"

TOUGH on oil-pumping — GENTLE on cylinder walls

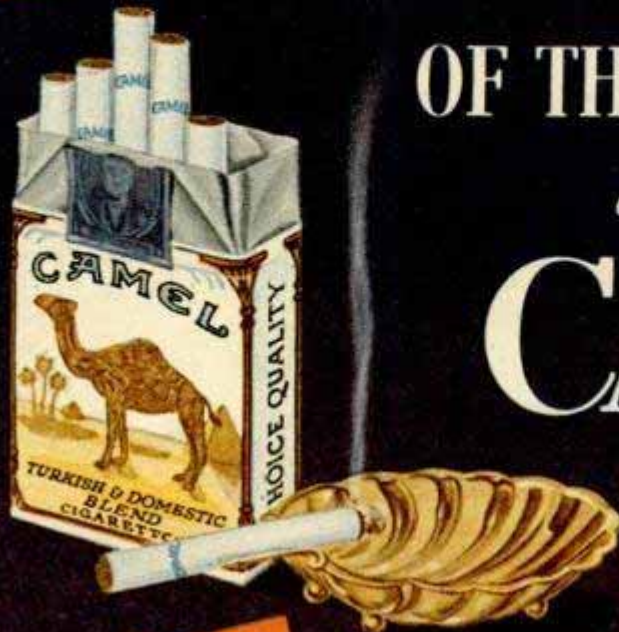
30-DAY TEST REVEALED

NOT ONE SINGLE CASE OF THROAT IRRITATION

due to smoking

CAMELS!

DOCTORS REPORT



Yes, that's what noted throat specialists reported after making weekly examinations of the throats of hundreds of people, from coast to coast, who smoked Camels, and only Camels, for 30 consecutive days!

SMOKERS REPORT



MRS. ARTHUR O'NEILL, housewife: "I made the Camel 30-Day Test and enjoyed it! For taste *and* flavor, it's Camels every time!"



STEEL WORKER Cyril Byrne: "On my job, a cigarette is a friend. I made the 30-Day Test - now Camels are my smoke for keeps!"



COLE PORTER, song writer: "The doctors' report *proves* what I've known about Camels for years. They're *mild* ... they are *flavorful*!"



TELEPHONE OPERATOR Rita Edwards: "The 30-Day Test convinced me! Camels are the mildest cigarette I've ever smoked!"



WILLIE HOPPE, master of the cue: "My test of Camels covers 20 years. I *know* how good Camels taste...how mild Camels are!"



JINX CLARK, show-skater: "I put Camels to the test in my 'T-Zone.' Nothing like them for flavor. And Camels are so mild!"



STOREKEEPER Bernard Unger: "Camels are a standout for flavor! And they're *mild*. I know...I smoke over a pack a day."



BOBSLED ACE Francis Tyler: "I'm talking from experience when I say Camels are mild. I've smoked them for years!"



Make your own
Camel 30-Day Test in your "T-Zone"

● Over and beyond the reports of noted throat specialists, the final authority on Camel mildness and flavor is your own "T-Zone" (T for taste, T for throat). Test Camels yourself for 30 days.