

THE AGE OF PACKAGED POWER

# POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

GREAT BRITAIN No. 4042E

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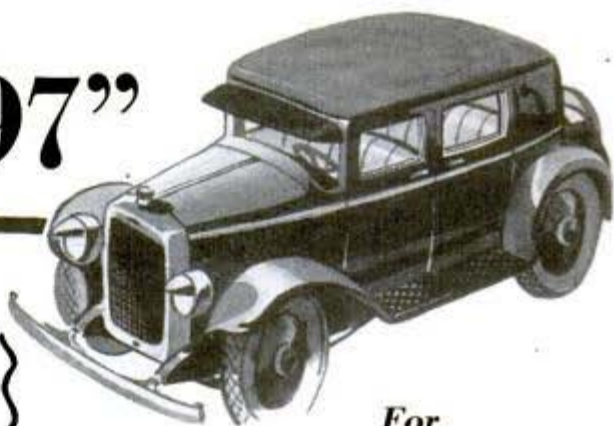
# Take a tip from "Old 97"

Everybody around the neighborhood knows "Old 97" . . . and has a lot of respect for her. She may be going on ten years old, but there's still plenty of "get up and go" to her.



In fact, "Old 97" has saved more than one neighbor the price of a service call in the winter months by giving pushes on cold mornings. She's a great old bus to have around.

What's the answer? Just ask the owner and he'll tell you: "I make sure that 'Old 97' gets a thorough Certified Re-Wiring check-up twice a year. She runs right because her electrical system is in perfect condition—cables, connections and electrical units."



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Economy . . . Power . . . Get a  
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RE-WIRING CHECK-UP**

Good performance from a car depends on the condition of the electrical system. That's why more and more drivers bring their cars in to Packard Certified Re-Wiring stations for a thorough check-up at least twice a year . . . or whenever there are signs of trouble. They know that a Packard Certified Re-Wiring mechanic, equipped with the proper tools and checking instruments, will trace down every corroded or undersize cable—every dirty or loose connection. If there's trouble in any of the electrical units, he'll find that, too, and correct it.

Get all the pep, power, economy and dependability that your car can give you, by going to a Packard Certified Re-Wiring station today. If your regular dealer cannot provide Certified Re-Wiring Service, have him get in touch with his Packard jobber for complete instructions. Packard Electric Division, General Motors Corporation, Warren, O.

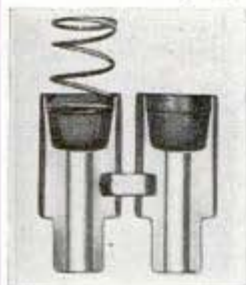
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## VALVE GRINDING BUSHING FOR FORD V-8, '85' AND '95' ENGINE



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Valve and Bushing in engine ready for grinding.

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Quickly removes and replaces rings without damage to grooves or piston. No. A-313. Price \$1.00.\*

## ARBOR PRESSES

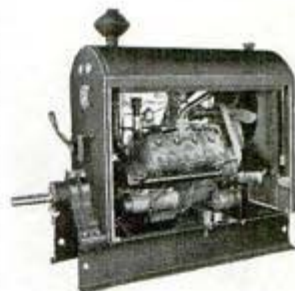
### HYDRAULIC and BENCH

KRW Hydraulic Arbor Presses are built for speed and convenience of operation. New 2 Speed Pump—Swinging Type Valve—"One Man" Bed Adjusting Device, and Combined Mechanical and Hydraulic Ram Motion are just a few of the features described in a new Bulletin just off the press. Hydraulic Presses built in 25, 50 and 75 ton sizes. Bench Presses in 3, 1 and 1/2 ton sizes. Use coupon for literature and prices.



## INDUSTRIAL POWER UNIT

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One owner writes—"Made a saving over electric power of \$330.95 in four months." Check the coupon for literature.

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V. G. Bushing  Brake Tongs  Molding Tool   
 Ring Remover  Arbor Presses  Power Units  FM-8

Name.....  
 Address.....  
 City..... State.....



## BUILDING FOR DEFENSE

The Bell System is putting in about 400 million dollars' worth of new equipment this year. . . . The busier this country gets with production and defense, the more everybody telephones. Our #1 job is to do our best to keep pace with the needs of the Nation in this emergency.



BELL TELEPHONE SYSTEM



● "The Telephone Hour" is broadcast every Monday. (N.B.C. Red Network, 8 P.M., Eastern Daylight Saving Time)

# Popular Mechanics Magazine

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H. H. WINDSOR, Jr., Editor and Publisher

August, 1941

Vol. 76, No. 2

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## Conquering Our Highest Peaks

NIGHT found the climbers marooned half way up the face of a 2,000-foot precipice on Long's Peak. There was only the dim light of the stars to show the way, and the cold mountain wind swirled snow in their faces. Faintly they could discern the nearest ledge, 300 feet below. What to do? Carl Blaurock, thrice president of the Colorado Mountain Club, tells what happened in his story, "Conquering America's Highest Peaks," in the September Coloroto section, accompanied by many color photographs.

## Siege Gun of Science

SOME atom will take a terrific mauling when the 4,900-ton cyclotron at the University of California starts shooting. Biggest of science's siege guns, it will make the other atom smashers look like pea shooters, and even the toughest of atoms should have its heart broken by its 60,000-miles-per-second bullets. Read about it next month.

## Next Month

TEXAS was not always the home of cowboys, jackrabbits and cactus. Once it was overrun with camels, three-toed horses, duckbill dinosaurs and crocodiles that bared teeth bigger than your finger when they grinned. We're sorry, but there were also rats and mice in those days. Most astonishing of all, archeologists have dug up 14-inch oysters and a clam shell bigger than your bridge table. "Dinosaur Detectives," a September feature, offers a scientific glimpse of early America.

## Tomorrow's Navy

ONE well-aimed hit in a vital spot blasted Britain's "Hood" to the bottom. A costly, tragic lesson, but America—building to defend itself on two oceans—can profit by that lesson. Next month Lieut. Franklin G. Percival, U. S. Navy (Retired), writes of the new ships and weapons of this war and the defenses against them. He believes in slower battleships, more heavily armed and armored. Read "Building Tomorrow's Navy."

## More Light for Less

GUESS how many different types of electric lamps and tubes there are. You're wrong, the number is 10,000. A September article tells how research, just since 1932, has more than trebled the light you get for your money. The new fluorescent lamp costs 50 percent less, lives 66 percent longer, is 40 percent more efficient than when it was introduced.

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# After all our Saving and Planning . . . NO VACATION?



**1.** How we struggled and saved, determined to see Yosemite this summer! But I warned George: "The miles are piling up on our car. Will it stand up under the strain of a trip like that?"



**2.** "Of course, Edith," he chuckled confidently. "But," I said, "I've heard that carbon sludge, and other contaminants—like corrosion—can damage even new cars. I'd feel safer if you had used Pyroil from the beginning, George."



**3.** Well, it happened! George came home with a long face. Trouble was brewing. I was afraid to speak. "Car broke down today," he muttered. "A seized bearing. Broke a rod and sent it right through the motor block. It's going to cost us a hundred dollars at least, for repairs!"



**4.** What to do! We decided to just forget it. But I heard George order a few cans of Pyroil. "Why didn't I take your advice sooner!" he shot at the garage owner. Then he said to me, "Never mind, Edith. We'll just start saving all over again!"

P. S. But, really, wonders never cease! That very day we got a letter from Uncle Bert in Montana. "Check enclosed for expenses," it said. "Just bought a ranch. Want you kids to come out and help me celebrate—and also take a trip with me to Yosemite! Yip-p-y!"

The use of Pyroil is insurance against accumulations of hard carbon, sticky gum and sludge. It prevents the formation of ruinous, metal-wearing acid-corrosion. It gives you silky-smooth, powerful operation. Ask your service station or garage salesman to add just a few ounces to gas tank and crankcase. Use it regularly! Manufactured and Guaranteed by Pyroil Company, W. V. Klodder, Founder, 58 Pyroil Bldg., LaCrosse, Wisconsin, U.S.A.



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MEREY  
OUNCES TO  
GAS TANK &  
CRANKCASE

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Please send Free folder, "What Car Manufacturers Say," and tell me how a few ounces of Pyroil added to gas tank and crankcase will preserve my engine and induce better performance.

Send details of your plan for Distributors.

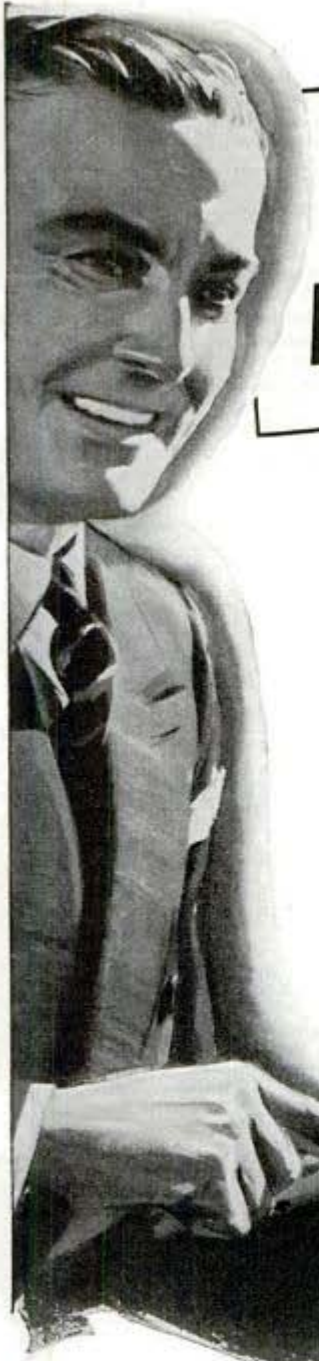
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# HOW MUCH DO YOU KNOW ABOUT YOUR CAR FINANCING?

*Do you figure your own financing?*

*Do you figure the cost yourself?*

**N**ATURALLY you look at a car very, very carefully before you decide to buy it. Why not take the same care in choosing a financing plan? It's wise to figure the cost yourself, in advance—to see exactly what you get for what you pay... to see just where and how you can save!

That's why we suggest that you send the coupon below and get your GMAC Figuring Chart. It shows you, in dollars and cents, just what you want to know about your time payments... enables you to figure your own "deal"—based on the length

of time you want and the amount you wish to pay monthly.

Then you can compare the cost of various finance plans...and what they offer. You'll be pleased to see that the low-cost General Motors Instalment Plan includes sound insurance protection for your car.

But learn about this convenient time-payment plan for yourself! Write for your Figuring Chart today! Then see your General Motors dealer.

This plan is available only through dealers in Chevrolet, Pontiac, Oldsmobile, Buick and Cadillac cars.

*Send for this Chart*

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INSTALMENT  
PLAN**

**GENERAL MOTORS ACCEPTANCE CORPORATION 2-2**  
1775 Broadway, New York

*Please send me copy of GMAC Figuring Chart for the car checked below:*

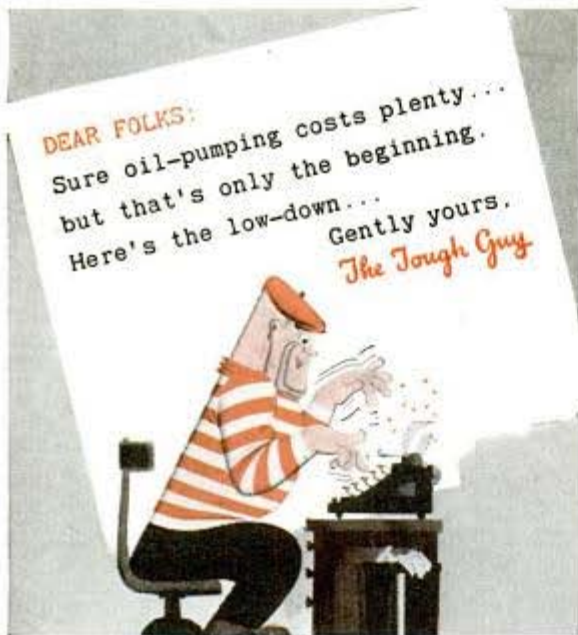
CHEVROLET  PONTIAC  OLDSMOBILE  BUICK  CADILLAC

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

County \_\_\_\_\_ State \_\_\_\_\_ U.S.A.



**WHEN YOUR CAR BEGINS TO USE TOO MUCH OIL...LOOK OUT**

Oil-pumping signals that all is not well within your motor. It tells you that a condition has developed that demands attention.



**YOU MAY BE HEADING INTO AN EXPENSIVE REPAIR BILL**



The longer you put it off—the more it will cost you. For oil-pumping usually means rapid cylinder wear has started . . . and that can be even more expensive than buying extra oil.

**AT THE FIRST SIGN OF OIL-PUMPING—DO THIS...**

Have your motor service man install Hastings Steel-Vent Piston Rings—the rings that not only put a stop to oil-pumping, but also check cylinder wear, and forestall high repair bills.

**HASTINGS MFG. COMPANY**  
Hastings, Mich. Toronto • Winnipeg



**HASTINGS**

STEEL-VENT PISTON RINGS

Stop Oil-Pumping

IN CARS, TRUCKS AND TRACTORS

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POPULAR MECHANICS





# Plan Your Future

## Choose Your Field NOW For Success

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Address \_\_\_\_\_  
8-41

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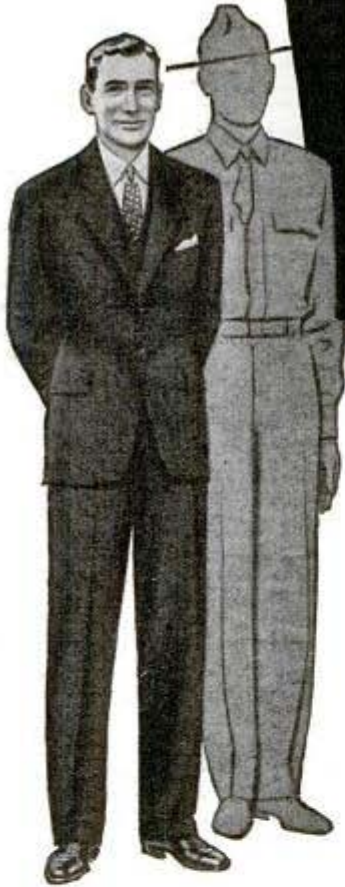
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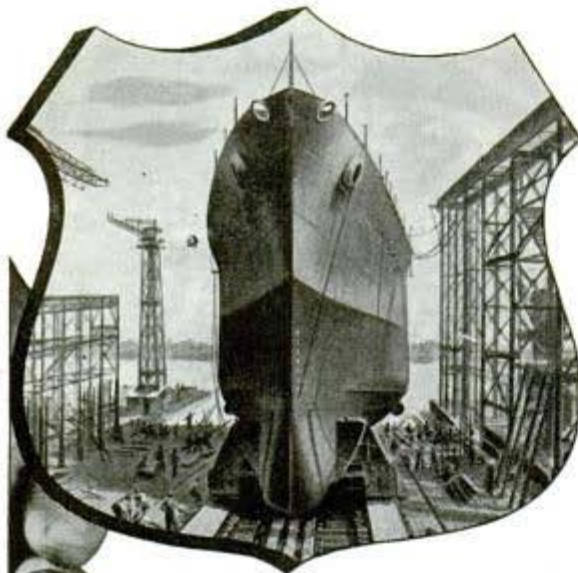
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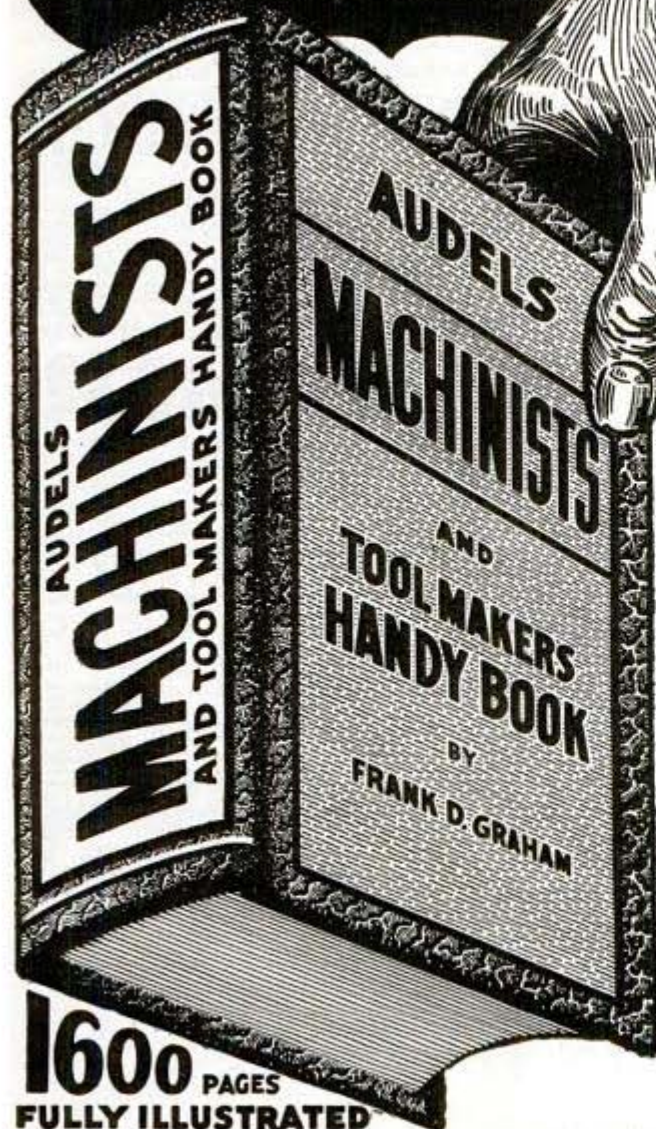
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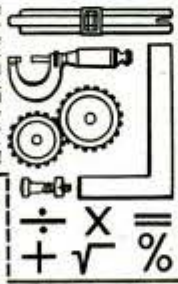
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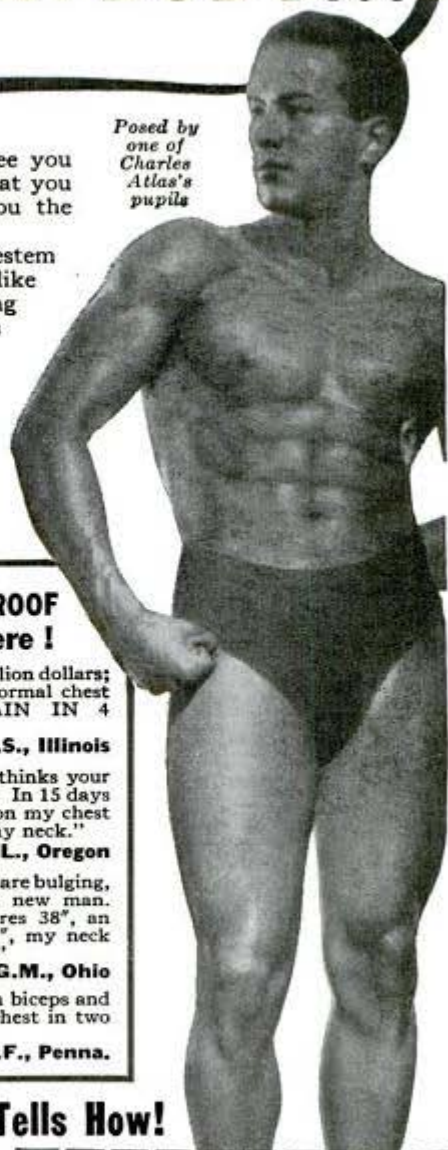
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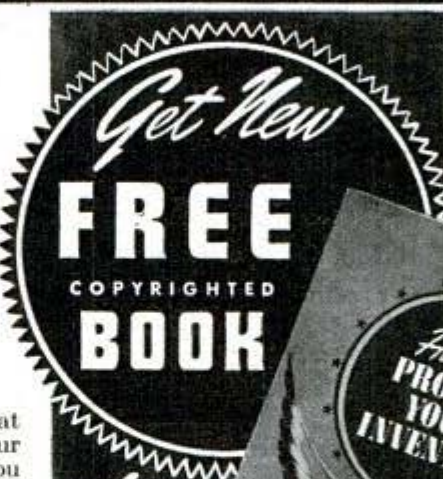
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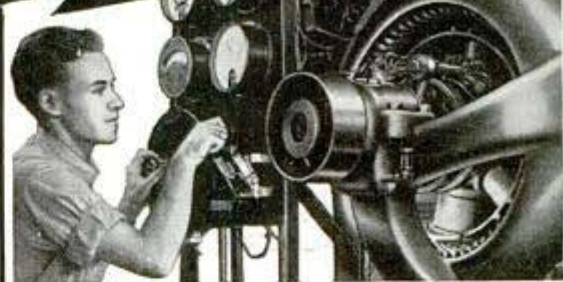


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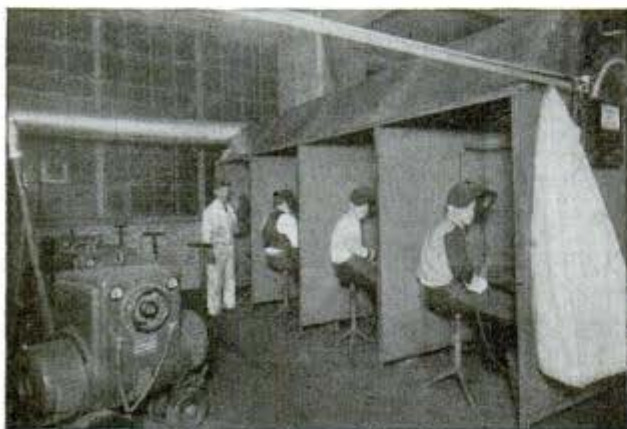
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PROFITABLE Mailorder, home work opportunities, plans. Your own boss. Details free. Mailorder magazine, dime. Roberts, 3705 East Hancock, Detroit.

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5c BUYS Back dated magazines. Catalog 10c (refunded) listing books, booklets, photos, arts studies, etc. Ciccone's, 863 First Avenue, New York City.

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MAGICIANS' Headquarters. 216-page catalog, pocket, parlor, professional tricks, 25c. Kanter's, 8-1311 Walnut, Philadelphia.

HOLLYWOOD Special! Magicians button catalogue, ghost illusion and free trick for 25c. Magic House of Charles, Box 888, Hollywood, California.

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OLD Money wanted. Will pay fifty dollars for nickel of 1913 with Liberty head (no buffalo). We pay cash premiums for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

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40 PAGE Complete coin recorder—50c. Coin Recorder, Bluffton, Ohio.

SENSATIONAL Offer. Certain cents worth \$750.00; nickels \$1000.00. Biggest value coin book published. 1941 edition. 36 pages illustrated with actual photographs. Special price 10c. American Coins, Box 3507-A, Cleveland, Ohio.

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FREE! Foreign coin, banknote and large 36 page illustrated coin catalogue to approval service applicants. Send 3c postage. Tatham Coinco, Springfield-125, Mass.

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SENSATIONAL Combination offer! Big packet 105 different including Iceland, Manchukuo, Ecuador (American flag in full colors), Danzig; airmails, commemoratives, triangle stamp, \$4 United States; complete set United States telegraphs, cataloging 20c. Packet British Colonies, including Gwalior, Hyderabad, Burma (new country) jubilee and coronations. Scarce Far Eastern republic cataloging 50c. Big illustrated lists of other bargains. Total catalog price over \$3.00! All for only 5c to approval applicants! World-Wide Stamp Company, Department 600-N, Camden, New York.

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SMOKY Mountain souvenir sheet and our famous 25 different airmail and commemorative packet including Columbians, Pan-Pacific, Edison, Zeppelin, etc., only 10c with fine U. S. and foreign approvals. Marco Stamp Co., Box 888, San Francisco, Calif.

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SPECIAL—Airmails—23 different, including triangles, zeppelin, Latin-America, etc. 5c to applicants for best value approvals. Continental Stamp Co., Dept. B, Sandy Hook, Conn.

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8 AIRMAILS, Each from different country, 5c. Approvals, Wallace Cole, Lake Crystal, Minn.

\$2.00 HONG KONG Stamp only 3c to approval buyers, LeDuc, Saint Petersburg, Florida.

SEYCHELLES, Nejd, Caymans, Manchukuo, Brunel, Turks Caicos, British Solomons (Cannibaland), Everything 3c with approvals. Viking, 130-Z Clinton St., Brooklyn, N. Y.

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20 MEXICO, 3c With approvals 1/4c up. Josiab Babcock, St. Joseph, Michigan.

150 GOOD Mixed foreign stamps, 5c coin. Stanton, Niantic, Conn.

1941 WHOLESALE Catalogue free—Eighty pages. Empire Stamp, Dept. 5, Toronto, Canada.

UNITED States on approval. Gordon Davison, Box 568C, Manchester, N. H.

100 MIXED U. S. commemoratives 30c. Jem Stamps, Port Jefferson, N. Y.

FIFTEEN Different dates U. S. large cents \$2.00. Chester Slaughter, Cleveland, Tenn.

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1941 SCOTT'S Stamp catalogues \$2.49 postpaid. Jaydee, 218 Dickinson S. W., Grand Rapids, Mich.

UNPICKED! 100 U. S. revenues on documents—10c! (700—50c.) Vanvoorhis, Hyndman, Penna.

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100 ALL Different U. S. 10c. Monjar, 1542 Waverly, Cincinnati, Ohio.

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CANAL Zone—Panama Canal commemoratives and Ecuador, showing U. S. flag in natural colors; also package 34 different, including: "Bull fight" stamp, Chinese "midget," giant diamond, "Christ" triangle, Mozambique, Morocco, giraffe, etc. Only 5c with approvals. Potomac Stamp Co., Dept. 1, Washington, D. C.

COMPLETE U. S. 1/4c to \$5.00 set only 10c. Matz, Carmi, Illinois.

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WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

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SCARCE Diamond airmail! Wonderful packet 115 different from strange countries. British colonies, Haiti, Tasmania, pictorials, etc. 5c with approvals. Reliable, 95 Nassau St., New York City.

SOUTH American—100 different 10c—with approvals. Davis, Silver Lake, Ind.

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WHOLESALE Dealer's catalog. Illustrated. Postage 5c. Frank's, 4900 Chalmers, Baltimore, Md.

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20 REPRINTS 25c. Rolls developed and 16 prints, or 8 prints and 2 enlargements, 25c. Candid 35mm. film developed and 36—3x4 prints, \$1.00. 18 exposure roll, 60c. Mercury Studios, Dept. 18, 109 N. Dearborn, Chicago.

IMMEDIATE Service! Pictures returned same day order is received. Sixteen guaranteed deckled-edge Velox prints from roll, 25c. One colored or two plain enlargements plus 8 deckled-edge Velox prints, 25c. Special! Coupon for 8x10 enlargement given with each 25c order. Any 36 exposure 35mm. film fine-grain developed. "Magic-Eye" tinted. Vaporate treated and each good negative enlarged to 3x4 on deckle-edge Velox paper, only \$1.00! Reloads: 36 exposure, 50c; 18 exposure 35c. 3x4 deckle-edge reprints, 3c each! Details, sample, mailers, other bargains free on request. American Studios, Box 70, La Crosse, Wis.

ROLL Developed and 4x6 oversize glossy Velox prints, 8 exposure 25c; 12 exposure 35c; 16 exposure 50c. Clemet Photo Service, Dept. M, 1318 W. Columbia Ave., Philadelphia, Penna.

OIL Coloring photographs a fascinating hobby or profitable business. Learn at home. Easy simplified method. Previous experience unnecessary. Send for free information and requirements. National Art School, 1315 Michigan, Dept. 343C, Chicago.

TWO Sets of "Deckledge" prints with every roll finished—25c. Very finest quality. Deckledge reprints 2c each. Brown Photo Company, 1910-42 Emerson, Minneapolis, Minnesota.

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MONEY-BACK Guarantee! Your choice 16 deckle-edge Velox prints, or 8 prints two 5x7 double-weight enlargements. 25c coin. Write for free mailers. Please U Film Service, 124, La Crosse, Wis.

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**DOUBLE-SIZE** Prints. Your roll developed and 8 double-size prints 25c; from 115, 120, or 127 size negatives you receive 4x6 inch prints. All smaller sizes receive 3 $\frac{1}{2}$  x 4 $\frac{1}{2}$  inch prints. 16 exposure rolls 50c; 12 exposure rolls 35c. Reprints 3c each. "Our Guarantee." Everlasting Hi-gloss finish. Overnight service. Pacific Photo Service, Box 666, San Francisco, Calif.

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**SIXTEEN** Prints from each roll developed or eight prints and two enlargements, 25c. Prompt and dependable. Globe Photo Service, La Crosse, Wisconsin.

**PHOTO** Mill service. Your choice for only 25c coin; roll developed and printed plain or deckle edge plus (1) two 5x7 enlargements or (2) one tinted 5x7 enlargement, or (3) one 8x10 enlargement, or (4) eight extra prints or (5) jumbo size prints instead of regular. Reprints 3c each. Highest quality workmanship and materials. Photo Mill, Box 629-12, Minneapolis, Minn.

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**ALBUM** Free with film developed and 16 prints 25c. Guaranteed reprints 1 $\frac{1}{2}$ c. Pioneer Photos, Hutchinson, Kansas.

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**COMPLETE** Passon Play, 8mm., \$2.95. Artcraft, Hammond Bldg., Hammond, Ind.

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**L. G. HERRICK'S** Everlasting rose perfume handkerchief, box \$1.00. 826 So. Hope St., Los Angeles, Calif.

**NEW** Sensational no leak toilet tank valve. Eliminates leaking toilet tanks. Easily installed. Saves water and assures perfect flushing. \$3.00 complete, postpaid. Folder free. Elhar Manufacturing Co., So. Glens Falls, N. Y.

### TOBACCO

**PAY** When received. Good Red Leaf chewing or smoking. 15 lb. \$1.00. Prompt shipment. Jim Ray, Ralston, Tennessee.

### SURVEYING INSTRUMENTS

**GUARANTEED** Factory rebuilt transits and levels for rent (with purchase option) or sale (cash or terms). Order now before prices advance. We will repair, trade in, or buy your old instruments. Ship prepaid for estimate and valuation. Write for List M-68 and complete information to Warren-Knight Co., 136 N. 12th St., Philadelphia, Penna.

### WANTED—MISCELLANEOUS

**UNUSED** United States postage stamps, at 85% of face value. Send registered. Prompt payment. Graubard, 3434-H Knox, New York City.

**WANTED:** Information on health equipment for the home. Manufactured or new and undeveloped equipment will be satisfactory. Write Box 163, Wil Equipment Co., St. Paul.

**CASH** For used microscopes, drawing sets, binoculars, slide rules, watches, scientific and medical instruments, tools. Satisfaction guaranteed. Elman's, 106-MH, South Wells, Chicago.

**HIGHEST** Prices for used cameras, binoculars, microscopes, drawing sets, tools, rifles, shot guns, any optical or scientific instrument. Satisfaction guaranteed. Gordon's, 162-M Madison, Chicago.

**CASH** For anything. Justice Jewelry Jobbers, 190 North Wells, Chicago.

**MERCURY.** Cash paid promptly. Quotations free. Wholesale Terminal, Norwood, Massachusetts.

**MERCURY** (Quicksilver), nickel, pewter, tin, cadmium, molybdenum, tungsten, metallic drosses, residues purchased. Write for quotations. Metallurgical Products Co., 35th and Moore Streets, Philadelphia, Penna. Established 1909.

### PERSONAL

**YOUR** Old family pictures copied or enlarged 8x10, \$1.50. Damaged photos restored. Zeis Studio, 728 Lesley, Rockford, Illinois.

**NERVOUS?** Conquer fear, worry, bashfulness! Free, special information. John Englund, Box 335, Ironwood, Mich.

**WIN** Prize money: Booklet—"Successful Contesting" shows how, 10c postpaid. Bulletin listing \$100,000.00 prizes included. World Publishers, 4515-B Cottage Grove, Chicago.

**MINDREADING** Secrets offer money making opportunities. Complete, easy instructions \$1.00. Satisfaction guaranteed. Cass Book Mart, 1231 Cass, Detroit, Mich.

**PERSONAL** Matchbooks, Samples free. Planet Co., 8034-E South Marshfield, Chicago.

**PSORIASIS** Sufferers: Pixacol has brought results when everything else failed. Applied externally, dries quickly, convenient. Try regular \$1 bottle without investing a cent! Write: Pixacol, Box 3583, Cleveland, Ohio.

**REMOVE** Your own tattoos, start profitable business. Write Tattoo Supply House, 651 South State, Chicago.

**SINUS** Trouble. If a victim of sinus or catarrhal infection, write National Laboratories, Benj. Franklin Station, Washington, D. C.

**SURPRISE** Friends, send mail from Mexico, 10c, stamps. Box 2706, Sacramento, California.

**DO** You need money for car or other necessity? Bank loan at low interest might be possible. Send 25c for information. John L. Hicks, 238 East Avenue, Rochester, N. Y.

**MEXICAN** Legal matters, William Cocks, Reliable American Attorney, El Paso, Texas.

### MISCELLANEOUS

**STEREOSCOPIC** (Three dimensional) art photos. Particulars for stamp. Oddity House, St. Petersburg, Fla.

**LA TOLTECA** Curio Company, Box 1002, Laredo, Texas; genuine hand made Mexican curios. Mail orders solicited; reasonable prices; write us.

**BIG** Mail for you. Latest moneymaking offers, opportunities, catalogs, magazines. Name listed in directory 10c. Ideal Service, 118-M, Park Ridge, Ill.

**NEW** Gun kills flies. Free circular. Kahler Fly Gun, Kankakee, Illinois.

**HIGHLY** Efficient all metal meat-food slicer for home or store. Only \$5.95. The Noremac Company, Box 25, Nutley, N. J.

**MAIL** Order business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-catching schemes. Free details. Nelson Company, 500 Sherman, Dept. 408-H, Chicago.

**WIN** Prize contests—34 page book tells how. 15c. Ideal Service, 8-PC, Park Ridge, Ill.

**GOOD** Eyesight without glasses or drugs. Eyestrain quickly relieved. Details free. A. Jacobson, Upsala, Minn.

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**COFFEE.** Better flavor. Cheaper. Recipe, 10c. Walka, A-4545 Bartlett, Milwaukee.

**START** Profitable tattooing and removing business. Free instructions. Write Tatoco, 651 South State, Chicago.

**ORES**—Minerals. Valuable collection. Circular free. Southwest Gem Company, Farmington, New Mexico.

**COATS** Of arms and crests, correctly painted in colors or black and white, from heraldic description or furnished copy, \$10.00 and up. Highest grade work. Heraldic Studios, 1914P Oakdale Avenue, Chicago, Ill.

**TATTOOING.** Engraving outfits. Illustrated list free. Percy Waters, Anniston, Ala.



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**A Correspondence Institution**  
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## BIG BUSINESS AT HOME With New Greaseless DOUGHNUT

Go into sensational new kind of food business! Start in your kitchen. Even without previous experience big daily profits possible even in small towns. Make and sell amazing GREASELESS DOUGHNUTS. We supply equipment and plans. Stores sell for you. Send postcard NOW for special quick-starting offer. Send no money.

BROWN BOBBY CO., 620 No. Michigan Av., Dept. E-188, Chicago, Ill.

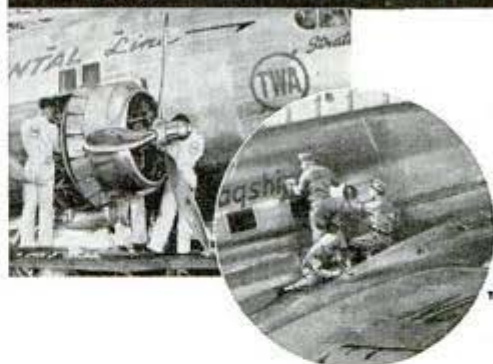
In answering an advertisement with a coupon, be sure to write name and complete address clearly.

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## ...Airline Mechanic



Photograph Courtesy Transcontinental and Western Air, Inc. and American Airlines, Inc.

To help keep great airliners in "flying trim" is one of the most fascinating jobs in all Aviation—and one of the BEST. The airline mechanic makes good pay from the start, has security ahead for life. Opportunities for advancement and success are unlimited—with air travel only in its infancy ... and air freight coming with a rush. The man who gets into this work NOW can move up fast... with airlines growing bigger and bigger—pushing into every corner of the nation.

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Please send information on Aero ITI training for Aviation careers. I am interested in the following branch of Aviation:  Aircraft Mechanics;  Aeronautical Engineering;  Undecided, please send more information. Years High School:  1,  2,  3,  4. Years College (Liberal Arts):  1,  2,  3,  4. Years Engineering College:  1,  2,  3,  4.

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IN RECENT LABORATORY "SMOKING BOWL" TESTS, PRINCE ALBERT BURNED

**86 DEGREES COOLER**

THAN THE AVERAGE OF THE 30 OTHER OF THE LARGEST-SELLING BRANDS TESTED — **COOLEST OF ALL!**

THAT SIGN HELPS DISCOURAGE TOURISTS. THIS IS WHERE SCIENTISTS STUDY THE MYSTERIOUS COSMIC RAYS

RIGHT NOW I'D LIKE TO STUDY A MILD, TASTY PIPE-LOAD OF PRINCE ALBERT

TELL US ABOUT COSMIC RAYS, DAD!



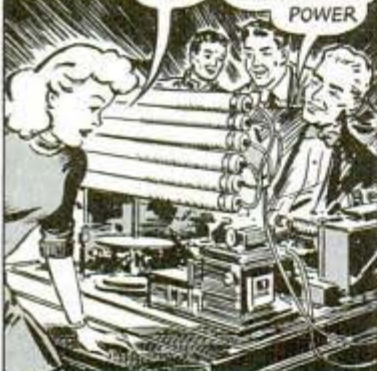
AT THE FAMOUS COSMIC RAY LABORATORY OF DENVER UNIVERSITY



SCIENCE THINKS THAT THE SPECTACULAR COSMIC RAYS WHICH SHOWER THE EARTH DESCEND FROM THE GREAT OUTER SPACES. THE RAYS, MOST POWERFUL KNOWN FORCE ON EARTH, ARE 5 TIMES STRONGER ATOP MT. EVANS THAN AT SEA-LEVEL. LIGHTNING STRIKING MT. EVANS BATHES PEOPLE AND OBJECTS IN A GHOSTLY GLOW

WHAT DOES SCIENCE HOPE TO FIND OUT ABOUT COSMIC RAYS, DAD?

HOW TO HARNESS AND REFINE THEIR TREMENDOUS POWER



THIS AMAZING DEVICE ABOVE TELLS WHICH WAY THE COSMIC RAYS ARE COMING, AND COUNTS THEM TOO!

IT'S IMPRESSIVE THE WAY MAN HELPS NATURE. TAKE CHOICE TOBACCO — PRINCE ALBERT IMPROVES IT WITH THE EASY-PACKING, EVEN-DRAWING CRIMP CUT AND THE FAMOUS NO-BITE PROCESS FOR SPECIAL MILDNESS, TONGUE-EASE!

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**50** PIPEFULS OF FRAGRANT TOBACCO IN EVERY HANDY POCKET TIN OF PRINCE ALBERT

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**PRINCE ALBERT** THE NATIONAL JOY SMOKE

## LATEST WEAPONS *for* DEFENSE

SCIENCE has answered the call to arms and today in scores of research laboratories new weapons that may help defend America are being developed and tested. Every branch of knowledge is being explored for its military value by scientists who have been sworn to secrecy.

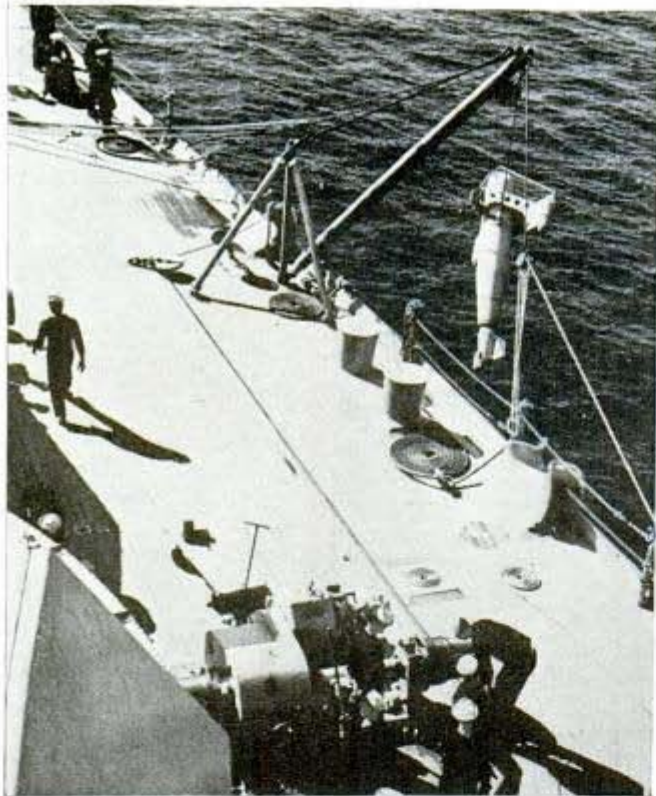
Are death rays, new rocket projectiles and robot bombers being investigated? Authorities will neither affirm nor deny such a leading question, so confidential is the research. For self protection not even the names of the men who are tackling the problems are being revealed.

Of course, weapons alone won't win a war and the present program is concerned with a thousand and one subjects that range all the way from how to make battleships go faster to how to increase the rubber content of the native guayule bush. Such things as adequate vitamins for a nation at war, and the discovery of adequate substitutes for strategic materials, are just as vital as guns and shells.

In this battle of the labora-

Large tube that creates positive ions for scientists to study the atom





Paravane being lowered over battleship's side helps to protect the war craft from mines by cutting free the floating explosives

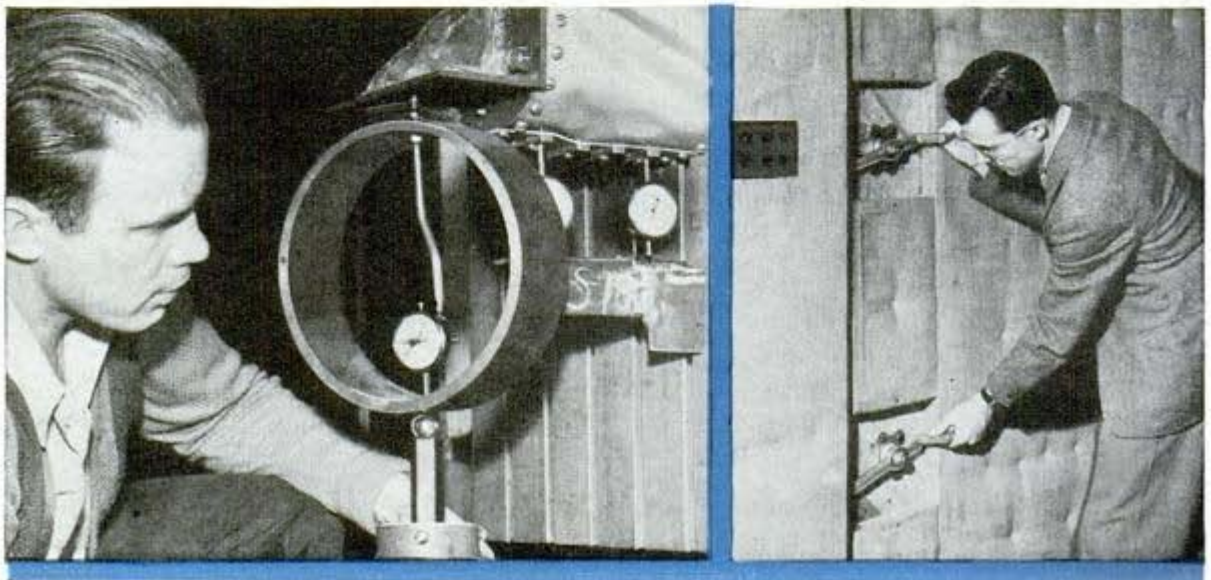
tories all the technical institutions from the Massachusetts Institute of Technology on the east coast to the California Institute of Technology on the west, and including many commercial research groups, have been organized under the direction of the National Defense Research Committee,

which was created last year to correlate scientific research on the mechanisms and devices of warfare. It is estimated that a third of the country's 4,500 physicists are engaged in national defense work. Some of them are probing the unknown for new knowledge while others are working on specific problems that the armed forces and the manufacturers of military weapons wish solved.

Details of this research program can't be discussed, yet in a general way some of the subjects that are obviously under investigation can be mentioned. One is the speeded up search for a quick way to extract Uranium-235, the substance that may hold the answer to atomic power and that would have extravagant military possibilities if it does. The great cyclotrons, surge generators and static accumulators of the universities, built for studies of the atom, are being used in parallel investigations.

Work likewise is progressing on the klystron generator of ultra-short wave radio beams that can be used by a pilot to determine his distance above ground, as a blind landing device for landing airplanes safely in zero-zero weather and in utter darkness, and even, from the ground or from the air, as a range finder for detecting and locating enemy bombers.

Below, testing the strength of a new airplane alloy. Right, padded cells of "dead room" where echoes are impossible and in which supersonic studies are conducted



2519

Its various peacetime possibilities include a method of sending hundreds of thousands of conversations simultaneously through a transcontinental "pipe line."

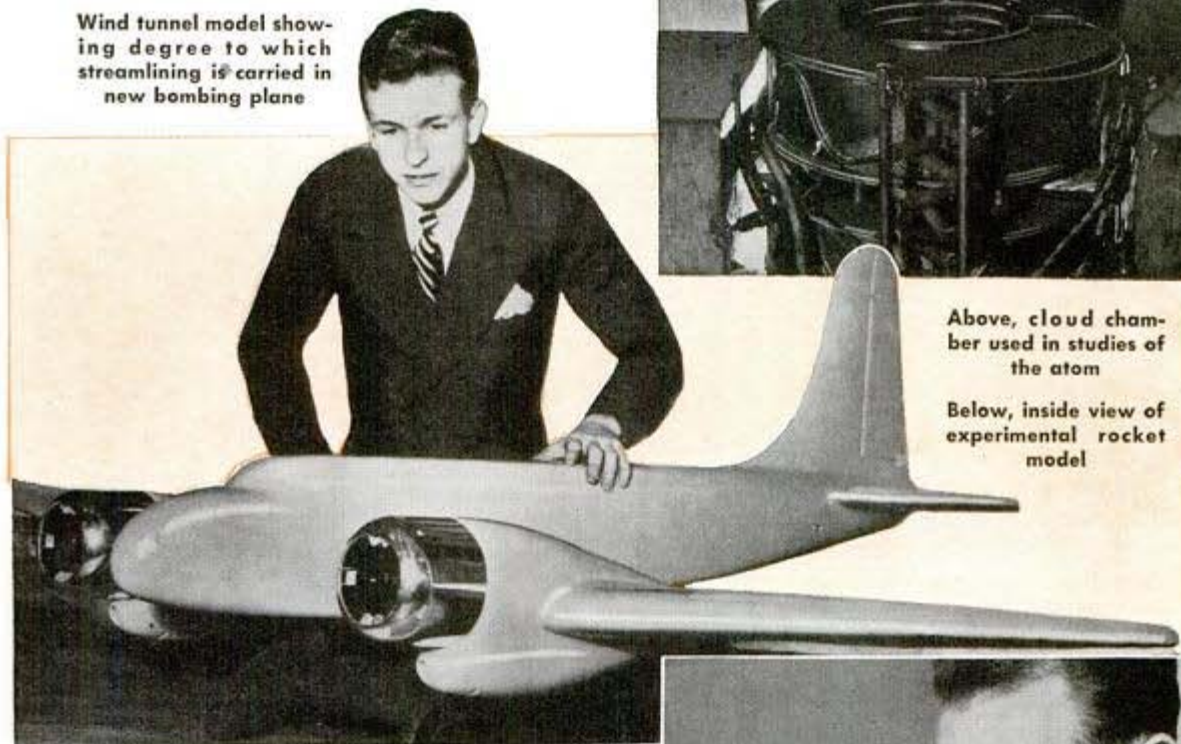
Other scientists are studying infrared radiations that may allow an observer literally to see through fog or darkness. Supersonics, the realm of vibrations far beyond the upper limit of audible hearing, is another subject on which secret research is being conducted.

Research in military aviation is so pressing that a number of plane manufacturers have built their own wind tunnels, so swamped are the research facilities of the universities and of the National Advisory

Wind tunnel model showing degree to which streamlining is carried in new bombing plane



Above, cloud chamber used in studies of the atom



Below, inside view of experimental rocket model

Committee for Aeronautics. The N.A.C.A. is opening a new research center in California in which, for the first time, the problems of flight at speeds well in excess of the speed of sound will be studied.

Long-range rockets for bombarding cities and short range "assault" rockets for blasting open fortified positions are two obvious military weapons to some rocket enthusiasts, who are surprised that rockets apparently have not been used in the present war.

Rockets carry their own fuel, hence can attain flight without the heavy guns and powder charges needed to launch shells through the air. Compared to present



2519



Above, resistance column used in creating streams of atomic particles

Right, fighting power of cruiser may be increased by research

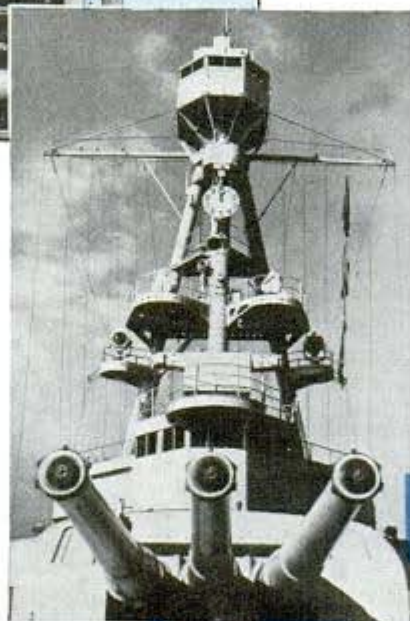
methods of attack they are light and cheap. Serious study is being given rockets by the physicists of at least two universities. The best shapes for combustion chambers are being studied, as well as the best fuel mixtures. One drawback to rockets in the past has been lack of a way to control their direction. This steering difficulty may have been overcome by studies based on patents issued to Dr. Robert H. Goddard that cover the employment of pilot gyroscopes for controlling rocket flight.

Air, steam, and natural gas are the sole raw materials for a new explosive developed at an eastern university. Just as good as other explosives, the new kind is far cheaper. Chemists are keeping other developments under cover, so much so that at a recent technical meeting where new developments are ordinarily discussed, speeches had to be limited to subjects of no military importance.

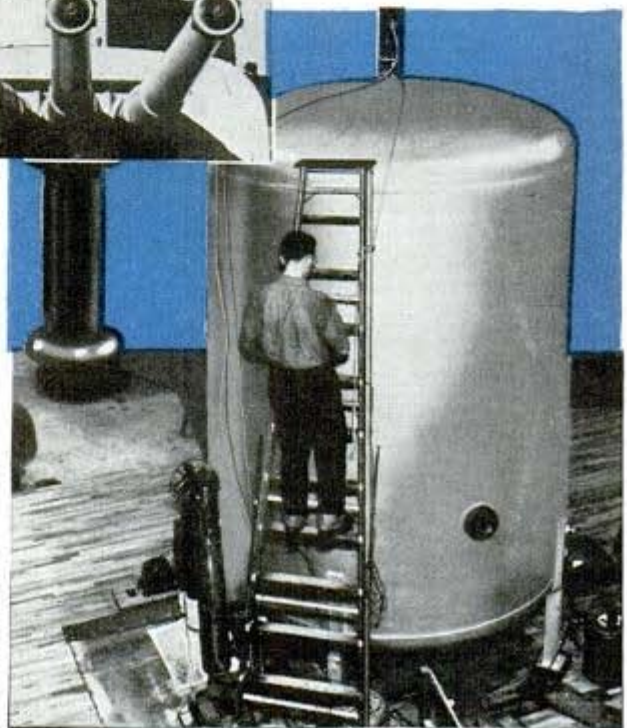
At first glance the study of marine organisms might seem to have nothing to do with national defense but the connection is plain when it is realized that barnacles and growths that attach themselves to hulls seriously decrease the speeds of fighting ships. If a way can be found, and it is being sought, to keep the hulls clean, naval vessels will be able to steam faster on less fuel and without the necessity of periodic drydocking.

If you have an idea you think might help make America stronger, don't send it to one of the universities. Submit it instead to the National Inventors Council, Room 7422, Department of Commerce Building, Washington, D. C. Send a typewritten description, with formulas or drawings attached, but don't send a model or sample. Your suggestion will receive immediate attention and will be referred at once to the right department of the government. The council is concerned solely with

(Continued to page 171)



Below, chamber in which streams of atomic particles are produced



2472

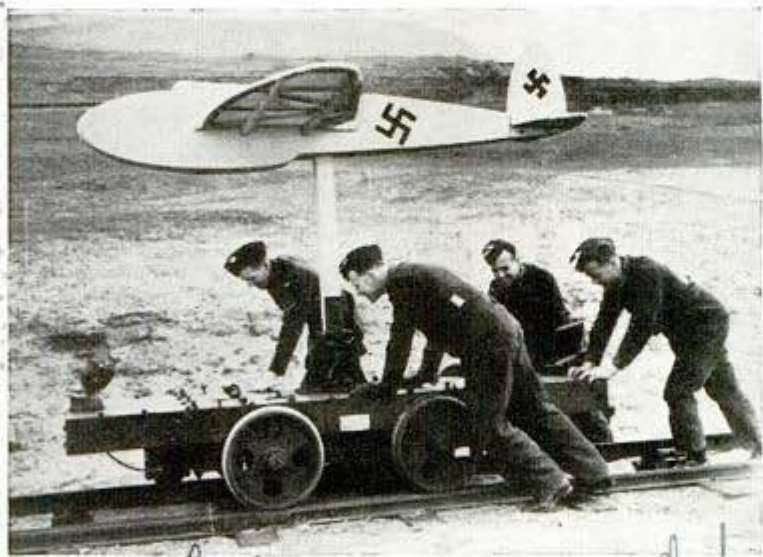
# Mother Goose Figures Line Children's Parade

Huge figures portraying Mother Goose characters were used as highway markers for the annual Story Book Parade at Alhambra, Calif. They were built by Alhambra high school students for the pageant in which hundreds of southern California school children participated. Among the stars of the parade were Humpty Dumpty, Tommy Tucker, Prince Charming, Little Miss Muffet and many other favorites.



High school students built these giant Mother Goose figures for children's parade

# Airplane Model on Rail Truck Is Target for Mobile Guns



Gunners of the British Royal Air Force get realistic practice on the ground by firing at a moving target, a model plane mounted above a flatcar on narrow-gauge rails. The mock enemy plane, nicknamed the "electric hare," is run swiftly around the track while gunners in mobile turrets pepper it.

Members of the Royal Air Force give their "electric hare" a start on its circular track, carrying model plane as a target for gunners

# Cloth Impregnated With Glue Used to Tighten Joints of Furniture

Cloth crosses impregnated with glue offer a convenient means of tightening loose chair rungs or other joints. The cloth is soaked in water for a half minute, then laid over the hole and the rung or leg is pushed into place, making the joint firm. The crosses are handy in other repair jobs, such as fixing umbrella heads or hammers.



American railroads issue about 80,000,000 timetables every year.

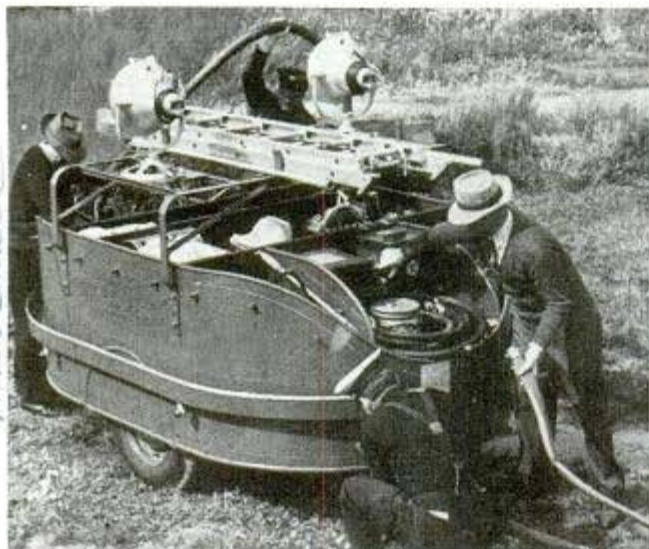
*New York Times*  
AUGUST, 1941  
2/29/40

*Little's Joint Sales Co., New York*

2467

# Trailer Fights Oil Fires With Protective Spray

California State Fire Marshall



Patterned after the small, mobile fire-fighting units with which London battles its incendiary bomb fires, a trailer unit is on duty guarding a California oil field. Easily towed to a blazing well, it packs a variety of equipment in a small space. Its nozzles deliver a spray that shields the fire fighters from the terrific heat and flames of an oil fire.

To combat the terrific heat of an oil fire, this trailer guarding a California oil field, sends up a spray that protects firemen. It carries ample equipment, gets to the fire in a hurry

Diverting Sprung  
Island City, N.J.

European Vehicle Service

# Jig Holds Small Auto Parts In a Firm Grip for Repairs

Hygrade Products Co. 35-35  
25-35  
5-10-16

As an aid to garage mechanics, a manufacturer has designed a convenient jig that will hold carburetors, fuel pumps, distributors, relays, wipers or any similar small part in a firm but safe grip for repairs. Its various clamping devices take hold rigidly but without injurious pressure, and once clamped in position the whole unit can be swung in an arc to permit reaching any part of the work. The jig consists of a flat table or bar on which the part to be repaired is fastened quickly with two clamps or a thumbnut; the bar pivots on a base, turning in a complete circle and locking at any point with a cam lever device.

The jig at right holds small automotive parts rigidly, swinging for easy access



Hygrade Products Co. 35-35  
25-35  
5-10-16

# Cigarette Kit Mounted on Steering Post Reached Easily While Driving



Holding cigarettes and matches within easy reach of the driver, a smoking kit that clips to the steering post provides a convenience for the driver who smokes, and contributes to his safety. It combines an ash tray, compartment for cigarettes and a holder for book matches. A snap lid is removed for emptying the metal ash tray and inserting cigarettes into the compartment, which holds ten or twelve.

Cigarettes, matches and ash tray are kept in reach of driver with this steering-post kit

6 Von Isenten Enterprises  
299 Copley Road  
Akron, Ohio



506. Prof. Richard W. Hays  
3260 Randolph Lincoln, Neb.

# Two Men Set 8,000 Trees a Day With Planter

To speed the planting of field and farmstead windbreaks, a machine operated by two men and having a capacity of 8,000 trees a day has been developed by the Soil Conservation Service and made available through the office at Lincoln, Neb. Seedlings and second year stock, evergreen or deciduous, may be planted equally well, the depth of planting being adjustable to a maximum of 16 inches. The soil is opened and held apart by a plow blade while the tree is placed in position. Packing wheels then firm the earth around the roots, after which disks throw loose soil against the base of the young tree. An audible signal operated from a wheel assists in spacing the trees regularly, usually at six-foot intervals, in the row. A 25-horsepower tractor is powerful enough to pull the planter, and needs the services of a third man to drive it.



Two men seated at rear of planter alternately set trees in crevice opened by plow, after which packer wheels press soil

Sleight the Greber Regional Engineering Co. Terminal

# Bed Blanket Wired for Heat Is Tested by "Sleeping Doll"

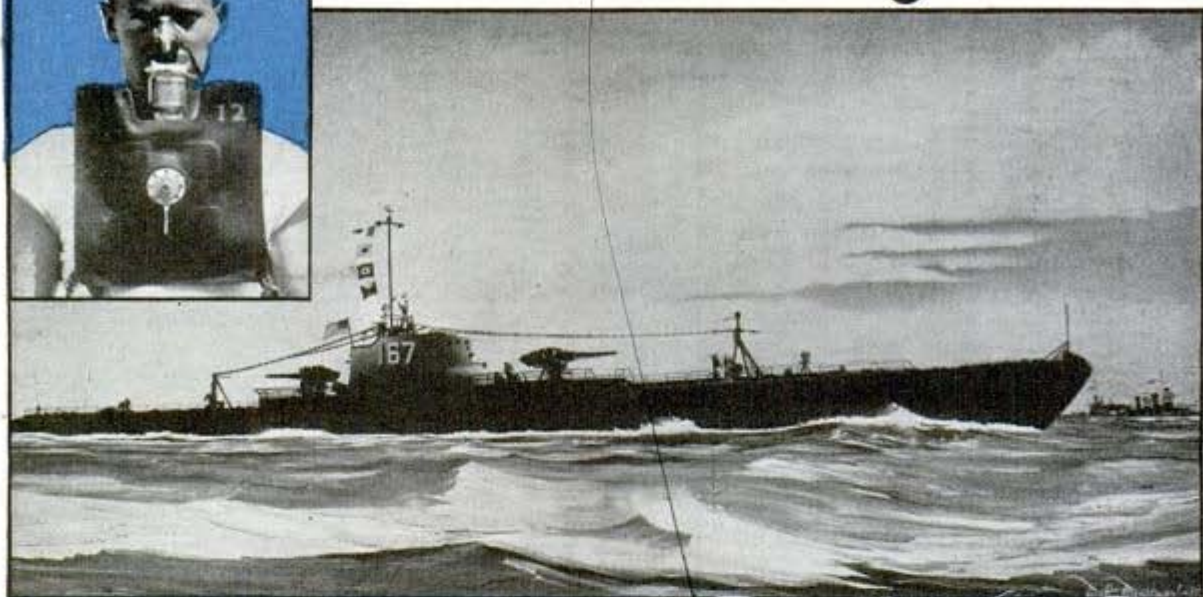
To assist engineers in testing a new electrically heated blanket, a dummy stuffed with straw has spent a winter of nights on the roof of the General Electric factory in

Bridgeport, Conn. Known by the affectionate name of "Maggie," the woman of straw reports via electrical meters the "comfort" she experiences during the night. By means of a special suit of long electric underwear, Maggie's body gives off heat at a rate approximating that of a person. She is protected from the cold by one automatically controlled electric blanket and a light bedspread. The amount of heat supplied by the blanket may be regulated according to the user's desire, by a thermostat in a control box at the bedside. Night charts keep records of outside temperature, the temperature of Maggie's body, and the amount of current needed to keep her warm.



Engineer reading charts at bedside of Maggie the dummy in tests to determine how well the automatic blanket serves to keep the sleeper warm

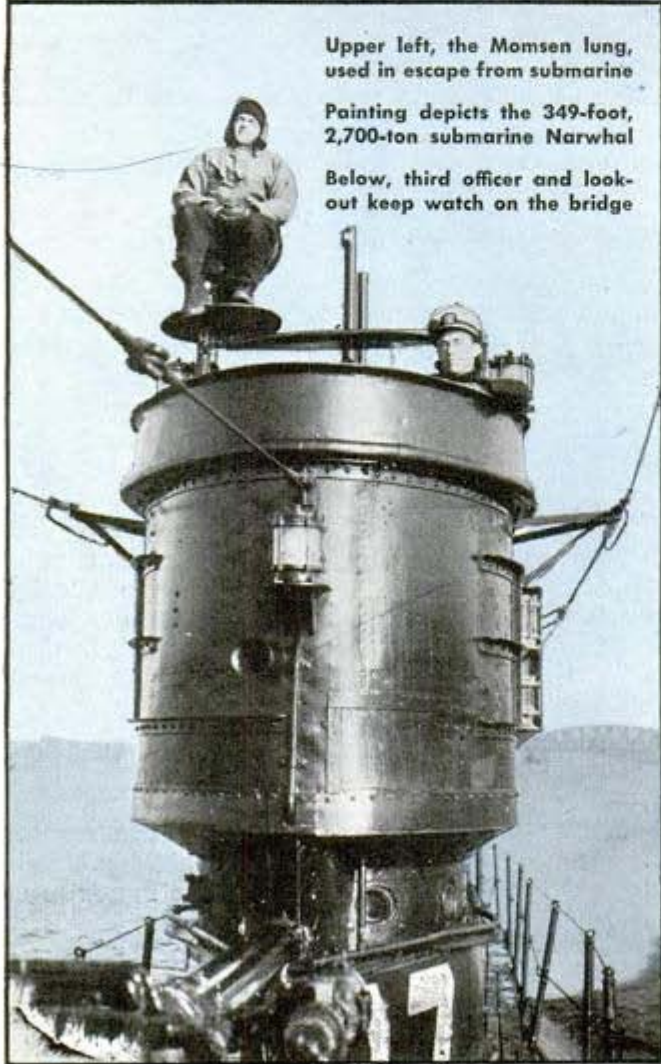
# Meeting the



Upper left, the Momsen lung, used in escape from submarine

Painting depicts the 349-foot, 2,700-ton submarine Narwhal

Below, third officer and lookout keep watch on the bridge



**By Capt. Simon Lake**

Inventor of the Even-Keel Submarine

**As Told to Martin Sheridan**

PEOPLE have different views on methods of meeting the submarine menace. At the beginning of the first world war in 1914, Winston Churchill, then Britain's First Lord of the Admiralty, said, "We must go over there and dig them out, as we would dig rats out of a hole."

That system did not prove successful 26 years ago. And it is not successful today, as the tremendous British shipping losses prove. Sinking of tonnage still goes on faster than the world is building and equipping. What are we to do?

I have been convinced for many years that the submarine is the premier weapon for defense, and that its ability to become invisible makes it invulnerable and invincible, in comparison with visible surface craft. Some submarines, through the carelessness of their commanders or through improper installation of machinery, may be caught, but in general the physical differences are such that, in the long run, the submarine must win

*and officer Lt. A. D. ...*

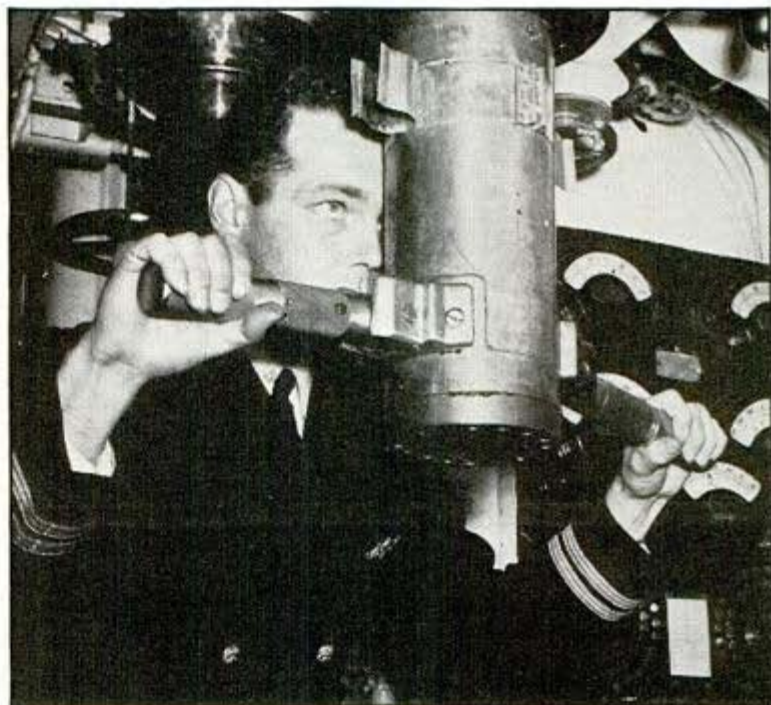
# Submarine Menace

out against the surface craft of the enemy.

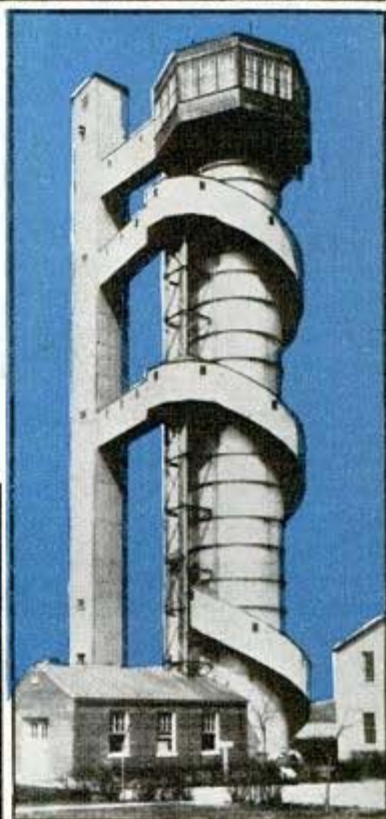
As far as I am aware, there is nothing that can be done to protect surface ships, either warships or merchant vessels, against submarine attack. The only thing that will enable commerce to carry on in the presence of military submarines is the cargo-carrying submarine which can evade the military underseas craft by itself becoming invisible to the enemy, evading even enemy aircraft as well as surface warships and submarines. Submarines cannot fight one another when they cannot see or locate one another.

The idea that a submarine can be located by an airplane is fallacious, except in waters of crystal clearness. A plane might be able to sight a submarine in the Mediterranean or in the Caribbean, but the odds against the destruction of the submarine by the airplane would be great, as the airplane must come directly overhead to drop a bomb on the underwater craft.

My reply to the Nazi "pig-boat" raiders would be a cargo-carrying submarine—not of ordinary size, not even the size of the 600-ton "Deutschland"—but large 13,000-ton steel cigars able to carry on world trade in spite of the most destructive and costly war in history.



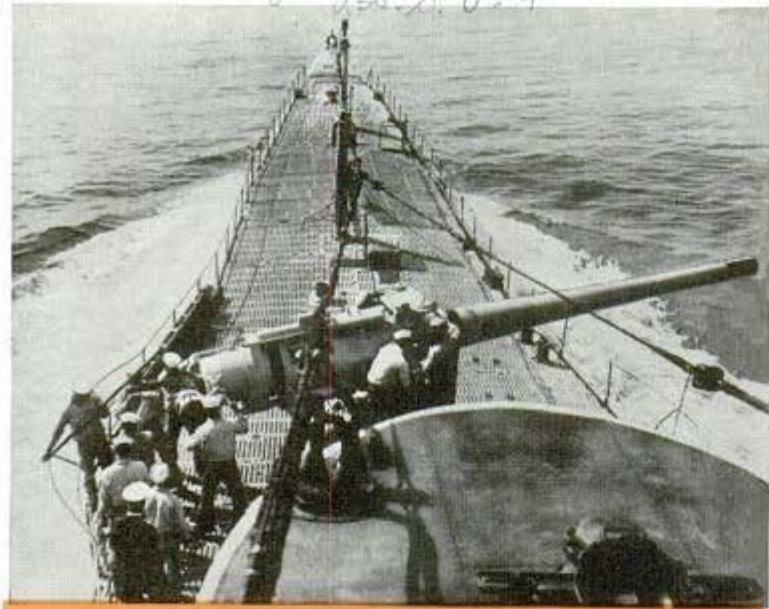
Capt. D. F. Weiss of U. S. Submarine R-10 sights through periscope while on maneuvers, submerged



In the navy's training tank at New London, Conn., (above) submarine crews learn the technique of escape. Left, submarine P2 breaks surface



L-300 Los Angeles Harbor  
of Jan. 4



Loading a shell into deck gun of the navy's largest submarine, *Kingston*. Levers at right control valves for submerging or surfacing

The idea is not new. It was born when I applied for United States patent, under date of April 2, 1897, the specifications that began as follows:

"The invention relates to a combined surface and submarine vessel, and may be employed either as a torpedo boat or for freight and general cruising purposes, or for submarine work of all kinds." The patent was issued in 1900 and covered the type of construction used by the Germans in building their famous cargo-carrier, "Deutschland," which merely submerged and traveled under the entire British blockade fleet in 1916, eluding not only hundreds of surface vessels, but airplanes and dirigibles as well.

Great Britain's practice of building ships faster than the enemy can sink them is senseless. It is to be compared with shoveling coal into a fire in the hope that the blaze will be choked.

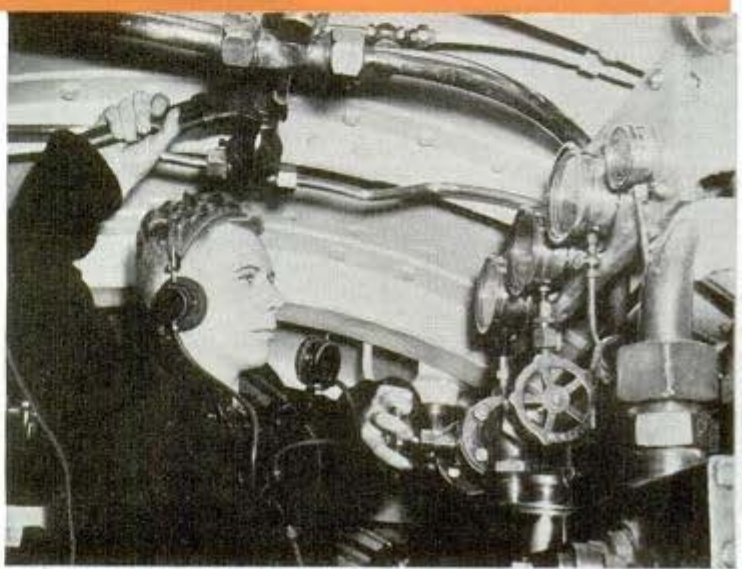


There is absolutely no percentage in hastily building several-million-dollar ships, loading them with valuable cargoes and sending them out to be sunk, when immunity from attack can be obtained at no extra cost.

For a supposedly inventive and progressive nation, we are curiously prejudiced. It took the Germans—with their reputation for stolidity and slow thinking—to attack successfully very much the same problem 25 years ago with boldness and imagination which they credited to the United States.

My plans call for vessels 438 feet long with a beam of 70 feet and quarters for 200 passengers. Top speed could reach 12 knots when fully loaded with 7,500 tons of cargo. Only 30 feet of water will be required for the loaded freighter-submarine. It is possible to build these all-welded steel vessels with retractible wheels within three

Eyes on gauges, an undersea "rookie" cuts in compressed air



2390

Sub 03-10.

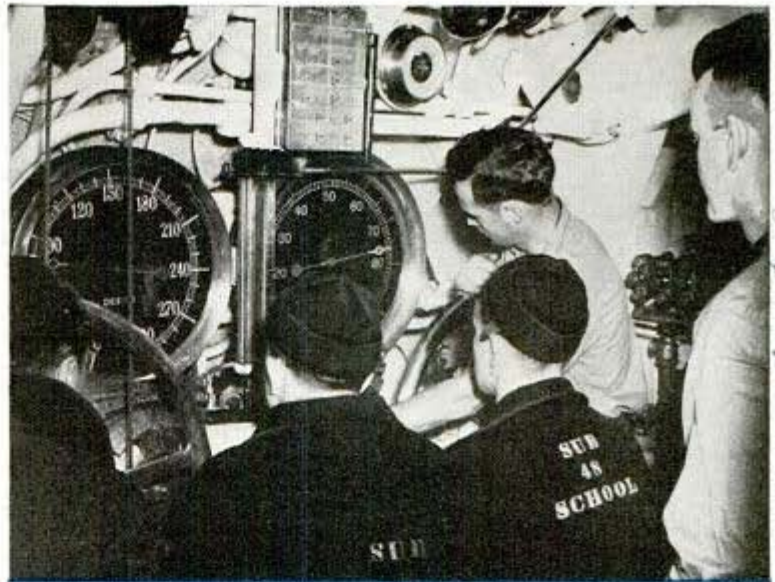
months after the materials are delivered at the shipyard.

A standard type surface freighter of the same load-carrying capacity would cost more to build and require a longer time to complete.

Great Britain must fight the enemy submarines with cargo submarines whose periscopes are so constructed that the heavens, as well as the horizon, can be scanned. The head of a periscope is only four to five inches in diameter, and when painted a neutral tint it cannot be seen with the naked eye a distance of more than 500 yards. If the sea is choppy it is difficult to discover it at a distance considerably less than 500 yards.

Because of her low-lying hull, it is possible for one submarine to pass another on the surface within five and three-quarters miles and remain unseen. Her wake would be far, far below the horizon of the most

Standing by for firing orders in forward torpedo compartment



Above, students watching instruments as sub levels off 76 feet down

Officer using model of submarine to demonstrate a point in sub class



*Lt. Commander. Lt. C. Crawford  
Officer in charge. Submarine School*



watchful, ruthless enemy submarine aloft. By the application of certain tried devices, which I cannot divulge to the public, the range of visibility can be reduced to less than one mile.

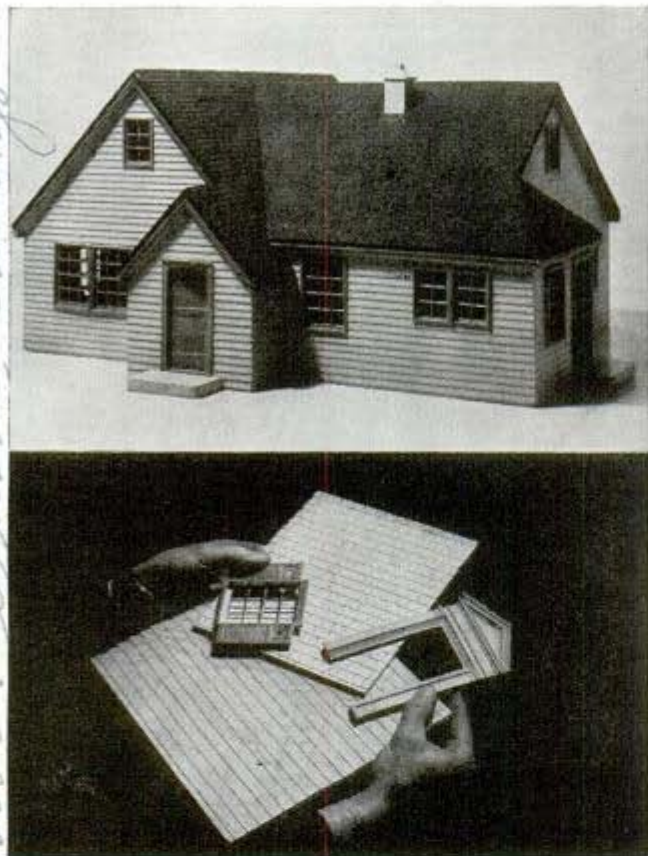
The cargo carrier can become entirely invisible to an enemy submarine merely by submerging. In two minutes she can dive under water. And no matter how rough the surface may be due to stormy weather, there is always smooth sailing from 30 feet down.

When the Germans made two round trips to this country in submarines during the first world

(Continued to page 183)

764.

## Scale Model of Home Built Easily With Prefabricated Parts



Top, model of home built from prefabricated parts; bottom, samples of miniature window, doorway, siding and roof material

div. of Engr. - Bill Scale Model of Roads  
1600 St. Jefferson Chicago  
Architectural Dept  
558

Work of building a scale model of your present home or of the bungalow you plan for the future is simplified by using prefabricated miniature building material now available. All parts are finished and ready for use, eliminating such work as grooving the siding and routing cornices and door panels, and therefore they can be fashioned quickly to fit the plans for any house. Material for each section of the house is sold separately, brads and glue being used in assembling them. Scale models between one-fourth and one inch to the foot can be made.

## Five Billion Birds in U. S., Sample Counts Indicate

There are at least 5,000,000,000 birds in the United States, and probably nearer six billion. However, this estimate by Roger T.

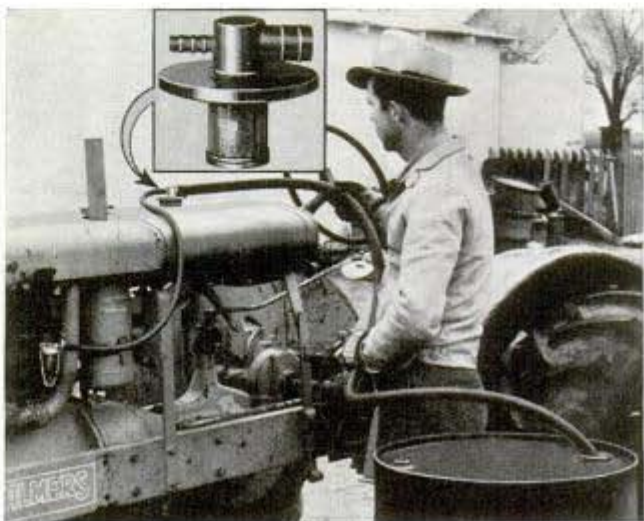
1006-5 of Co  
New York

Peterson of the National Audubon Society is admittedly a mere guess, for it is based on sample counts made in a few representative habitats during the nesting season. Close counts have never been made in the western mountains and short-grass plains, the pine country and salt marshes of the east. Density of bird populations varies just as that of human populations. Sample counts in the cultivated farmlands of Kansas, for example, indicate a bird population as low as one to five acres, while the woodlots and plantings around farm houses may be home to 20 birds to the acre.

2463

## Engine Fills Its Gas Tank From Storage Barrel

Using vacuum power created by the intake manifold, an engine can now fill its fuel tank from a barrel by means of a special pump attachment. The fuel is strained as it flows into the tank, and the pump automatically shuts off the flow as soon as the tank is full. Installed in five minutes without drilling holes, the vacuum pump will work on tractors, automobiles, boats and trucks, as well as Diesel and stationary engines. As there are no moving parts or adjustment valves, the unit is said to be long lasting.

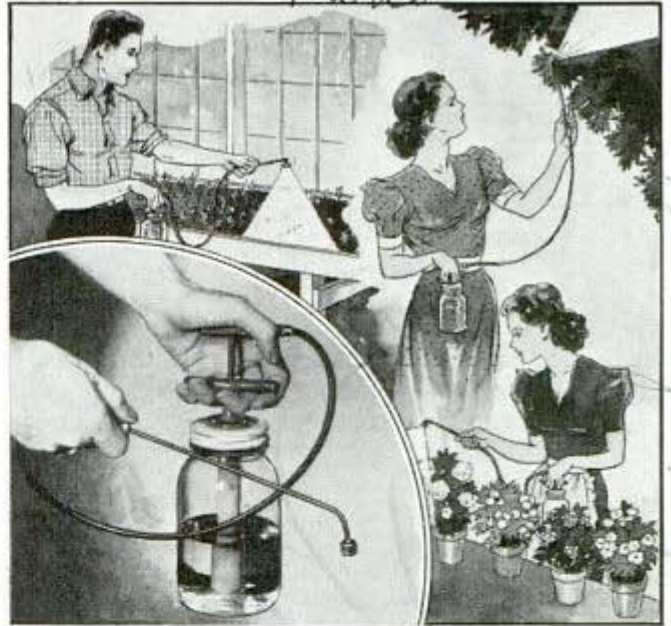


Vacuum device, inset at top, uses engine power to fill tank

L 534 Mrs. Lermaitis Hathap Llio  
741 Terminal St. Los Angeles  
Hared

# Plant Sprayer in Jar Is Pumped by One Hand

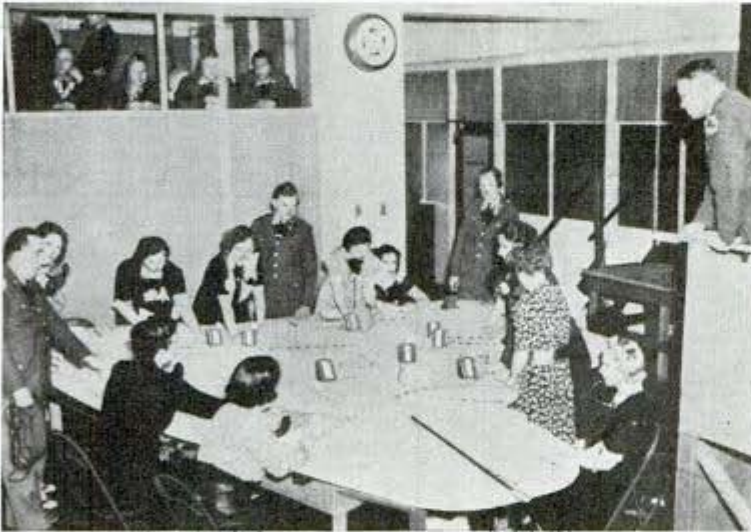
For use in the garden, a quart sprayer is operated simply by squeezing together a double handle which forces a plunger down within the glass jar container. It is light in weight, easy to carry and covers a wide area for its diminutive size. In the house it may be used to freshen cut flowers and for watering plants. The underside of leaves is reached with ease. Should the jar break, the cover and pump assembly may be fitted to another Mason jar.



Sketches show three uses for jar sprayer. In close-up photo note dual handle which, when squeezed together, operates pump to create spray

L 509

# Civilian Plane Spotting System Set Up on Northeast Coast



To plot the approach of enemy planes, a warning system is being organized in the northeastern states similar to that used in Great Britain. Volunteers will note and report to their nearest control points the course, altitude and type of spotted planes, and from there the information will be relayed to fighting bases.

Here plane's course is charted and reported to fighters

L 490

# Small Teeth Start Hacksaw Cut in Metal by Taking the First "Bite"

Equipped with a short stretch of small teeth now on the market is said to be easier to start. Back of the set of small teeth are the larger and deeper ones that do the cutting after a start has been made with a few short strokes. This relieves the regular teeth of the job of starting difficult cuts which may ruin the entire blade.



Fine teeth at left end of hacksaw blade start cut in metal; then coarse teeth finish job

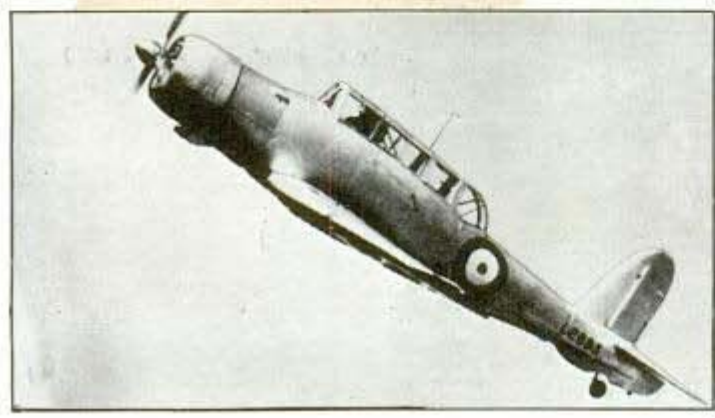
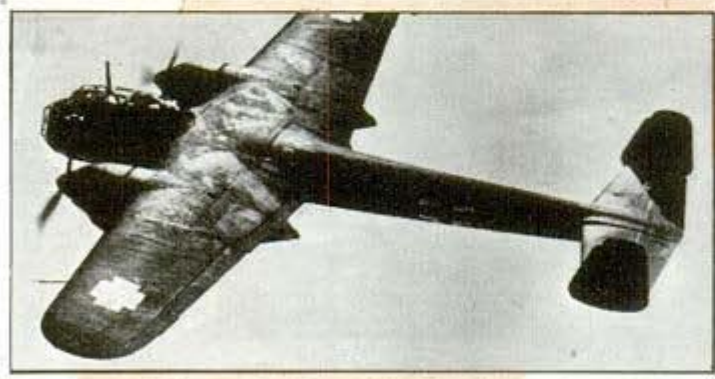
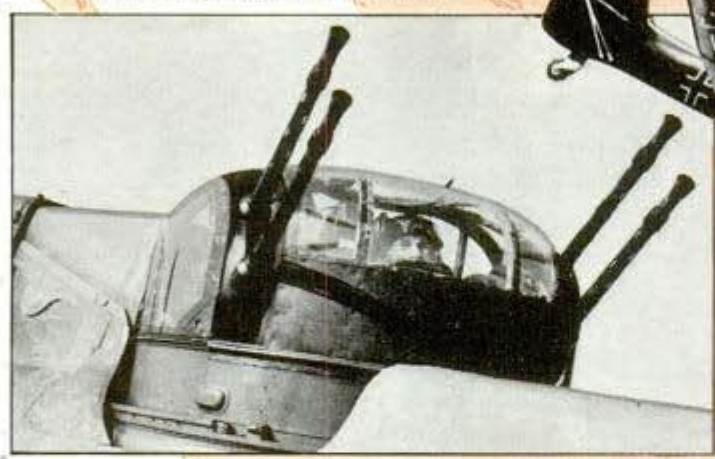
Mrs. Wanda E. Thompson  
New Haven, Conn.

West: Vaughan Seed Store  
Harris  
Milford, N.H.

462



Above, several British night fighters on patrol, watching for German bombers



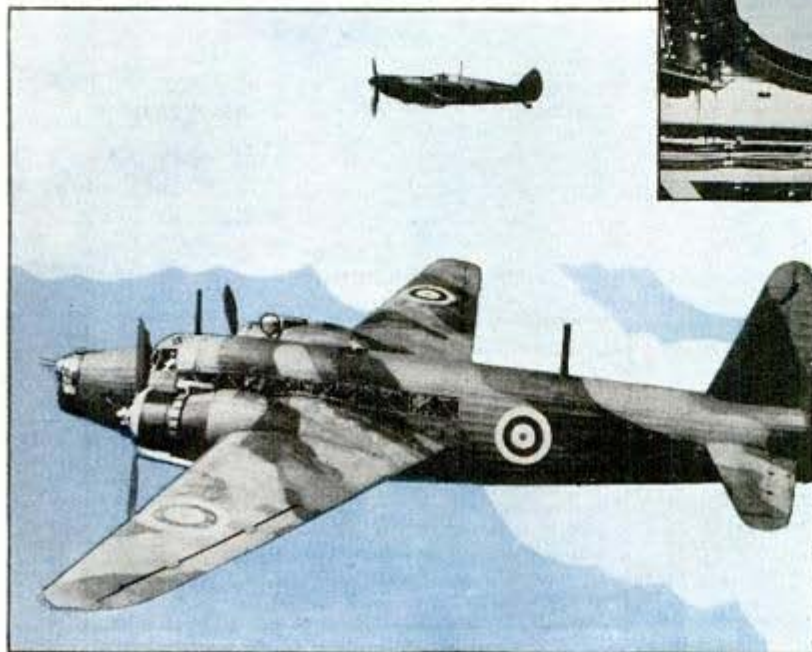
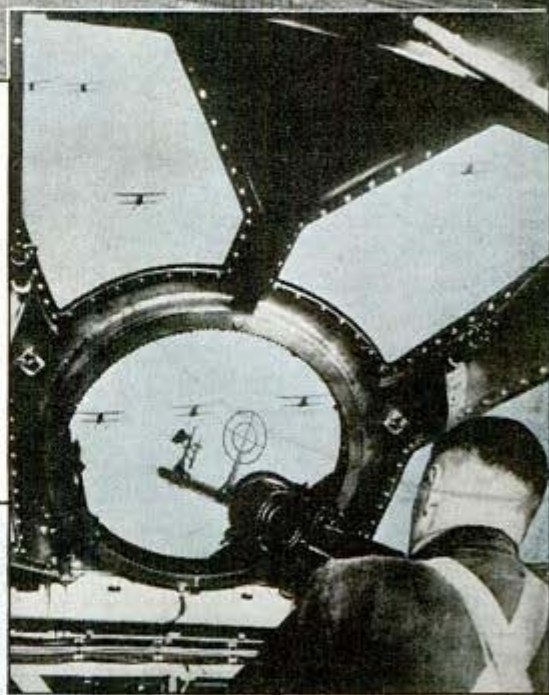
# The **BATTLE** for the **SKIES**

Over Europe and northern Africa a battle for control of the skies is raging, with Great Britain's warplanes pitted against those of the axis powers. On this and the page opposite are pictured some of the types used by both sides. Above is a German dive bomber, while to the left, second from top, is the deadly power-operated gun turret of England's Boulton Paul Defiant night fighter, which is powered by Rolls-Royce Merlin engines. Below the turret is Germany's "flying pencil," a Dornier bombing plane. At bottom is a British Blackburn Skua, designed particularly for dive bombing. It attacks by releasing a bomb near the lowest point of a nearly vertical dive toward its target





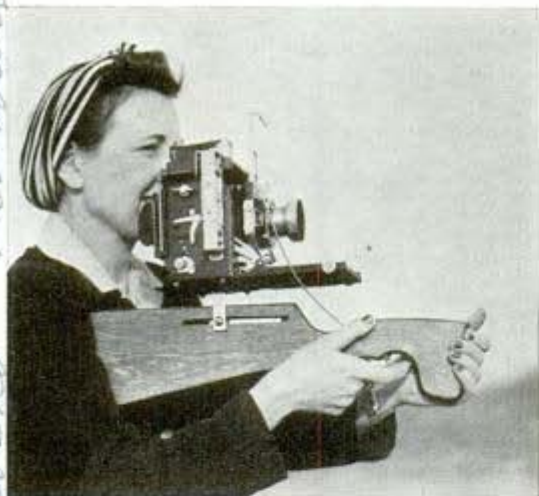
Above, Handley-Page high speed patrol bomber of Britain's Royal Air Force soaring over the English countryside while a train puffs below. One gun turret can be seen in front while a second is on top of the fuselage. Right, gunner in nose of Germany's "flying pencil" drawing a bead on approaching planes as he practices for fighting off British planes in raids over England. The "flying pencil" is an improvement on the Dornier DO-17, having greater speed and better maneuverability



Left, two units in Britain's air fighting force. In foreground is a Vickers-Wellington long-range bomber, powered by two 14-cylinder radial engines delivering more than 2,000 horsepower. The plane has three gun turrets, one in the tail. In background is a Supermarine Spitfire eight-gun, single-seat, day and night fighter. Equipped with Rolls-Royce engines, these planes are among the speediest military planes in the world

2458

## Wooden Mount for Camera Permits Aiming Like a Gun



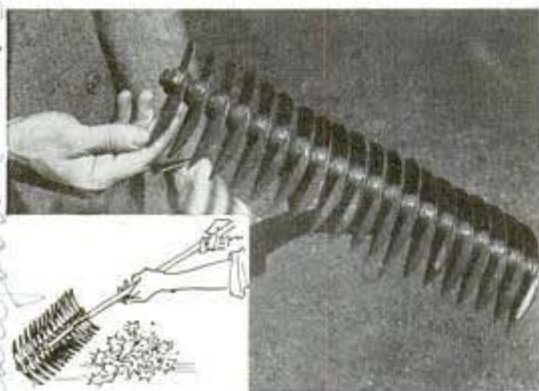
Camera mounting, shaped like gunstock, gives steady hold at shoulder. Trigger pulls the cable release

Providing a firm mounting for the camera, an inexpensive wooden stock now on the market may be gripped like a gun and braced against the shoulder while making shots with either a still or movie camera. The mounting, adjustable to hold both the large and miniature type, is designed for cameras having eye-level view finders. The cable release, threaded through the stock, is pulled like a trigger.

2532

## Push-Pull Self-Cleaning Rake Need Not Be Lifted

Fitted with crescent-shape fins in place of the ordinary tines, a self-cleaning rake may be worked back and forth like a vacuum cleaner without lifting it from the lawn to remove grass and leaves. The rake



"Half-moon" teeth let go leaves and grass, as shown in inset, when rake is pushed back without lifting

U.S. Rubber Co.  
Rockefeller Center, New York

glides easily as it is pushed back, and the refuse falls away of itself. The upper points of the half-moon blades are flanged for harrowing or breaking up sod lumps.

2511

## Golf Ball Has a Heart of Oil Giving It Added Energy

Golf balls now being made with a cushion of oil in the center are said to withstand a higher degree of pressure than former types, and to transmit more energy to the ball. The oil is doubly sealed in a round capsule and then inclosed in a resilient rubber molded container. The oil cushioned center was adopted after thirteen different centers were tested. A new winding machine which automatically controls tension of the rubber thread makes greater uniformity possible.

2419

## Batteries Take Place of Gasoline To Drive German Bikes



Two dry-cell batteries run this bike about 63 miles

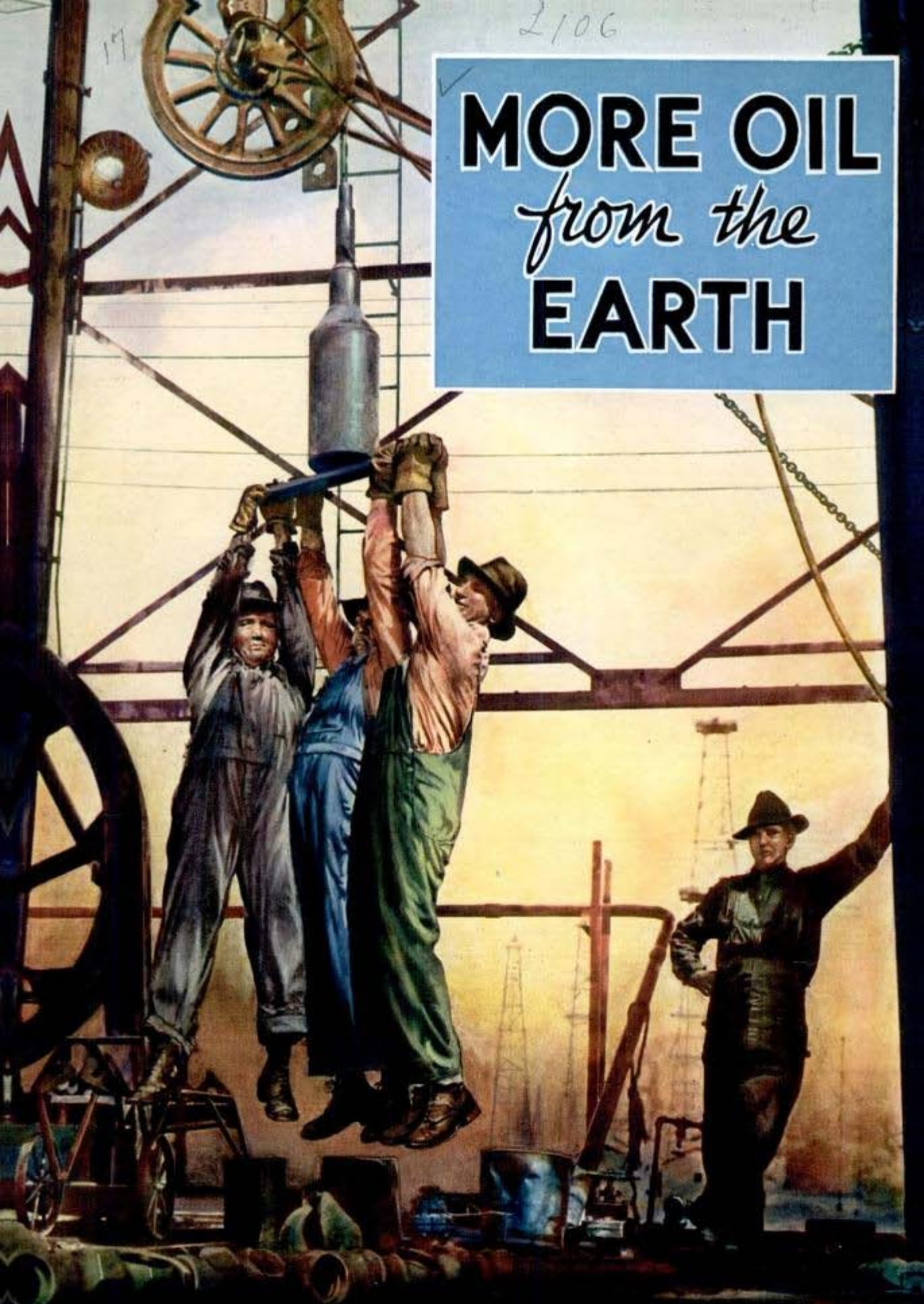
Among the power-driven bicycles operating in Germany is a motorbike that takes power from two dry cell batteries. It is said that the batteries yield enough current to run about 63 miles.

### IF YOU'RE IN A HURRY—

Readers who have used our new Where-to-Buy-It Index tell us they now obtain additional information about products described in Popular Mechanics in about half the time formerly required. Next time you want to know more about any device, just note the page on which it appears, then turn to the index, page 4-A. There you will find listed the name and address of the maker or seller of the product, if it is commercially available. Write directly to him. For a quick reply—Say You Saw It in Popular Mechanics.

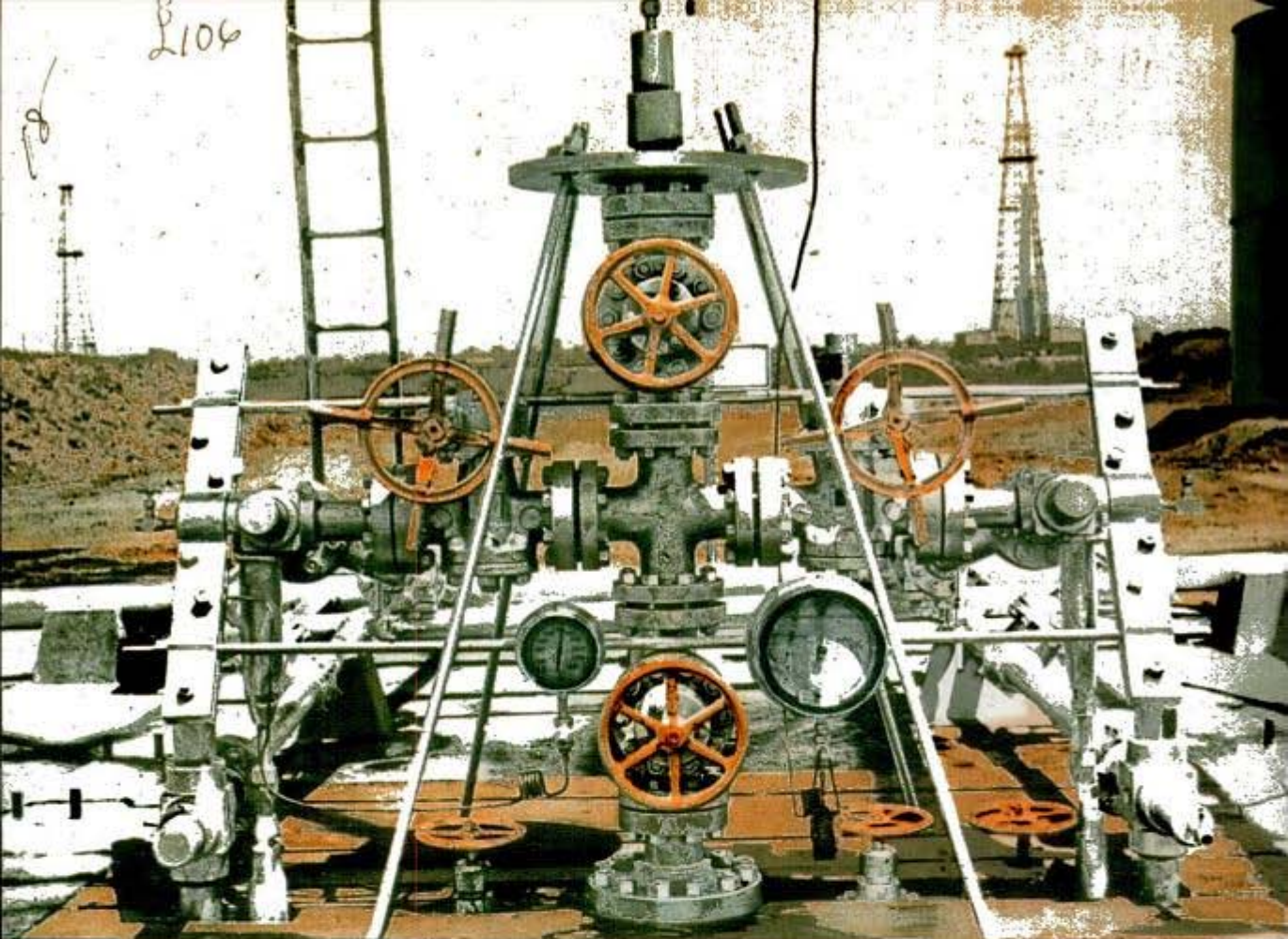
L106

# MORE OIL *from the* EARTH

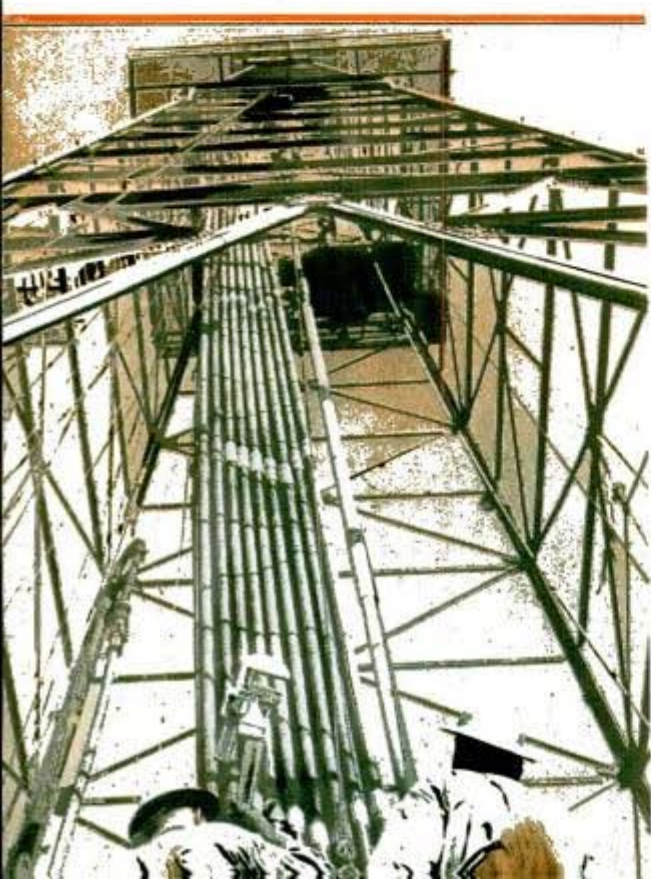


Electromagnet, used in "fishing" lost tools from bottom of oil wells, is powerful enough to support weight of several members of drill crew

L106



"Christmas tree" assembly of lines and valves by which oil well is brought in under control



TWENTY years ago it was said that by 1941 the United States would begin to feel the pinch of an oil famine. Today that unpleasant possibility has been pushed at least a third of a century into the future and it may be that 100 years from now we will still be running our cars and airplanes on petroleum products.

While some engineers have been prospecting for new pools and have been drilling deeper wells to tap lower sands, others have been trying to extract greater quantities of oil from our present fields. Shooting holes into the producing sands to open them up, acidizing the sands to increase their porosity, and recycling natural gas down the wells to increase the pressure in the oil strata have all helped to boost production. Water flooding the sands to float oil out and even forcing compressed air into the formations are being tried.

Yet, even with these helps, only 20 percent of the liquid in a pool of heavy oil is being recovered. Eighty percent is unrecoverable by present methods. Pools of lighter gravity yield half their supply and half remains in the ground. On the average, a field

*Emb. Thomas G. Tomson Dr. Los Angeles  
2872 Franklin Ave.*

Left, an unusual photo showing the drill pipe inside a derrick with drillers working at bottom

stops producing when only a third of the oil that it contains has been extracted.

Obviously, if another third of the oil in the pools could be recovered our reserves would be approximately doubled. Instead of a known recoverable supply of 20 billion barrels of petroleum, we could count on recovering 40 billion barrels from the present fields. That is exactly what is contemplated by a revolutionary production method called horizontal drilling. Oil is flowing by gravity out of the first horizontal oil well, drilled in Ohio. The horizontal well is producing more than the total production of the 50 nearest vertical wells in the same field. It was drilled into sand that averaged less than 15 percent saturation, not enough to permit recovery of a single spoonful by ordinary methods.

There are no technical reasons why such horizontal wells may not be drilled from depths of several thousand feet below the surface, although in some areas the heat at great depths would be a problem to overcome. The present rotary method of drilling oil wells might be adapted to drilling a shaft large enough to admit the drillers and their tools. Working inside an enlarged chamber at the bottom of the shaft and wearing masks to



Photo courtesy Petroleum World

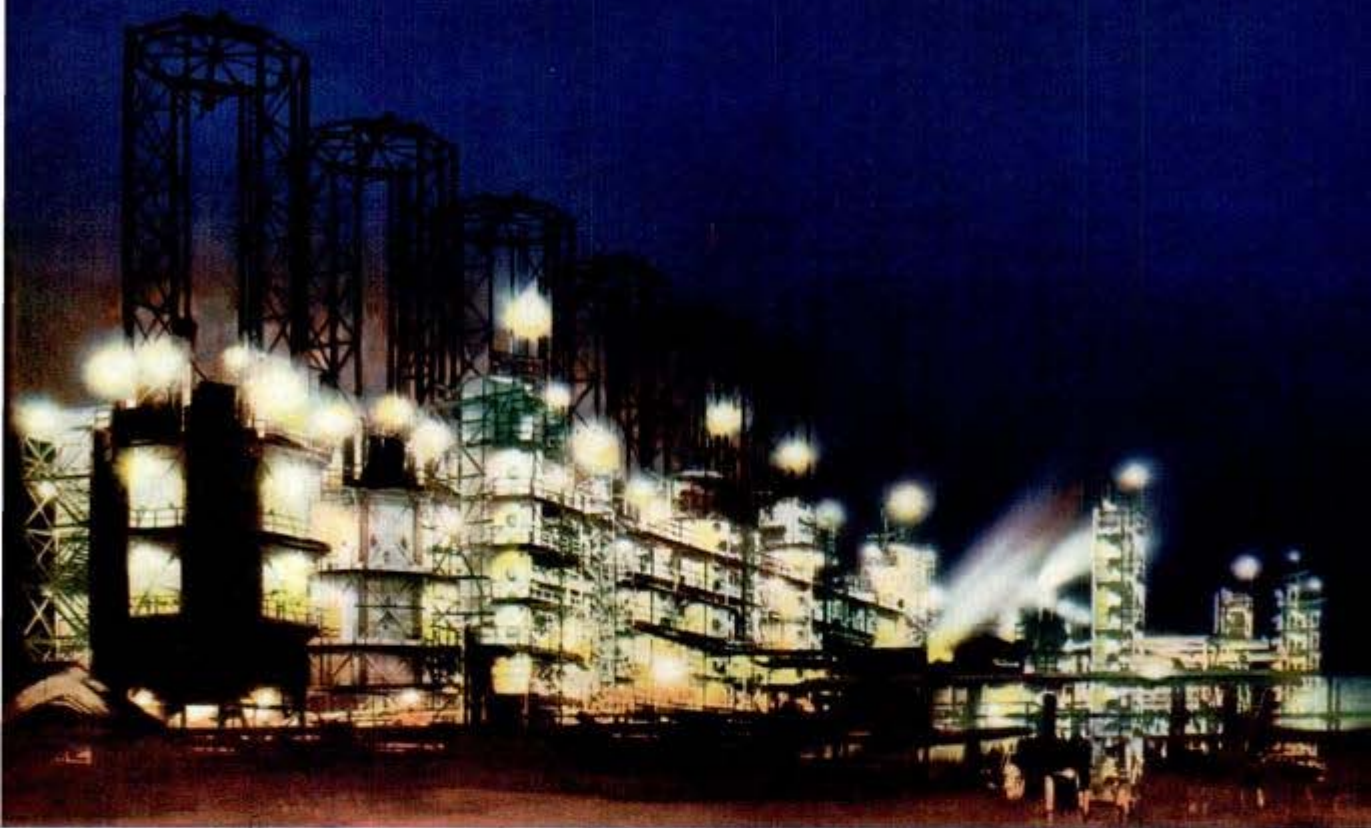
412 W. 6th St  
Los Angeles

Above, members of the drilling crew attaching drill pipe to a string of pipe in the hole



Above, wheel by which depth of gamma ray detector in well is measured. Below, part of modern refinery installation





20  
 2106  
 Here is a spectacular view of an oil refinery at night, with all its electric lights ablaze



to Petroleum World, 412 W. 6th St., Los Angeles

protect themselves against gas, the underground oil miners would operate electrical, gas-proof diamond drilling machines to cut holes several inches in diameter for distances as great as 3,500 feet. Radiating out in many directions, the horizontal wells drilled from a single working shaft would be able to drain 800 acres of formation. Horizontal wells are drilled in pairs, a cutting bit on the back end of the drill rod being used to lengthen one hole while the rod is being pulled from the opposite hole for removal of the cored rock. Ten-foot lengths of drill rod are added to the assembly as the distances grow.

Perfected over a 25-year period by Leo Ranney, petroleum engineer, horizontal drilling has also proved a success in developing large quantities of water for industrial and domestic purposes. The horizontal water wells now in use have a total

Among the growing number of petroleum byproducts is insecticide spray, here shown in use

2106

21

Right, another unusual picture from the oil fields, this shows welders engaged in assembling the casing as it is lowered slowly into well



Below, here are some of the huge towers used in the industry to break heavy crude oil into its fractions, resulting in the gasoline you use

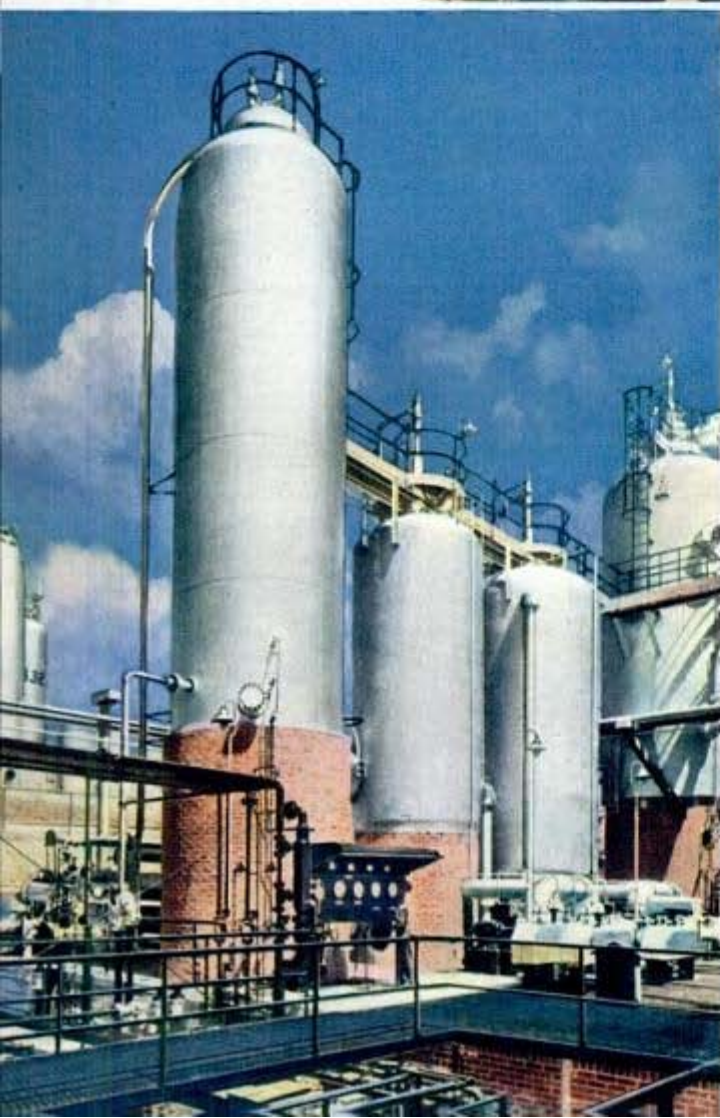


Photo courtesy Petroleum World

capacity of 200 million gallons per day. The method has been suggested as a way of extracting natural gas from coal mines, a development that would not only recover valuable fuel that is now being wasted but that, at the same time, would eliminate the dangerous gas hazard in coal mining operations.

Oil men are coming to the conclusion that horizontal drilling makes it possible at small additional cost to extract twice as much oil from the earth as was once believed possible.

Meanwhile the oil industry has been taking advantage of all the latest developments of science to transform what was once a swashbuckling hit-or-miss sort of vocation into a meticulous, accurate science all its own. Gamma rays are being used to hunt for oil-producing sands, the mysteries of static electricity are be-



Left, well illuminated for drilling after dark. Right, Ford Motor Company well in California is distinguished by sheet metal covering on framework of the derrick

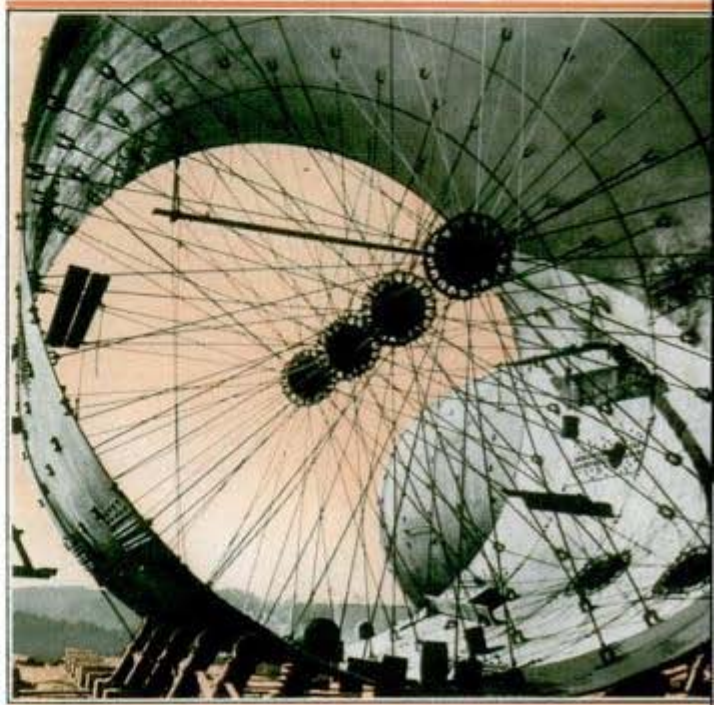


22  
 Drilled by Lacey with his angles

ing studied to make the handling of gasoline safer, and even cryogenics, the science of low temperatures, is being used to advantage in liquefying natural gas at 250 degrees below zero for compact storage in underground tanks.

In drilling races such as sometimes occur when a new field is being exploited, scores of wells may drill right through a number of good producing formations because of the hurry to get to a deep gusher zone. Later on, when the deep sands are exhausted, the operators may want to plug back and open up some of the shallower zones. In the past this had to be done by the expensive "hunt and try" method but now a way has been found to take advantage of the natural radioactivity that exists in almost all rock formations. Today a gamma-ray detector can be lowered down the inside of a steel oil well casing and an accurate radioactive log of the oil zones and their depths may be obtained after which the steel casing is

Right, this odd-looking piece of equipment, resembling an overgrown bicycle wheel, is a horizontal storage tank for natural gas, as it was being constructed





23

L106

Lane - Wells Co.  
5610 S. Soto St.  
Los Angeles

Seger - Muller counter  
Arbyle, Ia Scientific American  
June 1934

gun-perforated at the correct places so that oil can begin to flow.

The gamma-ray detector contains an ionization chamber full of gas, the conductivity of which is affected by gamma rays radiating from nearby radioactive substances. Variations in an electric current passing through the gas chamber amount to only one ten-trillionth of an ampere and this fluctuating current, after it has been tremendously amplified, is conducted through a coaxial cable to the surface and to other amplifying instruments where it operates an automatic pen recorder.

The gamma-ray detector is also used when a drilling boss wants to know how high, outside the casing, cement has been forced from the bottom after he has dumped a large quantity of cement down the well to shut off a water stratum. He mixes a radioactive ore with the cement and then lowers a gamma ray detector down the well and learns the exact height outside the casing to which the cement has risen.

Gasoline is a tricky substance that generates static electricity when it is poured from one vessel to another or is moved through a pipe, and the oil industry has had to devise scores of precautions to dissipate the static charges as soon as they accumulate. Otherwise a spark is apt to occur and a fire take place. Even a sea-

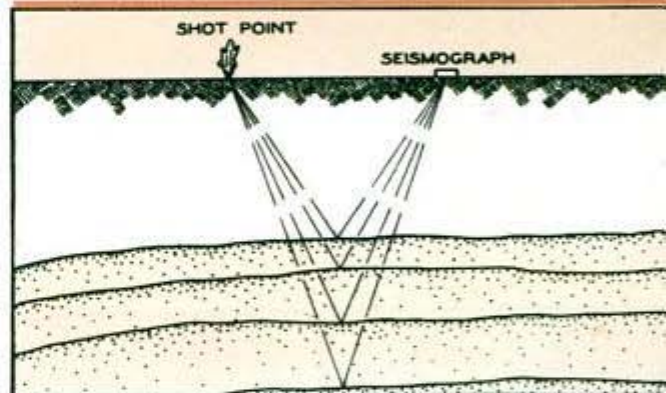
Ref: George F. Bruessing  
Union Oil Co

Below, portable steam-powered rotary drilling rig used for boring shallow oil wells

Union Oil Bldg. Los Angeles

Instead of being oversize charges, these are loaded heads containing powder charges and bullets that are lowered into well and fired into oil formation to open it up

Lane Wells Co



Above, method of locating oil formations. Charge is fired and its vibrations are reflected from various strata to a seismograph



Diamond J  
Motor Car Co 4567 W. 20th



24  
8106  
Above, cutting valves for packer assembly used in testing or acidizing oil wells. Acidizing is one of the means employed to extract more oil from existing fields, the sand being treated to increase its porosity

going tanker has to be grounded when it is loading or discharging from a pipeline. It is already perfectly grounded to the earth, of course, but it must be grounded to the pipeline to prevent stray earth currents in the pipeline or a static charge from setting off a spark which would cause a fire.

Not all tank farm and oil reservoir fires are caused by lightning. Sometimes an accumulated static charge causes a conflagration, although this hazard is becoming a thing of the past now that the old wooden-roofed tanks are being replaced with steel-topped reservoirs. Even so, there is one static hazard that remains a mystery. Sometimes, when a steel storage tank is being filled with gasoline, it blows up spontaneously even though every safety precaution is being observed. Apparently static manufactured by the flowing fluid causes a spark ignition and apparently, also, a small amount of water has to be present in the gasoline. Exactly what happens isn't understood and until some better method of control can be found, care has to be taken that all water used in cleansing gasoline in one of the refinery processes is removed before the liquid is moved to storage.



Left, instrument board gives drill boss full information on drilling progress

2586 Built by Westinghouse Transformer Div., Sharon, Pa.

## Emergency Mobile Substation Averts Shut-Down

Capable of rolling in and restoring power quickly if a regular power substation breaks down, a portable transformer on wheels may be rushed wherever it is needed to keep electric power flowing to industries and homes. Transformers are necessary distribution links that reduce high-tension current of the power lines to usable voltages. If lights in a city go out because of trouble in the substation, the power company can "plug in" the trailer unit to restore electric service while the regular equipment undergoes repairs. The mobile transformer is useful also when permanent substations are shut down for inspection or maintenance work,



Portable substation, built by Westinghouse, helps keep power flowing

or it can be used where current is needed temporarily on construction jobs. The unit is 10½ feet high, permitting it to go through highway underpasses. It weighs 12 tons.

## Camera Fixed on Binoculars Films Entire Horse Race

Binoculars furnish the telescopic sights for movie cameras with which judges at the Hollywood Park track film an entire horse race. Eight judges at various points on the track film the horses in their own

sections, and another camera at the grandstand records the race from start to finish. The camera is attached beneath the binoculars. As the race begins the judge raises his glasses to watch, and when he presses a button at the top, the camera records everything in the range of vision of the binoculars. Rubber-mounted to reduce vibration, the 16-millimeter camera takes the scene in color or black-and-white.



When glasses are trained on race, camera is started

## Chart on Floating Thermometer Tells Washing Temperatures

As a guide for the housewife in laundering different fabrics at the most suitable temperatures, a floating thermometer carries a table showing water temperature range recommended for wool, silk or rayon, cotton or linen, and bright colored fabrics. It is circled by a rubber ring, and has an easily readable dial of frosted aluminum.



*2590*  
*and track officials*  
*Hollywood*  
*film an entire*  
*Eight judges at various points*  
*on the track film the horses in their own*  
*sections, and another camera at the grandstand records the race from start to finish.*  
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*Rubber-mounted to reduce vibration, the 16-millimeter camera takes the scene in color or black-and-white.*  
*2529*  
*Washrite*  
*The Cooper Green Thermometer Co.*  
*Chicago, Ill.*  
*Barry Whitehead*

2573 *John & Hazel Co. Bristol Pa.*

## Bomber Gets a Shiny Nose Of Clear Plexiglas



Polishing up the Plexiglas nose for a bombing plane

For clear visibility and a tough life, the noses of bombers are made of Plexiglas, a crystal-clear plastic. It is able to withstand the terrific pressure of boring through the sky at 375 miles an hour. Before being installed, these windows are buffed and polished to a high degree of transparency.

2500

## Auto-Wheel Balancer on Casters Has Seat for Operator

Balancing automobile wheels without removing them is turned into a "while-you-wait" service with an easily portable wheel balancer, announced recently, that averages 20 minutes for all wheels on a car. From a built-in cushioned seat, the serviceman uses foot controls for spinner and



Operator can sit while he tests balance of wheel

brake, and hand controls for instruments. Wheels can be spun to an equivalent of 125 miles an hour. A built-in brake retards their speed. The apparatus carries a tool and weight kit, dash-light and dual direction speedometer, and operates on 110-volt current. Mounted on ball-bearing rubber-tired casters, it is 50 inches long, 32 inches wide and 18 inches high.

2554

## Parallax Corrector Fixes Lens On View Seen in Finder

To enable the cameraman to frame on film the exact view seen in the finder, there is a parallax corrector which compensates for the difference in position between the finder and the lens. The instrument is adjustable for the individual camera. With



Lever moves camera lens to position of view finder

the camera mounted on the corrector in the finder position, the photographer sights his picture in the usual way, then throws a lever which moves the lens to the exact location the finder had occupied. Thus the lens takes what the finder sees. Any shot can be centered perfectly at any distance.

2572

## High Count of White Blood Cells May Indicate Long Life

Prediction of the length of a person's life from a count of the number of white cells in his blood appears as a future possibility in the light of discovery made by Dr. Carl

The Hunter-Porter Corp. St. Louis, Mo.

Johnston Mfg. Co. 2825 E. Hennepin Minneapolis Minn.

76th and Park Ave  
New York City

L 581

Reich, of Lenox Hospital, and Dr. W. F. Dunning, of Columbia University, New York City. They found that in rats long life goes with a high count of white blood cells, and particularly with a high count of the type of cells called "neutrophile polys." These blood cells make up an important part of the body's defense against disease germs. Female rats had a higher count than the males, and the females of most of the strains studied had longer life spans than the males. Whether this relation between long life and white blood cells holds good with humans is a question for the future to answer. According to one authority, however, men have higher white blood counts than women, yet the average life span is longer for women than for men. This seems to conflict with the findings in the case of rats, but future study may shed more light on this subject.

## Prefabricated Steel-Wall House Has Canvas Partitions



Steel house with "umbrella" roof is built of prefabricated steel panels, has ceiling skylights and porthole windows on sides

Of radically new design, a prefabricated steel house, offered to the government as a solution of the problem of housing defense workers, is formed by bolting together 20 corrugated panels to form a circular building. Made by The Dymaxion Company, of Hoboken, N. J., it is said to be well suited for defense housing because of its low cost—about \$750—and the rapidity with which it could be manufactured. The steel house, which weighs 1½ tons, can be erected in six man-days, and dismantled in two days. Inside, it is 20 feet in diameter and 12 feet high, the four rooms being separated by canvas partitions. There are 10 "porthole" windows in the sides, and set in the ceiling are 15 skylights.

Designer: Dr. W. F. Dunning, New York City, N.Y.

## Movie Cameras Are Rigged on Odd Sled to Film Ski Scenes

In order to obtain close-up motion pictures of skiers in action, cameramen of

20th Century-Fox mounted cameras on an improvised sled "dolly." Cheap skis served as runners, upon which a framework of wood was constructed to hold two camera tripods and two operators. When coasting down hill the odd camera sled was steered by a third man on skis. To get walking or level skiing shots, several assistants were needed; they had to pull the sled by a rope attached to the front end over level snow-covered ground. The sled was used in making a movie in Sun Valley, Idaho.



Camera-carrying sled is steered by man on skis as movies are taken

AUGUST, 1941

Cont. Powell Clark, Box 540-27  
Metropolitan Station, Los Angeles

526.

# DEFENSE on the ASSEMBLY LINE



Hopping over rough ground like a cricket, a midget battle buggy from a Ford factory performs before critical U. S. Army men. These little trucks are swarming off assembly lines

**By Alvan Macauley**  
President,

Automobile Manufacturers Association

*New Central Blvd. Detroit*  
**I**N THE defense effort the whole country is sharing today, automobile and truck producers have shouldered a huge production load. For them, as for everyone else, the defense assignment is number one job.

All along the line this job is a fight against time. Energetic efforts of many hundreds of men—at drafting boards, in tool departments, on construction projects, and elsewhere—have pushed through the thousand-and-one preparations for production as never before. The same effort goes forward in production itself.

Airplane engines from the auto-

*Ford*



Bomb loaders like the truck above are a new automotive item  
Vast fleets of army trucks are essential to move vast armies





mobile industry went into service as early as July, 1940. The first of several factories was turning out 400 a month last April, with 1,000 a month to come. As other plants get into production, the automobile industry will be producing several times that number of airplane motors.

In Detroit, Dearborn, South Bend, Chicago and Indianapolis, builders are working double and triple shifts to hurry the structures for added engine production. The machine tools required by the thousands for this specialized work—lathes, broaches, boring and drilling machines are being delivered on schedule.

**The iron cavalry travels fast and well-armed. Two-way radio keeps in touch with the command and guns are ready for a brush with the enemy**  
**Hundreds of these big gun carriers will be rolling from the Chrysler factory before the year ends. This is the "M-3 medium 28-ton tank"**



326  
K.A. La Voie

General Motors Allison  
Plant at Chudson, N.Y.  
child

*Saginaw Steering Gear Div  
Saginaw, Mich*



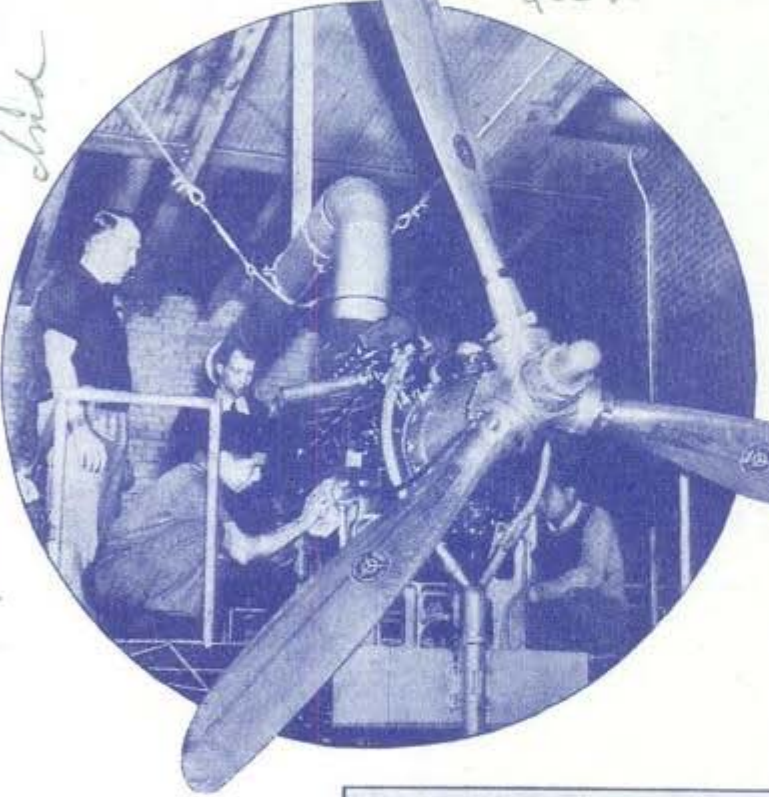
Here are the first of \$61,000,000 worth of machine guns coming from General Motors plants

first of three air-cooled engine jobs:

Inside a board and tarpaper shelter, work progressed all winter on a 24-hour construction day, bringing completion of a new engine plant last March. Production began in the spring; volume output scheduled to be reached in August.

Two other companies newly assigned to produce quantities of air-cooled airplane engines have scheduled first delivery for this year's end.

At least 150,000 men will be working on the automobile industry's defense jobs late in 1941, and for virtually all, the work will be new. In April one company had 8,000 trainees working under 350 supervisors.



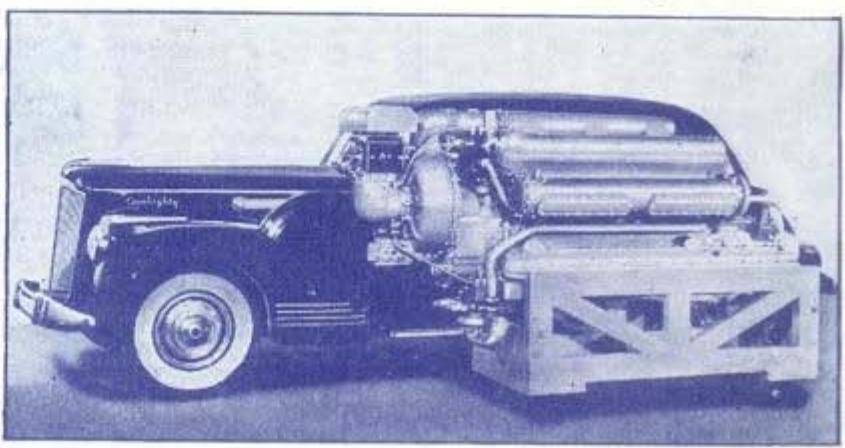
Left, cleaning an Allison air-cooled airplane engine in preparation for its first trial run

The 1,350-horsepower Packard engine built for navy patrol torpedo boats is as big as a sedan

Progress report on one contract for liquid-cooled airplane engines:

Six hundred men at work building trial engines. Plant structure was ready in April. Delivery of 3,000 machine tools running on schedule. Output on first 9,000 engines scheduled for early summer.

Progress report on the





2526

General Motors, Diesel Engine  
Div. Cleveland Ohio

Another had 400 key executives learning tank supervisory jobs. A third was using a marine-engine production department as training ground for aircraft motor work. On another aviation motor job, 2,800 production workers already had obtained their schooling at the machines, learning while output was in progress.

With tens of thousands of workers in the industry due to be moved up from present automotive tasks, one company prepared to give special instruction to 12 percent of its personnel. Another car



U.S. G. Robinson

**Munitions dump? No, these are blower rotors for navy Diesels**

**Dashing horse-drawn field artillery of bygone days has been supplanted by these rubber-tired gun mounts hauled by army trucks**



**Production of private cars for the world's most motoring nation is being cut to give right of way to U. S. Army equipment**

company, producing aviation engine parts, released skilled veterans to this exacting work by advancing younger employees to automotive jobs.

Automobile forge plants, machining departments and stamping plants in Detroit, Lansing, Saginaw, Toledo and other points are tackling production of shells, shell casings, fuses and percussion caps. Others are busy on parts for big guns and designing sample weapons for the Army.

A \$13,000,000 arsenal for production of gun and torpedo parts and ammunition



(Continued to page 186)

2579.

## Fountain Handle on Dipper Makes Sanitary Cup

Miss Leonore Selman



Tilting the dipper upward starts water flowing from fountain handle, to form a sanitary drinking cup

Sanitary advantages of the drinking fountain have been built into a modern version of the old-fashioned dipper. Water is dipped in the usual way but is not sipped from the cup. Instead you tilt the long-handled dipper until the water bubbles out near the end of the handle and then drink as you would at a fountain.

2563

## Pre-Forming Strands of Cable Increases Ease of Handling



they will lie in the cable. This eliminates cutting machines and the need for wrapping cut ends, since the cable will not ravel

Built by Electromotive  
Corps, La Grange, Ill.  
after cutting. There is less tendency for small strands to break, since they are under less tension; and if they do break, the strands continue to lie flat and do not protrude and endanger workmen's hands.

2585

## Diesels Pass Million-Mile Post Without Time Out for Repair

Two Diesel-electric streamliners pulling the Chicago and Northwestern railway's "400" between Chicago and Minneapolis have set a new standard for locomotives, running more than a million miles without time off for repairs. The twin locomotives, each comprising two units developing 4,000 horsepower, make a round trip of more than 800 miles every 24 hours and their record of 100 percent availability since they went into service in September, 1939, is unmatched. Daily servicing and the minor repairs necessary have been handled in the four or five hour period available at the end of the daily round trip. The "400" averages 63.3 miles per hour, and after the 400-mile daylight run its power units are immediately coupled to a standard sleeper train for an overnight return.

2261

## C-Shaped Chock for Plane Wheel Holds Front and Back

Airplane landing wheels can be held more firmly, while stationed on the ground, by a C-shaped chock made of wood, which is being used at the United States Coast Guard Station at Floyd Bennett Field. The chock can be lodged easily against the wheel and pulled tight, gripping the front and back of the wheel.



C-shaped wheel chock is placed or removed easily

Standard Safety Equipment Co  
232 W. Culver Street  
2563  
Winmore 1 Spidley  
1831 A. Main St. Los Angeles

L405

Westinghouse Electric & Mfg Co  
East Pittsburgh, Pa

# Motor-Generator Unit Speeds Up Old Machines

Old lathes, milling machines and boring mills are being reclaimed for operation under modern manufacturing methods with the aid of a combination motor and generator arrangement. It provides an inexpensive adjustable-speed power drive for machines which need power in a wide range of speeds, saving the time-wasting exchange of intricate gears or belts to alter speed, and it is applicable to many industries, including metal working, mining, aviation, printing and textiles. The new system simply changes alternating current to direct current to run a direct-current motor. This is accomplished by using an alternating-current motor to run a direct-current generator, and connecting the generator by wires to a direct-current motor which drives the machine. A direct-current motor operates over a wide range of speeds with good speed regulation, and it can deliver 3½ times the power when starting than at normal operating speeds.



Direct-current motor on bench receives power from generator on floor which in turn is driven by alternating-current motor

L474

# Miniature Film of Human Hand Enlarged to Man's Size



As proof of the claim that gigantic mural enlargements can be produced from 35-millimeter negatives without showing grain, a studio recently "blew up" one of these tiny films to the size of a man. The negative, slightly larger than a postage stamp, was enlarged 52 diameters, yet the resulting print, showing a human hand, was sharp in detail. The hand was illuminated by a single 60-watt desk lamp. The manufacturer of the fine-grain developer used in this demonstration said enlargements, when properly developed, are limited only by the size of available sensitized paper.

Compare size of tiny contact print at left with enlargement

☐ Traffic accidents in 1940 took 35,000 lives, and 1,320,000 persons—one in every 100 residents of the United States—were injured.

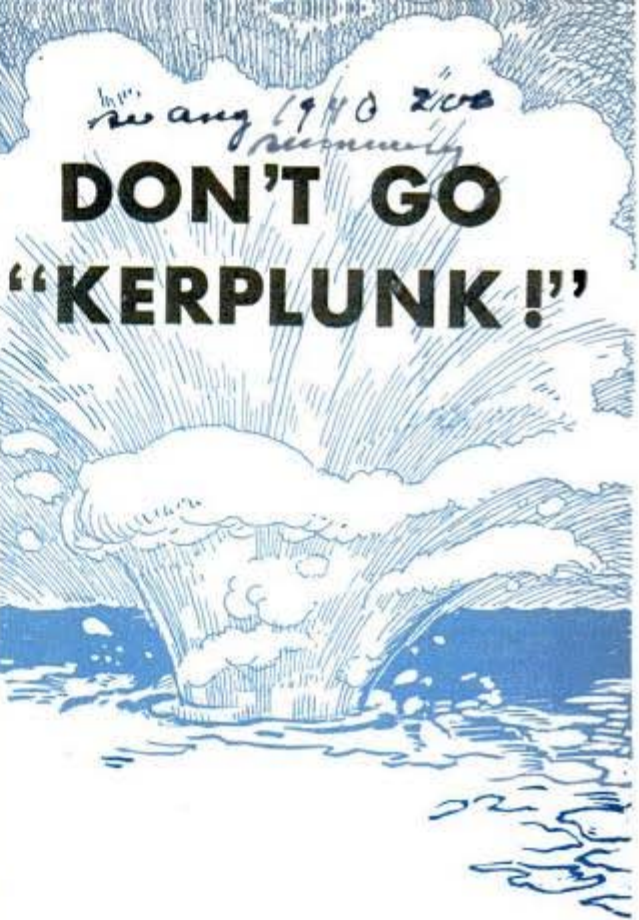
AUGUST, 1941

Mansfield Photo. Research Laboratories, 701 S La Salle, Chicago

L324



From the takeoff to the water's edge the various stages of a swan dive are shown in the picture above  
Six divers leap simultaneously from three different levels, below, each performing his favorite dive



*in any 1940 2/00*  
*summary*  
**DON'T GO**  
**"KERPLUNK!"**

**By Clyde A. Swendsen**  
Coach, 1936 American Olympic Team

**I**F YOU have ever climbed up to a high diving platform and then climbed down again instead of diving off, I don't blame you. It's a long way down and even a champion hurts himself if he dives improperly. The painless way to learn high diving is to master the fundamentals on dry land and on the low springboard before working up to the higher platforms.

Not even dives from the low board are performed properly by the average swimmer. I'm going to tell you a few things that will make you better than average. Once you have learned the fundamentals of diving, your knowledge will stay with you all your life.

One of the simplest dives and one that you should do correctly is the racing start. Use it any time you want to get started in a hurry. Stand in a semi-crouch, arms stretched back, and grip the edge of the pool with your toes. Now fall forward until you lose your balance. Spring toward the water with a terrific thrust of your legs and throw your arms forward, reaching for the water. You should be tensed and stretched as you hit.

*Ar. Swendsen*

*Black - Fox Military Institute*  
*7 N. Wilson*



This is the tuck position for forward somersault, head down, arms clasping ankles

For a racing start (above) grip edge of the pool with toes and fall forward, springing toward the water

The racing start is a shallow dive and you should go under water only a foot or two. Start the crawl kick with your legs as your glide slows down and pull back strongly with one arm as you return to the surface. Now you are in position to start a fast crawl without losing momentum.

Never make a dive until you have looked to see whether someone is swimming below you and never dive into strange water until you have tested its depth.

A well executed swan or jack-knife dive from a springboard is beautiful to watch. Most swimmers are sloppy springboard divers and yet good dives are easy once you understand what you are trying to do. Don't just hit the end of the board and jump off, but time yourself to the rebound. The springy board will do most of the work if you give it a chance.

Watch a good diver and you will see that he takes three fast steps and a hurdle to reach the end of



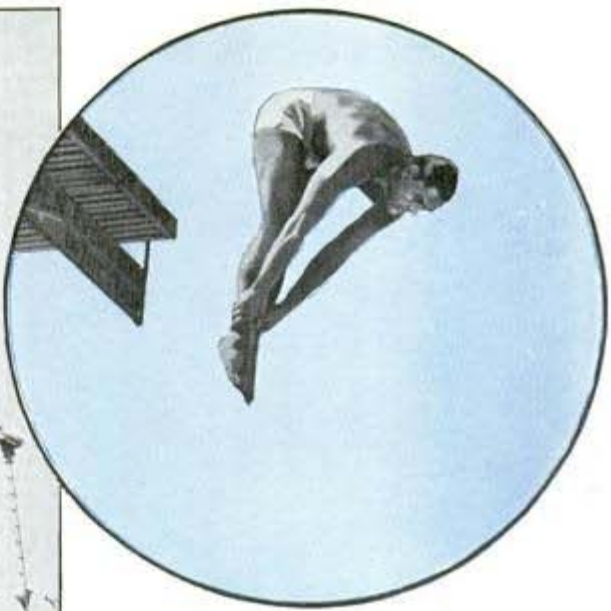
Taking off with perfect timing, two swimmers glide through the air together in swan dives

2324



Here's how a champion looks in a swan dive from a stationary platform at Olympic Swim Stadium, Los Angeles

Posed picture below illustrates the position for a swan dive. This is a good preliminary practice for the dive



To complete jackknife dive, above, swimmer raises his legs, keeping his head down

with thumbs clasped, one hand over the other. Keeping the thumbs clasped tightly will prevent one arm being thrown back when you hit the water, and avoid wrenching a shoulder. Your toes should be pointed but that's not all. Push out with your legs, tightening the thigh muscles, and then point your toes. That straightens your legs as well.

Always stretch for the water as you approach it. If your body is relaxed you will make a big splash and in addition you may be thrown

the board. That's what you should do. During this approach you should keep your balance by swinging your arms simultaneously at your sides instead of alternately. Raise your knee up into the air for the hurdle. Land on the end of the board on the balls of your feet and ride the board until it rebounds upward. That's the time to take off, at about a 75-degree angle. Don't hurry. Take the hurdle and the spring slow and easy and use your arms for lift.

Both hands and feet should enter the water cleanly. Your arms are extended over your head, not with the hands side by side but



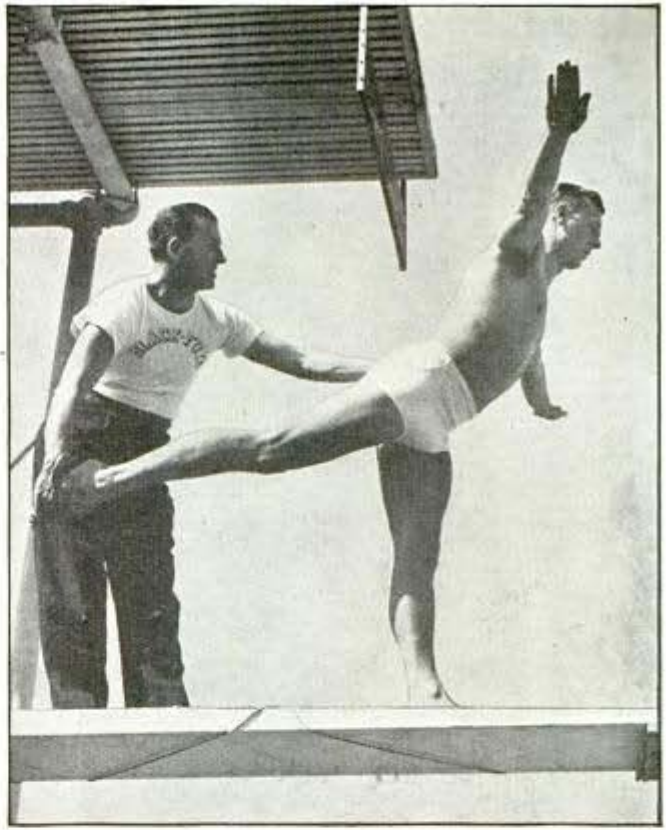
In practicing swan dive, stand on one foot, stretch the other back, and extend arms. Here Coach Swendsen instructs a pupil

around and sprain some muscles. These fundamentals apply to all dives.

You won't be able to remember all these points at the beginning so you should do plenty of practice on dry land. Practice getting your arms overhead with clasped thumbs and get your head down between your arms. Sit or lie down and practice pushing out your legs and pointing your toes.

Mark a path off on the ground, 16 feet long and 20 inches wide, to simulate the dimensions of a springboard. On this you should practice the three fast steps, the hurdle, and the takeoff. The average diver uses 13 feet of the board. You will need plenty of practice because when diving you should do all these things automatically instead of having to remember each point.

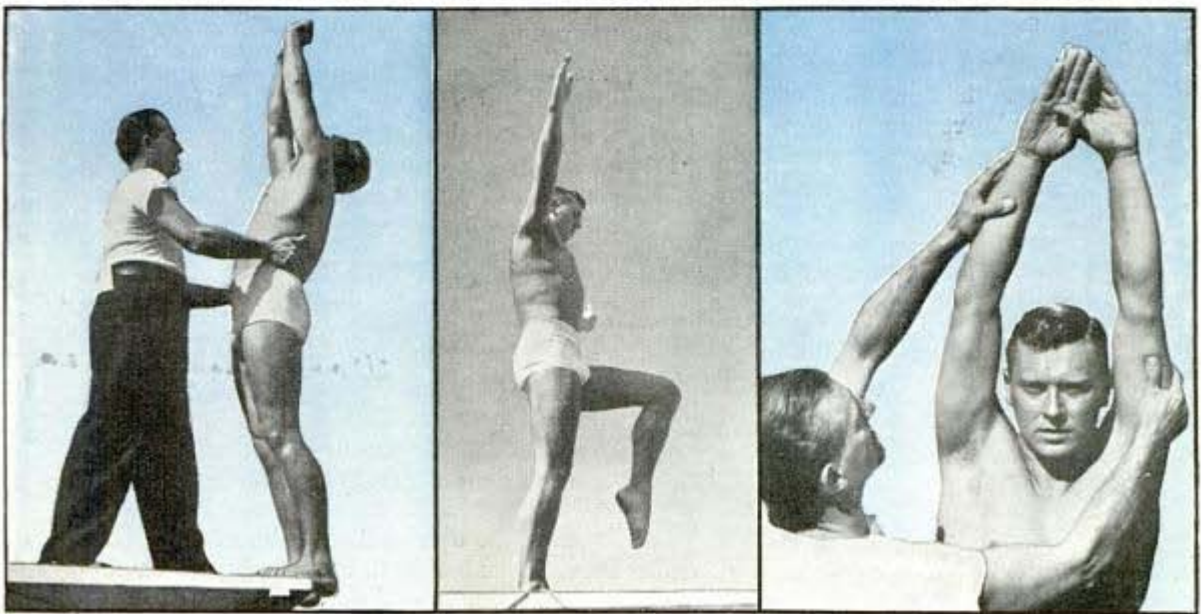
You will make better swan dives after some dry land training. Stand on one leg, stretch the other back, and stretch out your arms. Alternate on each leg. Then lie down and stretch your arms and legs up off the floor at the same time. Repeat these exercises at least half a dozen times, at each practice.



When you try the swan dive from the springboard you should arch your legs back while you are in the air by stretching from the waist down. Straighten your body and drop your head slightly as you near the water, and bring your outstretched

(Continued to page 178)

Left, Swendsen poises student for back dive. Center, raising knee for hurdle that carries you to end of springboard, increases bounce and makes for better dive. Right, clasp thumbs during dive, one hand over other



2551.

## Incendiary Sabotage 'Pencil' Produces Intense Flame

*W. G. Parsons, H. B. I. expert*



Testing the incendiary bomb used by saboteurs

Incendiary bombs, made up like fountain pens, are receiving attention of law enforcement officials in connection with national defense problems. During the first World War such bombs, which produce flames hot enough to burn through steel, were used in sabotage activities and caused untold damage to Europe-bound cargoes.

*Encl. Annual T. S. Storingman R. 1720. Shed Av. - N. Amunbeahalis*

## "Machine Gun" Road Jolts Autos Encroaching on Center Line

Careless motorists who weave in and out of their lanes on the open highway will receive a bouncing rebuke if they run into the center of a stretch of "machine-gun"



Centerline with "washboard" ridges keeps cars in line

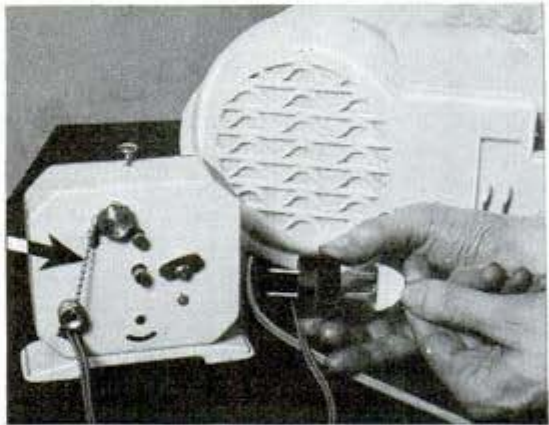
*is. B. Spiegel Col. 3958 W. D. D. Chicz*

paving between Peabody and Florence, Kans. Black-painted cement bars, 18 inches long and spaced a foot apart, protrude about an inch above the paving to replace the usual center line. When a car begins to swerve into the center line, the wheels start vibrating due to the bars, and the motorist is reminded to pull back into line again. It is believed that the new paving will keep motorists in their proper lanes and aid in preventing accidents.

2489

## Time Switch Run by Alarm Clock Turns Radio On or Off

Any average-type alarm clock may be fitted with a special time switch that turns on the radio or an electric appliance, or turns it off, at any desired time. With the alarm dial set at the time you want your radio tuned in, the switch goes into action at the right moment. The attachment con-



Arrow indicates time switch attached to alarm clock

sists of a knob that fits over the regular alarm key, a small chain that connects it with an on-and-off pull switch, and a cord with a special plug and socket for making connection with the wall outlet and receiving the appliance plug.

2516

## Tides Forecast Inland Weather Over a Long Range

*Woods Hole, Mass*

Studies by the Oceanographic Institution indicate that long-range weather forecasts for inland regions as far west as Illinois can be made from the sea-level gauges at Miami, Fla. Changes in sea level were found to be due to fluctuations in the Gulf Stream, which in turn varied with ocean-wide winds. It is these winds which influ-

*New York Times*



2537

ence continental weather, but they were too vast to measure until it was found that they move in the same great whirl as the tremendous Atlantic eddy, of which the Gulf Stream is a part. The inside of this eddy is a little higher than its outside edge, and as volume of the Gulf Stream increases the American coast level drops slightly. Since the winds and the Atlantic eddy seem coordinated, the winds can be gauged by the variation in sea level shown on the tide gauges. Strong winds cause a more thorough mixing of tropical heat with arctic cold, and result in slightly warmer weather in the north and cooler weather in the tropic regions. Thus a general correlation has been detected between the mean sea level at Miami and monthly temperatures as far west as Chicago.

2517

## Pipe Inspector Rides a Scooter Through 42-Inch Main



Pipe inspector eases his work with scooter pushed by foot

Not for mere exercise or fun, but to perform important work, H. H. Wilkening rides daily on his scooter. His task is to make regular examinations of 7½ miles of water mains being completed at new ordnance works near Joliet, Ill., to see that they are in line and properly joined. Because of the limited headroom in the 42-inch diameter pipes, Wilkening has found that the scooter provides a comfortable and suitably fast mode of transportation.

2493

## Hamper Has Removable Clothes Bag

Inside a new washable hamper is a laundry bag that you can pull out and send to the wash without touching the soiled clothes. Then a clean bag can be installed. The outside cover, which fits over a rustproof wire frame, also is removable for washing, and it can be matched with the color scheme of the bathroom. With all parts thus removable, the hamper can be kept sanitary. It resists water and mildew.



\$1.98 up

## ✓ Pine Odor to Perfume Car Evaporates From Phial

Filled with a liquid that will perfume the inside of the automobile with a refreshing pine odor, a glass phial clips on the car heater or other convenient place. It may be used, too, in the home wherever the smell of pine woods is desired. The liquid evaporates from a wick in the perforated cap.

250 Old Car



Clipping phial of pine scent to car heater

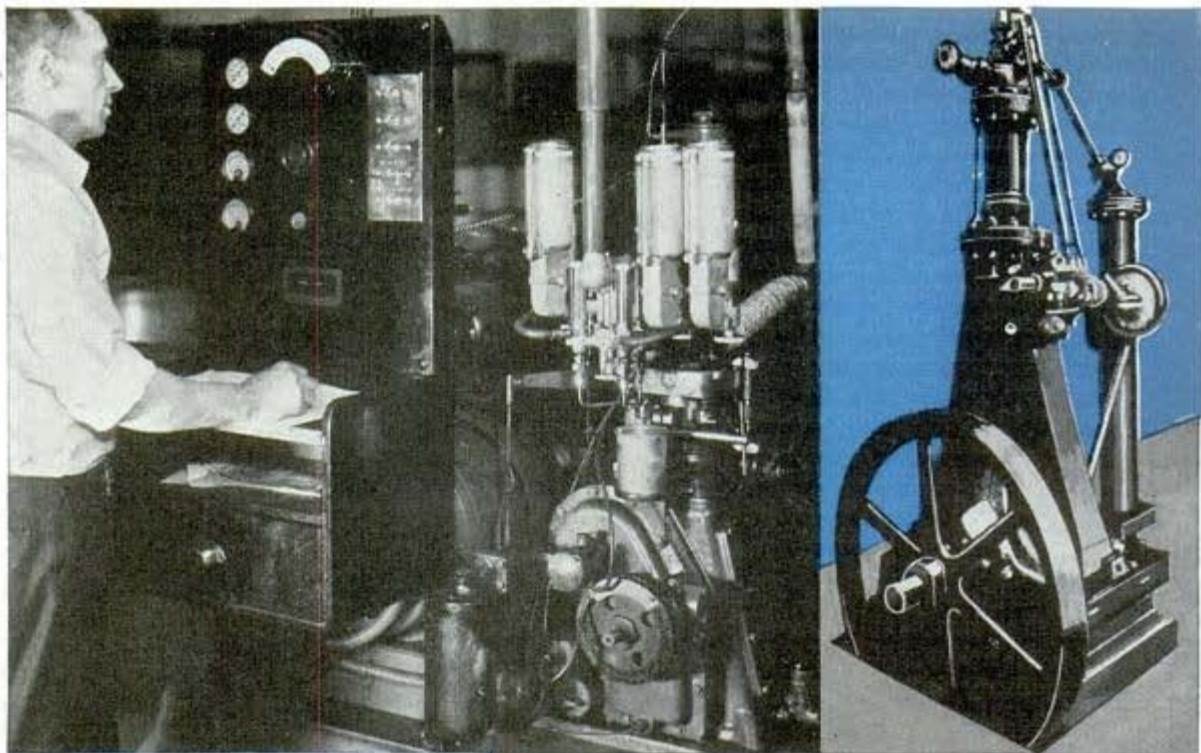
AUGUST, 1941

The Expello Corp  
Lester, N. H.

Kenahoe Cidrapice Works  
Hydro Jet Corp.  
C. H. ...

K 129 B.

*Waukesha motor for Waukesha Wis.*



Above, testing "knock" quality of gasoline by comparing with known fuels in standard octane rating engine built at Waukesha  
Upper right, the original Diesel engine

# The AGE of

## Part I

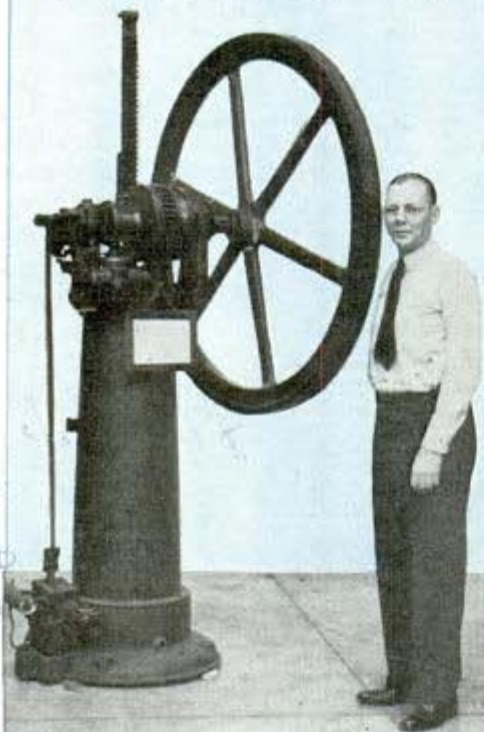
By Roderick M. Grant

SEVENTEEN passengers climb out of a Stratoliner at La Guardia field and learn, amazed, that they made the trip from Chicago in 2 hours and 48 minutes—record time. They had breezed along, 19,000 feet up, at 270 miles an hour.

A 13,900-ton motorship slides down the ways at Tampa. Penguins on dress parade watch a Diesel-powered snow cruiser lumber across Antarctic ice on a scientific treasure hunt. Bombers spill tons of death and devastation over three continents. A Dakota farmer flips the toggle switch to light his livingroom, and down in the basement an engine purrs softly into life to generate the power that lights his home, pumps his water, turns his grinder, operates his milking machines.

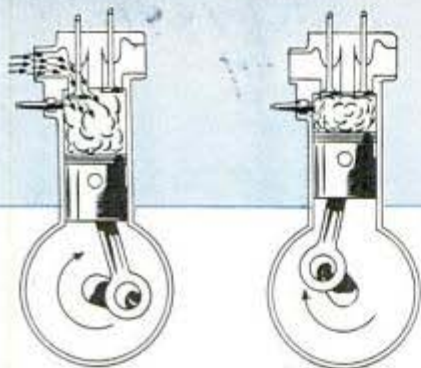
Front page sensations these would have been, a generation ago. Today the aboriginal New Zealander and the Indian far up the Amazon look up without excitement at the passing Clipper, and nomadic Americans drive across the 120-degree desert and up 14,000-foot Pike's Peak without thought of the engine that takes them anywhere at the touch of a pedal.

*Built in 1867 by Sasmorvic*

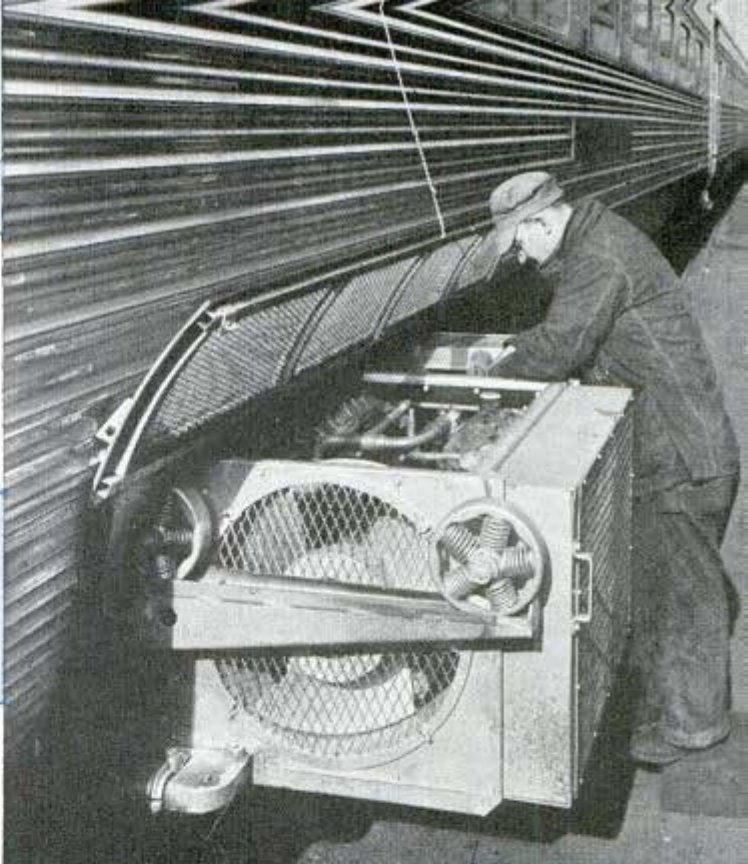
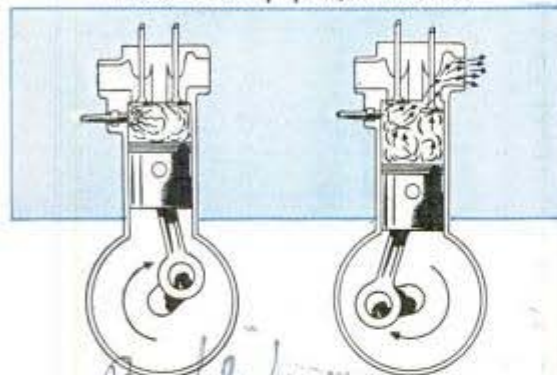


This free-piston Otto and Langen engine built in 1867, an early internal-combustion type, is seen at Ohio State University

*Columbus Ohio*



Here is the four-stroke cycle: above, intake and compression; below, the third or power stroke set off by spark, and exhaust



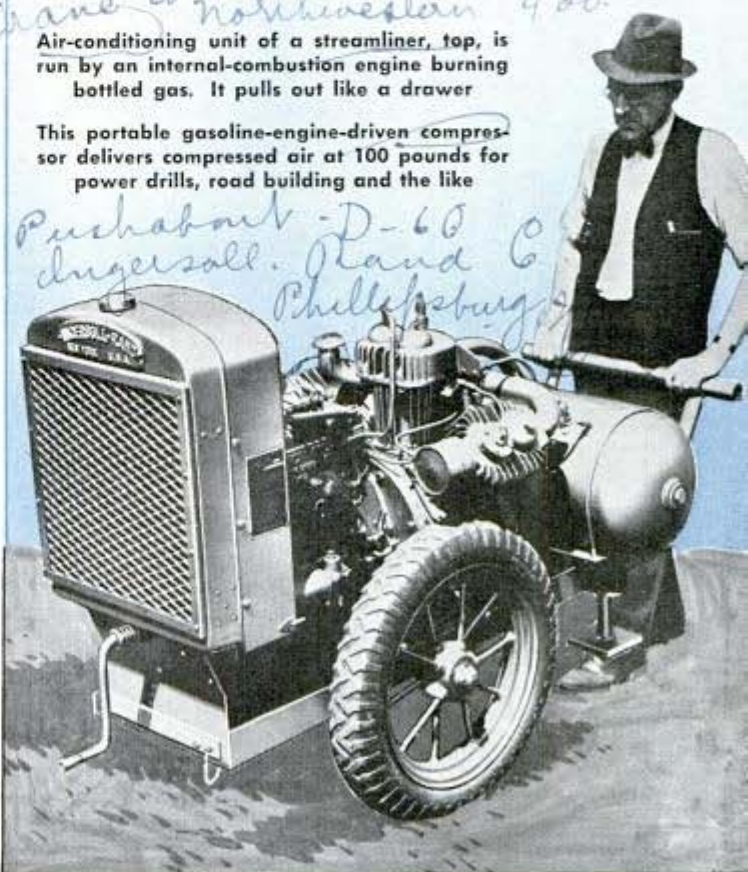
# PACKAGED POWER

People numbed by marvels take for granted the internal-combustion engine, which in less than a century has made real man's dream through the ages—to fly like birds, to swim like fish in the depths of the sea; which has raised man's standard of living to the highest level civilization has known, while it made possible the most horrible of uncivilized wars.

But how long can we take for granted the internal-combustion engine? Some geologists think its twilight may come within the lifetime of living men. For, while crankshafts can be turned by exploding gas or gunpowder or alcohol or coal dust or even flour inside a cylinder, this internal-combustion age we live in depends upon petroleum. When the last barrel of oil has been sucked from the earth, men may turn first—as the Germans already have—to producing synthetic gasoline from coal; then, as foresighted scientists are already doing, they may harness the

*to Cassel 4.00*  
*Train to Northwestern*  
Air-conditioning unit of a streamliner, top, is run by an internal-combustion engine burning bottled gas. It pulls out like a drawer

This portable gasoline-engine-driven compressor delivers compressed air at 100 pounds for power drills, road building and the like



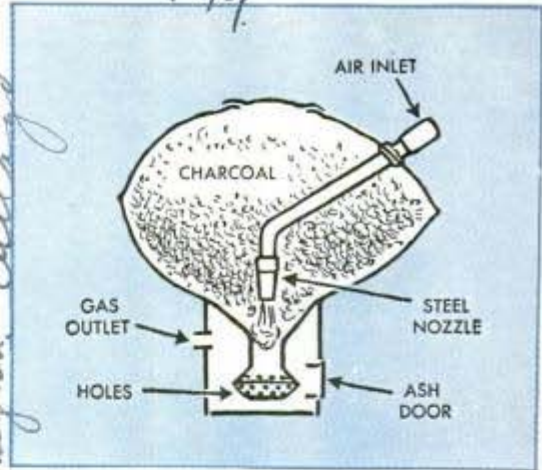
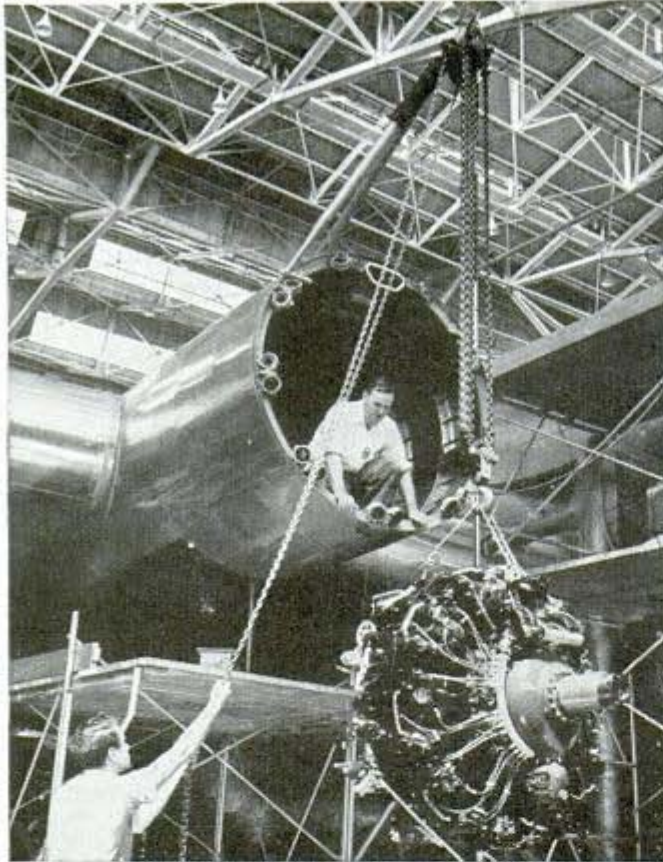
AUGUST, 1941

41

*Booklet*  
*Puchabout - D-60*  
*Ingersoll Rand Co*  
*Phillipsburg*  
*Chemistry and Wheels*  
*Ingersoll Motors Corp. Detroit*

K1293

see Sept 1941  
49



Gas-generating process of charcoal-burning units on Swedish autos is shown above

Left, the Douglas superbomber gets aviation's biggest engine, a 2,000-hp. Wright

Another authority, Dr. Gustav Egloff, research scientist of the Universal Oil Products Company, is more optimistic.

"I believe petroleum is being formed in the earth at a greater rate than we are consuming it," he says, pointing to the fact that

sun's power and the power packed in the uranium atom. But that will be the end of the internal-combustion era we know.

How long the world's petroleum stores will last is a controverted question. A pre-eminent geologist recently said American petroleum stores would probably be exhausted in 30 years; but, he added, there is ample coal to supply needs for 6,000 years.

oceans, lakes and rivers abound with fish and mollusks like those found in many petroleum-bearing soils. Microscopic diatoms identical with fossils found in California oil shales are being scooped alive from the ocean and yield two percent of oil—which might, he thinks, be greatly increased under the temperature, time and pressure conditions of the deep earth. The

The Diesel-powered tug taking its baptismal splash can tow oil barges with the capacity of 240 tank cars  
Socony-Vacuum Oil Co.

Maintainer of streamline Diesel engine lifts cylinder-head cover to inspect the valves and injector rockers  
Santa Fe Railway



St. Paul Society

42 Built at Lingell Shipbuilding Corp. yard, Seattle, Wash.

Caterpillar Tractor Co Highway 101, 40 mi  
K1299 Peoria Ill north of Santa Barbara



Beginnings of the revolution in farm power—one of the first gasoline-driven Caterpillars. Date, 1908

entire world's production of crude oil since the industry was born would not fill a hole a cubic mile in the earth, "an insignificant volume," says Dr. Egloff, "compared to what nature must have produced and still is producing."

He offered this prophecy: "In view of the increasing volumes of crude-oil reserves, the probability of continuous crude-oil formation, better utilization of crude oil and its products, and considering the trifling volume of petroleum used to date, one can look with assurance as to the future oil supplies for our every need for thousands of years."

That from a top man in the industry. So you may live to see the death of the internal-combustion age, or you may be witnessing only its birth. At any rate, let us glance at some milestones in the development of this power package so fundamental to peace and war in this year 1941.

You may credit a German monk of the fourteenth century, Berthold Schwartz, with originating the internal-combustion engine, for he is generally acknowledged the inventor of gunpowder and the gun. There are also reports

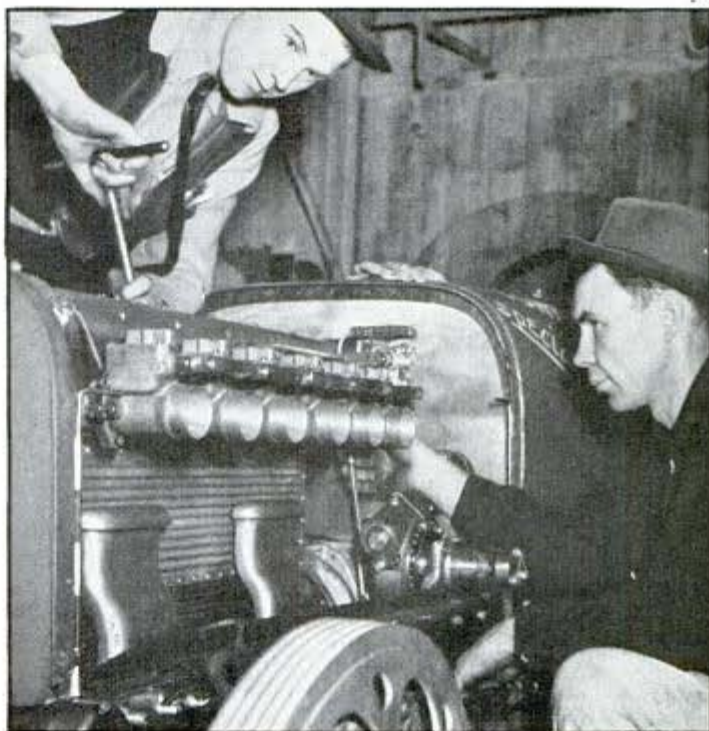
(Continued to page 172)

AUGUST, 1941



Contrast the granddaddy at upper left with this brute of a modern Caterpillar Diesel working on a highway job in California

Below, mechanics ready a six-carburetor racing car for the gun



State highway between  
Peoria Pass and Buellton

# Speedboat Tows Small Plane to Study Takeoff



Attached at the side of speedboat by a long arm, this model seaplane is towed on water to correct faults of the big ship in taking off. Crew members take motion pictures of its action at various speeds

Tests designed to reduce the tendency of amphibian planes to porpoise, or lunge when gathering speed for a takeoff are being conducted at Long Beach, Calif., by student engineers of California Institute of Technology. Specifically, they are attempting to verify a theoretical solution of the problem as worked out by the Cal Tech scientist, Prof. Robert Millikan. Used in the tests is a \$6,000 scale model of a Consolidated twin-engine flying boat, designated

as Model 31, which is attached by means of an outrigger to a fast speedboat. The model is hauled at varying speeds past stakes set at 30-foot intervals along shore, and the action on water is checked by members of the crew aboard the speedboat who take motion pictures and make constant speed recordings. Information on the travel angle of the model's keel in relation to the water at various speeds and under different conditions is of particular value.

# Portable Radio Therapy Unit Gives Treatments in Auto

Short-wave radiation treatments now may be taken at home, at the office, or even

while riding in a car by using a thermodyne apparatus designed by Dr. Lee de Forest, radio inventor.



Left, control panel for short-wave therapy unit is mounted on back of auto seat. Right, installing motor-generator in trunk compartment of car

This type of therapy is administered for arthritis, neuritis, colds, lame muscles and similar ills. The automobile unit includes a motor generator for stepping up current from the car's battery, a control panel that may be attached to the instrument board or to the back of the front seat, and two terminal pads, one of which is placed on the seat of the car and the other on the floor under the feet. The thermodyne also is effective in keeping a person warm while

*Ironall Products Co. 217 E 84th St. L 564*

working a cold room, in an exposed place, or while driving in the winter. In tests, people using the radiation pads have remained warm and comfortable in their shirt sleeves with the windows open during cold weather. Cost of the power required to warm the body by means of short waves amounts to about one-tenth that of heating the entire room.

*L 510*  
**Rain Suit for Sportsmen  
 Folds to Small Size**

Always ready for an unexpected rain, a waterproof jacket and trouser set, weighing about six ounces, can be folded away in a pocket, tackle box, golf bag or automobile glove compartment. It makes a package approximately

*Acme*



Golfer wearing rain suit which may be taken off and folded away as in inset

five by eight inches. Worn over the regular clothing, the suit protects the entire body. The Plioshen treated rayon, of which it is made, is windproof and mothproof, will not mildew, shrink or stretch, nor become sticky or stiff. Rubbing a damp cloth over the surface cleans it easily. The suits are made in green, brown, yellow and white, in all sizes.

AUGUST, 1941

*Acme Corp. 125 W. 45th St. New York City*

**Transparent Beds Help Nurses  
 Care for Hospital Babies**

*Nurse Mary Kelly*



*Lloyd Manufacturing - French*

*Acme*  
 All-around visibility of baby is given by transparent bassinet used in hospital, helping nurse keep watch over infants

Streamline bassinets that are transparent on all sides have been installed at Mercy Hospital in Chicago, Ill., enabling nurses to watch more closely over their new-born charges. Made of plastic materials, the new units can be converted into oxygen tents or incubators.

*L 513*  
**Army Tests Latest "Trackless" Tank  
 For Reconnaissance Units**

Officials of the War Department were given their first view recently of a "trackless" tank which is a departure from former types and may offer wider military use. Preliminary tests made at Fort Myer, Va., indicated the tank may be adaptable for reconnaissance purposes. It is reported that plans are made for redesign of the superstructure so suitable weapons may be added.

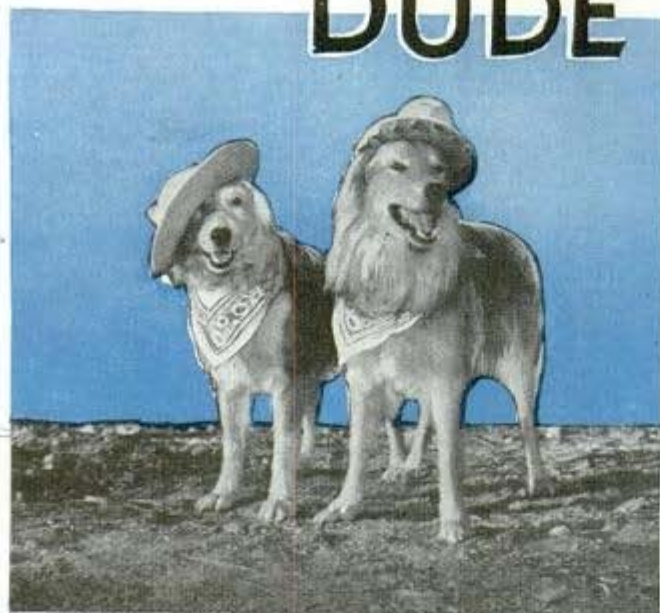


*Acme*  
 All wheels of "trackless" tank follow rise and fall of ground

*Trackless Tank Corp. 45 New York City*

# DUDE RANCH

*Richard A. Gias  
Melody's Shipman  
Owners*



Plenty of us would like to lead a dog's life as it is lived on the canine Dude Ranch in the San Bernardino mountains of California. Those new guests, above, apparently believed what they read in the advertisements, for they arrived all decked out in "dude" togs. The ranch is really a boarding kennel in a national forest, far from human habitation, where dogs with "fire-cracker" or city nerves are sent for rehabilitation



Elkhound pups in the "maternity ward," above, await arrival of mother with their lunch. Left, a pair of Norwegian elkhounds go picnicking in the station wagon. The ranch accommodates 150 dogs the year around. "Show" dogs are sent in September to grow thick coats in advance of the season in semi-tropical Los Angeles. Navy dogs stay there while their masters are at sea; vacationers send their pets up to the ranch for holidays. Below, a pair of wolfhounds start for an outing in the camp car





# for DOGS



Newfoundland puppies romp together on the porch of a bunk house, above. Each "guest" is allotted an individual house with a 15 by 40-foot runway. There are exercise corrals, dispensary, "maternity ward," and sanitary kitchens where more than 200 pounds of ground meat are prepared for a single feeding, along with biscuit, shredded wheat, cod liver oil and eggs. Special diets are available for dogs with finicky stomachs. The ranch owners raise Newfoundlands, Norwegian Elkhounds, Irish Wolfhounds and Chows. In the harness room, below, "Klondike," an Alaskan husky, awaits his personal leash

Above, a Newfoundland carries the dog lunches on a hike organized for his fellow guests. Below, a hungry collie forgets table manners when the chuck wagon rolls up to the door with "chow." Six hired hands attend the dog guests in peak season



2515.

## Typewriter Cover on Table Enlarges Top When Open



Typewriter cover on small desk forms two shelves at sides when open. Inset shows it closed over machine

Combining two useful purposes in one unit, a dustproof cover of the turret-top style, hinged to a typewriter desk, forms extra working space when it is lowered. Closed, the table top measures 17 by 20 inches, and opens up to 17 by 38 inches.

## One Antenna Replaces Many With Aid of Coupling Unit

With the aid of small cans containing a coupling unit recently patented by Howard K. Morgan, Transcontinental and Western Air, Inc., one radio antenna may be used



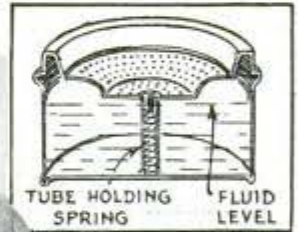
Coupling unit lets one antenna do the work of many

efficiently on several frequencies. It also can be operated on several frequencies simultaneously. Replacing complicated and expensive switches or a multiplicity of antennas, the device has made possible the development of directional antennas that work exceptionally well with TWA's two-way frequencies. The new system permits antennas to be located remote from all interference since signals are delivered to receivers through a single buried wire. Tests have shown the new antenna to be free from interference when installed in the vicinity of other antennas which were being disturbed by electrical noises.

2211

## Nonspill Can for Use on Bench Helps Clean Small Parts

For use on a bench where small parts are cleaned with inflammable liquids, a non-spill can that reduces evaporation to a minimum and guards against fire is available. The parts are placed in a perforated metal dasher mounted slightly above the fluid level. When the dasher is pressed downward the cleaning fluid filters through



TUBE HOLDING SPRING FLUID LEVEL



Inflammable liquid in can rises through perforated dasher, shown in inset, when it is pressed downward

the screen and flows over the parts, and when released it is forced above the liquid level by means of a vertical coil spring. The hinged cover, supported by a metal stand, is convenient for drying parts.

You can obtain additional information about commercial products described in this magazine by writing to the firms listed in the Where-to-Buy-It index, page 4-A.

Metal Arts Craftment  
6633 S. State, Chicago

37X La Salle, Chicago

Transcontinental & Western Air

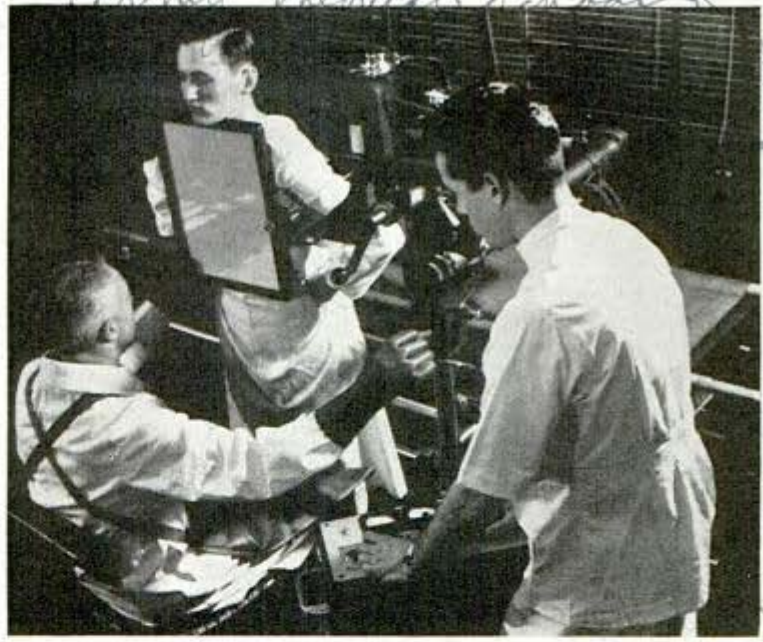
L342

U.S. Maj. Gen. de Lormier  
U.S. Army School of Radiology  
Army Medical School

# Battlefield X-Ray Examines a Soldier a Minute

Westinghouse Elec. & Mfg. Co. 150  
100 Broadway

Fastest portable X-ray in the world is the battlefield unit being distributed to army bases in the United States and its possessions. It takes just ten minutes to set the machine up in the field, and then it permits X-ray examination of one soldier per minute. Its purpose is to locate the position of bullets and shell fragments in wounded men where hospital facilities are not available, particularly in making direct studies of the patient without the use of films. It can be used, however, for making X-ray pictures as well. Regulation army stretchers will serve as tabletops for the unit. The stretcher bearing a patient can be placed directly on the frame and removed



Without waiting for transportation to a hospital, examiners can spot bullets and shell fragments in wounded soldiers with this portable X-ray

again after the examination has been made, so that the patient need not be disturbed.

Bureau of Plant Industry  
Division of Insects and Related Plants

L447

# Pyrethrum Reaper Opens Up a New Commercial Crop

Commercial production of pyrethrum flowers, used in making insecticides, has become possible in this country with the

invention of a mechanical harvester for pyrethrum heads. The machine, combining features of a corn binder and a cotton stripper, was built by U. S. Department of Agriculture engineers. Four acres or more could be harvested by two men with the machine in a day. Pyrethrum, with flowers resembling white daisies, is a close relative of the chrysanthemum. Because it could only be harvested by hand it has never been grown commercially here, but is imported from Japan, Yugoslavia, Brazil and Kenya. It forms the base of the popularly-used fly and mosquito sprays.



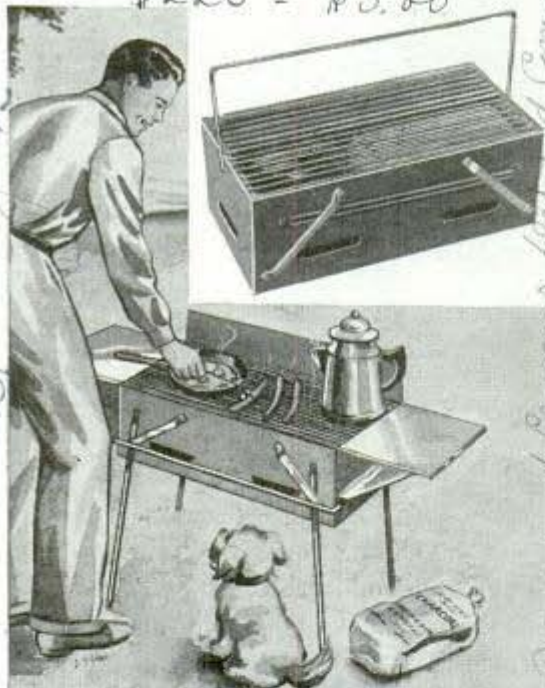
This "daisy" harvester is gathering pyrethrum heads, from which insect sprays are made. Previously pyrethrum flowers always were hand-picked

State taxes on gasoline and motor vehicle registrations last year averaged \$40.59 per car.

2 358.

## Picnic Grill on Folding Legs Has Removable Ash Pan

\$2.20 - \$3.00



Outdoor charcoal grill with shelves at ends and a windshield at back folds compactly as shown in inset

Picnickers can prepare a full meal outdoors on a collapsible grill that is 16 inches high when set up on its folding legs. The cooking surface is 9 by 18 inches, and removable shelves at the ends provide a place for extra pans or utensils. A sliding pan retains ashes and sparks, keeping them from falling on the ground, and there is a windshield at the back of the grill. When folded to a size of 10 by 18 by 6½ inches for storage, the legs are pivoted upward, shelves and windshield are stored inside the grill, and the unit may be carried by a hinged handle.

249

## Special Nails in "Floating Wall" Reduce Plaster Cracking



comprising wallboards fastened by a grid-covered nail which is pounded between the

Strains and vibrations resulting from the natural movement of the walls of buildings are the chief reasons for cracks in plaster. Now a "Floating Wall,"

boards instead of through them, is offered as a solution. When plaster is laid over the boards, the nails permit a resilient tie between the studs and plaster, thus reducing the danger of cracking when the building settles or the framing members warp.

2470

## U. S. Loses 4,402 Square Miles In Remeasurement of Area

In the first remeasurement of the continental United States since the census of 1880, the 1940 census shows a net reduction of 4,402 square miles for the total area. The basic remeasurement embodied a number of boundary changes, map improvements, new surveys and court decisions affecting boundaries. The total area now is 3,022,387 square miles compared with 3,026,789 previously. An increase of 3,352 square miles in land area was reported, but inland water area decreased 7,754 square miles. There were alterations in the accredited area of every state.

2222

## Automatic Tool Bends Tire Valve To Fit Any Auto Wheel

Guesswork may be taken out of tire-valve bending with an adjustable tool that shapes valves to fit any wheel design. A chart is furnished showing all wheel specifications, which enables the user to set the tool so it will bend the valve to any desired angle. Small in size, the tool can be fastened to the edge of a bench.



Fastened firmly to a bench, this valve-bending tool may be set for any angle required by auto wheel

Eclipse Metal Mfg. Co.  
Eden, New York

Bureau of Census, Dept of Commerce

National Supply Co.  
192 S. Stewart St.  
Chicago, Ill.

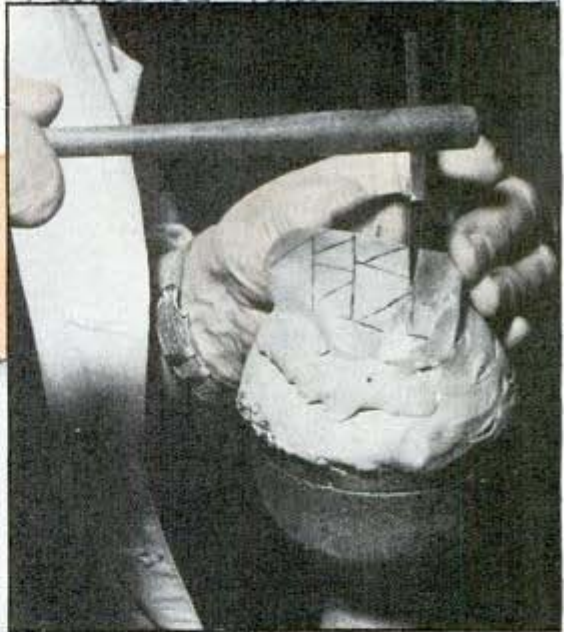
Brooklyn, N.Y.

2 460 story and layout -  
W. L. Weiss,

# \$ 2,000,000 OR NOTHING

2460

17 Laclede One - Trenton  
M.J.



Adrian Israelsky

The Vargas with steel blade in place for tapping. If cutter is lucky, diamond splits along black lines which indicate grooves cut with another diamond

Left, cutter marking corner to be sawed off diamond

Ever since Harry Winston bought the stone, he had experienced tortured dreams of seeing the Vargas crumble to "salt" under the cutter's hands. Such things happen.

In order to eliminate as much of the risk as possible, hun-

*(see Oct. 1946. 508) Acme*  
**T**HE size of a woman's palm and insured for a million dollars, the Presidente Vargas diamond, fourth largest ever found, is being cut into small gems that will sell in aggregate for about two million dollars.

Weighing 726.6 carats and shaped roughly like the geographical outline of Brazil, the country in which it was found, the Vargas was studied and tested for 18 months before the first cut was made with amazing accuracy a few weeks ago. The reason for that lengthy period of preparation was that one slip might have shattered the big diamond into a handful of dust.

dreds of glass replicas were cut; the diamond itself had been subjected to every known test, to determine its exact structure and brittleness. As a matter of fact, the usual procedure was reversed in the case of the Vargas.

Ordinarily after the lines of cutting have been marked in India ink on the diamond, another diamond is used to cut a tiny wedge-shaped groove along the main line. Then a Swedish steel blade is inserted; the blade is tapped with a mallet—and you either have two diamonds, or a small mound of dust.

Harry Winston Inc. 51  
620 Fifth Ave. N.Y.



Above, million-dollar gem cut from the Jonker diamond weighs 50 carats

Right, wrought iron gates guarding room in which the Vargas is being cut

Because of the unusual grain of the Vargas, it was decided to saw it first. Usually this process is reserved for the smaller pieces cut from the cleaved oblongs.

The saw is a bronze disk, 3/1000 inch thick, which bends as easily as paper. The edge is impregnated with a mixture of diamond dust and olive oil, turning at 2,500 revolutions per minute—at a faster rate it would slide without cutting; slower it would wobble and waste more of the diamond. In effect the saw is a cross-cut, and must be used across the grain; cleaving is done with the grain.

In cutting any diamond, 45 percent or more is lost in dust. Usually this dust can't be saved. For making dust used in cutting, industrial diamonds are ground in a mortar that looks like a lead pipe cartridge. The dust is



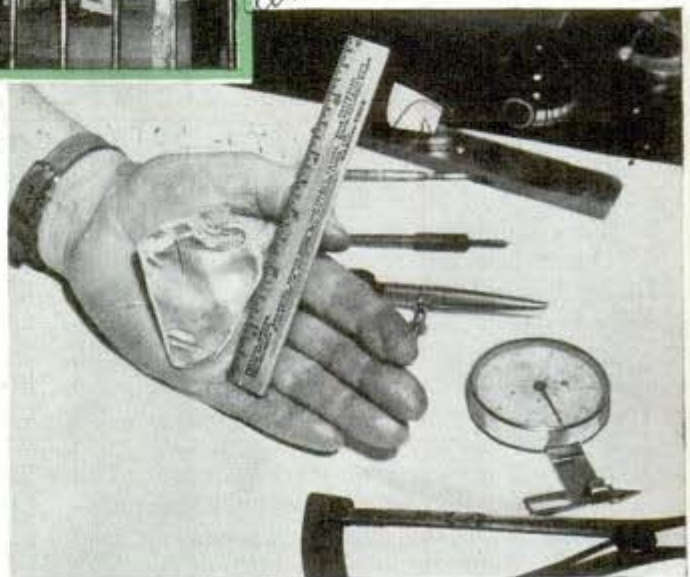
ground so fine, it will pass through a filter that will hold water.

Back in 1938 two brothers, Brazilian farmers, were walking along the bed of the Santo Antonio River and picked up a rock. At first it looked like a hunk of salt. But after they threw it away, Manoel Evancio, one of the brothers, noticed the way it caught the sun's rays. To satisfy himself, he brought the "hunk of salt" to a broker in Rio de Janeiro.

In a short time Manoel's suspicion was confirmed—it was the fourth largest diamond ever found, the Vargas. The brothers were paid more money than they could have earned in the course of their normal life span.

In a couple of hours diamond merchants from Antwerp to Johannesburg and New York had heard about the find, and were making feverish plans to buy it. One of these was Harry Winston. And while he was one of the first to arrive in Rio de Janeiro, he was too late. The diamond had been sold to Oswaldo Dautez do Reis for \$400,000 and sent to Amsterdam. That was the begin-

Below, ruler helps to demonstrate the size of the Brazilian diamond





Left, vault in which the Vargas is kept has solid steel doors, each 16 inches thick and arranged in layers. It is protected by an electric alarm



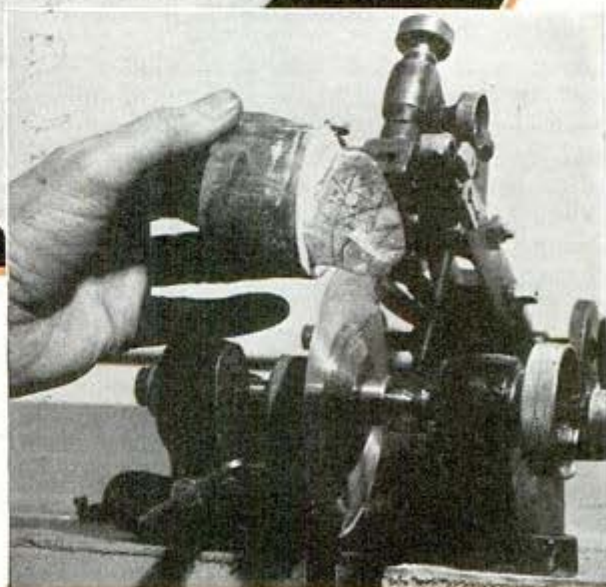
The Vargas, being held by the young woman, is almost the size of her palm

ning of a chase which kept Winston traveling four months, during which time he covered over 20,000 miles.

Eventually he bought the diamond. Unbelievably, though it was insured for a million dollars, it was shipped to America by ordinary registered mail, at a cost of 70 cents, with no more special precaution than one would take in shipping a silk shawl.

However, in this country, at the

(Continued to page 162)



Specially constructed cup holds Vargas diamond against bronze cutting blade. Next step is to turn on the power—and hope for the best. This is how one corner was sawed off before splitting the stone

*46 Dr. Langer's method is the necessary*

## Tiny Filaments Are Welded Under Magnifying Glass



Spot-welding a filament  $1/2,000$  inch in diameter is so delicate a job it is done under magnifying glass

One of the most delicate of welding operations is involved in the making of the tiny, K-shaped filaments for thermocouples used in measuring high-frequency currents or voltage. The nickel-chromium filament is  $1/2,000$  inch in diameter, one-fourth the thickness of a human hair, and it must be spot-welded into the posts of the thermocouple stem. This welding is done under a magnifying glass. The stem is afterward sealed into a tipless bulb.

*448*

## Chemical Analysis Made Quickly With Electric Current

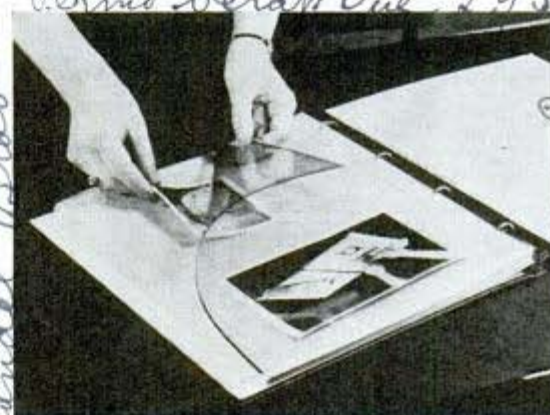
Chemical substances present in billionths of ounces can be measured accurately by recording tiny electric currents passing through the solution being tested, says Dr. Alois Langer, research chemist at Westinghouse Research Laboratories, East Pittsburgh, Pa. This method solves prob-

lems in minutes, instead of the hours required by ordinary analysis methods, and will simplify the work of the medical scientist and biologist. Using a measuring apparatus called the polarograph, Dr. Langer sets dials to correspond with the voltage of the substance to be measured, somewhat as a radio is tuned in to a certain station. Then he reads on a dial the amount of current passing through the solution, and thus can tell the amount of the particular substance it contains. Essential parts of the apparatus are a reservoir of mercury, a small storage battery and various electric meters.

*434*

## Transparent Leaves of Album Seal Themselves Over Photo

Self-sealing pages of a new scrapbook eliminate all need for the pastepot or brush or flatiron. Photographs, clippings or documents are laid in position on the page, then the transparent page is laid over them, automatically sealing them in the book. No heat or moisture is required. The transparent covering protects the exhibits from dirt, moisture or tampering.



Top, placing photograph under transparent page; below, sealing the picture by simple pressure on page



L 356. Cont. Powell Clark, Box 5403,  
Metro Station, Los Angeles

## Camera on Rider's Back Gets Movies of Hunt

Wearing a movie camera mounted in a special rigging on his back, the noted huntsman, Grover Vandevener, recorded some amazing action pictures of riders following him over the jumps. The shots were made for Paramount's film "Virginia." An idea of Director Edward H. Griffith, this is said to be the first time the stunt has been used in making movies. The film reflected the movements of the cameraman-jumper's horse, as well as those of the other horses following close behind.



35 mm.  
Bell's Howell  
Camera

Hunter-cameraman, right, top, prepares to take movies of hunt with motion picture camera mounted in a special holder strapped over his shoulders. Bottom, a typical scene caught by camera showing horse and rider going over hurdle



L 259

## Ladder on Wheels Teaches Six Roller Skaters at Once



Roller skate instructor here has five learners clinging to wheeled ladder

One instructor can teach six novices at a time the art of roller skating without much risk of spilling them on the floor, by using a "floating ladder" designed by Tim W. Smith, manager of a rink in Fountain City, Tenn. The beginners learn to balance themselves while clinging to the ladder which rolls on three bicycle wheels, one in front, two at the rear. After three such lessons a student is usually ready to be turned loose on his own.

AUGUST, 1941

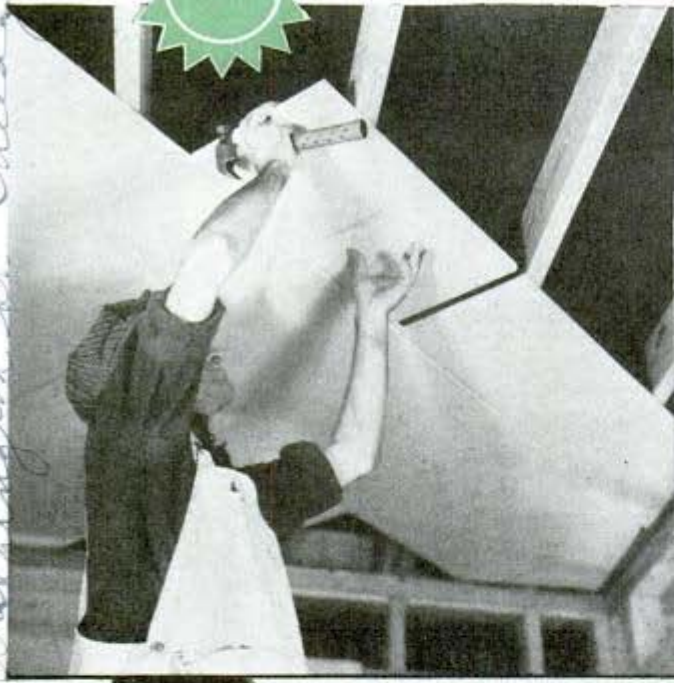
Palace Roller 55  
Rink

287

Chas. Wallace J. Morris  
590.2 Magnolia Ave.

# SEAL COMFORT

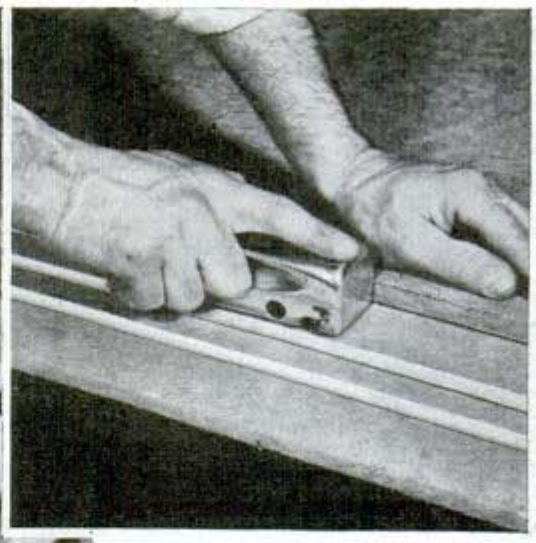
Ref.: Paul W. Case, Inc., Insulation Board Corporation, 1110 Washington St., Chicago



Applying insulating tile board to ceiling by nailing it to joists



Below, testing fire-resistance of mineral-wool insulation with blow torch



Grooving insulating board with tool devised for that purpose

uation by the man who owns his own home. That thing is to erect a barrier against heat waves attacking his home—a barrier that also will afford protection from cold in winter. Relief from torrid summer temperatures lies in the use of modern insulating materials, incorporated in the house at the time of construction, or added to the house that has been built without adequate insulation. Insulation also provides the answer to the home owner who wants to reduce his winter fuel bill, add to the comfort of himself and family, and make

**H**OW hot can your house get under the summer sun? Hotter than you think, possibly, since mid-year temperatures of 150 degrees Fahrenheit are not uncommon inside the outer walls of typical uninsulated frame houses. Unvented attics on a normal summer day may go over 115 degrees Fahrenheit, holding a thick blanket of hot air that keeps the interior of the house below from cooling off.

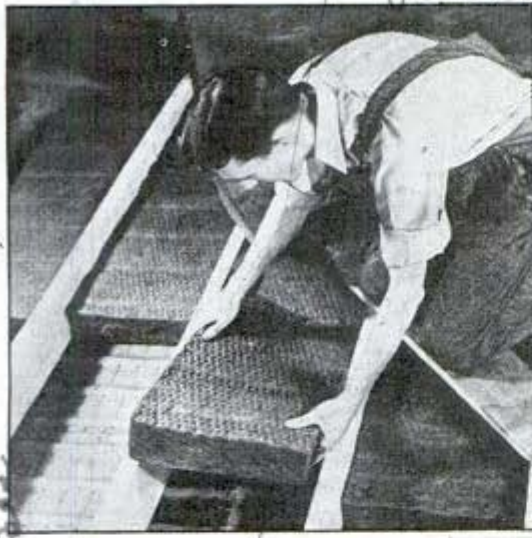
other gains in the way of decorative interior finish, healthful living and enjoyable atmospheric conditions the year round.

Heat always seeks the lowest temperature level. If the inside of your home is cooler than the outside, the heat seeks to enter and even things up. The more of that heat you keep outside, therefore, the cooler the interior of your house will remain. Insulation slows down the passage of heat through the walls, summer and winter,

Something can be done about such a sit-

*Johns-Manville Sales Corp. 228 40th, New York*  
*Rockwood*

# INTO YOUR HOME

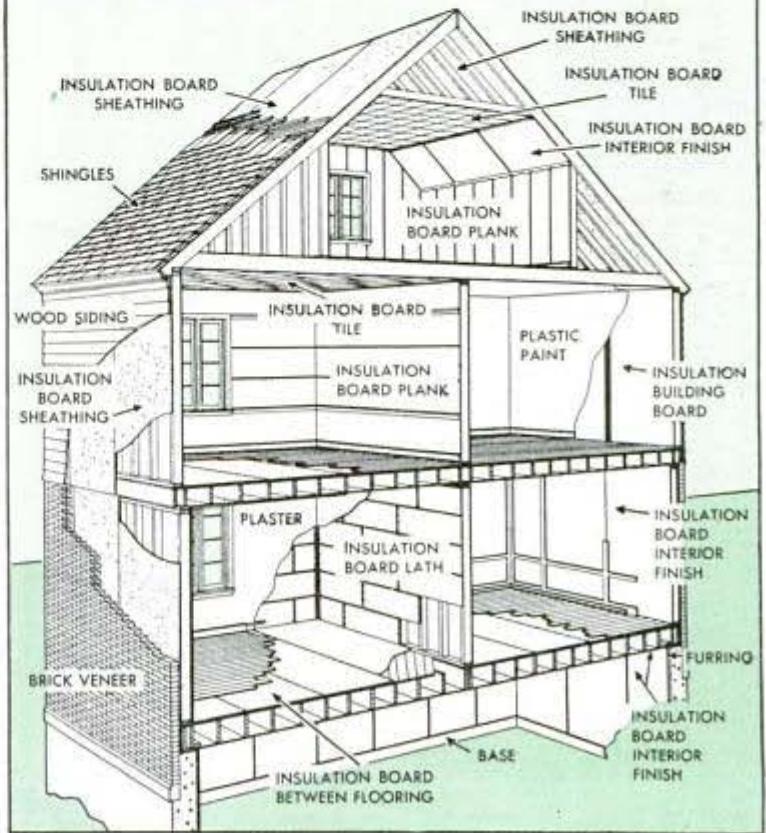


Applying insulating batts in attic. Any home owner can do the job hence it is the home owner's ally in combating undesirable temperatures.

Wall or ceiling insulation makes inside surfaces cooler in summer than they otherwise would be, hence lessens the feeling of heat in the room—the feeling you get when you enter an uninsulated room in the summer. Experiments have shown that insulation-board sheathing on a house, plus one-half-inch insulation lath, will keep out 42.3 percent of the heat that otherwise would pass through the the walls. It also will keep in the same amount of heat in the winter, which would be lost otherwise.

Modern insulating materials are produced in several forms for use where one or the other is best indicated. Flexible insulations, known as blankets or quilts, and made of eel grass, animal hair, wood fiber, mineral wool and other fibers; the

How shiplapped roof insulating board may be applied to a flat roof deck to seal out heat in summer and seal it in during winter. Below, sectional view of building showing typical uses of structural insulating board. Some applications are practical only for new houses



*W. S. Sullivan Co. 249 Grand*

*Peri Letter*

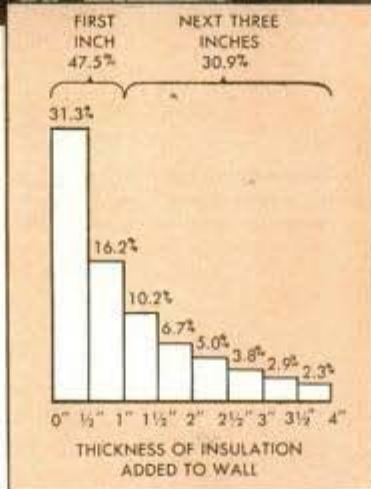
*Celox Corp 249 N Michigan*  
*Chicago*



Insulating tile board may be applied to ceiling by using an adhesive

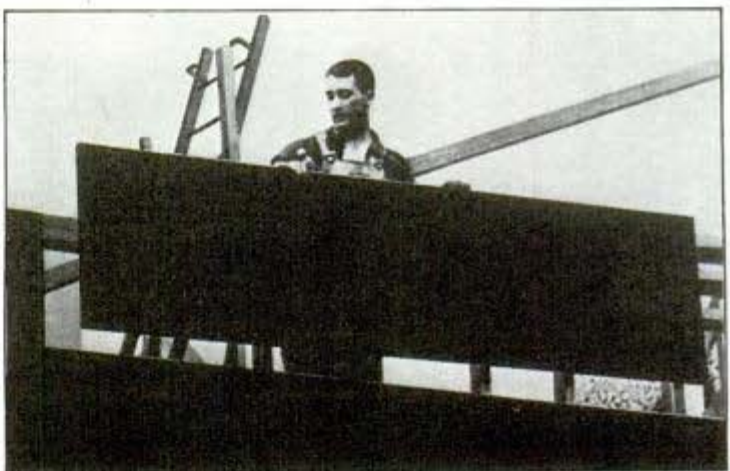
"fill" type of insulation, made from mineral substances, and produced in granular, powder and fibrous forms, which is "poured" or hand-packed into place between the structural members of a building; reflective insulation, either sheet steel or bright metallic foil (usually aluminum), and the board type, which is essentially manufactured insulating "lumber," made in many forms for every possible use in insulating, in construction as actual building material, and as decorative interior finish, such as beveled tile panels for ceilings, wainscots, overlay borders and friezes.

Heating costs are cut materially by proper insulation. For a typical seven-room residence, a brick veneer frame structure without insulation, but served by an efficient oil-heating plant, the cost of a season's heating is \$147. But by utilizing structural insulating board



Above, the percentages of heat "stopped" by adding insulation

Below, horizontal insulating-board sheathing is applied to wall studs



throughout as sheathing, as plaster base on exterior walls, and as floor and ceiling insulation and interior finish, 33.4% of the heat may be saved, with a dollar value of \$48.10. Installing weatherstrips will save 4.2% additional fuel, worth \$6.18. By adding storm windows 12.1% of the heat may be saved, an oil-cost reduction of \$17.80. A combination of the three cuts the fuel cost approximately in half, or about \$73.10.

Since less heat would be required, other savings would come in the form of a smaller heating plant and smaller radiators and accessories.

In a home of the type mentioned, insulating costs run about like this: Weatherstrips, \$50; storm windows, \$90; structural insulating board, \$180; a total of \$320. Thus the fuel saving would pay this cost in about five years, and the saving continues as long as the house stands.

If a man is handy with a saw and hammer he can insulate his home, using insulating board, for those are really the

see ind. 1908-149a  
 The Ruberoid Co. 500-6th Ave  
 New York City

only tools needed for the job. He would run into difficulty in trying to install blown-in mineral wool insulation himself, since specially-designed equipment is necessary, and this is usually leased to insulating contractors by the manufacturers of this type of insulation.

The home owner, though, who has an unfinished attic, may do an effective insulating job himself. He can install batts, blankets or reflective insulation between the roof rafters and between the ceiling joists, covering them, for utmost efficiency, with insulation board. The materials can also be placed in the attic floor. If he wishes to walk on his attic floor he will cover the insulation with flooring. Thus he may transform a useless, unattractive attic into the basis for an added room, or perhaps two. By using structural insulating board he can finish the job by placing room walls to the best advantage.

For the man who owns a home in which he is already living, insulating board can be utilized in a number of ways to give him not only effective insulation, but also a wide variety of decorative schemes.

If you are planning to build a home and want to insulate the walls, you may utilize insulation board sheathing on the outside of the wall studs, with insulation board lath (and plaster) or interior finish insulation board on the inside of the studs.

For a house already standing you can forego the sheathing, leaving in place the lumber sheathing already there, but you can nail furring strips over the already-finished walls of the rooms, and attach insulating board to the furring strips. If a decorative insulating board is used, you have your choice of any number of beautifying designs.

Insulation board may be sawed, beveled, grooved or hand-carved, and, because different surface textures are available, attractive interior finishes may be obtained by alternating different textures.

A given thickness of insulation will save a certain amount of fuel, in the case of winter heating, but it does not follow that twice the thickness of insulation will save twice as much fuel. For instance, insulation board sheathing and plaster base, used instead of other sheathing and lath, results in saving 42.3% of the heat that otherwise would pass through the wall. The sheathing and plaster base have a total thickness

(Continued to page 162)

AUGUST, 1941

2502  
**Cup Holder for Top of Desk  
 Seals Out Dust and Dirt**



Taking the place of unsanitary glass tumbler used on top of desk, this cabinet keeps paper cups clean

Built in suitable design to take its place beside the desk-type water bottle, a streamline cabinet now offered holds several days' supply of paper cups. Cups from 3½ to 10-ounce capacity may be kept clean within the dust-tight compartment.

2555  
**Electric Clock on Refrigerator  
 Defrosts It Automatically**

Defrosting is performed automatically on one of the latest electric refrigerators. A synchronous, self-starting electric clock is installed on the front of the refrigerator, below the door, and this starts defrosting action at the desired time.



Setting the electric clock in the base of the refrigerator to start the defroster at night

Norge Llew  
 Borg - Warner Corp  
 59

Материал, защищенный авторским правом

2578 Cont: Charles J. Bauer  
 c/o The Journal Herald Pub Co  
 Dayton, Ohio

# "Rocking Wings" Take the Bumps Out of Flight

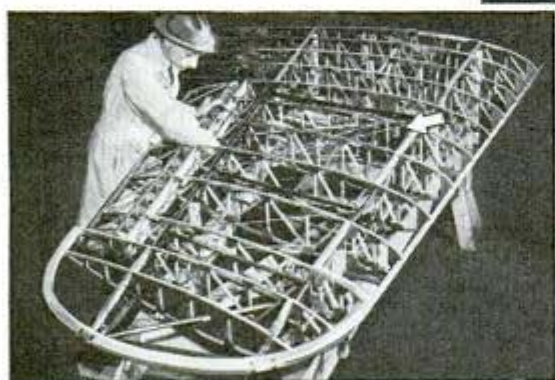
Hoefeli Corp. 1840 Howell Ave  
 Dayton, Ohio  
 Cornelius



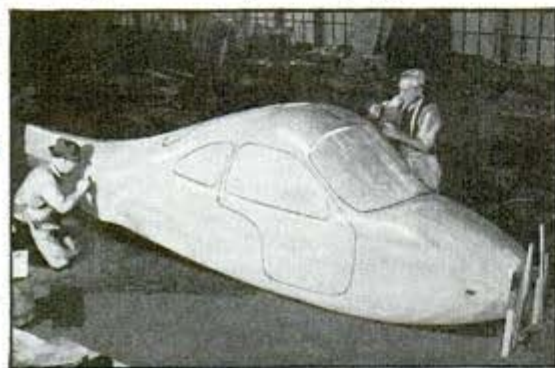
George Cornelius, inventor (top, left) with a scale model of his "V"-wing craft. He tested the powered model exhaustively on a novel mount on his automobile (right)



The drawing shows how the wings, rocked in unison or opposition, act as ailerons and elevators



Above, adjusting flap on movable wing; point of cantilever rocker fits into hole at arrow. Below, mold of fuselage used to shape the triple-plywood cabin



Nearing completion at a Dayton factory is a unique airplane with "rocking wings" that break the conventions of aeronautical engineering. George Cornelius is the designer who conceived the idea of movable wings capable of automatic adjustment to windstream variations, to "take the bumps out" of flying. Besides the claims made for high maneuverability and smooth riding, the plane is expected to be 10 or 12 percent faster than comparable craft of conventional design, and roomier, with side-by-side seating.

The movable wings are, in effect, themselves ailerons and elevators responding to the "stick." They rock on long cantilever-built members within the wing structure. Each wing will change its angle of attack as much as nine degrees in unison, or they

2542.

can vary from each other as much as six degrees. By setting the controls for a steep bank the pilot puts one wing at an angle six degrees at variance from the other. Flaps within the wings operate automatically to justify changes in the wing angles. When the wings are set at the maximum angle of attack, for landing, these flaps lower to act as air brakes. The division between the movable wings and their anchor section is about two feet from the fuselage.

Another novel feature of the plane is the forward sweep of the wings, which form a V with its base at the tail, the tips of the V corresponding to the wing tips.

The plane will be powered by a 130-horsepower air-cooled motor and a top speed of 158 miles an hour is planned. The over-all wing spread is 30 feet, 6 inches. The four-seat plane is 17 feet long.

2548

### Grenadier Guard on Cycle Packs a "Tommy Gun"

England's Grenadier Guards, famous the world over, are being mechanized to meet the threat of invasion. As part of the new order, some of the renowned fighting guards ride motorcycles mounting sub-machine guns so they may speed well equipped to defend any strategic point.



Grenadier Guard riding motorcycle has "Tommy gun" in firing position

## Magnified Shadow of Watch Part Reveals Any Imperfections



Escapement wheel for watch being inspected by comparing its shadow, greatly magnified, with an enlarged scale drawing.

Magnifications of more than 100 diameters created by an optical enlarger enable workmen at the factory of General Time Instruments Corporation, LaSalle, Ill., to detect and discard defective pieces by comparing small manufactured parts with standard drawings. The illustration shows a watch escapement wheel being examined.

Westcott Div.


Light rays made parallel by a condenser system are focused on a drawing board after passing the tiny wheel which lies in a glass tray. The greatly magnified shadow falls on a carefully prepared scale drawing of the part, and any deviation from the factory standards of tolerance becomes apparent immediately, since the shadow of an imperfectly made wheel would not fit exactly within the lines of the enlarged drawing.

Wide World

K1300. Cont. U.S. de. With Muller  
457. S. Serrano  
Los Angeles


# PUSH BUTTON MUSEUM

By pushing buttons in Griffith Observatory, Los Angeles, Calif., visitors may start and stop working models which demonstrate many interesting facts of science—and the visitors have fun, too, operating the devices

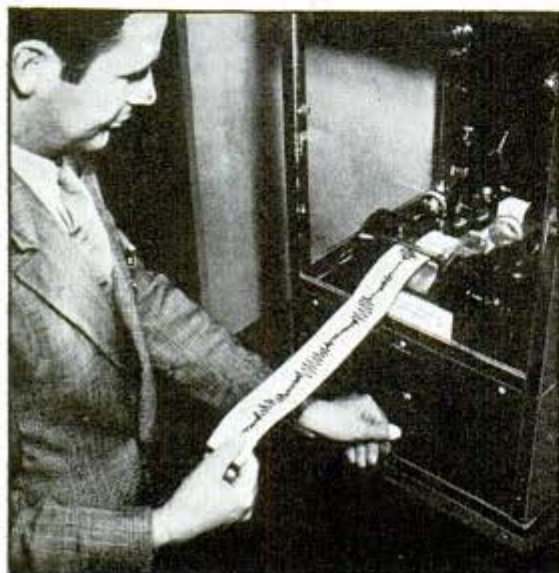


Above, as visitor keeps eye level with slot in moving curtain, he sees red dot circling a blue one. Moving slot represents fourth dimension of time, the revolving dots represent movement in space.

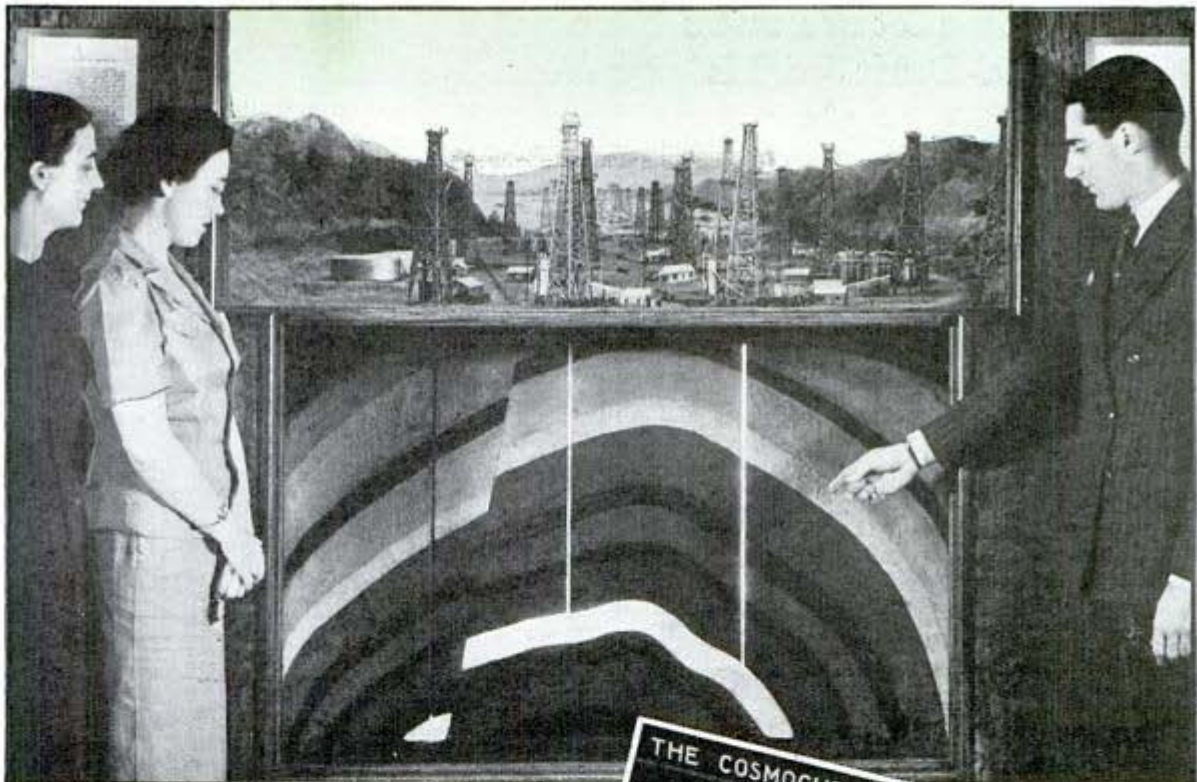
Right, interior of demonstrator



Right, latest television techniques are shown by pushing button of receiver equipped with 12-inch screen. Below, left, machine that produces "earthquake" at touch of a button. Record on tape is identical with that taken during actual 'quake. Below, right, models of planets Jupiter and Saturn rotate when button is pressed. Both Saturn and its rings revolve. Planets on display are changed to correspond with planets most prominent in night sky



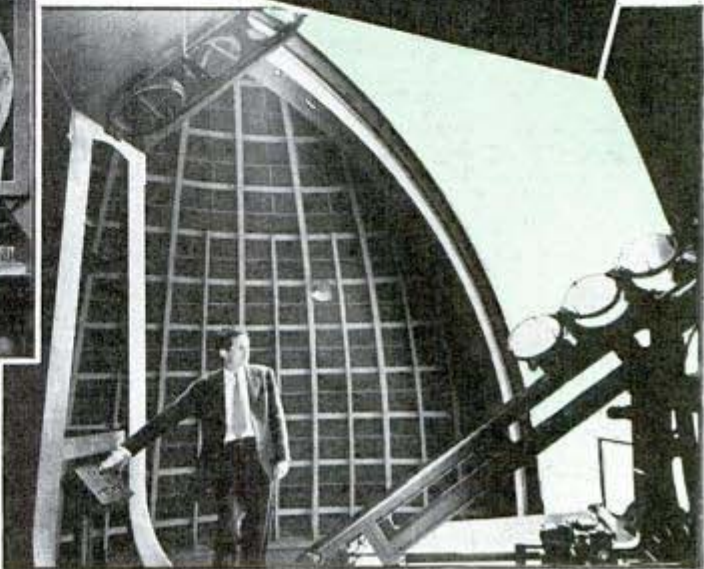




Above, pushing button sets in operation a demonstration of how oil is obtained. Lower part of machine represents oil-bearing formation. When apparatus is started, a red liquid representing oil rises through wells on surface. Right, Clock of Ages that tells history of the earth in four minutes. Photo of primitive man in center of clock indicates period of man's ancestors. Below, left, worker in observatory putting finishing touches on a model of the moon. Topography of models is carved with dental tools

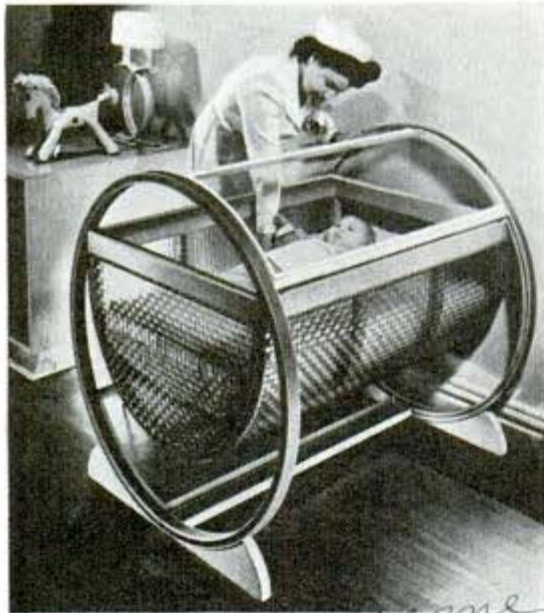


Right, apparatus reflects image of sun on screen so visitor may watch sunspots or may tilt a grating to show parts of spectrum. Here one telescope projects sun's image, second places it in spectroscope and third supplies light to spectrohelioscope



L 499. maker - for Kim  
225 E. 57th. Kew-Far

## Baby's Bassinet of Plastic Has Anti-Draft Shields



Plastic bassinet mounted between two large hoops protects baby on all sides and is easy to clean

Noteworthy for the abundance of plastics used in its construction, a baby's nursery in modern style, designed by Paul Bry of New York City, is made entirely of materials that are washable, hygienic, strong and durable. One feature is a Tenite plastic bassinet hung between two large rings of bleached walnut covered with sky-blue leatherette. Two shields, of transparent plastic sheeting, slide up on the end rings to provide a complete or partial cover to protect the baby against drafts.

## Wind Power Operates Turbine To Generate Electricity

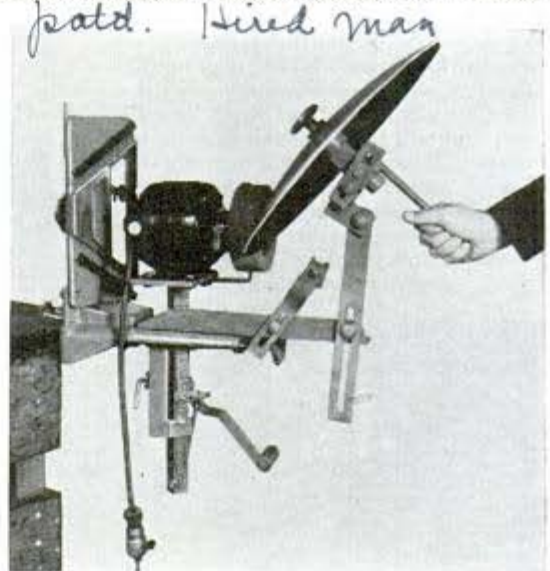


Latest experiments in converting wind power into electricity call for erection of a giant wind turbine like the model shown, which is being rushed to completion on a mountain top in Vermont. Mounted on a 110-foot steel tower, an assembly including

two 22-ton blades and a bomberlike structure having a "wingspread" of 180 feet will "yaw" into the wind under the control of mechanism within the tower. The rotating mass, including the blades, will weigh more than 75 tons. The turbine, owned by S. Morgan Smith Company of York, Pa., is expected to generate 1,000 kilowatts of power. It is believed that a series of such turbines scattered through hills would aid national defense since they would be less vulnerable to air attack than the equivalent generating capacity housed in a single station.

## Automatic Farm-Tool Sharpener Grinds Sickles and Disks

Being automatic in operation so little experience is required to run it, a farm tool sharpener grinds cutting edges of mower sickles with a bevel and angle comparable to factory practice, making the farmer independent of outside help. Sickles improperly ground require from 30 to 50 percent more power to pull, and this extra energy can be saved by 20 minutes'



Motor-driven grinder puts factory-type edge on disk or sickle, saving expense of having it done outside

work with the sharpener to restore the cutters. Guides aid in placing the sickle in the slides, and a simple gauge locates it for grinding. Then it is clamped securely and the grindstone brought into contact with the edge. The sharpener can be fastened on a bench, a wall or on a mower wheel. An attachment is available for grinding disks for harrows, cultivators and plows.

POPULAR MECHANICS

Borst Co. 60  
Third Av.

25 W. 54th St.

20 418

1100 Jan 1942

Wide World  
Island's Knob  
near Hubbardton

molitor, d.d.

www.izdat.com.ua

L 428

Chicago Bridge & Iron  
Works 332 Michigan  
Chicago

# Tractor and Crane Lift Giant Tubes for Tunnel



Large pipe many times their size is picked up and lowered into tunnel pit by tractor and trailer

*D-4*  
Dwarfed by their mammoth load, a Caterpillar Diesel tractor and LeTourneau crane handled huge steel sections used in building four steel-lined tunnels connecting with the tower house at Parker Dam

Calif. In the first movement they lifted the steel cylinders from trucks and lowered them to the bottom of a sixty-foot pit. Then the tractor and crane descended into the pit and helped in assembling the tubes.

*L 240*  
*Le Tourneau, Peoria, Ill.*  

## Cow and Calf Are at Home to Visitors in Dairy Billboard

Minnie Quarts and Lotta Pints, her calf, are at home to their public in a huge billboard advertising a dairy in Atlanta, Ga. They are sheltered in comfortable stalls behind a large plate-glass window, where they attract considerable attention. A ramp leads visitors to a "ringside" enclosure.



The enclosure accommodates visitors who come to see Minnie and her calf

✓ Production of passenger automobiles in the United States during 1940 reached 3,802,454 units with a value of \$2,494,409,824, an average of \$656 per car.

AUGUST, 1941

*Irwindale* 65  
*Peoria, Ill.*  
*and 1.3 it to*

# TRAILER-BLAZING



R1430

## Part III

By Commander Attilio Gatti

*98 30th August*  
WHILE our okapi is getting accustomed to man's smell and voice, let's visit the N'Kunda, the Secret Society of Baboon-Men.

These marvelous old men have spent their lives experimenting with medicinal herbs and plants in the jungle, meditating in their lonely huts on the secrets handed down to the members of their fraternity from generation to generation since immemorial times.

We are the first white people to study the N'Kunda; now their secret society is nearing extinction. The youth of the Bakuma Walengola no longer have the propensity for this life of isolation, toil and poverty. They have been infected with civilization, which for them means white men's clothing, a bicycle, the bustle and vices of a little town. They prefer to leave their tribe and work in a mine, where half of them are killed by unknown sicknesses.

But we'll long remember that ceremony of the N'Kunda—the little

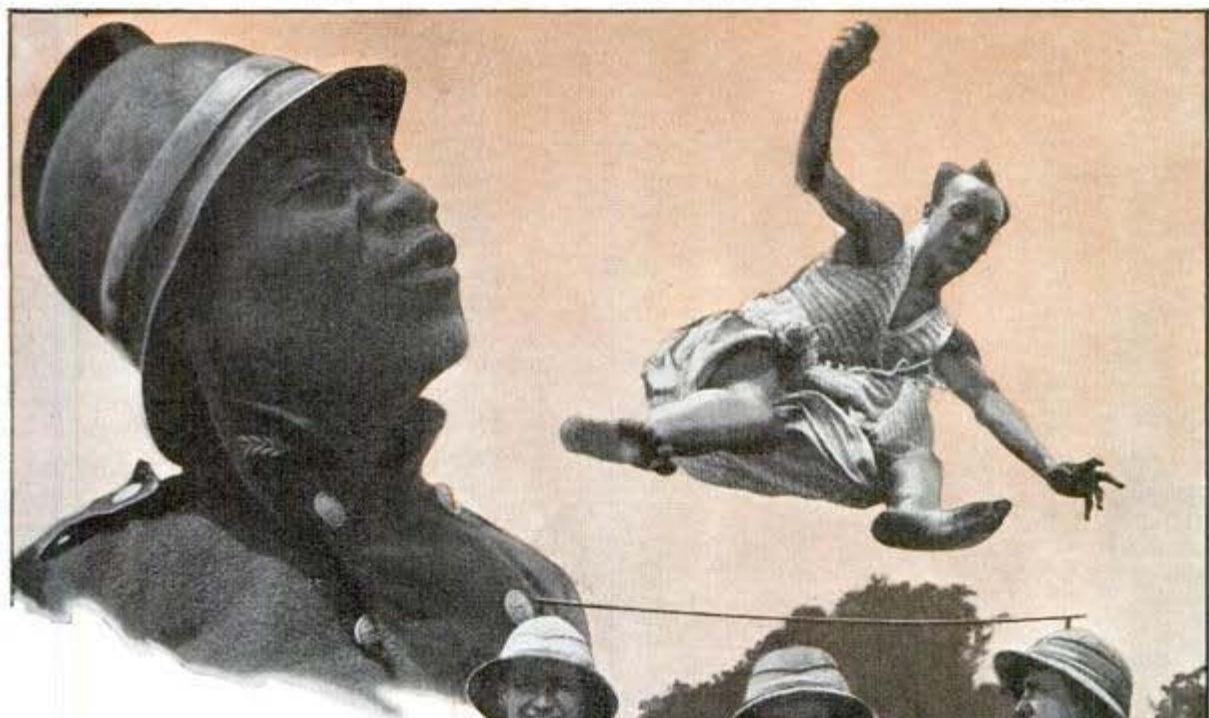
Watussi giants, tinkling bells fastened to their ankles, exhibit agile grace and skill in the dance of the lion

Camp monkeys make friends with "Spotty," the leopard kitten picked up in the bush by Kamanda, my gun bearer



K1430.

# through the African Jungles



The proud African above is wearing a helmet and coat presented by the Martin Johnsons—has worn them daily six years

jungle glade, the round sacred hut in the middle, those fourteen old men appearing at the summons of a tambour. Each wore a wooden mask, colored with ocher and chalk, whiskered with raffia and hemp, decorated with feathers. Their bodies were covered with dyed barkcloth, their arms doubled in length by the use of flat woven strips to give the effect of the long arms of the baboon.

The grotesque ritual dance began, and we, perspiring, oppressed by the heavy atmosphere even without exertion, were amazed to see those old men crouching, jumping, wrestling, with all the spring and lightness of a



Seven-foot Watussi princes leap over our heads, with room to spare  
Commander and Mrs. Gatti are welcomed by a gathering of the chiefs





These lithe Watussi are a race of rulers  
Clad in togas, many were eight feet tall



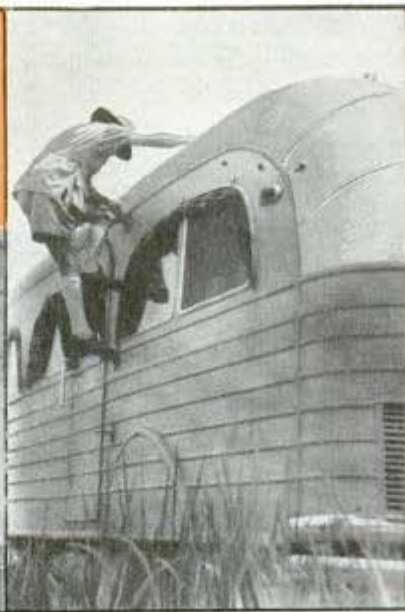
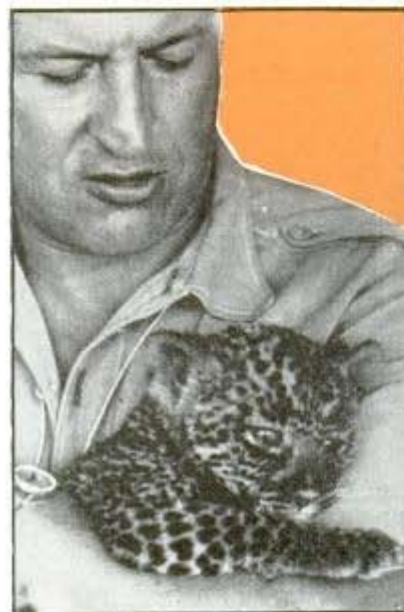
ballet, for hours without respite, without showing the slightest fatigue. Maybe one day we shall know and use the miraculous drug that gives the N'Kunda such uncanny strength.

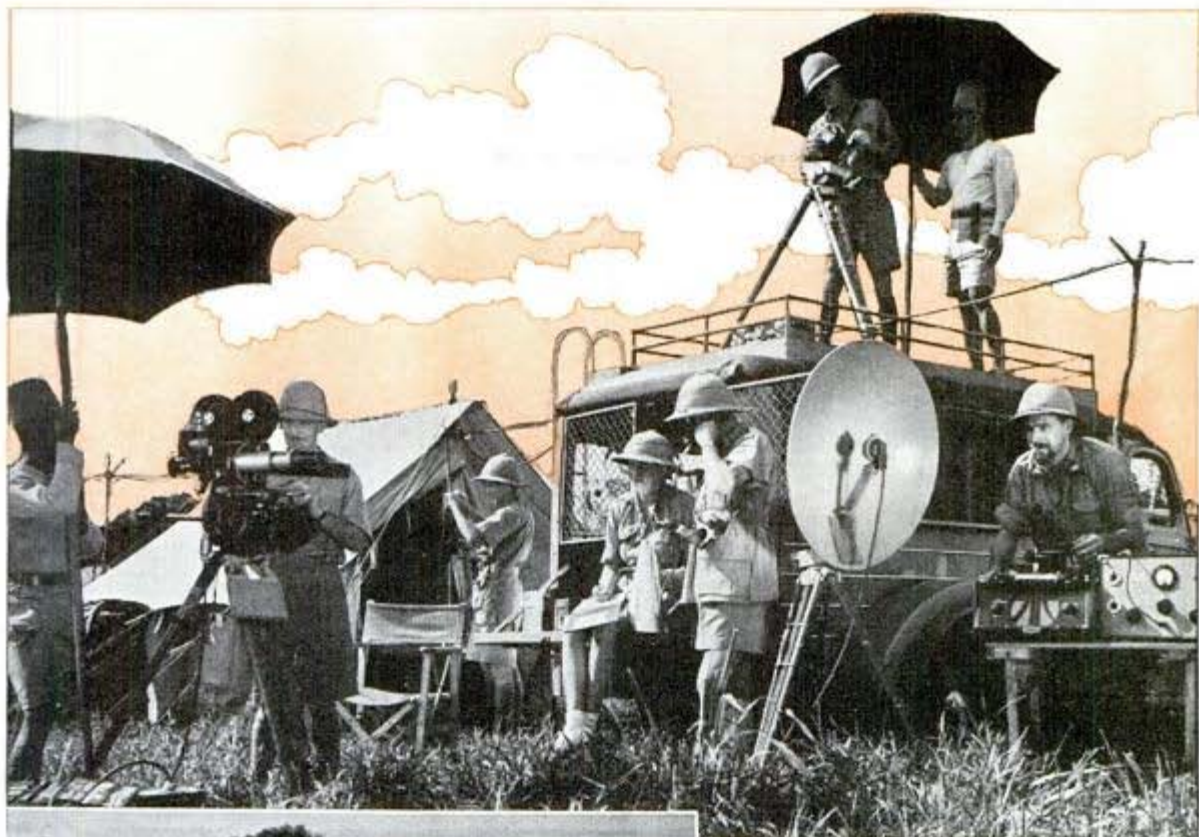
Some hundred miles across the Congo jungle and we are in the open again. What a relief! Let's pause before the Niangara fort, built by one of Stanley's followers with the help of a few soldiers. Later they were besieged in it, and fought until the last man lay dead. Who were the ferocious attackers? Why, the fathers of the inhabitants of this clean, beautiful village in front of which we are lining up our caravan.

They are peaceful now, these Mangbettus. But proud, stiff, and difficult to deal with if you do not approach them with rigid etiquette and punctilious manners. Those women sitting in a group near the trailers are only half the wives of Ekibondo, King of Niangara. He has seventy. The whole village is his house. Each wife has a hut for herself and her children. There are the huts of old relatives; of the court staff; of the King's police; the jail for wives who break rules; the granaries, and so on.

The King, like every woman and child, has a head shaped like something between a pear and a banana. The moment a child is born someone begins to bind the back part of the soft skull with a leather bandage. The child cries, but they say he would cry anyway. Day after day the operation is continued, until about the age of seven the bones have solidified in that elongated

Contented by a bottle of milk, the baby leopard cuddled down, a bundle of soft fur. In the center, below, coming down from the roof of a jungle yacht to stalk elephants with a camera in the tall grass. Right, when the alarm goes off it's quitting time for the crew of natives





Here is the expedition at work with movie and still cameras, and sound recorder (right) The lion slipped in as we filmed elephants Kamanda, standing by with the gun, discovered the leopard stalking us just in time



form. Barbarous? Maybe. Yet, after the Belgians tried to stop it, they had to countermand their order because of the cases of idiocy that developed in ninety percent of the children not treated according to the ancient Mangbettu custom.

More hundreds of miles, toward the south this time, and we are at the foot of the Mountains of the Moon, entering the Ruhindi plains—paradise of wild game. From the roof of one trailer I dominate the sea of yellow grass stretching unendingly in every direction, explore it with field glasses, ready to use a telephoto Leica-gun or automatic movie camera.

In the distance something huge and grey appears. I grab the phone to the driver.

"Stop, John. Elephants! A whole herd of them. And antelopes!"

I climb down the folding steps, wind the camera, check the express rifle. Followed by Kamanda, my gun bearer, I dive into the swish-swish of the grass. Bending low, we advance with the caution of Indians, trying to keep against the light breeze.

The antelope haven't heard us. But the whirr of the camera arouses the suspicion



The Mangbettu women gathered by the jungle yachts are just half the wives of Ekibondo, King of Niangara



Raffia whiskers hung from masks of "Baboon Men"

From a seat on trailer roof we watched for game



of the topi's hypersensitive ears. Their tense, alert heads turn toward us. The leader leaps, the others follow, they are gone.

We push on, until Kamanda tugs at my blouse. We are almost smack against the nearest elephant. Fortunately the breeze holds, elephants are short sighted, and this particular one has not yet sensed us. Raising an inch at a time, I focus my camera. Ten big elephants are around us. The camera whirrs. But Kamanda tugs again at my sleeve.

"Come, Bwana," he urges, "come quick."

A terrific roar sounds just behind us. A lion is walking in. We must slip away quickly; we have a rifle, yes; but not of a brand shooting at once at elephants in front and lions behind. I crawl and run until I reach a bush, and, I believe, safety from encirclement. Now, away from the elephants,

I surely can risk a better camera angle on the lion. The lion doesn't look toward me, but I feel that he knows I am here. His tail is beginning nervously to beat his flanks; he is crouching as if to spring.

I put out my hand, the silent command which Kamanda always answers immediately by passing me the rifle. But nothing happens. I turn my head—nobody is there! Has Kamanda gone crazy to abandon me in such a hole?

Luckily the lion, too, has turned, in answer to the roar of his mate. Taking advantage of the respite,



K1430

2527

I crawl back, cross the wind, until the camera is snatched out of my hand and the rifle is thrust at me.

"There," whispers Kamanda. "Up, Bwana, quick!"

Finally I see the crouching form which has stalked me while I stalked the lion. Happy for me that my good Kamanda was there! I take aim carefully. This is no time for a miss.

"Bang!" says the rifle.

"Wah!" says Kamanda.

What a brute of a leopard! Nine feet from nose to tip of tail. A spine shot has nailed it, not one split second too soon.

"Back to the cars."

Kamanda bends down, gathers something, then runs after me. Back to safety, I look at the bundle of soft brownish fur Kamanda has collected—a delightful little leopard kitten.

"Kamanda, give me a tin of milk."

"Spotty" approves, cleans up the whole tin, then relaxes on my arm, satisfied.

The Ruhindi plains disappear behind us and we climb up the steep rim of a valley separating two live volcanoes, portals to the kingdom of the Giant Princes.

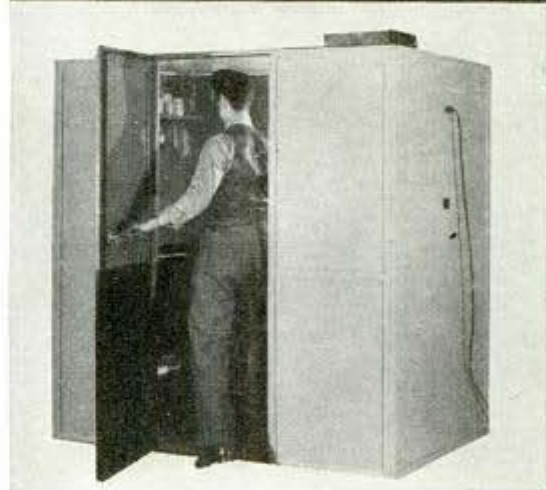
The months we spend among these giants have their climax in a great ceremony which draws to the capital, Nyanza, princes and nobles from every corner of Rwanda. The plaza before the palace of King Rudahigwa is crowded. Watussi princes, slim, handsome, elegant in their gracefully draped togas, white with red and orange designs of suns and triangles. The smallest of them are seven-footers; many are eight feet tall. Theirs is a race of rulers. The Watussi women, strange to say, are all of normal stature. Their togas are brightened by handkerchiefs of vivid colors knotted around their heads. All have a grand air, a charming manner that cannot be found elsewhere in Africa.

We stand near the King, feeling dwarfed by the stature of our host and his courtiers. On the opposite side are massed hundreds of Bahutus, the original natives of Rwanda, who are paternally ruled by the Watussi.

To the symphony of tambours is added the gay tinkle of hundreds of bells, fastened in bunches around the ankles of the princes who are giving an exhibition of their skill in the traditional dance of the lion—a marvel of leaps and jumps and simulated fights that leaves you spell-

(Continued to page 177)

## Full-Size Folding Darkroom Has a Built-In Sink



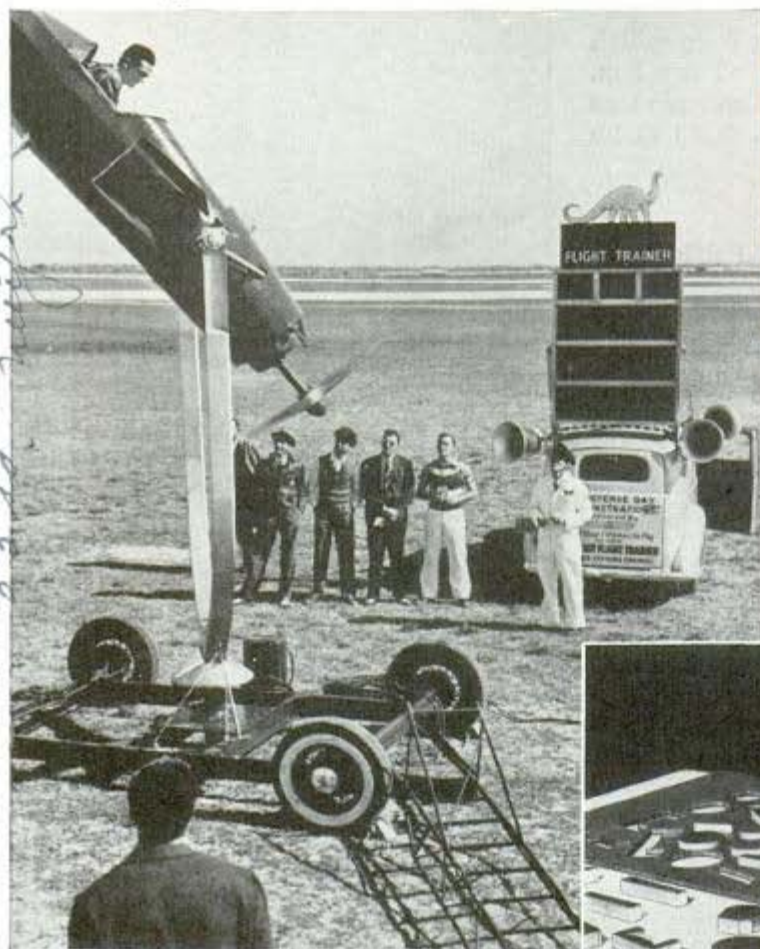
Top, interior of darkroom that may be set up anywhere in the house; it resembles a cabinet (below)

Any part of the house can be converted into a photo laboratory by means of a new collapsible darkroom. Built-in equipment includes a chemical-resistant sink with hot and cold water taps, two electric outlets, a ventilator; storage space beneath the sink for bottled chemicals, trays and towels; and a shelf above for dry chemicals, developing trays, timer, graduates and other small accessories. The sink, large enough to accommodate three 8-by-10-inch and one 11-by-14-inch developing trays, may be connected permanently to pipes, or only temporarily to hose. There is an adjustable shelf for the enlarger. The complete unit is six feet three inches high, six feet long and four feet wide, and when dismantled it is the size of its largest panel and about six inches thick.

Regent's Recreations Club. 268 Regent Ave.

# FITTING *the* MAN

Cont. Allen Warren Ellsboth 3.4.3 21  
 76 271



© R. S. Schultz and M. B. Lyngaugh, Psychological Corp., New York

Above, simple test for anyone: put cross on arrow showing way grinder should turn to sharpen tool. Left, Sinclair flight trainer

Below, testing aptitude by having subject fit blocks into holes. This test is used by Cleveland Employment Security Center

**G**ROWING more important every day in the nation's industrial scheme is a group of learned psychologists who have carved out some very interesting jobs for themselves by devising tests to find out which is the right job for you.

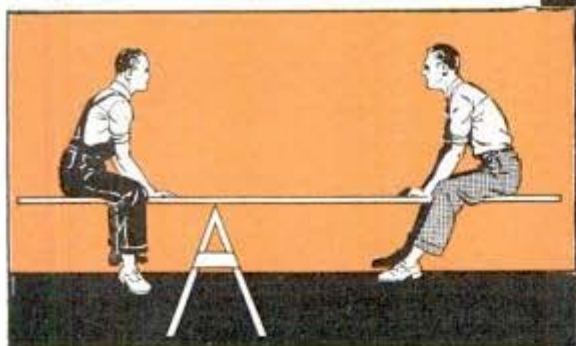
More than a million valuable human pegs will be fitted into comfortable industrial holes this year by means of aptitude tests the psychologists have arranged.

One reason for the tremendous spread of this tendency to sort out workers like peas in a canning factory is that the tests have very largely gone mechanical, just like industry itself into which the tests help feed the men. Devices which the applicant for a job can handle with his hands, ranging from wooden blocks and brass pins to complicated production machines, are to a great degree overshadowing questionnaires and interviews.



Above, applicant for a position at the Lockheed Aircraft plant is shown taking a manual-dexterity test while personnel executive times him with a stop watch. One entire room is fitted with test equipment for the use of whole groups at a time

L271  
to the **JOB**



© R. S. Schultz and M. B. Lynaugh, Psychological Corp., New York 522-5211

Above, another test for the reader: put cross next to figure you think weighs the most *Av.*

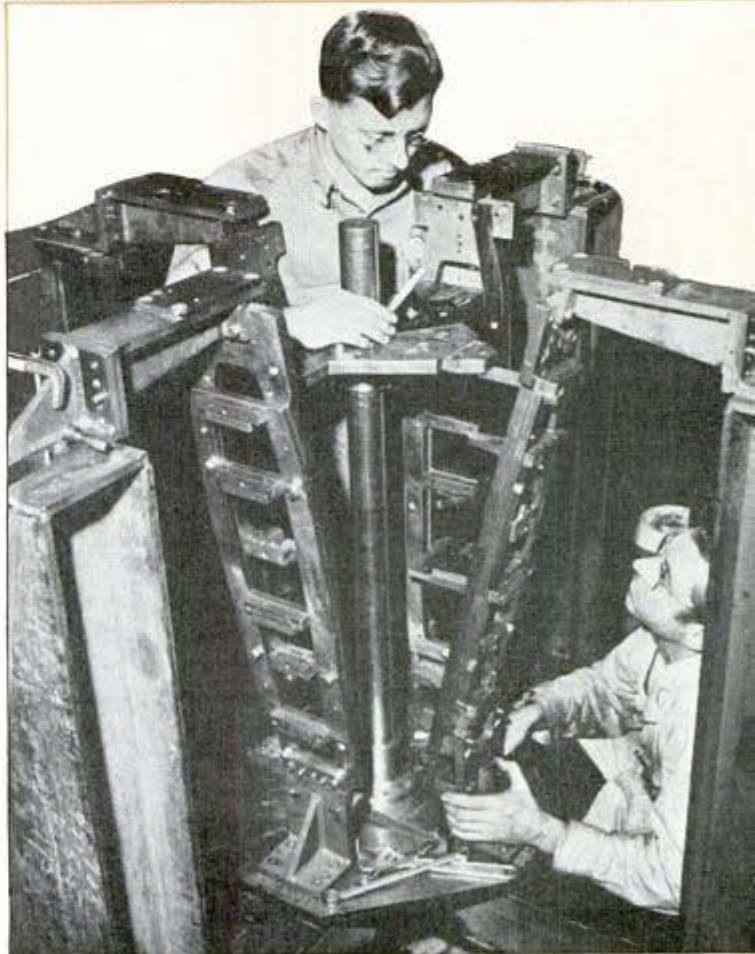
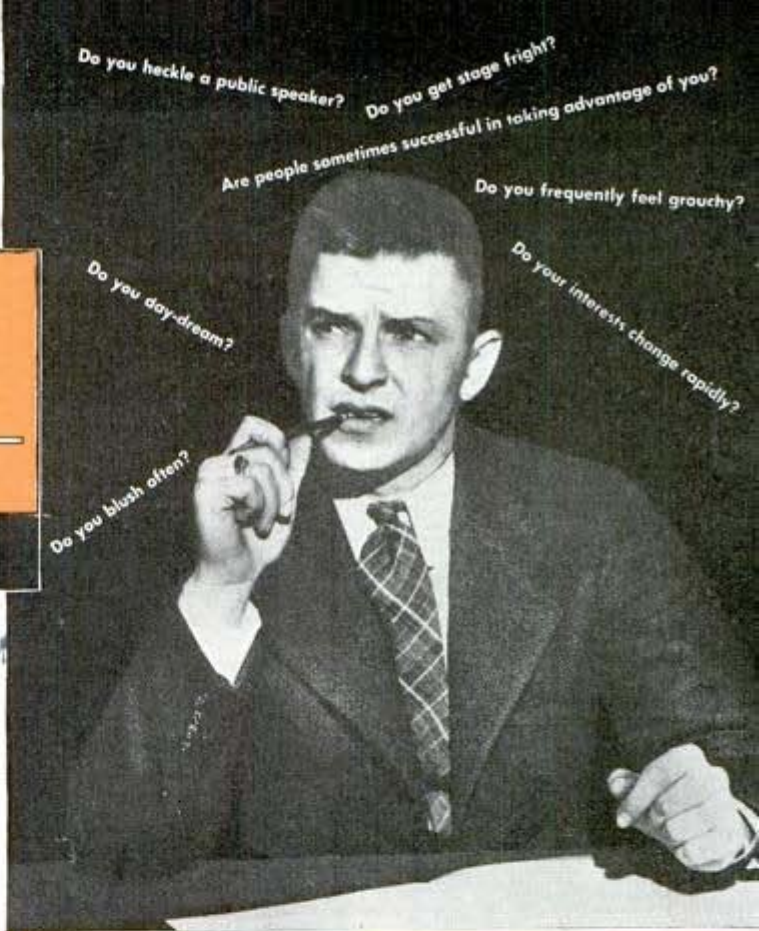
Right, showing a few of the questions asked the applicant in a General Electric questionnaire

Bottom, Lockheed Aircraft uses practical work tests to determine aptitude of applicants

Psychologists still use the questionnaire, which outlines school grades, experience, preferred occupations, likes and dislikes, opinions, reactions to words and pictures, powers of observation and so on. But more and more they check the man's statements and background with scientific telltale ratings given by the psychological machines. And in running men through their mental sieves and occupational graders they discover some interesting things.

For example, many a man who should be playing a violin in an orchestra is unhappy at his task of shoveling coal in a locomotive because his father, or male relative, or one of his father's friends whom he hero-worshipped when a child, worked on a railroad. The reverse is also true. In each case, childish desires, rather than aptitude, shaped a career.

And the next truck driver you see very likely has a genuine aptitude as a singer, an architect, a lawyer or any of several other vocations. Exhaustive tests show nearly all of us have the germ of





Above, testing dexterity by having applicant pick up three brass pins at a time and insert them into holes in board

ability along numerous lines. One career is merely developed at the expense of the others.

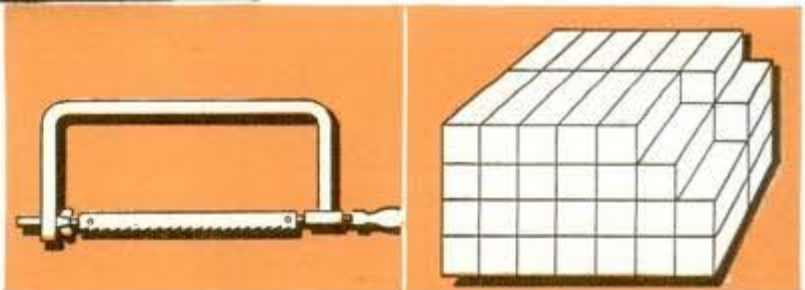
More than half of the thousands of persons examined in a leading psychological laboratory were found to have from six to eight aptitudes. Four out of five had five occupational aptitudes. Of 8,192 persons tested, only 14 had less than two aptitudes, meaning one or none, in which they excelled. The odds are more than 8,000 to one you can do one task well.

Because there are so many hidden factors in the psychological make-up of the average worker, most experts hesitate to say that a man should seek employment specifically as a bookkeeper, stenographer or adding machine operator even after hours of careful tests, written, oral and mechanical. They merely suggest that he engage in clerical work, describe his other special aptitudes and give him a list of the vocations into which he is likely to fit.

And some of the large corporations, like

General Electric Company, use four methods to fit the man to the job—scholastic training, questionnaires, gadgets and machines in an effort to assist him toward success. This company leans to the man with a brilliant scholarship record. Such a man might find himself enrolled in the student engineering or test course, soon seated at a genuine lathe with real materials and an accurate set of blueprints to work from. After a period of months, during which he is paid for his work, his real aptitude is gradually discovered by psychologists. It is quite possible under this patient method for a man to start with the intention of becoming an electrical engineer, but to come out as a crack appliance salesman for the concern. Both man and company benefit.

The machines used in this course are real machines, but ex-



© R. S. Schultz and M. B. Lynaugh, Psychological Corp., New York

What's wrong in drawing of this hacksaw: will the frame break, should the wing nut be on the outside of the frame or is the blade too small? In the drawing at right, how many blocks are in the pile?

periments with psychological devices are also being tried by the company on certain groups, more with the idea of checking the value of the devices than the aptitudes of the men, who are entered in the test schools regardless of what the blocks, pins and other equipment disclose. However, in one of the General Electric plants, several of the most popular personnel devices are operated in giving what are called the wiggly-block, the general dexterity and the tweezer tests. These latter two tests indicate the person's ability to place small objects in position quickly and accurately and strangely resulted in the hiring of women exclusively to assemble delicate instruments such as watt-hour meters.

Q 27 f

Westinghouse Electric and Manufacturing Company depends heavily on aptitude tests conducted at the work bench, although past training, scholastic record, personality, and other factors indicating likelihood to succeed are taken into consideration.

Lockheed Aircraft Corporation uses the wiggly block and rate of manipulation or manual dex-



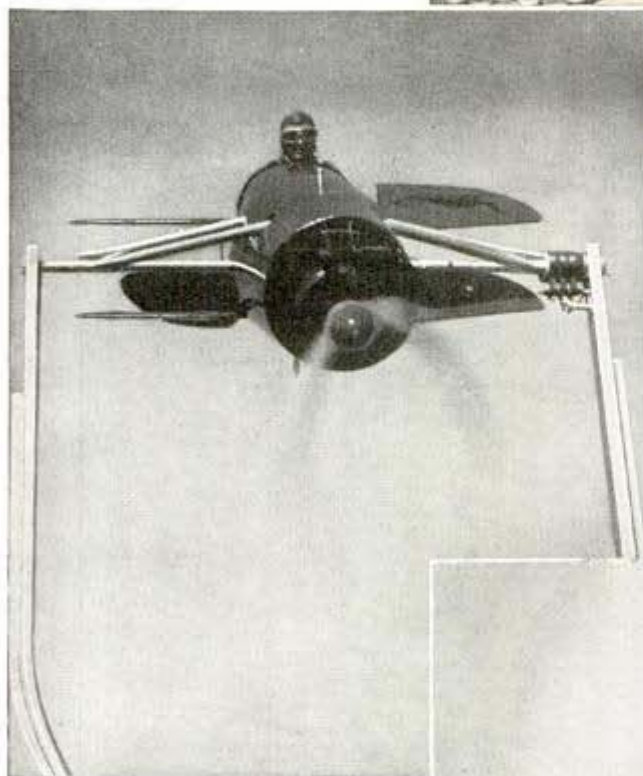
Another manual-dexterity test of the type popular in selecting workers

watch, the applicant puts the wiggly blocks together to form a cubic shape.

Johnson O'Connor, who developed this and many other accepted tests in his Human Engineering Laboratories in Stevens Institute of Technology in Hoboken, N. J., Illinois Institute of Tech-

(Continued to page 164)

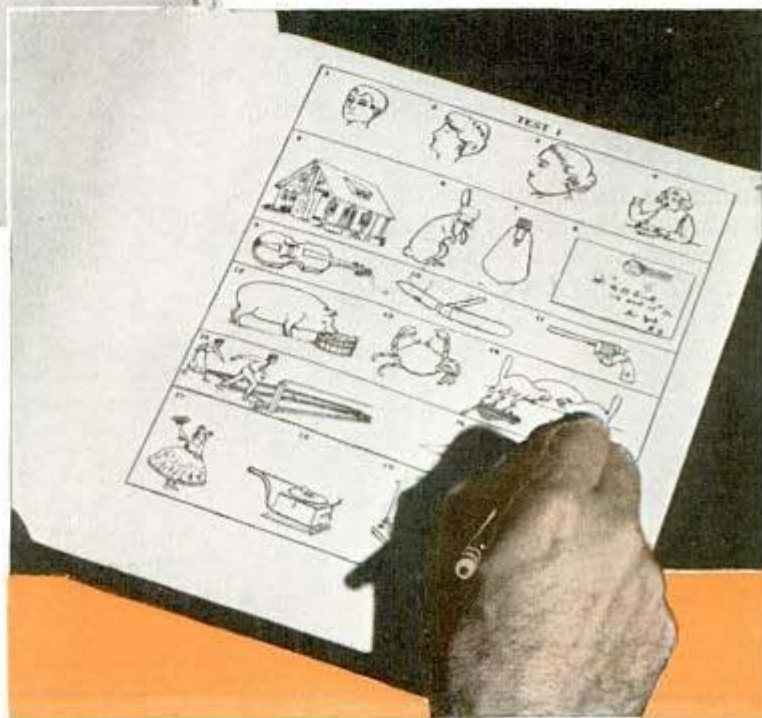
Below, applicant is required to draw in features missing in several pictures



Another view of the Sinclair training plane which is capable of a wide range of maneuvers

terity tests, together with practical work at machines to determine the aptitudes of its men.

In the wiggly block tests, a block of wood is employed that has been cut into a number of irregular parts, usually about a dozen. These are placed before the person being tested and while an examiner holds a stop



2539

### Rubbers Over Spiked Soles Keep Golf Shoes Dry

Master Metal Products  
114 W. 27th Street  
Buffalo, N.Y.



Notice the perforations in the rubber on the floor. These match the standard pattern of spikes on shoes

Golfers can keep their feet dry despite sudden showers or morning dew by wearing special rubbers that fit over spiked shoes. Perforations in the bottom of the rubbers accommodate the spikes in the sole and heel of the shoe. They roll up to be tucked away conveniently in the pocket of the golf bag.

Early

2349

### Hot Press Mounts Photographs With Dry Adhesive Tissue

Technical Associates  
1606 Carverton Blvd  
Los Angeles

\* Camera fans may dry-mount their favorite prints up to 11-by-14 inches with an inexpensive press that applies heat and



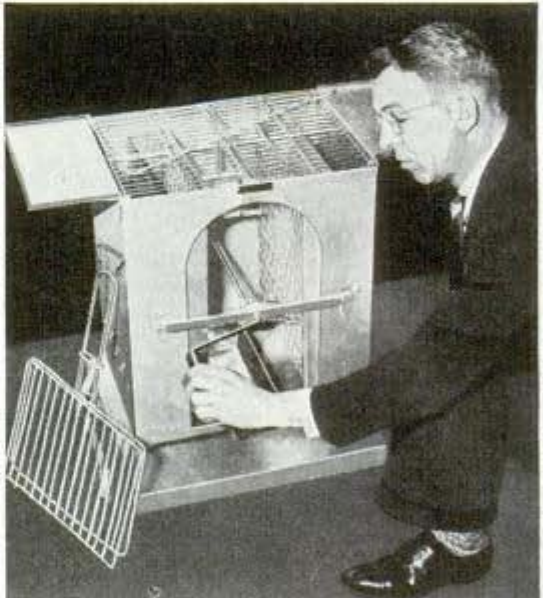
Electric press mounts photographic prints smoothly by applying heat and pressure evenly over surface

Master Metal Products  
Inc. - 291 Chicago Ave

pressure simultaneously and uses a dry mounting sheet coated on both sides with adhesive shellac. Mounted prints are free from the "patchwork" of uneven pressure marks sometimes made by hand irons, according to the manufacturer, because the press applies heat and pressure uniformly over the entire print. A built-in timer automatically turns off the heat at a preset lapse of time.

### 275 Buffalo, N.Y. Portable Grill Barbecues Meat On Spit Between Two Fires

For barbecuing meats, fowl or game, a portable grill is equipped with a hand-operated spit that turns the roast between two fire compartments, the intense heat from which seals the juices within. Easily carried, the unit may be used on level ground outdoors, or set in the fireplace indoors. Whatever dripping results from melting fat is caught in a removable pan. If desired, the rotating spit may be lifted out, and in its place a flat grill hung on



Roasting spit revolved by handle may be locked in any position. Note steak broiler at left of grill

hooks between the fire compartments for broiling steaks, chops, fish, wieners, hamburgers or strips of bacon. Two hinged grids on top hold frying pan or pot of coffee, and removable shelves at the ends help keep food warm. Heat control is provided by suspending the fire compartments on rods so they may be moved toward or away from the roasting meat.

✓ P-400  
National Defense Work Goes on the Night Shift



Thousands of factory windows are lighted these nights. Not only shipyards and aircraft plants, but allied industries turning out lathes and radios and turbines have gone on a 24-hours basis for national defense. Above, a Westinghouse engineer adjusts filaments in a 16-inch searchlight; upper right, pattern makers on night shift



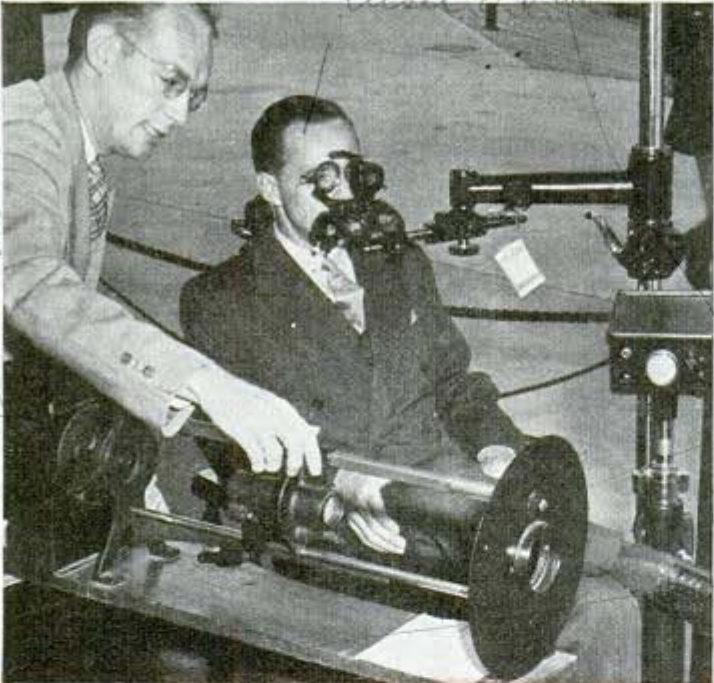
Tripling its 1940 defense production, Westinghouse Electric & Manufacturing Company is building steam turbines for the two-ocean navy, radio sets for army, navy and air service, gun mounts, floodlights and electric power machinery. At the Cleveland plant (left) floodlights for landing fields are assembled. In the circle are 315-pound stud bolts which will join two sections of the shaft for a giant generator

AUGUST, 1941

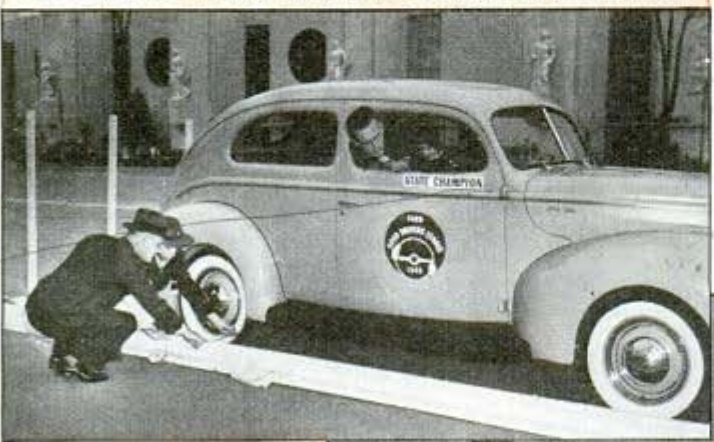
East Pittsburgh, Pa 77

2273 3674 Schaefer Road Dearborn, Mich

# YOUNG AMERICA



Above, each finalist in Good Drivers League national events must look through instrument at spot of light and describe what he sees. Test reveals tendency to be "cross-eyed" or "wall-eyed"



Above, test in which car must be parked within six inches of the curb. Stanchions at front and rear indicate location of vehicles already parked

Right, zig-zag test in which youthful driver weaves his car through rows of posts set at odd angles. It takes an accurate eye and real ability at wheel to pass test



**S**AFETY on the highway is the objective of a national competition in which boys and girls participate each year, with the winners from the 48 states and the District of Columbia going to Dearborn, Mich., for the final contests. University scholarships are awarded to the champions by the **Ford Good Drivers League**. Almost hairline precision in the handling of an automobile—parking, braking, backing, clutching and other maneuvers—is essential in the competition. The tests also include **psycho-physical** measurements such as sight, hearing, nerve stability and other characteristics and habitual reactions concerned in driving. At one point the contestants play with blocks to show their mechanical aptitude; at another they sit at the wheel and obey rapidly changing instructions appearing on a test device called the **drivometer**. A good score here indicates alertness and the ability to react quickly. Still another test involves the

Designed by J. A. H. Lower Associate Professor of Psychology, College of Arts, Columbia

Alan Phillips 1940. Mass.

Alan Merithew 1940 Michigan



L203

# Learns SAFE DRIVING

distance that it takes a contestant to apply the brakes and stop his car after hearing a gunshot. Driving competition includes both day and night maneuvers, proper curbing of the car, backing into a narrow designated space representing a private garage, winding between poles to reveal accurate judgment of distance, and other tests.

*Edsel Ford.*



Observer points to detonator which he fires as car moves, signaling driver to stop. As brakes are applied, detonator fires again, then time for driver to react is measured



Left, object of test is to thrust nail into V-shaped aperture without touching sides

Below, backing into garage is another test for the young driving contestants



*David Chamberlain*

*Observer, driving C. Perkins, State Teacher College, Buffalo, N.Y.*

2279

**Spray Helmet Visor Cleaned  
By Unrolling Film**



Vision is cleared quickly in helmet by tearing off soiled film, replacing it with fresh piece from roll

Chicago Eye Shield Co. 2304 W. Warren Chicago

Clear vision at all times is offered by a crop sprayer's head guard having a transparent film on the outer surface of the visor that may be renewed easily as soon as it becomes soiled. A 30-foot roll of moistureproof film on a spool is encased at the left of the wearer's eyes. When lime, sulphur or other spray elements cause blurring, the soiled portion of the film is pulled cross-wise and torn off, leaving a new, clean piece covering the "window." The film slides between flanges that hold it flush against the visor. Faster cleaning of the visor results in a saving of time and permits workmen to do a better job.

Chicago 411

**Fire Extinguisher Sounds Alarm  
Then Puts Out Blaze**



Equipped to sound an alarm as it starts to put out a fire, an automatic extinguisher may be hung on the wall anywhere in the home to stand guard against flames. Made to harmonize with the decorative scheme of any room, the unit

Jewell Paint Co. 345 N. Western Ave. is finished in silver, hammered brass or ivory. It is loaded with an ordinary cartridge that gives a warning explosion when heat melts a fusible link and thus releases a plunger against the cap. At the same time the glass bulb containing the liquid extinguisher breaks, the fluid discharging through holes at the base. It is said to be capable of smothering a large blaze.

2377 Chicago

**Wall Designs Applied by Roller  
On Ceiling-to-Floor Stencil**

It is easy to paint uniform designs on walls with the aid of a wall-length stencil and kit of simple tools now on the market. Made of a special kind of waxed paper that may be used repeatedly, the stencil is placed on the wall and secured by Scotch tape. Then a waterproof paint is applied, and when the first section has been painted the stencil is moved to the next section, and so on until the room is completed. The paint is poured onto a rubber sponge from which it is picked up by a roller brush and rubbed over the stencil until the openings have been painted. Then another roller brush is worked over the stencil to spread the paint. The stencils are made in many designs to suit any room in the house.



Left, using roller to paint designs on wall through stencil. Right, prints of two available patterns

2385

*Lucy J. Hutchison  
Columbia Broadcasting System  
Field Survey Unit*

# Field Radio Cars Chart the Power of Broadcast

Survey car, right, measures signals received from radio stations. Ring antenna on roof avoids ground interference

Below, taking reading of a station's intensity. Similar readings must be made at 300 points in a typical survey



significant to be shown on any but the government maps. Two cars cover the entire United States, one west and the other east of the Rockies. To run the special radio equipment, the generator is stepped up, and an extra battery is carried. Measurement of signal strength is made by an elaborate receiving set and a small independent transmitter of known strength. The transmitter signal can be compared with the signal of the station under survey, and this comparison calibrated to give the strength of the station's field in millivolts per meter. A non-directional ring antenna on the roof of the car enables the receiver to function without a ground, and thus is not affected by peculiarities of the soil.

2482

## Flexible Arm Spiked to Ground Holds Garden Floodlight

*485 Madison Heights*  
In charting the strength of signals from its network of stations, the Columbia Broadcasting System operates field survey cars over 60,000 miles of back roads each year. This work goes on constantly because of changes in power and frequency. The survey of a single station requires a week of preliminary office work by engineers who use maps of the U. S. Coast and Geodetic Survey to plot 300 spots the car must reach. These are listening posts picked without regard for their accessibility, since they follow straight lines from the transmitter. In order to make its way to each of these points to take readings, the car travels on small back roads too in-

For illuminating the garden at night there is a floodlight holder with a flexible arm which can be bent to throw the beam in any direction. At the base of the arm is a 12-inch spike to be driven into the ground wherever the floodlight is to be anchored. Holder and cord are waterproof. It is designed for use with reflector-type bulbs, and is also used for roadside signs.



*Milwaukee Wis*

*Held in Chicago Co  
212 2nd St. Chicago Ill* 81

2188

# Bringing the World of



Each headphone in hearing clinic at University of Southern California has a rheostat to control the volume. The professor uses a microphone. How the sounds of the alphabet are taught visually to the deaf in classrooms and motion pictures is shown in lip reading pictures below.

*Miss Lucile M. Moore, vice president Pacific Telephone & Telegraph Co., Los Angeles*



to give back a world to millions of persons—the world of sound. Instruments have been designed by which the deaf can hear through their teeth, even their fingers. Lip reading has been developed with the aid of motion pictures.

Not alone in lip reading have motion pictures become a vital part of the fight. Simple stories from everyday life have been filmed in such a way as to teach the deaf how to master normal contacts with society by means of lip reading and subtle interpretation of gestures, expressions, and a hundred other "visual clues."

Probably there is no man on earth who is not in some way affected by the deafness either of

Vibrations picked up through elbow from cork tip on vibrator are sent to the brain as sounds



457 S. Vermont Ave Los Angeles  
**By R. DeWitt Miller**

**A** MAN who has long ago lost hope of knowing what "sound" means, who has from birth lived in the half world of the totally deaf, sits holding a strange instrument between his teeth. A woman speaks into a microphone.

An expression almost of ecstasy crosses the man's face. He has heard his first sound, not through his ears, but through his teeth.

This is one of the miracles science is performing in its struggle against deafness. Science, with the aid of innumerable new devices, promises

# Sound to Deaf Ears

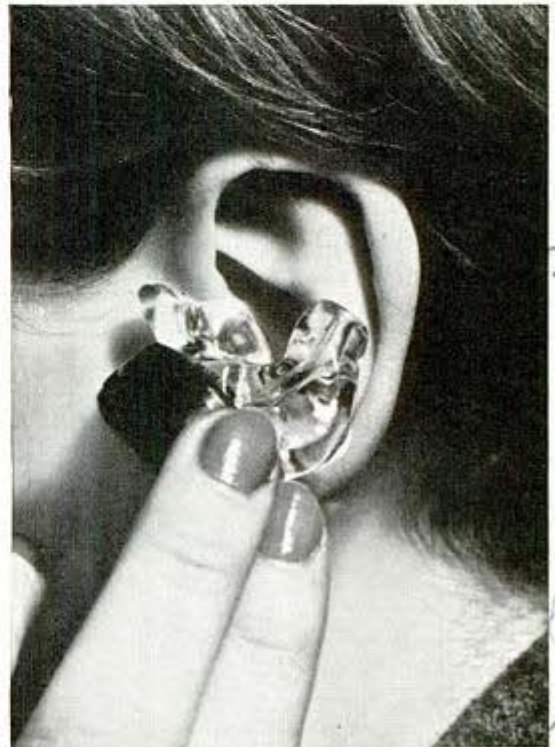


Above, two Phipps units applied to bones in front of ears help person almost totally deaf. Amplifier controls pitch and volume of sound from "mike" to unit

himself or of some one else. All about us are ruined lives, lost jobs, shattered hopes, and just plain annoyance caused in one way or another by deafness. Even the defense of our country may be affected in an appreciable degree by the mastery of this problem. Under bombing or bombardment the problems of deafness are increased a hundred fold. Even normal ears can't stand the roar and shriek of modern warfare. So the battle against deafness is our battle. But let's see what science is doing about it.

A hearing clinic is located in the Department of Psychology at the University of Southern California, under the direction of Dr. Boris V. Morkovin. Members and officers of the American Society for the Hard of Hearing, the National Council of the Teachers of the Hard of Hearing, and the Boston Guild for the Hard of Hearing also cooperate in this clinic.

Although the majority of the work of the clinic has to do with the partially deaf, much of the research is with persons who



Above, transparent plastic ear tip, molded to fit interior of the individual ear, uses the ear itself rather than bone induction. Only the black disk shows

*Volta Bureau  
Washington, D.C.*

*Otagaki Hearing Aids, 617  
S. Olive, Los Angeles, Calif.*



Top, teaching sounds of speech to persons deaf from birth

have never heard a sound. Here the new "Phipps unit" is of inestimable value. This unit is used to find any remaining hearing. It is in connection with cases of profound deafness, often from birth or early childhood, that its special type of bone transmission is particularly effective. The instrument is designed to send vibrations through the bones. It may be used between the teeth, behind the ear, at the back of the head, or other locations.

The vibrations of the instrument are caused either by the human voice, directed into a microphone, or by phonographic recordings of music or speech. All sound is vibration. A normal person hears these vibrations through his ears. But it is also possible to hear them through the bones. In this way a person deaf from birth receives for the first time a conception of what hearing is.



Phipps unit vibrator between teeth brings sound to brain

Below, same unit conveys sound from microphone to fingertips



Sometimes such a person can best hear through his fingers. In such cases a special instrument is employed, the vibrator of which is grasped between thumb and fingers. The "sound" is then picked up by the nerves of the fingers, rather than the bones. This is known as "tactile" hearing.

One of the most important functions of the Phipps unit is in stimulating residual hearing— hearing which, although apparently lost, can be revived. As hearing is lost, the memory of sound is often also lost. One person who became slowly deaf retained only the memory of the sounds of breaking waves and wind sighing through pines. When she saw either surf or wind-bent pines, she at once remembered the sounds. Through special training in a clinic, she gradually regained her

2188  
423  
hearing, until, with the help of a hearing aid, she could resume normal life. Although she began her hearing re-education with such laboratory apparatus as the Phipps unit, she now wears only a small portable hearing aid. A Phipps unit is designed for laboratory use. When a person regains partial hearing, he is generally advised to adopt a standard hearing aid.

The testing and fitting of hearing aids is another field in which science has made great advances. There are many types of deafness. A certain hearing aid will be most suitable for each type. Moreover, a hearing aid must be suited to the personality of the user. This takes careful scientific testing and adjustment.

To establish a basis for treatment, the amount of a person's hearing must be tested. Originally this was done by voice tests, the ticking of a watch, or the sound of a tuning fork. However, scientific research developed an instrument called an "audiometer," which reduces testing to an exact standard.

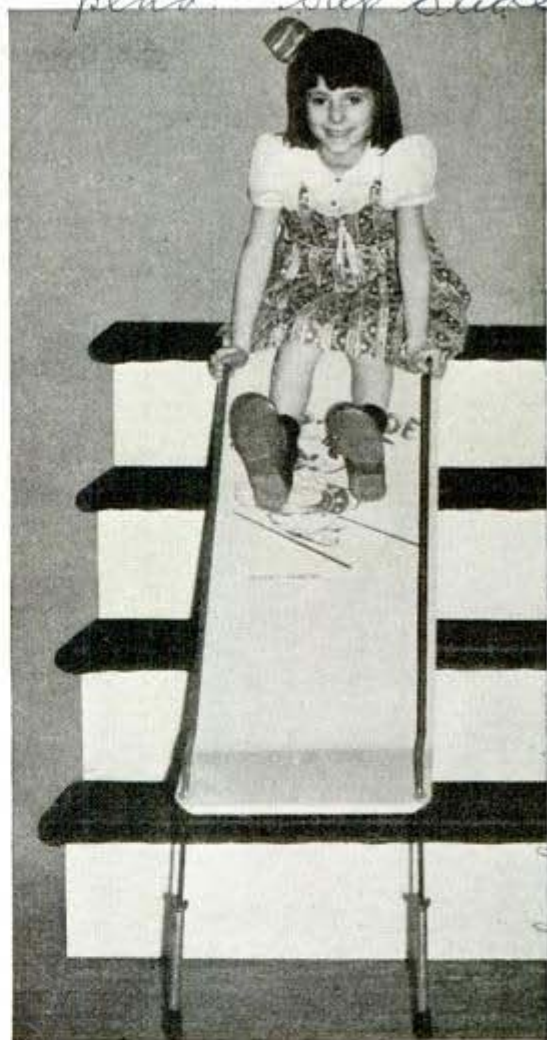
An audiometer uses a "constant tone" to test the amount and range of a subject's hearing. The subject sits with a head phone to his ear, and presses a button. The operator transmits sounds of varying pitch and strength through the head phone. Whenever the subject ceases to hear a sound, he releases the button, turning off a light and signaling the operator. In this way a complete graph of the subject's hearing is worked out. Other types of audiometers, employing recordings of the human voice, are used for testing large groups, such as school children.

When a person is suffering from severe loss of hearing, the clinic often combines development of residual hearing, a hearing aid and lip reading. Lip reading is taught both by demonstration and by motion pictures. Motion pictures used in this work begin by teaching the simplest lessons in lip reading. The basic film shows how each of the vowels and consonants appear when formed by the lips, teeth, and facial muscles. Next the individual sounds are combined into words, and finally into sentences. This first lesson closes with a test in which the teacher slowly repeats several sentences using all the sounds which have been demonstrated. The students attempt to write down the sentences which the lips form.

(Continued to page 176)

AUGUST, 1941

## Stairway Slide for Children Used Indoors or Out



© Stanley E. Stady

Safe slide provides fun for children, is easy to set up and does not mar finish on stairway or the floor

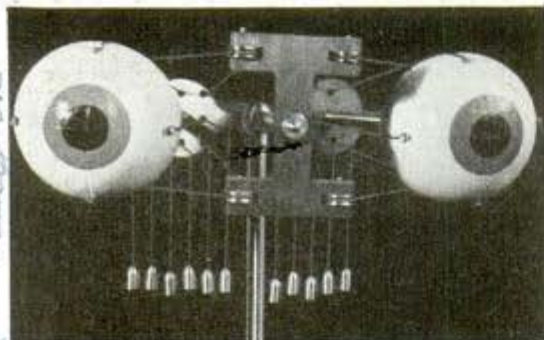
Children can have fun sliding down stairways by using a portable step-chute now on the market. This slide is easy to set up, as it rests on a skidproof rubber cushion at the top and adjustable legs at the bottom. The steel bed of the slide measures 14 by 48 inches and will not obstruct the entire width of most stairways. Adjustment of the rubber-tipped legs permits the angle or speed of the slide to be changed, as well as leveling to fit uneven surfaces. It may be used indoors or outdoors. Rails at the side help children steady themselves for the "take-off."

☐ To learn where to buy commercial products described in these pages, see the index.

Schechter Bros. Co.  
Hancock and Huntington

0 49 cl.

## Cutaway Models of Body Show How It Operates



Eye muscles are simulated by weights and pulleys at top; below, a cutaway model of human head and neck

Part of the new French government's program of training men and women to keep physically fit consists of a study of life with cutaway models. Various parts of the body have been modeled in glass; one exhibit, for example, showing the human head and neck with the outer skin omitted to reveal the muscles, nerves and circulatory system. Another is a mechanical model of the human eyes, which are movable and connected with weights and pulleys. The display embraces many forms of life, from human and lower animals down through the insects, flora and fauna, undersea and amoebic specimens.

452.

### Weight of Average Man's Heart Estimated at 11.5 Ounces

From records that have accumulated during the past 20 years at the university,

*New Haven, Conn.*

Dr. Paul D. Rosahn, of Yale University School of Medicine, has found a formula for estimating the weight of an adult man's heart. For men over 20 years of age the average weight is 11.5 ounces. A normal adult heart gets heavier as a man grows older, the increase amounting to a little less than half an ounce for every 22 pounds added to the body. The weight of the normal heart in grams, according to the formula, is equal to the age of the individual in years plus three times his body weight in kilograms plus 100. A heart is said to be abnormal if it weighs 77 grams more or less than that calculated from the formula.

836 7

### Candy Dispenser on Dashboard Serves One Mint at a Time

To keep handy a roll of the popular-type mint or fruit tablets there is a candy dispenser that fits on the automobile dashboard, installed either with suction cups or self-threading metal screws. The package of mints, with only the outer wrapper removed, is inserted in the barrel and a spring forces the package up until the top piece of candy is in position for removal by an in-and-out motion of a tiny handle.



Above, combination ashtray and mint dispenser on card table; below, candy dispenser on auto dashboard

Comb. Rene W. P. Leonard  
 12.2.8.42 '42 '42 '42 '42

J. J. Jenkins Co., Box 23, Shenandoah, Va.

*Luca Serace*  
 April 7, 1942



L 305

Hollywood High School

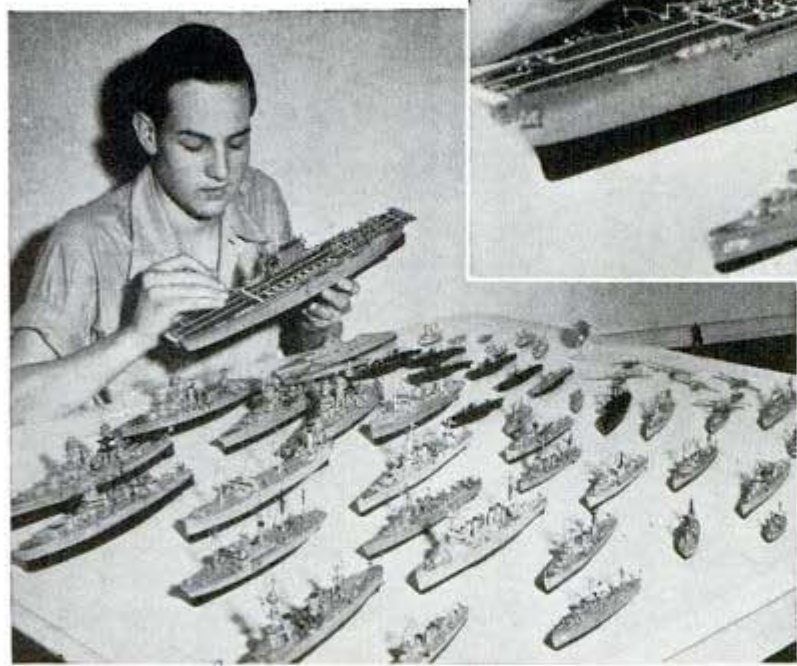
# Fifty-Two Ship Navy Is Whittled of Balsa Wood

Seventeen-year-old William Tompkins of Hollywood high school has a good start toward a two-ocean navy. For more than three years he has been whittling model ships from balsa wood, and today has a navy of 52 vessels. His tools were razor blades, pliers and jack knife, his materials balsa and strips of sheet aluminum. The models cover a wide range of types, including dreadnaughts, cruisers, destroyers, submarines and small surface craft, all carved accurately to scale. The largest vessel in the fleet is a model of the aircraft carrier Lexington.



*Acme*

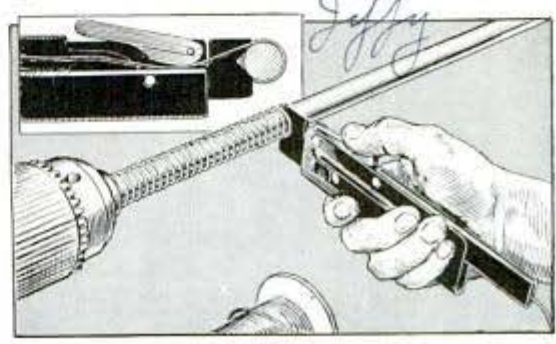
Largest vessel in the fleet built by a Hollywood youth is a model of the U. S. aircraft carrier Lexington



At left is part of the 52-ship navy, made of balsa wood and aluminum accurately fashioned to scale

# Hand Tool for Winding Springs Turns Out Uniform Coils

Springs of any tension, shape or length, of either compression or expansion type, can be made by hand with the aid of a small spring-winding tool. Wire, ranging from 0 to 3-64 in size, is fed through the handle of the tool. Pressure on a trigger keeps it at an even tension as the spring is wound. For compression springs the tool is held with the trigger on top, and is reversed for expansion springs. Slanting the tool to left while pressing it against the last coil wound makes a tight spring.



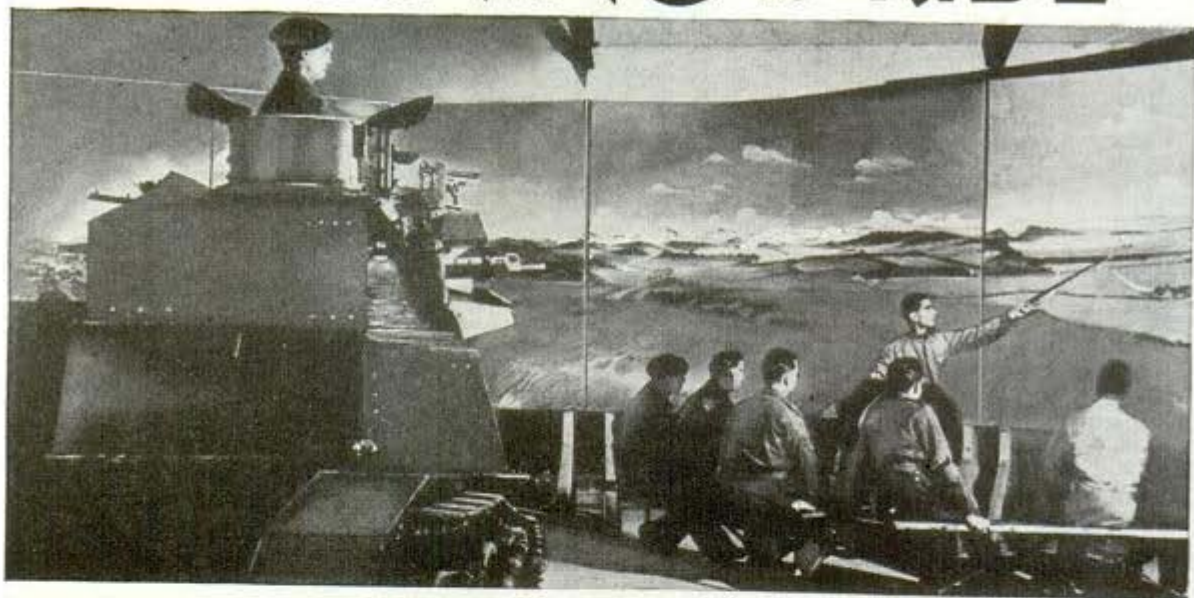
Thumb is held on trigger as coil is wound. Inset shows how trigger controls tension as wire is fed

AUGUST, 1941

L B Weyburn & Associates  
800 W. Madison, Chicago

260  
Cant. de ne. W. P. Leitchard  
122842 no. received

# LEARNING to RIDE



Studying landscape targets. Pupils must learn to identify targets and then fire quickly. Beam from electric torch makes the hits



Above, class investigating mysteries of light cruiser tank. One lesson is how to squeeze themselves into positions

Right, tank emerging from smoke screen with two-pounder Vickers gun seeking its range



AS FIGHTING tanks roll off the assembly lines in increasing numbers in England, trained crews must be ready to operate them. So a training camp has been set up in a remote region. After the tank crew recruits have passed rigid medical tests, they are admitted to the camp where their further training is conducted by specialists experienced in the handling of tanks of every description.

The pupils are instructed in long buildings divided into small classrooms. Each instructor teaches from four to sixteen tank students. In some classrooms staff sergeants explain the mechanism and use of the 7.92 mm. Besa gun and the two-pound Vickers gun which are the principal weapons of attack in modern tank warfare. In other classrooms, gunnery specialists train advanced pupils to become instructors themselves.

A short distance from the

# the IRON CAVALRY



main building are large sheds divided into sections where tank men are trained to find targets while being subjected to pitching and lurching experienced by crewmen as a tank travels over rough country. Here the pupil sits in a strange steel cage which turns and tosses him, so he experiences all the difficulties of firing from a tank in action. They call this machine "Rypa," a word

(Continued to page 168)

Above, pupil in fastest Rypa machine that pitches and lurches like a real tank while he tries to keep on the target



Above, blindfolded pupil practicing the handling of Besa machine gun so he learns to do everything by touch



Left, firing practice with two-pound Vickers gun which, with machine gun, forms main armament of British tank

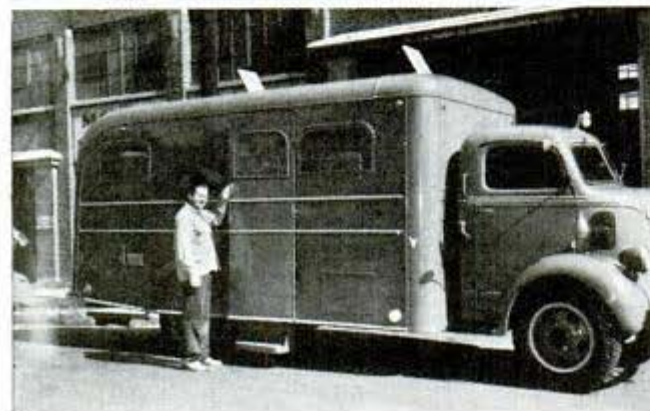
2 939 Built by Los Angeles Automobile Workshop 1020 Gouville Ave Los Angeles

## Many Home Comforts Included in Camp Car

Few of the comforts of home have been omitted from a camp car—actually a trailer mounted on a truck—which Al Pearce, radio comedian, uses on trips. The unit is

built on a cab-over-engine Ford truck powered by a 95-horsepower motor with a multiple-gear drive. Its top speed is 78 miles per hour in a gear corresponding to

overdrive and its low speed about one and one-half miles per hour in compound low gear. The dust-proof body has a frame of hardwood with an exterior covering of aluminum. Windows and the door are mounted in rubber. For circulation of cool air inside the car, an electric fan is mounted behind a refrigeration coil. For cold weather, there is a wall heater. Two Pullman compartments with tables give plenty of room for serving meals and other purposes. When the tables are removed the compartments can be converted into two double beds. There is an electric refrigerator, a sink, a three-burner stove, a gun rack in a closet, wall cabinets and baggage space. A Kohler electric plant, operated on gasoline, furnishes current for lights and electrical appliances which may be plugged into sockets similar to those in any home. A built-in radio, an inter-communicating telephone from drive compartment to the living quarters and an altimeter for use in mountains are other features. The motor, stove and wall heater all operate on butane gas, but the motor may be switched over to use regular gasoline in regions where butane is not available. Running on butane, which is superior to gasoline in many respects, the car has a cruising radius of 1,250 miles. It is fitted with two tanks with a capacity of 90 gallons of butane.



Top, Al Pearce adjusting the electric-plant motor. Center, view showing the interior of the camp car. Bottom, exterior of the vehicle which is built on truck chassis

✓ 2443 ✓

## Ship Gun Aimed at Planes Despite Rolling Sea

Ships' antiaircraft guns may be more effective by a patented fire-control system, assigned to the Sperry Gyroscope Co. It is claimed to keep the gun aimed at the moving target at all times regardless

Plaza, Brooklyn, N.Y.

New York  
Times 3/30/41

2357

Newark, N.J.  
Mrs. Jane Hughes

## Plane Riders Given Eye Masks And Paper Slippers

of the roll and pitch of the vessel, and to bring down airplanes flying horizontally, diving or gliding. A "correction device" controlled by a gyrocompass operates to stabilize the line of sight of the range finder. When the range finder sights an enemy plane, its elevation angle, the true sight angle and the slant range of the target are calculated automatically, and from this data the future position of the airplane also is automatically computed. Having noted also whether the target is changing altitude, as in the case of diving, the computer reconverts the position into absolute future bearings and absolute future elevation. A second corrector adjusts this reckoning to compensate for the pitch and roll of the ship and sends the corrected data on to the automatic gun-aiming mechanism which places the gun in firing position and keeps it there during the engagement.



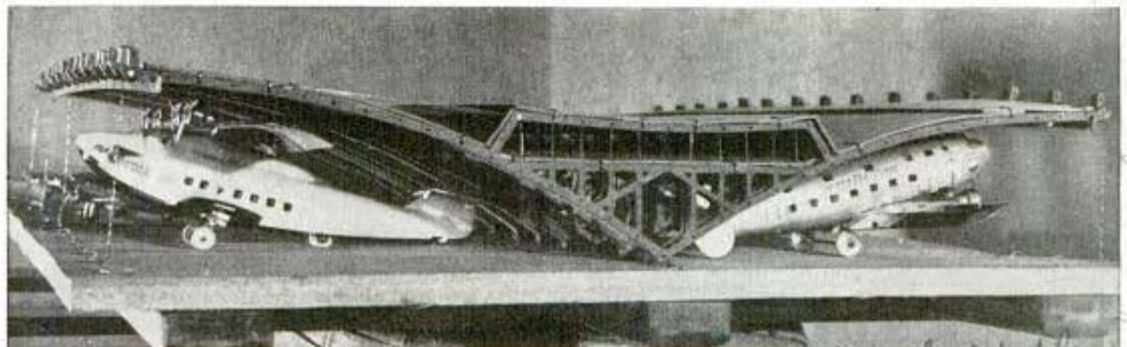
Airline passenger, left, being fitted with "blackout" eye mask designed to shut light from eyelids. Right, paper slippers help increase comfort

Passengers on Northwest Airlines planes are being provided with masks which protect the eyes and thus contribute to the passengers' comfort. These masks prevent bright light from striking the eyelids and enable the wearers to relax easily. With his eyes protected by the mask, one passenger is enabled to catch up on some sleep while sitting beside another who may want to keep the light burning in order to read. Air riders also are offered soft paper slippers which are cool and restful for the feet.

## Hangar Built Like an Umbrella Admits Biggest Planes

To do away with supporting columns at the airplane entrance gates, a spacious hangar has been designed like an arch in reverse. Arched steel members spread in opposite directions from a center anchor-

age to form the roof, the only other support consisting of cables fastened between the outer edges and the ground. These cables may be spaced to allow ample room for the largest planes to pass in and out.



Large-size planes can park under arched roofs built back to back. Cables counterbalance upward pull

AUGUST, 1941

Paul C. Chelagzi  
Civil Engineer

Wido Wolla  
Paul C. Chelagzi  
Engineer Firm

Botta Orshelme

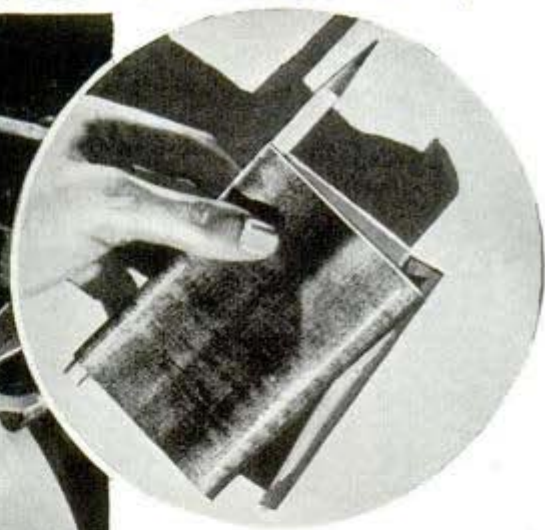
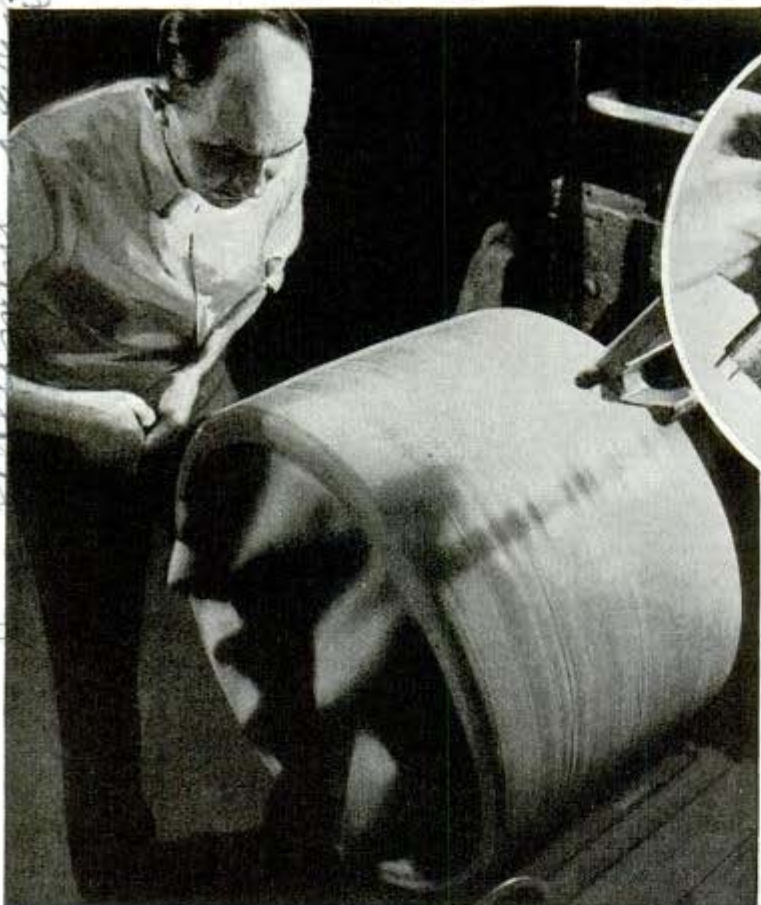
Helen Jacobson

Supl. Kay Fowler, Secretary, 267 Highland Ave. Boston, Mass. noted read Reelones

Changhai, China

# KING COTTON

✓ Reggott  
 Dr. C. A. Moss, Director, Division of Agricultural Research, U.S. Dept. of Agriculture  
 96  
 5  
 1



Above, pliable cotton-backed veneer can be rolled around pencil

Photo courtesy U. S. Plywood Co.

46th St. New York

Left, one step in making tire of improved, long-life cotton fiber

Photo courtesy Firestone Rubber Co.

Below, testing cotton fabric in hunt for new uses for the fiber

U. S. Dept. of Agriculture photo

Firestone Tire & Rubber Co. Akron, Ohio

**K**ING COTTON has not been dethroned, but his crown has been wobbling several years because synthetic fibers and paper cut into domestic consumption and then the war caused foreign sales to dwindle. To increase the uses of cotton, research experts have been working night and day and their efforts are yielding important results.

Before long America's women may be wearing cotton hose equal in sheerness to those made of silk. Even sooner we may be riding in plastic-body automobiles to which cotton has contributed. Our homes of the future can be wrapped in flameproof cotton blankets and airplanes can be made safer by covering rudder and elevator surfaces with fire-retardant cotton fabrics.

But these are only a few of the developments on which scientists have been, and still are working. Today they offer an improved cotton tire fiber that will increase the life of automobile tires considerably—one answer to the challenge of synthetic fibers. A sheet of thin wood veneer glued to a backing of cotton fabric is a new building product that can be applied directly over old walls to give



U.S. Dept. of Agriculture

L 105

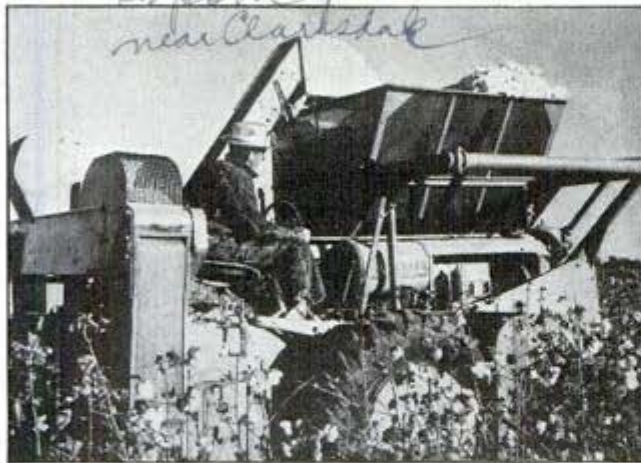
# COMES BACK

Right, party dress made of cotton in U. S. Department of Agriculture workroom

*Chicago*

Below, International Harvester cotton picker in operation on a Mississippi plantation

*Hopson near Clarksdale*



*Mrs Margaret Smith  
Textile expert,  
Bureau of  
Home Economics  
Washington  
D. C.*

*Mrs Mary Nell Foster,  
Member of Cotton, 1948,  
Memphis,  
Tenn.*

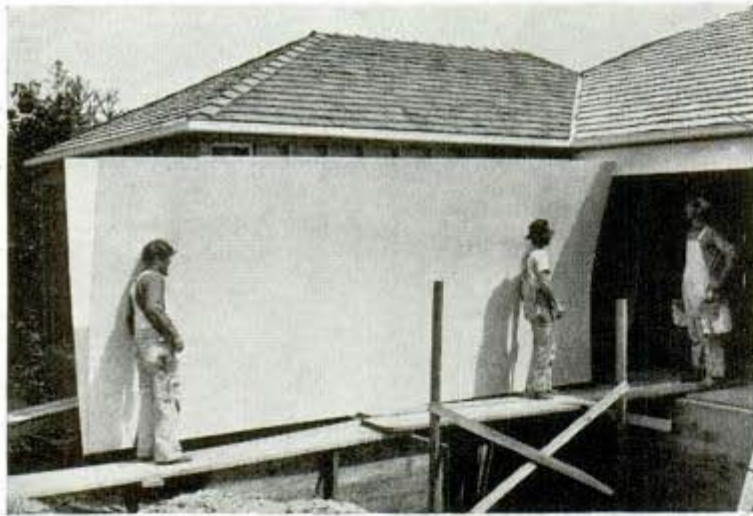
the appearance of fine wood paneling; fabric-covered panels of plywood are being made large enough to cover an entire wall of a room, and still another product for builders is a cotton cloth fused onto steel and then bonded to thin wood veneer. Looking and feeling like wood, it is handled and machined like steel and is highly fire-resistant.

A new crease-resistant finish is overcoming one of cotton's greatest disadvantages—its wrinkling propensities. A water-repellent finish makes cotton fabrics perspiration proof and protects cotton hose from mud and rain spotting. Still more important are the fire-retardant finishes being applied to curtains, ironing-board covers, tents and awnings. It is from the finishing field that we get flameproof cotton blankets for our homes—fire resistant lint and hull insulating materials.



Torch-testing fire-resisting cotton insulation  
Photo courtesy Barnhardt Mfg. Co.

*Mrs. Margaret Smith  
Member of Cotton, 1948,  
Memphis,  
Tenn.*



Cotton-fabric and plywood Speedwall board large enough to cover entire wall of a room is shown being moved into house

Photo courtesy Speedwall Co.

Backed by the nation's two million cotton growers, the research men are investigating the practicability of using cotton lint, linters and hull fiber in the manufacture of fine paper—paper that does not turn yellow with age. One new process for treating the raw materials appears successful, with the result that it may call for the use of 200,000 bales of linters per year in this field.

These same experiments, conducted at Mellon Institute of Industrial Research under the sponsorship of the Cotton Research Foundation, an affiliate of the National Cotton Council of America, are being extended to methods for enhancing the value of lint and linters as fibrous reinforcing agents for certain types of plastics. Cotton ranks well in flexibility as a plastic filler and its uses in this field are declared almost unlimited. Henry Ford recently predicted that plastic-body automobiles would be on the market soon and in one million cars of this type, approximately 100,000 bales of cotton would be used, if the present formula is employed. Plastics being studied in the Ford laboratory are reported to be 70 percent cellulose fiber

and 30 percent resin binder, pressed into cloth. Sheets of the cloth, heat-molded in a 1,000-ton press, produce a material said to be superior to steel in everything except tensile strength—50 percent lighter and 50 percent cheaper in production.

When cotton is ginned, one-third of the resulting product is fiber and two-thirds cottonseed; thus 1,500 pounds of seed cotton would yield one 500-pound bale of cotton and about 1,000 pounds of cottonseed, making cotton and cottonseed the principal by-products of the cotton plant. Cottonseed contains some 35 percent oil and 32 percent protein in the kernel. The oil is especially valued as a foodstuffs commodity, as shortening, as cooking and salad oil and for use in many manufactured oil-base goods, such as mayonnaise and oleomargarine. Cottonseed oil ranks third in importance in the broad field of edible fats serving the American consumer, the annual domestic production being about 1,325,000,000 pounds, compared to approximately 2,000,000,000 pounds of butter. Glycerine is a war commodity obtainable from cottonseed oil and other fats or oils.



A "mountain" of cottonseed for which new uses are being sought

Photo courtesy University of Tennessee

POPULAR MECHANICS

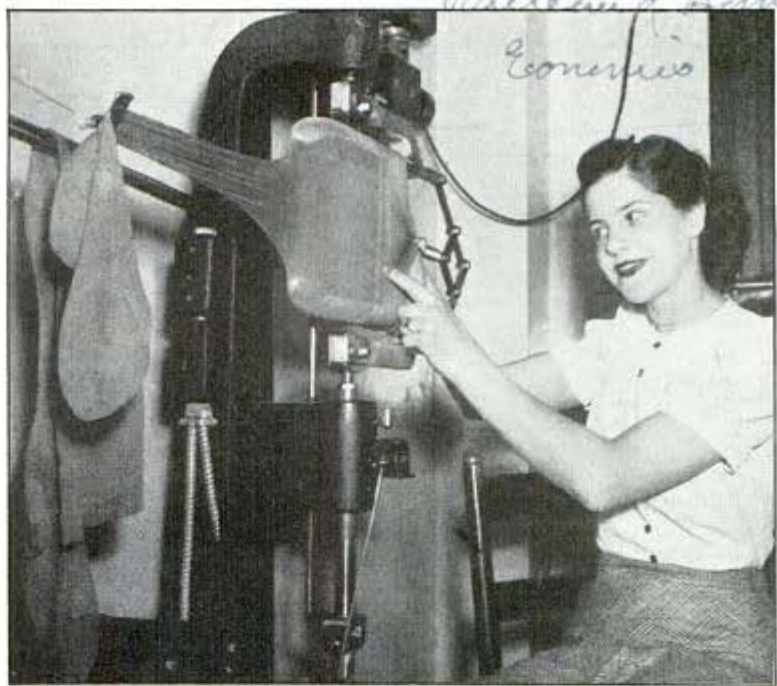


2 105

Miss Parker:  
Bureau of Home  
Economics

When nitrated to form nitroglycerine, it is used as an explosive.

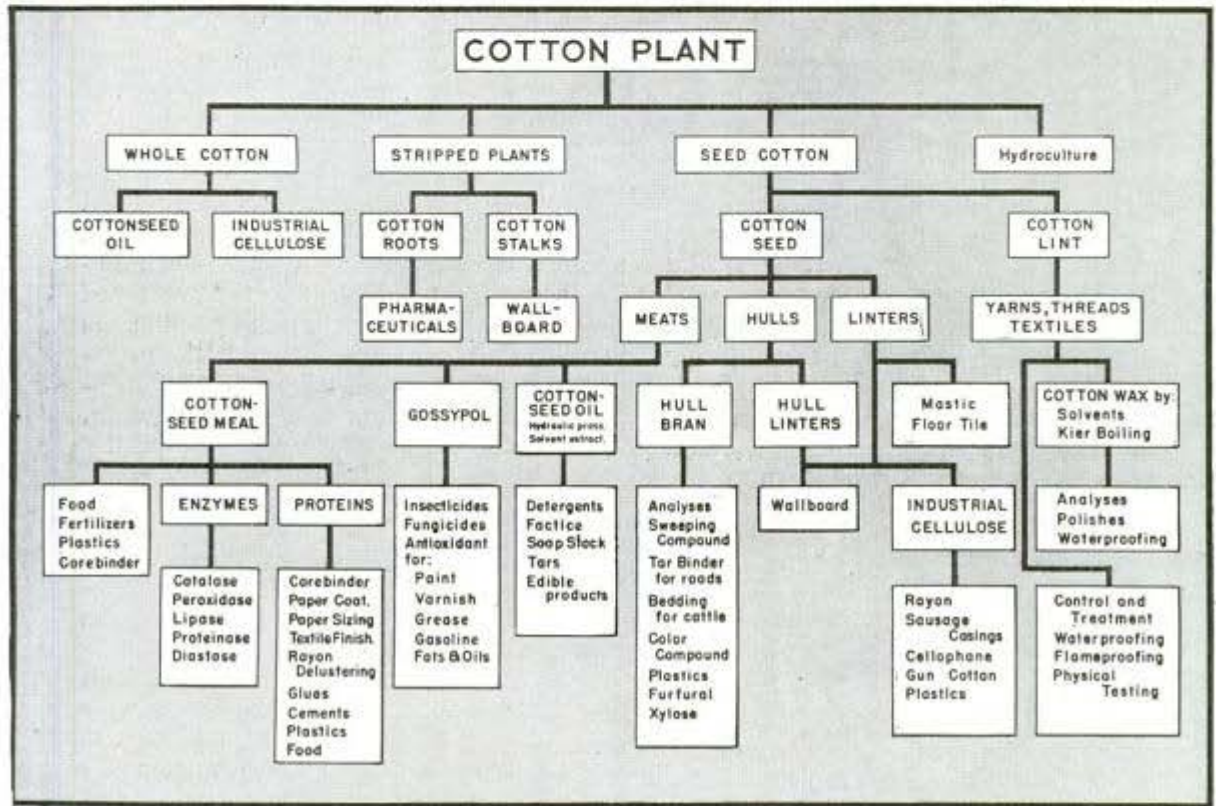
Cottonseed cake, the residue of the pressing operation for obtaining the oil, is reduced to a meal commercially important in feeding cattle. Delinted cottonseed hulls, the least valuable product of cottonseed, are available to the extent of 1,250,000 tons annually and are used most extensively as roughage and bulk feeding. From the hulls, linters are obtained totaling close to 700,000,000 pounds annually which are used in manufacturing mattresses, upholstery for furniture and automobiles, plastics, rayon, nitro-cellulose, medical dressings and other items. Nitro-cellulose is the best material in manufacture of explosives and constitutes the most



Testing cotton hose for elasticity. Government experts are seeking to produce cotton hose equal to silk in sheerness  
U. S. Dept. of Agriculture photo

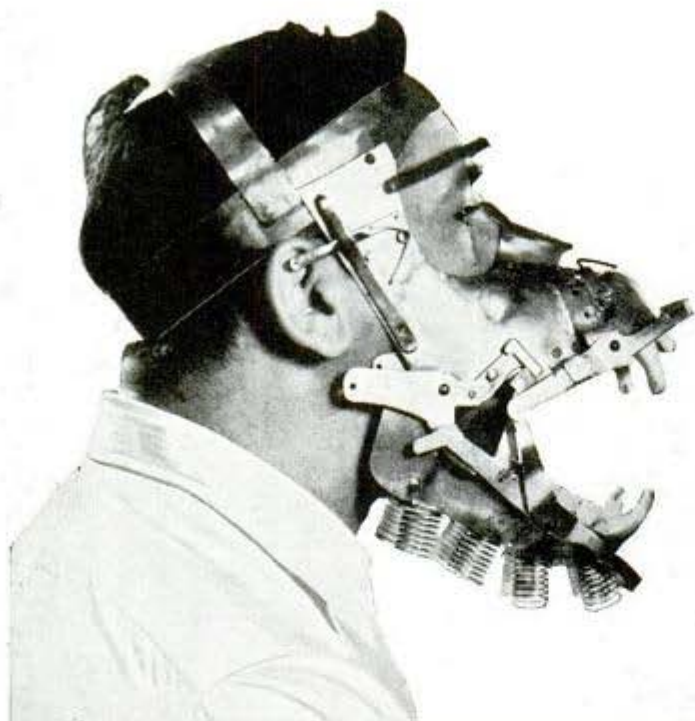
important war commodity derived from cottonseed processing.

(Continued to page 166)



This chart, reading from top to bottom, shows the more outstanding products of the cotton plant. Research work is under way in all branches of this "tree"

# "Tame" Gorilla for Movies Made of Aluminum



Vicious-looking gorilla, above, created by man, does bidding of movie directors. Left, top and bottom, working parts of the animal's jaws and hands



Since gorillas have resisted all attempts to train them for use in the movies, film producers have resorted to "synthetic" animals custom-built to fit the picture. One such animal completed recently by Max Factor Studios of Hollywood, Calif., is made up of an aluminum skeleton with its "bones" filled out with mohair. The

body is covered with a tanned leather hide into which thousands of hairs have been knotted by wig craftsmen. Basic and motionless portions of the gorilla's skull also are of aluminum, but the working parts in the jaws are made of duralumin, supplemented by steel springs and pinions. Bone teeth and synthetic flesh tongue and mouth lining have a natural appearance. For skin of the gorilla's head, smooth polished chamois is used, with hair wig-stitched in the proper locale. The "bones" of the cinema gorilla's hand extensions are of duralumin. The gorilla cost slightly less than \$3,000.

## Break-Off Head Renews the Life of Worn-Out Sandblasting Nozzle



Assembling sandblast nozzle with break-off head

To double or triple its normal life of service, a sandblasting nozzle has been designed with a break-off head that may be knocked off with a hammer when the orifice becomes too worn for further use. The unit is then reversed and used as a new one. Having a holder made of plastic, it weighs only one-third as much as conventional types, thus reducing fatigue. According to the manufacturer, the nozzle is staticproof, shockproof and rustproof.

*P. M. Ellsworth, Pa.*

*The Reverse Nozzle Co 1666 N. Highland Ave. 37th St. Bklyn. 488*



# The CRAFTSMAN

## Four-note DINNER CHIME *has soft tone*

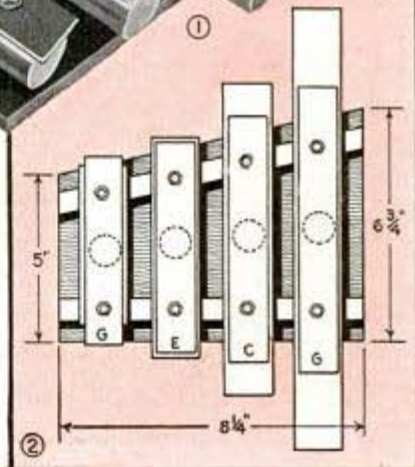
By Len Marcellus

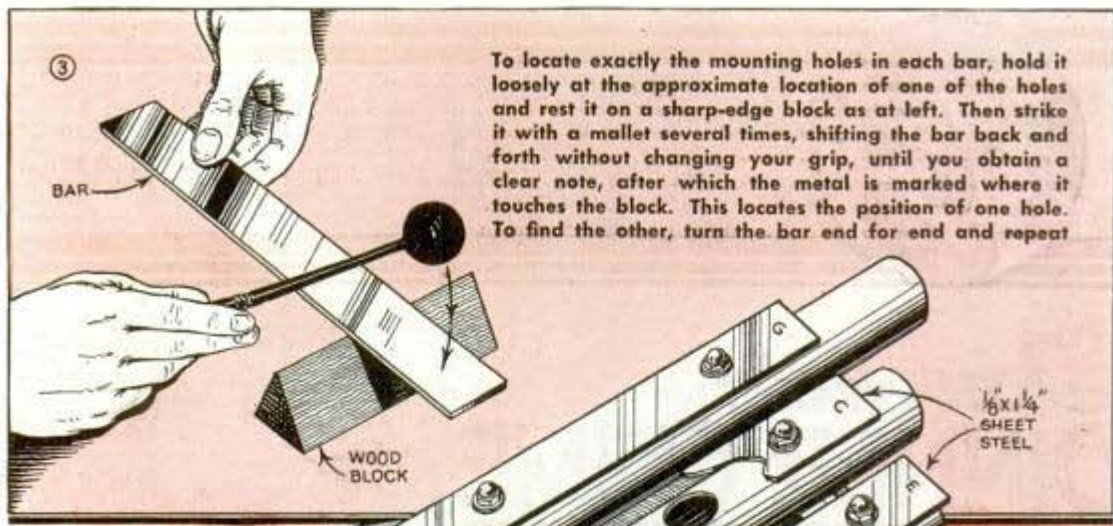
**C**OSTING little more than a dollar to make, the dinner chime shown in Fig. 1 can be finished in chrome and mounted on a maple, walnut or simply a plywood base. As an alternative, the tubes and bars may be enameled or they may be polished and protected with clear lacquer. The tubes are cut to length from standard thin-wall, brass flush pipe,  $1\frac{3}{8}$  in. in diameter, which can be purchased from a plumber. Fig. 6 gives the inside length of each tube between the cork caps. To this dimension the thickness of the cork plugs used, Fig. 7, must be added to obtain the over-all length. If you wish to add the intervening notes forming a full octave, the scale in Fig. 10 is used to determine the length of the extra tubes and bars. From Figs. 2, 4 and 8 you can see how the base is made. The tubes are attached in concave notches with flat-head stove bolts as in Fig. 5.

The bars are cut to size from  $\frac{1}{8}$ -in. sheet steel. Fig. 6 gives the length of these and also the space between the mounting holes which was found best in the case of the original model. The exact point at which these holes should be drilled from the end of the bar is found by the method shown and described

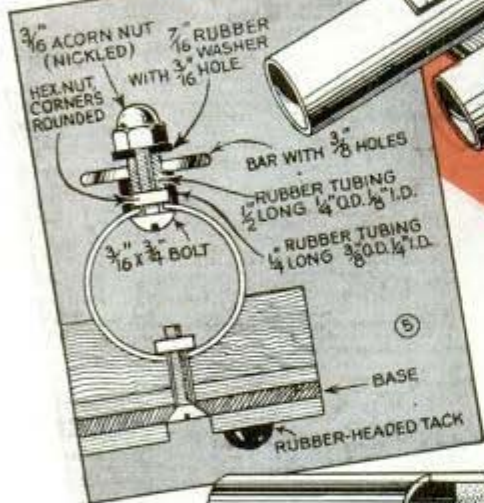
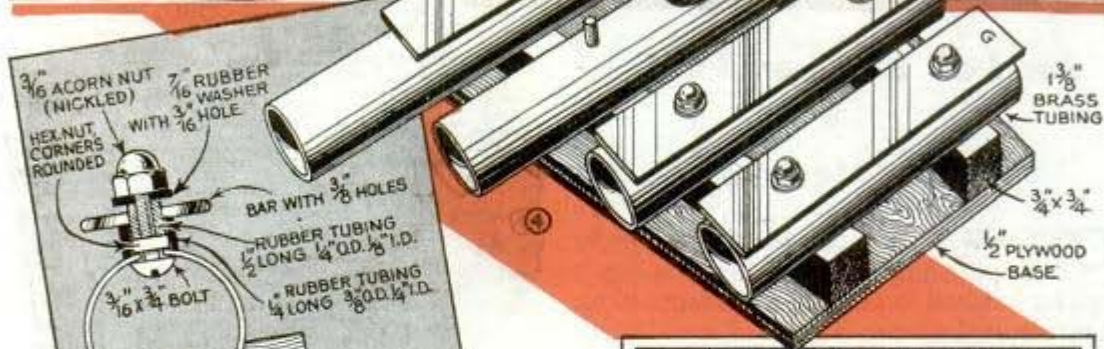


The soft, mellow notes in perfect harmony are distinctly audible throughout the house. The chime can be finished suitably in various ways to blend into its place in the home

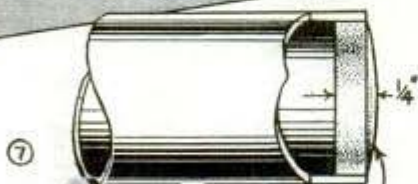




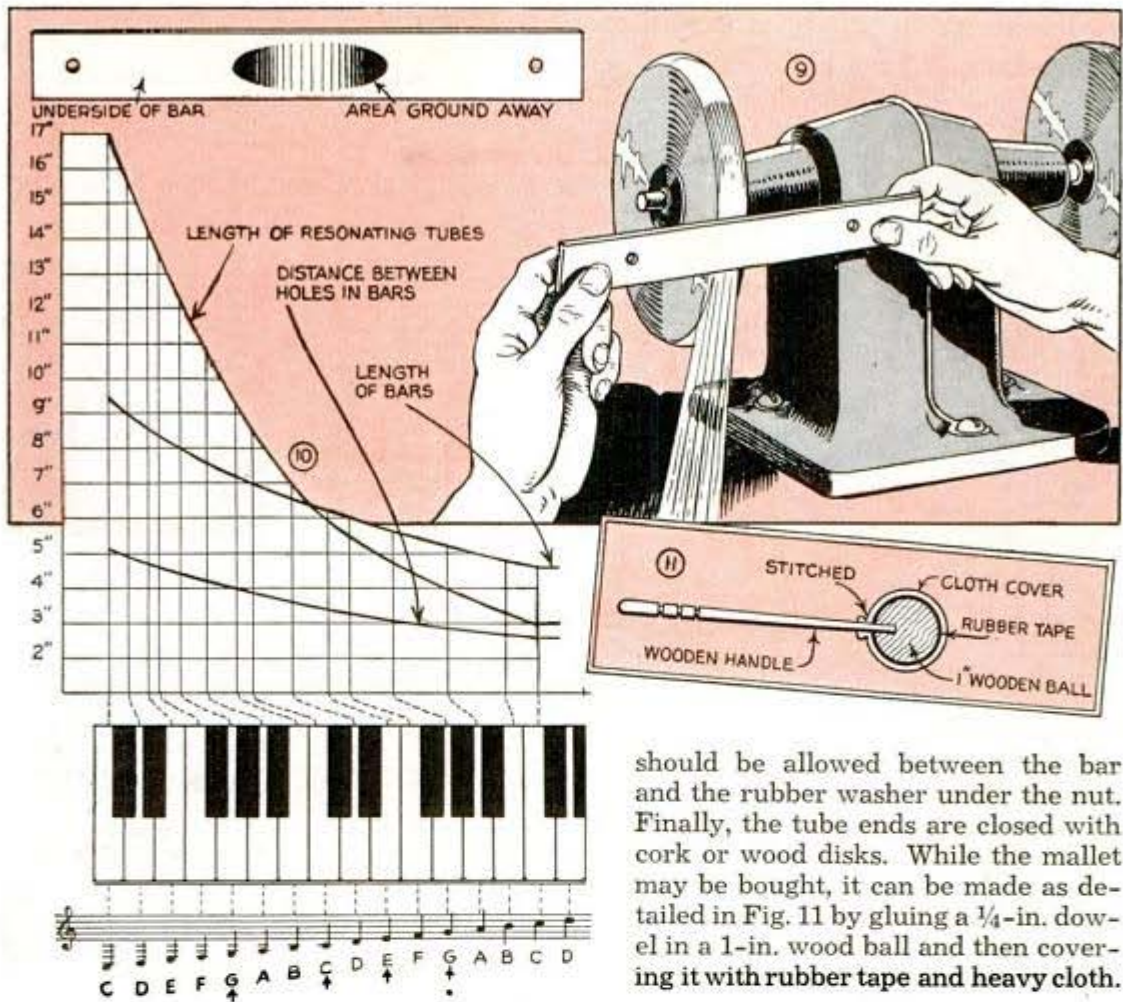
To locate exactly the mounting holes in each bar, hold it loosely at the approximate location of one of the holes and rest it on a sharp-edge block as at left. Then strike it with a mallet several times, shifting the bar back and forth without changing your grip, until you obtain a clear note, after which the metal is marked where it touches the block. This locates the position of one hole. To find the other, turn the bar end for end and repeat



NOTE	LENGTH OF BAR	TUBE	DISTANCE BETWEEN HOLES IN BAR
G	5 5/8"	4 3/4"	3 1/32"
E	6 1/4"	5 7/8"	3 3/8"
C	7"	8 1/2"	3 29/32"
G	8"	12 1/4"	4 7/16" ⑥



in Fig. 3. After drilling, the holes are used as a guide in locating the 3/16-in. holes to be drilled in line in the top of the tubes. The bars are tuned by carefully grinding away metal from the underside, a little bit at a time, as in Fig. 9. As this is quite a delicate task, each bar should be checked frequently with a piano or other musical instrument known to be in tune. When you start, the pitch of the bars may be from one-half to three notes higher than they will be after tuning them. In the final stages of the grinding, cool the metal to room temperature before testing, as you will find that the pitch of the bars is slightly lowered when the metal is warm. The bars rest above the tube openings on stove bolts fitted with short lengths of rubber tubing placed in the arrangement shown in Fig. 5, and are capped with standard acorn-type nuts. Notice that a little space

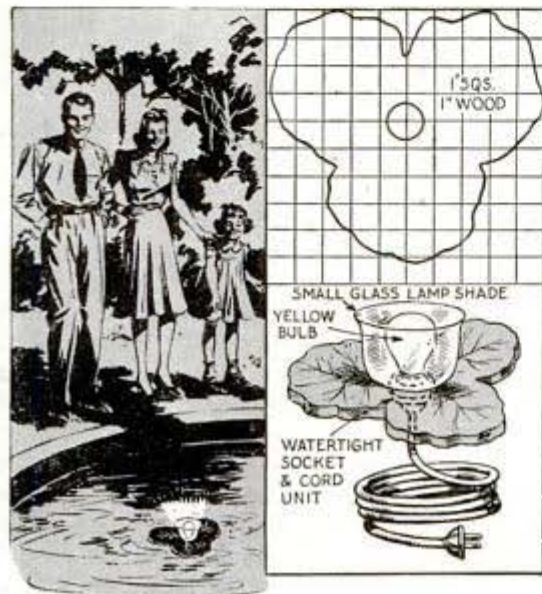


should be allowed between the bar and the rubber washer under the nut. Finally, the tube ends are closed with cork or wood disks. While the mallet may be bought, it can be made as detailed in Fig. 11 by gluing a 1/4-in. dowel in a 1-in. wood ball and then covering it with rubber tape and heavy cloth.

## Illuminated 'Water Lily' Floats on Surface of Garden Pool

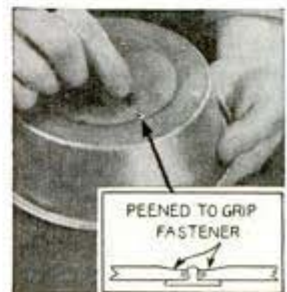
A garden pool can be dressed up to give an unusual appearance at night by using a

few of these illuminated lilies. Each one consists of a length of electric cord and waterproof socket, and a yellow glass shade shaped to represent the center of a lily. The assembly is mounted on a wood cut-out shaped to give the appearance of a lily pad and painted green.



## Snap Fastener Mends Hole in Pot

You can mend a small hole in a thin aluminum pot or pan with an ordinary dress snap fastener. If the hole is very small, it should be reamed out to take the stud of the fastener. After inserting the latter, peen the end of the stud to make it watertight.



## Mimeograph Impression Roller Dressed on Drill Press

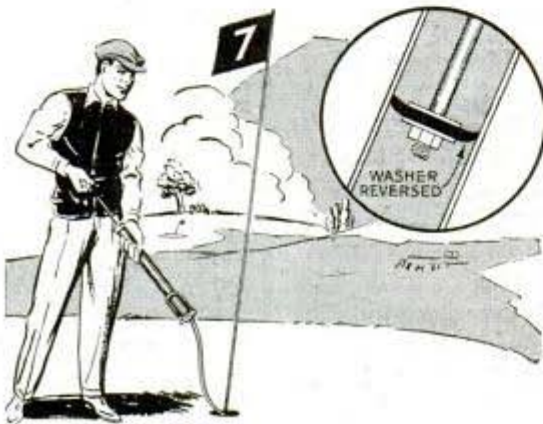


Finding that the impression roller of my mimeograph machine had swelled in the center due to occasional contact with the ink, I "turned" it down in a drill press. To do this, one end of the roller was placed in the chuck and the other end was centered in a block clamped to the table. Then a sheet of coarse sandpaper was held against the roller as indicated, while running the drill press at a medium speed. Wood strips tacked to each end of the sandpaper help in holding it uniformly against the roller.

—G. E. Hendrickson, Argyle, Wis.

## Cups on Greens of Golf Course Cleaned With Tire Pump

Noticing that some golf players disliked to retrieve their balls from cups that contained dirty water after rains, the caretaker of one small course, rigged up a suc-

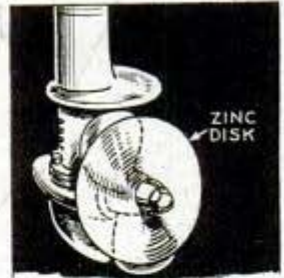


tion pump from an old tire pump to remove the water. The pump was converted for this purpose by merely reversing the leather inside the cylinder.

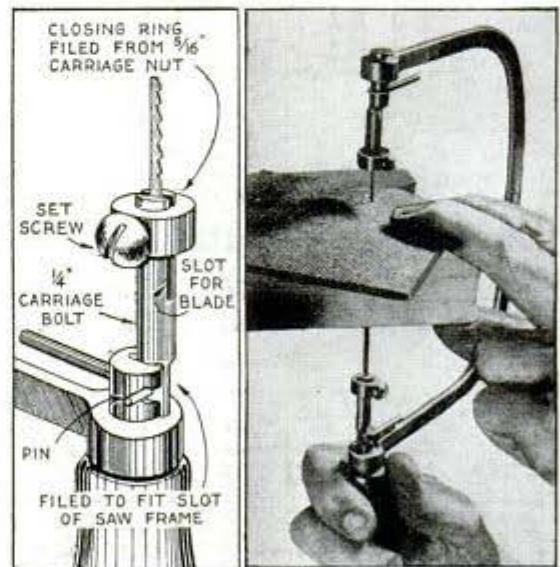
## Metal Disk Over Motor Propeller Slows Boat While Trolling

To slow a motor boat to a speed suitable for trolling, and yet have the motor run fast enough to operate smoothly, I placed a zinc disk in front of the propeller as shown. The disk should be of the same diameter as the propeller. An old auto hub cap will do if you have one of a suitable diameter.

—J. F. Stewart, Norwood, Manitoba, Can.



## Chucks to Adapt Jigsaw Blades For Use in Hand Scroll Saw

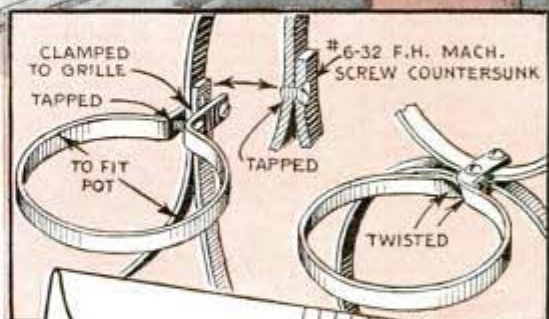
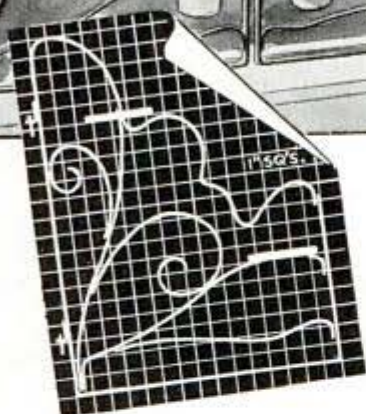
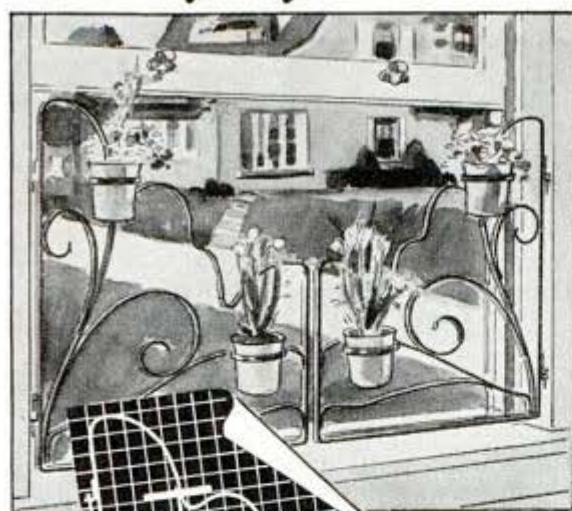


Because of the limited types of blades that are available for a coping saw, I adapted my frame so that jigsaw blades, of which there are a number of types, could be used in it. The adapter or chuck is made from a piece of 1/4-in. carriage bolt, which is filed flat at one end and provided with a pin to fit the saw frame. The other end of the bolt is slotted to take a saw blade, and has a closing ring to slip over it and clamp the blade in position by means of a set screw.

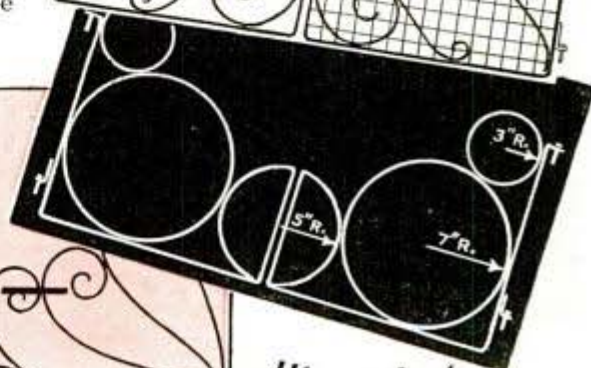
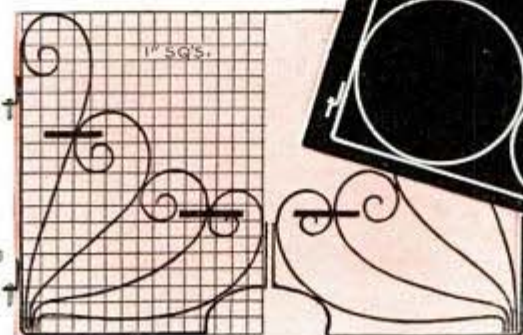
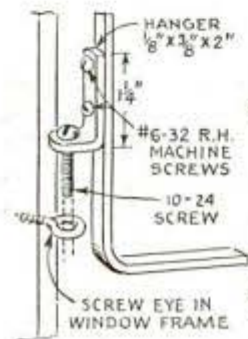
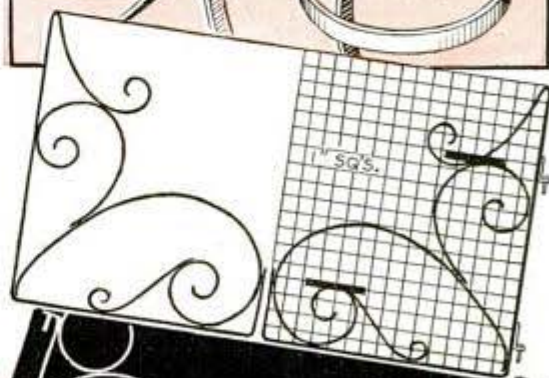
—Howard R. Heydorf, Missoula, Mont.

# Swinging WINDOW GRILLES

*hold potted plants*

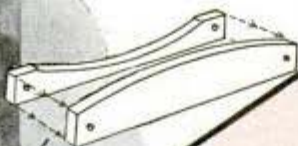
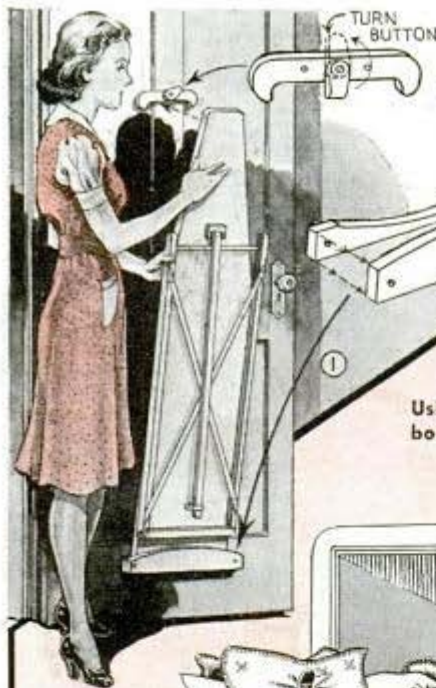


Many a window can be given an attractive touch of ornament and summer freshness by merely adding a couple of these swinging plant grilles. They are made from lengths of flat iron or brass, bent to form a pleasing scrollwork. While the joints can be welded or soldered, a simple method is to drill and tap the work to take flat-head screws as shown at the right. Pivoting of the grilles is accomplished by using machine screws as pins to slip into screw eyes that are driven into the window frame. Thus pivoted, the grilles are easy to push out of the way when adjusting the window or shade.



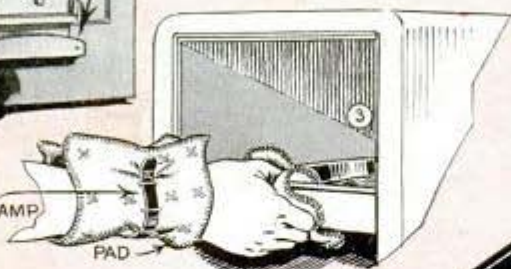
*Alternate designs*

# Solving HOME

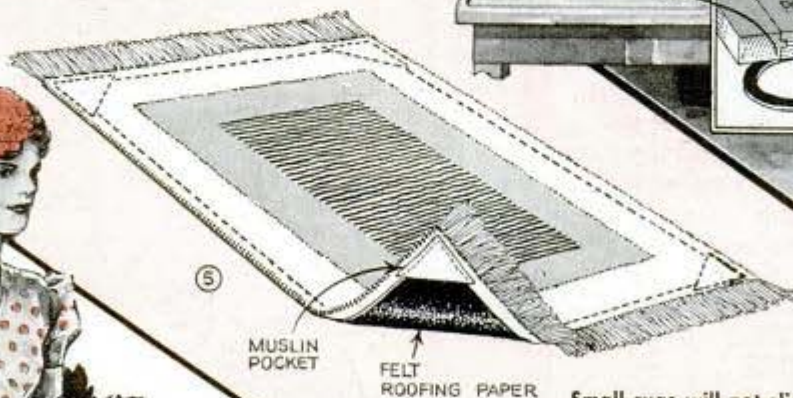


Using two brackets as in Fig. 1, you can easily store an ironing board on the inside of a closet door. A length of bamboo fitted with a clothespin, Fig. 2, makes a good clothesline prop

BICYCLE TROUSER CLAMP



A bicycle trouser clamp, Fig. 3, is handy to hold a pad around your wrist while removing hot pans from an oven. Fig. 4 shows how to keep a pastry board from sliding on a porcelain table top when kneading bread or rolling pie crust; just place a fruit-jar rubber under each of the four corners



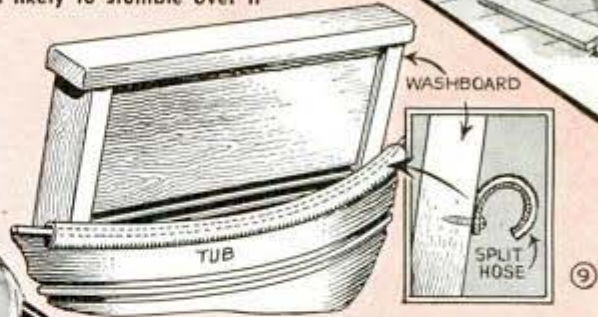
Small rugs will not slide around on highly polished floors if you put felt roofing paper on the underside as in Fig. 5. Triangular muslin pockets at each corner of the rug hold the paper in place. Bent as shown in Fig. 6, and slipped over the end of a baby carriage, a coat hanger makes a good hook to carry a shopping bag



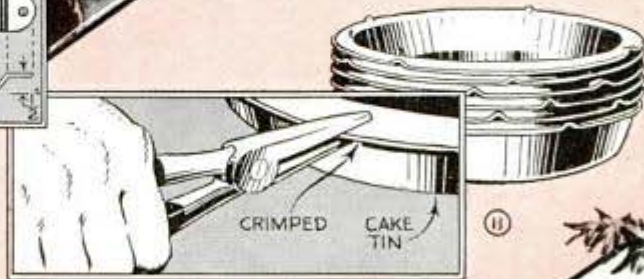
# PROBLEMS



To avoid an "eruption" and possibly scalded hands when pouring hot water into a rubber bag, hold it in the position shown in Fig. 7. A door mat set flush with the porch floor on a lattice, Fig. 8, allows dirt to sift through, and persons are less likely to stumble over it



A washboard in a tub will not slip if a piece of split hose is screwed to the board permitting the hose to be slipped over the rim of the tub when washing, as in Fig. 9. Collapsible tubes in a bathroom cabinet are stored neatly if suspended by the caps on a hanger as shown in Fig. 10. It is a notched metal strip screwed to the underside of one of the cabinet shelves



Stacked cake tins can be kept from sticking together, which makes them hard to separate, by crimping the edges as in Fig. 11. If your porch is small, you can have a table on it without taking up needed space by hinging a table top to the railing as in Fig. 12. A forked stick, hinged at the top, serves to brace the table in a horizontal position. When not in use, table folds flat against the railing

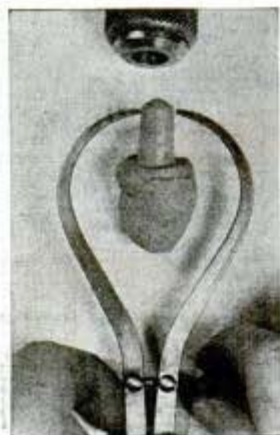


## "Painting" Centerboard Trunk Of a Sailboat



Difficulty of frequently painting the inside surfaces of the centerboard well or case of a sailboat after it had been built, was avoided by one sportsman who did a permanent job of protecting the surfaces when the boat was being assembled. This was done by driving copper nails into the surfaces, spacing them about 1 in. apart. Then, when the boat was put into use the action of the centerboard rubbed enough copper from the nails to keep the surrounding surfaces impregnated with copper.—J. A. Emmett, Annapolis, Md.

## Clay Reveals Hidden Contours Of Holes in Work



To check the progress of a hole being bored, or to determine the taper and proportions of one already made, force modeling clay into it. If the clay becomes soft from handling, or sticks to the work, dip it in ice water. This will harden the

clay. It also can be used for carving and molding impressions when a sample of the work cannot be taken to the mill.

## Iron Splitting Wedge Improved By V-Notches in Side

If you are troubled by having the wedges jump out of a log while trying to split it when it is wet or frozen, file several notches in each side of the wedge as indicated.



When a notched wedge is driven into a log, pressure tends to force the wood into the notches and prevent the wedge from rebounding.—W. C. Lammey, Naperville, Ill.

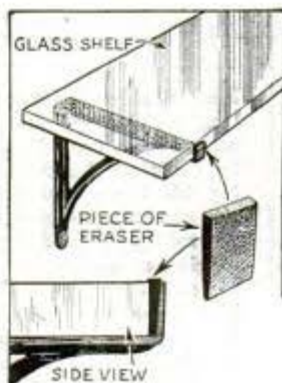
## Loose Handle in Push Broom Tightened With Brackets



When a large push broom cannot be kept tight on its handle, a couple of metal shelf brackets will serve as braces to keep it rigid. The brackets are screwed to the broom and to the handle.—Wilford Sherwood, New York.

## Glass Shelves Wedged in Place On Wall Brackets

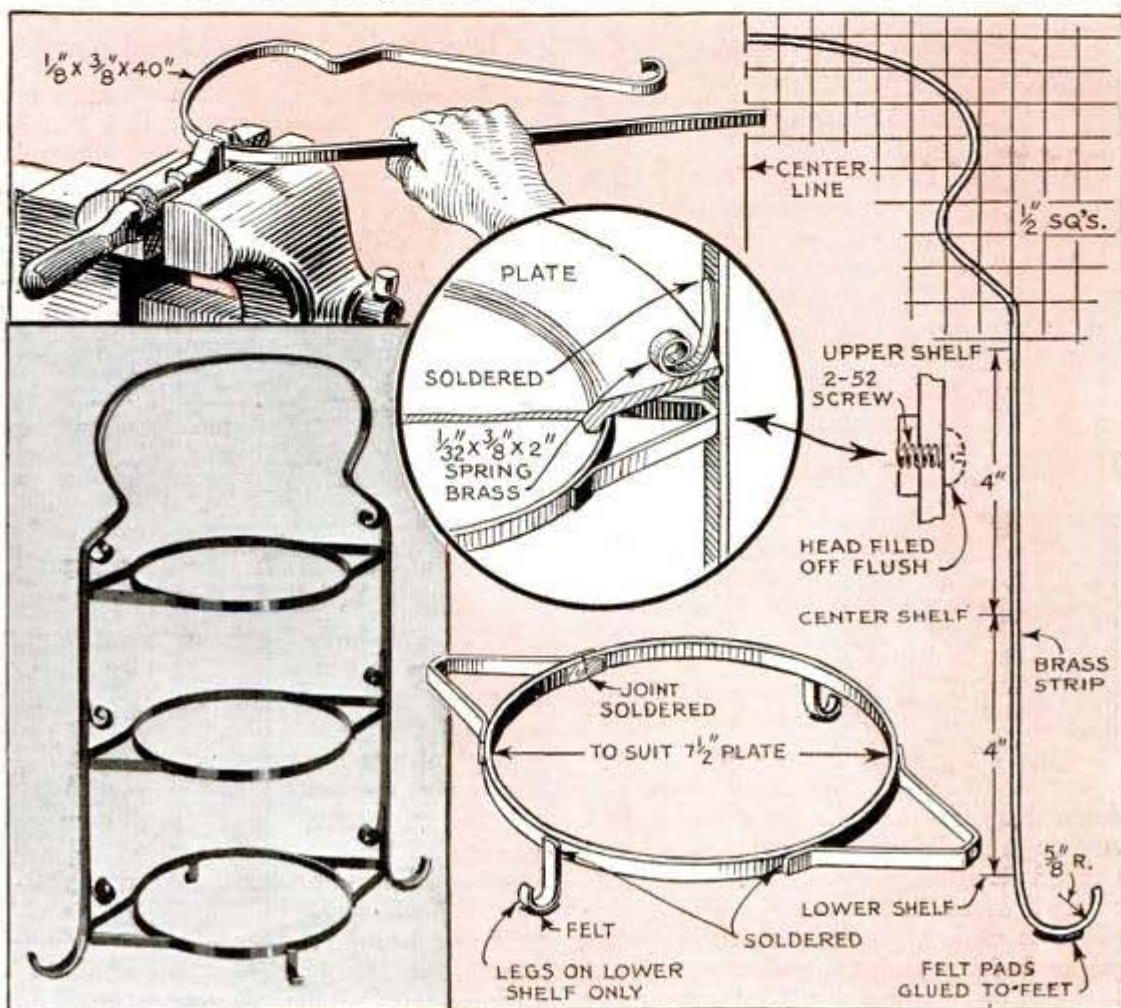
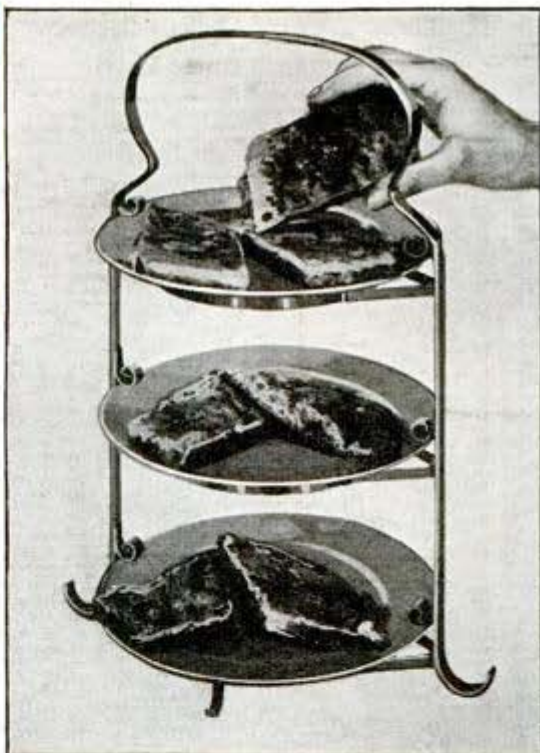
In erecting glass shelves, a good fit between the shelf and bracket can be had by using small rubber wedges as indicated. First set up the brackets in the usual manner and then slide the glass shelf into place. Lift the shelf slightly at the back while the wedge is slipped into the curved end of the bracket, and then push the shelf into place.



—W. C. Irvine, Nashville, Tenn.

# Three-tier TIDBIT TRAY

Three smart dessert plates and several lengths of flat brass stock are all you need to make this novel serving tray which is especially convenient for evening snacks. The framework consists of two legs formed from a single length of flat brass, bent at the center to form a handle and rounded at the ends to form feet. Bending is done between the padded jaws of a monkey wrench held in a vise. Note the use of small machine screws in addition to solder to assure sufficient strength where the plate holders are joined to the vertical pieces. The rings should fit around the bottom of the plates, and small spring clips soldered to the vertical pieces hold the plates in place, yet permit their removal for washing. Two short feet are provided on the lowest ring so that the stand has a four-point support. Felt pads attached to the feet prevent marring furniture finish



## Imitation Well Is Repository For the Garbage Can



Utility and decoration are combined in this attractive covered well as it hides an unsightly garbage can. A rope and pulley are provided to carry out the open-well effect, the end of the rope being tied to the lid of the can to aid in raising it when garbage is deposited.

—Leroy Williamson, Portland, Ore.

## Keeping Putty Fresh Indefinitely



After a can of putty has been opened, I have found the simplest way to keep it fresh is to follow the manufacturer's method, as most putty purchased over the counter is as fresh as the day it was packed. Although the lids of the cans in which it is packed fit loosely, special care has been taken to level the surface of the putty and cover it with a piece of waxed or oiled paper before packing. Whenever I am through using my putty, I do exactly the

same thing. In this way it will remain soft for a considerable length of time.

—R. Boettinger, Englewood, N. J.

## Leaders Stored in Shoe-Polish Can

Empty shoe-polish cans provide good containers for carrying moistened gut fishline leaders, as they have tight-fitting lids and are easy to open. Disks of blotting paper placed in the bottom and lid of a can and moistened with a little water before putting in the leaders will keep them in good condition for some time.



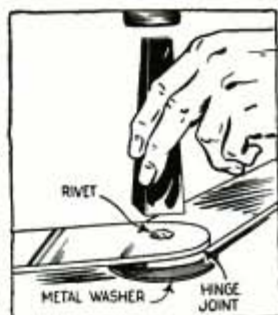
## Visor to Slip Over the Spectacles Improved From Cardboard



An emergency visor that can be attached instantly to your spectacles is improvised quickly with a piece of cardboard cut to the shape indicated. Use light cardboard so it will not throw too much strain on the frame of the spectacles.

## Pivoted Joints in Metal Riveted Loosely With Aid of Washer

When you have two pieces of iron to rivet together so that the joint will pivot, place a thin metal washer on the riveting block and let the rivet head rest in it. This will permit the head to space itself from the joint so that there is little friction between the parts.

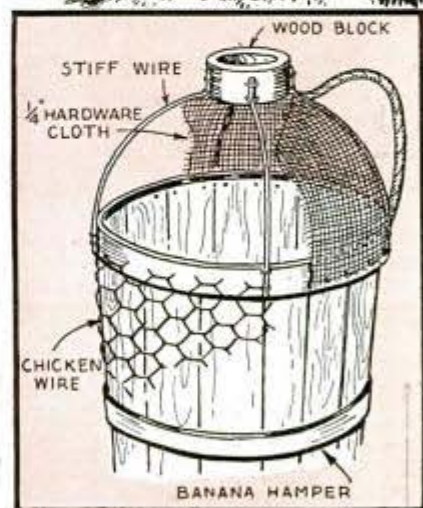


# Large Cement Jugs to Decorate Garden Nooks



Garden jugs and vases are made with little effort by using a wire-mesh-covered form that need not be removed. The top reinforcing is held together by a wooden block which is removed after the top has been cemented. As such a jug is purely ornamental, the mouth can be cemented shut so that water will not enter, which may freeze and crack the jug. The cement mixture consists of torpedo sand, 3 parts, cement, 1 part, and hydrated lime, 1/10 part. Add just enough water to get a "fatty" consistency. After standing an hour, the cement is troweled on while rotating the jug on a small turntable to scrape the cement against a form to get uniform contour all around. Color may be added to the cement, which is better than painting it.

—A. L. Neuenschwander, Miami, Fla.



## Cooking in Camp Without Dishes by Using Clean Clay or Hot Stone

You can broil a fish in camp without cooking utensils. After cleaning and seasoning it, place it on a flat rock which has been made blistering hot. There will be enough heat in the average stone to cook both sides without again heating. Another good way to prepare fish is to clean, season and then wrap them in large catalpa leaves. The fish can be covered with cornmeal first if desired. A well-seasoned fish covered

with a mud batter made from deep clay and water, if cooked in hot ashes for 20 minutes, will be about as tasty as though it were broiled in an oven. Potatoes, eggs and other foods also can be baked in clay coverings. A large bird may be roasted over an open fire if it is first impaled on a long, slender stick supported by croched stakes on each side of the fire, then turned slowly while it is cooking.

# Carving "JUMBO" with

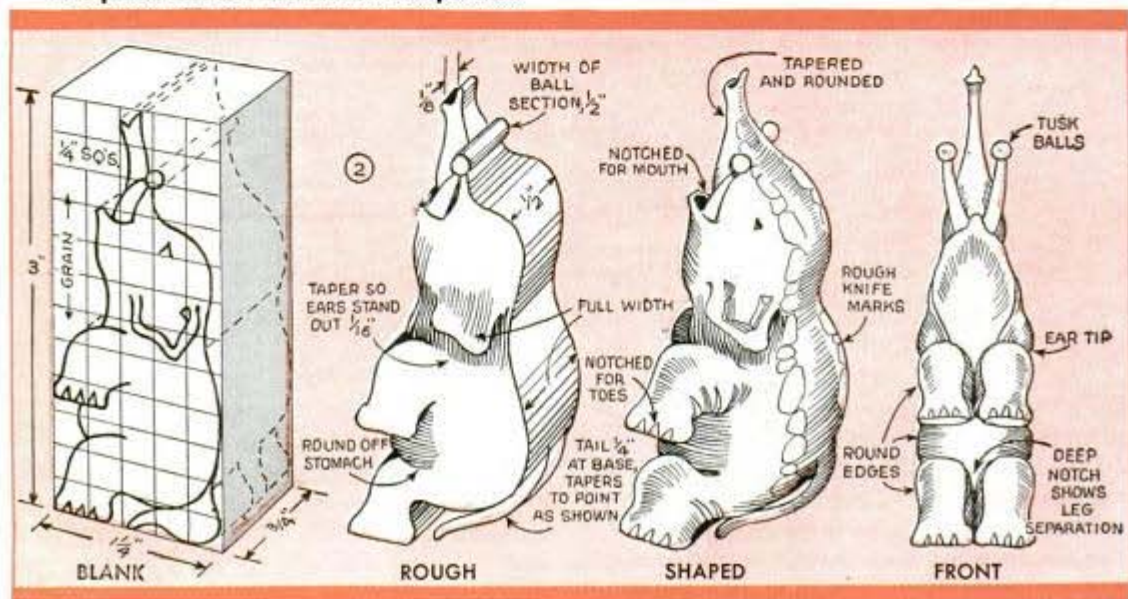
By E. J. Tangerman



"Jumbo on the tub" is simulated in a paperweight by mounting the carved elephant on the top part of an auto piston that has been cut off and polished

**JUMBO** the circus elephant is simple to whittle no matter what pose you choose. And you can use him in dozens of ways. Figs. 1 and 3 show him mounted on modern metal bases for paperweights, while Fig. 7 gives a third pose in which he serves as a simple knickknack on a desk or corner shelf. Other uses are a decoration for a cigarette box or a blotter handle, a letter opener, etc. His blocky shape requires only a little finishing—the rougher you leave him the more natural he looks. For a carving blank, pick a straight-grained, knotless piece of white pine or basswood, planed to about  $\frac{3}{4}$  in. thick. You can make him fatter if you like, using a block 1 or  $1\frac{1}{8}$  in. thick. On one side draw  $\frac{1}{4}$ -in. squares, then copy the pose you want, three of which are shown in Figs. 1, 3 and 7. Other poses are suggested in Fig. 6. Be careful to draw the elephant so that the grain runs the long way of the trunk and tail, otherwise they are likely to split or break off during carving. The details in Fig. 2 are for a vertical pose, while those in Fig. 4 are for a horizontal one. Fig. 8 shows the head carving, which is more or less common to any pose.

To begin carving, cut out the blank with your penknife. Avoid making any edge a continuous curved line; it looks better as a

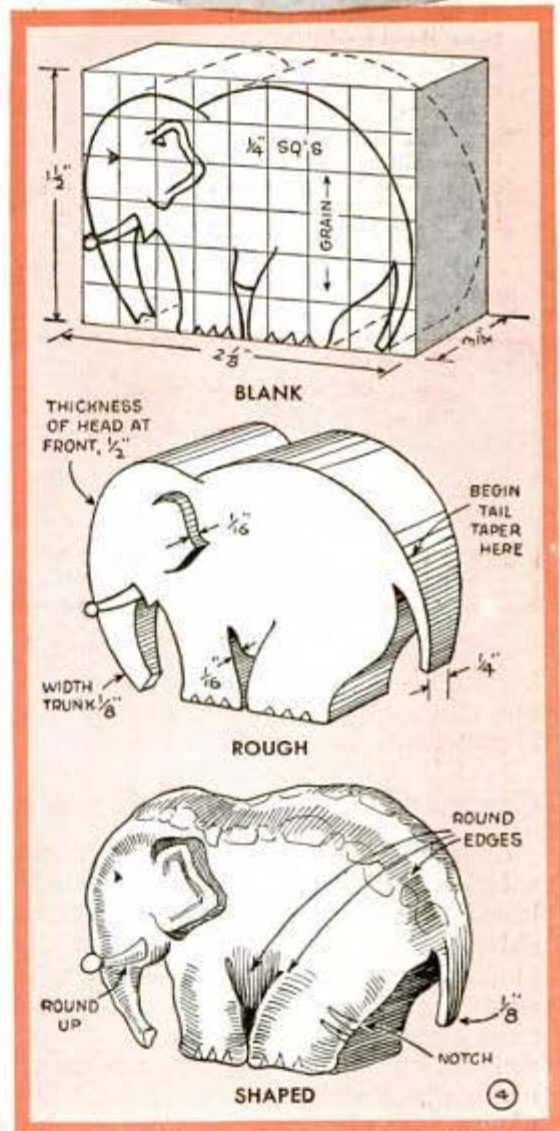


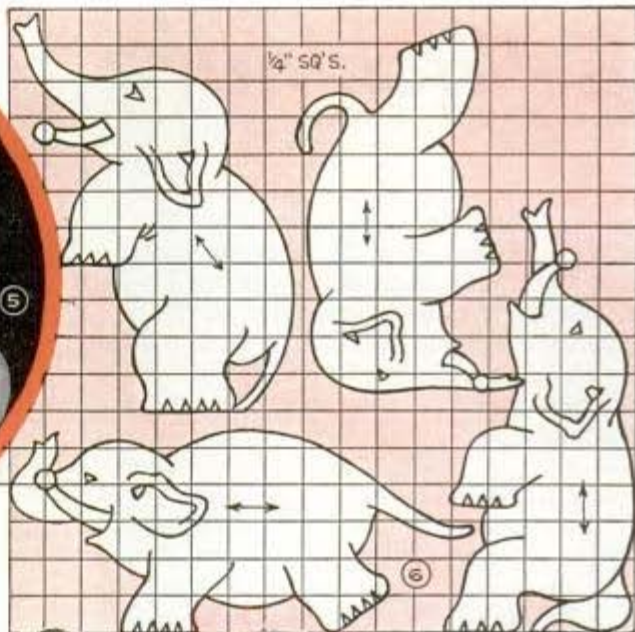
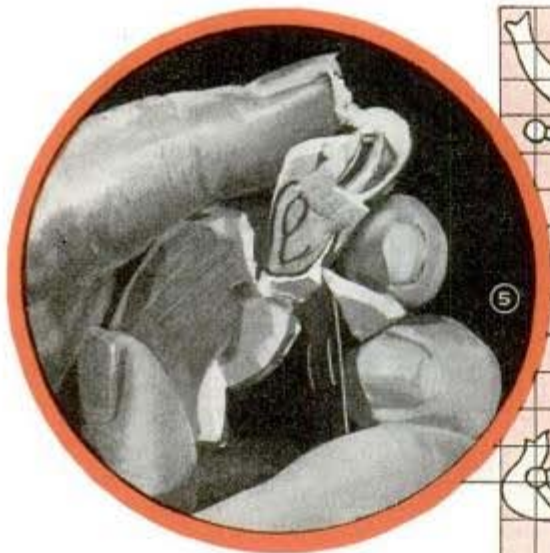
# a Jackknife

series of broken planes, just as your rough knife cuts would leave it. Cut a V-notch between the legs in front and back, and extend V-cuts up between the legs and body, Fig. 5. Thin down the tail and round it up. Cut a deep notch behind the head on each side. Now all that remains is the face. Outline the back of the ears with a straight-in cut about  $\frac{1}{16}$  in. deep, then cut in diagonally from the body to remove a V-shaped chip. Follow this with a shallow V-notch to represent the ear itself, another V-notch and a shallow shaving inside the lobe to outline it. Mark the tusk position, then thin down the trunk, making certain that the outer surfaces are in line above and below. Accent the mouth opening, and round up the tusks, shaping the balls at their ends. Then carefully round up the head and trunk. If you are unfortunate and break off a tusk, cut both off and have a tuskless elephant. Remember to shape the little "finger" at the end of Jumbo's trunk, so he can pick up peanuts. The line of his lower lip marks the butt end of his tusks. Locate the eyes and cut in little pyramids to form them. Now cut a series of V-notches around each foot to simulate toes, and also behind any bent joints, under the jaw, etc.

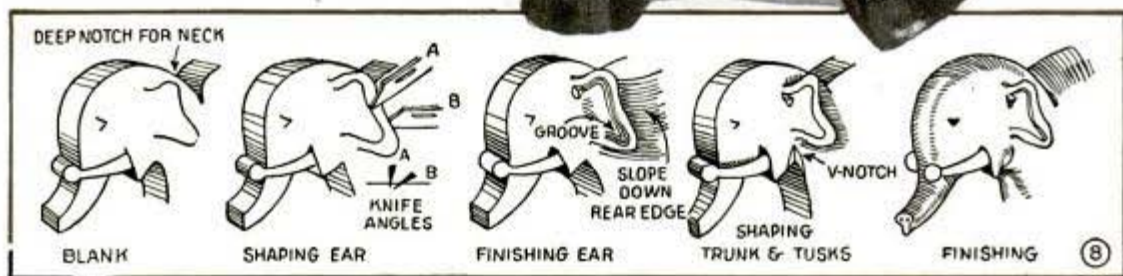
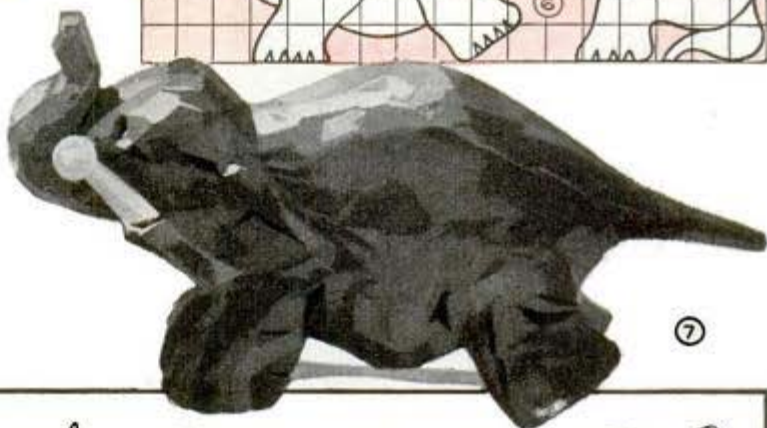
To get a grayish-black elephant color, mix equal parts of brown, black and white oil paints to get a blue or brown-gray. Thin it a little more than usual, and daub it on liberally. When all areas are covered, wipe off the surplus paint with a cloth. This will give Jumbo a soft finish, with a little shine to accent the creases of his hide. Touch up the inside of his mouth, the tip of his trunk, his toes and his eyes with pink (red and white mixed). Paint his tusks white, with gilt balls. If you want a fabled white elephant, paint him a dirty, light gray all over—no elephant is pure white unless whitewashed. You can also carve a little palanquin and a mahout if you wish to put Jumbo really on parade. These can be glued on. In that case, carve V-grooves to show a headcloth and a body-cloth. Then paint them in gay colors.

You can, of course, make such an elephant as elaborate as you wish—putting in





Use a sharp penknife for notching and grooving, and do not make any edge a continuous curved line. The figure looks better with all surfaces a series of broken planes just as left by the rough knife cuts



V-notches to simulate the creases in his hide. A good wood can use mahogany or walnut, and should be oiled and waxed. If you want him larger, use  $\frac{3}{8}$  or  $\frac{1}{2}$ -in.

squares. Or again, lay out the designs on  $\frac{1}{8}$  or  $\frac{1}{4}$ -in. wood and carve them as silhouettes for a wall frieze, picture-frame decoration, or wall panel.

## Chemical Spray to Kill Grass in the Joints of Brick Walk or Street

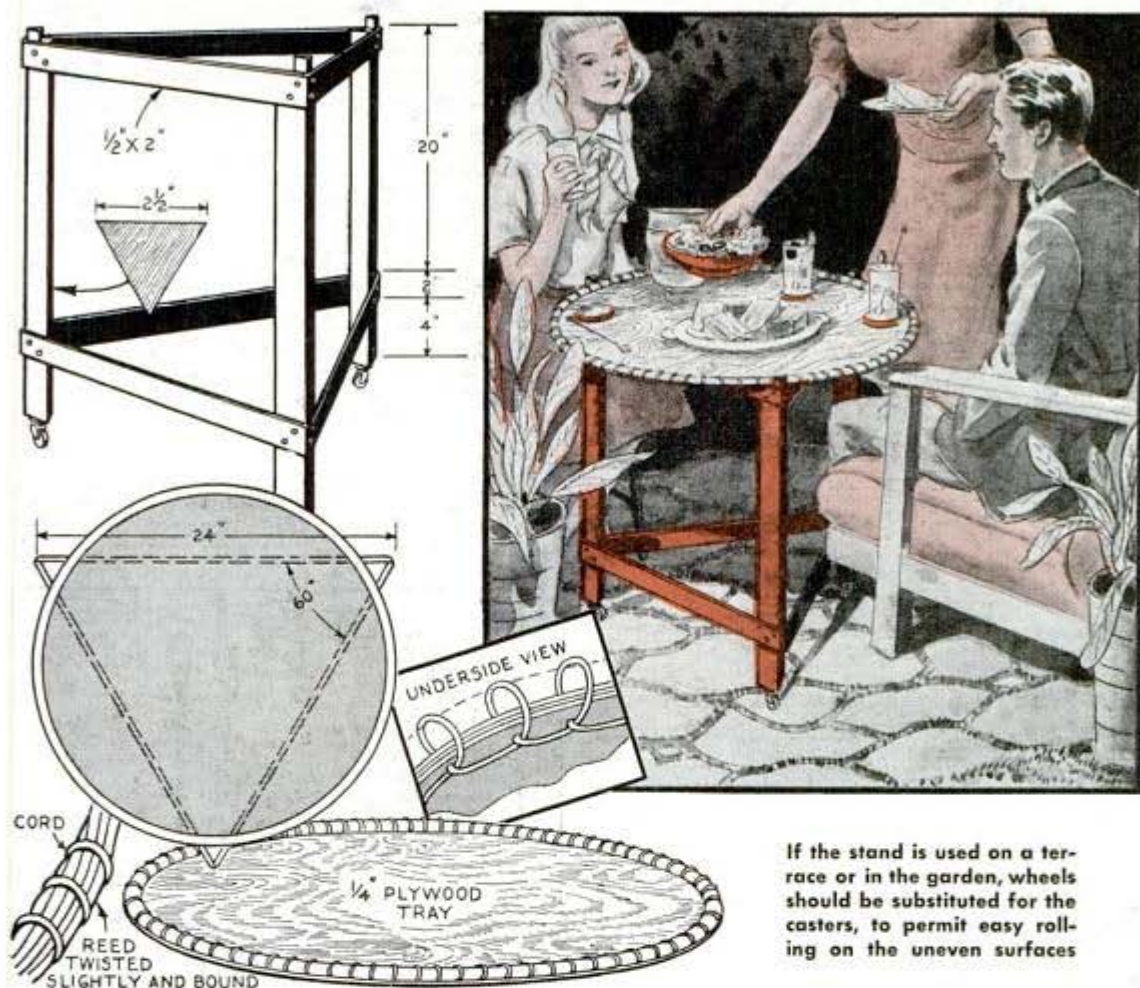
Grass that grows between the bricks or cobblestones in a walk or pavement may be killed with a strong solution of calcium chloride dissolved in water. The solution is simply poured into the crevices if the area is small, or sprayed onto the walk from a garden sprinkling can if more convenient. Two applications are usually enough to stop the growth of grass for a season. Quack grass may be killed by

spraying with a solution made by dissolving sodium chlorate, 1 lb., in water, 1 gal. With this solution, spraying two or three times per season is adequate. A weed killer which is not poisonous to cattle is made by dissolving calcium chloride, 2 lbs., and sodium chlorate, 3 lbs., in water, 4 gals.

To arrange short-stem flowers in a tall vase, place the stems in soda straws.



# Wheeled Porch Stand Has Removable Tea Tray



If the stand is used on a terrace or in the garden, wheels should be substituted for the casters, to permit easy rolling on the uneven surfaces

This light, triangular stand is ideal to support a large tea tray so that it can be moved about conveniently on a porch. The original stand was fitted with a rattan tray, but one of similar size can be made of plywood with a decorative rim of rattan or reed strands bound with brown cord, and

varnished. In binding the reed, the cord is laced through small holes drilled in the tray near the edges, as indicated in the small detail. Raffia could be substituted for the cord. A decalcomania transfer or painted design in the center of the tray adds to the appearance.

## Knurling Tool Tightens Glass Door Knobs in Sockets

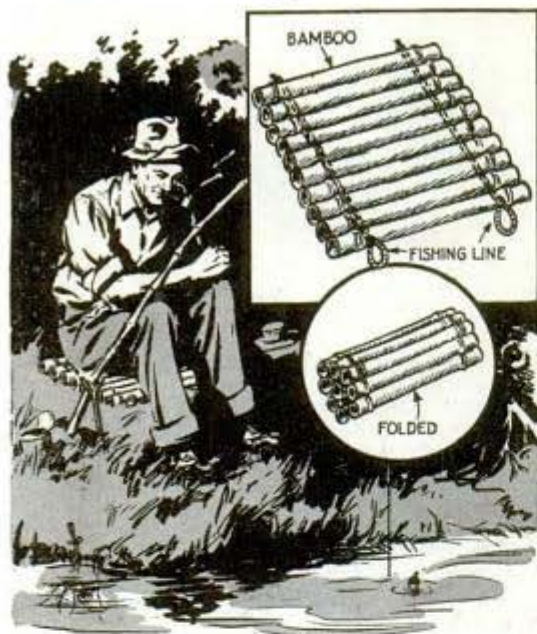
If a glass door knob loosens in its socket, a good way to tighten it is to use a knurling tool. Chuck the knob in a lathe and then use the knurling tool to press the edge of the metal socket tightly around the knob. Do this work carefully. The knurling marks tend to enhance the appearance of the socket rather than mar it.

—Raymond F. Yates, Lockport, N. Y.

☐ Have you tried using a silk violin string for stringing beads? It is stronger than thread and will last indefinitely.



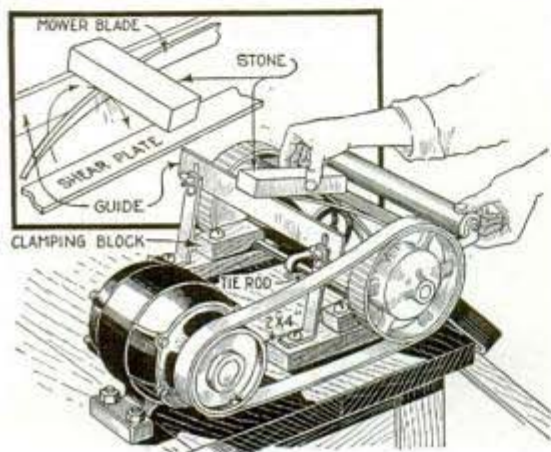
## Fisherman's Portable Roll-Up Seat Made From Lengths of Bamboo



A handy seat for use when still fishing from a bank of a stream is made from lengths of bamboo. Being light, it can be rolled up and carried easily, and it is made by tying several lengths of bamboo together with fishing line as indicated. A further advantage of such a seat is that it will float if accidentally dropped into the water.

## Simple Motor Hookup to Sharpen Lawnmower With Hand Stone

This arrangement enables me to sharpen a lawnmower accurately in a few minutes. Clamping blocks to take the mower tie rod are screwed to a bench so that the end of the mower handle will rest on the floor. Then a guide bar for a hand stone is



screwed to the blocks, and a small electric motor is belted to one of the wheels. It is best to either gear down the motor or provide a resistance in the circuit so that it rotates about a hundred or so revolutions a minute. In use, hold a stone across the mower shear plate and the guide bar, adjusting the latter so that the stone just touches the cutting blades. Then start the motor. After the blades have been trued up, adjust the shear plate against them correctly and rotate the mower for about 10 min., applying plenty of oil to the plate. This will smooth the cutting edges, after which the mower is ready for use.

—Wm. Madison, Oshkosh, Wis.

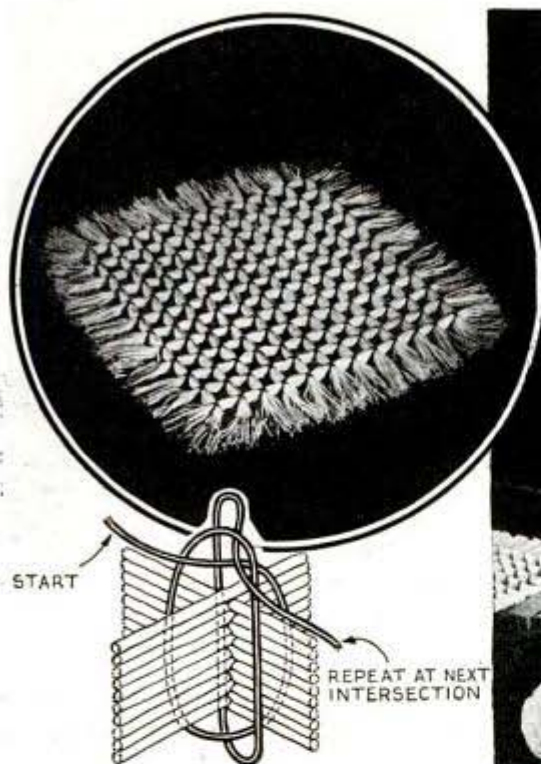
## Six Wieners Roasted at One Time In This Wire Holder



Instead of impaling a wiener on a pointed stick and roasting one at a time, use a wire holder like the one shown and save time. There will be enough "spring" in the bent wire to grip six wieners firmly, and there is no possibility of the holder burning off and dropping the wiener into the fire. With two or three of these holders, wieners for a large group can be roasted.

☐ If sheets are hung on the line dripping wet, the weight of the water tends to pull them down so that they dry with few wrinkles.

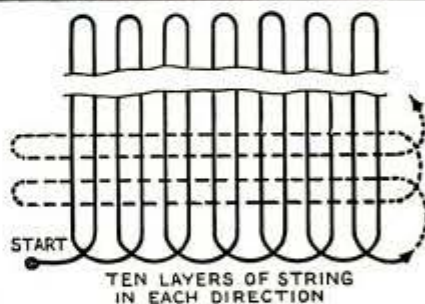
# "Waffle" Hot Pads Are Woven on Simple Frame



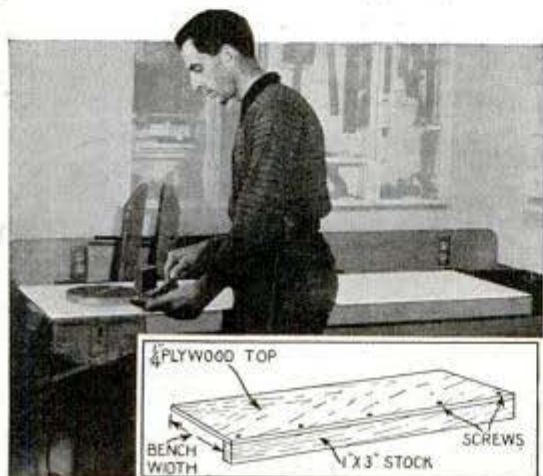
The weaving is done on a simple wood frame about 12 in. square, around the top of which finishing nails are spaced  $\frac{1}{2}$  in. apart



Children will have a lot of fun making these hot pads for gifts. They are woven with cotton thread on a simple wood frame. Begin weaving as shown in the detail at right, passing the thread back and forth and around the nails until you have built up ten layers or more. Then each joint is tied as shown in the detail above. Do not pull the tying thread too tightly or you will mar the waffle effect. The pad is cut out of the frame with a pair of scissors by snipping off the threads an inch or so from the pad.



## False Top on Home-Shop Bench Keeps It Free of Paint



Home workshop fans who have good benches can protect them against paint and glue or burns from hot soldering irons by using a false top when doing this work. The top is merely a plywood panel with a strip screwed to the front edge to rest against the bench edge and keep the top in place.—E. M. Love, Monterey Park, Calif.

When rust or congealed oil causes a lock to stick, it can often be loosened by squirting gasoline into the keyhole and other openings in the case. After the lock has been loosened, it should be removed from the door and taken apart for cleaning and proper lubrication.

## Drill Press Is Used as a Tool Rest To Turn on Outer End of Lathe



When you have some large-diameter work that must be turned on the left-hand end of a lathe headstock, a floor-type drill-press will serve as an adjustable tool rest. Just remove the tool rest from the lathe and clamp it in one of the slots in the drill-press table, then raise or lower the table to bring the rest to the desired height.—Carl N. Furay, Manchester, Conn.

## Shoehorn Serves as "Erasure Aid"

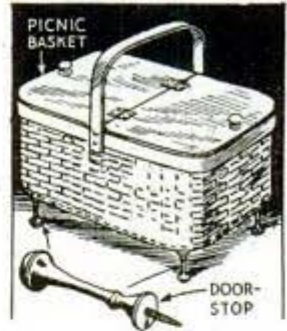
One typist finds that a common shoehorn serves nicely as a shield to avoid smudging the carbon copy when making an erasure on the original copy in a typewriter. The shoehorn fits the contour of the platen and



being stiff, prevents any possibility of an impression being made on the carbon copy.  
—Glenn R. Hasselrooth, Eugene, Ore.

## Short Legs on the Picnic Basket Help Keep Out Insects

Doorstops fitted at each corner of a picnic basket will provide short legs, which will raise the basket off the ground so that insects will be less likely to crawl into it. The legs are also handy when having a picnic lunch on a sandy beach as the basket is raised so that sand is not likely to be kicked into it accidentally.



## Clay Modeling Tool From Handle Of Worn-Out Toothbrush



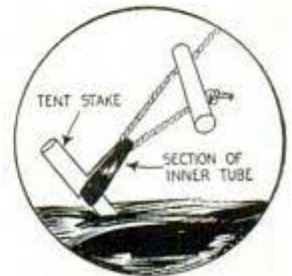
A plastic tool that will last indefinitely for modeling clay can be made from an old toothbrush handle. Shear off the bristles with an old razor blade, and then saw off the opposite end of the handle at an angle. Sharpen

this end and shape the handle to suit with a piece of sandpaper.—Alexander Valentine, Middle Village, Queens, N. Y.

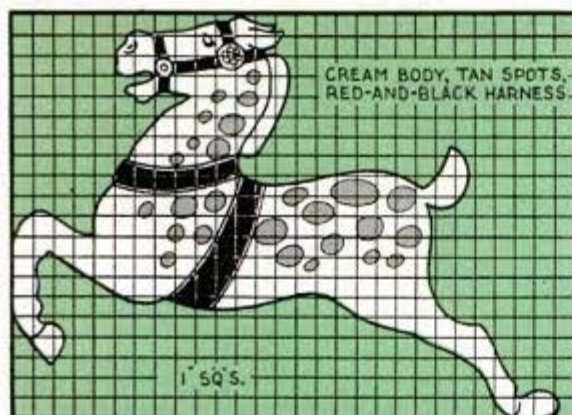
## Automatic Tent-Rope Tightener

Uniform tension on the guy ropes of a tent can be maintained by using rubber bands at the stakes as shown. Bands about 1½ in. wide cut from old inner tubes are about the right size for an average camper's tent.

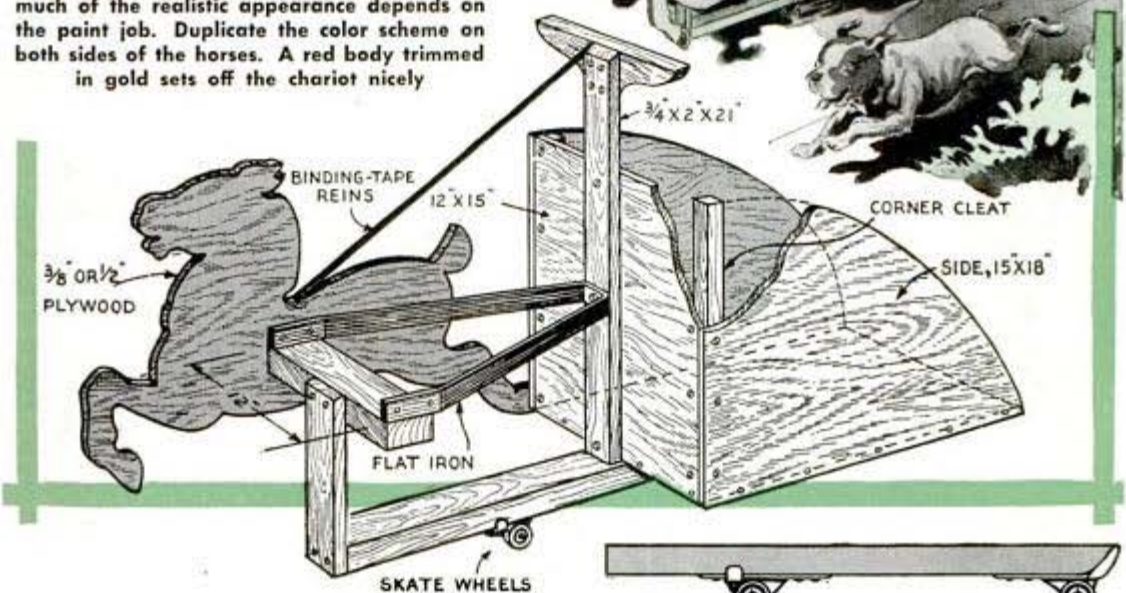
—Wm. Edgar Abbott, Hayfork, Calif.



# Roman-Chariot Scooter Thrills the Youngsters



The horse cutouts are decorated carefully, as much of the realistic appearance depends on the paint job. Duplicate the color scheme on both sides of the horses. A red body trimmed in gold sets off the chariot nicely



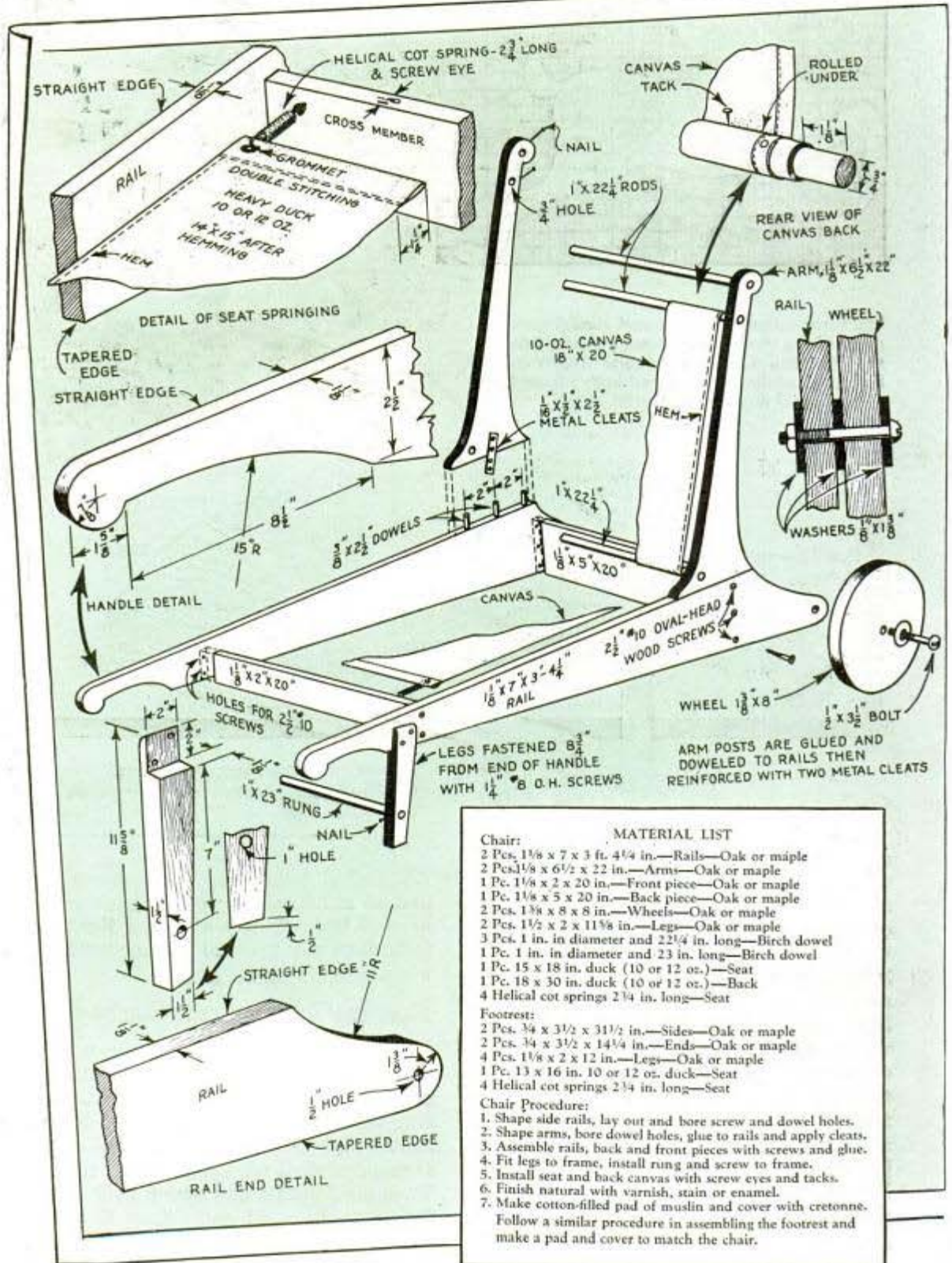
This colorful scooter can be maneuvered as easily as the regular soapbox type with which everyone is familiar, and it is narrow enough to permit two of them abreast on the average sidewalk. The chassis is of the usual construction, being a length of 2 by 4-in. stock with roller-skate wheels attached to provide a fairly short wheel-base. The body is made of outdoor plywood, secured to cleats at the forward corners and to a pine floor, which is nailed to the chassis. The horses are scrollsawed from  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. outdoor plywood and are attached as shown, with a vertical member on the chassis and two light, flat-iron braces. The rear hoof of each horse is screwed to the side of the chariot body. All edges of the plywood are rounded with sandpaper to avoid chipping under hard

use, and all pointed projections are modified as much as possible. Large rubber-headed tacks in the edges of the horse's front legs will provide further protection.

## Roofing Tar Protects Garbage Can

Ordinary roofing or road tar is one of the best materials to protect the inside surface of a garbage can. First, clean the can thoroughly, being sure to clean the seams and joints carefully. If the can is greasy, wash it with gasoline in the open. Then melt the tar and flow it over the surface by rolling the can. Keep the tar hot so that a layer no thicker than two coats of paint is applied.

# WHEELBARROW CHAIR



**MATERIAL LIST**

Chair:

- 2 Pcs. 1 3/8" x 7 x 3 ft. 4 1/4 in.—Rails—Oak or maple
- 2 Pcs. 1 3/8" x 6 1/2" x 22 in.—Arms—Oak or maple
- 1 Pc. 1 3/8" x 2 x 20 in.—Front piece—Oak or maple
- 1 Pc. 1 3/8" x 5 x 20 in.—Back piece—Oak or maple
- 2 Pcs. 1 3/8" x 8 x 8 in.—Wheels—Oak or maple
- 2 Pcs. 1 1/2" x 2 x 11 1/8 in.—Legs—Oak or maple
- 3 Pcs. 1 in. in diameter and 22 1/4 in. long—Birch dowel
- 1 Pc. 1 in. in diameter and 23 in. long—Birch dowel
- 1 Pc. 15 x 18 in. duck (10 or 12 oz.)—Seat
- 1 Pc. 18 x 30 in. duck (10 or 12 oz.)—Back
- 4 Helical cot springs 2 3/4 in. long—Seat

Footrest:

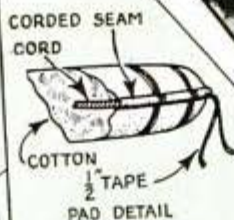
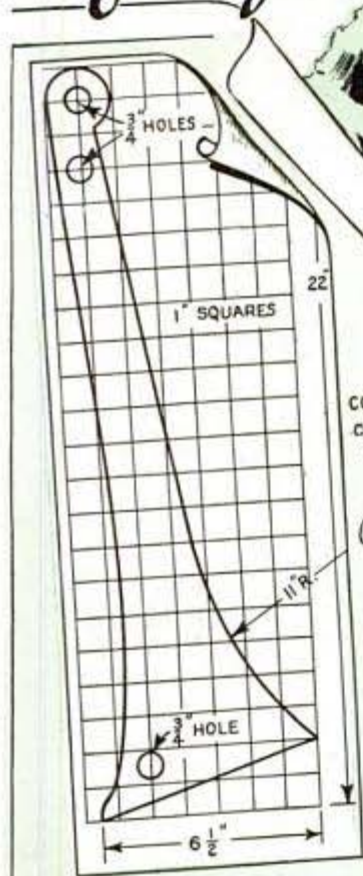
- 2 Pcs. 3/4 x 3 1/2 x 31 1/2 in.—Sides—Oak or maple
- 2 Pcs. 3/4 x 3 1/2 x 14 1/4 in.—Ends—Oak or maple
- 4 Pcs. 1 1/8" x 2 x 12 in.—Legs—Oak or maple
- 1 Pc. 13 x 16 in. 10 or 12 oz. duck—Seat
- 4 Helical cot springs 2 3/4 in. long—Seat

**Chair Procedure:**

1. Shape side rails, lay out and bore screw and dowel holes.
2. Shape arms, bore dowel holes, glue to rails and apply cleats.
3. Assemble rails, back and front pieces with screws and glue.
4. Fit legs to frame, install rung and screw to frame.
5. Install seat and back canvas with screw eyes and tacks.
6. Finish natural with varnish, stain or enamel.
7. Make cotton-filled pad of muslin and cover with cretonne.

Follow a similar procedure in assembling the footrest and make a pad and cover to match the chair.

# for your garden



WHEELBARROW CHAIR REQUIRES A COTTON-FILLED PAD 20 BY 36 IN. ABOUT 2 IN. THICK—TIED AND COVERED WITH BRIGHTLY COLORED CRETONNE. FOOTREST REQUIRES A 14 BY 18-IN. PAD COVERED WITH THE SAME MATERIAL. BOTH HAVE TAPE TIE STRINGS TO HOLD PAD IN PLACE

SCREW EYE

PATTERN OF CHAIR ARM

$\frac{3}{4}$ " X  $3\frac{1}{2}$ " X  $14\frac{1}{4}$ "

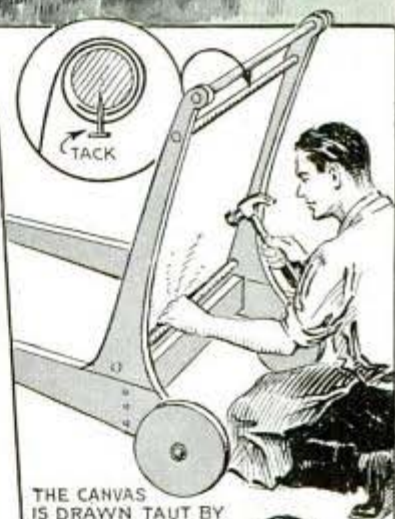
2" #8 OVAL-HEAD SCREWS

JOINT SCREWED & GLUED

SIDE SCREWED

END DETAIL

LEG DETAIL



THE CANVAS IS DRAWN TAUT BY TURNING LOWER RAIL AND IS THEN SECURED WITH TACKS



DOWEL HOLES ARE ACCURATELY SPACED WITH A KNIFE LINE AND GAUGE

Resiliency in the seats of this chair and the footrest to match is obtained by using helical springs to suspend the canvas bottom between cross members. All the parts are fastened together with screws, although resin glue will give still greater strength. The cushions are removable

## Umbrella and Embroidery Rings Provide Entertaining Game



On dull evenings when there is nothing to do, you can pass a little time away without much preparation by using an umbrella and some embroidery hoops. Set the opened umbrella on the floor with the handle projecting toward you. Then move back a few paces and toss the hoops over the handle. You will be surprised how difficult it is to do this. Scoring can be arranged to suit, a good suggestion being to count a ringer five points, or a hoop falling into the umbrella two points, and those missing the umbrella and falling on the floor counting five off the score of the player. Other rules may be invented to simplify or complicate the game.

## Long Fishline Is Waxed in a Jiffy With Bottle and Corks



If you have several hundred yards of fishline to wax, it can be done rapidly by using a bottle and a couple of slotted corks. Put one cork in the bottle and slip the other one over the edge of a can containing some melted

wax. Then, using the bottle to submerge the line, pull it through the slots in the corks, the cork on the can edge serving as a wringer to remove excess wax.

## Kinked Bail on a Paint Bucket Stays Up or Down

To support the bail on your paint bucket vertically so it can be grasped quickly when changing to another position, just kink the bail as shown. The bail can also be forced down against the side of the bucket.



## Crutch Tip Improves Putty Knife



When removing a pane of glass or fitting a new one in a window, it is often necessary to give the glass a few light taps to loosen or push it in place. If a rubber crutch tip is pushed over the putty knife handle, the latter can be used for this purpose without danger of breaking the glass.

## Wood Strips Steamed for Bending By Hot Iron and Damp Cloth

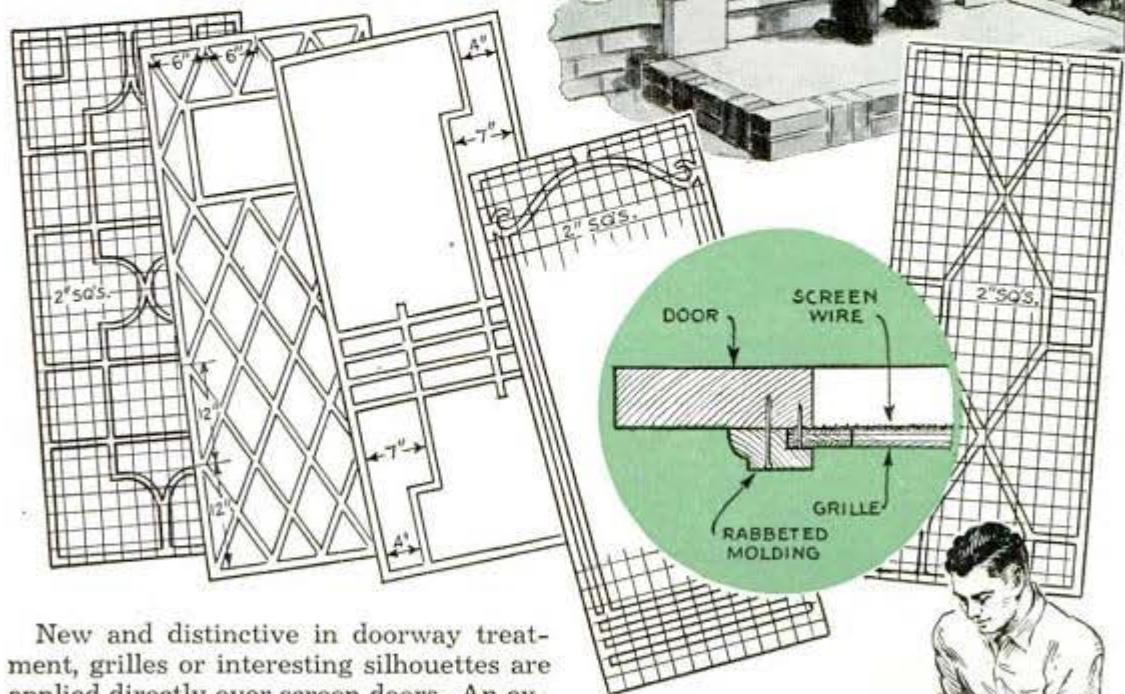
While making models of airplanes and other objects where a number of small wood strips must be bent, one model builder steams the strips with a hot iron before bending them. A damp cloth is placed over the strip to be bent and then the iron is run over it. This produces steam, which is forced into the wood. Dampening and ironing the cloth two or three times will wet the wood sufficiently.







# Plain SCREEN DOORS *made attractive*

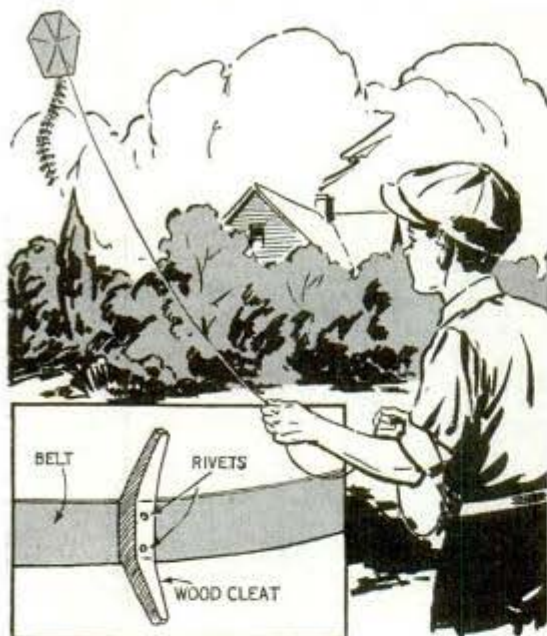


New and distinctive in doorway treatment, grilles or interesting silhouettes are applied directly over screen doors. An example of how a screen door served to "frame a picture" is shown above. Such a silhouette can be cut from sheet metal, but you can use any stiff sheet material that will withstand weather. Five types of grilles are also shown. These can be fashioned from wood or metal strips, or a design can be scrollsawed from waterproof plywood. The grilles are held in place by molding as shown in the circular insert.

THE OVERLAY IS PLACED ON THE OUTSIDE OF THE WIRE



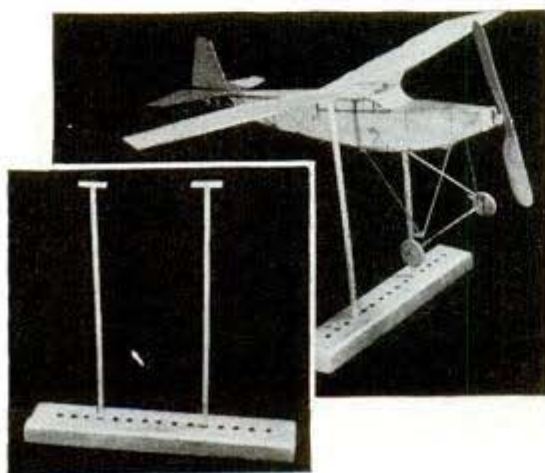
## Kite Flyer Has Freedom of Arms By Using Cleat on Belt



A wooden cleat riveted to a belt to go around your waist will leave both hands free when flying a kite. The string is wound on the cleat and is unwound as desired. If the end of the string is tied securely to the cleat, there will be no danger of the kite getting away from you as often happens when you hold a ball of string.

## Jig to Adjust Model Airplane For Center of Balance

The center of balance of model airplanes can be found quickly with this simple jig. It consists of a base block having a series of holes bored in line to take a couple of T-shaped vertical members. These are



120

spaced to suit the plane, which is supported along the center of the wing width. The plane is then adjusted for lateral balance by adding weight to the light end.

—Ray J. Marran, Kansas City, Mo.

## Loss of Outboard Motor Avoided By Bottle-Cap Sockets

To help insure against the loss of an outboard motor, caused by the clamp screws loosening, one sportsman nailed a couple of bottle caps onto the boat transom at the points where the clamp screws contacted it. The caps served as sockets for the screw ends so that the motor could not jump off the transom if the screws loosened slightly.



## Match Under a Triangular Ruler Aids in Inking Lines



the same time, serve as a roller for easy manipulation of the ruler.

## Noninflammable Insecticide

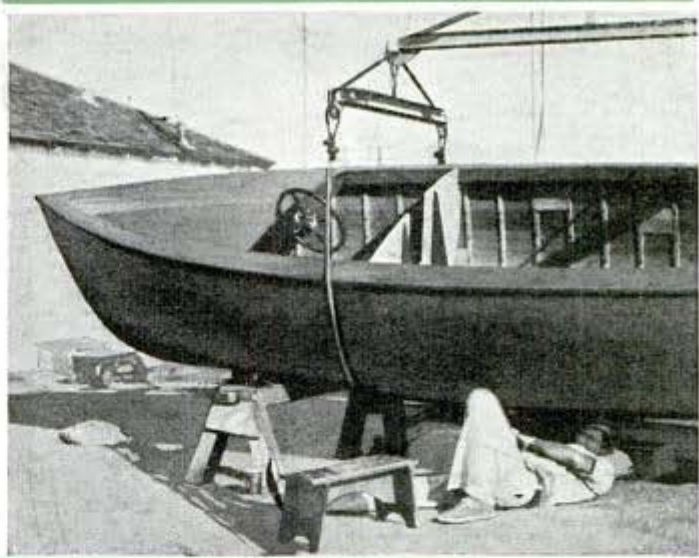
An effective and noninflammable insect destroyer can be made by dissolving rosin, 1 oz., and oil of amber, 1 oz., in a mixture consisting of gasoline,  $\frac{1}{2}$  gal., and carbon tetrachloride,  $\frac{1}{2}$  gal. It may be used in a spray gun to kill flies, bedbugs, fleas, ants, roaches, and other pests. The rosin forms a cake around the insect eggs and thus prevents hatching. It is not necessary that the destroyer be aimed at the pest. Finely divided particles of it in the air kill insects.

# "FALCON"—a trim 18-ft. Inboard

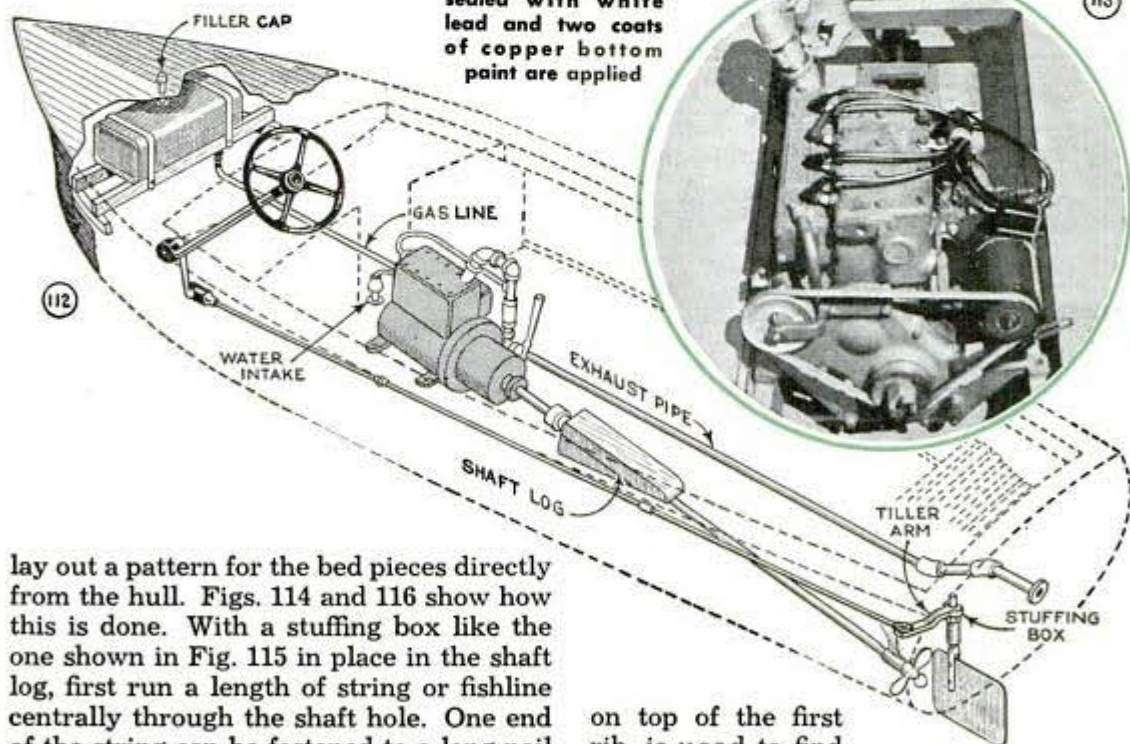
## Part V

### Engine, Rudder, Strut, Steering Gear and Seats

WITH the hull practically completed, you can now install the power plant. Fig. 113 shows the type of engine that was used in "Falcon," and the cutaway view in Fig. 112 gives a general idea of the location of the gas tank, engine, exhaust pipe, etc. Fitting the beds upon which the engine sets comes first. While the dimensions given in Fig. 117 can be followed if you use a similar engine as shown, it is best to

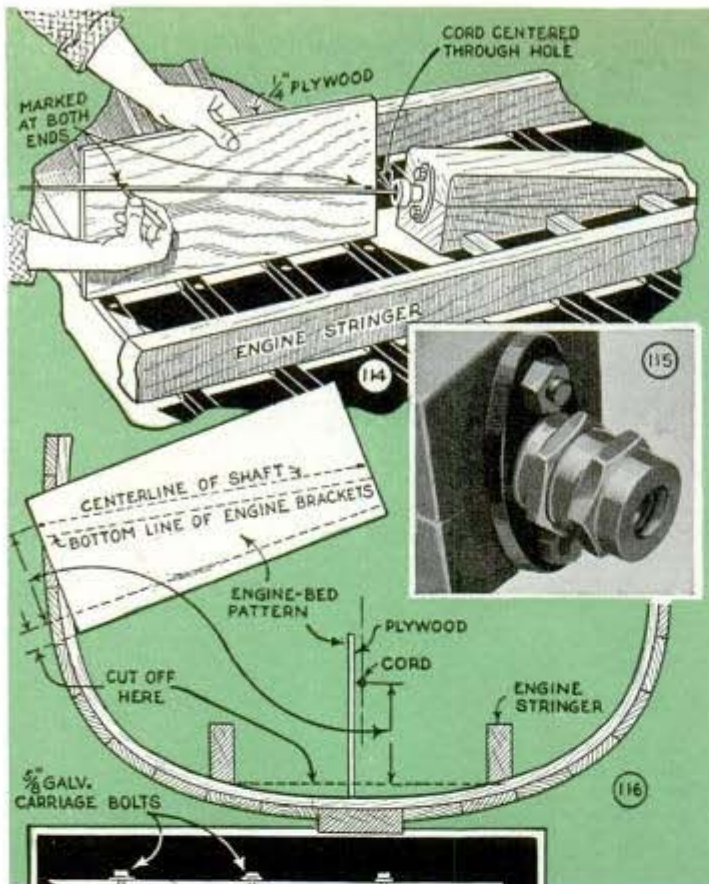


The bottom seams are sealed with white lead and two coats of copper bottom paint are applied

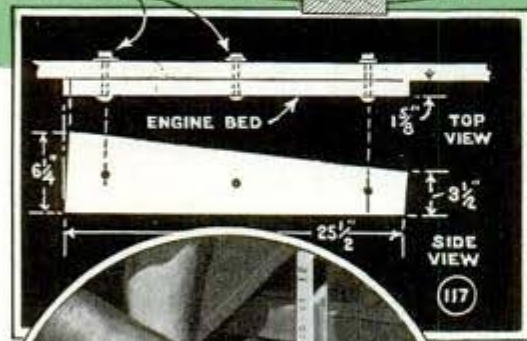


lay out a pattern for the bed pieces directly from the hull. Figs. 114 and 116 show how this is done. With a stuffing box like the one shown in Fig. 115 in place in the shaft log, first run a length of string or fishline centrally through the shaft hole. One end of the string can be fastened to a long nail driven into the underside of the keel and the other end to a floor board, or a timber. Next, stand a 1/4-in. plywood panel on edge across four ribs, holding it against the string and make a mark on it at each end as in Fig. 114. Then draw a line through these points. After this, a straightedge, placed between the engine stringers and

on top of the first rib, is used to find the distance between the bottom edge of the stringer and the top of the rib at a point directly below the cord. This distance is represented by the dotted line in Fig. 116. A similar measurement is made at the fourth rib and then the two distances are transferred to each respective end of your pattern, after which this amount is

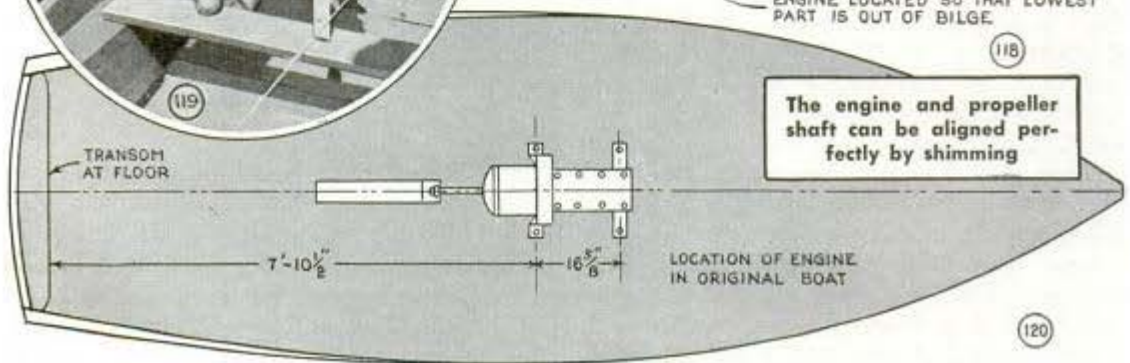
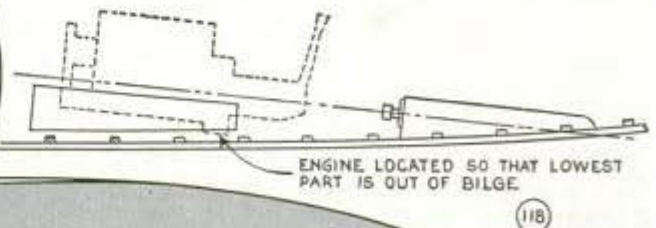
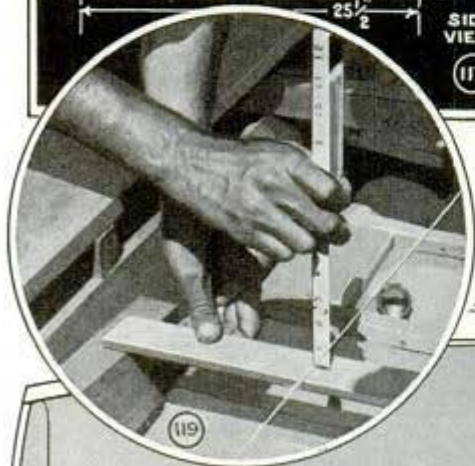


cut off. Now you measure vertically the distance between the center of the crankshaft and the bottom of the engine feet and mark it on the pattern as shown. This will give the exact shape of the beds for your boat. After these are cut from oak or fir and bolted to the sides of the stringers, they are checked with the string as in Fig. 119 to make sure that they are at the right height. The engine should be shifted on the beds until its lower end clears the bilge sufficiently, yet is located a suitable distance from the end of the stuffing box. Figs. 118 and 120 give the location of the engine used in the original boat. If in aligning the engine, you find that the forward end of the propeller shaft does not slide into the coupling on the end of the engine, it may be necessary to shim the latter on the beds until both are in alignment.



When the boat is launched, a final alignment checkup is made.

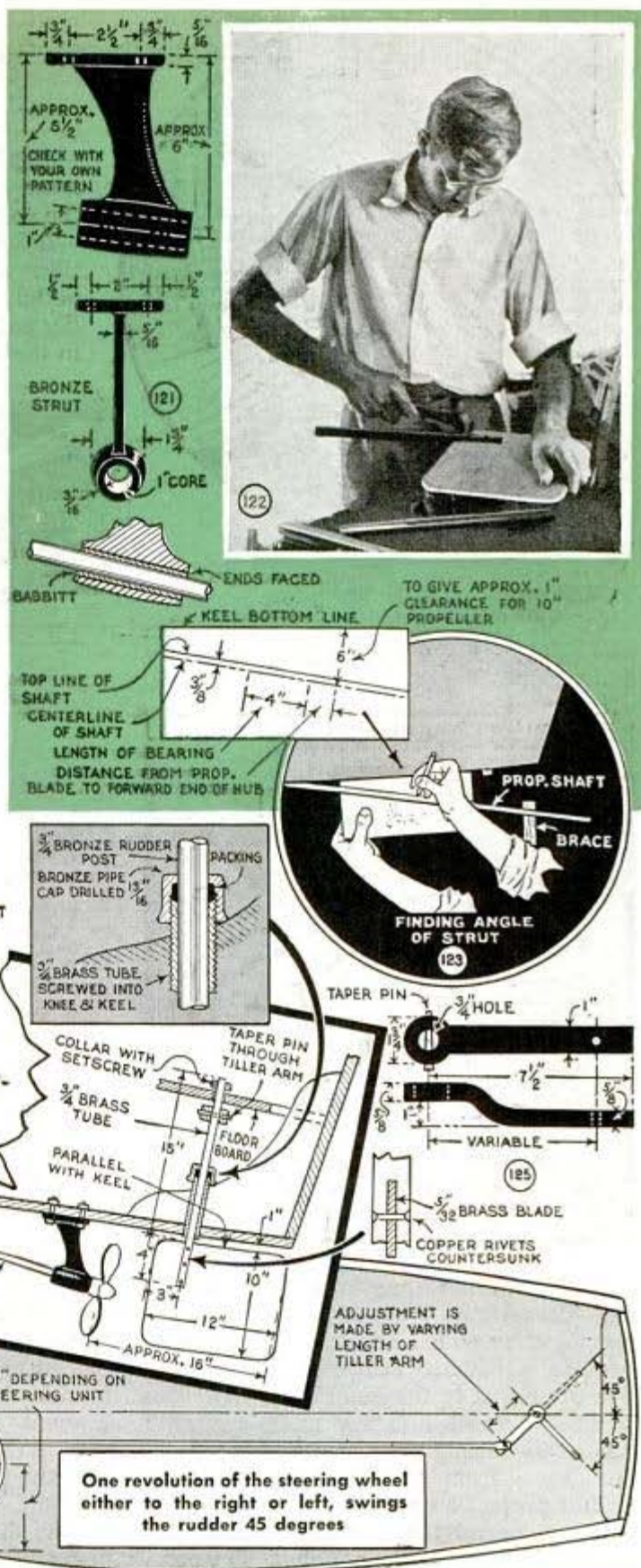
Take pains in laying out the strut for the propeller shaft. To find the shaft angle of this, the shaft is braced temporarily in its ultimate position and a piece of plywood is held alongside of it on which the angle is marked as in Fig. 123. Next, a line representing half the diameter of the shaft, is

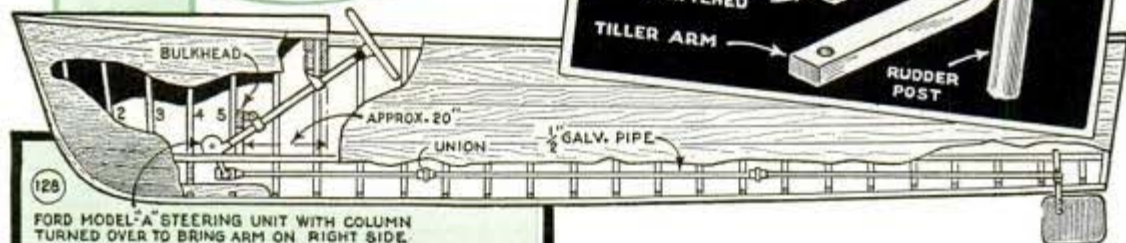
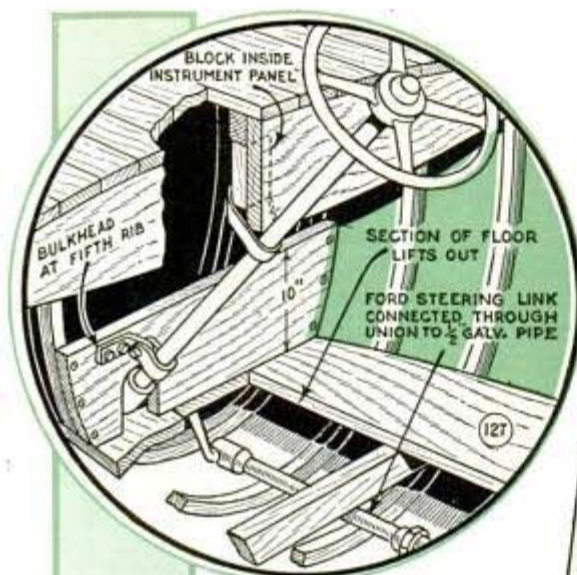


The engine and propeller shaft can be aligned perfectly by shimming

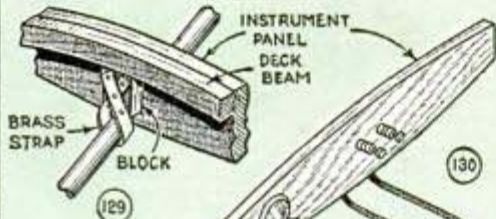
marked  $\frac{3}{8}$  in. below and parallel with the previous mark, and then the other points are laid out as indicated. It may be possible to obtain a stock strut having the right shaft angle, but if not, a pattern of white pine can be made following the details in Fig. 121 from which you can have a bronze casting made. A bearing is provided in the strut as shown in the detail above Fig. 124. First, the portion of the shaft passing through the strut is smoked so that the babbitt will not adhere to it. Then after it is held centered in the hole by a notched support, putty or asbestos paste is packed around each end of the strut, forming a pouring well in the putty at one end. Be sure to provide a vent hole in the casting. Just before pouring the molten babbitt, the flame of a blowtorch should be played on the strut for about five minutes.

A view of the complete rudder assembly is shown in





128 FORD MODEL-A STEERING UNIT WITH COLUMN TURNED OVER TO BRING ARM ON RIGHT SIDE.



129 MOTORCYCLE-TYPE CONTROL. PIANO WIRE IN FLEXIBLE TUBE

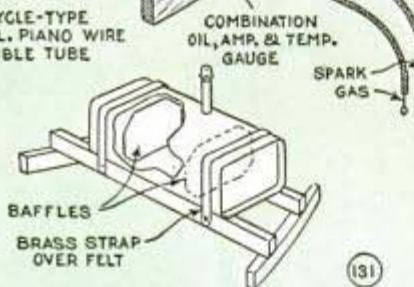
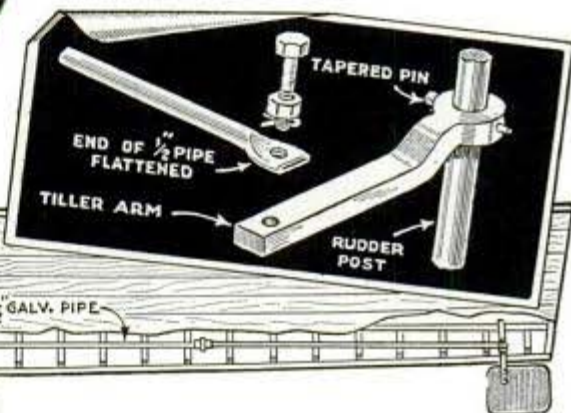


Fig. 124. A short brass tube having an inside diameter of  $\frac{3}{4}$  in. is threaded its full length, after which one end is reamed to provide a beveled seat for the packing. See the detail to the left of Fig. 123. The tube is turned into an undersize hole drilled up through the keel and the transom knee from the bottom. The tube should project above the latter just sufficiently to permit the pipe cap to be screwed down tightly upon the packing. The rudder is cut from a  $\frac{5}{16}$ -in. brass plate and

riveted in a slot cut in the rudder post as shown in Fig. 122. Note that the plate is set in the slot at an angle so that it will be parallel with the keel when in place. The rudder post extends up through the floor boards and a collar is fitted to the upper end at a point to give the rudder a 1-in. clearance at the keel.

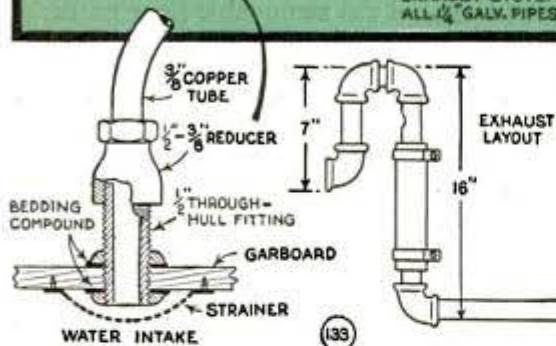
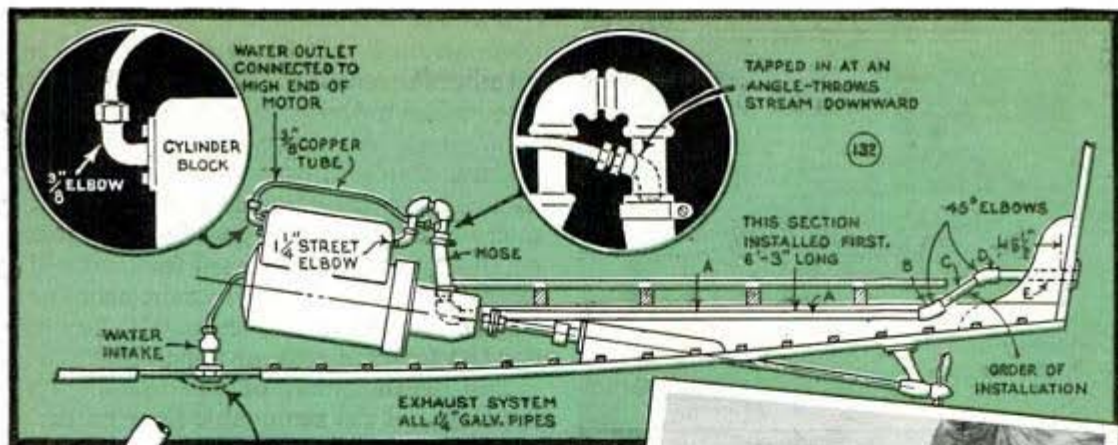
A bronze casting also is made of the tiller arm detailed in Fig. 125. A tapered pin is used to fasten it to the rudder post. The exact location of the hole in the arm for attaching it to the steer-



ing link is determined by experimenting with the steering unit used. One revolution of the wheel should bring the rudder from dead ahead to hard aport, or a 45-degree swing, and the same to starboard. In other words, two revolutions should turn the rudder from extreme left to extreme right. (See Fig. 126.)

In the original boat, a Ford model-A steering unit was used, the column being turned over so that the arm at the lower end was on the right instead of the left side. The lower end of the column is anchored securely to a bulkhead by a collar and an angle bracket as in Fig. 127, while the upper end is fastened with a brass strap to a block mounted behind the instrument panel as in Fig. 129. After cutting off and threading the end of the steering link, it is connected to the tiller arm by  $\frac{1}{2}$ -in. galvanized pipe. This is made up of two pieces which are joined with unions to make it easy to install beneath the floor timbers. (See Fig. 128.) The aft end of the pipe is flattened and drilled for attaching it to the tiller arm.

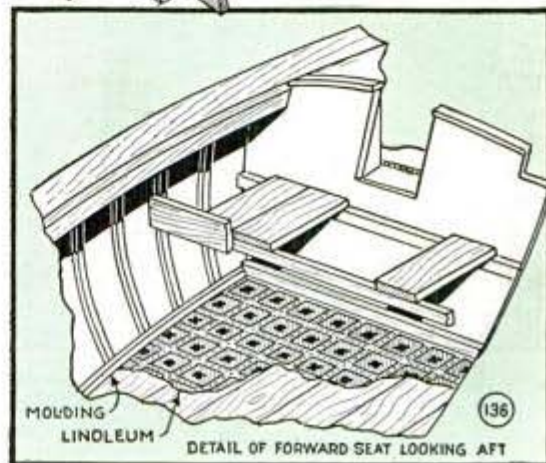
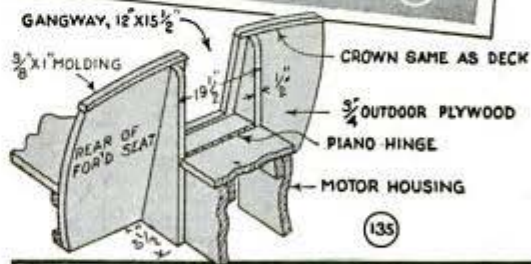
Now for the exhaust pipe. The connection at the manifold consists of pipe nipples and elbows assembled in an inverted U-shape so that it will be impossible for



The exhaust pipe is placed beneath the floor timbers and next to the starboard engine stringer. It is connected near the engine with a flexible steel hose

water to run back through the exhaust and into the manifold. The fittings making up the offset in the pipe at the transom are assembled in the order given in Fig. 132, the long piece being coupled to the U-shape unit first. For this, use a short length of flexible steel hose, fastening it at each end with ordinary hose clamps as shown. The part which passes through the transom should fit tightly in a hole located in the position given in Fig. 133, and then the threaded end is fitted with a brass flange. The water outlet from the engine should run from the high end of the block to prevent the formation of a steam pocket, although some engines offer a choice of making the connection at either end. The outlet connection should enter the exhaust pipe at the angle shown in the circular detail to throw the stream downward. A standard through-the-hull fitting like the one shown in Fig. 133 is fitted in the starboard garboard plank.

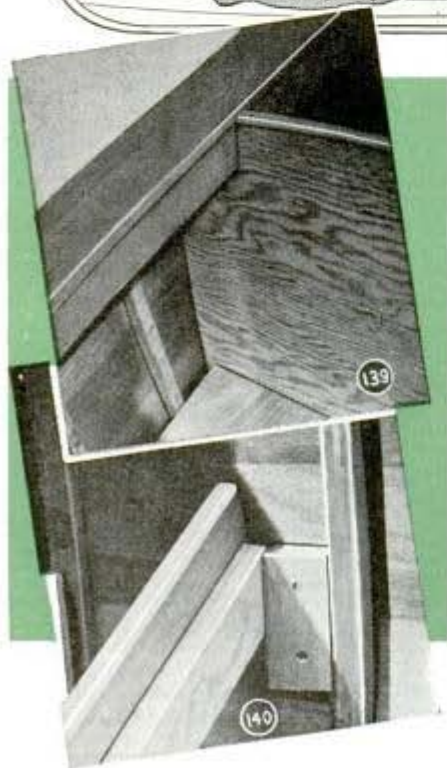
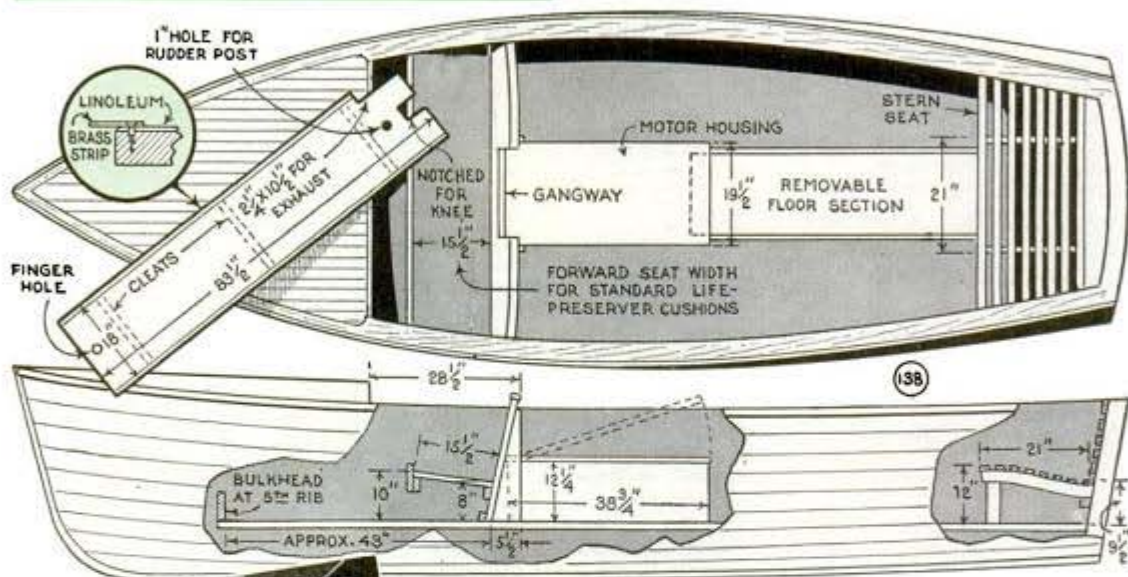
You may be able to secure an auto gas tank of a size suitable for mounting in a cradle under the forward deck. If not, you





can make one to fit of sheet iron or copper as shown in Fig. 131 and mount it on cross members screwed to the sides of the ribs. The baffles in the tank will prevent excessive pounding of the contents in rough waters. Don't forget to vent the filler tube by drilling a small hole in it well above the maximum level of the gasoline. A flexible cable-covered wire is used for controlling the engine from the instrument panel as in Fig. 130, and the batteries may be kept under the forward seat, or beneath the deck.

The arrangement of the seats, engine housing and the removable floor section is

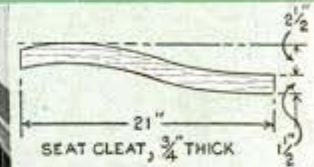
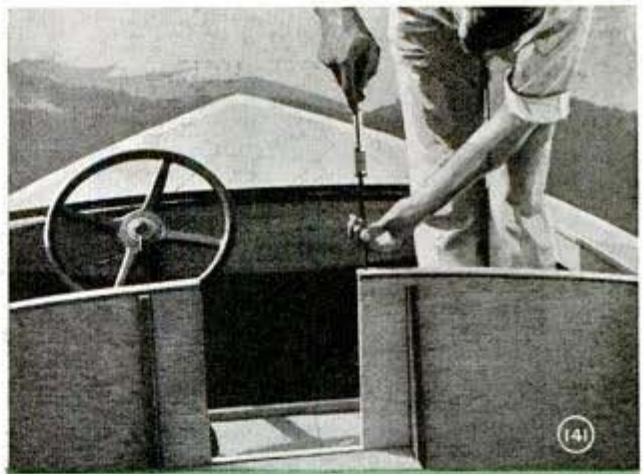


given in Fig. 138. The back of the forward seat is of plywood, cut and notched to fit neatly at the coaming (see Fig. 139) 28½ in. aft of the instrument panel. Before attempting to cut the back to shape, a pattern of the opening should be made. On a scrap piece which is roughly cut to fit against the planks, the curvature of the hull is marked with dividers, or with a pencil and small block as shown in Fig. 134. After it is cut, it is tacked temporarily in place at the proper slant. Next, a second piece is placed against the face of the coaming and nailed to the first, after which a pencil mark is made on it at the bottom edge of the coaming. Both sides of the hull are treated alike and then the two patterns are connected at the bottom with a straightedge set on the floor. When you are satisfied with the fit of the pattern, it is removed and used to mark the material. Braces are screwed to the aft side along each side of the gangway as shown in Fig. 135, and a cleat is fastened to the floor against which the forward edge of the back is set. The top edge is crowned to conform with the deck and is covered with a strip of half-round molding as

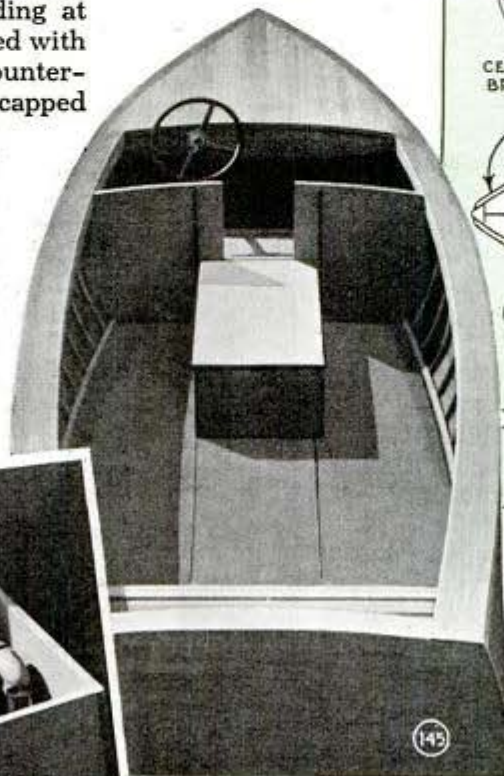
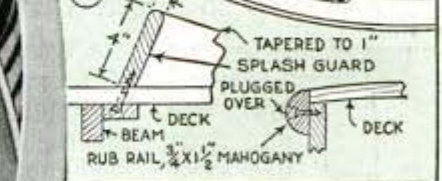
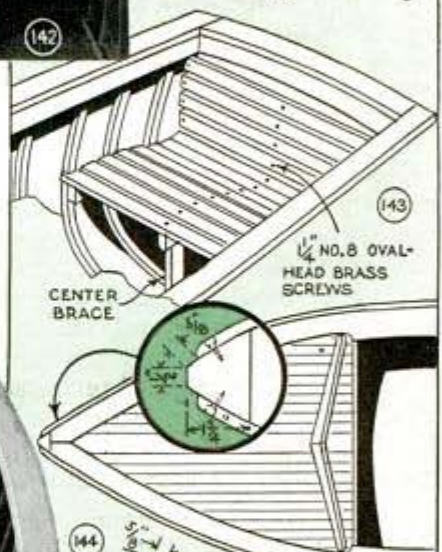


shown in Fig. 141. The seat itself is made up of a number of boards placed as shown in Fig. 136. At the rear edge they are screwed to a cleat fastened across the back 8 in. up from the floor, while at the front, the pieces are set in a rabbet formed by two pieces attached to the hull as in Fig. 140. The seat width given will accommodate standard life-preserver cushions. Overhanging strips of metal screwed to the edges of the removable floor section after it is covered with linoleum, provide rabbeted edges for keeping it in place. From Figs. 137, 142 and 143 you can see clearly how the seat at the stern is constructed of 2-in. slats and supported on cleats as indicated. Finally, the engine is boxed-in and fitted with a hinged cover, Figs. 145 and 146, to make it readily accessible, and then linoleum is applied to the floor. The rub-rail molding at the sheer is attached with brass screws in counter-bored holes and capped with mahogany plugs as shown. If you plan to add the cabin, which will be described next month, it is not necessary to fit a splash guard to the forward deck as in Fig. 144.

(To be concluded)



Cleats cut to the shape indicated and screwed to the ribs at each side, give a comfortable slant to the stern seat



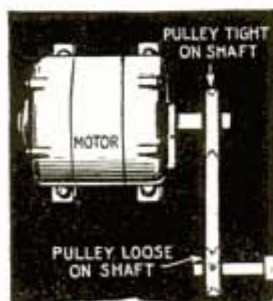
Complete, except for the splash guard, the view at the left shows "Falcon" as a runabout, ready for launching. Equipped with a 20 hp. engine, trial runs at Newport Beach, Calif., were clocked at 17 m.p.h. The hull requires no changes whatever if you decide to make the boat a cabin cruiser, as the cabin consists of a separate unit which fits inside the cockpit

## Pin to Anchor Archery Target Fastened to Leg of Support



Here is a good method of anchoring an archery target so that the wind will not blow it over. One leg of the target support is fitted with a piece of flat iron, which is drilled at the lower end to take a long steel pin. In use, the pin is pushed through the hole into the ground. When not in use, it is removed and slipped under a staple in the leg. In this way, the pin is always at hand, and there is no possibility of it being misplaced.—Richard R. Busch, Chicago.

## Easy Way to Align V-Pulleys



A better method of lining up pulleys for V-belt operation than the usual one of sighting is to loosen the driven pulley, put the belt in place and run the motor or countershaft for a few seconds.

This will automatically cause the loose pulley to move laterally on the shaft until it is in alignment with the driver. As soon as the pulleys come into alignment, stop the motor and tighten the loose one on the shaft. With this method, slight inaccuracies resulting from trying to align the pul-

leys by sight are avoided, and the belt will last longer because of the absence of excessive wear on one side.

—W. C. Wilhite, Carlinville, Ill.

## Drawer Partitions Held in Place By Strips of Channel Brass

Partitions in drawers can be installed easily, even after they have been assembled, if you use lengths of channel brass to hold them. Attach the metal with small screws or brads and countersink the heads. Plywood will do for the partitions.—S. J. Gancher, Richmond Hill, N. Y.



## Picnic Forks Pin Plant Branches To Ground to Start New Growth

When you want to hold a branch or trailer of certain kinds of plants close to the ground so that they will take root at the joints and start new growths, try using



wooden picnic forks for the purpose. Just slip the fork over the branch as shown and press it into the ground, taking care not to force the fork deep enough to pinch and damage the tender plant.

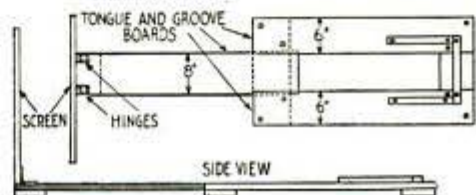
# Strap-Hinge Tripod Head Tilts Ninety Degrees



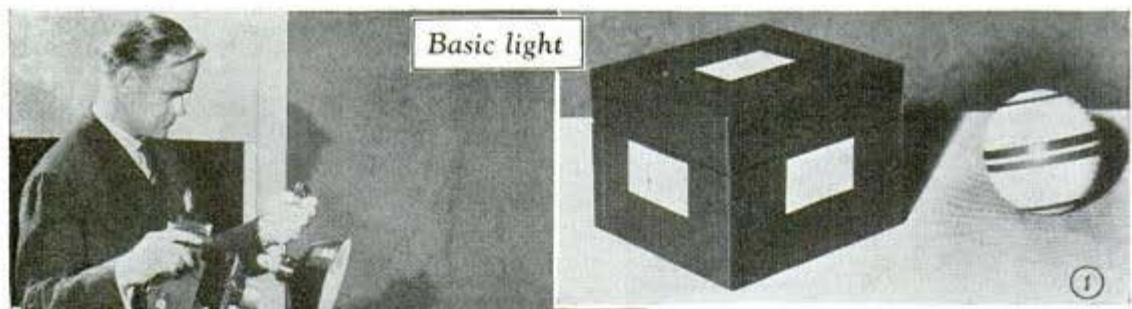
Holding your camera steady in vertical or horizontal position, Figs. 1 and 2, or at any other angle between these limits, this tilting tripod head should be a welcome addition to the photo equipment of those who like to make their own cheaply. A 6-in. strap hinge is bent as in Fig. 3. Then pivot posts are riveted at the ends to take lengths of flat brass which are pivoted together, using a screw and wingnut. These pieces should be just long enough to hold the strap hinge at right angles when they are set end to end

# Stand for Horizontal Enlarger Has an Adjustable Easel

This stand makes it easy to adjust a horizontal enlarger for prints of different sizes. The distance between the paper and the lens is varied by moving the screen which holds the paper. Two tongue-and-groove boards, cleated together so a third board can slide between them, make up the stationary part of the stand on which the enlarging camera is mounted. The plywood screen or easel is fastened to the movable board with a pair of stiff hinges, which allows the paper to be tilted to correct distortion. The paper can be fastened to the easel with thumbtacks or rubber bands.



Roll film will usually slip into a tank reel more easily if the film is given a slight reverse bend about  $\frac{1}{4}$  in. from the end.



Basic light

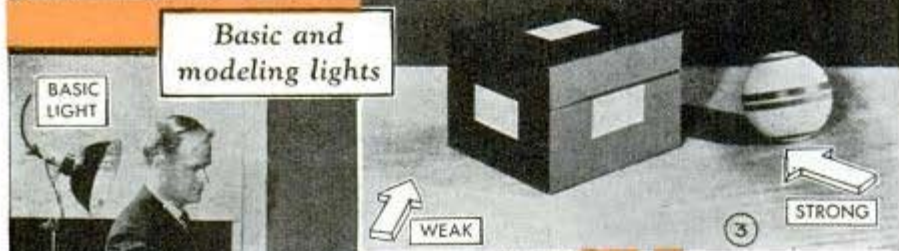
①

# Good Photos

by  
Thomas P.  
Lake



Basic and modeling lights



BASIC LIGHT

WEAK

STRONG

③



④

MODELING LIGHT

STRONG

⑤



Basic modeling and backlights

WEAK

STRONG



BASIC LIGHT

MODELING LIGHT

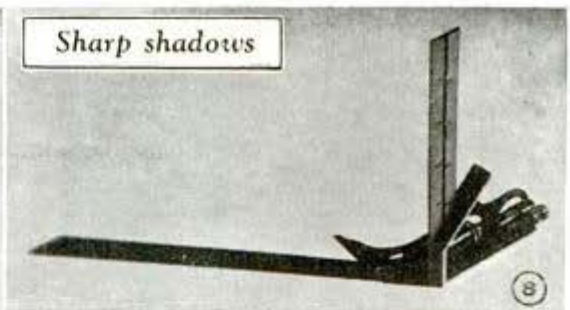
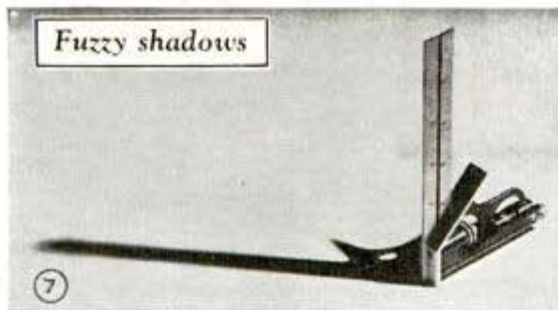
BACKGROUND LIGHTED

⑥

A basic light, which is located near the camera, illuminates the three visible surfaces of the box about equally. To make one surface predominate, you use a modeling light. Sometimes even two modeling lights are employed, on opposite sides and with one subordinated to the other. Notice how the dark background was lighted to provide contrast with the subject photographed by using a backlight

ONE of the amateur photographer's toughest problems is to take good pictures of mechanical objects. Most of the time he finds himself with photographs that show large black areas where there should be many details; a background that merges confusingly with the object itself; the major emphasis thrown on a minor point; a cluttered-up setting or some other defect. Most of the common defects in mechanical pictures can be avoided by proper lighting and good arrangement.

Although daylight may be used, mechanical objects lend themselves best to photography by artificial light. The cameraman should have a half dozen inexpensive floodlamps, No. 2 preferred, plus suitable clamp-on sockets with reflectors and a couple of adjustable



# of MECHANICAL OBJECTS

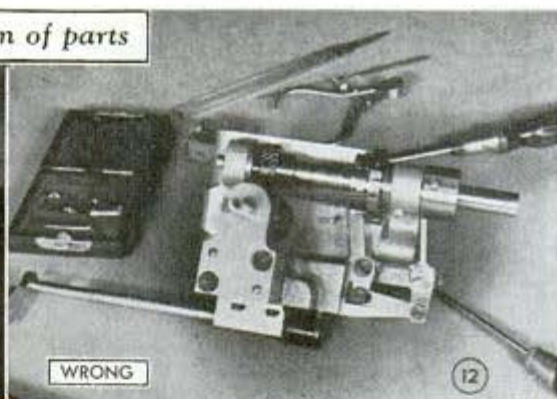
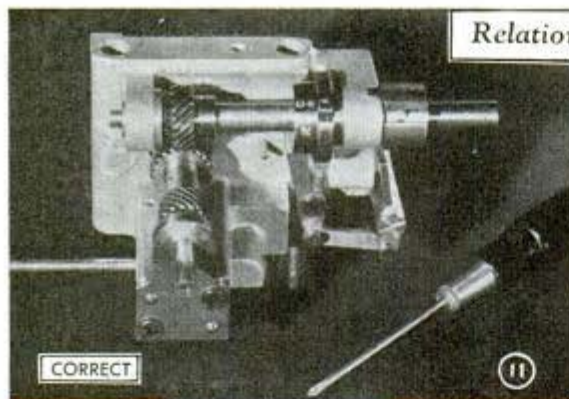
stands. Three lights are generally enough, but sometimes four or five are required. The first step in lighting is illustrated in Fig. 2, which shows a light near the camera. This is a "basic" light as it illuminates about equally the three surfaces in range of the camera lens. Fig. 1 shows the result of such lighting. Note that the various surfaces of the box are all about the same tone of gray. An improvement is shown in Fig. 3, taken with a basic light and a second or "modeling" light as shown in Fig. 4, placed comparatively close to the object. Its relative position makes this light the stronger. It is called a modeling light because it brings out contour and gives relief to an object. You will observe that one side is considerably lighter and contrasts with the other two sides that are visible. The best position for the modeling light must be determined by experiment for each picture. Some subjects require a second modeling light on the opposite side. In this case, however, one must be subordinated to the other by using a smaller size bulb or by placing it at a greater distance. Another step in lighting is to produce contrast between the object and the background by careful use of a "backlight" placed as shown in Fig. 6. The result, Fig. 5, has a much lighter background than either Figs. 1 or 3.

After arranging the lights satisfactorily, the object is arranged to emphasize its purpose and bring out its particular features to the best advantage. This usually requires slight shifting of the lights, although their function is not disturbed. Where shadows tend to emphasize some portion of an object, control of shadows is important. Often a fuzzy shadow as the

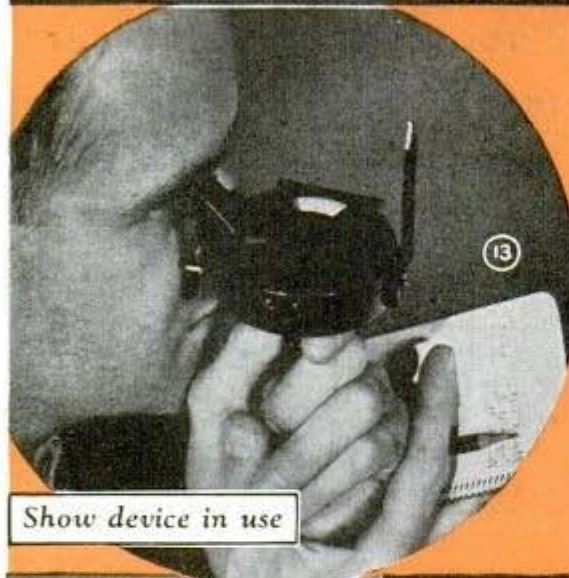


one in Fig. 7 is not desired, but a clear-cut shadow as the one in Fig. 8 is preferred. When such a sharp shadow is wanted, you can use a card with a small hole in it. This is held in front of the light as shown in Fig. 9. By varying the distance of the card from the light, and altering the size of the hole, a wide range of effects is possible. Maximum softness of shadows is obtained by holding a small disk to shield the light, allowing the illumination on the object to come from the light reflector.

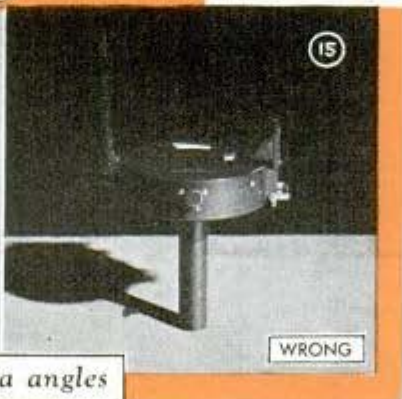
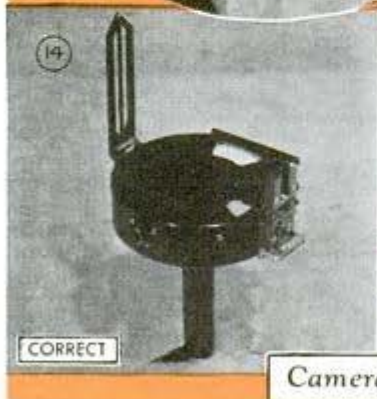
Very often it is desirable to show small objects with something familiar to provide



Relation of parts



Show device in use



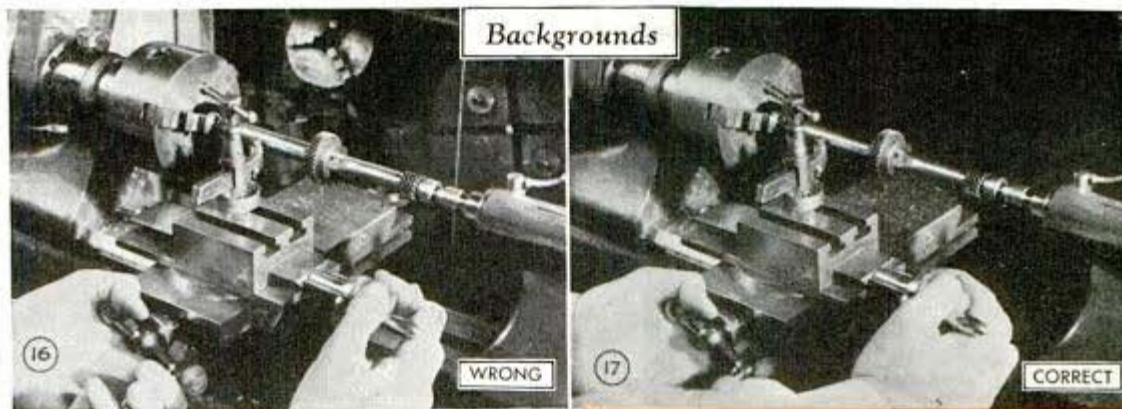
Camera angles

a clue to size. In Fig. 10 an assembled unit and its parts are shown with a 6-in. scale which effectively suggests the size of the parts. In addition to a scale, a pencil, watch or other familiar object can be used. Or, if the object can be held in the hand, this is often a good clue to size besides providing a touch of animation on an otherwise "dead" object. Mechanical objects are usually pictured to show various parts in their relative positions. This aim is attained by the position of an object and the

angle at which the camera is set. Note how nicely the relation of the gears are shown in Fig. 11, which makes the operation of the device quite obvious. This effective presentation is lacking completely in Fig. 12, and other objects in the photo detract considerably from the featured device. In pictures of this kind, where the high camera angle excludes a vertical background, the backlight is usually directed on the objects from above and from the opposite side. This often provides revealing highlights and also serves to fill in shadows that otherwise would be too dark. In Fig. 11 the lighting brought out the device in contrast with the background, and individual parts were carefully highlighted and shadowed to bring them out in bold relief.

To bring out the purpose of a device, the method of using it, and its relative size, an action pose like that in Fig. 13 has distinct advantages. For a detail photo of the device itself and its component parts, a high camera angle over it gives excellent results as in Fig. 14. However, in this case, a low camera viewpoint, resulting as in Fig. 15, tends to obscure the parts of the device. Also, sharp shadows and lack of contrast between the background and the object, make this photo of very little value.

It is often somewhat of a problem to photograph a large object with many shadows, and shiny parts. The shadowed portions require long exposures to obtain good detail, yet a long exposure allows halation to



conceal the details of bright areas. The best way to meet this difficulty is to lightly daub the bright spots with modeling clay before making the exposure. This procedure lays a thin coating of clay over the surface and reduces reflections. See Fig. 18. One photographer of glassware, dips the glass objects in milk and the resulting film, when dry, is just enough to eliminate bright reflections. Sometimes a fly-spray gun is of great convenience in applying milk to portions of objects too large for dipping.

In making pictures around machines, a large sheet of gray cardboard is excellent for use as a portable backdrop. Fig. 16 illustrates a confusing background which often results when the precaution of using a backdrop or screen is overlooked. Fig. 17 shows the same machine against a uniform



backdrop that concealed unwanted scenery. A backdrop or screen may be black on one side and white on the other, which gives opportunity to obtain contrast with devices to be photographed.

## Parts of Enlargement Are "Burned In" With Flashlight

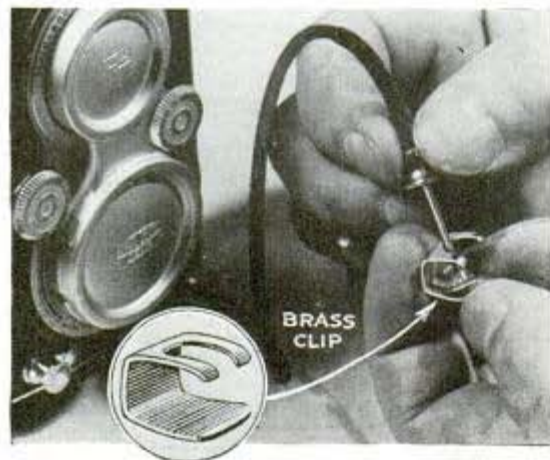
When large portions of an enlargement must be "burned in" (made darker), it is sometimes easier to use a small flashlight than to darken the areas with light from the enlarger. The danger of heat from the prolonged exposure crinkling the negative also is eliminated. Use a small pen-type flashlight and if a very narrow beam is needed hold a piece of black paper with a small hole in it over the lens.

### Test for Short-Stop Bath

The condition of the acetic-acid short-stop bath can be determined by placing a piece of blue litmus paper in it. If the paper turns red, the bath is still good. If the blue color of the paper does not change, it means that the acid has been neutralized by alkali carried over from the developer and it should be renewed.



## Clip Holds Camera Shutter Open For Time Exposure



If your camera has no provision for setting the shutter at "time," you can use the metal clip shown here on the cable release when you want the shutter to remain open for a considerable length of time. This is often necessary when checking the focus-

ing scale or view-finder of the camera. The clip is a strip of thin brass with a notch filed in one end and bent to a U-shape.

## Dish Cover Protects Reflector

An oiled-silk dish cover will protect the polished reflecting surface of your flash reflector and make it stay bright longer. Just slip the cover over the reflector as shown each time you finish using it. Larger covers of the same type can be used on photoflood reflectors.



⚠ Never use ordinary red or orange glass for a darkroom safelight without testing it carefully to make sure it will stop all undesired light rays.

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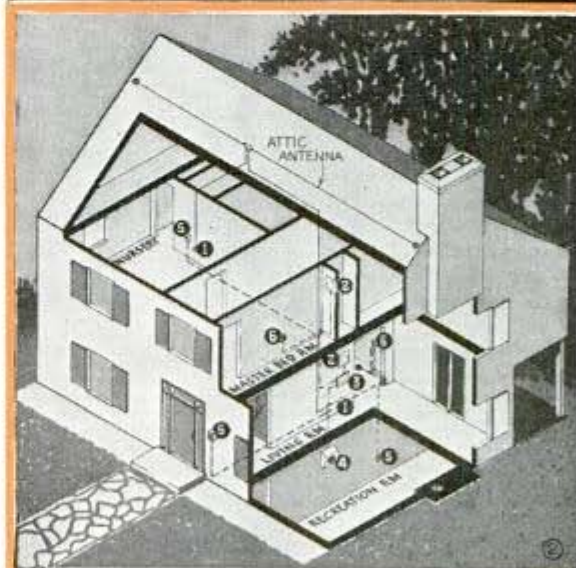
# RADIO



## Installations In New Homes

**B**UILT-IN master control radio wiring is practical in small homes and should be included in the plans and specifications before construction is started. The cutaway plan shown in Fig. 2 makes broadcast programs available in three principal rooms, and a second branch outlet from the multiple antenna system provides for a separate receiver in the nursery.

The system illustrated includes inter-room communication equipment consisting of two separate circuits, each with one master station and remote stations for 2-way operation. A standard 11-tube radio tuner chassis and speaker are mounted in the living room wall and extend through so that the back of the equipment is accessible from the basement stairway behind the wall. Extension speakers with individual volume controls and suitable load pads are located in one of the bedrooms and on the wall in the recreation room. The key numbers in Fig. 2 are identified as follows: (1) antenna outlets; (2) speakers in walls; (3) radio tuner; (4) speaker on wall; (5) remote intercommunicator and (6) master communicator.



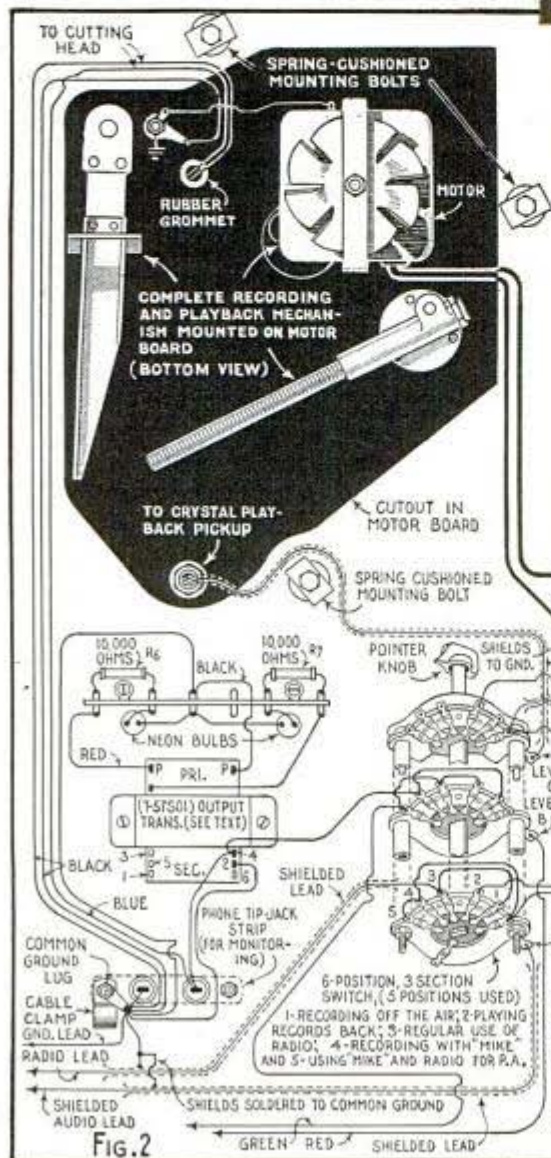
Other suggestions for home builders are illustrated in photos 1, 3 and 4. Photo No. 1 shows one section of a row of wall cabinets which houses an all-wave radio, loud-speaker and automatic record changer. Photo 3 is a 3-compartment wall niche, the upper sections of which are provided with outlets; photo 4 shows how an extension telephone niche may be employed for the installation of a combination midget receiver and inter-call system if desired.



# WORKS WITH RECEIVER

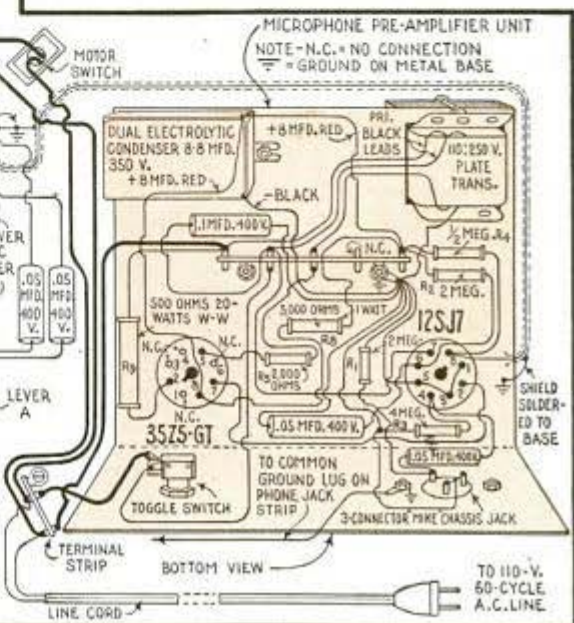
crophone and using the microphone and radio-set amplifier for a public address system if desired. Fig. 2 shows the various parts in their relative positions and all wiring details; the actual assembly arrangement under the motor board is clearly indicated in photo B.

Two inexpensive "Littelfuse" miniature neon bulbs provide a highly useful volume indicator to show correct volume setting when recording. Facing the controls, see photo A, the neon bulb on the left should flicker all the time during



the recording operation; the one on the right, however, should never be permitted to glow as this indicates overcutting. When wiring the pre-amplifier, which is assembled on a metal base, the dimensions of which are given on underside view photo D, no particular precautions are required except to keep the leads as short as possible. The tube filaments are wired in series and a 500-ohm, 20-watt resistor is used to drop the 110 volts to the required voltage for the filaments; make well soldered connections at all points. No sockets are used with the

(Continued to page 180)



Use 4/24/42

# Complete Six-Tube Two-Band Kit Receiver



DESIGNED for easy building at low cost, this six-tube a.c.-d.c. superheterodyne receiver includes many of the latest features such as push-button tuning; built-in loop antenna; automatic volume control; 2½ watts output; phono connection strip and variable tone control.

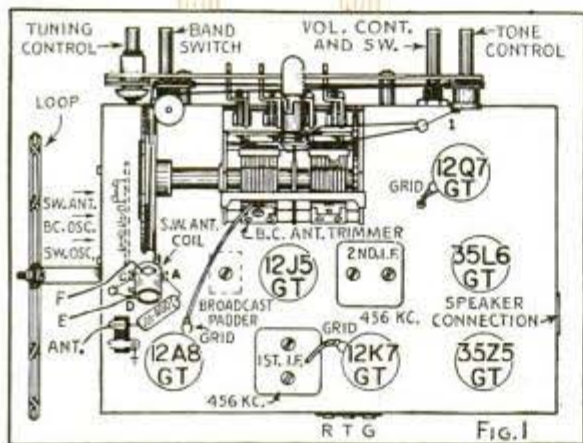
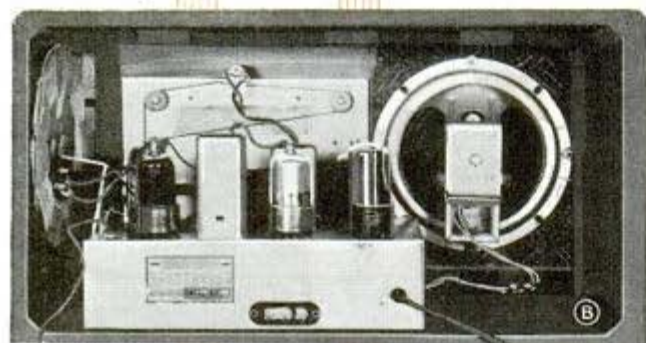
The tuning range covers the standard broadcast band from 535 to 1,720 kilocycles, and the 5.65 and 18.3 megacycle band for foreign and domestic short-wave stations. Push buttons permit quick and easy selection of any four favorite stations. These automatic push buttons are of the mechanical tuning variety and are easily adjusted with a small screwdriver from the front by simply removing the plastic knobs, loosening the screws under

each knob, and tuning in the stations selected by means of the manual tuning control. The knob is then held to prevent the condenser from turning while the lever is depressed and the setscrew tightened. This is one of the simplest methods now in use.

Multi-purpose tubes of the following types are employed: 12A8-GT, 12J5-GT, 12K7-GT, 12Q7-GT, 35L6-GT and 35Z5-GT. The tube heaters are wired in series with a suitable dropping resistor. A 6½-in. PM dynamic-type speaker is employed; the punched and drilled chassis base shown in Fig. 1 is supplied ready for mounting the various parts in the positions indicated.

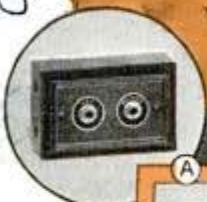
The connection strip marked R, T and G on the diagram permits separate use of the audio amplifier portion of the receiver. On the broadcast band the use of the loop antenna alone is claimed to produce excellent results. For reception at great distances, especially on the short-wave band, provision is made for connecting an external antenna.

All wiring diagrams and instruction sheets are included in the complete inexpensive kit now available to students and experimenters. Photos A and B show front and rear views of the completed assembly.



*Practical Radio, Inc. 5205 Cedar Ave. Cleveland Ohio*

# Practical RADIO SUGGESTIONS

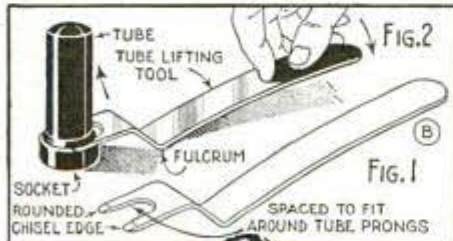
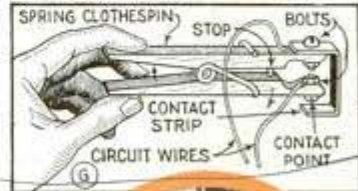


(A) Up to 20 pairs of earphones are supplied by this code-practice oscillator for group instruction; unit also includes a built-in magnetic speaker. Small outlet boxes provide a convenient means for terminating key and phone connections at each operator's position

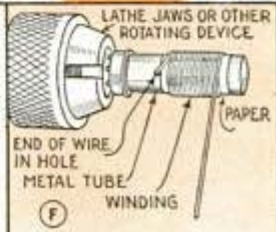
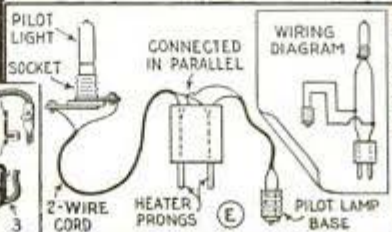
(D) Dish-shaped baffle on microphone permits changing directional characteristics and reduces feedback; the reflector is held in place with a small thumb screw



(G) Spring clothespin with contacts and stop makes temporary-contact switch to test experimental circuits; (B) Figs. 1 and 2 show details for tube puller made from metal strip 8 in. long and 1 1/4 in. wide



(C) One of the three phono adapters shown will enable you to connect a record player or "mike" to almost any radio; (E) Handy trouble light plugs into either a tube or pilot light socket in set; (F) Old metal tube makes good form for winding air coils; (H) Replace type-27 tubes with type-56 for better tone and increased volume



*Practical Radio Co. Camden N.J.  
S. W. Woodruff Co. 1428 N. Wells Chicago*

*J. J. van. Leiden*  
*6194 mesa ave*  
**Loud Speaker for F-M Receivers**  
**Has Wide Frequency Range**  
*to answer*



Especially designed for frequency modulation systems, this radio speaker is said to be so sensitive that it has the effect of adding approximately 1½ stages of amplification to any good receiver. Sound range runs from 30 to 10,000 cycles for efficient F-M reproduction. It is claimed to have very little distortion, and is uniform within 4 decibels, plus or minus, over its entire range; handles inputs up to 25 watts.

### Condenser and Coil Checker



This unit provides a means for testing condensers and inductances in the radio-frequency range under conditions that simulate actual operating conditions. For use on 110 volts a.c. or d.c., it comprises an oscillator covering from 60 kilocycles to 26 megacycles in 6 coil ranges, together with a frequency-matching indi-

*Lear Avia Inc*  
*Dayton Ohio*  
**Portable Two-Way Radio**  
 The dial on this compact unit is calibrated for frequency ranges and also in capacity from .0004 to 1 mfd.

### Portable Two-Way Radio

A 10-watt transmitter and a companion receiver, both housed in a single carrying case, operate in the 3,000-6,000 kc. band for communication between a ground station and aircraft.



### Universal Communications Set

Twelve tubes are employed in this highly efficient NC-200 receiver which uses an improved tuning and band-switching arrangement. Ten accurately calibrated ranges have individual dial scales. Six of



these ranges are of the general coverage type tuning continuously from 490 to 30,000 kc. There are four band-spread ranges for the 10, 20, 40 and 80-meter bands each spread out over the major portion of the dial scale. Single-control tuning, separate speaker, noise limiter and calibrated signal level meter are features.

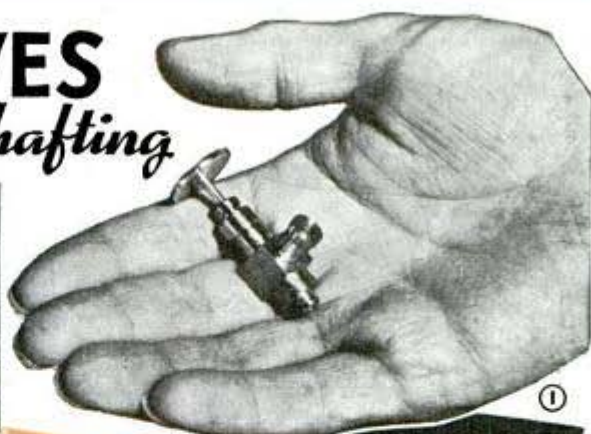
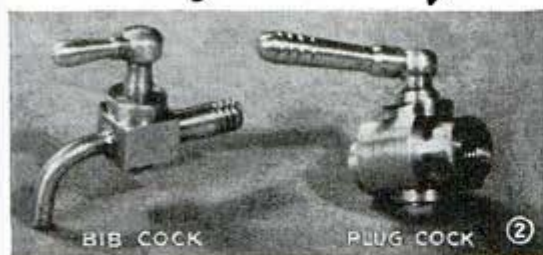
Blueprints covering simplified radio construction articles in this and past issues are available for 25c each. Many popular tested circuits to choose from. Original detailed parts lists with names of supply sources, can be obtained from Popular Mechanics Radio Department upon receipt of postage.

**NEXT MONTH—How to Build the Improved Little Giant "Pup."** This popular miniature 3-tube tuned r.f. receiver now uses the new high filament voltage tubes that eliminate the line resistor; has a 5-in. P. M. dynamic speaker and beam-power output of 1½ watts. Also—**A Low-Cost Multi-Vibrator Signal Generator**



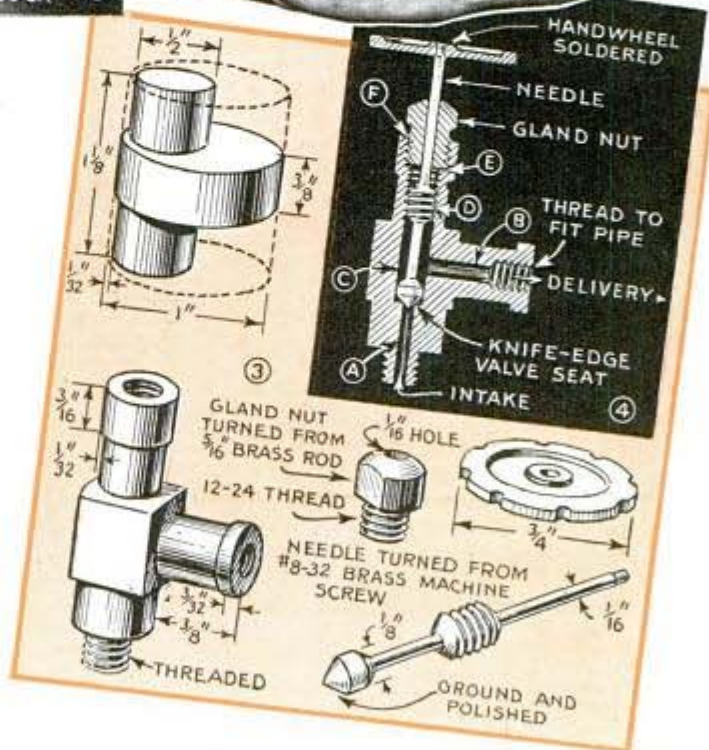
# SHOP NOTES

## MIDGET VALVES *turned from bronze shafting*



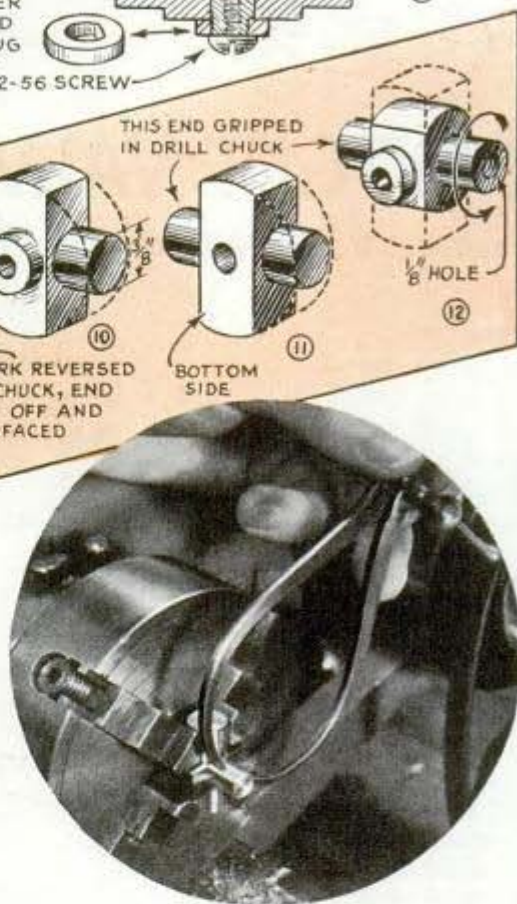
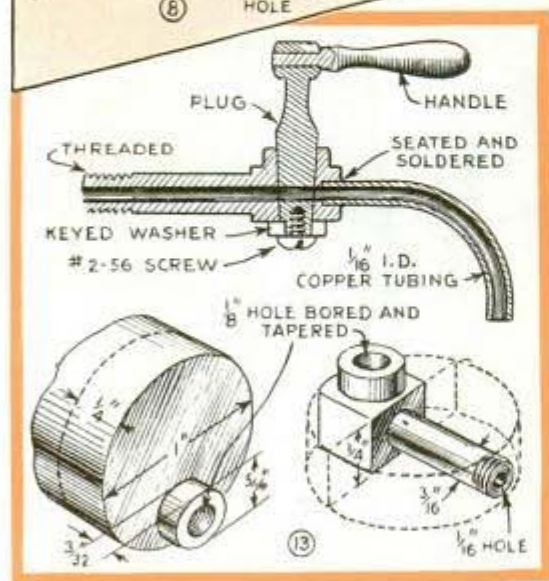
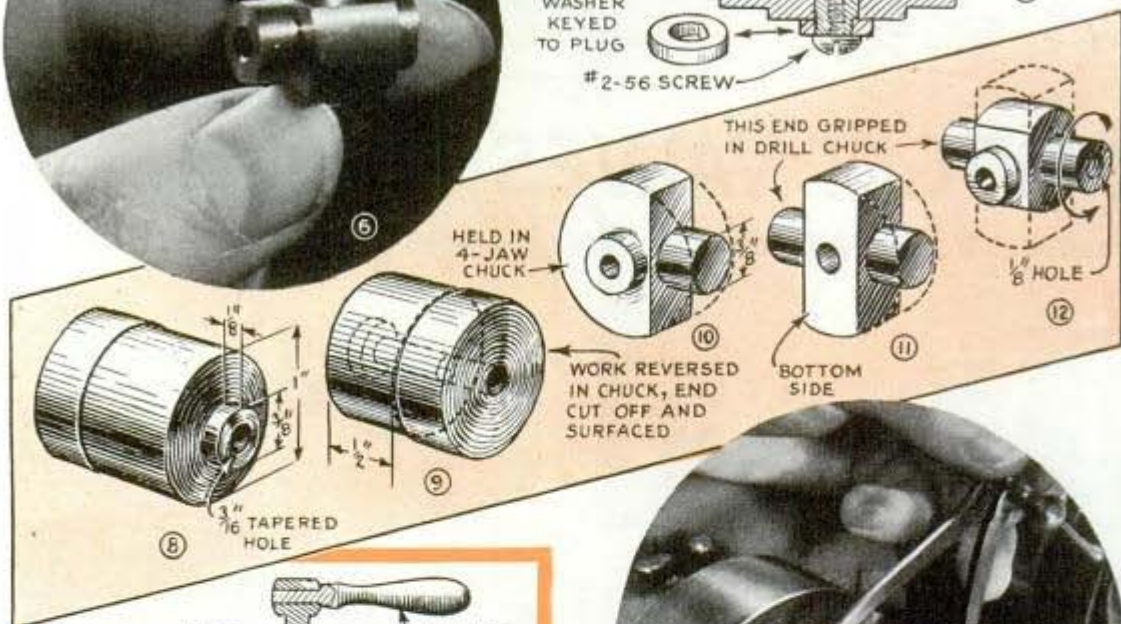
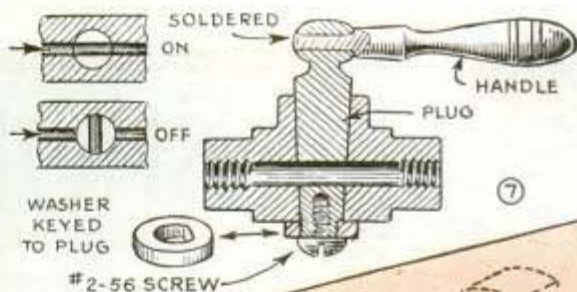
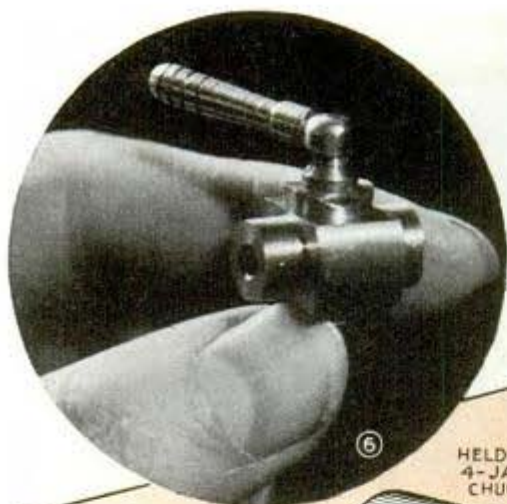
By Alexander Maxwell

MODELMAKERS and others who find it difficult to obtain stock valves to suit the scale of their working models, can turn them easily to the exact size desired from ordinary bronze shafting. The secret of shaping the body from a single piece of stock lies in the manner in which the work is placed in the chuck during the various steps in turning. Except for threading and tapping, which is done by hand, the tiny valves can be made complete on the lathe. Figs. 1 and 2 show three types which should fill most model requirements, the size of which can be modified to suit. The needle valve, Fig. 1, generally is used when comparatively high steam or air pressure is maintained. Referring to Fig. 3, a piece of 1-in. bronze is chucked so that the  $\frac{1}{2}$ -in. ends may be turned off center as shown. A four-jaw chuck is used to hold the work while turning one end, after which it is held in a drill chuck to turn the opposite end. Then, from the remaining center portion the delivery end is turned, the work being



### (5) Boring Procedure

- A— $\frac{1}{16}$ -in. hole through body for intake
- B— $\frac{1}{16}$ -in. hole through side for delivery
- C—Counterbore  $\frac{3}{4}$  in. deep with No. 29 drill
- D—Thread counterbored hole with No. 8-32 tap
- E—Counterbore (C)  $\frac{3}{16}$  in. deep—No. 16 drill
- F—Thread for gland nut with No. 12-24 tap

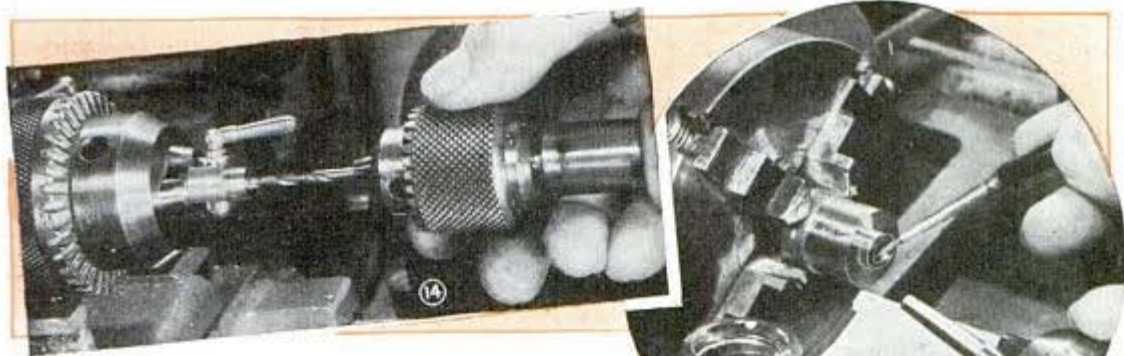


12. First the end is faced as in Fig. 8, after which a tapered hole is provided through the center. For tapering the hole, a suitable tool can be made from a length of  $\frac{1}{4}$ -in. drill rod by grinding away one side as indicated in Fig. 16. The hole is reamed by hand until tapered perfectly. At this stage the plug of the valve, Fig. 7, can be seated. As the plug must be made of material which is softer than the seat, it is turned from brass and lapped in the tapered hole with fine emery and oil before being cut to length. This operation is shown being done in Fig. 15. With the tapered plug chucked in the tailstock of the lathe, fine emery is applied in the hole to start and the plug is advanced. After this, rottenstone and rouge are used to give a high polish. Continuing the turning, the work is reversed in the chuck and faced to length, Fig. 9. Then it is held at the edge in

chucked in the position shown in the photo below Fig. 11, and finally the sides are filed square at the center. From the section view in Fig. 4, you can see the position of the needle and the gland nut in the body. Fig. 5 gives the order in which the holes are drilled, counterbored and tapped to receive these parts. The seat may be ground to a knife edge by using fine emery under the end of a drill rod. No packing will be necessary in the valve, providing the threaded parts make a fairly wringing fit.

The plug cock in Fig. 6 is turned to shape by following the steps given in Figs. 8 to





the position shown in Fig. 10 and the end is turned. After this, it is held in a drill chuck to do the remaining machining indicated in Figs. 11 and 12. When the plug is keyed in place as detailed in the sectional view, Fig. 7, a  $\frac{1}{8}$ -in. hole is bored centrally through both parts as in Fig. 14.

Similar facing and lapping operations are required in making the bib cock detailed in Fig. 13, the principal variation being the copper spout which is seated in the counterbored delivery end of the valve.

TAPER  
GROUND HALF  
AWAY TO MAKE  
CUTTING EDGE



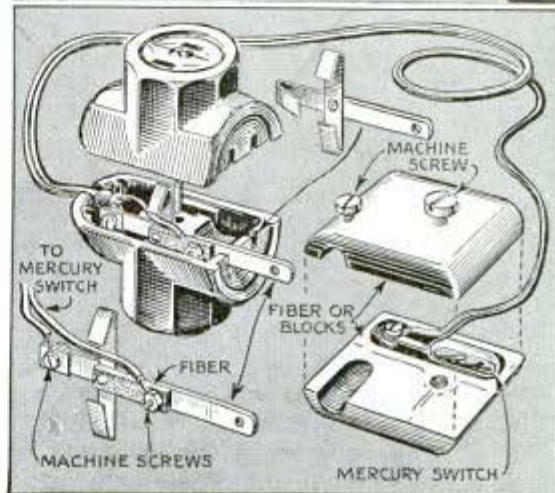
$\frac{1}{4}$ " DRILL ROD WITH 2° TAPER TURNED ON END

By filing away part of the waste indicated by the dotted lines, less time will be required to turn the intake end to size.

## Time Switch to Control Appliances Fits on Alarm Clock

This switch, which will enable an alarm clock to turn on or off your radio or any other electrical appliance in the home at a predetermined time, can be made for a few cents. All you need is a mercury switch, a small block of fiber or plastic and a three-way outlet plug. The latter is altered as shown, after which the fiber or plastic block is split in half and recessed to take the mercury switch. In use, the switch is clamped to the alarm key of the clock, and the plug is inserted into a wall outlet, the appliance to be controlled being connected into the altered plug. It is a good idea to solder a stop pin on the back of the clock to stop the key when it has turned sufficiently to tip the mercury switch and open or close the circuit, whichever is desired. Resetting the switch is just a matter of turning the alarm key back to its original position.—Banks Wannamaker, Chicago.

**TELL YOUR FRIENDS** through the medium of *Popular Mechanics* just how you solved that little tricky problem encountered in your home, work or hobby. Money and labor-saving ideas, shortcuts to do things quickly and more efficiently, wrinkles that others will appreciate knowing—that is the kind of information we try to pass along on these pages. Just send us a clear sketch or photo with a brief description giving the essentials. For those ideas that are suitable we will send you a check and return those not acceptable. Address Homecraft Editor.



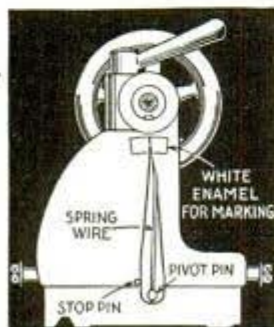
## Cutlery Handles Notched to Hang On Wire Above Work Tables



A cook in a restaurant notched all of the handles of his cutlery so that they could be hung on a wire stretched within easy reach above his work tables. In this way, the articles were always at hand without taking any space on the tables. The notches should be cut so that the knives will hang with their cutting edges toward the wall, or away from the worker.

## Indicator for Setting Tailstock Of Lathe at Zero Position

After turning a taper on work by means of the tailstock setover method, you can move the tailstock back to align the centers without loss of time if this indicator is used. It consists of a sheet-metal pointer pivoted to a pin in the lathe bed, and a length of spring wire, which is fastened rigidly in the pin and wrapped around the pointer. The



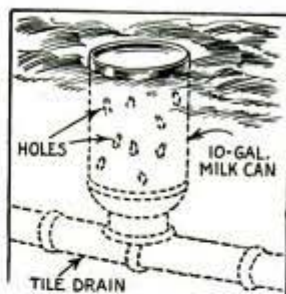
wire causes the pointer to bear against a stop pin in the tailstock so that the pointer follows the pin regardless of its position. After aligning the centers perfectly, mark the position of the pointer end on the tailstock with white enamel. Then if the tail-

stock is moved, just move it back to bring the pointer to the mark and the centers will be in alignment.

—Emil Wittman, Philadelphia, Pa.

## Tile Drainage of Compact Soils Aided by Perforated Cans

Although his land was well tiled, one Indiana farmer found that it often required several days for water to leave his fields after a heavy rain because of the compact condition of the soil, which retarded passage of the water to the tile underneath. After experimenting, it was found that old milk cans inverted over joints in the tile solved the problem by permitting the water to reach it quickly. The cans were perforated, and one can to each 30 to 40 rods of tile was found to be sufficient.

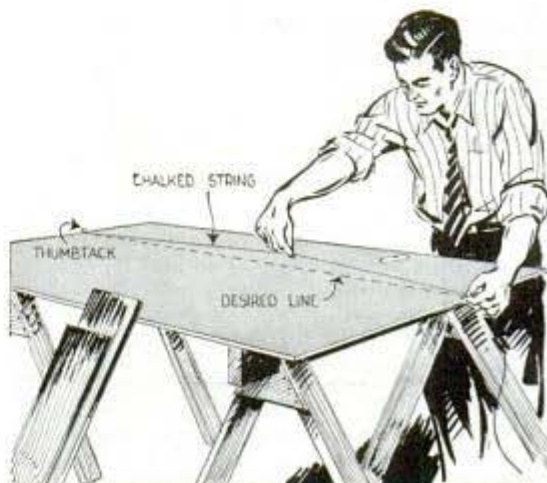


—Simon M. Schwartz, Berne, Ind.

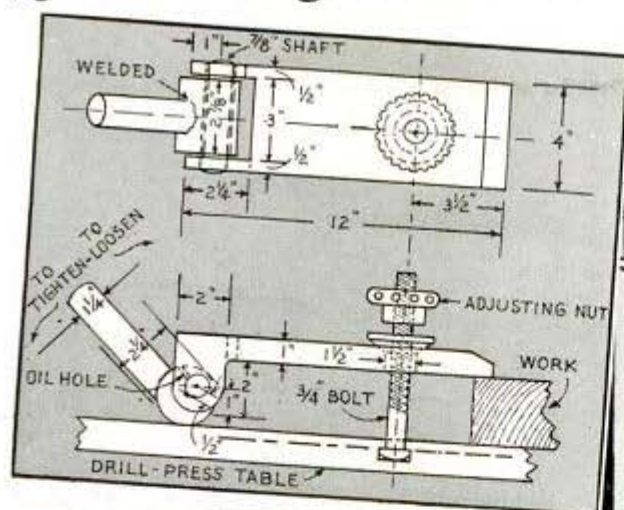
## Lines Made on Large Sheet Stock With a Chalk Line

Instead of trying to use a straightedge in marking large plywood panels and other building materials that come in large sheets, use a chalk line. You can save time, and the line can be made just as accurately, if care is taken and the line held taut while snapping it to make the chalk impression.

—Peter B. Horsley, Calgary, Alta., Can.



# Quick-Acting Drill-Press Clamp Speeds Work

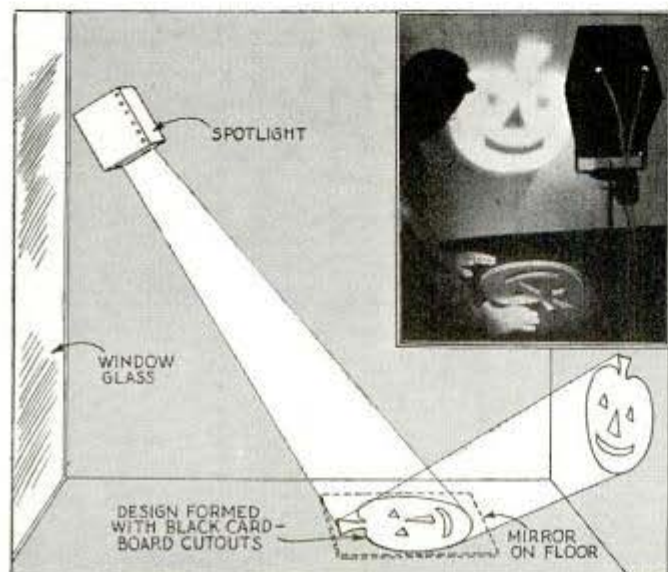


In shops where jobs consisting of many small pieces of the same or nearly the same thickness have to be drilled, this clamp will save time as it is closed or released by simply moving a handle. Also, it saves time when drilling a number of holes in line in a long piece of work. Cold-rolled steel will serve for making the clamp.

# Seasonal Window Trimming Done by Reflected Images

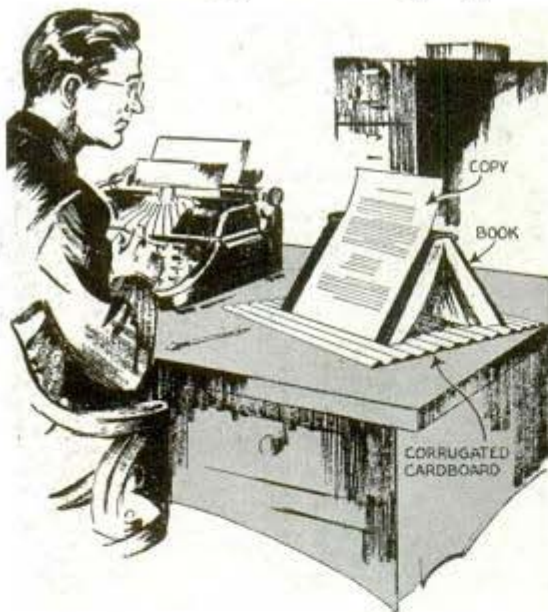
Pumpkins, cats, witches, reindeers, Santas and bunnies are only a few of the seasonal decorating motifs possible through the use of this window trimmer's trick. A mirror and a spotlight are all that are required in the way of equipment. Simple cutouts of black cardboard are used to form the figure or design desired. These

are arranged on the surface of a mirror laid on the black-covered window floor. The pattern thus formed is reflected upon the white backdrop when the beam from the spotlight is focused on the mirror. It is not necessary that the spotlight be located directly in line with mirror and its image. It may be placed over to one side, concealed behind a drape or some piece of decoration. In this case, the cutouts forming the design on the mirror can be arranged in such a manner that their relative positions will correct the distortion caused by placing the spotlight out of line. Ideas may be worked out with a flashlight and a small mirror. Use of tinted mirror glass or filtering the spotlight beam produce designs in color.



Greasy concrete can be cleaned by scattering trisodium phosphate thickly on the spots and then sprinkling with just enough water to dissolve it. After waiting an hour or more, scrubbing with water will remove the spots.

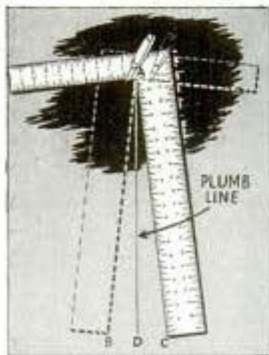
## Corrugated Cardboard and Book Hold Copy While Typing



A holder for copy while typing can be improvised from a book and a piece of corrugated cardboard. Just open the book as indicated and place it on the cardboard with the edges of the book cover resting in two of the corrugations. The copy leans against the book with the lower edge resting in one of the corrugations to keep it from slipping.

## Steel Square Used as Plumb Bob

You can use a steel carpenter's square as a plumb bob as follows: Stick a knife blade in a vertical wall or board with the cutting edge upward. Then hang the short side of the square on the blade 1 in. from the inner corner, so that it swings free. Wait until it stops swinging and then draw line AC. Now reverse the square to the opposite side of the knife, moving the latter so that the inner corner of the square is exactly at the beginning of line AC with the blade on the 1-in. mark. Then draw line AB. Divide these lines in half at the lower end and draw line AD. Next move the square on the knife blade until the inner edge



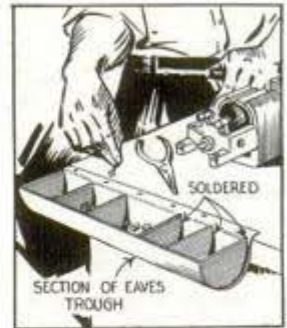
coincides with line AD. At this point nick the edge of the square slightly with a file. The long side of the square will always hang in a true vertical position if the nicked edge is placed on a knife blade.

coincides with line AD. At this point nick the edge of the square slightly with a file. The long side of the square will always hang in a true vertical position if the nicked edge is placed on a knife blade.

—Thomas T. Hersey, Mitchell, S. D.

## Small Parts Tray on End of Bench Handy for Dismantling Work

Mechanics and others who dismantle motors, magnetos and similar work will find this partitioned tray just the thing to receive screws, nuts and other parts as the work progresses. The tray

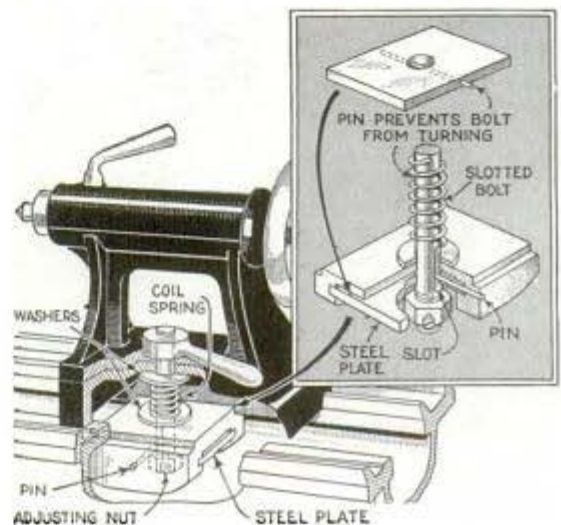


is a length of eavestrough with several partitions of sheet metal soldered in place to divide the trough into compartments.

—Charles Conrad, Grand Rapids Mich.

## Quick-Acting Tailstock Clamp Saves Time on Bench Lathe

On small bench lathes that are equipped with a tailstock clamping arrangement that requires the use of a separate wrench, this assembly will save time as a half turn of the handle nut loosens the tailstock so that it can be adjusted. First recess the steel block that rides under the lathe ways to take a flat piece of steel, drilling this piece and the tailstock for a new clamping bolt. Thread one end of this bolt for an



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adjusting nut. Run a coarse thread on the other end for a handle nut, which you can make. Next, slot the bolt where it passes through the steel piece and run a pin through the plate and bolt. This is to keep the bolt from turning when in use. Now assemble the clamping bolt as shown, placing a coil spring over it between the tailstock and the block under the ways. With the handle nut turned to the left as far as possible, run up the adjusting nut to tighten the tailstock and key the nut with a cotter pin. Then turn the handle nut to the right as far as possible and you will find the tailstock can be moved along the ways easily.

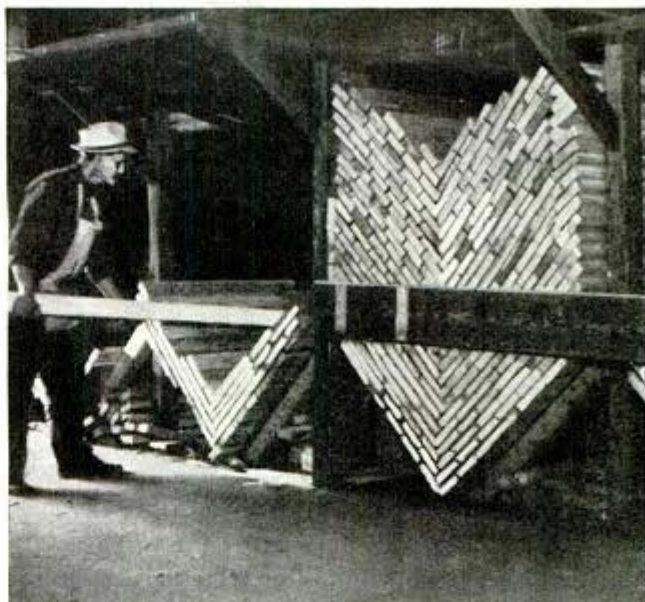
### Ladder on Sloped Ground Held by Spade Anchors

Possibility of a ladder slipping when set on a sloping surface, was avoided by a painter who fitted these sliding anchors at the lower ends of the side rails. The anchors are made of flat iron and slide in rings or loops screwed to the ladder. The rails should be planed to a slight taper so that the anchors will bind and stay in place when pulled up. They are forced into the ground with the foot.



AUGUST, 1941

### Lumber Piled in V-Bottom Bins Has Less Tendency to Warp

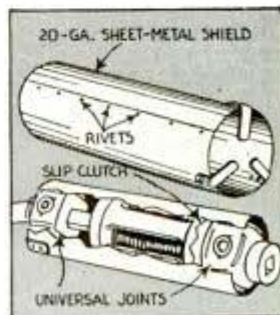


To save time in piling lumber and to help prevent it from warping, one company stores it in bins with V-shaped bottoms. Because of the angle at which the lumber is piled, it tends to slide into place as each piece is laid up. Also the tendency of each piece to slide downward makes wedging unnecessary to prevent warping, especially after some of the pieces have been removed. A piece nailed temporarily across the front of the bin aids in lining up the ends of the boards to make a neat pile.

—Opie Read, Jr., Chicago.

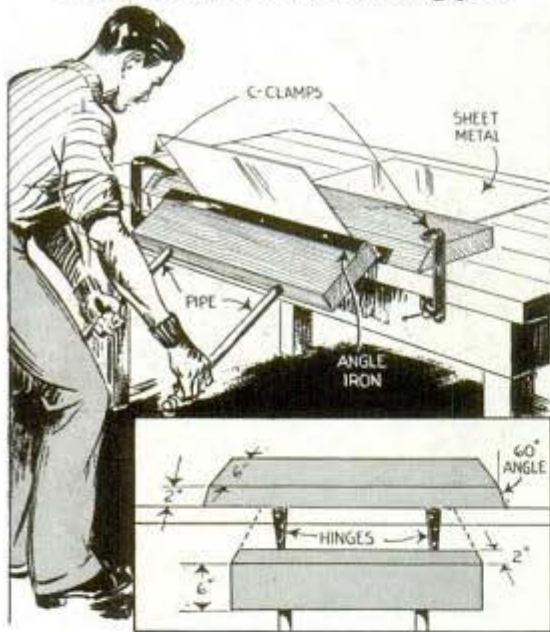
### Power-Take-Off Unit of Tractor Shielded by Metal Tube

Danger of workmen catching their clothing in universal joints and slip clutches of tractor power-take-off units, can be avoided by using shields of the type shown. These are neat, and they rotate with the units, but are so attached that should the clothing be caught in them they will slip on the units so that the clothing will not be wound up. Made from sheet-metal, the shields are merely sleeves that slip over the units where they are held at the ends by tabs, which are bent down against the units.



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## Small Sheet-Metal Brake Handles The Occasional Bending Job

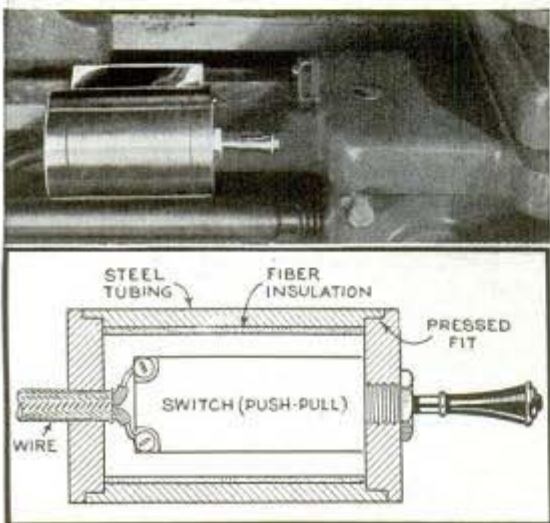


Home owners, merchants and others who have only an occasional job of bending sheet metal will find that this simple brake fills their needs. It is made from 2 by 6-in. wood and clamps to a workbench. The bending faces of the brake are lined with iron, and pipe handles enable you to exert sufficient leverage on the work.

—Homer Sweany, Beech Grove, Ind.

## Lathe Carriage Operates Switch At Predetermined Point

Instead of standing beside his lathe all the time while turning long work in order to stop the motor or swing the carriage



back when the end of the work was reached, one operator used a limit switch, which was operated by the carriage. This permitted him to do other work while the cut was being made. The switch is made as shown in the detail, and is clamped to the ways so that it can be moved to any point along the ways as required by the length of work.

## Barn Lantern Supported on Wire Reduces Danger of Fire

In a stable, haymow or any place about a barn where a lighted lantern is used there is a fire hazard, for even though one is careful it might be upset. To minimize this danger, a farmer strung a heavy wire at points in the stable and mow where



light was most needed. Round-eyed harness snaps were slipped over the separate wires before stretching them. In this way, the lantern can be suspended at any point where it is needed by simply hooking the bail into the snap.

## Rubber Lagging on Iron Pulleys Prevents Belt Slippage

Where a short belt runs from a large iron pulley to one of half the diameter or less, it is often difficult to overcome slippage on the smaller pulley. To avoid this trouble, a mechanic cuts a section of an old inner tube and stretches it around the outside of the pulley, as shown.



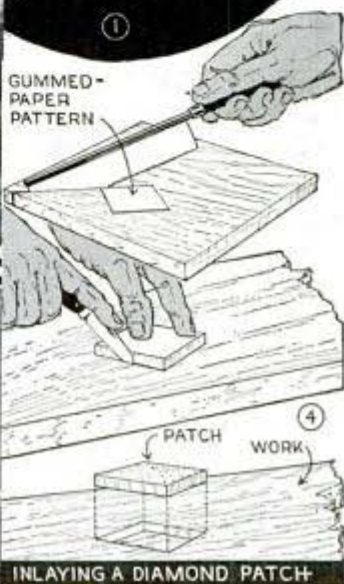
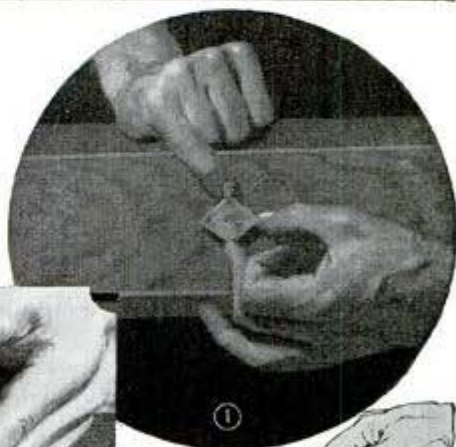


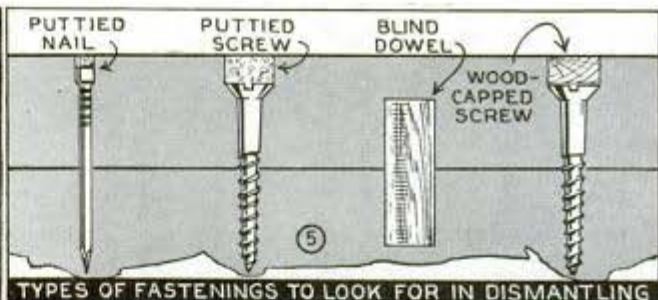
# Restoring ANTIQUE FURNITURE

By Robert Clarence Stahler

## PART I—Making repairs and removing old finish

**H**AVE you a piece of antique furniture that you would like to use in your home, but have kept hidden away because it needed restoring? Or, if you have none on hand, but would like an antique piece or two in your home, inquire among your friends or at used-furniture stores. From such sources, you can often pick up a piece for practically nothing that needs only minor repairing and finishing to restore its original beauty. With a few common hand tools, some shellac and varnish, any good craftsman can do this. If possible, before beginning work, inspect a genuine old piece that has never been refinished. Probably you will find minute marks and scars, and the finish will have



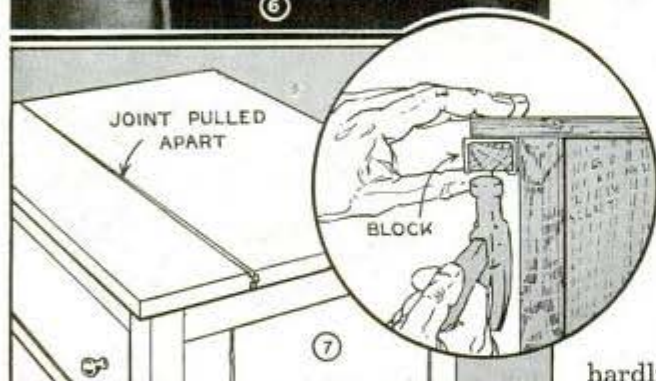


taken on a dull polish that only age and handling imparts. These indications of age should appear in your restored piece.

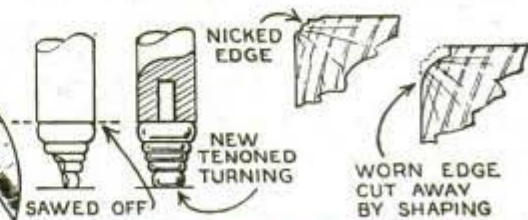
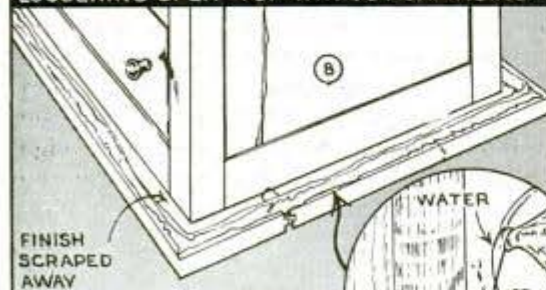
Begin by making all needed repairs before you remove the old finish. In this way, the new wood will receive the same discoloration as the old when finish removers are used. If possible, use old wood for the repairs as it will better match that of the antique piece. Old unrepairable pieces that you can pick up for practically nothing from used-furniture dealers will supply wood for this purpose.

Diamond patching, Figs. 1 and 4, is a good way to hide small holes and blemishes in flat surfaces. This consists of cutting out the blemish and then inlaying a diamond-shaped patch of wood to match the grain and color of surrounding wood. If the color cannot be matched, use a lighter shade of wood and stain it later. Do the work carefully and the patch will

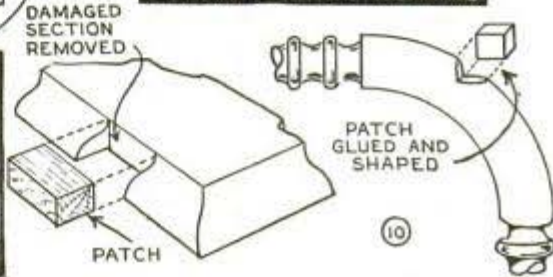
hardly be noticeable. Fig. 10 shows other ways of repairing nicks and gouges in shaped and curved surfaces, as well as renewing broken feet. Scarred edges of furniture legs are taken care of easily by



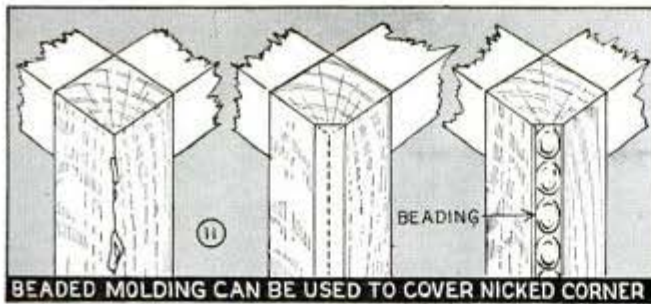
LOOSENING SPLIT TOP WITHOUT DAMAGING



SEVERAL SIMPLE REPAIRS





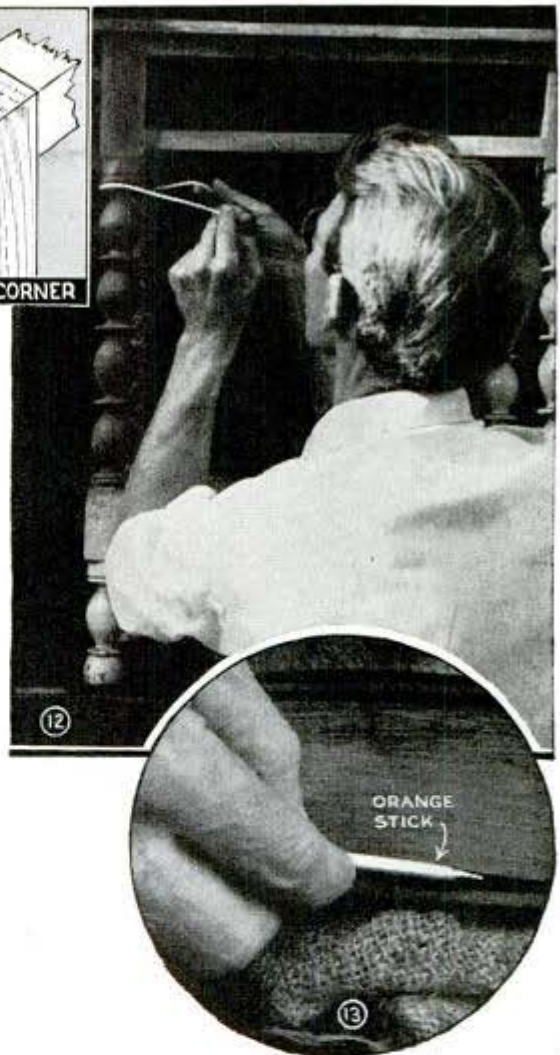


BEADED MOLDING CAN BE USED TO COVER NICKED CORNER

planing away the edge and then gluing on a triangular wood strip which is sanded down carefully to form a new edge. In some cases a beaded molding may be used as in Fig. 11, although this alters the original appearance of the piece.

Occasionally a split or spread top must be removed for repairing or regluing. Fig. 5 shows some types of hidden fastenings that you may encounter in such cases. If countersunk nails are found, these can be removed easily by using a diagonal-nose, side-cutting pliers as in Fig. 2. After making sure that all fasteners have been removed but glue still holds the top, loosen the top at the ends with a hammer and padded block as in Fig. 7. Do this carefully, holding the block across the grain, otherwise you may split the wood. After starting to loosen the top in this way, finish the job with a number of wedges driven progressively underneath it. However, if this method fails to loosen the top, you will have to soften the glue with water, as in Fig. 8. Invert the furniture piece and make a putty dam around the overhanging top to retain the water.

Wobbly pieces will have to be taken apart. Less resistance will be had if the pieces are stored in a hot, dry place for a few days—in an attic in summer or over a hot-air register in winter. This causes the wood to shrink and loosens the tight joints. Before reassembling the work, remove every trace of old glue. A cloth dipped in hot water is effective to clean the rung and stretcher holes of chairs. Use only the best glue, such as the new resin glue, and be sure to return the various parts to their original positions. Use plenty of clamps with pads under the jaws, to hold the parts tightly until the glue dries. If you lack these, rope tourniquets, Fig. 6, can be used on chairs if they are set on a flat surface, while an improvised clamp as in Fig. 16 will take care of flat work. In using this clamp, first put the work in it,

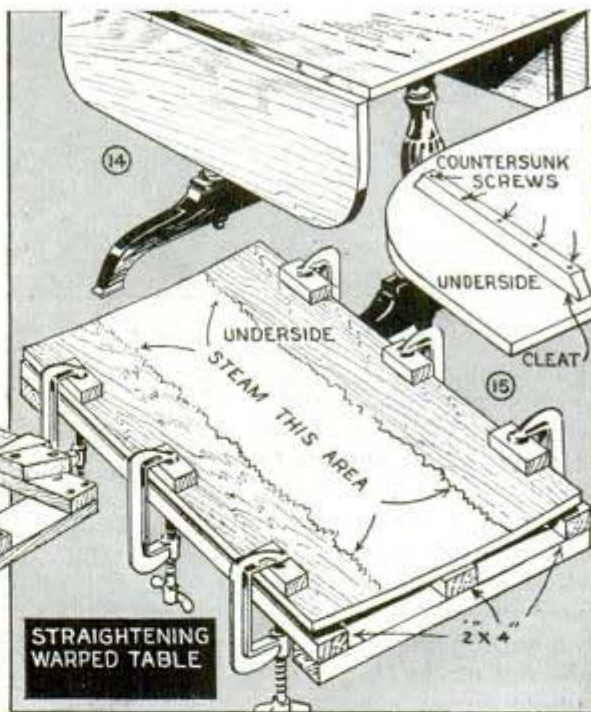
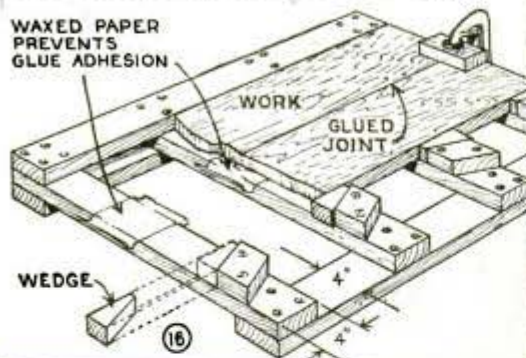


holding it down with a C-clamp. Locate and screw the wedge blocks to the cross members, allowing clearance to start the wedges. Then remove the work, apply glue to the joints, replace it in the clamp and pull up the joints tightly by driving the wedges between the work and the wedge blocks. All wet glue that oozes from the joints must be removed carefully as stain will not penetrate it after it dries.

If you are working on a drop-leaf table, the top or leaves are likely to be warped, Fig. 14. The usual cure by soaking them in water and then clamping them flat to dry is only a temporary cure as the warp eventually reappears. A more permanent method is shown in Fig. 15. The leaf is clamped in a frame and steamed slowly, using a hot iron and a damp cloth as when pressing a garment, Fig. 3, alternately wetting the cloth and ironing it dry on the wood. While doing this the clamps are slowly tightened at intervals until the leaf is

straight. It may take an hour of steaming to do this. When the leaf is flat, release the clamps a trifle, which permits the expanded wood to contract upon drying without danger of splitting, which might occur if the clamps were left tight. When dry, strips are screwed across the underside.

After all repairs have been made, except those in which stick shellac or plastic wood must be used as in Fig. 9,



The old finish is wiped off after softening it with varnish remover

the old finish is removed with the best grade of paint-and-varnish remover. Clean burlap is excellent for wiping off the loosened finish, Fig. 17. When as much as possible has been removed, apply clean remover to loosen the remaining traces. Then while the wood is still wet, wash off all traces of varnish remover with turpentine. However, naphtha or benzene can be used if sufficient ventilation is provided to carry off the fumes. It is important that all traces of varnish remover must be elimi-

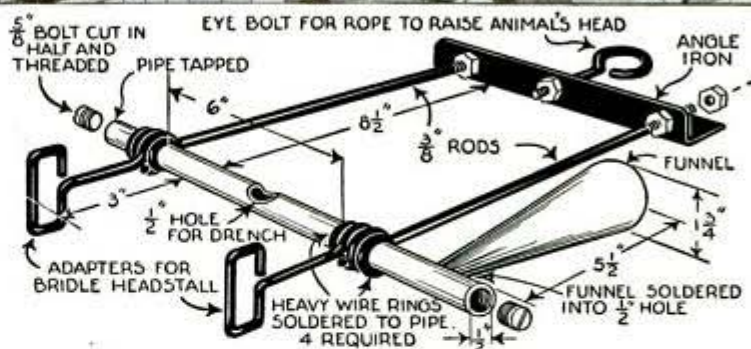
nated before any finish is applied; new finish will not dry over traces of remover even if this is dry. After thorough cleaning, the pieces are set in a warm, airy location but not in direct sunlight where they might warp. If some of the wood has a muddy tint or is too dark to match adjacent pieces, it may have to be lightly bleached. Bleaching solutions or powders can be obtained at a paint store or you can use a saturated solution of oxalic-acid crystals (poisonous) dissolved in water for moderate bleaching. It is often difficult to remove all traces of light colored enamels from open-grained wood, but after washing with turpentine, naphtha or benzene, proper filling to be described later, will cover these traces of enamel. Ink stains can usually be removed by means of a commercial ink-remover and mildew stains will usually fade under a bleach, but if they remain, you may have to resort to scraping.

Thoroughly cleaned work, when dry, is ready for sanding with No. 4/0 garnet paper, which should be rubbed with the grain. Crosswise strokes cause objectionable scratches. On turnings you can use narrow strips of fine emery cloth drawn back and forth in boot-black fashion as shown in Fig. 12, while steel wool is best for carvings. Also, to get into crevices, an orange stick, Fig. 13, flattened at one end will be handy.

(Concluded next month)

# Animals Drenched Safely With This Hollow Bit

With this bit, drenching of an animal is not difficult, and there is no danger of accidentally breaking off the neck of the bottle in its mouth. The drenching liquid is poured into a funnel at one end of the bit and flows through the latter and out of a hole in its center. The bit is  $\frac{1}{2}$ -in. pipe, which is tapped at both ends and stopped with plugs made by cutting off bolts and slotting the ends to take a screwdriver. Be sure that all joints are smooth, and all edges, corners and projections are rounded to avoid injuring the animal's mouth. After use, the bit should be cleaned and disinfected.

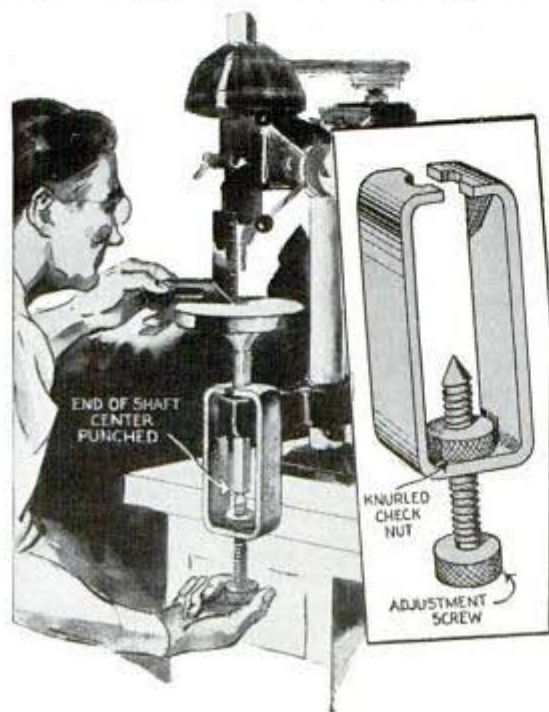


## Attachment for Fine Adjustment of the Drill-Press Table

Needing some method of raising and lowering the table of a small drill press to a very fine adjustment, I rigged up the attachment shown. Made of flat iron, it fits

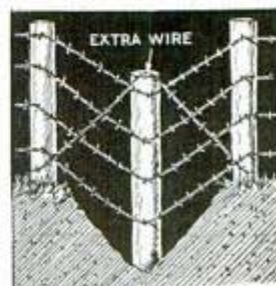
over the table support and is provided with an adjustment screw, which works in the centered end of the table standard, a check or lock nut being provided to hold the adjustment. In use, the clamping screw regularly provided on the drill-press table is released, and the table is raised or lowered by turning the adjusting screw of the attachment.

—Chas. H. Willey, Penacook, N. H.



## Anchoring Fence Post in Ditches

To anchor a fence post in a low spot or in the center of a drainage ditch where the fence wires might lift it when the ground becomes wet, a farmer uses the method shown.



The wires are strung in the usual manner, after which an extra piece of wire is stretched from the adjacent posts to pass over the top of the one in the ditch.

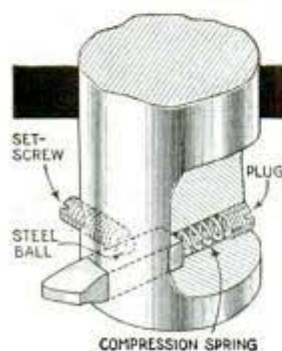
## Machine Screws Held in Vise To Cut or Thread Them



This jig will enable you to clamp machine screws securely while threading or cutting them off. Made from two pieces of flat iron or steel, the jig is assembled and clamped in a bench vise as indicated in the lower right-hand detail. Dimensions can be altered to suit, and if screws of varying sizes are handled, a different jig can be made for each size.

—Paul H. Lyman, Wauwatosa, Wis.

## Easily Adjusted Boring Bar Used in a Drill Press



In our shop we often use a drill press or milling machine for boring jobs where only the boring tool itself can be adjusted. In doing this, considerable time was lost in knocking the tool in and out to get a fine adjustment. To avoid this loss of time, we made up the bar shown. It works under spring pressure, and a fine adjustment can be made in a jiffy by loosening the set screw and turning the plug in or out as

desired, setting the tool with a pair of calipers. The steel ball under the set screw permits easy movement of the tool without loosening the screw too much.

—E. McDonald, Denver, Colo.

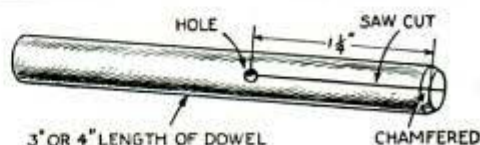
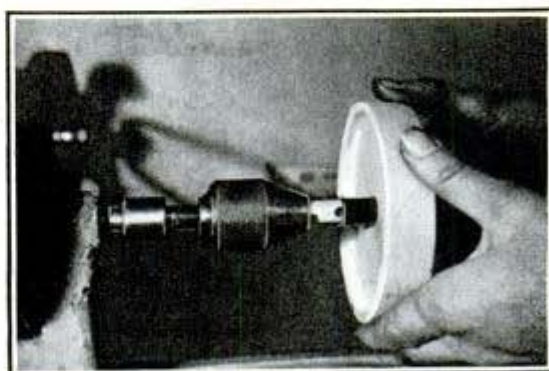
## Rubber "Finger" Strips Paper From Roll on Counter

Instead of moistening his fingers to pick up the end of a roll of wrapping paper on his counter, one merchant uses a strip of rubber belting. This is tacked to the counter so that the free end rubs against the paper roll. Turning the roll raises the end of the paper.



## Simple Reamer for Holes in Wood

A length of dowel fitted with sandpaper provides a handy reamer for enlarging holes in wood. Slit the dowel from one end and drill a small hole at the end of the slit to prevent further splitting. In use, the dowel is chucked in a lathe or hand drill,

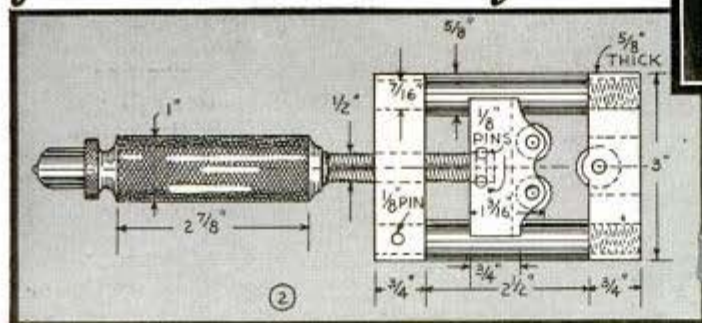


and a piece of abrasive paper is wrapped around it, inserting one end into the slit and winding the paper in the direction opposite to that of rotation. The reamer is adjusted for size by placing one or more pieces of thin cardboard under the abrasive paper to increase the overall diameter.

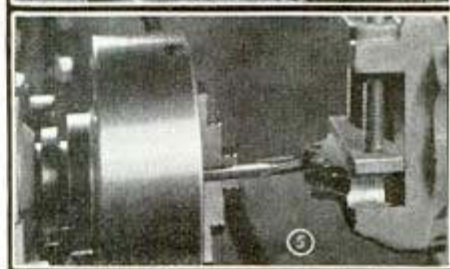
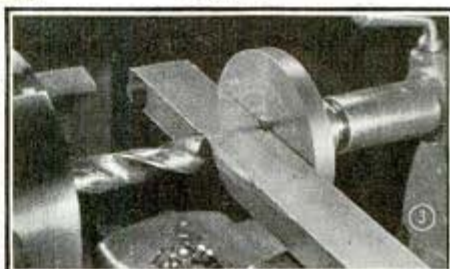


# Three-wheel KNURLING TOOL

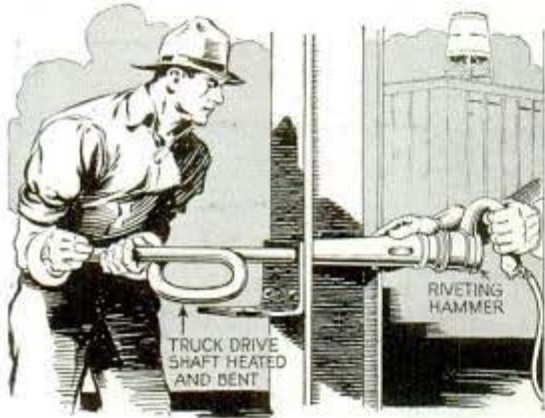
*prevents bending small work*



As knurling in a lathe requires considerable pressure which may bend slender work, the tool shown in Figs. 1 and 2 was designed to give equal pressure on both sides. With the exception of the knurls, the tool was made of cold-rolled stock. The two side rods were turned and threaded at one end to screw into the back cross member, and turned at the other end to a push fit into the front cross member. The slot for the center knurl was cut by drilling three holes and filing away the waste. Then the surface on each side of the slot was recessed. The front cross member was drilled at each end for the side rods, and drilled and tapped in the center for the hand screw. Steps in making the sliding knurl holder are shown in Figs. 3 to 5. Accurate fitting of the sliding knurl holder to the side rods was accomplished by drilling, Fig. 3. Then the work was chucked as in Fig. 4, and the ends cut away, after which the slot was cut by using a milling attachment, Fig. 5. The hand screw was turned to shape from 1-in. rod, threaded, knurled and then cut off. After the handle was screwed in place, it was fastened to the sliding knurl holder with two  $\frac{1}{8}$ -in. pins. The hand screw and the sliding bar were fitted to work freely, then the front cross member was forced tightly in place and was drilled at each end for pins which locked it to the side rods.

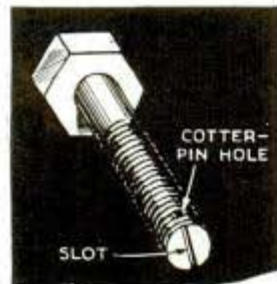


## Bucking Bar With Loop in Center Absorbs Hammer Shocks



Looped in the center, this bucking bar tends to absorb shocks and to dissipate heat from the rivet being driven. It is made from an old drive shaft, which is cupped on one end to fit over a rivet head.

## Direction of Hole in Bolt Marked To Use Castellated Nut and Key

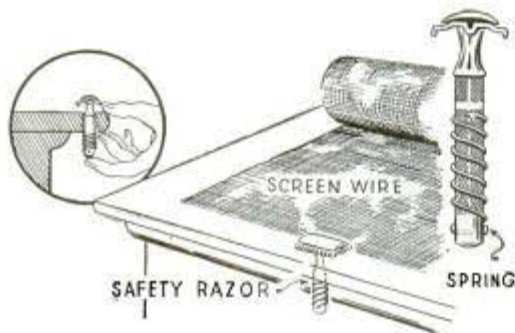


Before installing a bolt on which a castellated nut and cotter key are to be used, file a shallow slot on the end of the bolt to correspond with the key hole. Then you will have no difficulty in inserting the key.

—D. C. Ward, East Orange, N. J.

## Clamp Holds End of Screen Wire While Measuring It in Lengths

Set in a hole drilled in the counter, an old safety-razor frame was used by one merchant as a clamp to hold the end of a

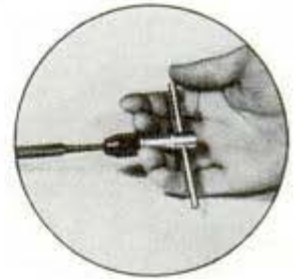


roll of screen wire while measuring off lengths requested by his customers. A spring at the lower end of the razor handle provides the clamping action, pulling the comb part of the razor down tightly.

## Tap Holder Serves as File Handle

I have found that a small tap holder makes an ideal handle for a file as it allows the hand to remain in a comfortable position while working. The holder is also handy for this purpose because it can be changed from one file to another in a jiffy.

—Allen Fiske, Chicago.



## Pitchfork Fitted With "Flag" Located Easily in Field



To avoid overlooking and possibly losing a pitchfork left in a field between jobs, one farmer drilled a hole in the end of the handle of each one of his forks so that a handkerchief could easily be inserted. Then,

if the fork is stuck in the ground in the field to be left, he merely pulls out a handkerchief and threads it through the hole. In this way it is easy to locate the fork.

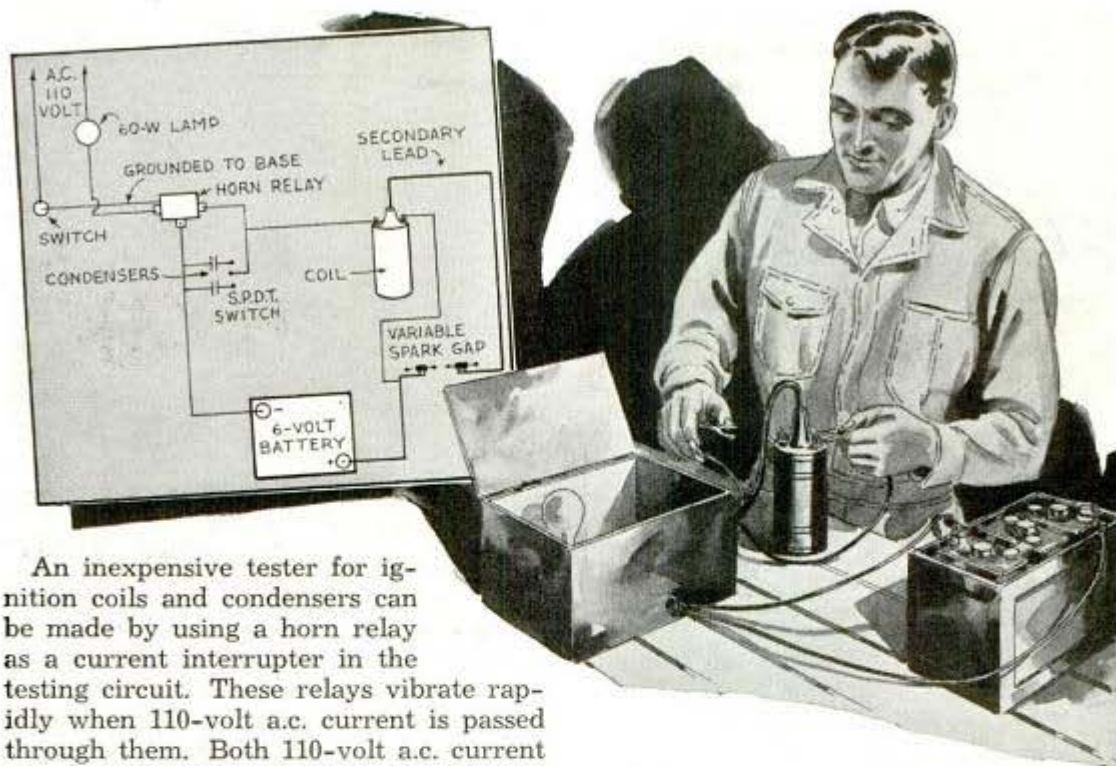
## Poultry Nests Fastened to Wall By Storm-Sash Hangers

Nests for poultry can be removed easily for cleaning if they are fastened to a wall with storm-sash hangers. It is best to space the hangers the same distance apart so that the nests will be interchangeable.

—Everett Hanson, Argyle, Wis.



# Ignition-Coil Tester Made From a Horn Relay



An inexpensive tester for ignition coils and condensers can be made by using a horn relay as a current interrupter in the testing circuit. These relays vibrate rapidly when 110-volt a.c. current is passed through them. Both 110-volt a.c. current and 6-volt battery current pass through the relay, but the heavier current is reduced by the resistance of a 50 or 60-watt lamp in the circuit. The a.c. current is connected to the base of the relay and to the terminal marked for the horn-button wire. This terminal can be identified as the one connected to the coil of the relay. The rest of the wiring shows plainly in the diagram.

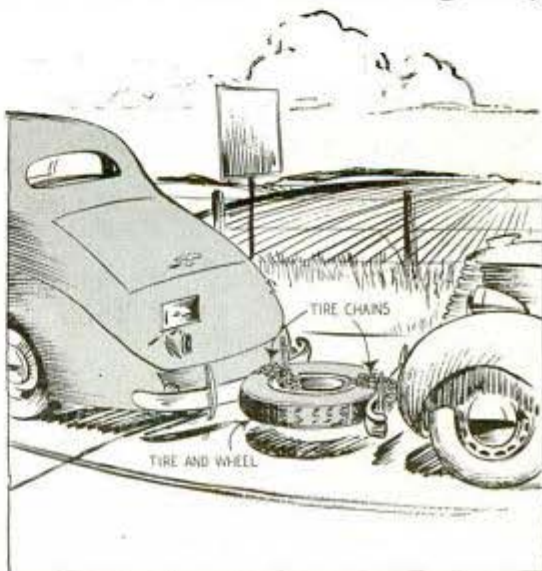
One of the condensers in the circuit should be removable so that a condenser to be tested can be substituted for it. If desired, a d.c. milliammeter can be connected in series with the spark gap to check the output of coils, and a neon tube may be used in the secondary circuit so the flashes may be seen.—F. R. Crawford, Pratt, Kans.

## Spare Wheel Serves as Shockless Tow Bar in Emergency

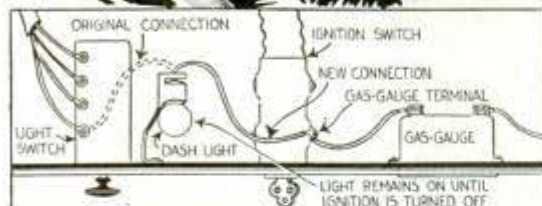
While on a trip I had occasion to tow a car about 30 miles with an inexperienced driver at the wheel. Using a tow rope would have resulted in damaged fenders and excessive use of brakes as well as gasoline. To avoid this and give me control over both cars, I lashed my spare tire and wheel between the two bumpers, first letting out some of the air so that the tire would tend to absorb shocks between the cars. With this arrangement, the driver of the towed car merely steered it, the brakes on my own car serving both cars.

—Lysle Hall, Sioux City, Ia.

Loose screws in a car body can be kept tight if they are flattened slightly on two sides to increase their diameter.



## Instrument-Panel Light Wired To Warn When Switch Is On



After leaving his ignition switch on several times when putting the car away at night, one motorist wired the instrument-panel light so that it operated in conjunction with the switch. In this way, the illuminated panel warned that the switch was still on after the headlights had been turned off. To change the light, just remove the wire from its present terminal, and connect it to the terminal on the "cold" side of the switch, that is, the terminal that is dead when the switch is turned off.

—Geo. Nealley, Santa Rosa, Calif.

## Clock Spring on Wooden Handle Locates Tacks in an Auto Tire

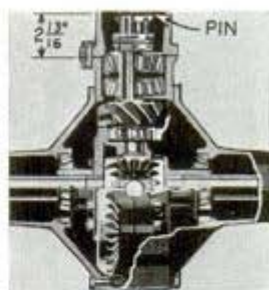


Difficulties sometimes experienced in locating the position of a tack or other small, sharp object that has punctured the tube, are avoided by one mechanic who uses this flexible tool for the purpose. It consists of a length of a clock spring screwed to a wood handle. In use, the tool is placed inside of the tire and pressure is applied to flex the spring so

that it contacts the entire surface of the tire. Then the tool is moved around the inside of the tire until the projecting point of the tack is contacted.

## How to Remove Driveshaft Pin From Ford V-8 Car

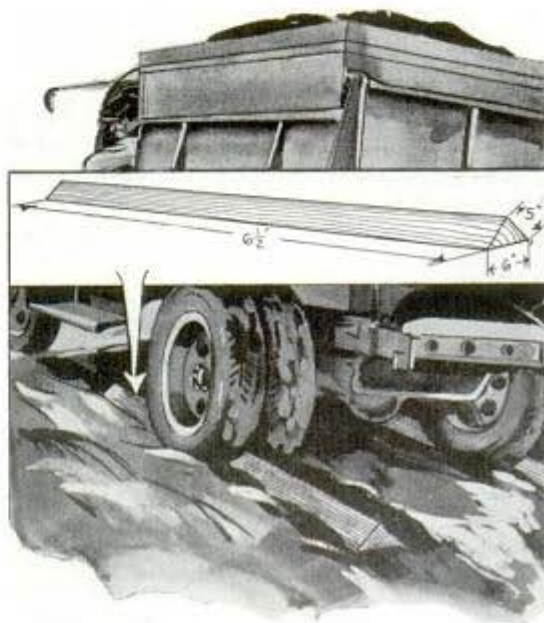
When a high-pitched noise develops in the rear axle of a Ford V-8, it is likely that the driveshaft pin has broken. This is not serious, but the noise is very annoying, and can



be eliminated without removing the axle assembly. Jack up one rear wheel, drill a  $1\frac{1}{8}$ -in. hole through the torque tube  $2\frac{1}{16}$  in. from the flange. Then rotate the rear wheel with the transmission in neutral and the pin will drop out in two pieces. It is unnecessary to install another pin. Tap the hole and screw a  $\frac{1}{8}$ -in. pipe plug into it to close it.—Norman E. Carlson, Itasca, Ill.

## Truck Moved Out of Mud Hole On Triangular "Plank"

One driver of a dual-wheeled truck who often had to get off hard-surfaced roads where he was likely to get stuck in a mud hole, found that a three-cornered plank enabled him to move the truck with little

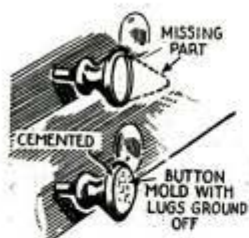




trouble. The plank was of a size to fit between the dual wheels so that good traction was afforded for the tires.

—Martin Mittermiller, Marshfield, Wis.

### Simple Repair for Plastic Knobs On Car Instrument Panel



When a plastic button or knob on the instrument-panel controls of a car becomes lost or broken, I make a repair with a button mold. This costs little and saves the expense of replacing the whole control, which is usually necessary if the repair is made from parts available for this purpose. The small lugs are ground off the button mold, which is cemented into the control socket from which the plastic ornament was lost.

—R. E. Buck, Lynn, Mass.

### Fishing Pole Carried in Tube Fastened Under Trailer

Desiring to carry a long fishing pole on a trailer, one motorist put a length of conduit on the underside of the trailer and inserted the pole into this. The conduit was attached with pipe straps, and the ends were capped to keep the pole in place.

—E. H. Hibbard, Jr., Milwaukee, Wis.



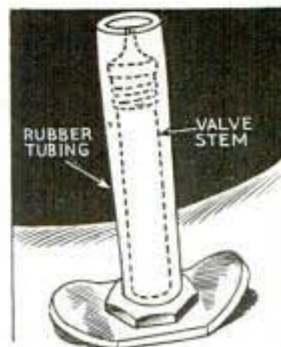
### Truck Motor on Stationary Jobs Cooled by Oversize Radiator



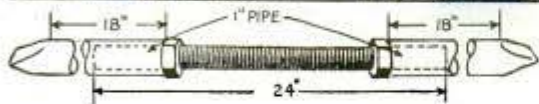
Heavy truck engines, used to drive hammer mills, corn shellers and other machines, frequently overheat due to long periods of stationary operation. To keep the engine temperature within safe limits, one operator increased the capacity of the radiator by enlarging the original tank. The top of this was removed with a cutting torch, leaving the sides curved as indicated. Then the sides and top of an additional tank were cut to shape from sheet metal and welded in place.

### Valve-Stem Threads Kept Clean By Rubber-Tube Cover

If the inner tubes in your tires have valve stems of the type shown, slip a piece of rubber tubing over each stem after the tires have been mounted to protect the threads from road grit. When it is necessary to patch the tubes, no time will be lost in removing the valve-securing nut.



## Spreader to Remove the Springs From a Ford Car



Spreading the springs on a Ford car to remove them from the shackle bolts is an easy matter with this spreader. It consists of a couple of pipe lengths flattened and beveled at the ends and then slipped over an iron rod, which is threaded its entire length and fitted with two nuts. In use, the spreader is lengthened to slip behind

the spring eyes, after which the nuts are turned to extend the pipes and spread the spring sufficiently to loosen the bolts.

—Wayne B. West, Melrose, New Mex.

## Width of Large Truck Indicated By Lamp on Top of Cab

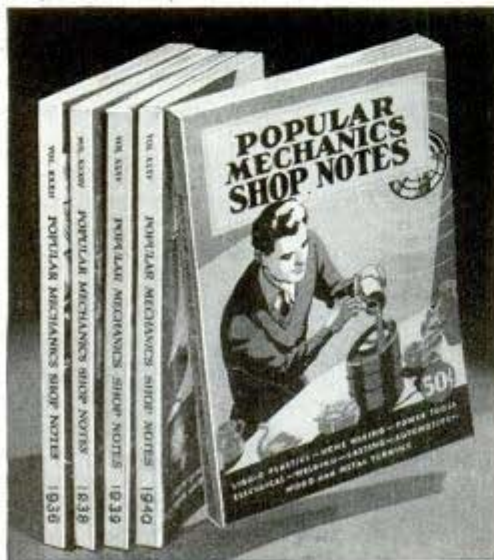
As a safety factor in warning oncoming motorists of an approaching truck at night, one company placed a headlamp on top of the cab so that it showed the width of the truck body. This lessened the number of accidents due to sideswiping of the truck by motorists on narrow highways. The light also illuminated the name of the trucking company which was lettered across the front of the body.

—Morris Katz, Aurora, Ill.



## BETTER JOBS OPEN FOR SHOP MEN WITH IDEAS

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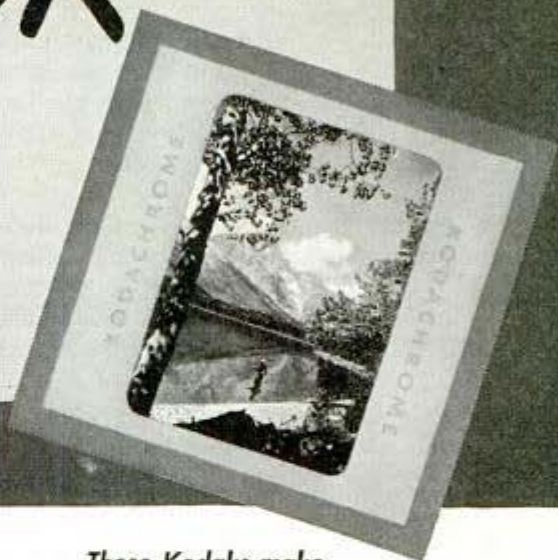
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See this reasonably priced equipment at your Kodak dealer's

**KODACHROME FILM** Eastman's film for gorgeous full-color "stills"

# Seal Comfort Into Your Home

(Continued from page 59)

of approximately 1¼ inches. By adding another half-inch of insulation board, 10.8% more heat is saved. Still another half-inch would save 7.3%, another half-inch would save 5.3%, and so on. In other words, the first 1¼ inches would save 42.3%, while three inches more save only 33.3%.

Insulation-board lath, on which is placed a coating of plaster, has the desirable feature of eliminating the alternating light and dark streaks common to walls constructed with ordinary wood lath. In the latter case the marks result from moisture and dust deposits on the cooler plaster between the laths, but insulation board lath has a uniform temperature over its entire surface.

In insulating roofs some heating engineers prefer all insulation in the ceiling, others prefer it entirely in the roof structure, while still others divide it between the two locations. Common practice, in the

case of pitched roofs, is to divide the insulation between the roof and ceiling, or to place it all in the ceiling. It is slightly more effective when all in the ceiling.

If blankets or quilts of insulating material are installed between studs, joists or rafters, the best method is to suspend them midway between the two sides of the wall, and not in contact with either surface, nailing them to the adjacent framing members.

Insulation board, when unpainted, also is capable of many uses in absorbing sound, thus helping to make the home quieter, as well as more comfortable.

On the farm the board type of insulation may be used in practically every structure for controlling temperature. It results in maintaining comfortable dwellings, comfortable shelters for animals, in saving feed and fuel, in decreasing mortality of young livestock, in increasing yields from mature stock, in preventing frozen water pipes, and in the preservation of food.

## \$2,000,000 or Nothing

(Continued from page 53)

Winston offices in Radio City, New York, it has been guarded behind a series of electrically controlled wrought-iron gates.

If all goes according to schedule, it will take about fifteen months to complete the cutting of the Vargas into 23 individual gems. Until the diamond is completely cut, its actual value can not be determined, since the color may appear to be one thing before cutting, and another afterward. However, some idea can be gained from the Jonker, which Mr. Winston also owned. Only 10 percent of the Jonker was perfect, while the entire Vargas appears flawless—and one square-cut-emerald section of the Jonker is priced at a million dollars.

That should give some idea of the responsibility which rests on the cutter, and why Adrian Grasselly, who is cutting the Vargas, had insomnia and lost weight as the time for cutting approached. While he was in constant consultation with Mr. Winston and other experts, it was his hand which set the saw, his hand which tapped the cleaver—and thus it would have been his hand which turned a million-dollar diamond into a cupful of dust.

That explains why diamond cutters are among the highest paid craftsmen in the world. It is true that most of them never have an opportunity to cut a diamond much larger than four or five carats—only five or six have ever cut a stone anywhere near as large as the Vargas at 726.6 carats—but small diamonds are valuable, and a fortune rides on the cutter's hands.

Before the fall of Holland about 40,000 cutters were employed; now practically all the cutting is being done in New York, and there are less than 500 expert cutters available—all employed at premium wages. In Holland the average cutter earned about \$20 a week. In this country a good cutter earns better than \$80 a week, and there are always three or four jobs to every one cutter. That is the main reason diamonds are growing daily simpler and more expensive. With cutters' wages going up, their time is too valuable to be used in cutting intricate shapes.

Write to the firms listed in the Where-to-Buy-It index, page 4-A, to learn more about products described in this magazine.



2271

# Fitting the Man to the Job

(Continued from page 75)

nology in Chicago, and in Boston, calls it a structural visualization test and finds it helps fix a person's ability to see in three dimensions and is valuable in determining such widely separated aptitudes as landing an airplane or designing a building.

A set of square blocks with one, two or three black sides, which must be put together so that resulting cube is black, is used by O'Connor for the same general purpose.

The manual dexterity test, which especially indicates ability to assemble machines, such as radios and motors, employs a board, usually with 45 holes in it and a corresponding number of round blocks like lozenges. The applicant for a test is timed while placing the blocks in the holes. For both the finger dexterity and tweezer tests, a board is used with 100 small holes. In the finger dexterity test, each of the holes is filled with three small brass pins, picked up with the fingers. In the other test, a pair of tweezers is employed and one pin goes in each hole. Both manipulations are timed with a stop watch.

These tests are used in hundreds of corporations and institutions with vocational advisory departments, like the Y.M.C.A., which in New York City alone under the direction of Dr. Joseph V. Hanna, professor of psychology in New York University, has guided some 10,000 men into the right job.

Under experimentation in the Human Engineering Laboratories at Stevens Institute is an ingenious machine which is being used to test color discrimination. One hundred slides are colored one hundred shades of blue and starting with the greatest contrast, they are shown to an applicant in pairs until the person can no longer distinguish between the shades. A standard rating is thus found.

And two other whole series of tests have been developed, one at the University of Minnesota and another at the Psychological Corporation in New York City, which has more than 300 trained aptitude experts, who teach and advise corporation personnel executives and install a large variety of tests for personality, mental alertness and dexterity with tools.

Most famous of the University of Minnesota tests is the Minnesota Spatial Relations Test. It employs four boards, each

with 58 differently shaped holes in it and cut-out pieces of wood shaped like the holes. There is a hole for each piece and the speed with which the applicant finds the right hole with the right piece determines his discrimination in recognizing sizes and shapes.

So popular are aptitude tests that the Sinclair Oil Company has devised a ground pilot-training ship which is being routed around the country's airports so visitors can test their aptitude at flying. Men between the ages of 18 and 23 show the best aptitude for flying, the public tests show, with girls of 19 and 20 who do not drive cars ranking next. Strangely, they show more pilot-ability than their auto-driving older and younger sisters.

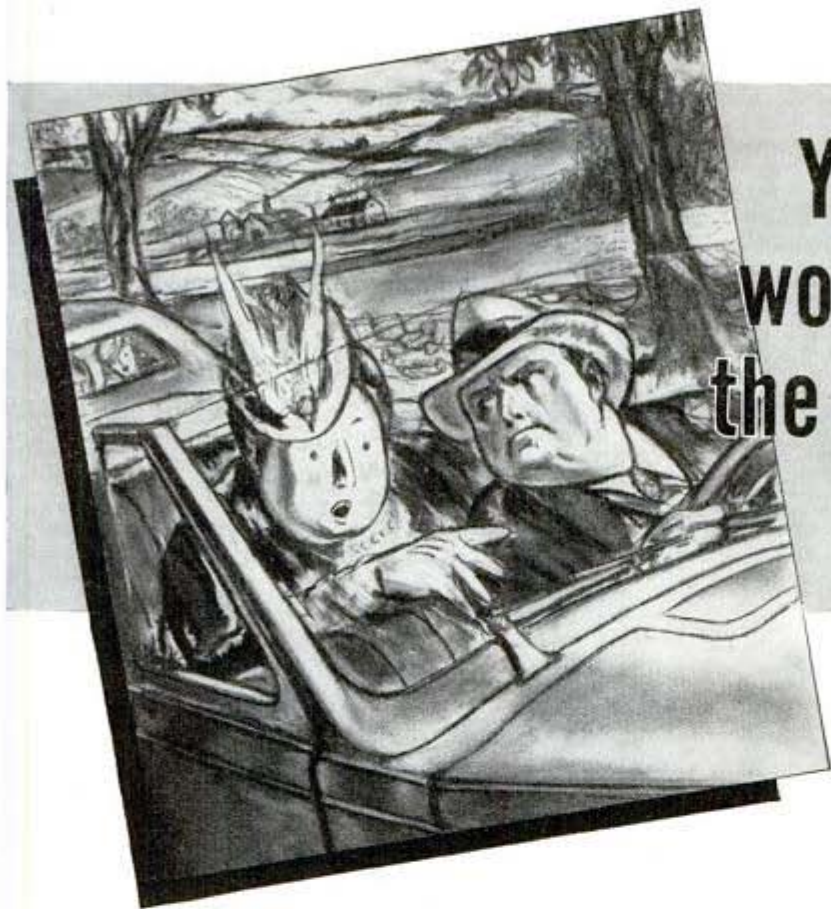
Looking like an abbreviated airplane which has been rigged 15 feet from the ground, the aptitude plane can duplicate most aviation maneuvers with safety to the embryo pilot. Powered with an electric motor, at full speed the propeller blasts a 75-mile-an-hour wind over the cockpit which gives the pilot the actual feel of flying. The slipstream on control surfaces gives the trainer an immediate response whenever the controls are changed. On an electrically controlled Flight-o-graph, instructions are flashed to the pilot to bank, turn, level-off, climb and descend. Aerobatics, such as loops, Immelmans, snap rolls, spins and chandelles are possible.

An example of the unexpected use of a music interest test recently turned up at the Human Engineering Laboratories in the form of a young man who had been taking mechanical engineering and had reached an advanced stage in his education, only to find that he was engaged in something he disliked. His test showed that he had mechanical ability, but was strongly inclined toward music.

He's happy now, designing and making saxophones and clarinets which he can toot to his heart's content when he gets bored with his mechanical tasks.

Despite the tremendous increase in volume and speed of motor travel, the average American motorist this year will buy about 1.26 replacement tires, contrasting with 2.27 tires per car bought in 1928.

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worry about  
the back-seat  
driver

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---



TEXACO'S 40-POINT CHASSIS LUBRICATION SERVICE AT ALL TEXACO AND OTHER GOOD DEALERS

2105

## King Cotton Comes Back

(Continued from page 95)

The hulls may be processed further to yield hull fiber and bran. Clean hull bran contains a greater concentration of furfural-yielding compounds than any other commercially important source material which is as readily supplied in concentrated quantity and as economically available.

Furfural is used as selective solvent for refining petroleum and has prospective important applications in the making of dyes, fungicides, tanning agents, preservatives and antioxidants, but its potentially greatest value lies in the fact that furfural and phenol form a resin which mixed with a suitable filler yields a molding composition of superior plasticity. Potential production of furfural from cottonseed hulls now available would be about 132,000 tons. It sells for about nine cents per pound.

Proteins from cottonseed may be used extensively in the future in adhesives, plastics and in the manufacture of spinnable synthetic fibers possessing properties closely akin to wool. Lignin, obtained from hull bran, is employed in certain plastics.

Importance of cottonseed is revealed in the fact that America's annual cottonseed oil production, about 1,325,000,000 pounds, is equal to the fat that could be recovered from 50,000,000 hogs. The value of cottonseed products exceeds \$150,000,000 per year, with 350,000,000 bushels of seed being crushed in 450 oil-extracting plants.

A cottonseed processing method eight times as efficient as any previously used has been developed at the University of Tennessee. It reduces seed cooking time from 120 to 15 minutes, increases the oil yield and improves the quality of the oil and the residue cake. The flaked seed kernels must be conditioned by cooking before the oil can be extracted efficiently. The university also has produced a cottonseed conditioner or humidifier which operates to introduce moisture into abnormally dry cottonseed. Excessive milling losses are sustained when the cotton seed has a moisture content below 10 percent. Another development is a plastic molding composition prepared from cottonseed hulls. Other studies have resulted in a wall board material involving use of hulls.

Experiments with hulls as a filler for furfural and phenol resin molding com-



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A volume of HOT WATER at such a LOW COST. A few shovels of coal, wood, or oil in the smallest type of stove will supply all the heat needed to produce all the HOT WATER required. Owners are high in their praise and frankly state that IT SHOULD BE IN EVERY HOME or place where HOT WATER is needed. A size to fit every stove pipe or smoke stack. WRITE TODAY!

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All this Hot Water from the WASTE STOVE PIPE HEAT—This amazing invention takes full advantage of the 400° to 800° WASTED HEAT that goes up the chimney—Makes HOT WATER quick, while COOKING or BAKING—makes WASH DAYS and BATH DAYS a real pleasure. Eliminates the problem of HOT WATER in any home. No other method of heating gives such a volume of HOT WATER at such a LOW COST. A few shovels of coal, wood, or oil in the smallest type of stove will supply all the heat needed to produce all the HOT WATER required. Owners are high in their praise and frankly state that IT SHOULD BE IN EVERY HOME or place where HOT WATER is needed. A size to fit every stove pipe or smoke stack. WRITE TODAY!

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2105

pounds in the place of the usual wood flour are under way at the university. Results indicate that the hulls lend excellent strength, that they make unnecessary the addition of lubricants in the form of oil and waxes and that they add a degree of elasticity to the molded plastics which makes them superior to more brittle plastics for many uses.

At the Mellon Institute it has been found that a highly absorbent activated carbon particularly suited to water purification and medicinal uses can be produced practicably from hulls.

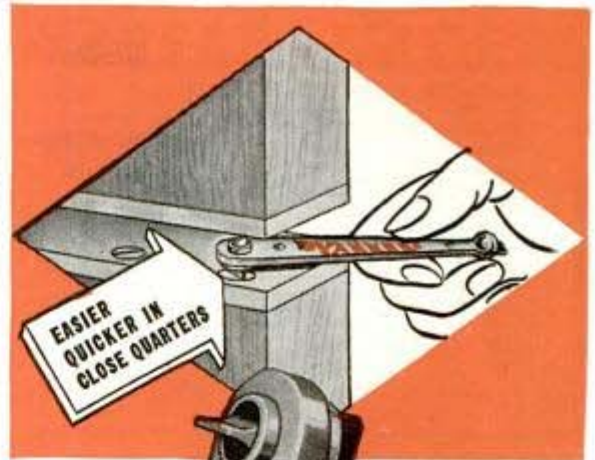
Last year the cotton council announced the development of the superior cord for auto tires. Individual cotton fibers are processed to yield a cord with a 35 percent greater breaking strength and nearly 300 percent longer flexing life than the best conventional cotton cords of the same size.

Federal agencies are working on the development of cotton hose having the desirable qualities of silk. The difficulty in producing such hose has been that the average cotton fiber is short, about one inch, whereas a silk filament is extremely long, more than 500 yards when the cocoon is unwrapped. Thus the long-fiber silk hose molds itself to the wearer's leg and does not have the streaky effect, resulting from the use of short fibers, that the cotton hose has. The longer the cotton fiber the less obvious is this streaky effect. Fuzziness long common to the cotton hose may be eliminated by singeing.

Government agencies are also seeking to increase the use of cotton fiber by recommending open-mesh bags for the packaging of fruits and vegetables, cotton fabric for reinforcing bituminous-surfaced roads, cotton bags for raw sugar, cotton bagging to cover bales of cotton, and either fabrics or bags for numerous other purposes. Manufacturers are being encouraged to produce cotton insulation made from cotton, linters and spinnable waste. A total of 6,700,000 pounds of insulating material is called for in the federal aid program.

Of particular interest to the cotton grower is a new process that may revolutionize the planting and growing of cotton. Cotton seed normally is coated with a tightly clinging lint which makes mechanical

(Continued to page 168)



ACTUAL SIZE  
No. 3400

ONLY 50¢  
AT HARDWARE STORES

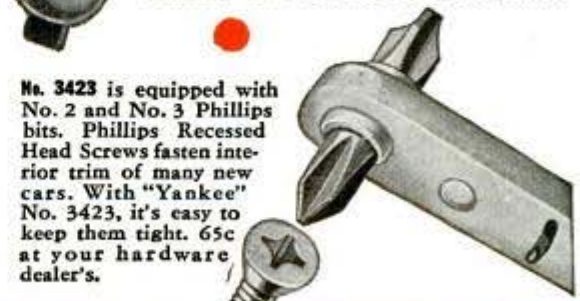
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(Continued from page 167)

planting difficult and which carries many of the plant diseases which destroy about 25 percent of the crop each year. The new process removes the lint and treats the seed with a compound to protect it against soil-borne diseases. The treated seeds are smooth and can be hill-dropped like corn instead of being planted in a row.

With science on the job, King Cotton is staging a comeback of national importance. The highest domestic consumption of cotton on record was achieved last year, most of which went into normal peace-time uses.

260.

# Learning to Ride the Iron Cavalry

(Continued from page 89)

derived from the initial letters for rolling, yawing, pitching, and action. In the Rypas, of which there are three types, the recruit learns to make and alter his range quickly with each movement of the tank.

The Rypa to which the gunner is first introduced is comparatively harmless. It goes through its gyrations slowly, and slowly the recruit learns to use his gun. During practice, this gun is an air gun which fires pellets at a rotating target. Only after the recruit has reached a satisfactory degree of marksmanship is he passed on to the next Rypa-machine which subjects him to more violent shaking.

After some weeks of training, when the potential gunner is good at sharpshooting even from a Rypa Model 2, he enters a Rypa which behaves like a real tank at a cruising speed of between forty and fifty miles per hour.

Rypa practice comprises less than half of the recruit's training. In a building which looks like a film studio, a wide-spread panorama of rolling countryside is painted on tall canvas screens—including hills, swamps, plains, and suburban streets. In the center of the building stands a large cruising tank, with a pupil at its gun. The pupil is expected to identify the targets and then fire quickly. First he finds the range upon the target selected by his instructor. Then in actual firing, he presses the switch of an electric torch mounted on the gun so that the beam of light reveals the quality of his marksmanship. He usu-

(Continued to page 170)



# NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

Works off 110 volt electric light circuit. For this unheard of price you can get the marvelous Dynamic Super-Charged Welder complete—ready to plug into light socket. The Dynamic does both metallic and carbon arc welding. You can also solder and braze on the lightest material.

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### Does Farm, Factory and Home Repairs

Without previous welding experience you can make for yourself as much as \$5.00 on a repair job that can be done in less than one hour. Many welders make as much as \$15.00 to \$20.00 a day. The Dynamic Welder is light and easily portable.

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ADDRESS.....

**HARLEY-DAVIDSON**  
WORLD'S CHAMPION MOTORCYCLE

(Continued from page 168)



For surefire dependability  
be sure your spark plugs are  
**CHAMPIONS!**

Champion Spark Plugs enable the car owner to get plus performance and dependability because of many patented and exclusive features. Outstanding among them is the sensational new patented \*Sillment seal which gives the car owner positive assurance of spark plugs free from troublesome leakage, so vital to peak performance and economy in today's engines.

Profit by the experience of motorists everywhere who have found that Champions correct poor engine performance due to spark plugs. Remember, too, it pays to change all spark plugs, including Champions, every 10,000 miles.



The **Sillment seal** outstanding among Champion's patented features, eliminates troublesome leakage common to ordinary spark plugs. Leaky spark plugs overheat, causing pre-ignition and rough, unresponsive engine operation. Insist on Champions—the spark plugs champions use.

*You're always ahead with Champion!*  
SPARK PLUGS

ally operates his gun while blindfolded, because he often will be unable to see the mechanism in the darkness of a tank in action. After a short time, he learns to do everything by touch.

The steering of the tank, too, has to be done in almost complete darkness. Steering a tank is different from steering an automobile. In a tank, there is no steering wheel, only left and right-hand levers and a four-speed gear box with reverse. It requires about six weeks' hard training to pass the test as a perfect tank driver. The tank driver has, instead of a windshield, a small hole about six inches long and two inches deep, either covered with bullet-proof glass or obscured by rotating shutters. But the man at the levers is not wholly dependent on the peephole. Generally his course is determined by what the other members of the crew tell him.

The instruction is by no means complete after the courses in gunning and driving have been finished. In a tank every man's life depends on the collaboration of every other man. Usually there are four men to a tank crew, and every one of them is trained to take over any other man's job in an emergency. Only after a thorough training of all its members is the tank crew ready for action. Then they leave their Rypas and squeeze themselves through the narrow opening of a real tank which will fire at a target that is not a lighted spot on a painted canvas. In action there is even less of a tank to be seen than during practice. The tank is there all right, but cruising at a speed of fifty miles per hour, it hides behind a screen of smoke from chemical containers thrown from a small, double-barreled mortar.

**Model Builders Attention!**

	V	V-2	V-3
Hex	1/2"	3/8"	3/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	5/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

Champion has designed 3 spark plugs for model gas engines which give the same dependable performance as regular Champions. Sillment sealed. Sillimanite insulator. Alloy needlepoint

electrodes for easy starting. One piece construction.

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SPARK PLUG CO.  
900 Upton Ave.

Toledo • Ohio

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## Latest Weapons for Defense

(Continued from page 4)

suggestions relating to national defense, has nothing to do with patenting inventions, and does not finance experimental work. Whether or not your idea is accepted you are apt to receive little more than a brief acknowledgment that your letter has been received. If a suggestion is turned down, the council won't tell why, as that might furnish a clue to the actual preparations going on behind the scenes.

The council is receiving hundreds of suggestions a day and although not more than one in a hundred may be worthwhile, that one idea may be worth waiting for. If you earnestly want to contribute to defense, here's a tip: don't just dash off a letter, as one contributor did, suggesting that a death ray with a 100-mile range would be a good thing. Maybe it would. So might artificial clouds that would explode on contact with a bomber, or some sort of "negative" magnetism that would repel torpedoes. Brainstorms such as those are a dime a gross. What the council is waiting for is ideas on how to make such dreams come true. If you can work out the main details of a practical idea, trained men will try to make it useful. Paravanes used to ward off mines are the outcome of one idea submitted during the last war.

Aside from the research that the universities are doing, 132 of them have added special engineering classes in which some 70,000 men are being trained to fit the special needs of aircraft factories and other manufacturers of armament. The courses are designed to fill the needs of local factories and are based on the fact that with the present rapid expansion of production, large numbers of trained men are needed to fill key jobs and supervisory posts. In most cases the students are employed and are attending classes after working hours.

What will be the outcome of the present research program? It will make America stronger and contribute to the benefits of civilization after the war is over. Nearly all military devices have some peacetime uses. Radio and aviation were new when the last war began and much of their usefulness is due to the rapid strides made under the impetus of that national emergency. Every branch of science will benefit from work that is going on today.

## At last A MODERN HAMMERLESS SINGLE at a real low price!



Into model 220, Savage has built fast-handling characteristics never before available in a gun of this type. Its well-proportioned walnut stock has comfortable grip for natural, easy holding qualities. Its broad, well-rounded fore-end positively will not shoot loose. Its modern coil-spring, sear, and hammer action is *lightning fast*. The trigger pull is short, clean, crisp. The tapered locking block automatically takes up wear and will *always* maintain a tight lockup.

It has an easy-working opening lever and automatic top tang safety, well forward on grip.

It has a wide, automatic ejector, and a trim, precision-bored barrel of forged steel.

**MODEL 220 \$11<sup>90</sup>**  
Single Barrel

12, 16, 20 Gauge and .410 Bore

**MODEL 220-P**  
(with Aero-Dyne Super Poly Choke) **\$16<sup>95</sup>**

12, 16, 20 Gauge and .410 Bore



### MODEL 221 Utility Gun

One stock and frame with interchangeable .30/30 rifle barrel and 12 ga. shotgun barrel. Other models with rifle barrel cal. .25/20 or .32/20, or .22 Hornet, and shotgun barrels 12, 16 or 20 gauge.

**\$20<sup>90</sup>**

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## The Age of Packaged Power

(Continued from page 43)

that the great Genghis Khan used gunpowder in Asiatic cannon as early as 1234. But it was a Dutch engineer, Christian Huygens, who in 1680 first proposed harnessing gunpowder in a cylinder to produce continuous motive power. Thus in its simplest terms an internal-combustion engine consists of a cylinder in which the heat of an explosion causes gases to thrust against a piston which, by a connecting rod, drives a shaft; heat is converted into work.

For want of fuels, ignition and metals the engine evolved slowly. Robert Street of England patented a turpentine-burner in 1794; its explosion was set off by flame introduced through a port. Hydrogen-gas engines arrived in 1820. Most engines of the last century burned illuminating gas, and the charcoal-burning trucks of wartime Italy and the gas-burning lorries of London are throwbacks to that generation. An American, Drake, introduced incandescent metal as a means of ignition in 1855. Lenoir of Paris produced a battery-fired spark-ignition engine in 1860. Two years later he drove a carriage three miles with one of these engines.

Two Germans, Otto and Langen, in 1866 developed the four-cycle system (charging, compression, explosion, expulsion) still in use. Meanwhile the first oil well was driven at Titusville, Pa., in 1859; in 1885 Daimler carried the Otto engine further from gas to oil, and a new era arrived.

From here on progress was swift. The French led in the first years of the automobile. Then in the nineties Duryea, Olds, Haynes and Ford got under way. Canfield of Michigan patented the chambered spark plug. Haynes introduced aluminum alloy. Henry Ford picked up a valve stem from a wrecked French racing car, and, astonished at its lightness, learned it contained vanadium—the hardest metal. These were the beginnings of automotive metallurgy. In 1911 General Motors opened the first metallurgical laboratory. Today's cars and trucks stand battering over 100,000 miles because of what science—now armed with the X-ray and spectrograph and stroboscope—has learned about metals. Valves made of silicon-chromium steels function red hot for miles without failing. Nickel, chromium, tungsten, vanadium, molybde-

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num, manganese, all these hard metals endow your car with toughness and longevity.

The Diesel engine, too, owes a debt to the metallurgist. Dr. Rudolph Diesel patented his compression-ignition engine in 1892. It blew up, proving he was right, and in 1897 he produced his first successful engine, a one-cylinder, 25-horsepower unit that weighed 400 pounds per horsepower. In the gasoline engine, fuel and air are mixed in the carburetor, shot into the cylinder and exploded by electric spark. In the Diesel, air is fed into the cylinder, compressed to about one-sixteenth normal volume, then fuel (usually, but not necessarily oil) is injected and exploded by the 1,000-degree heat of compression. A generation of engineers developed precision instruments to meter and inject the fuel through almost microscopic spray nozzles. Light, strong alloys made possible today's mobile Diesel which weighs 10 or 12 pounds per horsepower. The two-cycle system also improved its weight-horsepower ratio; every down stroke is a power stroke.

Milestones passed rapidly. Magneto ignition came in 1905. Charles F. Kettering's battery ignition went into the 1910 Cadillac. Kettering's self-starter in 1911 made it possible for women to drive. The supercharger opened the way for the Stratoliner. Chrysler in 1934 began developing "Superfinish," the microscopically smooth surfacing of load-bearing parts with tolerances of ten-thousandths of an inch.

Your automobile owes as much to the fuel chemist as to the engine designer. Kerosene was the oil man's best seller in 1899 and gasoline was a drug on the market. Ten years later automotive gasoline demand was overtaking supply, and to increase the yield from crude oil some refineries carried over in the distillation more of the heavy ends, or kerosene; unfortunately this "motor spirit" fuel separated in the storage tanks into straight-run gasoline which floated on the heavier kerosene.

Then in 1916 Dr. William M. Burton of Standard Oil distilled gasoline under pressure—the first "cracked" gasoline. "Cracking," however, was reversible; under compression and heat in the cylinder the cracked gasoline broke down into light and heavy ends. Dr. Burton told the engine builders bluntly they must design an

(Continued to page 174)

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(Continued from page 173)

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engine good enough for the fuel. Harry L. Horning, head of the Waukesha Motor company, took the hint and began redesigning the combustion chamber. Early experiments had shown turbulence was essential to perfect combustion, so he tried a fan inside the chamber. The resulting explosion blew the engine head through the roof, but it proved the point. Next Horning and Ricardo of England shaped the combustion chamber so that fuel and air whirled naturally and mixed perfectly, developing more power, less "ping."

The fuel men were busy, too. Kettering, working to exonerate his ignition system of blame for the knock, developed "knockless" Ethyl gasoline. Why it works is still not precisely known; probably its lead content slows the pressure rise of combustion so that volatile and heavy ends of the gasoline burn in a progressive explosion. It is high pressure suddenly developed that causes the "ping." Now the way was open for the seven-to-one compression of modern cars, with greater speed, climbing ability and miles per gallon.

Filling-station gasolines had so wide a range of knock qualities that in 1928 engine makers and oil men had to get together on some standard for rating fuel. They adopted a standard test engine built for them at the Waukesha Motor plant, agreed on uniform procedure for grading the anti-knock or octane rating of any gasoline by comparison in the test engine with a standard fuel. Pure iso-octane was called 100 octane. Pure heptane was called zero octane. A gasoline that matches in knock quality a mixture of 70 parts of iso-octane with 30 parts of heptane is rated 70 octane.

America alone knows the secret of making 100-octane aviation gasoline. Tomorrow it may be your automobile fuel, bringing many more miles per gallon. Already 115-octane airplane fuel is available. To the interceptor plane and bomber it means higher speed, greater load-carrying ability. Without aviation gasoline the 84-ton flying boat being built for the Navy might never lift off the sea.

From this glance at the beginnings of the internal-combustion age we turn next month to see what it has done and has yet to do for the farmer and sailor, war-maker and builder—and yourself.

(Concluded next month)



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(Continued from page 85)

With motion pictures, simple lessons may be elaborated into scenes from everyday life, filmed in banks, grocery stores, at birthday parties, or in any situation in which a deaf person might be called on to take a part. The actors are usually persons with normal hearing, but specially trained to speak with easily distinguishable lip movements. Movies have aided greatly in teaching the deaf to read every bodily motion or facial expression.

Classrooms for the deaf are equipped with speech amplification apparatus. Each chair has a headphone and a rheostat. The instructor speaks into a microphone which transmits through the head sets.

Classes for the hard of hearing touch not only the cause and treatment for various types of hearing defects, but also the psychology of deafness. The human mind is prone to take the easiest road. As a person's hearing begins to fail, he is likely to quit trying to hear. It is often necessary for a trained psychologist to show a deaf person that, although he thinks he is using all his hearing capacity, his subconscious mind is really tricking him into being "hearing lazy."

But science alone can't win over silence—all of us must help. How? By telling those around you whose hearing is lost or failing, to contact a reliable hearing clinic and find what science can do for them. If there is no clinic near you, write The American Society for the Hard of Hearing, Volta Bureau, Washington, D. C.

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Having occasion to use many strips of crepe paper, one window trimmer found that he could slice the rolls quickly with one of the modern bread knives having a serrated edge. The knife permitted a sawing action to be used, which proved less tiresome than using scissors.



N 1430

## Trailer-Blazing Through Africa

(Continued from page 71)

bound. Virgins wearing a belt of antelope skin around their slim hips execute complicated figures with precision, beat their hands in unison with bells and tambours, advance and retreat in waves of beauty and grace.

We look up in astonishment as young princes take ten or twelve steps, then leap with ease over a seven-foot high jump with almost a foot to spare. King Rudahigwa brings us to stand under the hurdle. High over us the princes sail, one after the other, landing lightly, turning to flash a smile, then joining their comrades in banter.

The scene fades out. You are alone, standing on a swampy plain, desperately calling a native boy who is rapidly disappearing. Somewhere the poor devil, scared out of his wits, has thrown away your rifle in his flight.

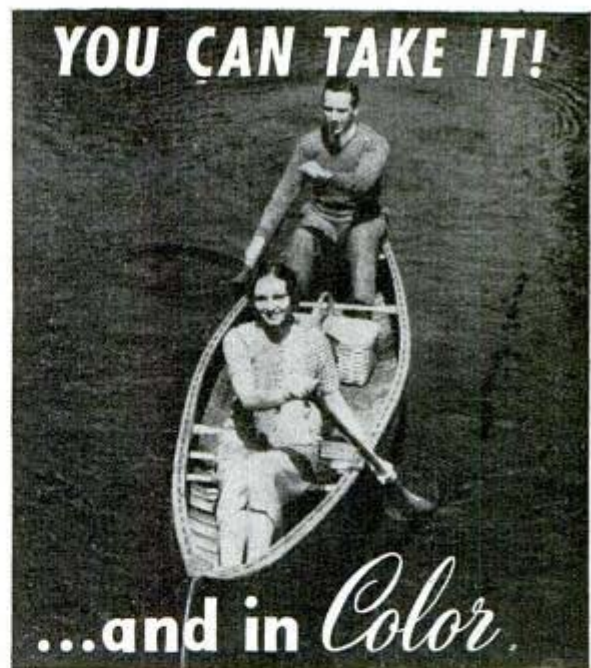
You turn toward the thunder of hundreds of hoofs. Behind is the river and safety, for it is deep enough to stop the buffaloes. But will you ever manage the distance? Never. Your left ankle is sprained so badly you cannot even put down your foot. Maybe you are cursing me for leaving you there alone, in my place. But I wanted you to feel all I felt when I was there, in that same valley of the Ruzizi, exactly in your predicament.

While you were in ambush, hoping to photograph a big herd of buffaloes, millions of them—or at least two hundred—appeared out of the reeds, galloping toward the river. You heard a shot behind you. Then you saw your boy running away with your rifle. And the buffaloes swerving to one side, in a thunderous circle you knew would soon bring them back to that same place—for that's the way of buffaloes.

And now you see the reed curtain violently part, letting out an avalanche of horned beasts. With a superhuman effort you hop on your right foot toward the river. But they are pounding straight for you. You are finished. Images of the past flash through your mind, while you hopelessly hop, hop, hop.

Suddenly you stop, turn and close your eyes. Then you shout. You don't know why, but you wave your helmet, as if to

(Continued to page 178)



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K 1430

(Continued from page 177)

scare a horse. And a whole world of buffaloes engulfs you.

You wave and shout, and your nose is filled with an acrid odor, your face is splattered with mud. You hear grunts and snorts on every side. The avalanche breaks in front, flowing past you, right and left. You wonder why you are still alive, and you realize the miracle! Instinctively you have done the only thing that could make a charging buffalo swerve. The whole herd has passed by you.

You are safe—at least, until they return. Your ankle is worse than before, but you forget it. Somehow you are running toward the river. You reach it, fall in, swim a few strokes, touch ground again, crumple down on the muddy shore, panting, exhausted.

The brutes can come back, now. As for you, you are through with exploring. Forever and ever. Or, anyway—until the next time.

(The End)

## Don't Go "Kerplunk!"

(Continued from page 37)

arms together. Your back and legs should remain rigid.

The jackknife is a basic dive that is required in all competitions. Simple as it is, many people fail at it because they forget one detail. At the top of the dive you are supposed to bend down and touch your shins with your hands, then allow your legs and feet to go up. The common mistake is to raise your trunk back up instead. That drops you flat on the water. It's just as easy to do the dive correctly. When you remember to keep your head down and to raise your legs up away from the jackknife position you will make a clean, deep dive. Keep your eyes fixed on the water to help time yourself while you are in the air.

As you gain confidence you can begin trying forward and backward somersaults, but here again you should practice on dry land first. The secret of a successful somersault is in the way you handle what is called the tuck position. In the tuck you draw yourself up into a ball, knees up near your chest, hands clasped to your shins.

For a forward somersault you duck your head forward as you reach for your shins, at the same time jerking your heels back. Hold on to your shins down by the ankles. These movements will make you spin forward in the air. Open up in time to hit the water feet first, simply by letting go the ankles and straightening out your legs. The arms remain at your sides.

The tuck for a back somersault is a little different. Remember, your head is heavy and the way you move it helps control the direction in which you spin. So for a back somersault, jerk your head backward instead of forward in the tuck. Clasp the legs

at the knees instead of at the ankles. In both somersaults, of course, you enter the water feet first and if you are going to do a lot of such dives you should wear a nose clip to prevent water from being forced up your nose and possibly causing trouble.

Never try to flatten out as soon as you enter the water if you are diving from any height. If you try to stop yourself too soon you may get a bad sprain. A good diver uses most of the depth under the board.

I've purposely refrained from telling you how to perform the more difficult dives. The fundamentals you have read here should be learned thoroughly. High fancy diving is nothing more than this plus a little acrobatic work. You will be perfectly competent to go on to fancier diving after you have trained yourself in these instructions. If you want to get into the championship class you should plan to spend at least one and a half hours at practice three or four times a week, under a good instructor. A good tumbler usually makes a good diver and you should work out in the gym and on the tumbling mat. In fact, a good gymnastic instructor can do you worlds of good while you are learning the first stages of diving.

Diving is a sport in which girls can compete with men and boys on an equal basis. Girls really should make better divers than men, due to their natural gracefulness, and the reason so few of them reach the top seems to be that they spend too little time in practice. If you want to be a champion, spend plenty of time learning the fundamentals. Poor preliminary training is the main reason why we don't have many more divers of championship quality.

L 324

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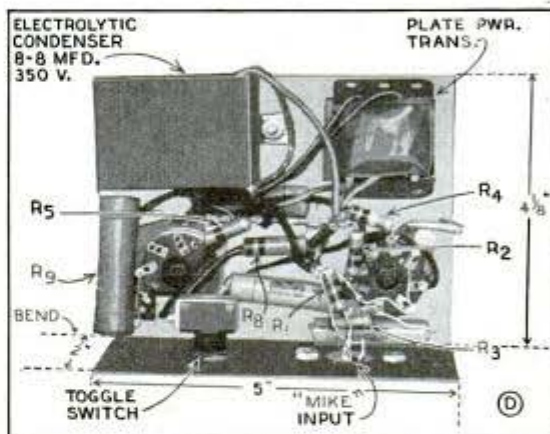
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## Home Recorder and Player Unit

(Continued from page 137)

miniature neon bulbs. Holes are drilled in the motor board just large enough to permit them to be inserted for a snug force fit. The Thordarson T-57S01 output transformer is connected backward for supplying voltage to the neon volume indicators. Although the neon bulbs are not shown grounded in the schematic circuit diagram Fig. 3, they are at common ground in diagram Fig. 2 and should be so connected for best results. A detailed list of the original parts used is available from Popular Mechanics radio department without charge.

When all wiring is completed in the portable recorder unit, you are ready to connect it to your radio. Leads to the radio



should be 4 or 5 feet long. A superheterodyne type of receiver should be used, and the set should have at least 5 or 6 tubes. Midget receivers are not suitable. The following connections are now made in your receiver which must be first disconnected from the power line: the lead from the "hot" terminal of the radio volume control should be unsoldered and connected to the inner conductor of the shielded lead coming from the recorder, marked "radio." The inner conductor of the shielded lead marked "audio" connects to the volume control terminal from which you unsoldered the "hot" lead. To identify the "hot" terminal on your radio set volume control, it will be the terminal on the right as viewed from the back if the terminals are up. When viewed from the back and if the terminals are down, it will be the terminal lug on the left.

(Continued to page 182)



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## Meeting the Submarine Menace

(Continued from page 11)

war, they offered us a lesson that we failed to learn. Here were two small undersea craft that made round trips between the United States and Germany, carrying more than 500 tons of cargo through districts where thousands of vessels kept a sharp watch. The British navy knew when the "Deutschland" was scheduled to leave Baltimore. Several destroyers waited outside the three-mile limit to sink the U-boat. But the "Deutschland" dropped out of sight before reaching the three-mile zone and eluded them all.

In the current offensive against British shipping lanes none of us knows exactly how many submarines the Germans are using, but she must have at least 200 of the destructive craft.

From extensive 24-hour submergence tests I have found that with 15 cubic feet of free uncontaminated air per hour per man at normal atmospheric pressure, men could live comfortably for long periods. My proposed merchant submarine could be transformed into an air-conditioned troop transport for 2,500 men and their equipment. Perhaps the Germans intend to try to invade Britain in this manner.

Such transports could safely make long voyages even through surface-patrolled areas as they have the ability to take on invisibility at will by submerging to zones of quiet and safety beneath the sea.

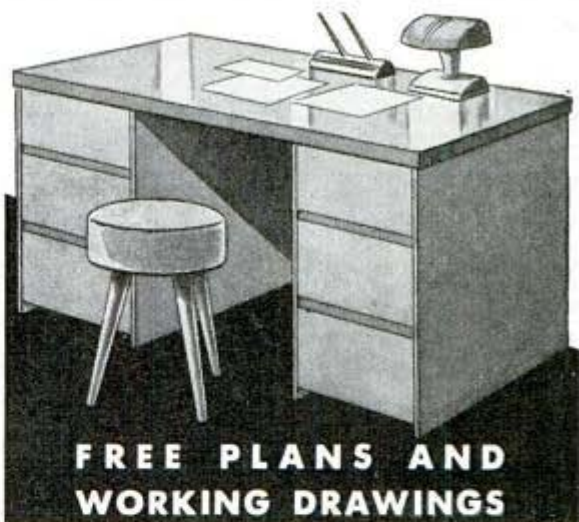
There are many other uses for the cargo submarine, aside from running the blockade. As freighters they can open up the route north of Russia and Siberia and thus enable a ship to treble her profits in trading between English and other European ports and certain important Oriental ports.

They will open up a territory of more than three million square miles by the use of the rivers that empty into the Arctic Ocean and drain northern Russia and Siberia, which are rich in natural products and have great agricultural possibilities. They will solve the problem for Britain of getting out mineral and agricultural products from northern Canada.

Submarines have done more damage than can be imagined. Ever since 1920 I have been campaigning to limit military submarines in the following respects:

(Continued to page 185)

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(Continued from page 183)

eliminate the deck guns, reduce their size and their radius of action to 1,000 miles, so they could not embark on long privateering and destructive voyages, but would have sufficient range and seaworthiness to enable them to protect their home waters.

My son, Thomas A. Edison Lake, is building a 30-foot test model of his new armed torpedo boat with aerodynamic principles of marine construction. It is intended to seek out enemy submarines and destroy them with depth bombs and other secret devices. He and I worked together for years developing the submarine. Now we are devising means of offsetting the effectiveness of enemy undersea craft.

His creation has an airplane-type fuselage built on three pontoons—two forward and one aft. A knee-action unit practically eliminates shock. The fuselage rides clear of the water, with the two forward pontoons each carrying engine and shaft leading to a marine propeller. Steering is accomplished by the operator's control of the rear pontoon. When completed, the test torpedo boat is to be demonstrated before representatives of the Navy.

The full-size torpedo boat will be 90 feet long, carrying four 21-inch torpedo tubes, four gun turrets, and means for laying mines and discharging depth bombs. His vessel will give greater ease of handling than the present torpedo boats which provide unsteady platforms from which to fire guns or discharge torpedoes.

I regret that so many of my inventions have been used by certain governments as destructive weapons of warfare instead of constructive instruments for recovering more of the natural products which Mother Earth has provided so lavishly for the benefit of mankind under the sea and which can so easily be secured by a properly designed submarine. I am looking forward to the day when nations will use submarines as defenders rather than offenders, and as commercial cargo-carrying units.

If China had a defensive underwater fleet of only four submarines, she would have been able to keep Japanese troopships from landing near Shanghai. And before Great Britain can hope to carry on near-normal trade in face of the stiff submarine offensive of the enemy, she must fall back on the submarine-freighter—or be starved out!

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## Defense on the Assembly Line

(Continued from page 31)

components for the Navy has been undertaken by one company with more than 4,000 men slated for jobs. Two plants are in production on machine guns, two more are far along in plans to get into production. A truck company is among several companies at work on artillery ammunition. Another manufacturer is converting a machine-gun design to U. S. standards.

An automobile company has undertaken production of shell cases in a plant built for that purpose in World War days.

Machines built especially for automobile forgings are ramming out shell blanks.

Plants in the automotive industry are working on national defense contracts exceeding \$1,500,000,000 in value. Orders being executed include:

Chrysler Corporation, tank plant and tanks .....	\$ 53,500,000
Ford Motor Co., trucks, cars, aircraft engine plant and engines.....	162,476,614
General Motors Corp., machine guns, shells, trailers, etc.....	89,538,250
Allison Engineering Co., airplane engines and parts.....	190,000,000
Buick Motor Division, aircraft engine plant and engines.....	74,172,670
Chevrolet Division, trucks and cars....	53,841,881
Hudson Motor Car Co., ammunition components, engine parts .....	21,083,137
Packard Motor Car Co., aircraft and marine engines and parts, cars....	217,000,000
The Studebaker Corp., aircraft engine plant, engines, trucks.....	84,841,901

Today's equipment is capable of producing shells six times as fast as during the World War. Utilization of automotive forge tools was worked out through educational orders placed by the War Department early in 1940. These orders helped acquaint automobile men with defense production problems and paved the way for getting machining tools for finishing shells in volume, which no motor company possessed.

Fast-moving fortresses, 28-ton medium tanks, are slated to roll out of a quarter-mile-long tank arsenal by early fall—ahead of schedule.

The tanks to come will be built by production line methods. Totally unlike automobile and truck production is this job. The largest tank ring gear could circle the front end of a passenger car like a quoit around a stake.

While the tank plant was still rising, pat-

2526

tern makers produced scale models in wood, exact to thousandths of an inch, to make possible prompt production of heavy armor plate units and the numerous intricate components of the tank shell and mechanism. As in automobile assembly these units have to be so exactly made as to be interchangeable.

First shipments of sub-assembly units for airplanes from Detroit's automotive plants, began in early February.

Two programs are under way: Supply of units such as wing sections, flaps, tail surfaces, ailerons and other sub-assemblies to aid several airplane makers in completing contracts; second, a huge project under which automobile companies manufacture parts and sub-assemblies going into three of the newest types of bombing planes.

Six manufacturers of motor vehicles and bodies are among the companies which have assignments in this work. From one to two hundred thousand men will be needed in fulfillment of these jobs.

At the rate of 15 a week, marine engines from one automobile concern are going into navy torpedo boats. These 1,350-horsepower engines dwarf even the largest automobile motors.

It's a navy secret how many Diesel engines are coming from one automobile plant for submarines and other naval craft. Almost the entire production of this plant has been converted to making propulsion machines for the U. S. fleet.

Sharing the load of defense production, whether of motors, plane parts, tanks or vehicles, is a large and growing army of parts and accessory producers. Major automobile companies, too, have put their equipment to work on manufacture of precision units, crankshafts, connecting rods and other parts for aircraft engines. A truck maker turns out 8,000-pound transmissions for tanks.

To increase the supply of magnesium, vital lightweight metal, a new foundry got into production during the winter. Aluminum casting capacity of the nation was stepped up 300,000 pounds a month by completion in 12 weeks of a new foundry built by another motor company.

Through the Automotive Committee for Air Defense, which established a technical exhibit of aircraft parts in Detroit, the in-

(Continued to page 188)

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(Continued from page 187)

dustry compiled an inventory of the facilities of 800 parts and accessory producers. This will speed distribution of orders among an expanding circle of plants, men and machines.

Off the production lines of a score of automobile plants are rolling 13,000 army motor vehicles a month, a rate rising toward 20,000 monthly. In June the U. S. land forces expected to have 190,000 motor vehicles. The new cars form an assorted list—pygmy trucks 80 inches long, seven-ton jobs, armored reconnaissance and combat cars, field shops, hospital units and personnel carriers.

Midget trucks are coming from three companies. Another is turning out strange looking units, half truck, half tractor. In between are four and six-wheel vehicles, from a half ton to seven tons capacity. Special military trailers, field range cabinets, field kitchens also are among the products of the automobile industry.

Military trucks have special equipment—towing hooks for guns, blackout lighting equipment, radiator brush guards, high fenders and—most important—power transmitted to all wheels. Many carry armor plate. Army trucks travel 40, 50 miles an hour or more on roads. But they must also stand the punishment of operation across country—to get men, guns and supplies virtually anywhere that draft animals could take them, faster than any non-motorized column could travel.

More than a quarter million vehicles of all types are expected to be in the army service by fall, with the truck assembly lines of the motor industry ready to produce as many more as defense needs might call for. Years of volume output for civilian service made it possible to meet quickly the high military requirements.

There are many big defense jobs under way, and plenty of these involve painstaking, difficult work. Here is just one example which indicates how elaborate an accessory can be: The carburetor for a modern aircraft engine is more costly than many a complete automobile, more difficult to design than was the entire Liberty engine of World War days.

The record of accomplishment to date is one of which the people of the country generally as well as those within the industry can feel proud.

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For boys wishing to build wheelbarrows, wagons, scooters or bicycle trailers, we supply blue prints at 25c each.

MUSSEIMAN PRODUCTS CO. 6225-B St. Clair Ave. Cleveland, Ohio

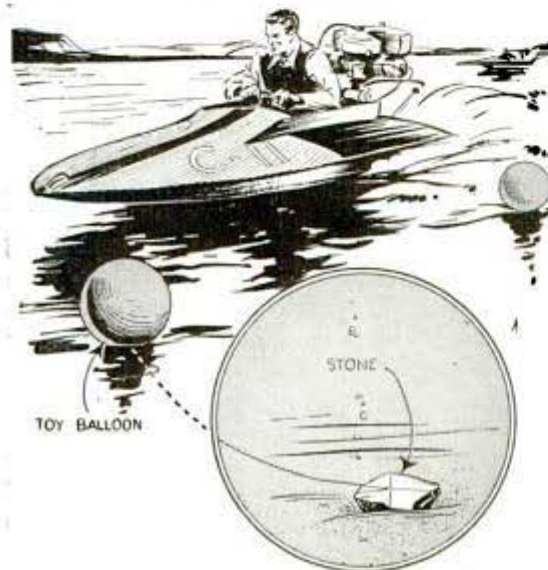
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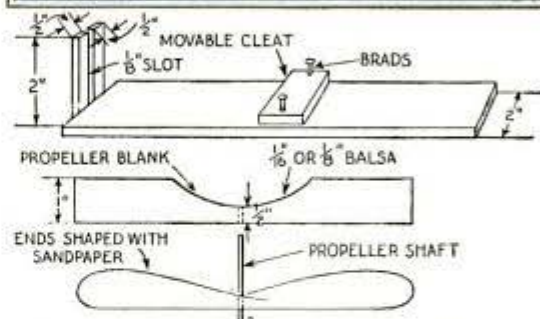
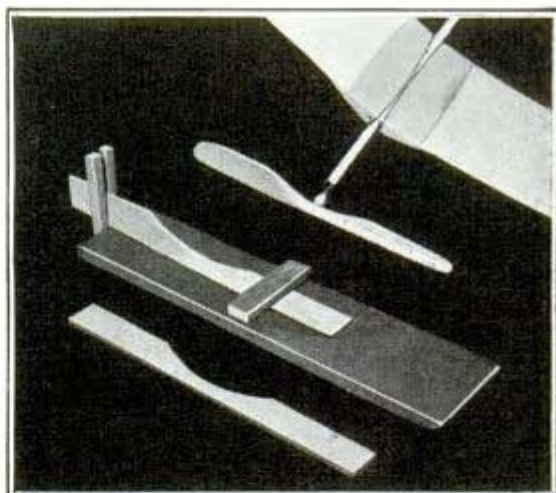
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To prevent a fish from sliding about while removing the scales, one camper tacks the toe of an old storm rubber to the scaling board. Then the nose of the fish is inserted into the rubber pocket thus formed, making it only necessary to press your thumb on its tail to hold it while removing the scales.



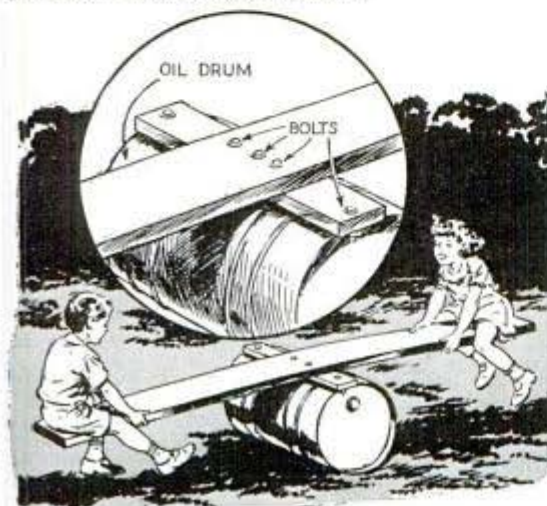
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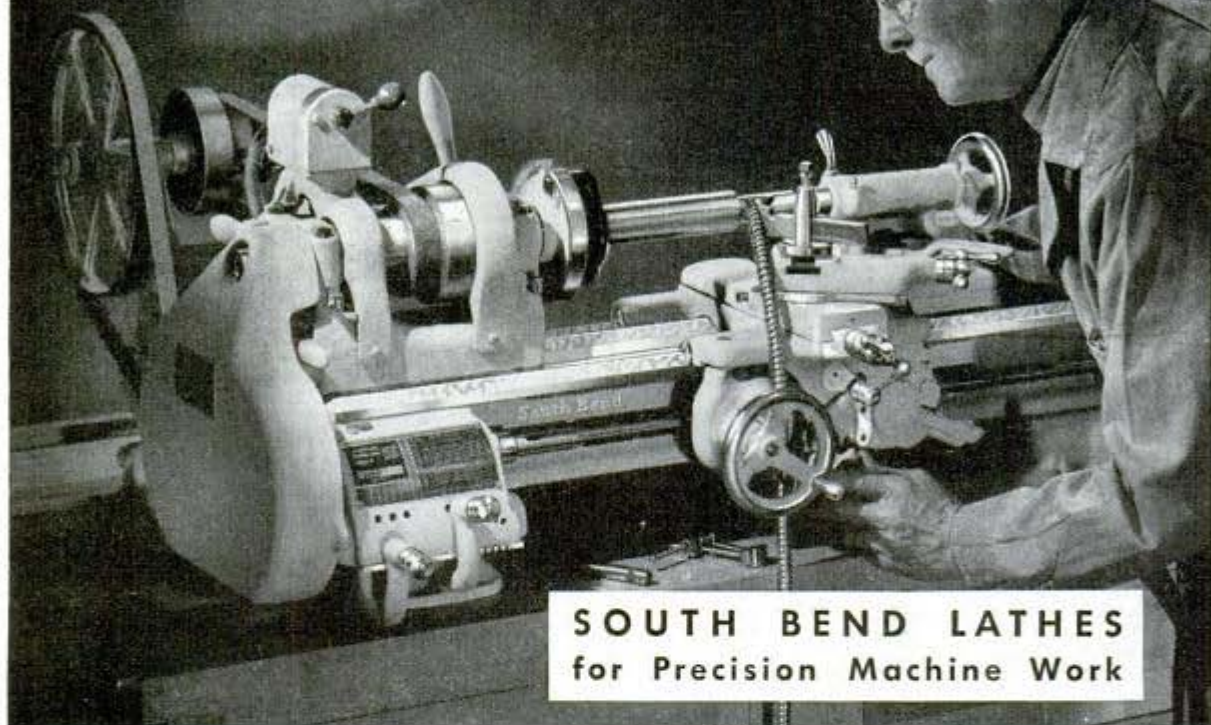


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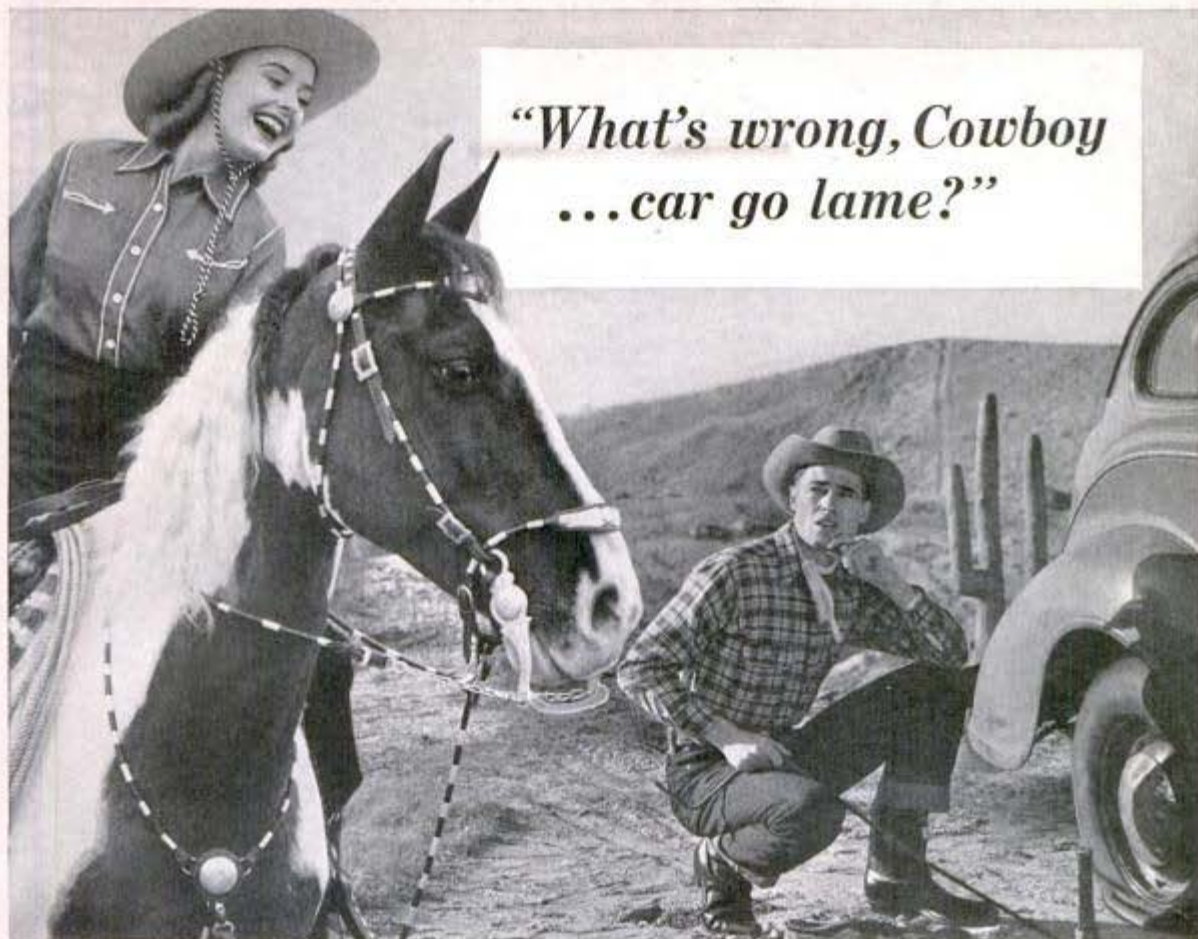
## SOUTH BEND LATHE WORKS

LATHE BUILDERS SINCE 1906

107 E. Madison St., South Bend, Ind., U. S. A.



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...car go lame?"*

**COWBOY:** *This thing's worse'n a half-broke bronc.*


**GIRL:** *Too bad you don't know rubber like you know saddle leather.*

**COWBOY:** *Meanin' what?*

**GIRL:** *When you buy tires, put your brand on the best in the corral—switch to B. F. Goodrich.*

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