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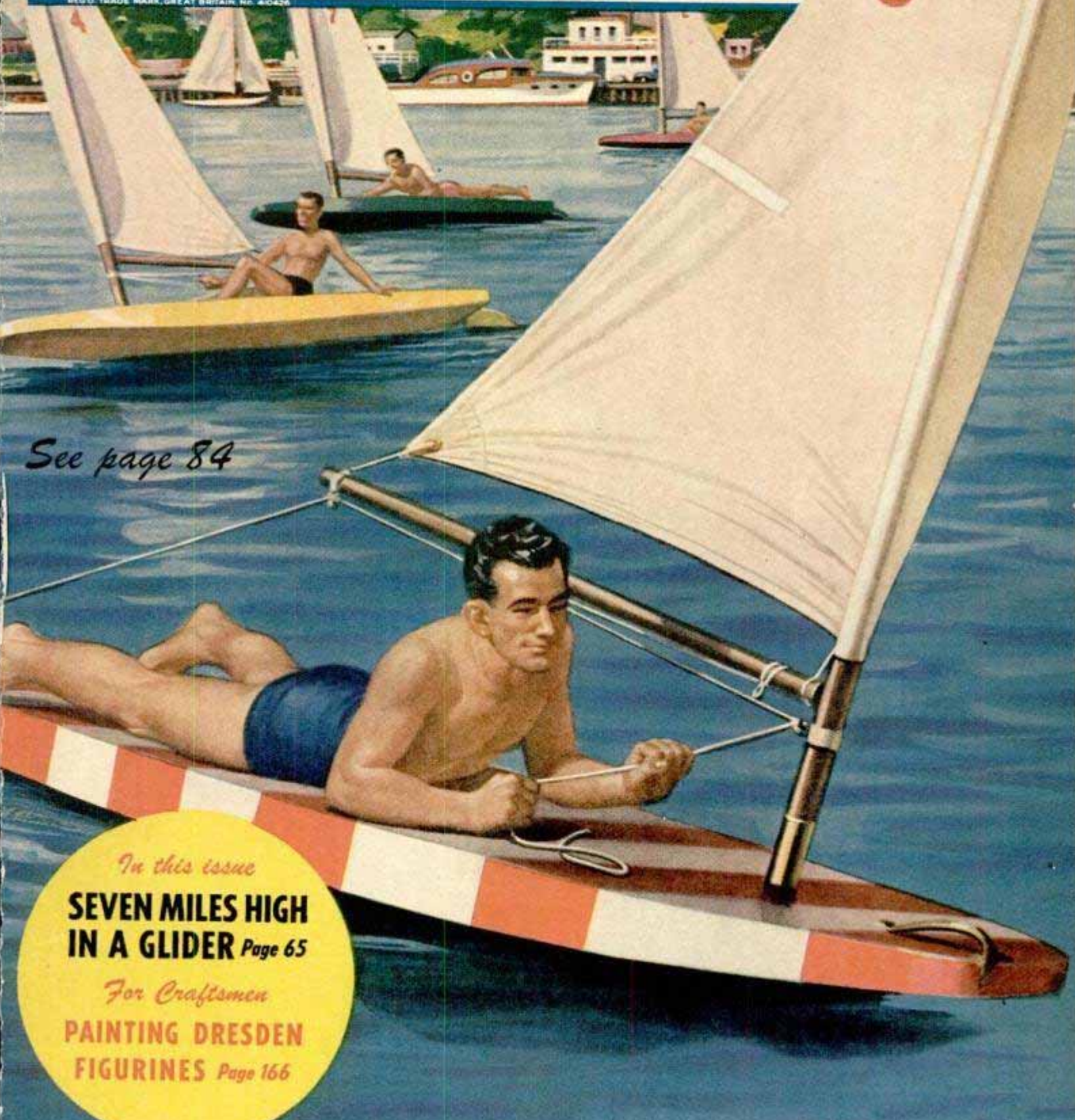


# POPULAR MECHANICS

## MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 410476



*See page 84*

*In this issue*  
**SEVEN MILES HIGH  
IN A GLIDER** *Page 65*

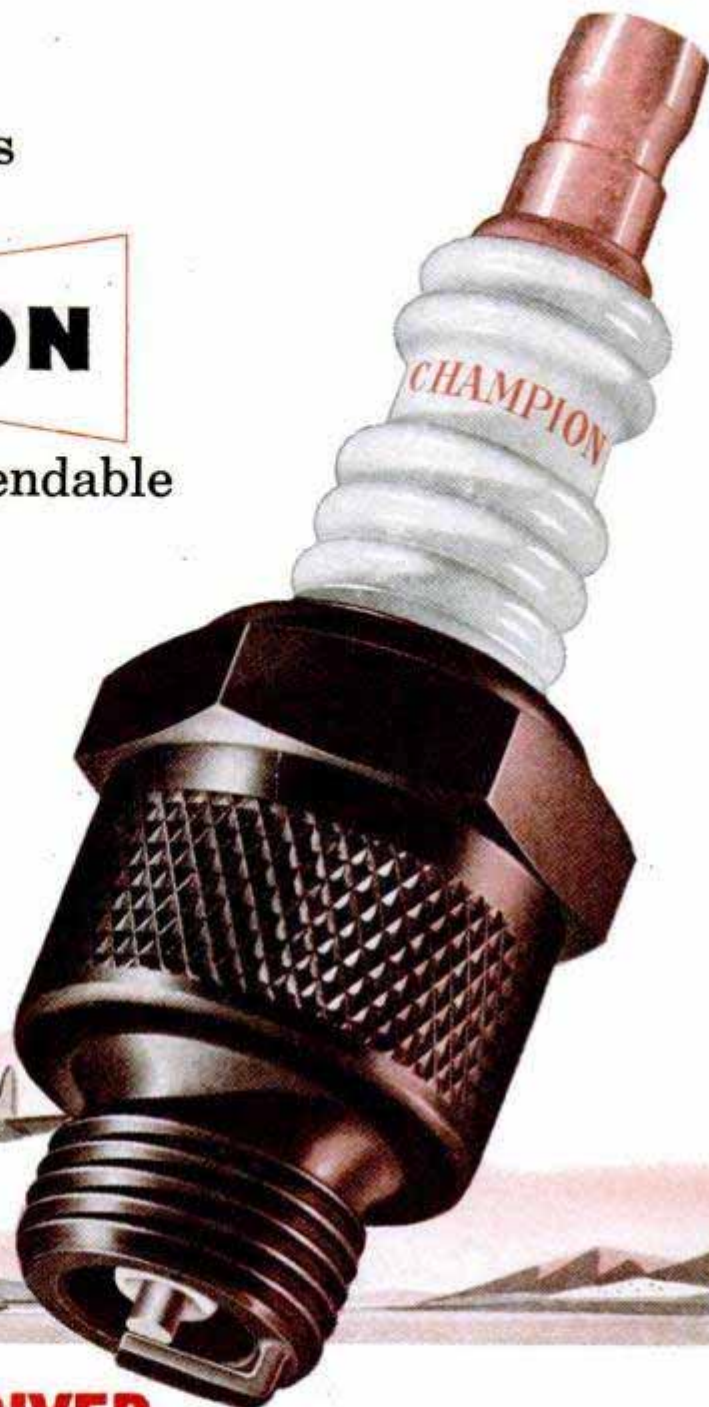
*For Craftsmen*  
**PAINTING DRESDEN  
FIGURINES** *Page 166*

Leading Airlines

Use

**CHAMPION**

the World's Most Dependable  
Spark Plug!



## BE A CHAMPION DRIVER

*—Follow These Rules To Stretch Tire Mileage.*



Switching tires from one wheel to another in rotation prolongs their life by spreading wear evenly over five tires. Have your service man "criss-cross" your tires approximately every 6000 miles.



Inflation to correct pressure is the easiest and most important way to stretch tire mileage. Under inflation of 5 lbs. cuts tire life 32%—6 lbs., 39%—9 lbs., 52%. Check tire pressure once a week!



Only Champions have earned this stamp of public approval—America's Favorite Spark Plug. Be a Champion driver. Follow the experts like leading airlines and insist on dependable Champions.

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

# Dave Saves the Day

Puts  
**"NEW LIFE"**  
 in his trusty Ford!

**LIFE SAVER**

**1** ON SUNDAY THE GANG IS GOING UP TO SWAN LAKE. WHY DON'T WE GO ANY PLACE ANY MORE?

CAN'T HELP IT, DEAR. WHEN A FORD HAS AS MANY MILES AND YEARS ON IT AS OURS HAS, IT NEEDS REPOWERING

**2** AN **AUTHORIZED** RECONDITIONED FORD ENGINE COSTS JUST A LITTLE MORE THAN A MAJOR OVERHAUL. AND BROTHER, WHAT PEP IT ADDS TO YOUR FORD!

YOU SAY ONE DAY TO PUT IT IN? GOOD DEAL! I'LL SURPRISE NANCY—I'M GOING OVER TO SEE THE FORD DEALER THIS NOON!

I FIGURE THERE'S NO SENSE IN NOT GETTING THE BEST—THAT'S WHY I CAME HERE TO GET AN **AUTHORIZED** RECONDITIONED ENGINE FOR MY FORD

YOU'RE RIGHT! IT'S RISKY NOT GETTING THE GENUINE ARTICLE. IT'S LOW-PRICED AND WE CAN WORK OUT AN EASY PAYMENT PLAN FOR YOU

DAVE, IT RUNS LIKE A NEW CAR! WE'LL BE UP AT SWAN LAKE BY THE TIME THE REST OF THE GANG GETS THERE!

YOU SAID IT, HONEY! AND NOW OUR CAR WILL LAST US FOR MANY MORE THOUSANDS OF MILES!

**3**

### Your guarantee of the real thing

- All wearing parts and surfaces reconditioned or replaced with new Genuine Ford Parts •
- Guaranteed by Authorized Reconditioner against defects for 4,000 miles or 90 days • See your nearest Ford Dealer or Independent Garage.



This One





*Examining specimen on metallographic microscope at Bell Telephone Laboratories*

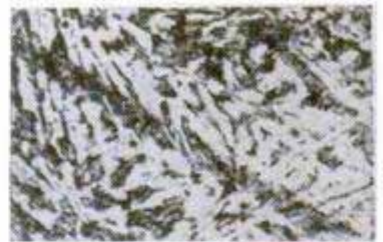
## The look that keeps telephone costs **DOWN**

Through his microscope this Bell metallurgist examines a bit of material which is proposed for telephone use. From what he sees of grain structure, he gains insight into performance not provided by spectrum or chemical analysis. He learns how to make telephone parts stand up longer, so that telephone costs can be kept as low as possible.

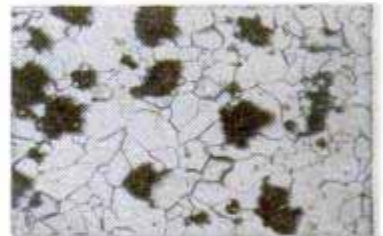
The items which come under scrutiny are many and varied, ranging from manhole covers to hair-thin wires for coils, from linemen's safety buckles to the precious metal on relay contacts.

In joints and connections—soldered or welded, brazed or riveted—photomicrographs reveal flaws which would escape ordinary tests. They show if a batch of steel has the right structure to stand up in service; why a guy wire let go in a high wind or a filament snapped in a vacuum tube; how to make switchboard plugs last longer.

In their exploration of micro-structure, Bell Telephone Laboratories scientists have contributed importantly to the metallographic art. You enjoy the benefits of their work in the value and reliability of your telephone service, and its low cost.



*Photomicrograph of white cast iron which is hard and brittle.*



*Same iron rendered malleable by heat treatment. Shows spots of nodular carbon.*

## BELL TELEPHONE LABORATORIES



WORKING CONTINUALLY TO KEEP YOUR TELEPHONE SERVICE BIG IN VALUE AND LOW IN COST

# Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



## this month's cover

THE DAY IS A CORKER and there's a steady breeze blowing in off the lake. You crave excitement so you round up some friends for a sailing-board race. Into the water slides your craft—actually not much more than a 12-foot board supporting a 16-foot mast. Before you're even wet with spray you are smack in the middle of a red-hot race. You're slicing through the water at a fine clip when suddenly the wind snaps the boom around, the board gives a shuddering roll and flips you into the waves. Just for a storybook ending, we'll say you hoist yourself aboard the bucking craft and sweep past your opponents to win the miniature regatta. Sailing boards—overgrown paddleboards with a sail—are the latest water craze. They ghost along on the gentlest breeze, yet can be handled in moderately heavy winds. If you like water sports, sailing boards are just your meat and so is the story on page 84

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Volume 94 JULY 1950 Number 1

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# Learn **RADAR** and **ELECTRONICS**



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TRAINING DEVICES MAINTENANCE  
AIR TRAFFIC CONTROL AND WARNING  
WIRE MAINTENANCE  
MISSILE GUIDANCE SYSTEMS  
COMMUNICATIONS  
OPERATIONS  
PHOTOMAPPING**



Recorded only in the distortion-free *quality zone*, music "comes alive" on RCA Victor 45-rpm records.

## *What magic number makes music mirror-clear?*

Now, for more than a year, music-lovers have had—and acclaimed—RCA Victor's remarkable 45-rpm record-playing system. Already, millions know "45" as the magic number that makes music mirror-clear.

As was said when the American Society of Industrial Engineers presented RCA Victor with its 1950 Merit Award, "We are moved to admiration by your bold departure from past practices in developing a completely inte-

grated record and record-player system."

Research leading to "45"—confirmed at RCA Laboratories—covered 11 years ... and resulted in small, non-breakable records which can be stored by hundreds in ordinary bookshelves, yet play as long as conventional 12-inch records. The automatic player, fastest ever built, changes records in less than 3 seconds—plays up to 50 minutes of glorious music at the touch of a button! Every advantage of convenience and cost, marks "45" as the ideal system!

Another great RCA development is the finest long-play record (33 $\frac{1}{3}$ -rpm) on the market—for your enjoyment of symphonies, concertos, and full-length operas. Radio Corporation of America, Radio City, N. Y. 20.



Fully automatic RCA Victor 45-rpm record player and records—small enough to hold in one hand ... inexpensive enough for any purse.



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*World Leader in Radio — First in Television*

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## IS A LIFE PRESERVER FOR YOUR CAR!

You can preserve the life of your car with Pyroil. With Pyroil, your motor oil will adhere to metal surfaces assuring lubricated "starts" that prevent excessive wear. Pyroil provides added protection against corrosion, gum and sludge deposits. Preserve the life of your car with Pyroil. Ask your gas station attendant to add Pyroil and add miles to your car.

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### PYROIL COMPANY

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

Name \_\_\_\_\_

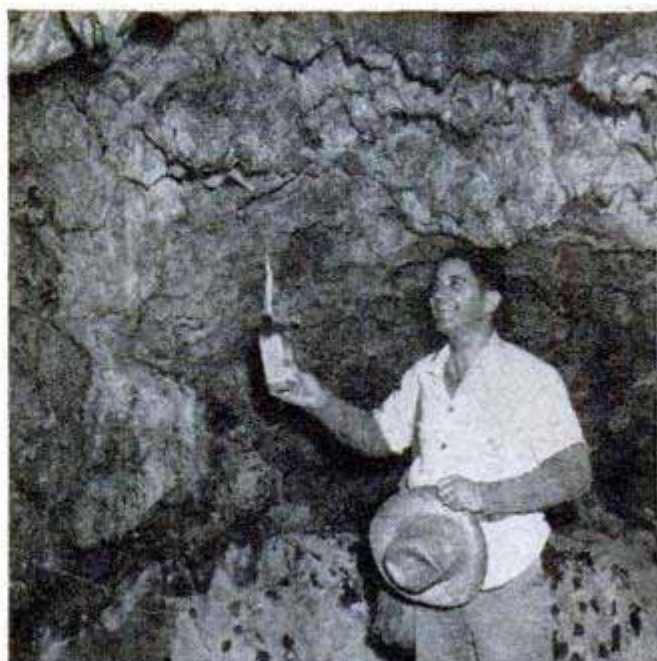
Address \_\_\_\_\_

City or Town \_\_\_\_\_ State \_\_\_\_\_



in this corner.....

## THE EDITORS



**I**T IS VERY COLD in the basement of a volcano. Take this from Danny Morse, the photographer who alone was let in on the secret of the caves deep beneath Hawaii's Mauna Loa when Harry Fox, their discoverer, returned 14 years after his first "find" to explore the miles of lava tubes. Danny is shown here wearing heavy sweaters as he looked over a room 80 feet underground by the light of a kerosene lamp. The story of these subvolcanic caves appears on page 72.

\* \* \*

### "Baby Sitter" for the Deaf

A microphone that can distinguish between a baby's cooing and gurgling and its cry for attention is the heart of a new "baby sitter" that will be a boon to deaf parents. Adjusted to react only to the baby's cry, it will alert deaf or distant parents anywhere in the house by turning on a light or agitating a vibrator.

\* \* \*

### Nothing New Under the Sun

To the Editor:

In regard to your article and picture in the April *Popular Mechanics* entitled "Figure Skating With Roller Skates," this article tells of a "new product" on the market in Japan—roller skates with three wheels in a single row. These roller skates show a striking similarity to certain "very old products" of American make.

(Continued to page 8)



# Let me send You **FREE PROOF** that you can become an expert **ACCOUNTANT... BOOKKEEPER** OR **C.P.A.**

**LOWELL C. DOAK**  
C. P. A., M. B. A.  
Director of  
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By the LaSalle Problem Method..

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Assignment 1  
THE BALANCE SHEET



QUOTING from the "Journal of Accountancy," the authoritative organ of the professional accountants of the United States:  
"The accounting profession is probably the best paid in the world. If there be a profession in which the average compensation is higher, it is not known to us."  
"There is need for accountants. There is ample compensation for accountants. There is no prospect that the supply will overtake the demand within the lifetime of even the youngest of us."

LaSalle Extension University  
A Correspondence Institution  
CHICAGO

## THIS SAME LESSON STARTED ME

toward a well-paid public accounting career—and my C.P.A. degree. I knew nothing of accounting before—yet my progress was rapid—my earning power climbed fast. This sample lesson will show you why.

**I**F you have been envying the high incomes and good jobs enjoyed by thousands of men and women Accountants today . . . incomes ranging from \$4,000 to \$10,000 and more per year . . . why not launch such a career for yourself?

Do you doubt that you can?

Then let me send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand

men and women toward successful accounting careers. I want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain . . . how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree, of Certified Public Accountant if you so aspire.

It doesn't matter whether you've had previous bookkeeping experience, or whether you don't know a debit from a credit. Whether you wish to qualify as an expert bookkeeper, advanced accountant, cost accountant, auditor, government accountant, income tax specialist, or public accountant . . . you'll find in LaSalle's Problem Method the exact plan to prepare you rapidly and inexpensively—in spare hours at home—without losing a day from your present job.

So right now, today . . . if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions . . . send your name and address to me on the coupon below. I'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

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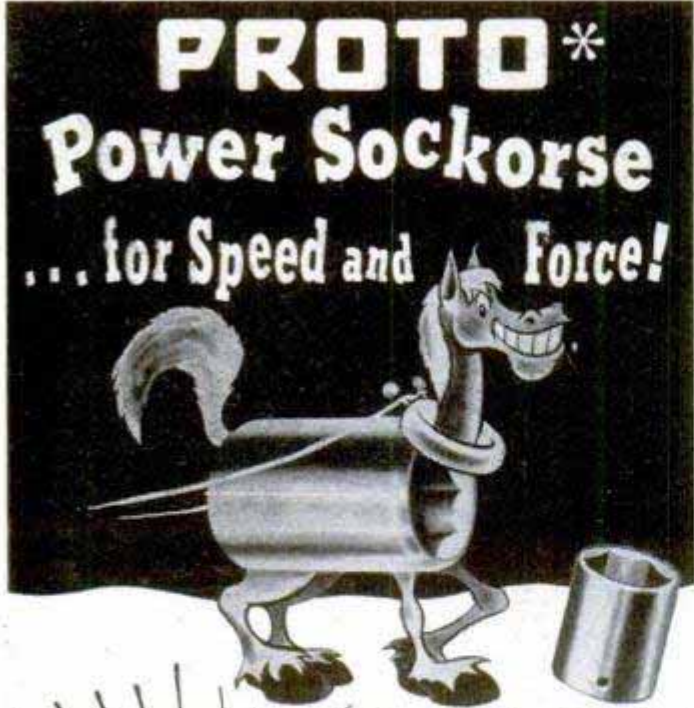
Name . . . . . Age . . . . .

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6-Point (Hex) Socket



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6-Point Deep Socket



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**\* PROTO** means **PRO**fessional **TO**ols. It's the new name for the tools that have been preferred for 43 years.

5086



(Continued from page 6)

I am now working with the National Park Service at Hampton National Historic Site, an old mansion . . . near Baltimore, Md. Among the many ancient objects in the house is a pair of very early roller skates . . . much like the Japanese version except that there are only two wheels in a single row . . .

John L. Benson,  
709 Washington Ave.,  
Towson 4, Md.

\* \* \*



**Letter to the Editor**

Dear Sir:

In your issue of *Popular Mechanics* for February, 1950, you published a photograph and note dealing with fluorescent lighting for street lamps. It is stated that the lamps are suitable for tunnels and may eventually be used for lighting roadways.

Perhaps it would interest your readers to know that both in the nearby town of Wolverhampton and in Birmingham fluorescent street lighting has been in use for fully a year and, in my opinion, has to a great extent though not altogether eliminated glare, especially so in wet weather. Eyestrain which otherwise results from street lamps is almost overcome.

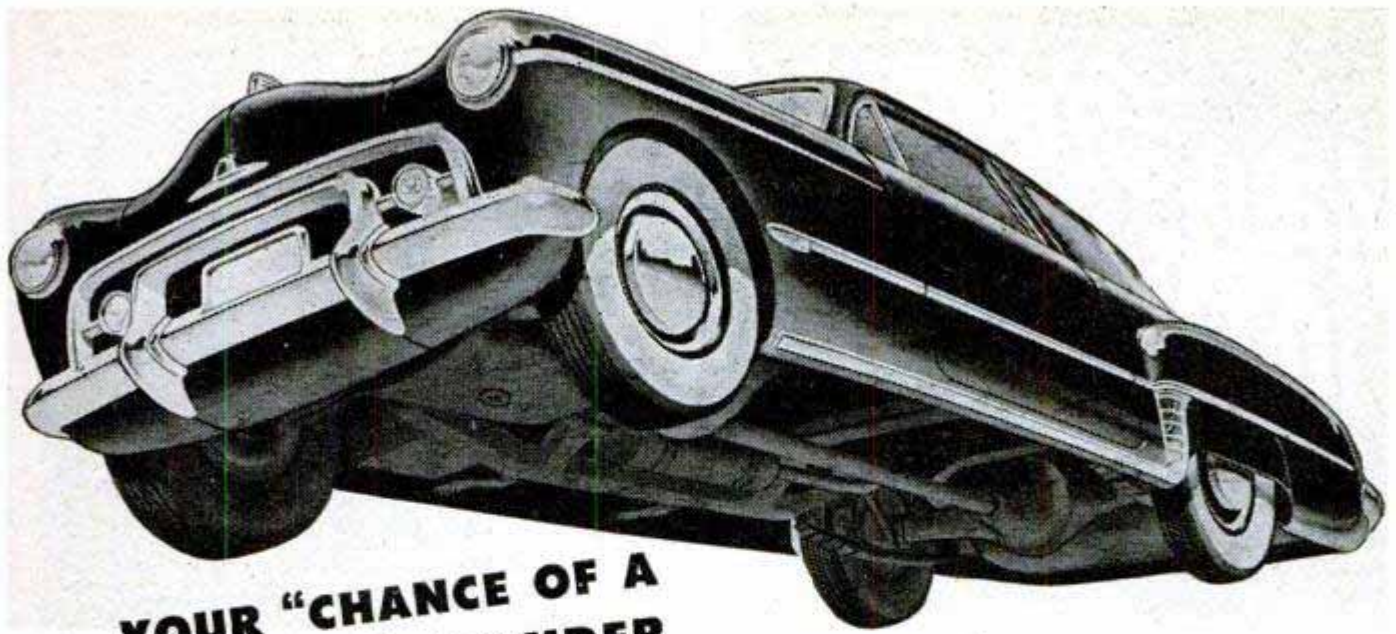
Smaller types of this class of lamp having a direct air-driven generator totally enclosed in the casing are also being developed for use in coal mines, etc.

A. W. Firkins,  
104 Codsall Road,  
Tettenhall, Staffordshire,  
England.

\* \* \*

☐ A garden for the sightless in Sunderland, England, has four-inch curbs to guide the feet of the blind visitors and metal tags with braille legends to identify the flowers.

(Continued to page 10)



## YOUR "CHANCE OF A LIFETIME" IS UNDER THIS AUTOMOBILE!

• Don't take our word for it. *Look* magazine recently listed "six best job opportunities." Job opportunity Number 1 was AUTO MECHANIC. Here's what the U. S. Department of Labor had to say: "Present, future opportunities for trained workers very good. Opportunity to open own shop."

Here's what *we* say: If you want to get ahead in this field, I. C. S. can help. The I. C. S. "Auto Mechanics Course" covers the basic principles and the latest wrinkles. It gives you *practical*, workable answers to

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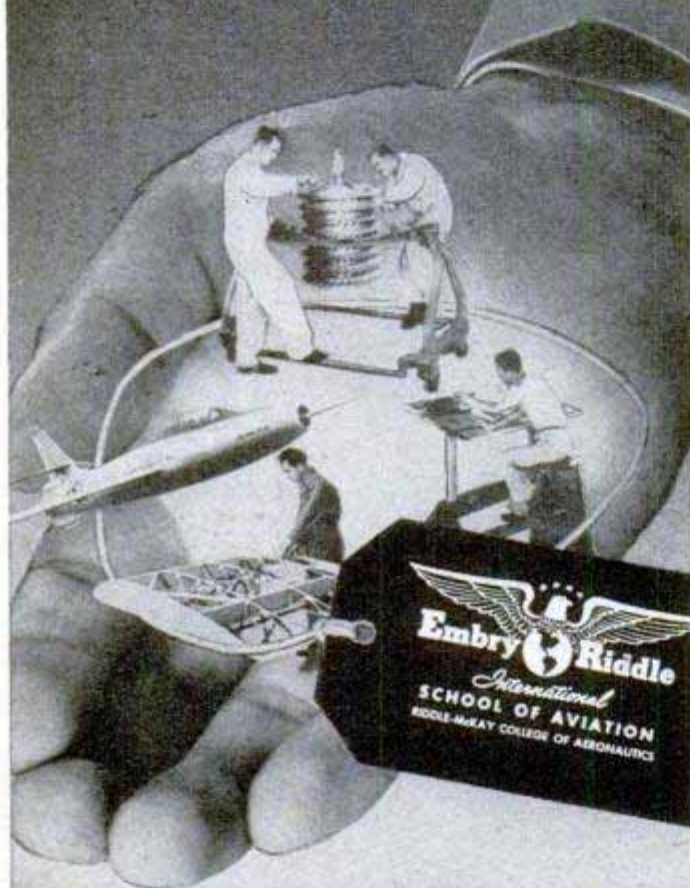
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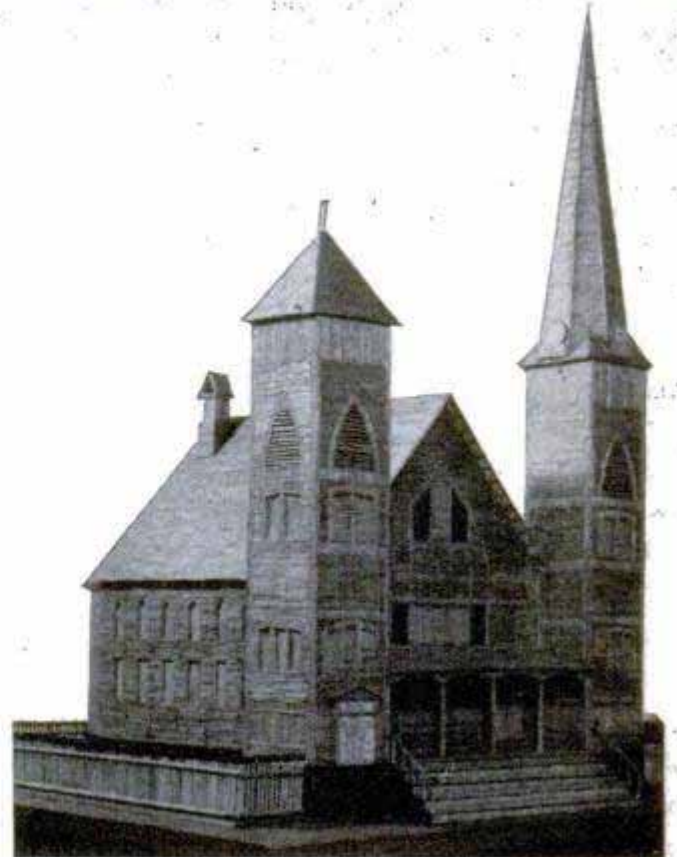
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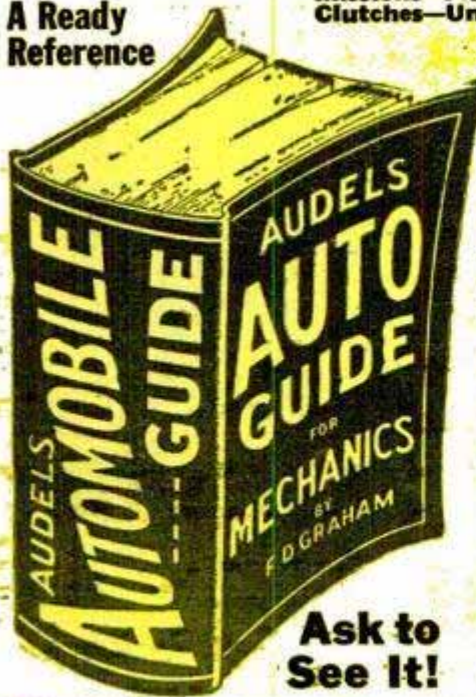
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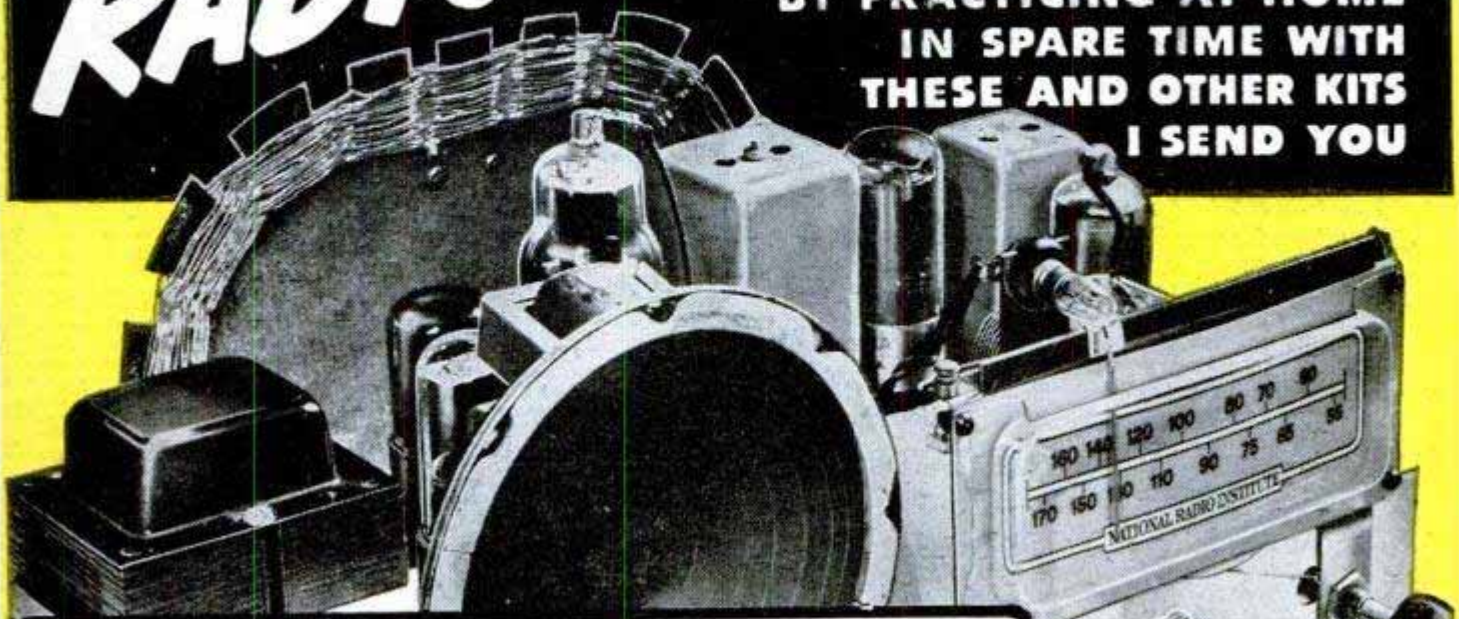
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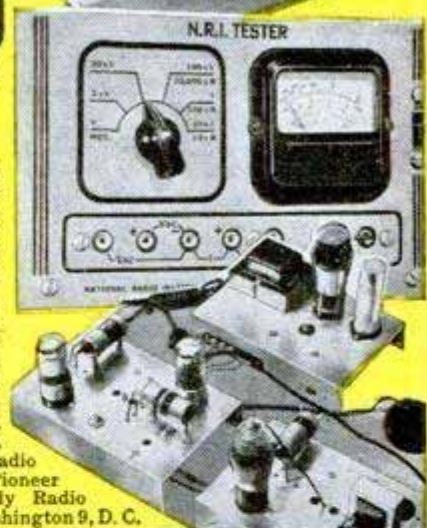
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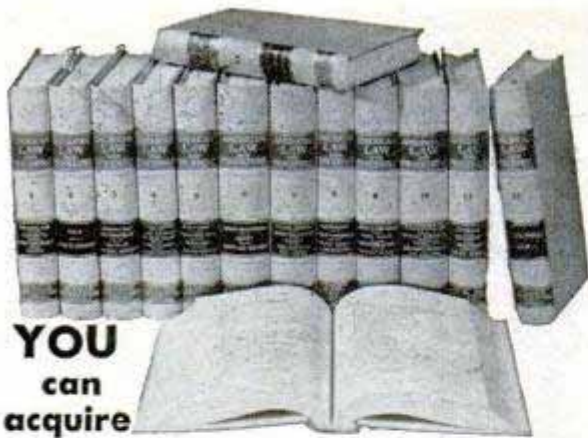
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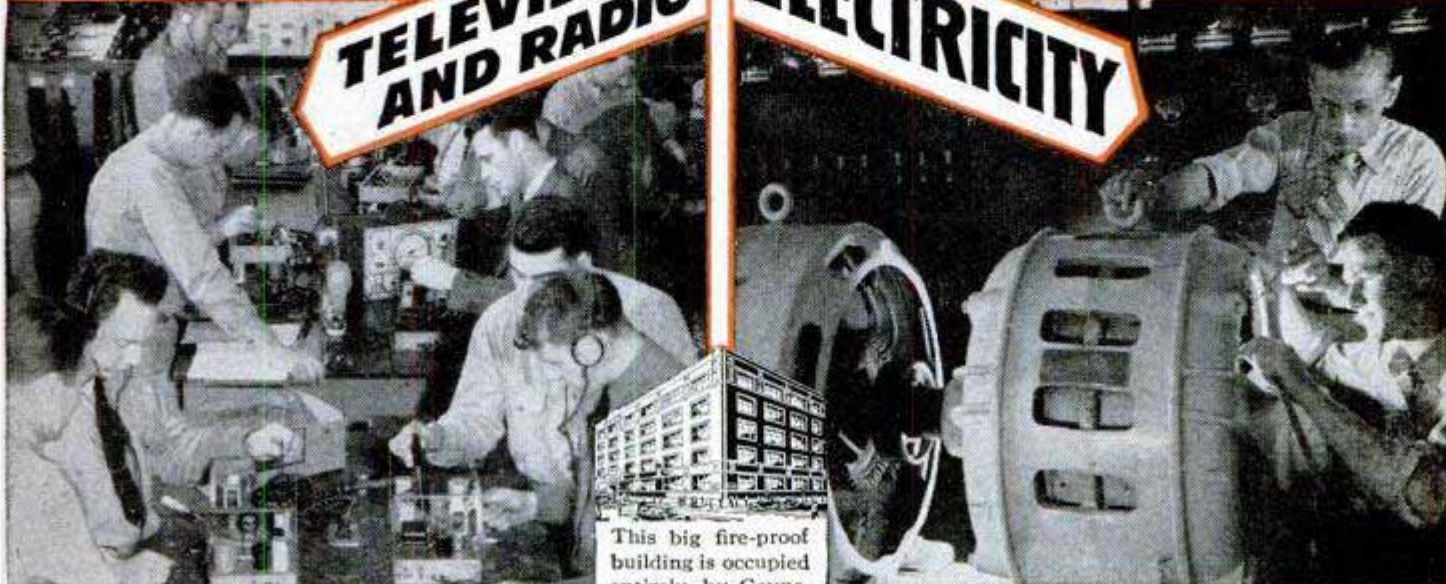
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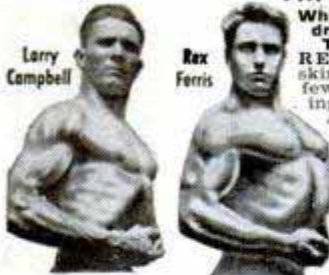
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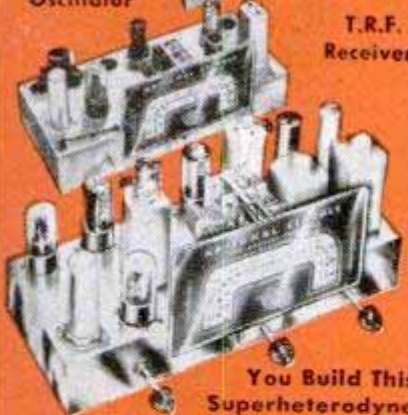


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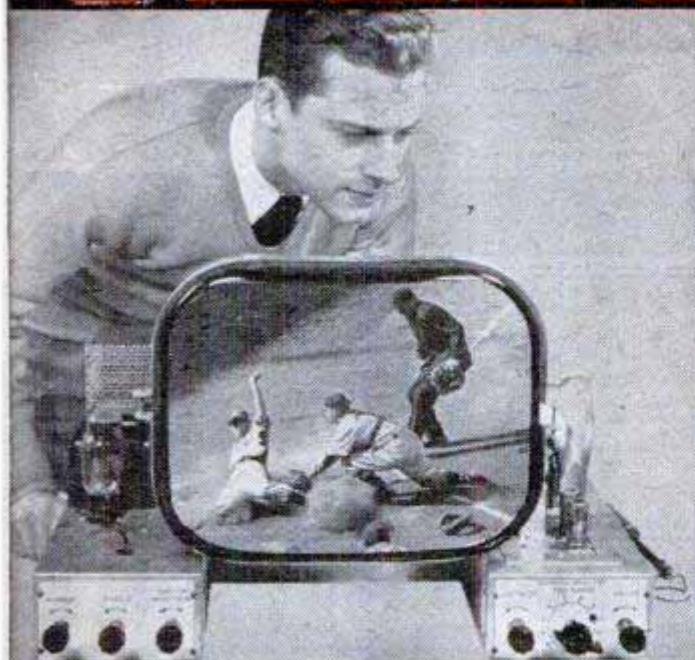
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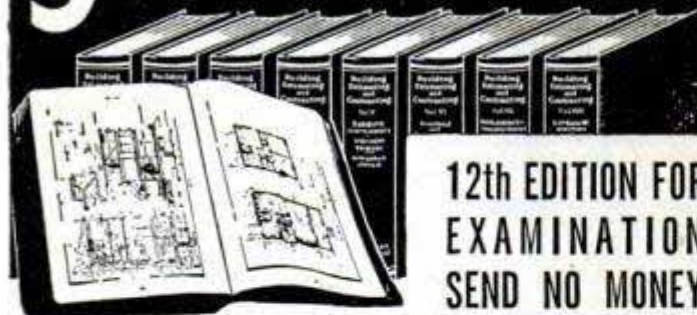
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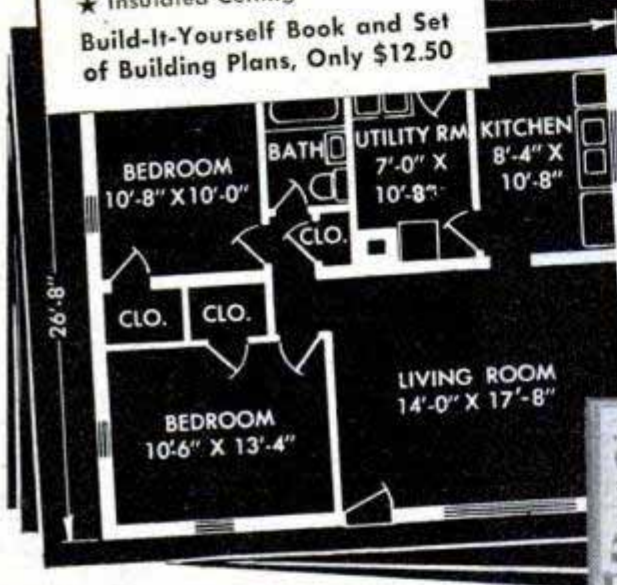
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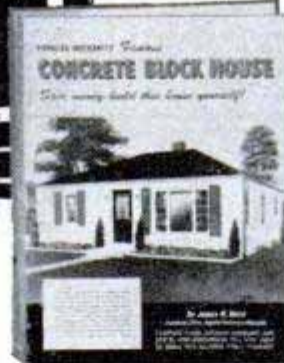
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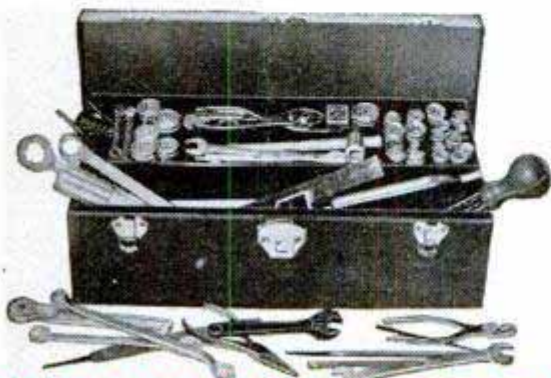
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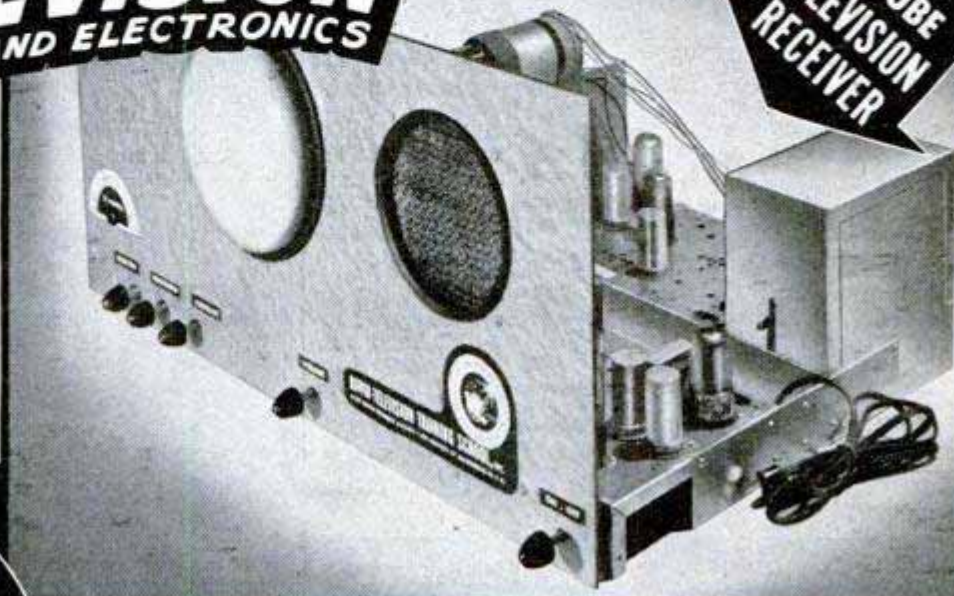
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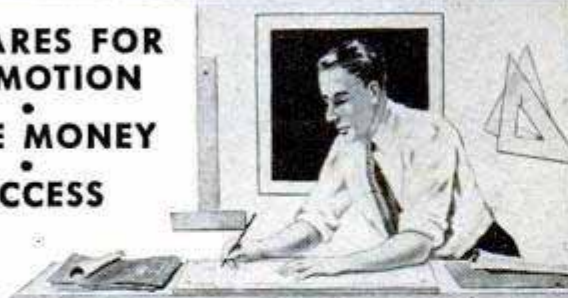
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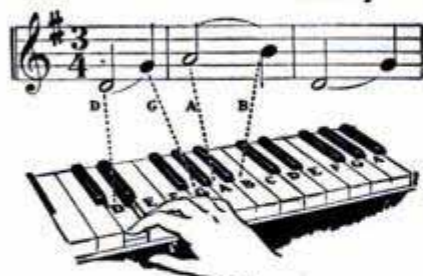
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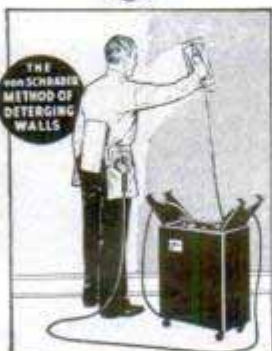
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# \$15<sup>20</sup> an hour!

This is the average earning reported by Presto salesman WILLIAM F. WYDALLIS. "The sky's the limit" on Presto profits because of America's serious need for this new fire extinguishing discovery.

Folks Are Amazed when you Tell Them This New Kind of Protection Costs Only **\$3<sup>98</sup>**



## Only Presto Has All These Features!

-  Ends Fire as Fast as 2 Seconds
-  Chemical Contents 1.5 to 6 Times More Effective than Others on an Equal Weight Basis
-  Weighs Less Than 1 Lb.
-  Easily Held in One Hand—Even by a Child
-  Needs No Inspection or Re-Charging—Does Not Corrode or Deteriorate
-  Costs Only \$3.98—Yet Out-Performs Bulky Extinguishers Costing Several Times as Much
-  Automatic Pressure—No Pumping
-  Guaranteed for 20 Years—Certificate Is Packed with Every Presto

WOULDN'T YOU like to be making the kind of money William F. Wydallis is making? His story (printed at right) is just one example of the brilliant success that Presto salesmen are meeting everywhere! A Florida salesman earned \$600 in one month. An Ohio man earned \$2100 in 2 months. A New York salesman earned \$1500 in one month. A New Hampshire salesman added the Presto as a *sideline* and picked up an extra \$1800 in 20 months.

### What is the Secret?

PRESTO contains an amazing new chemical—"Chlorobromomethane" or "C.B." developed as a secret defense against fire during the war.

In comparing the effectiveness of "C.B." in fighting various kinds of fires The Dow Chemical Company's report states: "It has been proved that 'C.B.' is about 1.5 to 6 times as effective as other common extinguishing agents on an equal weight basis."

This extra effectiveness of "C.B." means that Presto can be made light and handy enough for even a woman or child to use. Just a twist of the knob . . . and flames disappear! "Sells on sight" to owners of homes, cars, stores, farms, service stations, boats, motorcycles, factories, offices.

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Everyone is terrified at the very thought of FIRE! Every year fire kills more than 11,000 people. Most people who see Presto in action want one or more—ESPECIALLY WHEN THE PRICE IS ONLY \$3.98 EACH!

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WILLIAM F. WYDALLIS

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"For every hour I have devoted to the Presto, I find that I have earned an average of \$15.20 an hour. I am now convinced that extraordinary money can be made in this safety field. I am devoting more of my time to this product now since I have discovered that the earnings on this item are greater than any item I have handled in the past."

—William F. Wydallis  
Van Wert, Ohio



CHARLES KAMA

This Presto salesman from Texas was featured as "Salesman of the Month" on the front cover of a sales magazine. He told the magazine's reporter:

"I think I've succeeded pretty well. I'm making more than a thousand dollars a month—and I haven't touched bottom yet."

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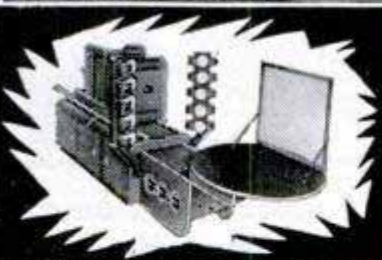
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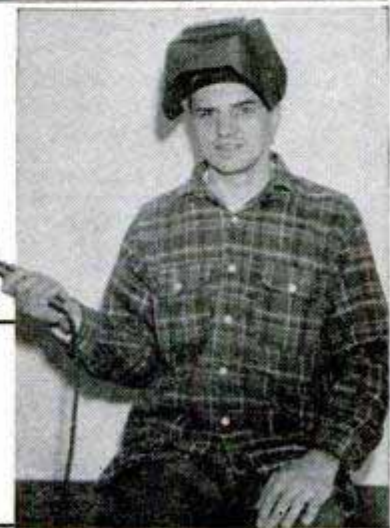
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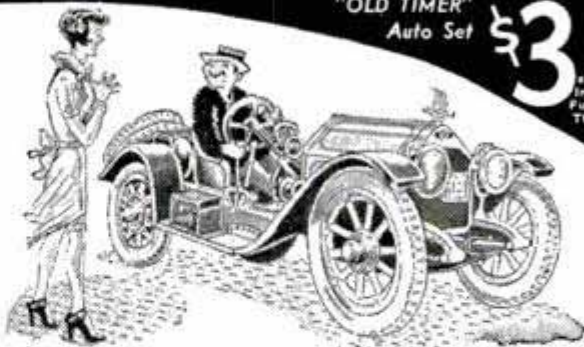
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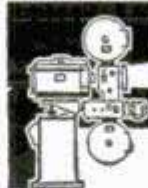
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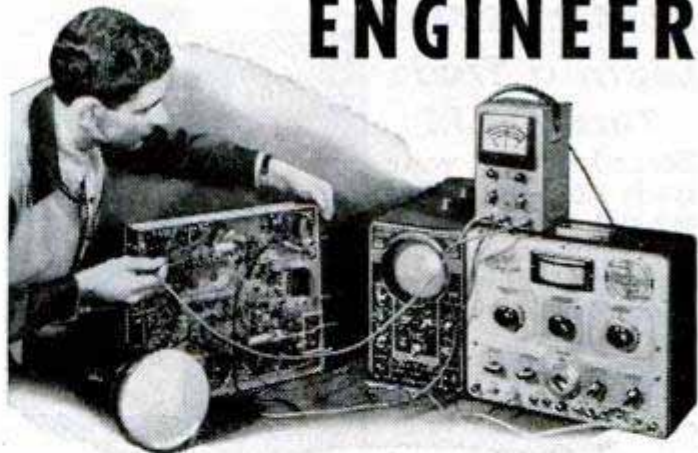
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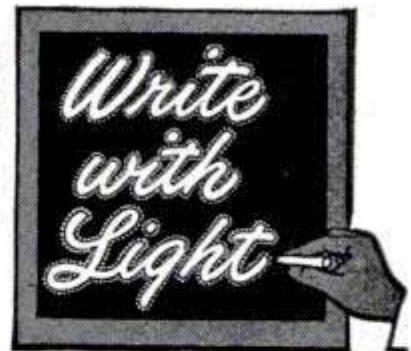
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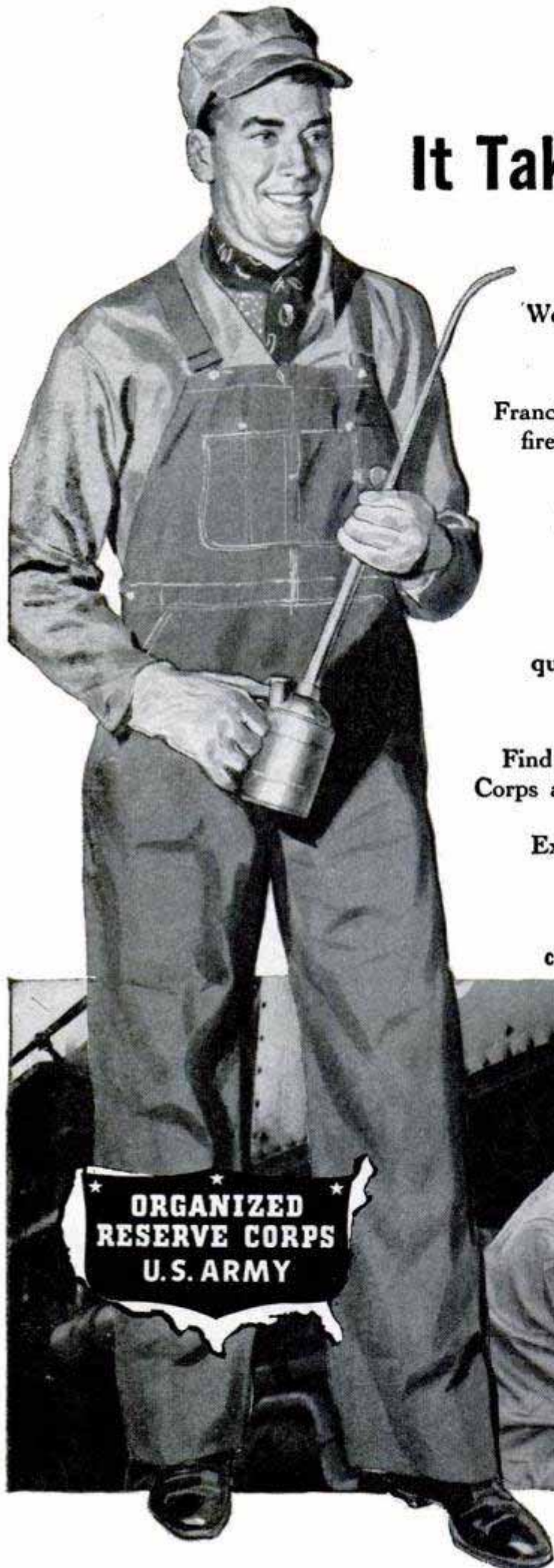
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HOW To set up and run a mirror shop! Resilver mirrors. Make chipped glass nameplates. Electroplating salts and rectifiers. John Sprinkle, V60, Marion, Indiana.

CASH For your idea, 280 manufacturers need inventions, patented or unpatented. List free. Invention Bureau, 208M Clinton, Oak Park, Illinois.

MAKE Money making new greaseless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

A BUSINESS In your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Chemica Division, 1269 S. Norton, Los Angeles 6.

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. Gordan Publishers, Box 23, Pawtucket, R. I.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

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

### MONEYMAKING OPPORTUNITIES

MONEYMAKING, Mail order books. Wholesale, retail, 1000 ways to make dollars. Free literature. Clancy, 1799-W Cedar, New York 53, N. Y.

CANDY-Making. Well paying home business. Amazing instruction course with formulas. \$1.00. Nelko, Box 3462-C, Chicago 54, Ill.

MAKE Back-yard profits. Unusual opportunities! Interesting booklet free. Pickett's, Florence, Kentucky.

MAIL Order magazine sent free. Many money making opportunities. Observer, Montague, Michigan.

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

EARN Money by mail, like I do! Free details. House of Friendship, Bowen Court, Douglas, Mass.

FREE Broadside describing "137 Business Plans." W. Nothner, Lake City 3, Arkansas.

DISTRIBUTE Sensational songwriter booklet, "Commercial Music." Ideal home mail-order business, publication, details, discounts, \$1.00. Popular, Box 927, Atlanta, Georgia.

BUY Nylons direct from mill. Make good profits on fast selling nylons. Quick delivery on any quantity. Write for confidential wholesale price list. Joy Hosiery Mills, Delawareanna 13, New Jersey.

START Your own profitable, specialized, mail order business! Interesting "how" details, free. I. J. Associates, 310 Garfield Avenue, Plainfield, N. J.

UNPAINTED Bookends, plaques, novelties. Free list. Plastercraft Arts, 1611 E. Fifteenth, Cheyenne, Wyo.

GREAT, Easy. New car refinish, around 21c. Formula ends painting, polishing. Two ingredients, 35c coin. Skeptical? Postal. Teycer, Chemist, 1287½, Chicago 90.

PRIZE Contests present amazing money-making opportunities. Only 10c. National Contest Bulletin, Box 2685-P, Miami 16, Florida.

\$15 HOURLY, Spare-time, without investment! Aichner, 267-G1 Maple, New Wilmington, Penna.

MAKE And sell a proven item welcomed by smokers like I do. Details free. Thos. W. Mogck Laboratories, 40 Wood St., Camden 2, N. J.

PRECUT Fine southern pine lawn and porch chairs. Assemble in fifteen minutes. Sell for \$6.00 or more. Your cost \$2.50 delivered. Minimum order of four. No c.o.d. Send money order today. E. L. Overstreet, 210 Arena St., Lufkin, Texas.

WESTERN Advertiser offers many worthwhile moneymaking opportunities. Sample copy free. H. Edlund, 557 Kensington, Los Angeles 26, Calif.

AUTOMOBILE Salesmen wanted! Train now. Sales manual, tips, trade secrets, \$1, postpaid. Jandor, 613 Voris, Peoria 3, Ill.

QUICK Profits taking magazine subscriptions, handling greeting cards. Cassell Publishers Service, Westfield, N. J.

CHURCHES, Organizations \$130 and 12 card tables. You sell advertisements for table tops. Unique Gift Club Plan, Pine Hill, New Jersey.

BOOKKEEPERS Earn \$100.00 week operating your "bookkeeping service." Simplified plan. Information free. Bookkeeping Service, Box 664-M, Springfield, Missouri.

LEARN Professional candy making profitable home business. Details 10c. Pate, Kissimmee, Florida.

RAISE Your business value, standing, as state notary public. Information. Stationers, Helotes 50, Texas.

DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

\$250 WEEK Reported! Free illustrated book "505 Odd Successful Businesses." Work home! Expect something odd! Pacific-E, Oceanside, California.

EASY Ways to earn extra income are described in Money-Making Hobbies. 132 projects you can make at home and sell anywhere. 160 pages, \$1.98. Popular Mechanics Press, 200-MH East Ontario, Chicago 11, Ill.

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

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

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

### FORMULAS, PLANS, ETC.

WATERLESS Hand cleaner. (No ammonia.) Easily made. Good profit. 2 dependable formulas \$1.00. Nelko Chemical Service, Box 3462, Chicago 54, Ill.

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

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

**FREE** Formulas for making 3 types of waterless hand cleaner. Also glass cleaner and amazing "lazybones" auto cleaner-polish. Organic Chemicals, 1269 S. Norton Ave., Los Angeles 6.

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

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

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

## PLASTICS

**NEW** Liquid plastic. Clear, colors. Cast without heat. Embed flowers, insects, coins. Saw, drill, carve. Complete kit only \$3.95 postpaid, or send 25c for exciting new home project manual showing how to get started. Castolite, Dept. H-101, Woodstock, Illinois.

**LUCITE**, Plexiglas, acetate. 85 different colors, thicknesses. Immediate shipment from stock. Rod, tube, casting plastic. Wholesale, retail. Catalog, instructions, bargain lists, 10c. Gem-O-Lite, Box 686S, North Hollywood, Calif.

**AMAZING** Liquid plastic kit \$3.25. Embed articles. Make solid objects. Beautiful results quickly, inexpensively. 15 cents for catalogue. Kristalon Plastics, Dept. Z-70, Box 29, Wilmette, Illinois.

**PLASTIC**: Sheets, cut pieces, and scrap in clear and colors. Rod, tubing, acetate, dies, jewelry findings. Send \$1.00 for 4 pound scrap assortment and fabricating manual. Regal Plastic Supply, 720 Main, Kansas City, Missouri.

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

**EARN** Money with plastics. New book, "Money-Making Hobbies," shows you how. 160 pages, \$1.98. Popular Mechanics Press, 200 E. Ontario, Chicago 11, Ill.

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

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

## CHEMISTRY

**COMBINATION** Offer—Chemical balance with weights. Catalog of chemicals, apparatus, kits, \$1.00. Catalog only, 25c. Rex Laboratories, 2849-A Birchwood, Chicago 45, Illinois.

**USED**: Analytical balances, microscopes to 440X. Guaranteed. Excellent condition. Bargain. Dr. R. Bunch, 2256 Admiral Dr., Indianapolis, Indiana.

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

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

**CHEMICALS** And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester, 20, N. Y.

## AGENTS WANTED

**IMAGINE**—Extra cash for you! Sell friends amazing value metallic, felt applique, comic, 50 for \$1.00 Christmas cards. Exclusive gift wraps. All-Occasion assortments, scented stationery. Animated books, gifts. Profits to 100%. Special offers. Bonus. Write today for free samples name imprinted Christmas cards, napkins, stationery, feature assortments on approval and free catalog. Elmira Greeting Card Co., C2109 Elmira, N. Y.

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

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

**BRAND** New! Amazingly different and smart Christmas cards bring you big money! Take easy orders for sensational new Christmas cards. Pays up to 100% cash profit. Christmas cards with name 50 for \$1, up. Big line. Personal stationery and book matches. Get sample assortments on approval. Imprints free. Write today. North Star, 31 Glenwood, Dept. J-18, Minneapolis, Minn.

**NEED** Extra dollars? Even beginners make profits to 100% selling new "Christmas pearls," metallics, hankie assortments. Big line novelties, kiddies' books, wrappings. Bonus. Free sample portfolios name imprinted Christmas cards, stationery—50 for \$1.00, up. Feature boxes on approval. Write Pilgrim Greetings, 111 Summer, Dept. AN-4, Boston, Mass.

**\$18.00** AN Evening spare time! Ambitious, reliable men, women, wanted to end refrigerator defrosting nuisance for every housewife. Exclusive patented device. West made \$600.00 first three weeks spare time. That's exceptional. Pleasant, dignified. Write for free details. D-Frost-O-Matic, Dept. PMC-7, 6 N. Michigan, Chicago 2.

**HAPPY** Money-making days for you! Sell friends metallic Christmas cards, wrappings, children's books, gifts, novelties. Big profits. Bonus. Special offers. Request feature samples on approval, free samples name imprinted Christmas cards, stationery, napkins, free catalog and free selling guide. New England Art Publishers, North Abington 253, Mass.

**AGENTS**, Salesmen, demonstrators, distributors: For biggest profits sell the "NuSilver, NuChrome, NuBrass, Plating Liquids," products. Cloth applied. Up to 900%. Get free sample offer. NuSilver, 508-PM-7 N.Y. Street, Aurora, Illinois.

**MAKE** Money easy. \$5.00 for selling only ten \$1.00 21 Christmas card boxes. Also metallic cards, personalized cards and stationery, note paper and wrappings. Send for samples. Howard P. Ellis, Dept. PM-7, Pitman, N. J.

**BEST** Indian carpets; arts and crafts; silks, sarees; tea, coffee; coconuts; cashewnuts; dry fruits; musical instruments; postage stamps; etc.; available. Address: Nativity Viegas, Post Box 1477, Bombay, India.

**AMAZING** Offer—\$40 is yours for selling only 50 boxes Christmas cards. And this can be done in a single day. Free samples. Other leading boxes on approval. Many surprise items. No experience needed. Free samples personalized Christmas cards, stationery, napkins. Write today. It costs nothing to try. Cheerful Card Co., 1483 White Plains, N. Y.

**MEXICAN** Feather pictures. Sell gift shops, etc. Profitable. Details free. Miciak, 241-25 85 Ave., Bellerose 6, N. Y.

**AMAZING** Metallic birthday cards, stationery, napkins. Samples on approval. Plateless, 392 Broadway, New York 13.

**MAKE** Money fast! Sell Christmas and everyday cards to friends, neighbors, clubs, others. Amazing profits. Over 100 sell on sight items including 5 leading 21 card \$1 assortments, religious, 50 for \$1, metallics, comics. Stationery, children's books, ladies' rain sandals, deluxe personals. Bargain offers. Extra cash bonus plan. Write today for samples on approval. Hedenkamp, 361 Broadway, Dept. PM-7, New York.

**SELL** Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious, "7x11" cost 6c, sells 35c. Make money. 15 samples \$1.00 postpaid. Lowy, 812 Broadway, Dept. 550, New York City 3.

**SELL** New automatic floor waxer. Trigger on handle. Hands never touch floors or wax. Retail \$2.95. Profit 125%. Write Smith, Inc., Greenfield 2, Mass.

**\$50.00** EASILY Made in spare time. Sell sensational new name-imprinted Christmas cards. 50 sell for only \$1.00. Not obtainable elsewhere. Big profit. Write for free samples. Kit on approval. Regal Greetings, Hazel Park 21, Michigan.

**NYLON** Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P7, 3936 Market, Philadelphia 4, Penna.

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

**FREE** Samples, and amazing plan giving you gorgeous dress without penny cost. Rush name today with dress size. Harford, Dept. C-135, Cincinnati 25, Ohio.

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

**SHINE** Shoes without "polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kistee, 151, Akron, Ohio.

**EARN** \$3 Hour spare time—Sell Sunshine's beautiful, exclusive Christmas cards. 21 nationally famous French folders, \$1.00; 24 evergreen cards, 24 lined envelopes \$1.00; 50 imprints \$1.25. Many more. Samples on approval. Write for Sunshine's complete sales kit, free imprint folders. Sunshine Art Studios, Dept. PM-7, 115 Fulton Street, New York 8, N. Y.

**ANYONE** Can sell Hoover DuPont Nylon Uniforms for beauty shops, waitresses, doctors, nurses, others. In white and colors. Exclusive styles. Top quality. Low priced. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. F-100, New York 11, N. Y.

**CHRISTMAS** Card agents. Sell America's only \$1.00 Gift wrap assortment containing 30 full size sheets; giant plastic pencil containing personalized pencils; Santa stocking with name; Rudolph, the red nosed reindeer assortment. Over 100 Christmas card box assortments and surprise items. Write today for five free portfolios of personalized Christmas cards. Elmercraft, Dept. 13, 5930 S. Western, Chicago 36.

**MEXICAN** Feather pictures. Big profits; no investment! Free details; sample 10c stamps. Silvia-PD, Apartado 9036, Mexico City.

**SELL** Christmas cards with name, 50 for \$1, up. Big cash profits. Keep up to 50c on 21-card \$1 assortments, 100 fast-sellers. Amazing premium bonuses. Assortments on approval. Imprints free. Creative Card, 2505 Cermak, Dept. D-24, Chicago, Ill.

**AT** Last! Something new and sensational in Christmas cards. Show gorgeous satins, velours and metallics never before offered. Get easy orders fast! Pays up to 100% cash profit. Free samples of 30 Christmas cards with name, 50 for \$1.00 up. 80 assortments. Personalized book matches and stationery, gift items. 2 assortments on approval. Write Puro Co., 2801 Locust, Dept. 040-J, St. Louis, Mo.

**MAKE** Sensational profits! 100 fast-selling, repeat household items! Literature free. Royalty, Box 748-A, Passaic, N. J.

**HOUSE** Paint—Sell users and stores. Private label. Steady work. Big pay. Certified Products, Louisville, Ky.

**MONEY**—Double yours. 100 fine razor blades and dandy pen retail \$1.00. Wholesale prices. Sample deal \$1.00. McKittrick Distributor, Mt. Vernon, Illinois.

**FREE** Outfit starts you making big money. Sell popular priced Air Cushion shoes. Newest style sensations. Advance commissions. Cash bonuses. Experience unnecessary. Special shoe offers. Merritt Shoes, O-102 Brockton, Mass.

**COUNTY** Agents. Sell dealers. Gas-electric mowers—\$39.90. Rotacut, RC-2016, Excelsior Springs, Mo.

**\$50 CASH!** Sell America's leading 21 card Christmas assortments. Samples on approval. New, sensational money-making gift items. Free samples 50 and 25 for \$1.00 personal Christmas cards. Write Lorain Art Studios, Dept. 51, Vermillion, Ohio.

**AGENTS**—Make big money! Sell sensational new houseware items! Write for free details, sales plan today! Arrow, Dept. 10, 1501 Broadway, New York 18, N. Y.

**\$50 YOURS.** Sell only 100 boxes beautiful Xmas cards; also 50 and 25 for \$1 imprinted; others: novelties, metallics; stationery, write now for approval samples, cost nothing to try. Pen-n Brush, PM-7, 139 Duane St., New York City 13.

**GREETING** Cards, personal stationery, napkins. Country's outstanding line. Samples on approval. Liberty Bell Studios, Dept. PM-1, 1013 Filbert St., Philadelphia 7, Penna.

**QUICK** Profits selling beautiful personalized napkins. Selling kit free. Snowcraft, 81-B Theron, Johnson City, N. Y.

**POWER** Mower—\$39.50. Delivered. Complete. Sales kit free. Modern-AF, Excelsior Springs, Mo.

**300% PROFIT** Selling new product. Big demand everywhere. Fully guaranteed and bonded. Friendly Products Co., Dept. P750, Box 665, Youngstown 1, Ohio.



**PAST PROFITS**—No investment. Send for big, free catalog. Plastic aprons, tablecloths, etc. 150 sure-fire items. We guarantee sales. Write the Halliday Company, Dept. M-5, 347 Broadway, Passaic, N. J.

**SAVE**—Make money. Buy merchandise wholesale. Free details. Orysen's, 1147 Sunnyside, Waukesha, Wisc.

**SENSATIONAL Nylons** guaranteed against runs. Nationally advertised. Not sold in stores. No experience or money needed. Also lingerie, robes, men's hosiery. Outfit, sample, etc. free. Wonderful opportunity earn big money spare or full time. See our full page advertisement on page 61. Kendex Corp., Babylon 946, New York.

**EARN Money fast**—full or part time. Sample kit of genuine leather key cases \$1.00. Take orders for imprinting. Large commissions. Imprinting Service Company, 18614 Schoolcraft Avenue, Detroit 23, Mich.

**200 NEW Money making plans, tips, ideas** for increasing your income. Folio free. Reynard Pub., Smithfield 3, Ohio.

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

**NOVELTIES** And household items! Fast sellers for agents, dealers, and gift shops. Write for 16-page Sunshine catalog. Sunshine Sales, Dept. WP3, Loudonville, Ohio.

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

**GREETING Card assortments.** Personalized napkins, book matches. Gift items. Raum, 4154g Fifth Street, Philadelphia 40.

**MEN — Women,** sell money-making household items from fully illustrated catalog. Sales outfit free. National, Box 88, Boston 22, Mass.

**COSTS 4c.** Sells fast for \$1. Information free. Pacific Sales, Box 1458A, Wenatchee, Wash.

**FREE** Outfit, write today! Sell embroidered advertising uniforms and work clothes, initial buckles, belts, badges, 2000 emblems. Hook-Fast Co., Box 480PM, Roanoke, Virginia.

**MEXICAN Feather pictures,** unusual novelty. \$1.00 (stamps) brings \$2.00 worth samples. Refund if unsatisfied. Aztec Art, Apartado 762, Mexico City.

**BE** Renewal headquarters for all magazines. Handle everything at home. Big profits. No experience—no capital needed. Free catalog tells how. Write McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

**DRAW** Side income under notary public appointment. Stationers, Helotes 50, Tex.

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

**NEW** Atomic plumber cleans clogged sinks—Toilets with ease. Handiest tool made. Needed in every home, store, factory. Sells fast at \$1.25. Cost 50c. Zimpcor, 4642 No. Central Ave., Chicago.

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

**PROFITS To 100%.** Show lovely greeting cards, plastics, metallics, personalized stationery, napkins, coasters, novelties. Approval sample. Torres, 373A Fulton St., Brooklyn 1, N. Y.

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

**FREE Literature**—Thousands wholesale supply sources. Money-making business ideas. Wilkin Company, Hillsboro 4, Ohio.

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

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

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

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

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

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

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

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

### HIGH-GRADE SALESMEN

**LONG** Needed invention. Every home, store, farm a prospect. Full or part time. Low price, long profit. Free outfit. Write Red Comet, Inc., Dept. 655, Littleton, Colo.

**SALESMEN** Calling on garages, gas stations. New \$16.98 item. Align-A-Matic, Box 94, West Orange, N. J.

**ADVERTISING** Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-750, 7530 Greenwood, Chicago.

**EXCEPTIONAL** Earnings selling famous Bostonian shirts. Spare time, full time, sideline. Sales kit, actual fabrics, free. Bostonian, 89 Bickford, Dept. A-10, Boston 30, Mass.

**SALESMEN**—Absolutely make \$50.00 a day. New sensational utility item for every food, beverage outlet, etc. Big profits. Johnson-Hill, 53-BA West Jackson, Chicago.

**SALESMEN**—Sell calendars and advertising novelties. Buyers everywhere. Low prices. Big commissions advanced, bonuses. Sample free. Consolidated-Modern Press, 329 So. Wood, Chicago 12, Ill.

**100% PROFITS** In carbon paper, ribbon. Rothblat, 9½ Thayer Street, New York 34.

**CALENDARS** And advertising novelties. Full time or side line. Every business wants them. Few calendar salesmen are on the road now which means more sales for you. Fleming Calendar Co., 6539 Cottage Grove, Chicago 37, Ill.

**BIG** Money during summer and fall. Sell exclusive Christmas cards to business and professional men. Write for details. Liberty Bell Studios, 1013 Filbert, Philadelphia 7, Penna.

**SENSATIONAL Nylons** guaranteed against runs. Nationally advertised. Not sold in stores. No experience or money needed. Also lingerie, robes, men's hosiery. Outfit, sample, etc. free. Wonderful opportunity earn big money spare or full time. See our full page advertisement on page 61. Kendex Corp., Babylon 946, N. Y.

**AD Matches!** Sell amazing designs—20, 30, 40 and 240-light book matches. Big spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-7, Chicago 32, Illinois.

**WRITE 3 Words**—Collect \$7.65 on 10-second demonstration to merchants. Write on glass with amazing magic crayon—Presto! 5 color advertising message takes fire, glows like brilliant neon. Three sales daily bring \$22.95 profit. Rush postcard for details. Complete sales kit, free! Maxilume Co., 125 W. Hubbard, Dept. CL-8, Chicago 10, Ill.

**IF** You sell, you need Opportunity Magazine—the "salesman's bible," packed with down-to-earth ideas that boost your earnings; filled with hundreds of announcements of new, fast selling items and lines. Send your name and tell us what you're selling now for free copy of latest issue. No obligation. Opportunity, 28 E. Jackson, Dept. 32, Chicago 4, Ill.

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

### EDUCATIONAL AND INSTRUCTION

**WIN** A well-paid job in travel—step into a new world of glamorous opportunity! Today more Americans are "going places" than ever before in history. As a result, the hotel and institutional field is surging ahead to new prosperity. Successful Lewis graduates are "making good" everywhere in luxurious hotels, fashionable resorts, smart restaurants, and clubs. Free book explains how to qualify at home for a well-paid position in this ever-growing business where you are not dropped because you are over 40, shows you how you are registered free of extra cost in the Lewis National Placement Service. Course approved for Veterans' training. Write today. Room SL-395, Lewis Hotel Training School, Washington 7, D. C. (Now in its 34th year.)

**INCREASE** Your earnings. Learn watch repairing, clock repairing or jewelry repair and design. We furnish supplies and tools. A licensed school. Large percentage of students report good income in spare time while learning. Write today for free information on course you want. Illinois School of Watch Repairing, Dept. CPM-7, 2870 Elston Ave., Chicago 18, Ill.

**MAKE** Up to \$35-\$45 week as a trained practical nurse! Learn quickly at home. Booklet free. Chicago School of Nursing, Dept. M-7, Chicago.

**"HOW To Break and Train Horses"**—A book every farmer and horseman should have. It is free; no obligation. Simply address Beery School of Horsemanship, Dept. 1107, Pleasant Hill, Ohio.

**LEARN** The collection agency business. Highly profitable. Easily mastered. Free folder. Cole Associates, Syracuse 2, N. Y.

**ENJOY** "Better Memory." Write Tom Harrison, 726F North Fifteenth, Waco, Texas.

**YOU** For president of your own credit-collection agency. Many who answered our ads now have their names on office doors. Franklin Credit, Roanoke 7, Va.

**WELDING** Training pays. Catalog free. GI approved. Hobart Trade School, Box 279-M-703, Troy, Ohio.

**CIVIL** Service jobs. Study course and service helps you pass exam. Write Box 363, Oak Park, Illinois.

**BE** A real estate broker through home study or classroom instruction. Write for free book. Approved for veterans. Weaver School of Real Estate, 15 E. Pershing Rd., Box CP-7, Kansas City 8, Missouri.

**MIND** Asleep? Try "Thinking Alphabet." Write Frank Tibolt 17M, Philadelphia 20.

**GET** U. S. gov't job! Start high as \$66.34 week. Secure positions. Men—women qualify now. Many openings expected soon. Experience usually unnecessary. Free 40-page book shows jobs, salaries, sample tests. Write: Franklin Institute, Dept. G-24, Rochester, N. Y.

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

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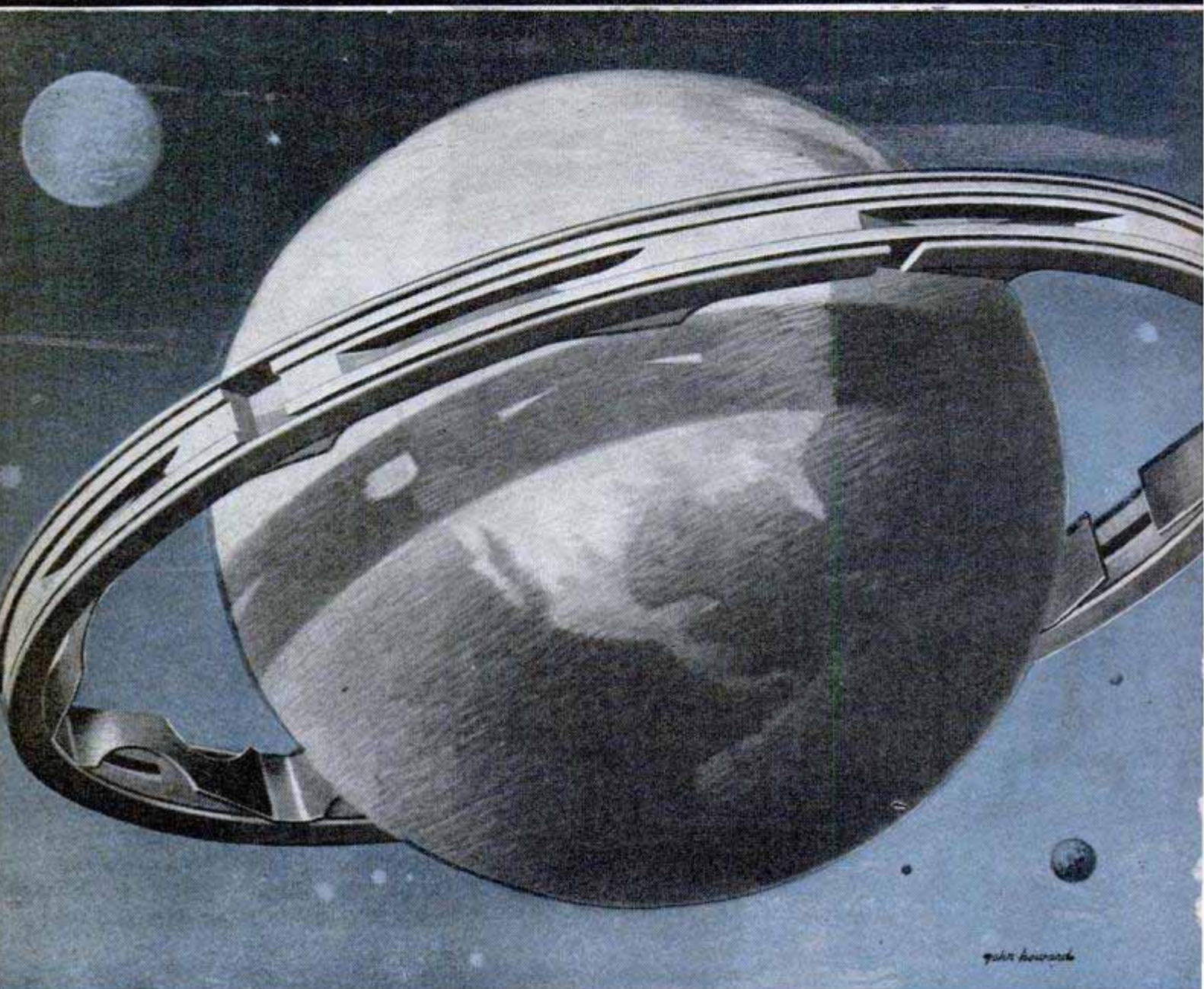
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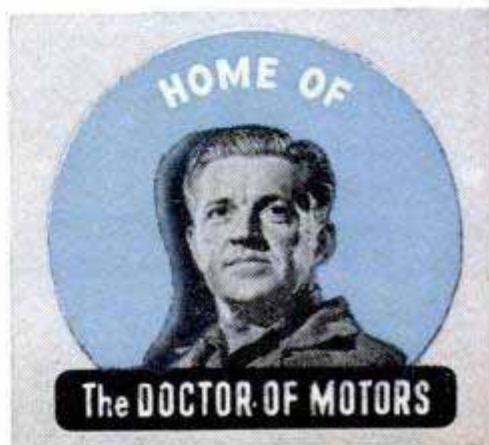
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# Seven Miles Up in a Glider

By Harland C. Ross

**I**N A GLIDER I have soared to the stratosphere, to an altitude of 36,100 feet, and turned back to earth only because my passenger and I were half frozen and beginning to suffer from lack of oxygen.

Huddled in our fleece-lined flying suits, we had climbed as high as our demand-type oxygen equipment was considered safe. In a pressure-cabin glider that I am now designing, I believe that I'll be able to soar to 50,000 feet or higher.

Climbing my half-ton medium performance glider to seven miles above sea level was possible by using a little-known phenomenon called the Sierra standing wave. This is a strong updraft of air that occurs when a storm approaching from the west strikes the Sierra Nevada range in California and takes on a wavelike flow. It seems to be identical with the standing wave that is created downstream when water flows over an obstacle in its path.

When a wind blows against the 12,000 and 14,000-foot peaks of the Sierra, the resulting air wave in the lee of the mountains possibly rises to 50,000 or 60,000 feet.

Alto-cumulus "roll" clouds, with their bases at about 13,000 feet, usually form above Owens Valley on the east or lee side of the mountains when the wave is present. Above them usually are several layers of lenticular, almost airfoil-shaped clouds that hang motionless. When these signs are seen, the Sierra wave can be found by flying in front of the stationary roll clouds and climbing up between them and the mountains to the west. The wave may stand steadily in place for several hours or several days.

I first experienced the wave in 1947 while crossing the mountains from the west in a light airplane. We were at 14,000 feet and about 80 miles north of Bishop, my home field. The smooth updraft, after we had

Before attempting altitude record in the glider shown at top, Ross put oxygen bottle and auxiliary equipment between front and rear cockpits





For take-off and to recover altitude, an auxiliary engine is cranked into place on top of an experimental glider. Pulling rope within cockpit starts it

crossed the mountains and briefly experienced a downdraft, carried us to 18,000 feet and was still going up. There was no oxygen on board and so I put the nose down and reduced the power to prevent more climbing. Steering lengthwise along the wave, I took advantage of the lift all the way home with considerably reduced throttle. Since then I've used the wave many times.

A couple of years ago, with a student in a Cessna, we encountered lift at 9000 feet in the lee of the Sierra. At 11,500 feet I switched off the engine and stopped the propeller by stalling the plane. A powered aircraft isn't supposed to fly when the engine is killed, but the Cessna climbed to 17,500 feet in a few minutes. We flew dead-engine for an hour while the student practiced stalls, spins and turns, then glided to the downwind side of a roll cloud where we found the usual downdraft. Losing altitude in a hurry, we started the engine over the field and made a normal landing.

Other pilots have observed the powerful lift of the Sierra wave, including a B-29 pilot who had been told to maintain a constant altitude of 30,000 feet during some cosmic-ray research. He couldn't do it on the course that he was flying. In spite of nosing down and greatly reducing his throttle settings, he climbed more than 700 feet per minute.

I've been a sailplane addict for years and I realized soon after I found the wave and studied it that it would be ideal for cross-



Controlled entirely from within craft, engine shown at left in erect position can be cranked down into a streamlined housing, above, when power isn't required

country soaring and for altitude flights. So it has proved, and in the last couple of years many glider pilots have been towed up into the wave by aircraft at Bishop, have cut loose, and have soared for hours. Sometimes they use a cloud "street" that occasionally extends for 100 miles to the south and 80 miles or so to the north. No extremely long cross-country flights have been made along the wave yet—but they will be. There's a chance that by taking advantage of thermals, plus the waves created by the various ranges to the east, a glider will be able to fly from Bishop to Salt Lake City, more than 400 miles away.

The wave provides such good lift that there's a temptation to keep on going up, even when there is no oxygen on board. This can carry a person to dangerous altitudes. At least one glider pilot suffered anoxia and passed out somewhere above 22,000 feet. He recovered consciousness after his glider had piloted itself out of the wave and had descended to 11,000 feet. Today, the rule is that all pilots who ride the wave should be equipped with oxygen.

The bitter cold of high altitude causes trouble, too. Temperatures range downward to minus 60 degrees Centigrade. A couple inches of Fiberglas insulation around the inside of the cockpit helps keep out the cold and you wear the warmest flight clothes you can get. One glider man found heavy underwear, wool pants and shirt, alpaca-lined flying suit, three pairs of wool socks, heavy shoes, flying boots and

heavy gloves weren't enough for comfort. He was still cold.

Chemical heating pads have been tried, also painting the nose of the ship black so as to absorb more solar radiation. Electrically heated suits aren't desired, because of the weight of the batteries, but since fingers and toes get cold first, heated shoes and gloves can help for three or four hours.

Canopy icing occurs from the condensation of your breath and can get so bad that you almost have to go on instruments. The best solution so far is to glue an extra panel of plastic, with an airspace between, over the windshield area. The panel stays warmer, doesn't frost over so thoroughly, and permits vision ahead.

Too, plastic canopies contract in the cold and split away from their fastenings. This is overcome by installing them so that they can move with changes of temperature. On most gliders the controls stiffen up at altitude, due to the contraction of the cables, but in the case of one glider that is built of magnesium the controls get sloppy instead. The magnesium structure contracts faster than do the cables. Spoiler flaps and trim tabs often don't work in the cold air because ordinary greases are used in the fittings and will freeze solid. Lubricants that have been developed by the U.S. Army and don't stiffen up at low temperatures will be used on future flights.

Early this year I prepared my glider for a record altitude attempt by making some of the modifications I've outlined. It is a

**Lenticular cloud over Owens Valley, with Sierras in background, indicates wave exists for good soaring**



**Instruments in Schweizer sailplane which set height record. Knob in center frees it from the tow plane. Below, bundled up in cold-weather flying equipment, Ross, front, and Deibert, rear, start on record attempt**



two-place Schweizer TG-3 sailplane, with a wingspan of 55 feet and a loaded weight of 1100 pounds. Instruments include bank and turn, climb indicator, altimeter, air speed, compass and thermometer, in both cockpits. The oxygen supply is carried between the two cockpits and for the flight a sealed barograph was carried aft of the rear cockpit. The ship is equipped with radio, a great help for calling the field if a distant landing has to be made.

On January 27, the cloud formations in the Bishop area showed that the wave had formed. That afternoon George Deibert of Bishop and I, dressed in everything we had and wearing parachutes, took off behind a towplane and were towed in circles to 9000 feet, after which the towplane headed west. At 11,500 feet the variometer showed a rate of climb of 1000 feet a minute. That meant that we were well inside the wave and so we released from the tow plane. By heading directly into the wind the rate of climb was increased to 1500 feet per minute. At 13,000 feet we put on our masks and checked the oxygen system.

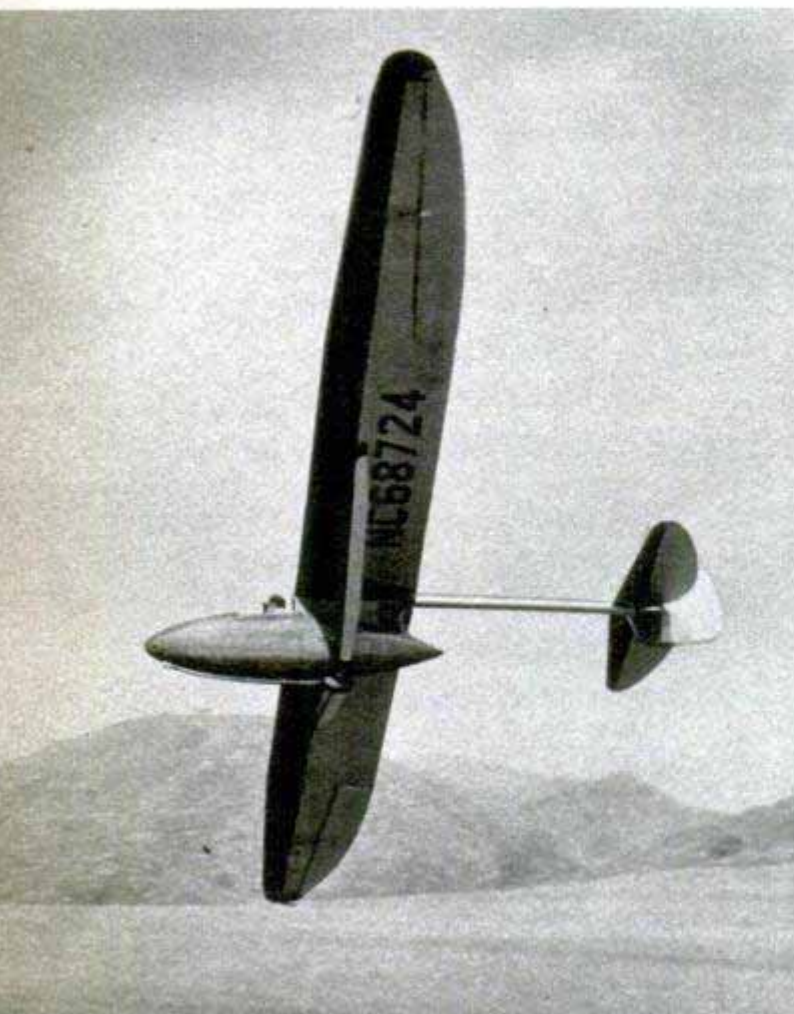
We were between the mountains and a roll cloud and soared around until we had climbed to 22,000 feet, at which altitude our climbing speed slowly dropped to zero. Then I noticed that we had drifted back over the stationary roll cloud because of an increase in wind velocity. We were out of the strongest part of the wave. I headed into the wind again, put the nose down to get a forward speed of 60 miles per hour,

and glided back into the best lift area. We quickly climbed to 27,000 feet.

There the lift weakened and while George was taking pictures I looked around for a better area. Twenty-five miles to the south, toward Mount Whitney, the roll clouds looked good and we headed in that direction, losing 2000 feet during the glide. Heading into the wind, we picked up the wave and climbed at 400 feet per minute to 28,000 feet. At 30,000 feet the lift was increasing and I realized that we were smashing records in both the absolute-altitude and the altitude-gained categories and for both single-place and multi-place gliders.

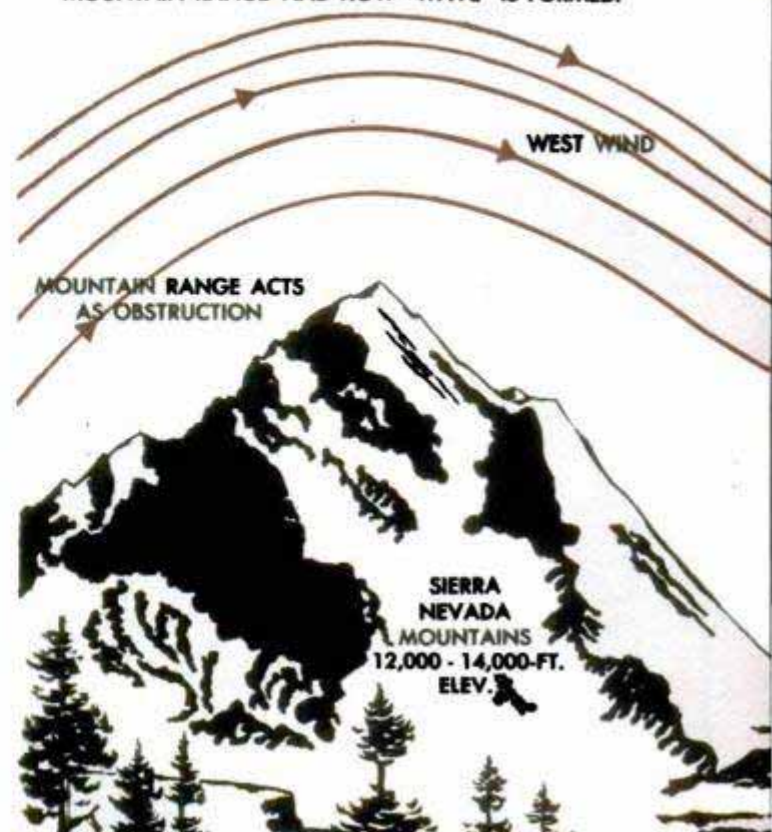
By now the canopy had frosted over and even the double windshield had a thin layer of frost. We could still see out a bit. With the sun low on the horizon it was beginning to get very cold. At 35,000 feet, the outside air temperature read minus 53 degrees Centigrade. Pulling my mask off for a few seconds, I asked George if he'd like to take one final picture. Talking was pretty difficult, and it was also hard to hear anything at that altitude. George pulled open his canopy, took his picture, and closed the canopy in a hurry. It was warmer inside.

We were still climbing but now the wind seemed to slacken and the air suddenly became very gusty, indicating that we were passing out of the wave. Probably we had moved in front of it. The trim tabs were frozen and when I began to use full rudder in the gusts I realized that the rudder was also partly frozen. We turned back toward



Making a tight turn close to the ground, left, glider pilot lines himself up with runway for a landing. Below, a typical cloud formation over Owens Valley when the helpful Sierra standing wave is at work

FLOWING LINES SHOW PATH OF STRONG WIND OVER MOUNTAIN RANGE AND HOW "WAVE" IS FORMED.



the wave, headed into the wind once again, and rode the gusts up to 36,100 feet indicated altitude.

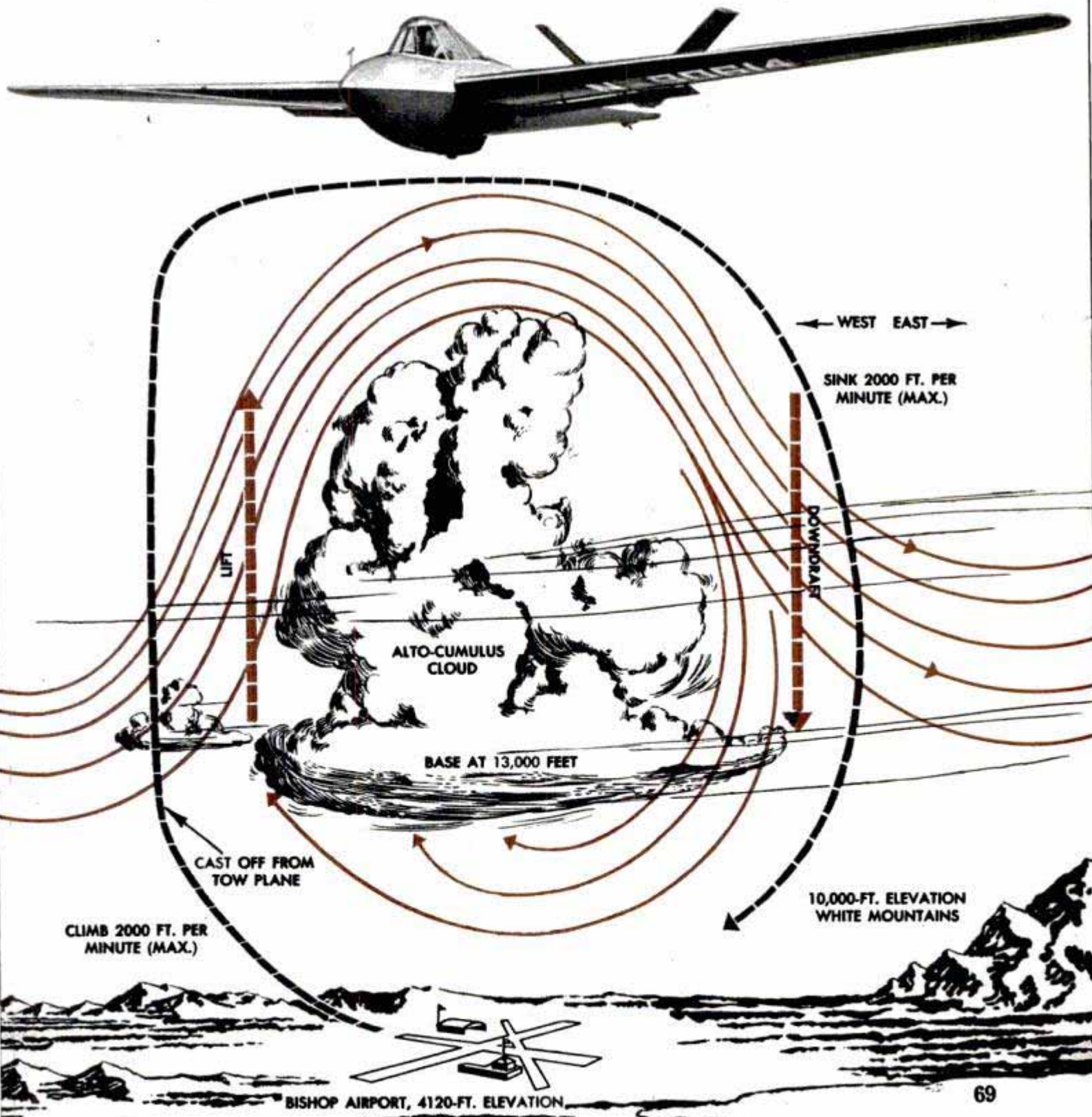
My feet were getting painful and we were both afraid of frostbitten toes. The effort to hold the ship level with the controls very stiff was becoming tiresome. All in all it was a good time to start getting down again. We dove toward Bishop at 90 miles per hour, then spiraled down from 25,000 feet with the spoilers open. All the way down George kept saying, "Gee, it's a long way up here."

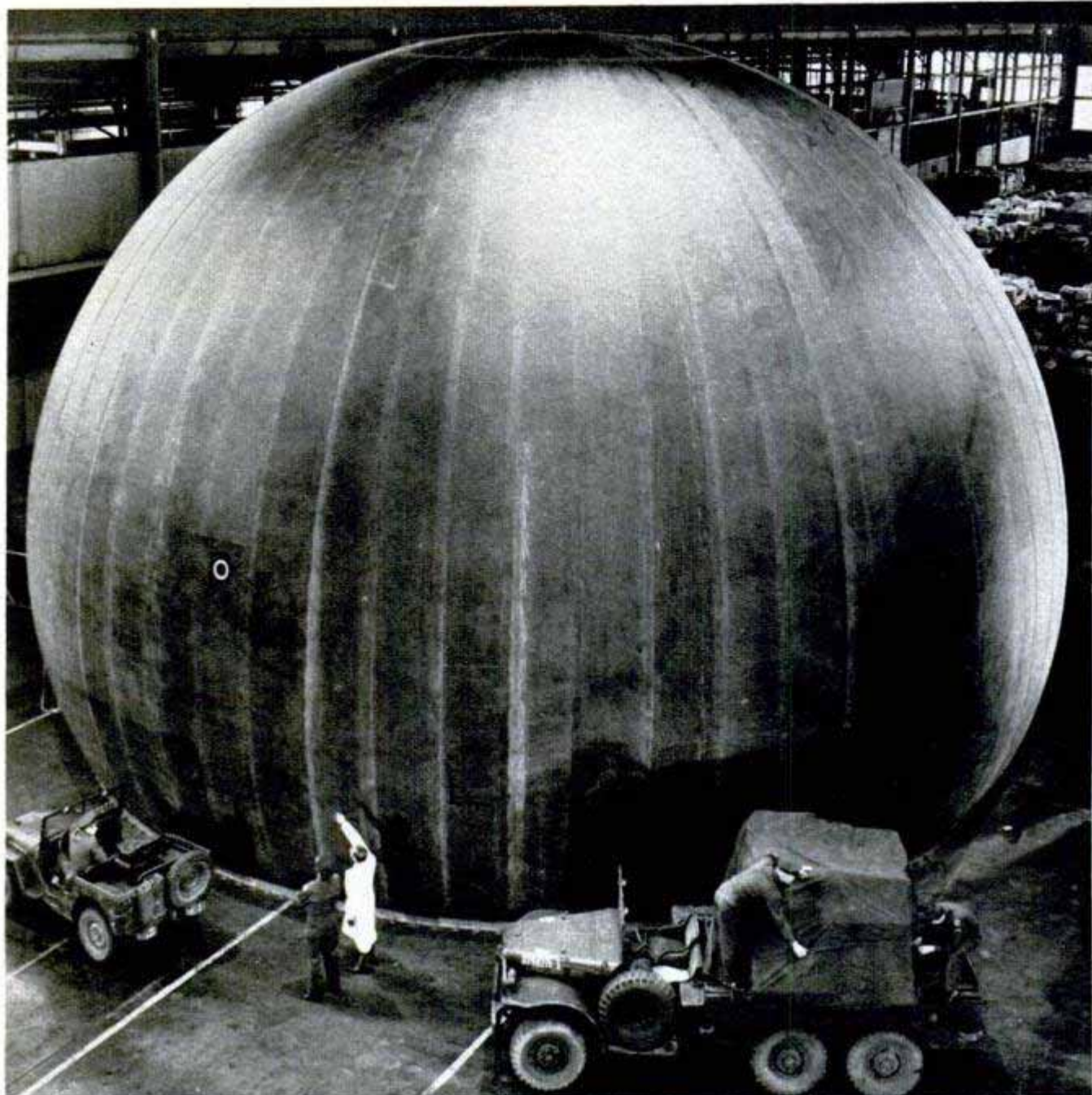
The flight lasted 2½ hours, including the 30-minute tow, and while the absolute altitude attained hasn't been officially confirmed as yet I'm told that we set a record. The altitude gained above the release or

low point is another record, 24,600 feet.

With some kind of heat to keep you warm and with pressure oxygen equipment it should be possible to ride the Sierra wave to 40,000 feet or higher. Much above that point a pressure suit or pressure cabin would be needed. If my plans materialize I'm going to build a single-place glider that uses an aircraft drop tank as the streamlined cabin. The tank would be pressurized and I'd ride inside in a prone position.

With an all-metal wing of 55 feet and an aspect ratio of 24 to 1, I'll have a high-performance glider capable of 100 miles per hour between thermals on cross-country runs and capable of riding to the top of the Sierra wave. When I get it built I'll go after some new single-place records.





## House for Radar

Big rubber domes that look like giant mushrooms now are protecting Air Force radar installations from wind, snow, sleet and ice. The domes, made of glass fiber, rayon or nylon fabric coated with rubber, measure 167 feet in circumference and 36 feet in height. The balloonlike shelter is

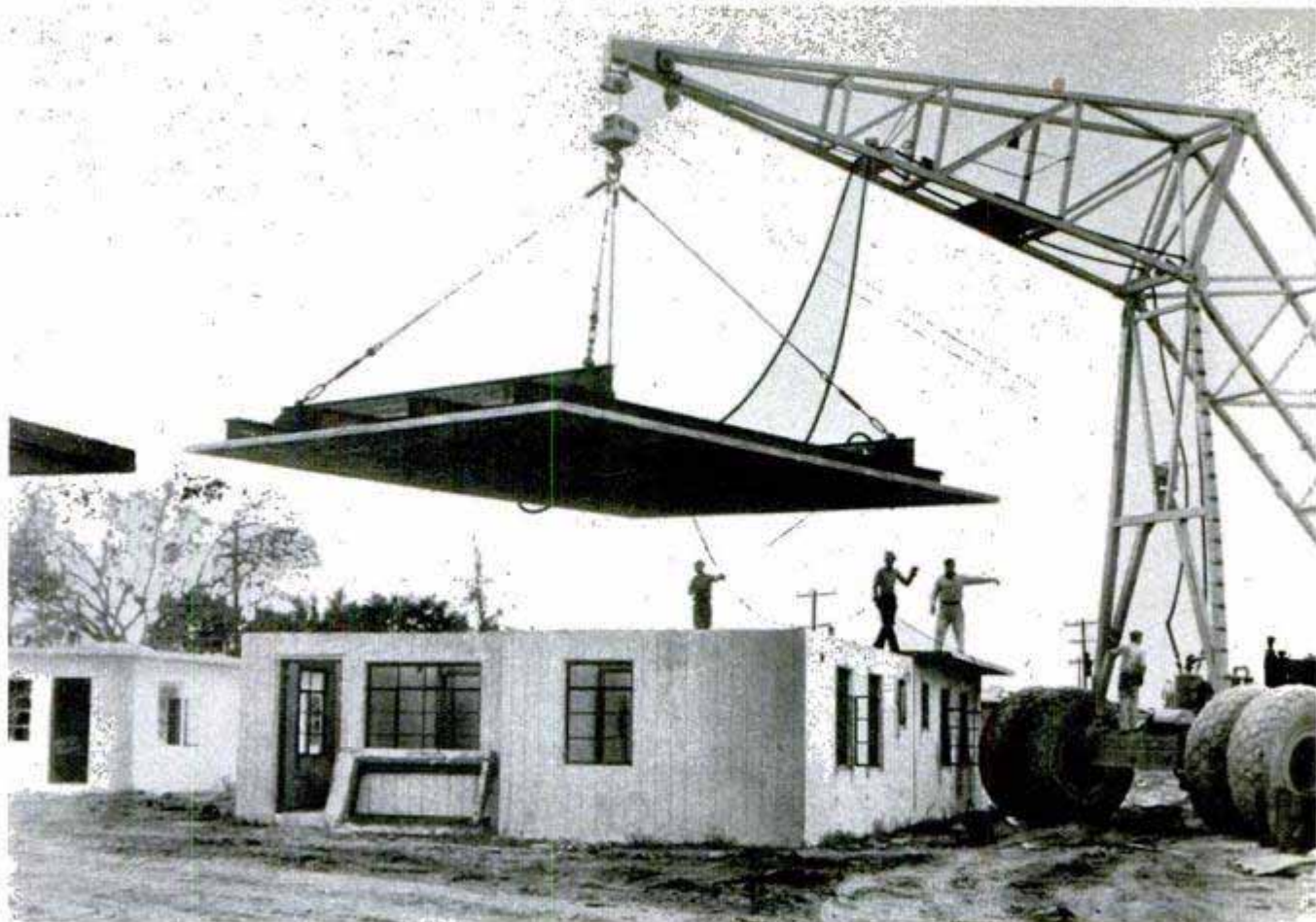
mounted atop a 25-foot tower but has no interior supports. With only  $\frac{1}{20}$  pound of air pressure, the covering is tight. Erected over radar equipment, the dome withstands 125-mile-an-hour winds and, through flexing, shakes off ice and snow from its rounded surface. Operators who enter the dome must first go through a tunnel which has an air-lock chamber.

## Tomorrow's Supersonic Plane Too Fast for Man to Fly

Humans can't see and react fast enough to pilot tomorrow's supersonic planes, according to Col. Victor Byrnes of the U. S. Air Force School of Aviation Medicine, Randolph Field, Tex. Two aircraft coming out of the clouds 8000 feet apart would collide before either pilot could do anything about it. He says electronic devices now being developed will have to control the planes. To illustrate the 8000-foot example, at 1800 miles per hour a pilot will travel

about a mile every two seconds. Four tenths of a second will be needed for the image of the oncoming plane to be relayed to his brain, while his plane has traveled 1042 feet. During this time, he has seen but not recognized the image, which takes an average of one second and 2640 feet of travel by the plane. Motor reaction time to move the control surfaces would take about  $\frac{4}{10}$  second, or 1042 feet, making a total of 4724 feet.

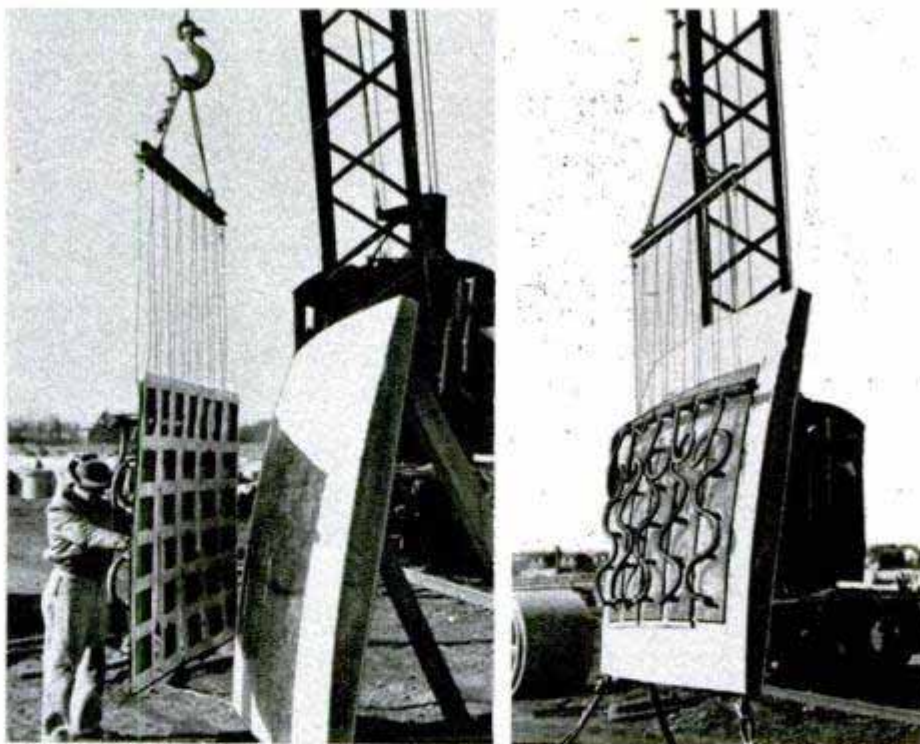




## Vacuum "Hook" Lifts Slabs

Concrete slabs weighing more than 17 tons are "hooked" to the boom of a crane by a giant suction cup. Called a vacuum lifter, the suction cup is used to lift concrete roof slabs into position at a Norfolk low-cost housing project. The lifter eliminates the need for bolts or special reinforcements in moving concrete pieces and also prevents cracks by providing an even distribution of stresses over the entire area. There is no hazard in using the vacuum lifter because the slab would not be released for at least five minutes even if the air-exhaust line were disconnected.

Suction in the lifter frame connects this concrete slab to the cables of the crane. Below, left, a smaller frame is guided into position against a curved two-ton slab. Right, hoisting the slab. Note the numerous hoses



## Rope-Fiber Plant Turns Soil Into a Building-Block Material

Once a waste product, the portion of the sisal plant that remains after fibers have been removed for making rope is now used to form soil into building blocks. Developed in Africa, where there are large sisal-

growing areas, the sisal by-product stabilizes the soil, producing blocks that are used in place of concrete blocks. A British chemical company is erecting two African factories to produce the soil stabilizer.



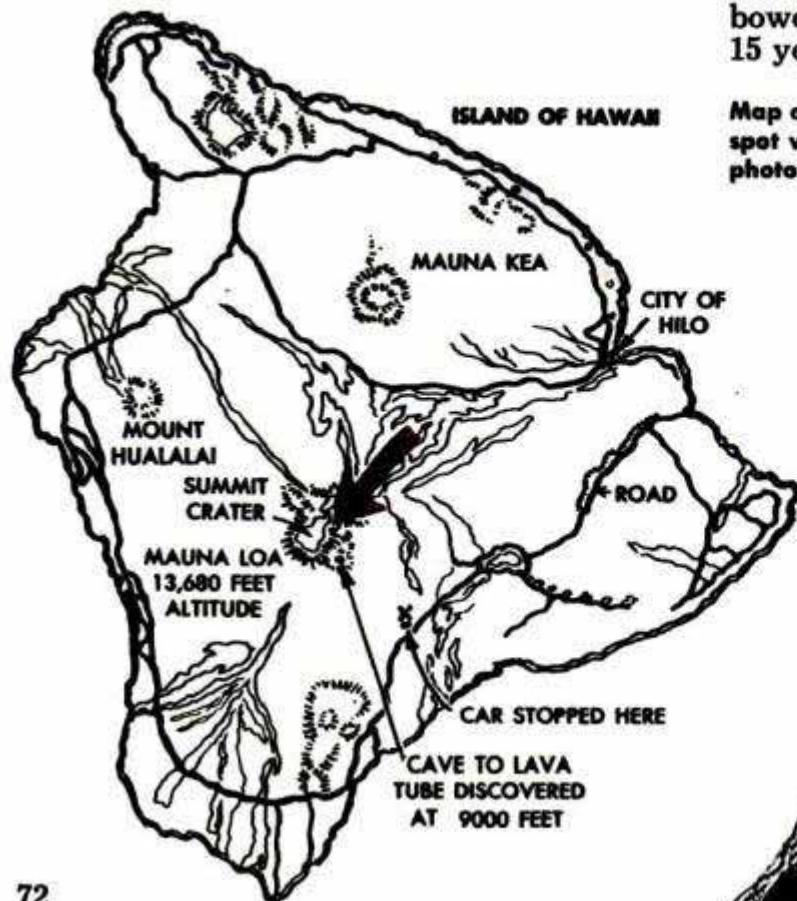
Harry Fox, discoverer of the volcano tubes, follows one around a bend. Molten lava ran through these tubes

# BENEATH a LIVE VOLCANO

By Richard M. Botts

CRAWLING along the unexplored upper slopes of the fiery volcano, Mauna Loa, his shoes torn to shreds and his clothing drenched with rain, Harry Fox, amateur volcanologist, stumbled upon a rare discovery. He found an almost obscured entrance to some perfectly preserved lava tubes which wandered far back into the bowels of this boiling volcano. That was 15 years ago.

Map of the area shows location of Mauna Loa and the spot where Fox discovered opening to lava tube. The photo on opposite page shows goat skulls in tube



MOUNTAIN CRACKS OPEN HERE  
ALLOWING LAVA TO FLOW DOWNHILL

LAVA ABOUT  
80 FEET DEEP

ENTRANCE  
TO TUBES

TUBES



## Miles of underground caverns formed by molten lava under Hawaii's Mauna Loa crater are still the private secret of their discoverer and the photographer who dared explore the tubes with him

Harry knew he'd found something pretty important back in 1935 for his later research proved these unusually large tubes to be exceedingly rare. Small, extinct, cavelike formations have been found, but nothing approaching the size and perfection of these tubes which extend for miles along the mountain.

Deciding to keep his find secret until he could return to the Island of Hawaii with proper equipment and photograph the tubes, Harry sailed for Honolulu, 200 miles away. But, he didn't know it would be 14 years before he'd once more scale Mauna Loa. And in that length of time an active volcano can throw up so much lava the whole countryside may be changed.

Back in Honolulu, Harry discovered the reason such lava tubes are not found. For one thing, hundreds of square miles of this volcano is virgin territory—almost entirely

unexplored. Many lava tubes are only 10 feet underground and exceedingly small. Others are as much as 100 feet underground and it isn't often there is an earth disturbance severe enough to cave in the top of such a deep tube. Even if an entrance is found, a subsequent lava flow may cover the tube's entrance or fill it up like a sewer. Forest Rangers require a permit and guide for explorations in this National Park Area and they usually stick to one or two well-worn trails. It's pretty rugged country and they don't want to be continually fishing out lost amateur explorers. They have enough trouble with that unpredictable and unruly "baby," Mauna Loa.

Strangely enough, the two volcanoes classified as active in the Hawaiian group are found on only one island—the Island of Hawaii. And 13,680-foot Mauna Loa is one of them.

TOP OF MAUNA LOA (13,680 FEET HIGH)

VOLCANIC CRATER FOUR MILES LONG,  
300 TO 600 FEET DEEP

FIRE FOUNTAIN

LAKE FILLS AND LAVA FLOWS  
OUT BREAK IN MOUNTAINSIDE

LAVA VENT

IN THEORY THE LAVA SHOOTS UP THESE VENTS FROM SEA BOTTOM—PERHAPS 100 MILES DEEP. THE VENTS THEORY HAS NEVER BEEN PROVED

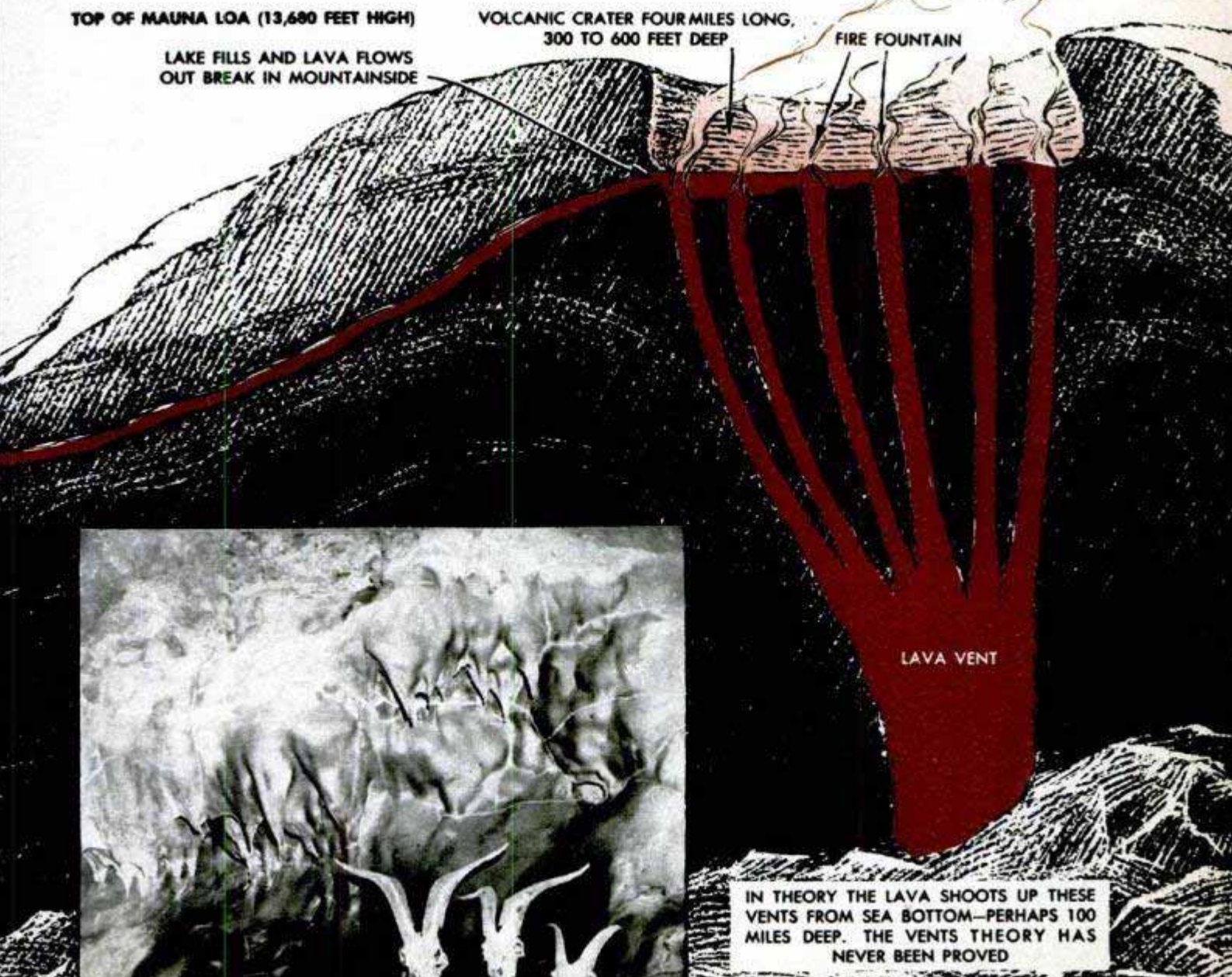




Photo by Danny Morse

Fox tests air with flame of a kerosene lantern. If flame goes straight up the tunnel is air-locked

The volcano Mauna Loa is not built in the typical cone fashion found in other volcanoes. Instead, it is dome-shaped and runs from 30 to 50 miles from summit to sea. In the center of this dome is an oval crater which is about four miles long and 600 feet deep. The walls of the crater are perfectly straight. In the bottom of the crater are the fire fountains which resemble upside-down ice-cream cones.

Earthquakes occur just before a volcanic eruption, and then up through these fire fountains shoots the pumice which has been heated to 1800 degrees! Next comes lava, a sticky, slow-moving molasseslike liquid. At times 50 to 60 fountains will gush flaming-red lava 100 to 600 feet in the air. The lava then falls back into the crater forming a large lava lake. (Seldom does the lava flow over the crater—although this has occurred.) Eventually, however, the

Arrow points to crack which is the entrance to the lava tubes. Fox and companion camped here in cave



continuous earthquakes and tremendous lava tension break open the mountain several thousand feet below the crater. The lava lake in the crater oozes out the crack and runs down the mountainside forming a lava flow which grows wider and wider as it progresses.

The lava moves slowly and solidifies as it moves. The lava beneath the crust of the flow is much hotter and soon forms tubes to carry the hot liquid from the top of the mountain to the end of the flow. Eventually the flow stops—but meanwhile it may have wiped out roads and villages as it advanced toward the ocean.

In 1949, soon after Mauna Loa once again "blew its top," Harry decided to find the entrance to the lava tubes again.

Money was the main problem. It costs plenty to outfit even a two-man expedition, pay air fares and hire a photographer. Local volcanologists pointed out that there have been four serious eruptions since 1935. In all probability, the entrance to the tube would be covered with lava.

Fortunately for Harry, he ran into Danny Morse, a free-lance photographer and hiker. He agreed to go along and take a chance on finding the cave.

They spent a week lining up surplus Army boots that would stand the razor-sharp lava, built some kerosene torches, purchased flashlights, film, blankets, food, a tent and some heavy clothing as the temperature at night sometimes drops to zero even on a Hawaiian volcano.

Then in late October 1949, Harry and Danny Morse boarded a plane for the Island of Hawaii. Only one person, C. E. Meyers, knew where they were going or that they were making an attempt to find the tubes again. Meyers was given only a general position of the caves. He was to report to Rangers if Harry and Danny did not return on schedule.

In the city of Hilo they rented a car, still keeping their destination secret. Driving south about 31 miles they arrived at the 4000-foot level of Mauna Loa. Abandoning their car, they began hiking toward the volcano's summit.

There are several marked trails to the summit of the volcano. These trails, even though kept in shape by the Forest Rangers, are pretty rugged. Danny and Harry, however, went off the beaten track through dense forest which in many cases was almost impassable. But as they climbed higher and higher, the forest began to thin out. After the 7000-foot level, there was little shrubbery—just miles and miles of sharp, crunching lava.

At the 9000-foot level Harry got out his compass and began taking bearings. The area was becoming more familiar. "We

might see an undershirt I left near the cave 14 years ago," he told Danny.

Sure enough, shortly thereafter, crawling down a ravine, Harry spotted his undershirt, still in one piece after the rain and volcanic eruptions of almost 15 years!

Both men slid the rest of the way down the ravine to the cave's entrance and looked 85 feet down to the entrance to one of the tubes. As it was getting late, they pitched their tent and decided to explore in the morning.

The next day both men crawled into the cave and wormed their way 85 feet to the floor. The cave itself was a large section of a lava tube which caved in, probably from some earth disturbance.

At one end of the cave they found the entrance to a lava tube. Assembling their photographic equipment and homemade kerosene torches, they plunged into the tube. The tube itself was unusual as it contained dozens of different types of fine-quality stalactites averaging one to two feet long. The walls of the tubes below the stalactite level were of various shades of chocolate. Each level of lava flow that went through the tubes had a different shade.

Harry and Danny decided not to follow this particular tube as the flame from their torch went straight up, which indicated that the tube was air-locked. Returning to the original cave they started through another tube which led uphill. In this case, the flame from their torch pointed uphill.



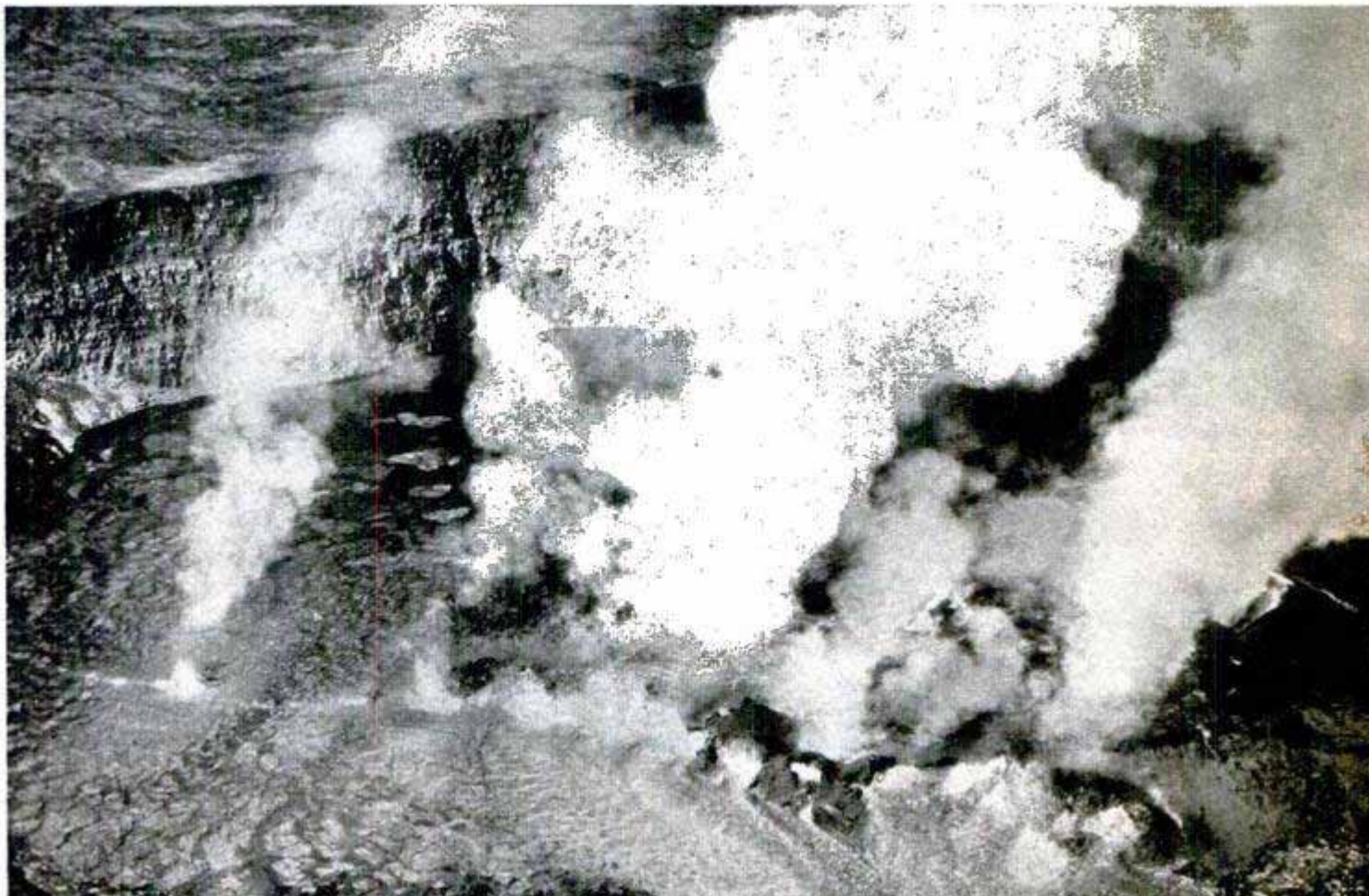
Explorer takes a drink from water that dripped from stalactites in tunnel. Water and air are both pure

When the flame leans in either direction, it means an opening somewhere—even though small—has caused a draft from the main cave. The flame will naturally follow the flow of air.

Another cautionary procedure was to determine the length of time available for exploring, and divide it by two. This was done, because they were sure there was no other way out of the tube—except into the fire pit. Thus, if six hours are available for exploring, they divided by two. At the end of three hours, if no opening was found,

(Continued to page 228)

Aerial view of erupting Mauna Loa shows sharp walls of crater around the lava lake and rows of fire fountains



DISPLACEMENT  
8550 - 9000 TONS  
LENGTH, 627 FT.  
SPEED, 30 KNOTS  
(APPROX.)

9.7-IN. TRIPLE  
GUN TURRETS

9.7-IN.  
TRIPLE GUN  
TURRET

IT IS BELIEVED  
THIS DOME HOUSES  
LAUNCHING GEAR FOR  
GUIDED MISSILES  
OR ROCKETS.

P. K. TYPE SUBMARINE  
LENGTH, 320 FT.  
10 21-IN. TUBES  
2 4-IN. GUNS  
2 45-MM. AA GUNS  
SURFACE SPEED, 18 KNOTS  
SUBMERGED SPEED, 10 KNOTS

TRIPLE 16-IN. GUNS

CREW

WORKING CHAMBER

MAGAZINES

WATER LINE

CREW

2500-TON DESTROYERS  
SPEED (APPROX.) 37 KNOTS  
LENGTH  
(APPROX.)  
400 FT.

FORWARD MAIN  
FIRE CONTROL  
TOWER

5-IN. TWIN DUAL-PURPOSE GUNS

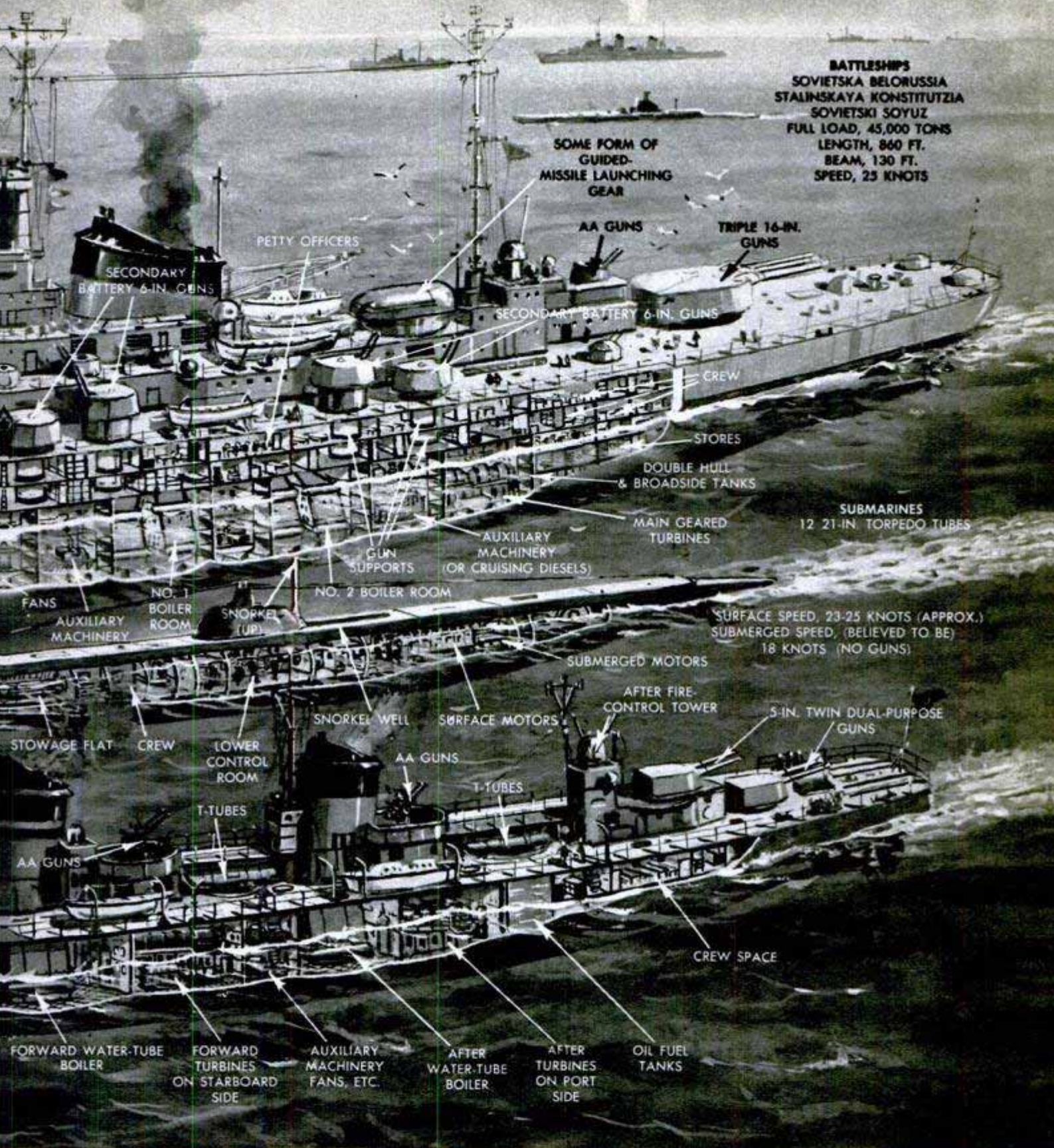
5-IN. TWIN DUAL-PURPOSE GUNS

AA GUNS

OIL FUEL TANKS

# RUSSIAN NAVY

**R**USSIAN and former Polish and German shipyards are working at top speed to build up Soviet sea power. Battleships, cruisers, destroyers and submarines are under construction. Certain details of the new Russian ships are known and depicted here by the British artist, G. H. Davis. The disposition of the main armament of the ships and the guided-missile launching gear (on battleships) has been



**BATTLESHIPS**  
**SOVIETSKA BELORUSSIA**  
**STALINSKAYA KONSTITUTZIA**  
**SOVIETSKI SOYUZ**  
 FULL LOAD, 45,000 TONS  
 LENGTH, 860 FT.  
 BEAM, 130 FT.  
 SPEED, 23 KNOTS

SOME FORM OF  
 GUIDED-  
 MISSILE LAUNCHING  
 GEAR

AA GUNS

TRIPLE 16-IN.  
 GUNS

PETTY OFFICERS

SECONDARY  
 BATTERY 6-IN. GUNS

SECONDARY BATTERY 6-IN. GUNS

CREW

STORES

DOUBLE HULL  
 & BROADSIDE TANKS

SUBMARINES  
 12 21-IN. TORPEDO TUBES

MAIN GEARED  
 TURBINES

AUXILIARY  
 MACHINERY  
 (OR CRUISING DIESELS)

GUN  
 SUPPORTS

NO. 2 BOILER ROOM

SURFACE SPEED, 23-25 KNOTS (APPROX.)  
 SUBMERGED SPEED, (BELIEVED TO BE)  
 18 KNOTS (NO GUNS)

FANS  
 AUXILIARY  
 MACHINERY

NO. 1  
 BOILER  
 ROOM

SNORKEL  
 (UP)

SUBMERGED MOTORS

AFTER FIRE  
 CONTROL TOWER

5-IN. TWIN DUAL-PURPOSE  
 GUNS

SNORKEL WELL

SURFACE MOTORS

STOWAGE FLAT

CREW

LOWER  
 CONTROL  
 ROOM

AA GUNS

T-TUBES

AA GUNS

CREW SPACE

FORWARD WATER-TUBE  
 BOILER

FORWARD  
 TURBINES  
 ON STARBOARD  
 SIDE

AUXILIARY  
 MACHINERY  
 FANS, ETC.

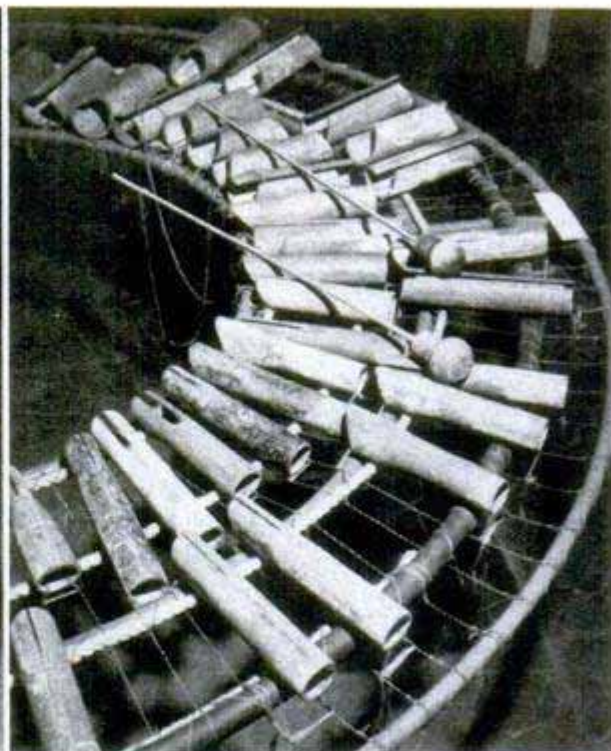
AFTER  
 WATER-TUBE  
 BOILER

AFTER  
 TURBINES  
 ON PORT  
 SIDE

OIL FUEL  
 TANKS

confirmed but the type of missile used is doubtful. Details of the submarines are believed to be correct though dimensions are not available and the speeds are only approximate. It is known that these "pig-boats" mount twelve 21-inch torpedo tubes and that there is considerable German influence behind this construction. The Russians are believed to have 270 or more submarines of all types, including midgets.

However, it is reported that they have only a dozen of the dangerous Schnorkel-type subs under construction. German influence is also seen in the new large destroyers of 2500 tons. Main armaments are in turrets and of the dual-purpose type and all ships carry heavy antiaircraft protection. The destroyers have two boilers and the machinery spaces are so arranged that if one set is knocked out the other remains intact.



## Xylophone "Pipes" a Tune

Plumbing may not be a musical trade, but John Robey of Honolulu converted a collection of piping, junked by a plumber, into a xylophone for only a dollar—the cost of the paint and mallet wood. Each tonal pipe was cut to produce the desired note

by trial and error. For some notes a wide slit was cut along the length of the pipe; for others, only a short, narrow slit was needed to produce the proper tone. To prevent the piping in the support stand from deadening the sounds of the tonal pipes, Robey rests them on a rubber hose and several lengths of rope.

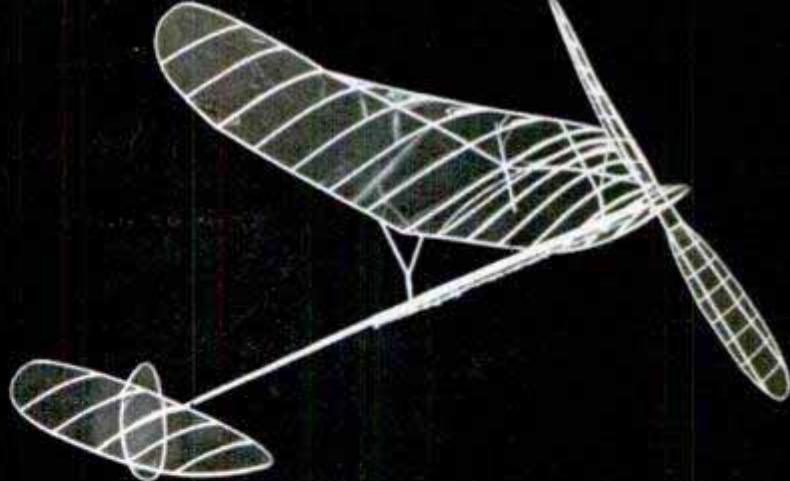


## Chemical "Paves" Beaches By Hardening Sand

No more boggy beaches for our Marines—a new chemical process quickly converts strips of sand into paved highways. The method was developed by the Navy in cooperation with Dr. Hans F. Winterkorn of Princeton University. Although the name of the chemical used has not been released, it is a plentiful material which costs less than 16 cents a pound. Ordinary road-building equipment is used, and the operation can be completed at a forward speed of 12 feet a second. The hardened sand will support the weight of a Jeep within two hours and a loaded 13½-ton truck in 24 hours. The sand "pavement" can be made six inches thick. Another process, developed by the Army for soil instead of sand, hardens muddy fields for heavy vehicles and can be used to make air strips.

☐ Two live lobsters are canned in a single tin with enough treated water and oxygen to keep them alive for six days at 40 degrees F.





# FLYING GOSSAMER

Photos by Smith-Coda

Its oversize prop spins lazily as the real featherweight of model airplanes takes off on an endurance flight

**WORKING** with airplane models requires the gentle touch when they are so light it takes 10 of them to add up to one ounce. To these fragile craft a man-size sneeze can be as destructive as a hurricane! Even the slight breeze caused by a man walking rapidly past them can cause a wing structure to buckle. These flying gossamers are the real prima donnas of the hobby field.

Strictly "hothouse flowers," these models are flown only indoors. Drafts are shunned like the plague and the air must be so still that a smoke ring would hover for minutes before breaking up. Despite the underweight design, the planes have tremendous stamina, some flights lasting more than a half hour. Power is provided by a special rubber band that turns a giant propeller at the slow-motion rate of about 60 turns a minute.

The history of this type of aircraft dates back to 1930 when two men at the Massachusetts Institute of Technology, John Glass and Robert Cleary, developed the technique of making and using the microfilm that forms the ship's skin. The material has an estimated thickness of from 2 to 5 millionths of an inch. The hobbyist makes this "fabric" himself, buying the material

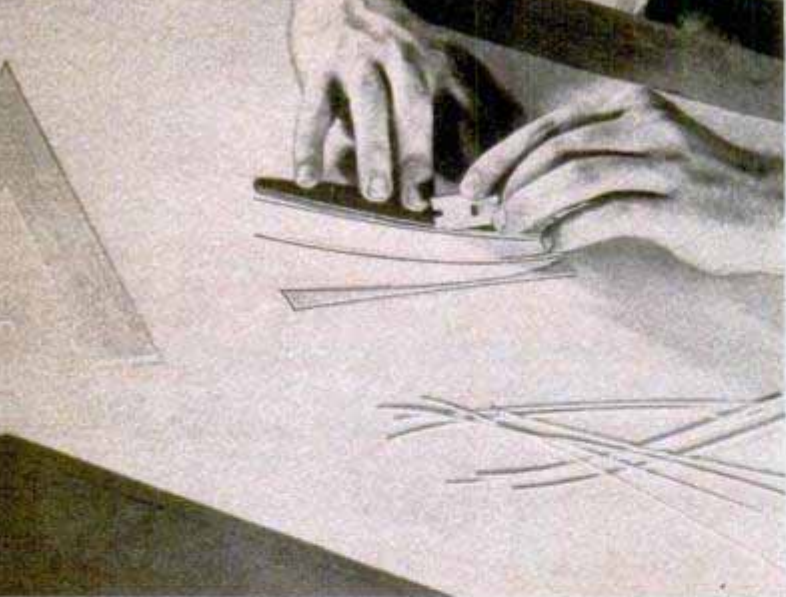
in liquid form. It is an acetate-base solution containing a thinner and a plasticizer.

To convert this liquid into wing fabric, a small amount of it is poured into a tub of water. It spreads evenly over the surface of the water, drying in seconds to form an incredibly thin membrane. A loop of wire is slipped under the film and slowly brought into contact with the membrane. Very carefully, the hobbyist slides the wire and film out of the water and hangs it up to age for a week before it is ready for use.

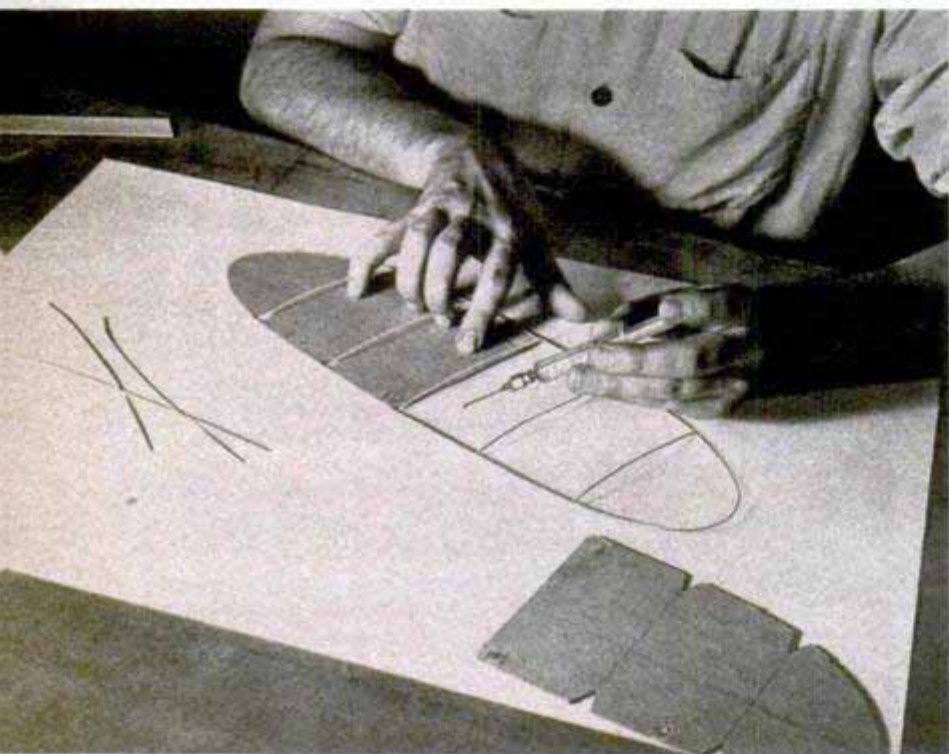
The "fuselage" is equally delicate, although it must be sturdy enough to support the rubber-band motor. It is usually made in the form of a hollow tube for strength with minimum weight. Selected balsa is sanded down to paper thinness and rolled into the tubular shape.

Wing spars are cut from sheets of  $\frac{1}{32}$ -inch material and are tapered at the tips. The ribs are carefully formed to exact curves that have been calculated in wind-tunnel tests. Tailplane, rudder and propeller are also made in skeleton form like the wing and covered with the transparent microfilm.

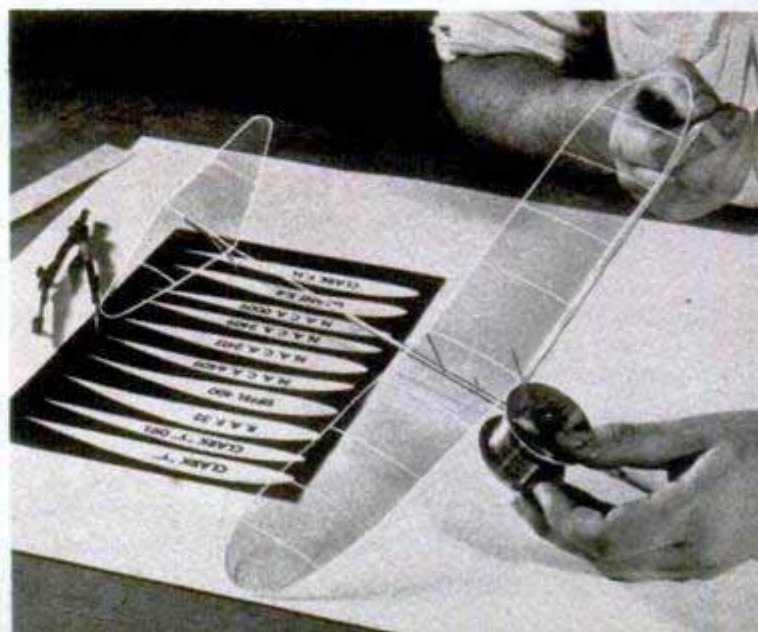
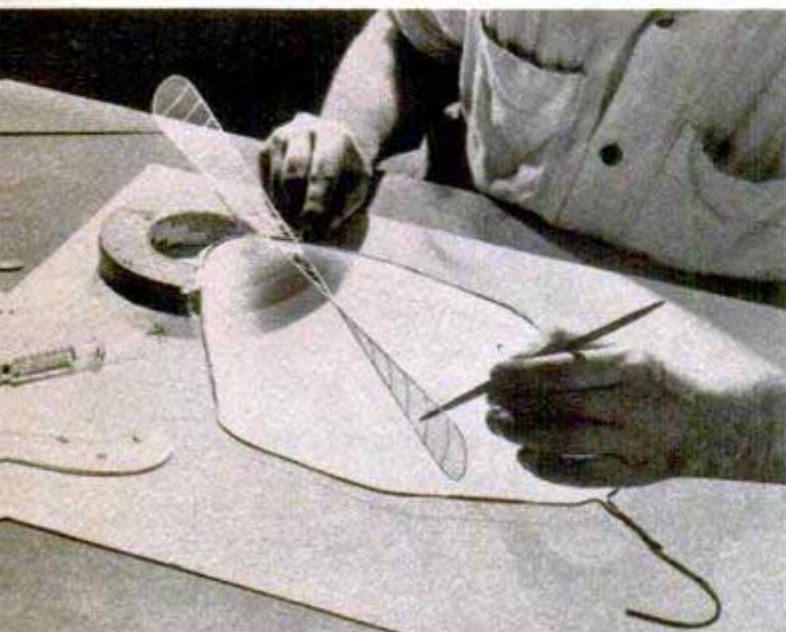
A typical model has a wing span of 34 inches and weighs as little as 32 thousandths of an ounce, minus motor. The

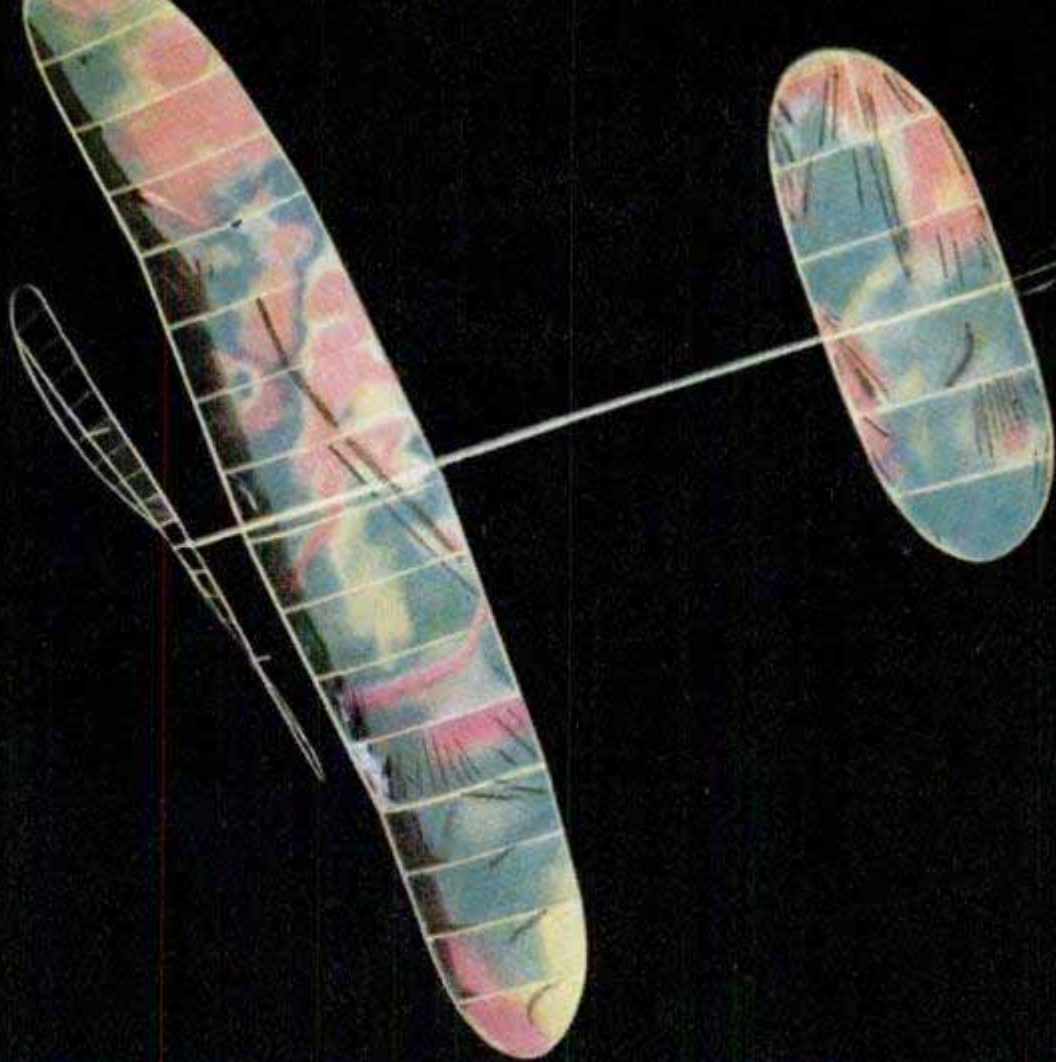


Left, wing ribs are cut from sheet balsa to mathematically figured curves. Right, this slender balsa spar is bent around a template when wet and held with tissue until dry to form the outline for circular rudder



Above, left, a hypodermic syringe dispenses cement in tiny quantities. Right, microfilm is lifted from water surface with a large wire loop. Below, left, microfilm sticks to anything when wet so this brush is used to moisten fabric being mounted on propeller skeleton. Right, guy wires are one third as thick as a human hair





motor, made of a special rubber called T-56, weighs about 43 thousandths of an ounce and can be given more than 2000 turns to drive the 18-inch propeller.

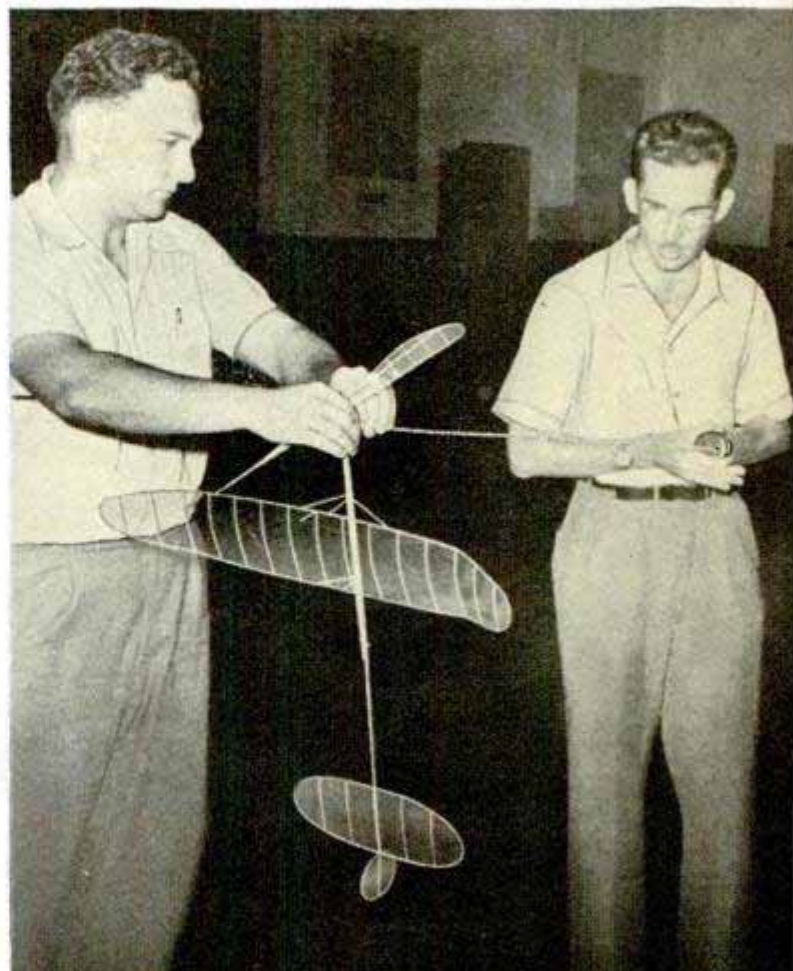
Hobbyists spend as long as 20 hours in the construction of each model, but some of the more expert have cut the time down to less than 10 hours. Since a serious fan never goes to a meet with fewer than three or four planes, often coming home with nothing but mangled spars, it is obvious that plenty of time can be spent with the hobby.

Meets are held in large armories and dirigible hangars. The longest flying time determines the winner. The records provide proof of the tremendous staying power of the flimsy craft. Some planes in the larger classes have remained aloft for more than a half hour, circling around in 30-foot circles until their rubber motors run down.

These flying gossamers are no playthings for the nervous individual. There's no flash and speed to them. During a meet, no one is allowed to run or even to walk briskly—the air currents might damage a future record-breaker. But, if you're interested in a hobby that's inexpensive, this is it. You can build yourself one of these planes for as little as a nickel! Now that the five-cent cigar is history, where can you get more for your money?

Above, beautiful colors of microfilm are a guide to film thickness. Dark red sections are thickest. Progressively thinner are light red, green and yellow

Winding the rubber-band motor requires extreme care



# Tapestry in Typewriting

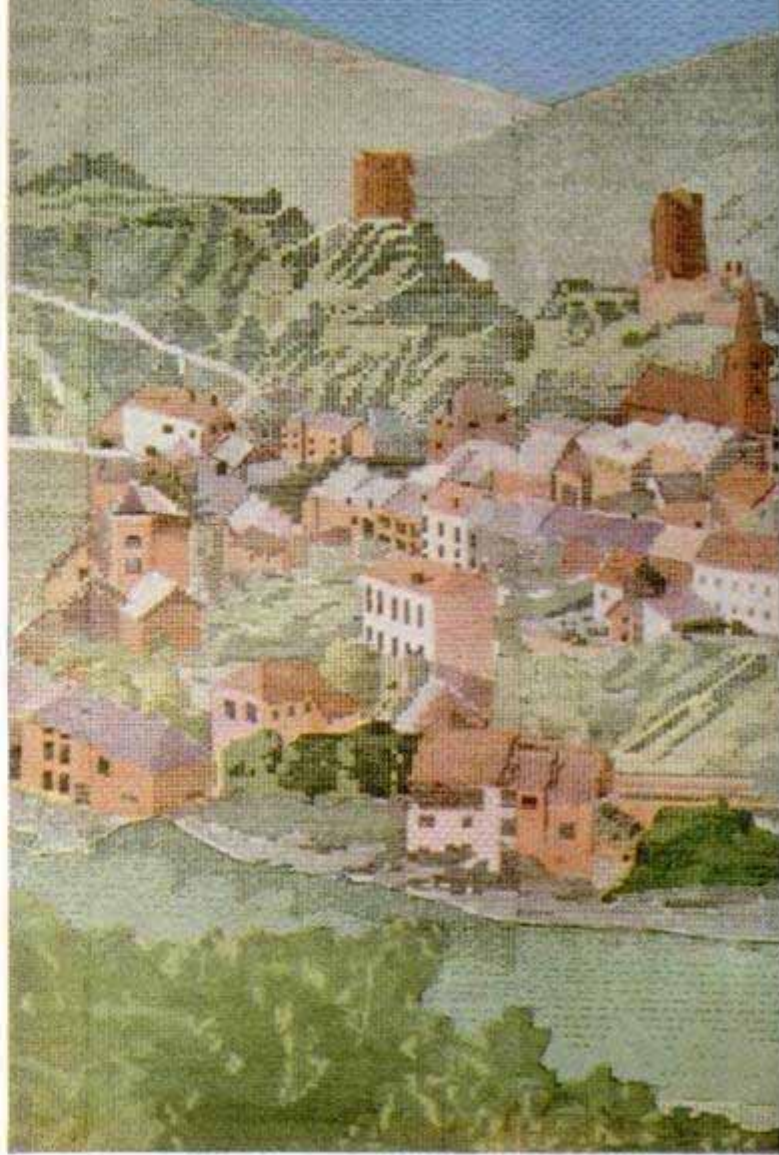
**E**RNEST MESSELY, an instructor in business correspondence at Roubaix, France, sat down at his typewriter, struck the keys 180,000 times and "wove" the beautiful tapestry shown on these pages.

It wasn't as easy as it sounds. He was inspired to try his hand at "painting" with a typewriter by an article on the subject which appeared more than a year ago in *Mecanique Populaire*, the French edition of *Popular Mechanics*.

The completed work of art measures almost 4½ feet in length by slightly more than two feet in width. From a few feet away it looks like a tapestry woven in great detail. It was typed on paper panels eight inches wide. Three different colors of paper—green, yellow and blue—and three ribbon colors—red, black and violet—were combined to achieve the multicolor effect in the painting. Messely varied the intensity of the colors by his choice of typewritten characters and the pressure on each stroke. The 84 characters of the keyboard produce many different results; for example, an "M" is darker than an "I" and a black "H" combined with a red "I" produces a shadowed red. The typewriter artist experimented many hours with the various characters before he started his painting. He estimates that he worked 400 hours in completing the art work.

Messely now is working on a much larger painting which he feels will be far superior to his original tapestry. He has made two changes in his typewriter to give it greater versatility: a finer line-space mechanism and interchangeable type assemblies. A ribbon manufacturer is supplying him with ribbons of eight different colors. He is typewriting the new art work, which will measure five feet by three feet, on a special cotton cloth which will not deteriorate with age or exposure to light as fast as paper.

Because Messely has ribbons of many different colors to work with, it is unnecessary for him to use a colored background material for the separate panels of the new painting. He says the particular design of the new work will make it completely different from any paintings, drawings or designs stamped on tapestries. Requiring many more hours of typewriting than the original painting, the new work will show figures and buildings close-up instead of from a distance.



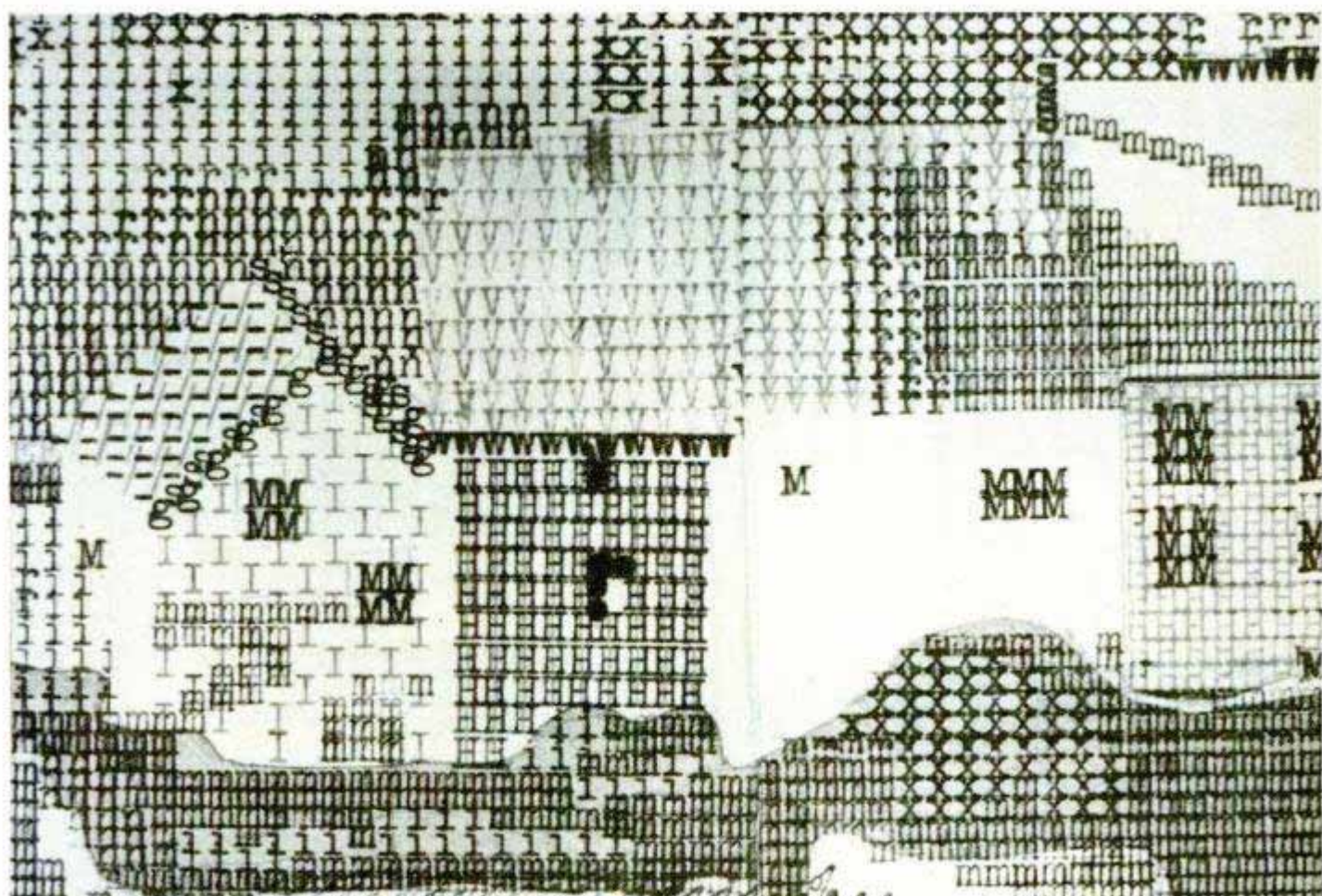
↓ Messely is typing his new work of art on a cotton cloth which will not deteriorate as fast as paper. Several panels will be combined in finished painting





↑ From a few feet away, the typewritten masterpiece looks like an exquisite tapestry. Variations in the characters and pressure of strokes produce shading

↓ Enlarged detail of the small area outlined above shows how individual characters produce the painting. There are about 180,000 strokes in work of art

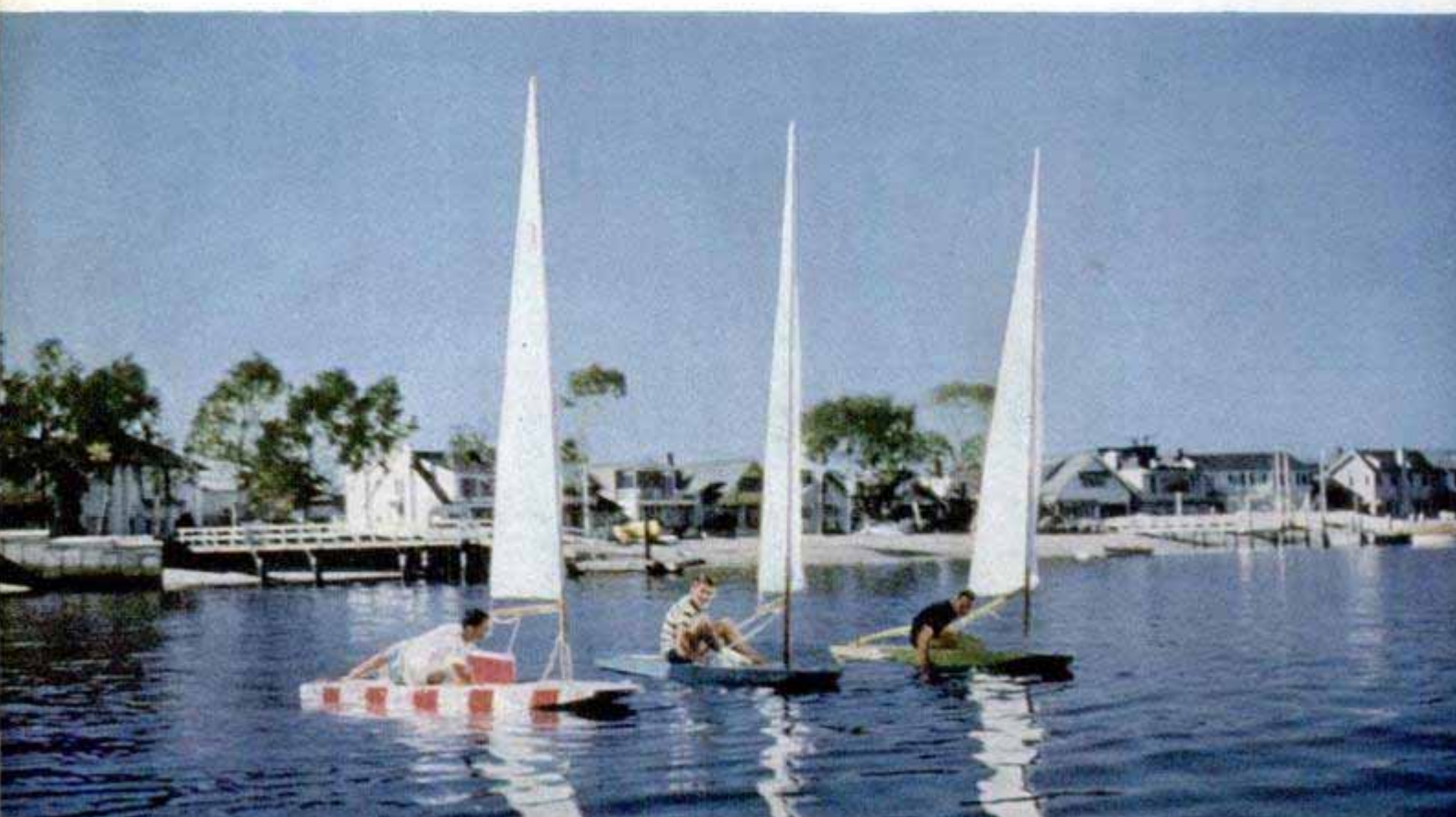


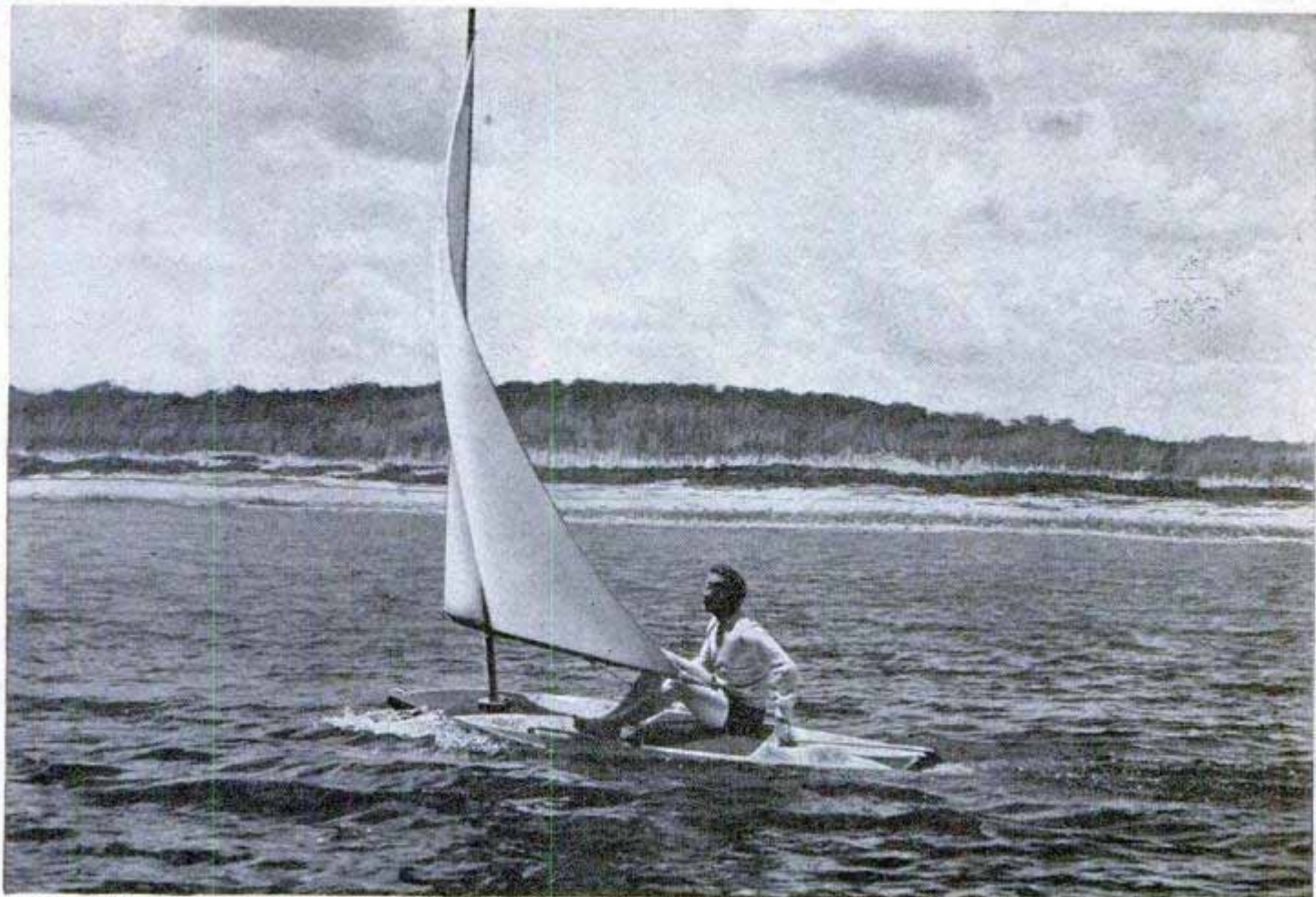


## SAIL ON THE "FLYING FISH"

**S**AILING on a board is a new ocean sport that provides splashing thrills for young sailors who don't mind an occasional spill. The sailing boards, about twice as long as their skippers, ghost along in light airs that hardly move larger sailboats, yet an expert sailor can keep his craft upright in winds that blow up to 20 miles an hour.

The "Flying Fish," shown on this page, can be navigated through moderate surf and out into open ocean. The hull is an overgrown paddle board, 12 feet long and 32 inches wide. Hollow for buoyancy, it has a flat plywood deck, rounded plywood bottom, spruce sides and is braced internally with five bulkheads. The hull is seven





Young skipper navigates Sailfish, a craft of the sailing-board type, out to sea for a bout with the larger waves in open water

inches deep at its deepest point.

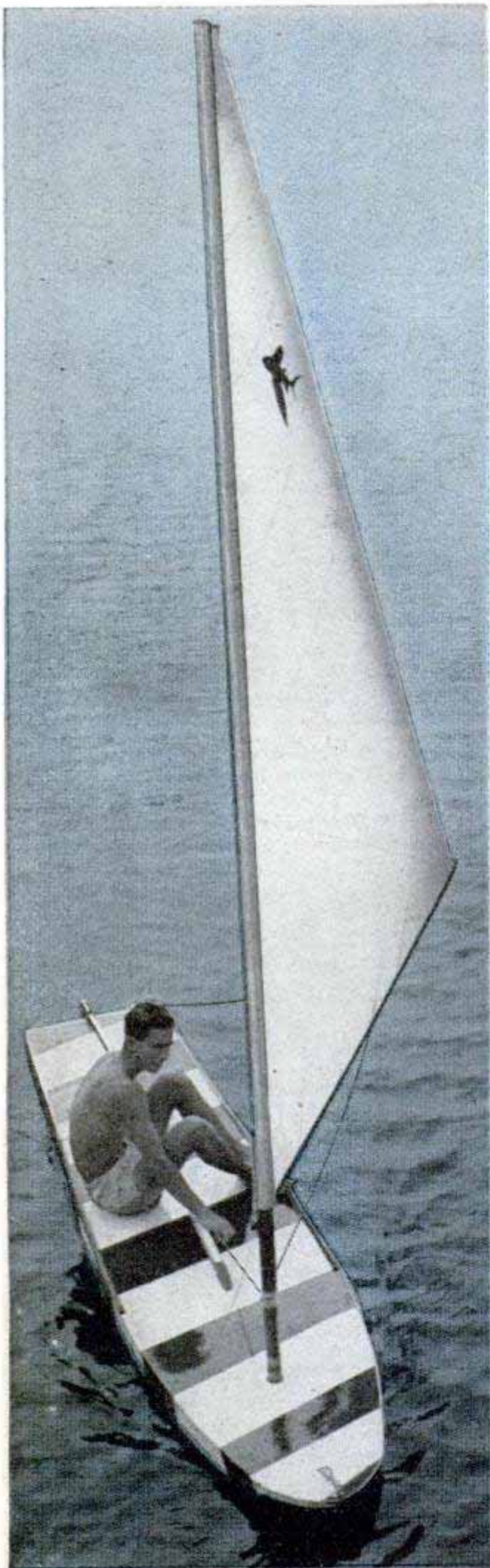
The hull is equipped with a detachable centerboard, rudder and tiller. A 16-foot wooden mast with a nine-foot boom slips into a brass pipe that projects from the hull. The sail, which has 54 square feet of surface, is fastened to the mast by a sleeve sewn into the leading edge. The whole outfit weighs 85 pounds, yet it will support two heavy adults.

Usually, the skipper sits crosswise on his board, handling the tiller with one hand and the sheet with the other, but some young sailors prefer to lie flat on the deck and steer with their feet. In a moderate wind the board glides along at about 10 miles an hour. Spills are avoided by handling the little craft conservatively, but in the heat of a race a skipper may flop over several times before he finishes. There's not much danger though, providing the sailor can swim — the boards are nonsinkable and easily righted.

The first sailboard of this kind was built by Harry Davis of Long Beach, Calif., who

Amateur sailors can buy Sailfish ready-made or in kit form. Craft ghosts along in light airs but can be kept upright in heavy breeze





soon was swamped with orders. He sells them commercially for \$132.

Another sailing board, called the "Sailfish," is available either as a completed craft or in kit form. One kit contains the hull with all parts pre-cut and ready to assemble. The other kit includes the pretailored sail, mast, tiller, hardware and other parts. The handy young sailor can assemble the Sailfish himself without special tools, thereby saving considerable money. The only additional materials required are paint and varnish.

One unique feature of the Sailfish is a "flip up" rudder, making the craft especially easy to launch or beach. During these operations the rudder can be tipped up so it can't be damaged in shallow water. A nonslip mat atop the hull gives the sailor added stability during the tense moments of a race, and hand grips along the sides make the craft easier to handle out of the water.

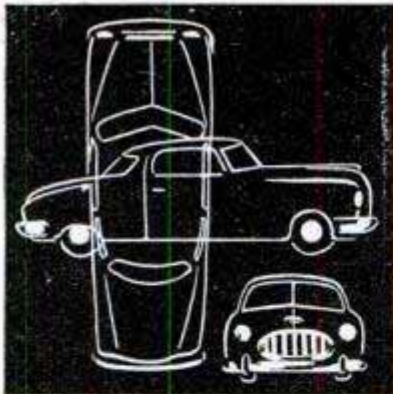
Sailing boards have become so popular that a yacht club of Long Beach recently started a class for this type of craft, and races are run off regularly. Reckless skipper frequently find themselves dunked in the surf, but their craft can be righted so quickly that a doused sailor may go on to win the race.

Flying Fish have recently made their appearance on inland rivers and lakes, where the midget craft are providing a thrilling new water sport, both for the spectators and the amateur sailors.

← Skipper sits on deck of Flying Fish, handling the sheet and tiller. Below, rudder goes on tiller, mast is installed, sail slipped on, centerboard pushed down through hull slot and craft is ready for the sea







# Detroit Listening Post

*By Siler Freeman*

**N**EW ENGINE development in the automotive industry is proceeding along several fronts. Most popular is the V-type high-compression power plant which General Motors has made popular and efficient. Chrysler and Ford are both following this line of development, adding a few of their own ideas. Lincoln, too, is working on a V-8 which will probably closely parallel its principal rival, Cadillac. Reason for this is that it has many of Cadillac's former engineers in its ranks now. The ex-GM men worked on the early Cadillac high-compression engine which went to Oldsmobile as the basis of its Rocket development. The word is: Watch out for Lincoln in 1951.

Still another phase of engine development can be found in Nash's small but hard-working laboratory. This gets away from the V-type power plant and heads off in the direction of the pancake engine.

Nash has been running one on the test line for some time. It is also high compression, takes up very little room and could be used as the nucleus of the rear-engine car, when and if a need is found for that type of automobile.

Then again, it might be used in the present-day models. Nash engineers like it and have it ready any time George Mason gives the word.

The wooden body has about passed out of the automotive picture. Its last stand was in the station-wagon field and it has been ousted even there.

Fisher Body, which with Pontiac, pioneered the all-steel station wagon, has gone over entirely to the metal on its suburbs and station wagons. In fact, the utility vehicles are beginning to look more like passenger cars than the passenger cars themselves. Comfort, instead of or maybe in addition to utility, seems to be the order of the day.

Most of the other companies have also gone over to metal instead of wood. Briggs right after the war went into extensive work on metals and plastics for interior trims. Now, many of the body builders are using what appears to be wood for

trim but it is in reality decals on metal.

Changing over from wood to steel on station-wagon bodies takes a lot of the expensive upkeep out of the vehicles. It also is a lot safer.

The "fastback" or torpedo-type bodies seem to be losing out to the "notch back" or bustle-type. Nash's new Rambler line is of the latter type, despite the company's insistence in the past on aerodynamic styling furthering its economy claims for its larger cars.

The steel-top models, which won't be out in the Rambler line until late this fall, will also follow the notch-back styling of the convertible, brought out in April.

Chevrolet, which has divided its production volume about equally between the two types of bodies, reports a slight edge to the bustle back. Buick, which offers the two styles, too has found the latter styling preferred by its buyers.

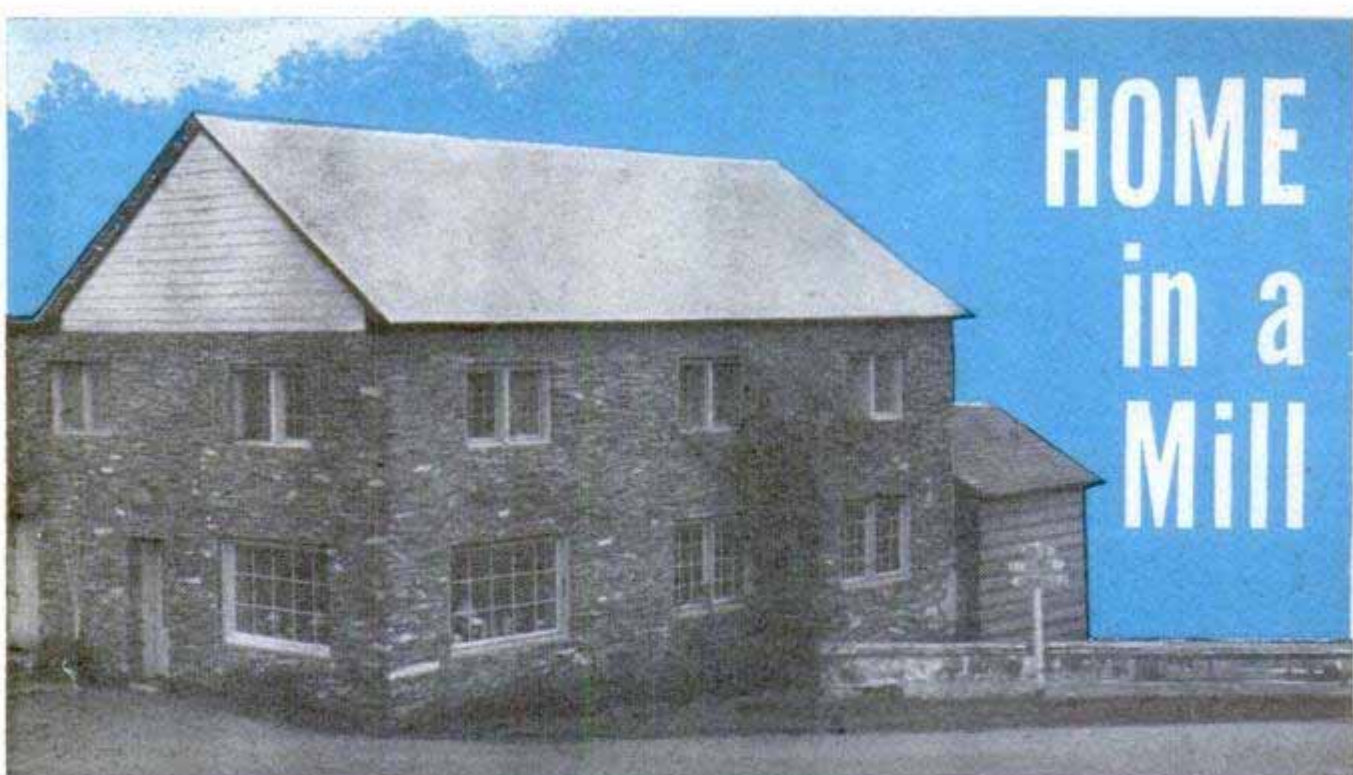
Production schedules will be sharply revised for the last half of 1950. While the record-breaking pace of the second quarter will probably not be maintained, plans for the third quarter are optimistic; even the final quarter may be surprising.

Price cuts, if they come at all, will be in the latter part of the year, perhaps to help clean up on 1950 models before swinging into the 1951 cars. General Motors' decision to run this year's models through most of the year has helped the divisions' planning a great deal.

The auto industry is watching the buying public's reaction to the short-wheel-base car. It is expected to get its true test this month when the low-priced Kaiser gets into dealer showrooms.

Nash's Rambler, while proving popular, was not seen by the industry as a true test, appealing only to the convertible-minded. Kaiser's entry, however, is a closed job and will have a much wider market.

What happens to the new Kaiser may affect the planning of some of the other independents, who have been toying with smaller cars. Willys-Overland is already committed to the idea but there are others who are wavering.

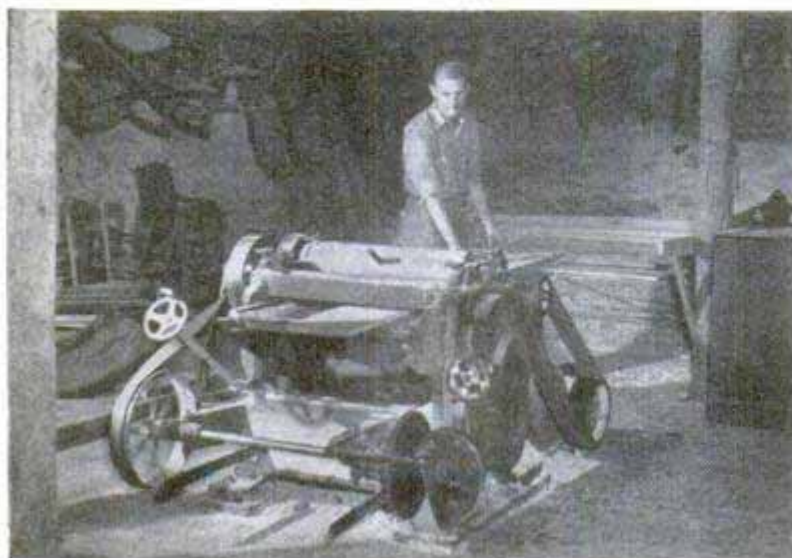


# HOME in a Mill

Abandoned grist mill, built years before Paul Revere's ride, was restored by the Armstrongs and now serves as their home. Below, their own power plant provides fuel for electric range



Below, it doesn't cost Armstrong a penny to run the power tools in his shop. Turbine in the mill race generates the electricity



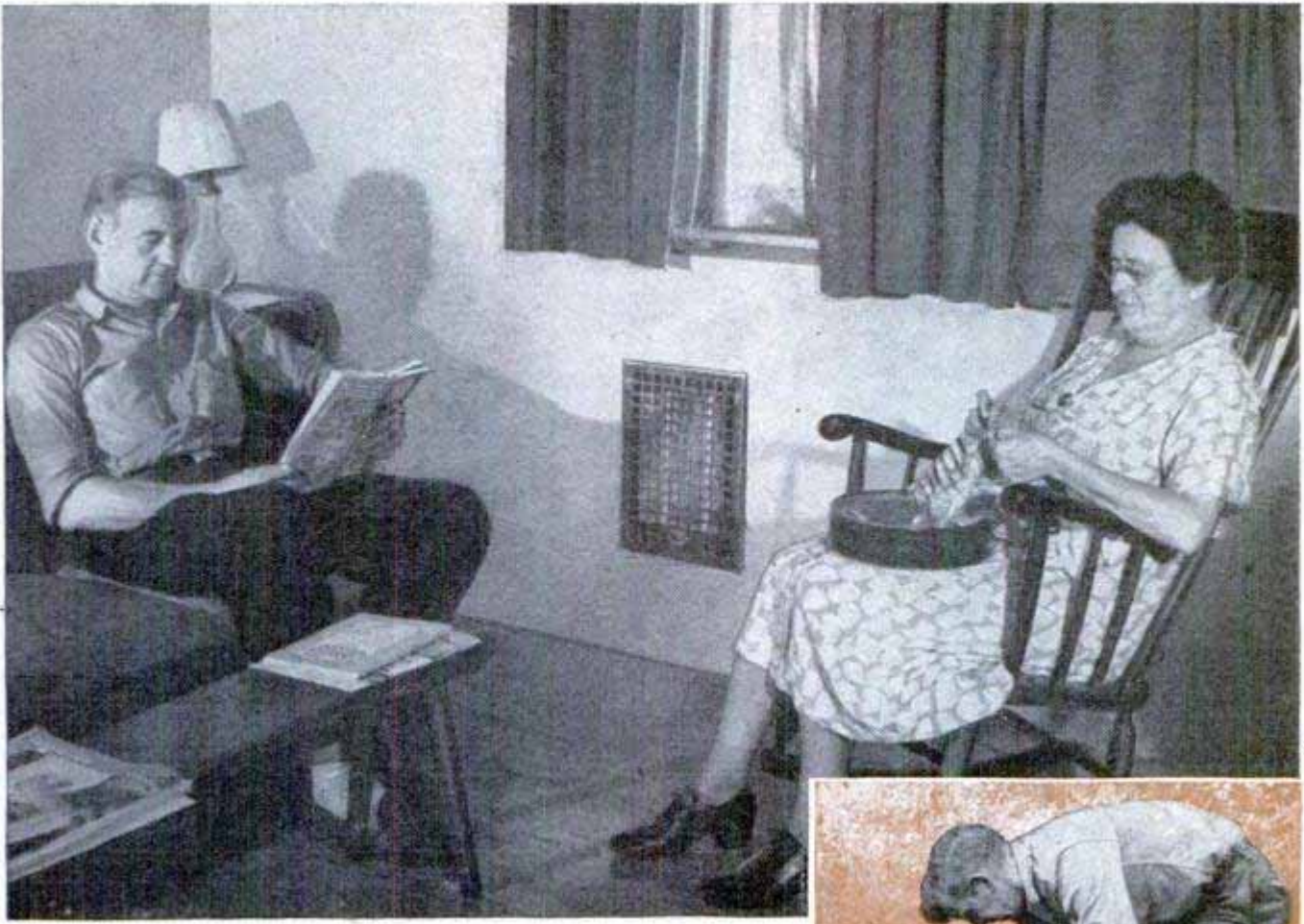
**F**UEL AND UTILITY bills never upset the budget of Wesley Armstrong, for they never arrive in his mailbox. Armstrong and his wife have built themselves a self-sufficient haven where they have an unlimited supply of free electricity.

A few years ago the Armstrongs decided to build themselves a home. Their search for a site led them to the little settlement of Mortonville, Pa., on historical Brandywine Creek. There a surprised realtor found them enthusiastic over an abandoned grist mill, built 'way back in 1768.

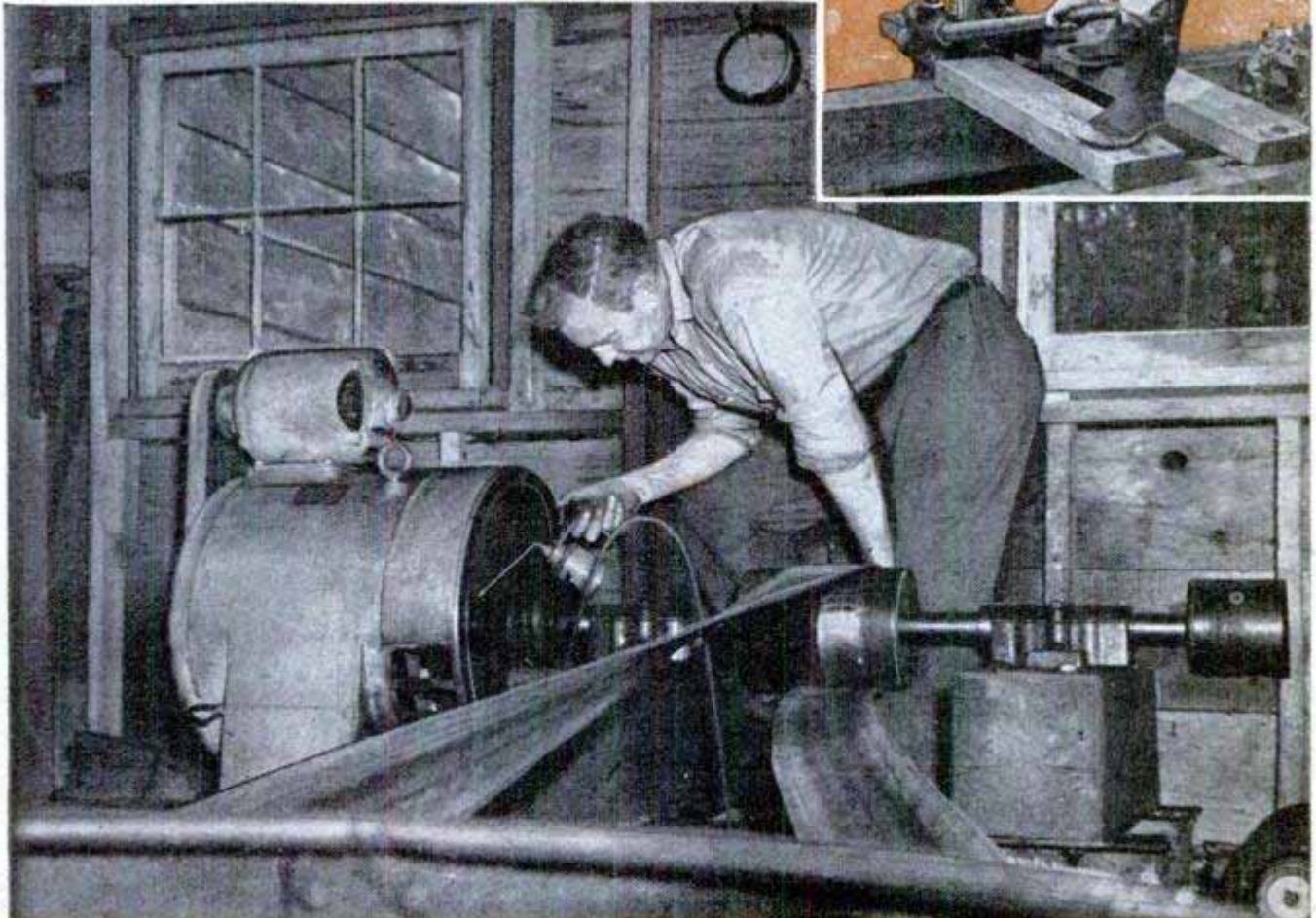
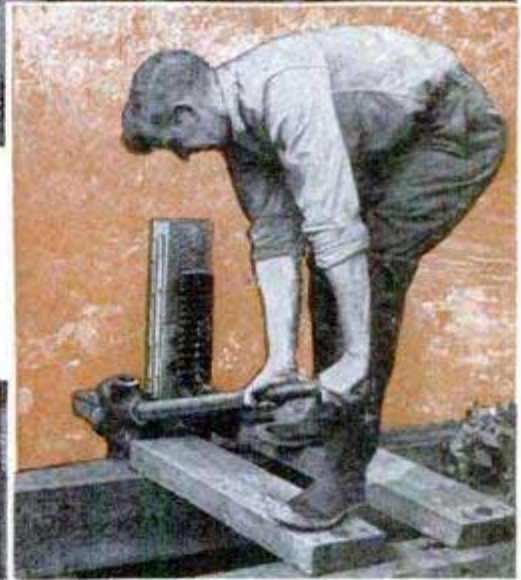
Neighbors' doubts soon turned to enthusiasm as Armstrong jacked up the walls and rebuilt them as sturdy as they had been 180 years before. To minimize dampness, he changed the course of the mill race to run beside the building instead of through it.

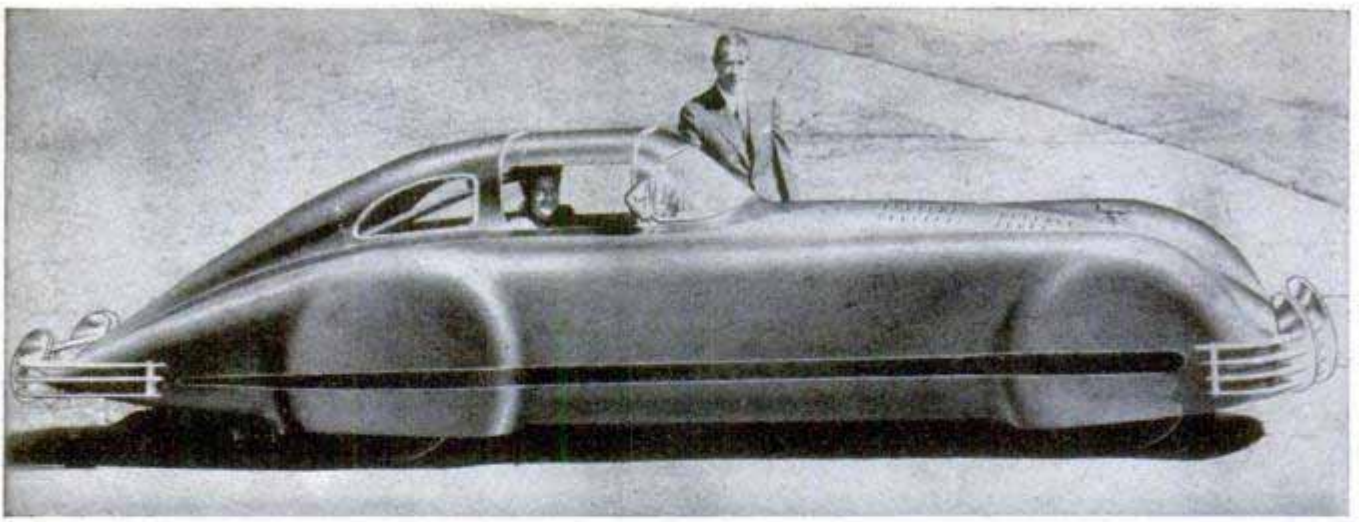
Then came the turbine. He installed it himself, and after weeks of hard work it began turning the generator to provide electricity which lights the home and powers the tools in the big workshop. The electric current also warms the old mill through radiant heaters and furnishes fuel for the range.

Two years of spare-time work and \$10,000 went into the old mill, but the Armstrongs are firmly convinced their home is worth it. They have a good many other plans for using the inexhaustible power of Brandywine Creek.



Free electricity heats the once-abandoned mill, too. Radiant coils in every room keep the home comfortable. Armstrong plans to install an air-conditioning system next. Right, he operates the head gate which controls the flow of water down the mill race. Below, oiling the bearings of the generator is a daily task. Wide endless belt connects generator with the turbine





## Propane Powers Superspeed Car

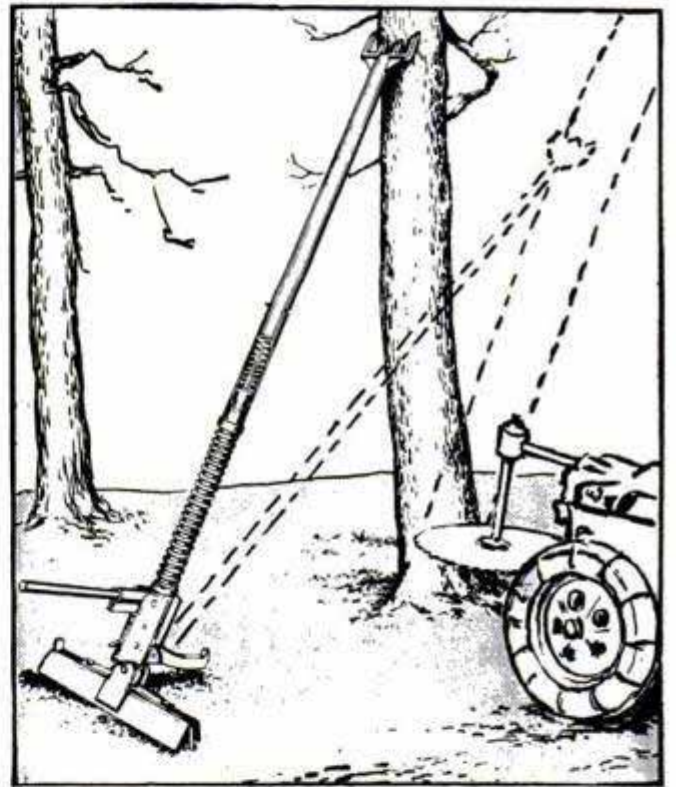
Demonstrating the efficiency of 125-octane propane as motor fuel, a streamlined automobile, designed by L. J. Fageol of Kent, Ohio, has been clocked at 135 miles

an hour. Fageol, president of the Twin Coach Co., reports that propane provides faster acceleration and more economical operation than gasoline. Fuel costs are cut 30 percent. The high-compression engine develops 275 horsepower on propane.



## Lawn-Sprinkler Shutoff Valve

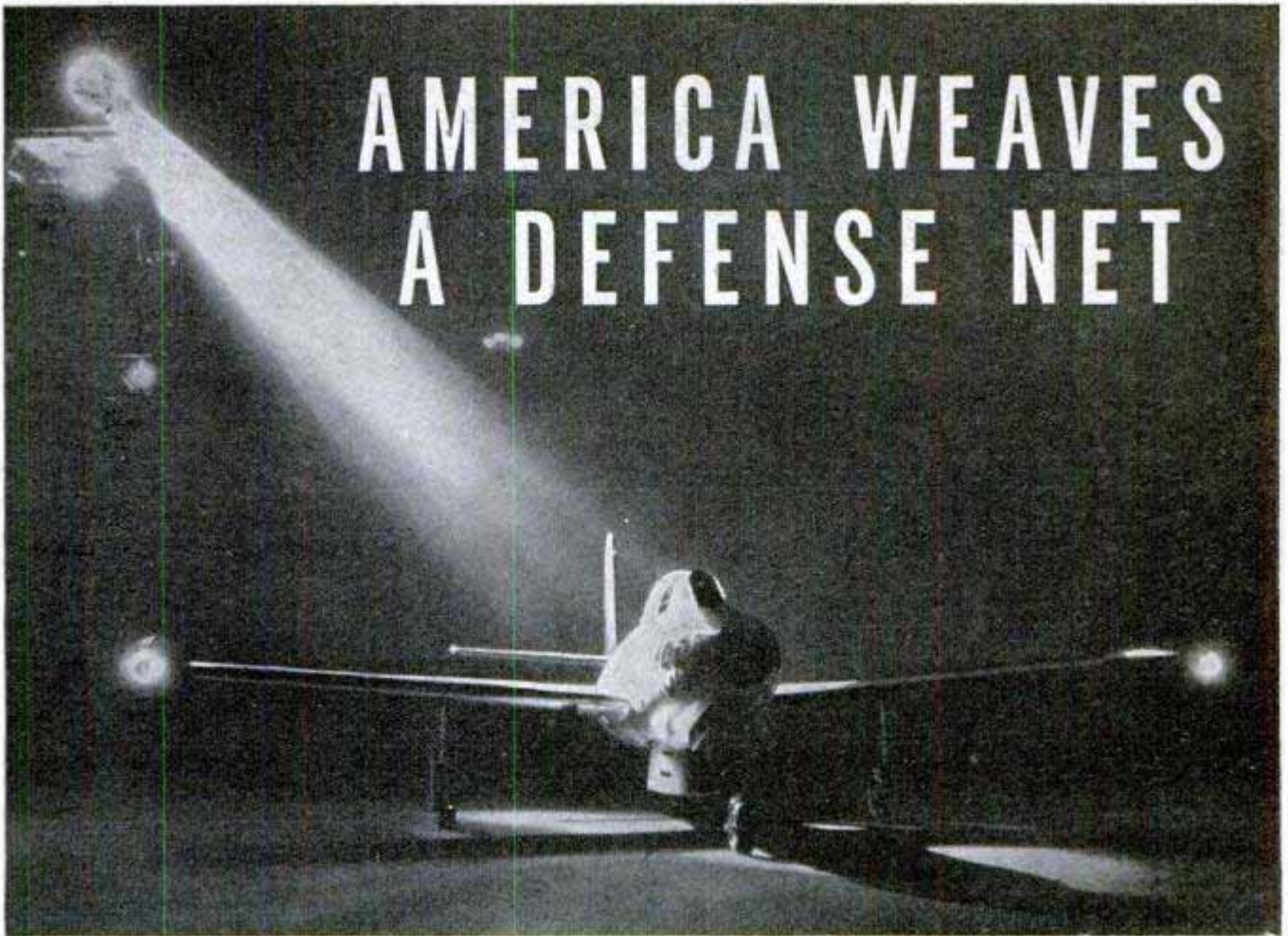
Tired of ducking under the spray or trying to hold the hose kinked so you won't get wet while moving the lawn sprinkler? You can solve the problem by inserting a flow-control valve in the hose just outside the range of the sprinkler. When you press a button on the valve, the water flow is stopped and you can walk up to the sprinkler without getting a shower bath. After you've moved the sprinkler, you step back, release the button and spraying is resumed. You can also control the amount of water flowing into the sprinkler by screwing the button in or out.



## Jack Fells Tree in Right Direction

Safety to the operator and the saw rig is insured by an ingenious tree-felling jack. A combination of two springs operates the jack. A heavy spring starts the tree and a lighter spring automatically "kicks in" to fell the tree in the desired direction. The base of the jack is hinged and folds as the tree falls, keeping it flat on the ground. Lugs on the base prevent it from slipping on ice or snow. A four-pronged fork at the top of a steel tube holds the tree firmly, keeping it from turning. The jack virtually eliminates the time and work of undercutting the tree.

# AMERICA WEAVES A DEFENSE NET



U. S. Air Force photo

Scramble one with blinkers! A Thunderjet from the 33rd Fighter Group starts on a night interception of "enemy" bombers. Black portions of map below indicate U.S. areas already active in aircraft-spotter program

**By Richard F. Dempewolff**

**T**WELVE BLACK SPOTS thrummed across the Cape Cod sky. Down where the desolate sand dunes jut into the Atlantic, they had not gone unnoticed by two sharp-eyed men standing beside a jerry-built beach shack. One, holding a telephone, snapped a terse message into the mouthpiece:

"Aircraft Flash! — Yoke Queen 7438 — 0942 — Northeast, 2½ miles — 12 four-engine military foreign, seen, about 5000 south."

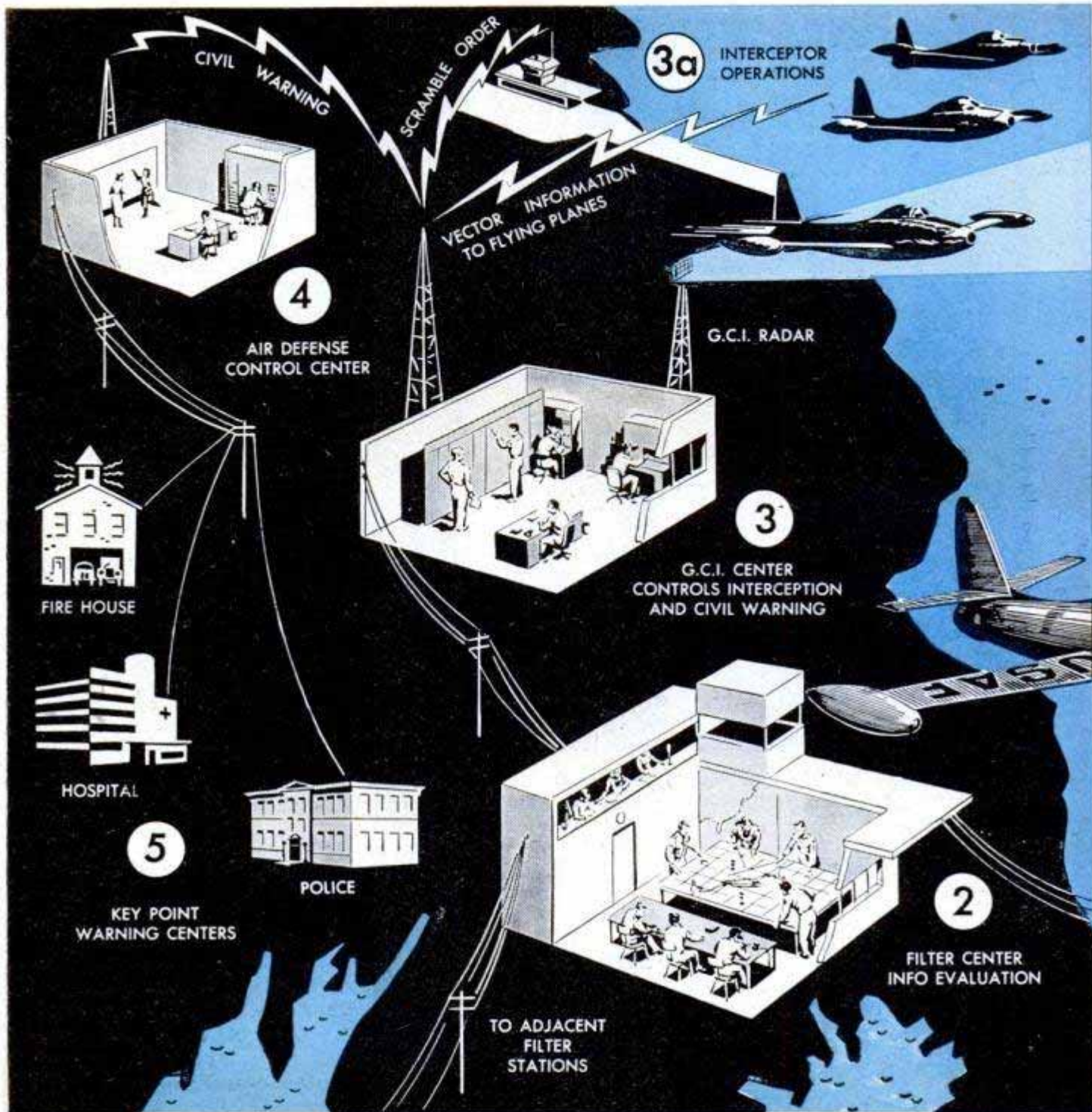
The seeming gibberish set in motion a chain reaction of nuclear-fission proportions. More than 200 miles away in Providence, R. I., the message flashed to a series of military and civil warning and control centers. Thousands of people leaped into action. Telephone lines and radio lanes buzzed with the coded information:—that, at a specific location over the Cape, at 9:42 a.m., 12 big foreign four-engined military bombers were flying southward at 5000 feet altitude.

In less than four minutes, special firehouses, police stations and hospitals in the path of the bomber wave were being alerted. Arrangements were made to alert factories for immediate shutdown, to halt transportation and direct civilians to cover. Already, at half a dozen air bases in the area, squadrons of Thunderjets and high-powered Mustang fighters were roaring skyward to intercept the "enemy." Airlines crackled with vectoring information, beamed to the airborne fighter pilots from Ground Control Intercept stations, where military men at plotting boards followed the progress of the bombers as more reports on them poured through the switchboards—relayed from hundreds of eagle-eyed spotters like the two men on the Cape.

Two men on the Cape.

All this is no war-time reminiscence. It happened last fall, when 10 Eastern states fell under "attack" by our own B-29s to test the efficiency of a super aircraft-spotter program that will be a vital part of our defense





against any power attacking the U.S. by air.

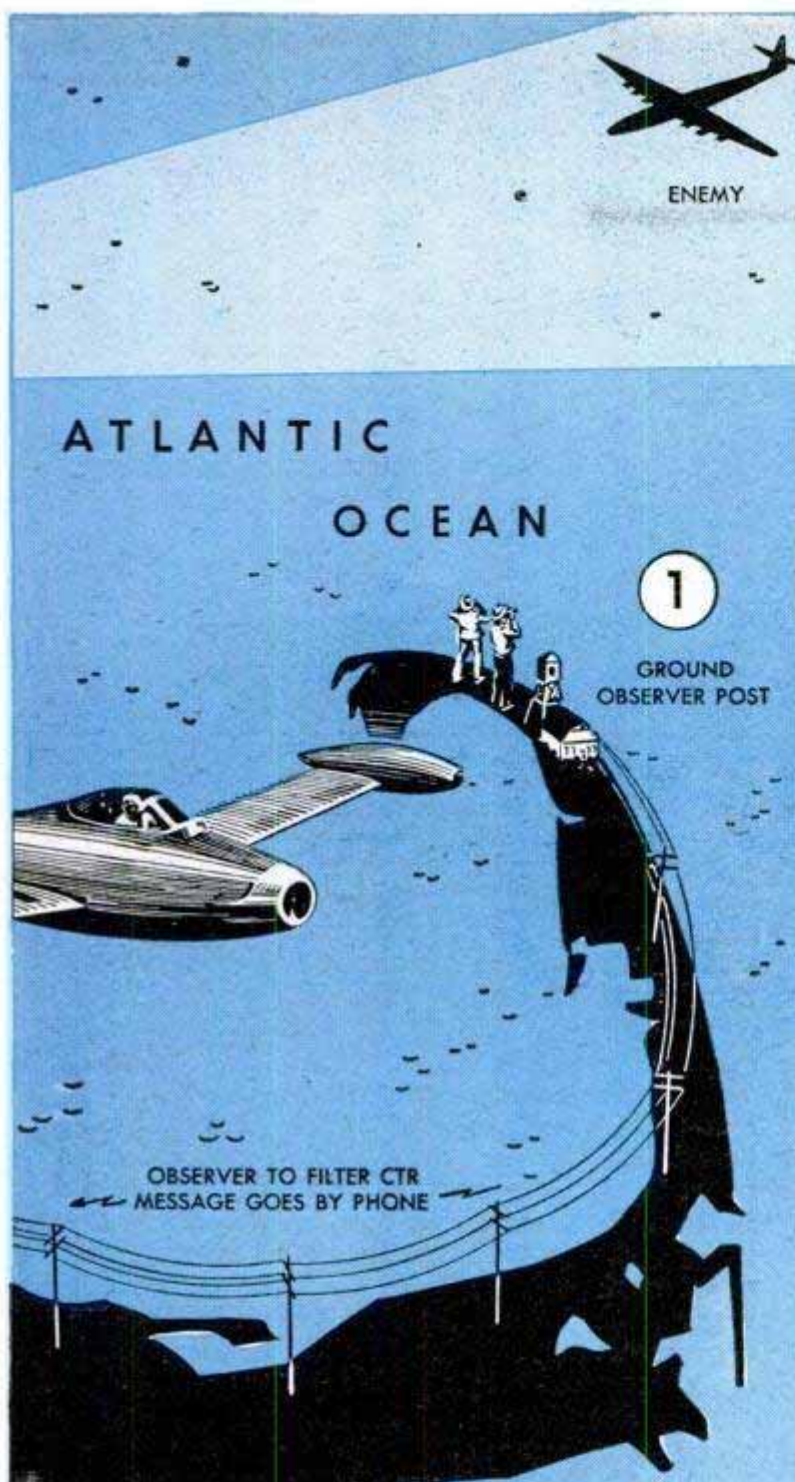
Many people wonder what we're doing, if anything, to keep enemy A or H-bombs from being dumped in our lap. We're doing plenty, within the budgets Congress has allowed. Few, outside the military, know how much.

At the Aircraft and Guided Missiles Center in Ft. Bliss, Tex., a spectacular array of new weapons includes self-aiming anti-aircraft guns that can pour an almost impenetrable curtain of proximity-fused shells at high-flying supersonic aircraft. There are sky-sweeper guns that will literally spatter the upper air with explosive death. New detectors can pin-point planes flying 1000 miles per hour at 80,000 feet while they're still more than 175 miles away—giving our defenses 10 whole minutes (that's a lot in

modern air war) to prepare guns for tracking, and throw jet interceptors into the air.

"We've got to assume that an enemy bomber will travel at least 350 miles per hour," the Air Force points out. Hence, the most vital part of defense is the early tip-off that they're on the way. That's being prepared for in a big way.

Out across the wide reaches of northern Alaska and Canada, sled trains are plowing through Arctic snow, delivering some \$50,000,000 worth of equipment to build a "fence" of early warning radar across North America's back door. Sites are picked and construction plans complete. Since most of the work is super-secret, few details are being released. But some of the radar screens will show a warning blip at 300 miles. Others will reach 150 miles out,



to catch glimpses of any approaching aircraft.

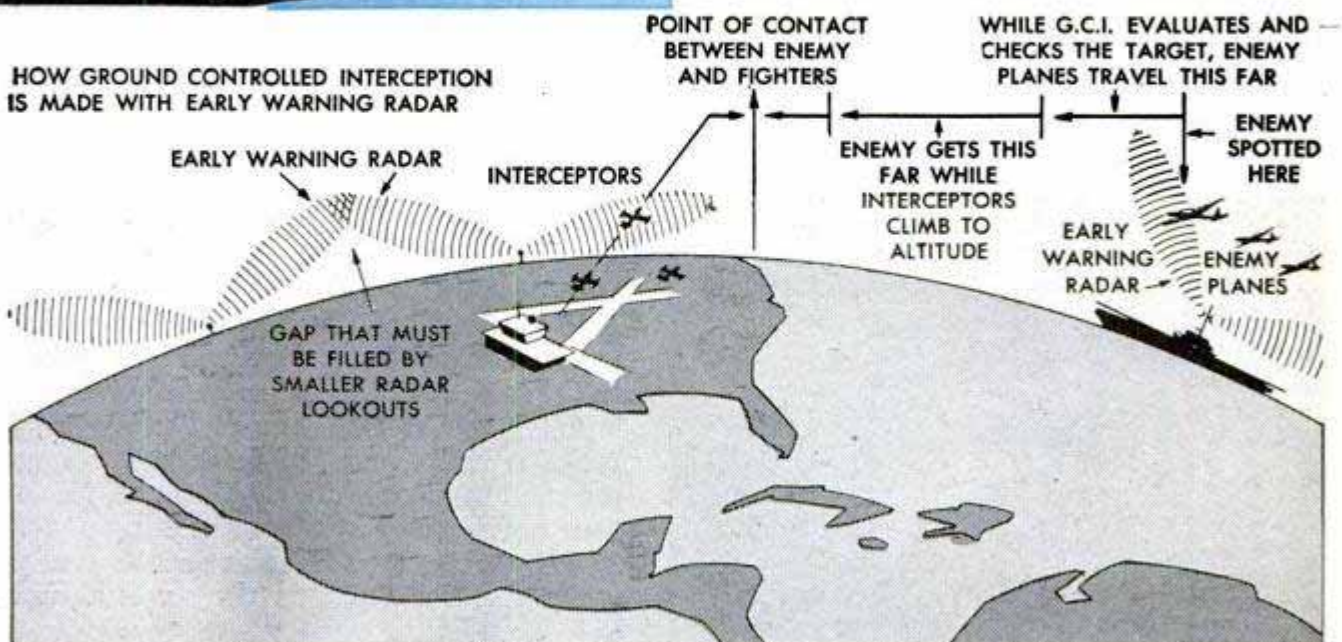
The Great Lakes industrial area, where a sneak attack could indefinitely cripple our war-production potential, will be ringed by special radar installations at Mason City, Iowa, East Farmington and Elkhorn, Wis., and a point northeast of Duluth, Minn. Just the costs for the land and buildings will run \$500,000 to \$1,000,000 for each station, without the radar.

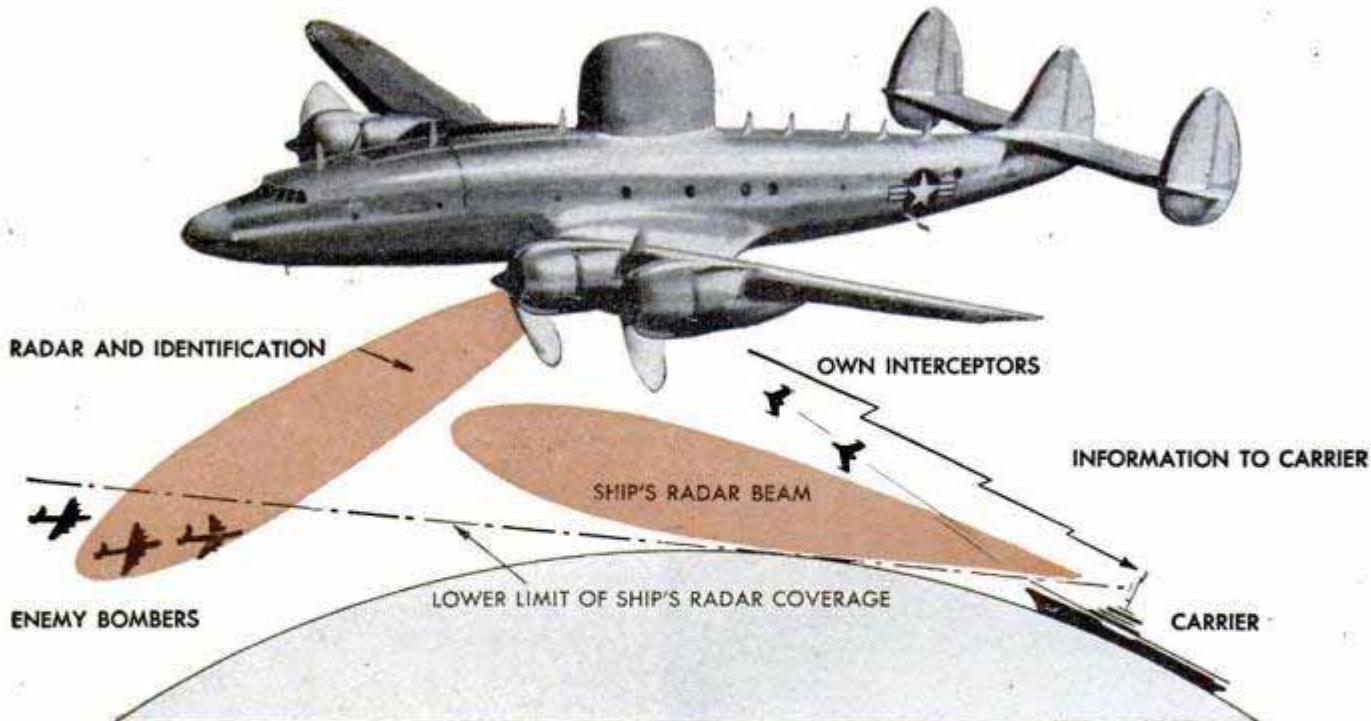
Flanking the country, equally well-equipped picket ships are being posted, with radar range that will fan out in a broad sweep down each ocean.

When President Truman announced his decision to produce the H-bomb, steps were taken to police all air space inside the country. Pilots flying anything from kites to jet transports within 100 miles of any atomic-energy plant or other strategic area will have to file flight plans and make periodic reports — or stand a chance of being blown from the sky. Overseas planes coming in along the coast from Canada to Norfolk must do the same before entering within 200 miles of our shores. All southbound flights over the Canadian border, crossing the northeastern and northwestern corners of the U. S., must likewise be registered.

But even "radar fences" aren't fool-proof. Many strategists don't even like the term. Radar beams, of course, ride a

How the ground-observer system works, from the initial spotting through key warning centers, is shown at left. Danger signals can be relayed on through entire chain in about four minutes. After the first early warning from ship or plane radar, below, success of interception hinges on the speed of notifications. Ground watchers plug the "blind spots" through which low-flying craft might sneak





Lockheed Aircraft Co. photo

With shipborne radar limited because it cannot "see" over the horizon, powerful sets in radomes above and beneath high-altitude Navy Constellations extend range of detection for many miles at sea

straight line, like television, and run out off the earth's curved surface into space. If you could see a cross section of the beams of two radar sweeps, 300 miles apart, they'd look like two pairs of butterfly wings side by side. Beneath the bottom edges there would be a wide, squatty, triangular gap of open air between the stations. Enemy planes, swooping low, might weave in and out through the network, following these gaps. These are the gaps that will be filled by the super lookout system.

From filter-center reports, path of an enemy flight is charted on plotting board at interception station



Part of the grid, which is being organized by a team of Air Force experts, state governors and local volunteers, already is under way. It calls for about 8250 observation posts at 8-mile intervals across 21 northern states. These, plus some 25 filter centers, will be manned by 150,000 trained volunteers—men and women air-raid wardens from the last war, reservist groups, Coast Guardsmen and a host of interested everyday neighborhood folk. The mammoth ground-observer corps will report all low-flying planes. They'll be connected by existing telephone lines to filter centers, where the information is evaluated and dispersed instantaneously to interceptor squadrons and civil agencies.

How does it work? Like a charm. In a week-long exercise dubbed "Operation Lookout," the Eastern Air Defense Force at Mitchel Field, L. I., tested its first fully organized 10 states, including the whole northeastern sector from Maine to Delaware. Lookout posts were carefully spotted to complement existing GCI and early warning radar.

It wasn't easy. Air Force men, often working with old maps, had their troubles. One post in Connecticut looked good on a 1910 contour map, but when the observer reported there he discovered it was smack in the middle of a huge artificial lake.

After minor adjustments, however, 563 lookout posts and six filter centers were manned by nearly 12,000 civilians, working four hours a day at a breathtaking pace. In 34 key areas, civil agencies stood ready to warn the populace as they would under actual attack.



For seven days, 33 B-29s and hundreds of fighter planes tried to wreak theoretical havoc throughout New England. Over New Hampshire a formation headed for factory areas. Spotters' warnings flashed over phone lines. Before they'd gone halfway, F-51 Mustangs of the 82nd Fighter Wing, screamed up from Grenier Air Base.

Fast-climbing Navy Bearcats out of "secret" Long Island air bases, rose to intercept "atom bomb carriers" bound for New York City. Three more waves of bombers thundered in on the big town from other compass points. Suddenly, the morning quiet was shattered by the shrill whine of 600-mile-an-hour F-84 Thunderjets, screaming in from Falmouth Air Base to join the Bearcats and trounce the invader. F-82 twin Mustangs from the 52nd Fighter Wing out of New Jersey stopped a dozen waves over the southern area.

Two or three times a day New York was "almost bombed" by the roaring 29s. Vicious-looking fighter formations swept in dozens of times a day trying to strafe industrial targets up and down the coast. None made it; spotters got them all. In Pennsylvania, an observer reported to his filter center that a man had parachuted from a plane. The information was received at the Mitchel Field, L. I., master control base before the jumper hit the ground.

"Those spotters," an Air Force man declared, "were really on the ball. Though required only to identify planes by the number of engines, many were giving ac-

tual plane types and military designations. In cloudy areas, they were successfully identifying by sound. They didn't miss a single trick."

The most impressive factor was the speed of reporting—vital in modern air war. "A jet bomber," the Air Force points out, "flying low over the coast at Portland, Me., could be over Boston nine minutes later. Fast is a mild word for it. It calls for on-the-spot identification, instantaneous communication and interception."

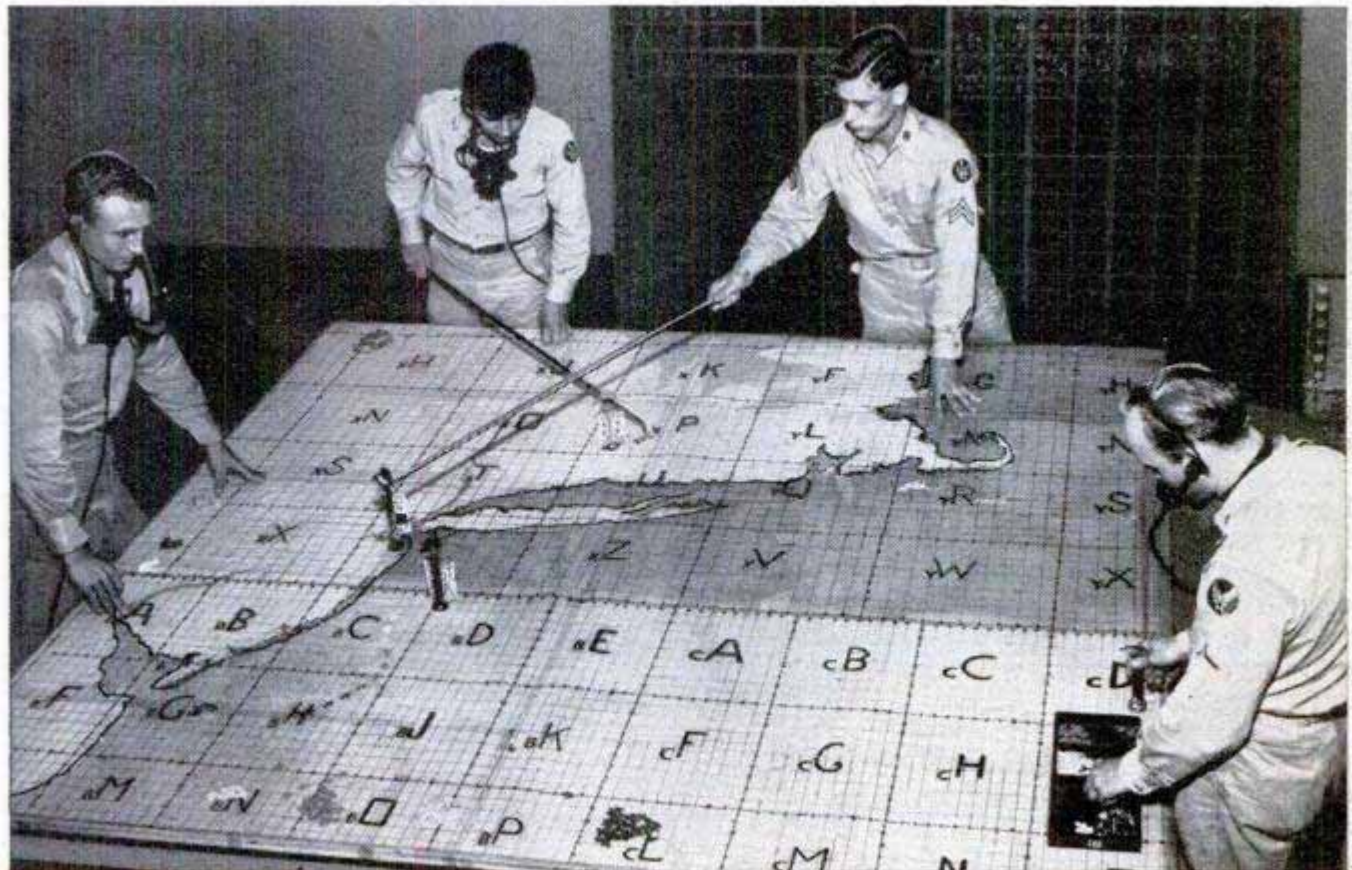
Here's how it worked when the spotters called in the first warning on that bomber wave over Cape Cod:

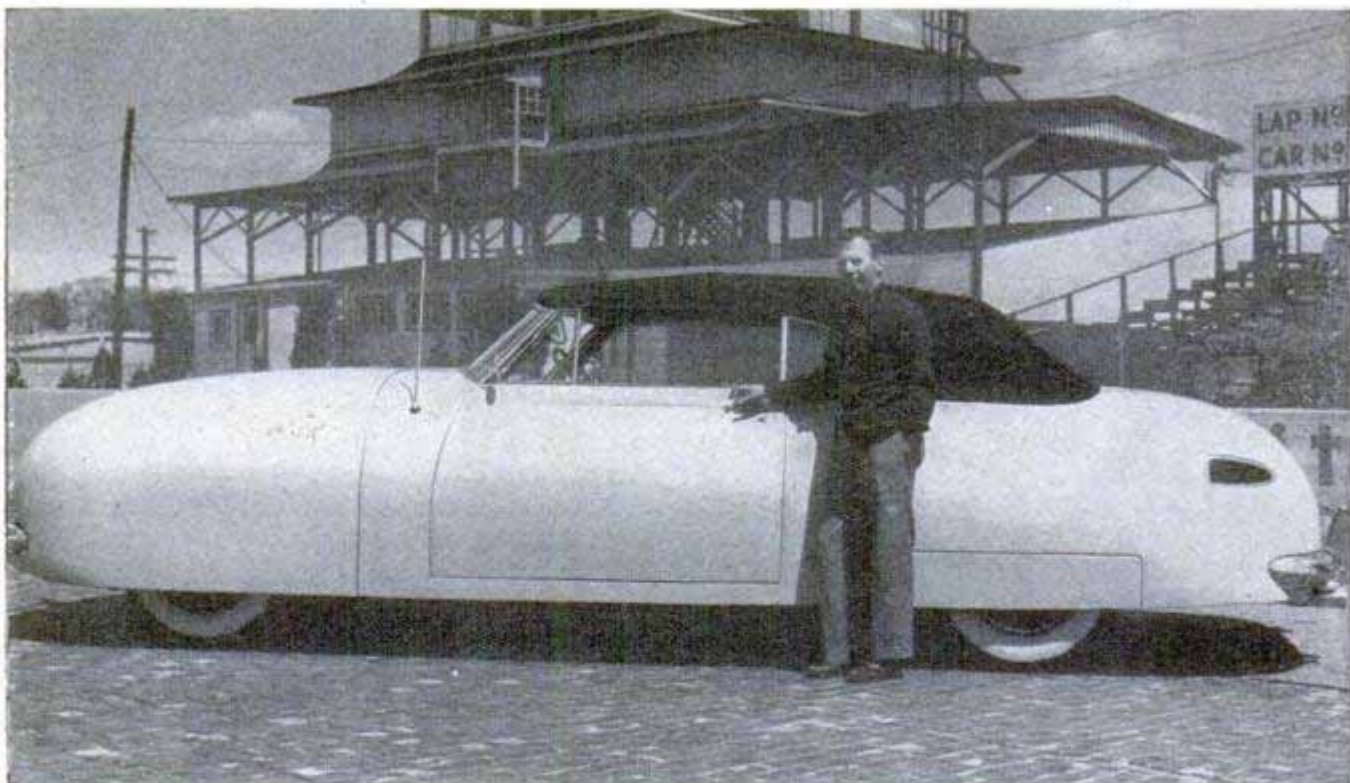
From the tip of the Cape, the message flashed over alerted phone lines to the big filter center in Providence. Here, an operator with headset, standing before a tremendous plywood table of the area, wrote the information on a white card. A little movable plastic arrow, representing an enemy-bomber wave, was placed on the map at Yoke Queen 7438 (the location given), and the card placed beside it. As more calls came in from other spotters, verifying the bomber wave and location, a blue card was switched for the white one, and the arrow moved along the track being taken by the planes. The blue card was the signal for things to happen.

On a high platform over the grid map sat three "tellers," also wearing headsets that spouted spotter information. Two "overlap tellers" immediately reported the data

(Continued to page 240)

Stands with cards bearing additional data about "enemy" flights track their paths around grid map of area

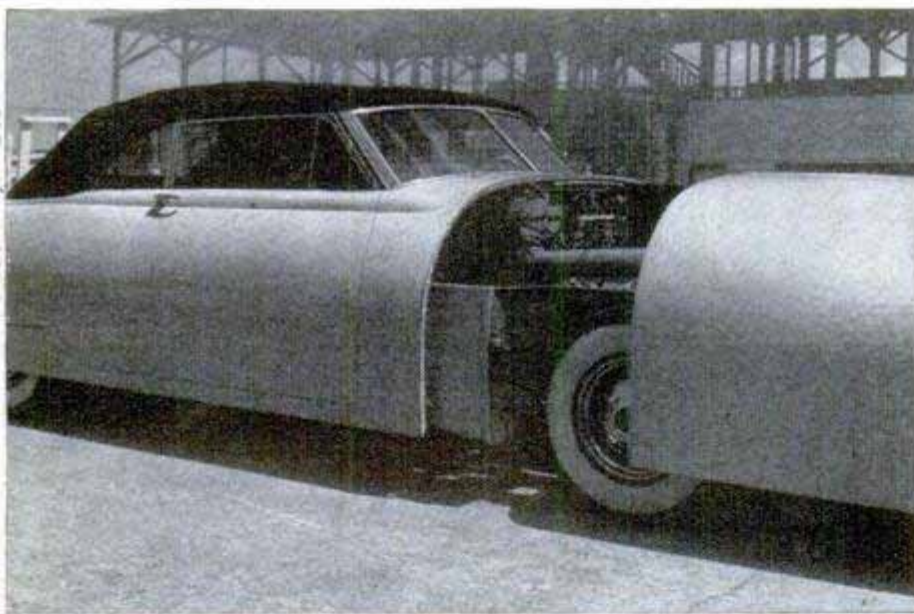




There's not even a screwhead visible on the body of the super-streamlined auto, built on a Cadillac chassis. Hood and door panels are made of aluminum and the rest of the body is fashioned from 18-gauge steel

## Hood Slides Open On Custom Car

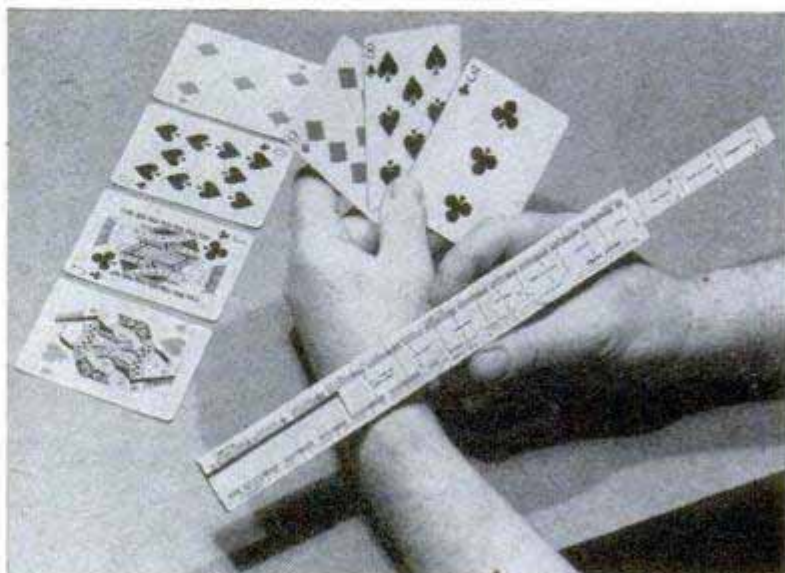
Smooth, unbroken lines provide the ultimate in streamlining on a custom-built automobile body designed by Rudy Makela of Indianapolis. The car is built on a standard 1942 Cadillac chassis. All appointments are flush with the body. No screwheads are visible on the car's exterior. Access to the engine is provided by a sliding-drawer type of hood mounting. Resting on a series of rollers, the hood can be pulled forward to uncover the engine.

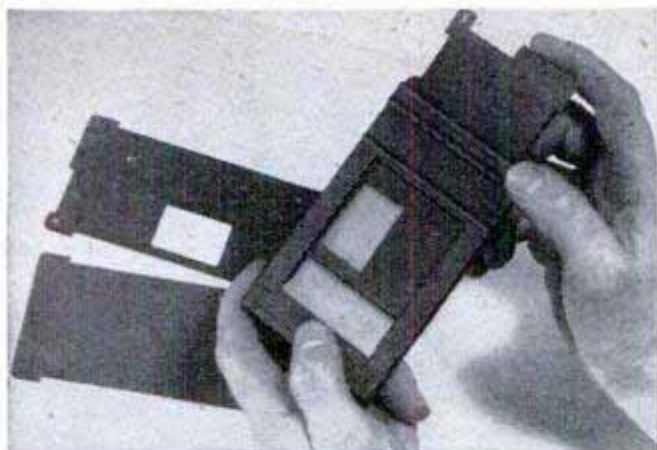


## Poker by Slide Rule

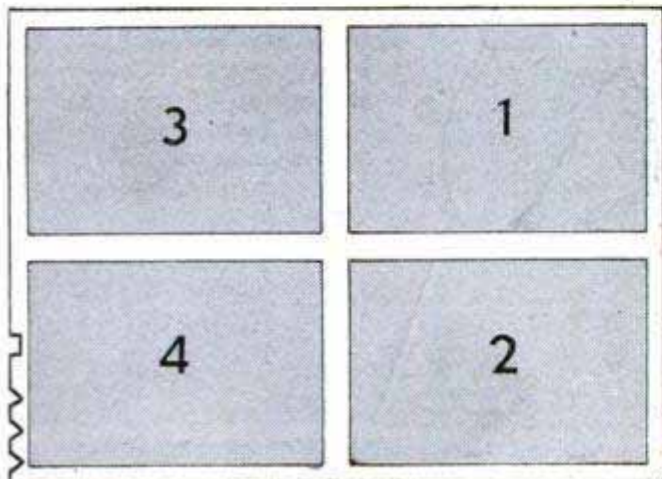
Poker players get scientific when they use a slide rule that is based on the chances of drawing to various card combinations. For use in five-card stud, seven-card stud and five-card draw, the slide rule tells the player whether to get out, stay or raise under each situation. By using the device, you know the odds are with you, whether the cards are or not!

☐ There are more than 8000 varieties of coal being mined in Britain, from various anthracites to noncoking coals.





Above, two masks and a slide enable photographer to put four 35-mm. shots on one film, as shown below



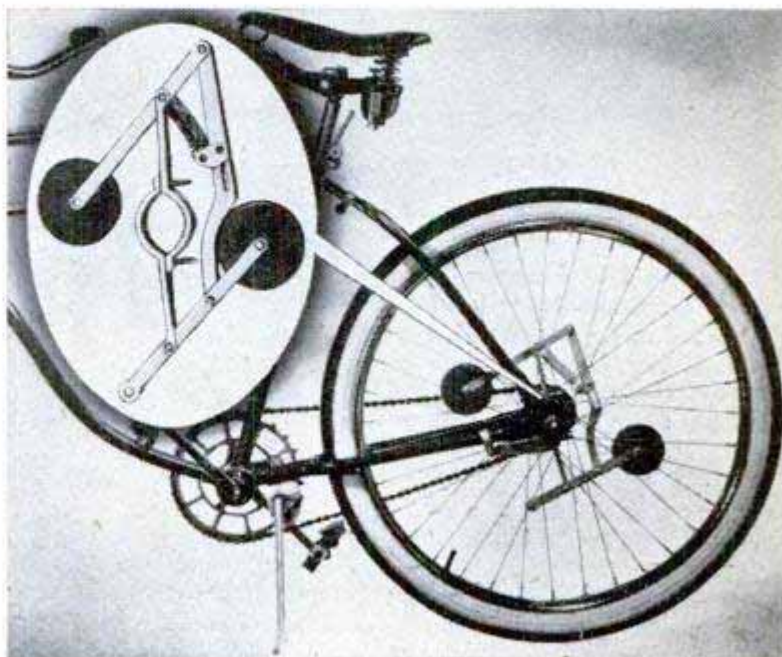
### Masks Cut Costs for Color Fans

Color photographers who use  $2\frac{1}{4}$  by  $3\frac{1}{4}$  cut film get four times as many exposures on a sheet of film when they use a set of masks in their holders. The metal masks enable the photographer to make four transparencies, each of 35-mm. size, on one sheet. The masks also make possible the showing of the transparencies in a standard 35-mm. projector.

### Bike Coasting Booster

Bicycles coast farther and faster with a new booster attachment. It has disks that move out toward the rim of the wheel after a speed of seven miles an hour is reached, permitting kinetic force to improve the speed and coasting distance. The booster fits all standard bicycles.

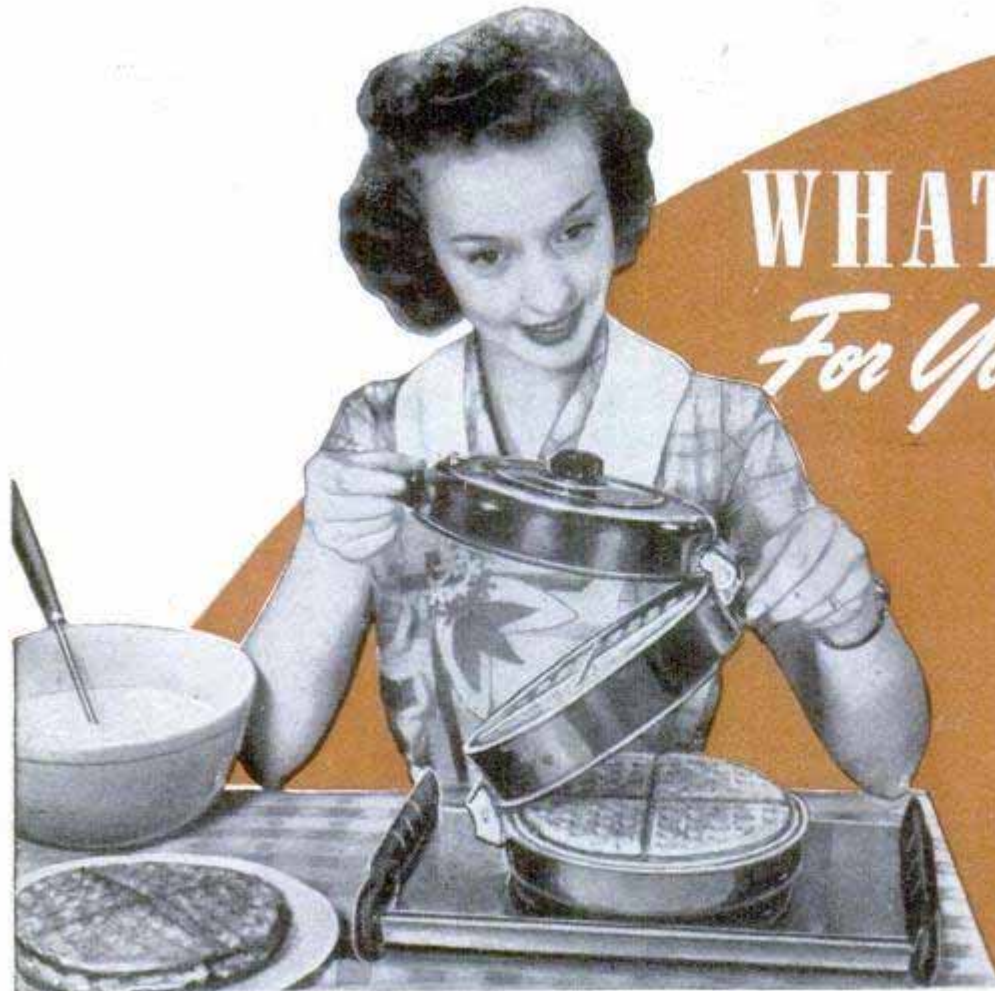
At high operating speeds the new Rolls Royce and Pratt & Whitney J-48 jet engines deliver 11,000 horsepower, an equivalent of five horsepower per pound of engine weight—in contrast to one horsepower per pound of engine weight from the most powerful piston engines.



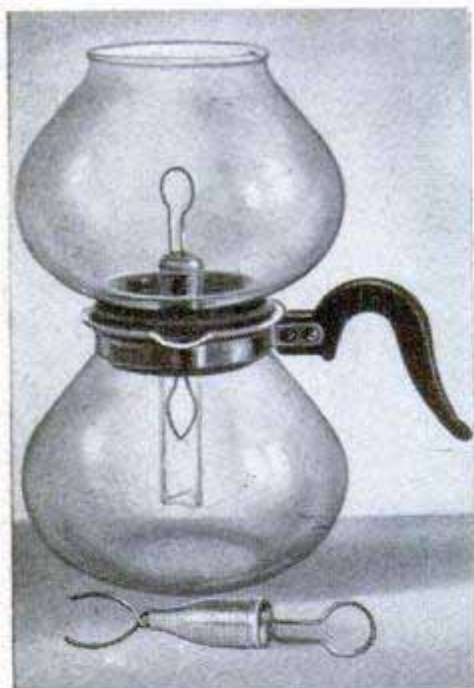
### Portable "Pantry" Holds Camp Food

Food for campers can be stored at a convenient height in a collapsible "pantry" which hangs from a tree limb. The cupboard consists of four shelves, supported by ropes and covered with canvas. Ropes from the top shelf are looped over a tree limb, and additional ropes from the bottom shelf can be staked to the ground if desired. In hot weather the canvas can be wet down to convert the cupboard into a cooler. When collapsed, the cupboard is only  $3\frac{1}{2}$  inches high. The canvas and ropes are available separately if the handyman wishes to cut his own shelves.

# WHAT'S NEW *For Your Home*

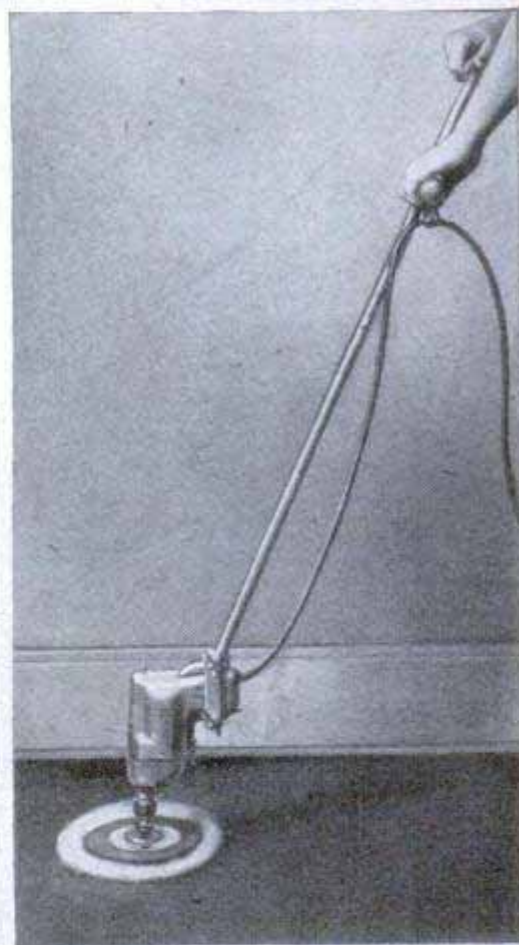


**TWO WAFFLES** are baked at a time in a "double jointed" iron. Both waffles are ready at the same time because one thermostat controls the two baking units. The base tray, permanently attached to the iron, catches all drippings

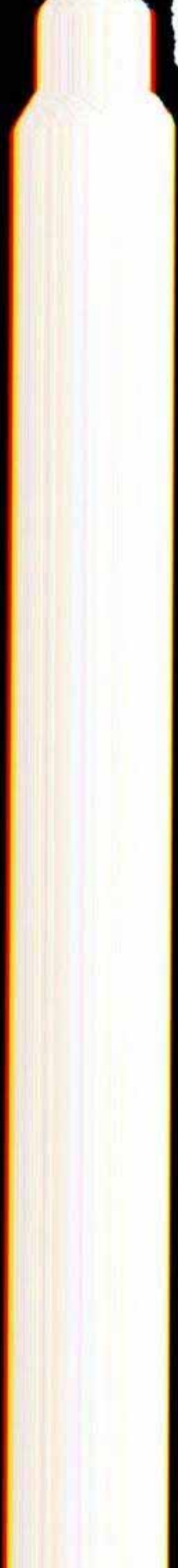


↑ **SPRING FILTER** keeps coffee clear and is unbreakable. It is built like a tapered coil spring and it seats in the hole firmly. You can stir coffee in the top bowl without worrying lest you tilt filter, letting grounds out

↓ **TRIGGER PINS** are the new member of the clothespin family. Made of plastic, they clip clothes to a line with finger pressure on the "trigger" inside the ring. They're easy to carry—slip them on a finger



↑ **ELECTRIC DRILL** now has a new job: Polishing and waxing your floors. Kit includes an extension handle, so you won't even have to bend over, a polisher and a waxer





**"Be**

PUT  
cells  
at

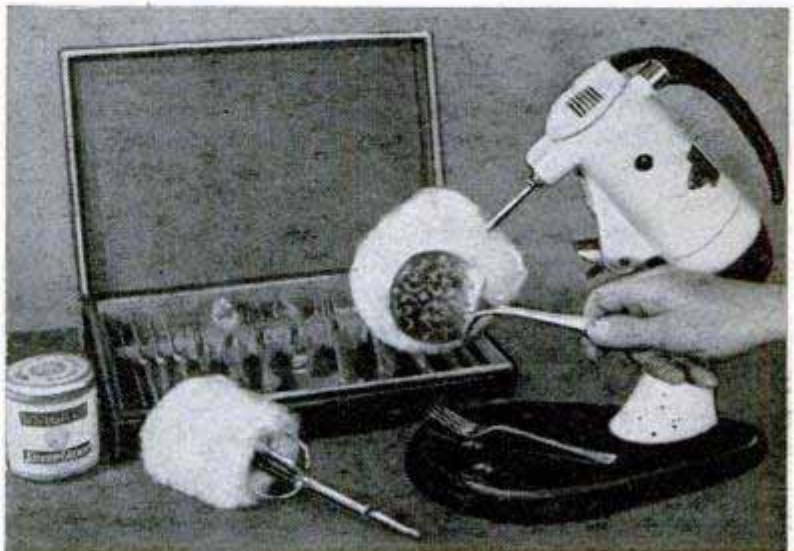
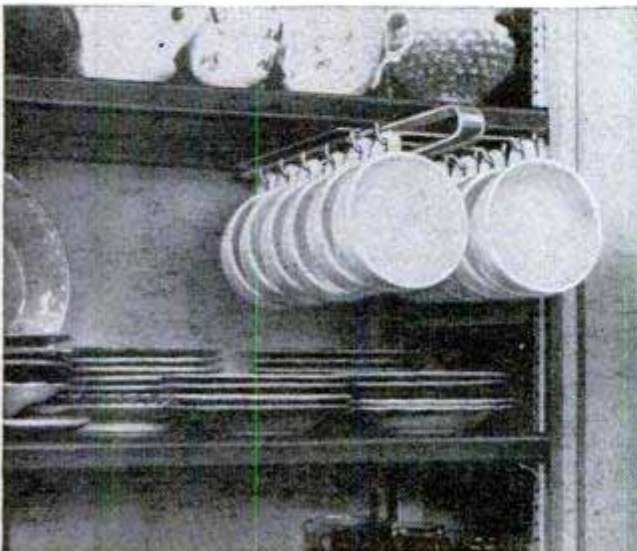
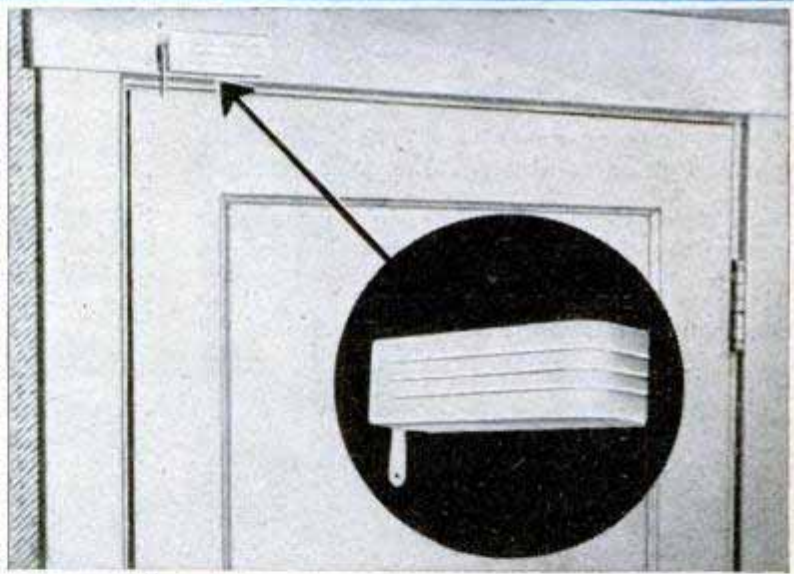


**CLOSET STRETCHER**, above, lets you hang 12 skirts or 6 trousers, using very little space. It fastens to wall or door

**BURGLAR ALARM**, right, scares away intruders with ear-piercing sound when door or window is opened. It's battery-powered

**CUP RACK**, below, ends risky stacking. Pull out the rack and cups are easily removed. Push it in and they're out of way

**MIXER BONNET**, below right, fits over the beater of an electric mixer so you can polish shoes, silver or furniture with it

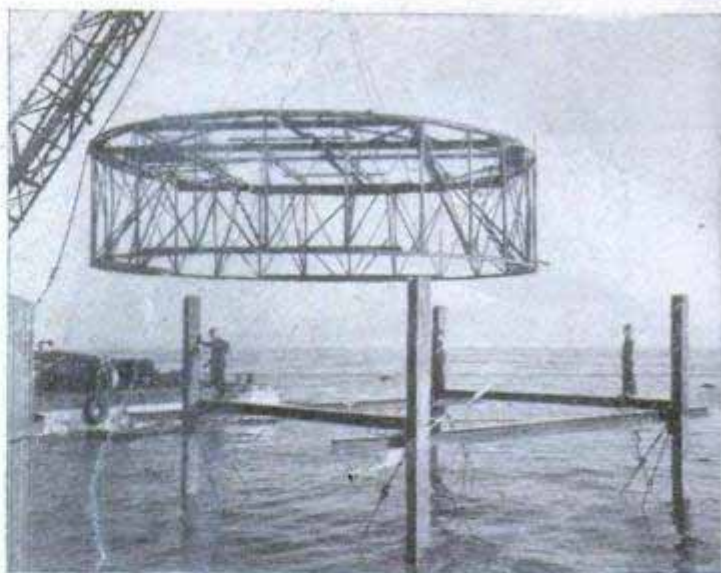




Above, lowering one of the 79-foot piles into position prior to driving. The piles interlock

Top, right, circular template guides the piles during the driving, after which it is removed

Lined up like plates on a banquet table, these sea-wall barrels will hold in 136 acres of fill



## "Barrel Stave" Sea Wall

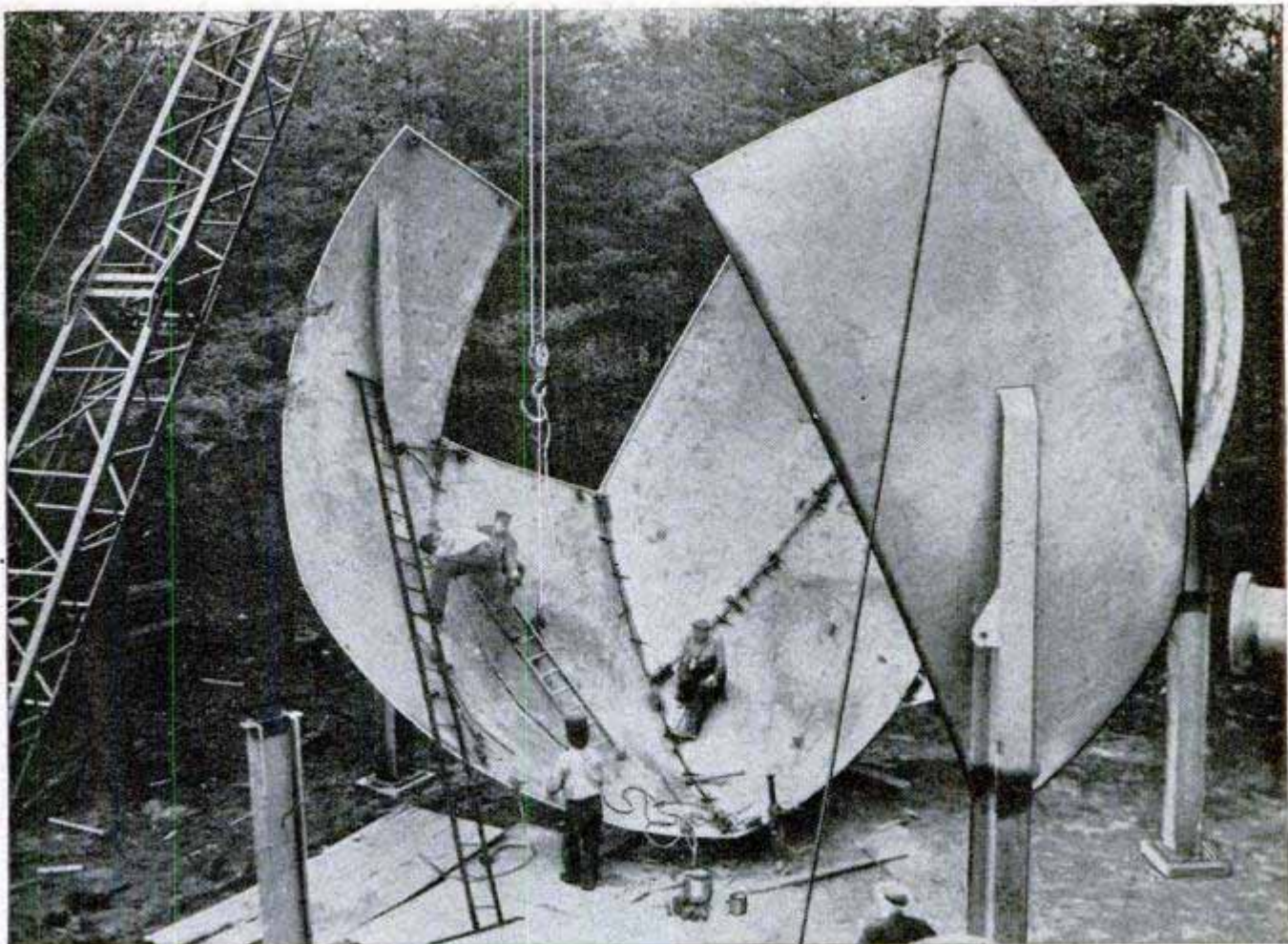
PUT TOGETHER like giant barrels, 44 circular cells form a sea wall that holds back the ocean at Long Beach, Calif. Sand, dredged from the mouth of the adjacent Los Angeles River, was pumped inside the wall to increase California's area by 136 acres — valuable acres on which wells will be set up to drill into the vast oil pool underlying the harbor.

These huge "barrels," each 62 feet across, were formed by driving sheet-steel piling deep into the ocean floor. A circular template held the interlocking piles in place during the driving operation. It was removed after all the "staves" of the barrel had been driven. The circular shape and the interlocking piling make a rugged cell which, when filled with ocean-bottom sand, holds back the surging sea. The wall was designed by R. R. Shoemaker, Long Beach's chief harbor engineer.

Bethlehem Pacific Coast Steel photos







Workmen assemble pieces of the sphere and tack-weld them in position. Patterns for the sections of the tank, called an icosasphere, were cut from a model made of plastic with a "memory" shown in the photograph below

## "Memory" Plastics Aid Tank Builders

Spherical tanks are made with fewer seams and less scrap with patterns made of plastics with a "memory," those that return to their original shape when reheated. First, the plastic is formed into the desired spherical shape and then cut into pieces that will provide a minimum of seam welding and a reduction of waste material. These pieces are then disassembled, reheated and, because of their "memory" characteristic, they flatten to their original sheet form. These flattened sections are accurate models from which pat-



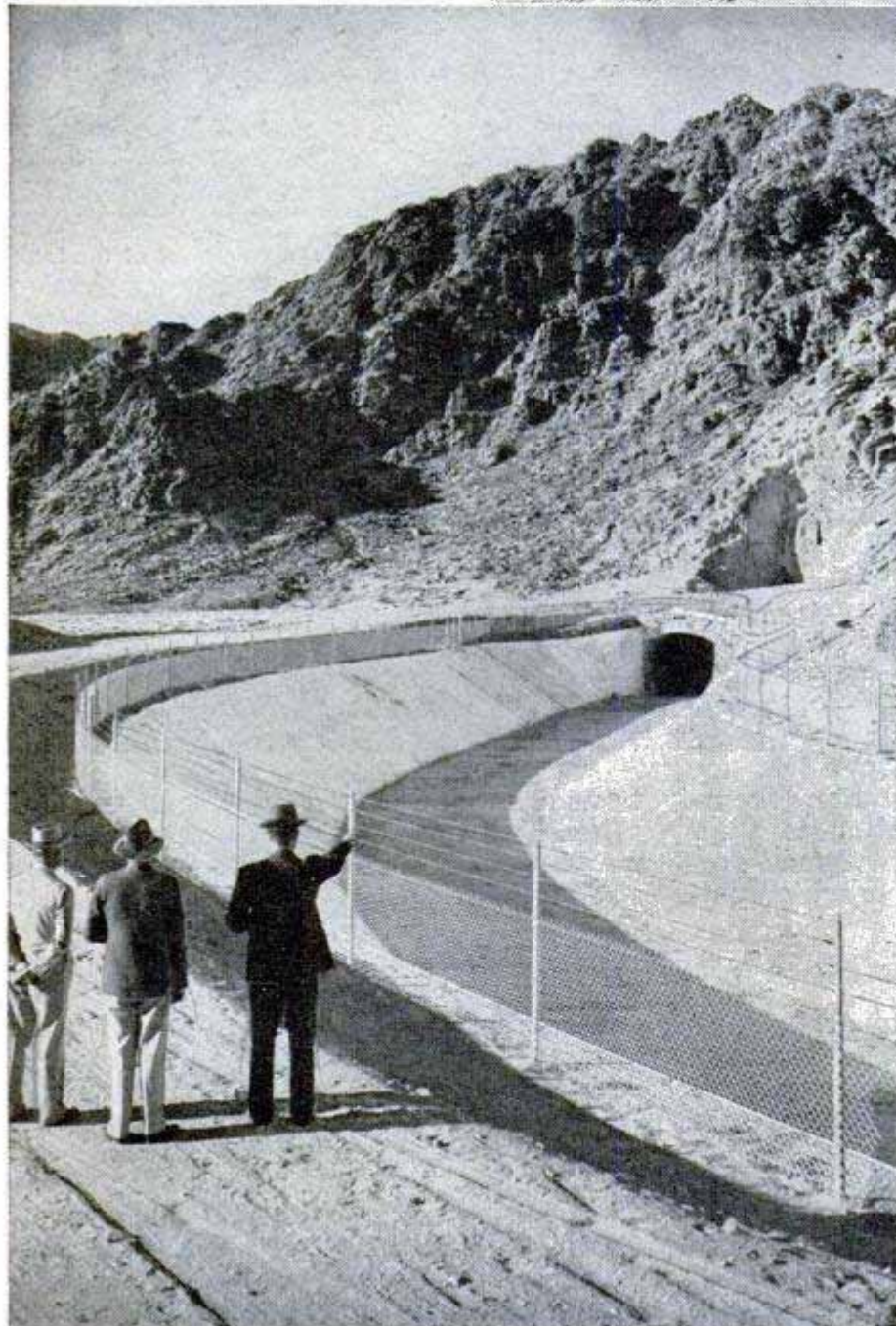
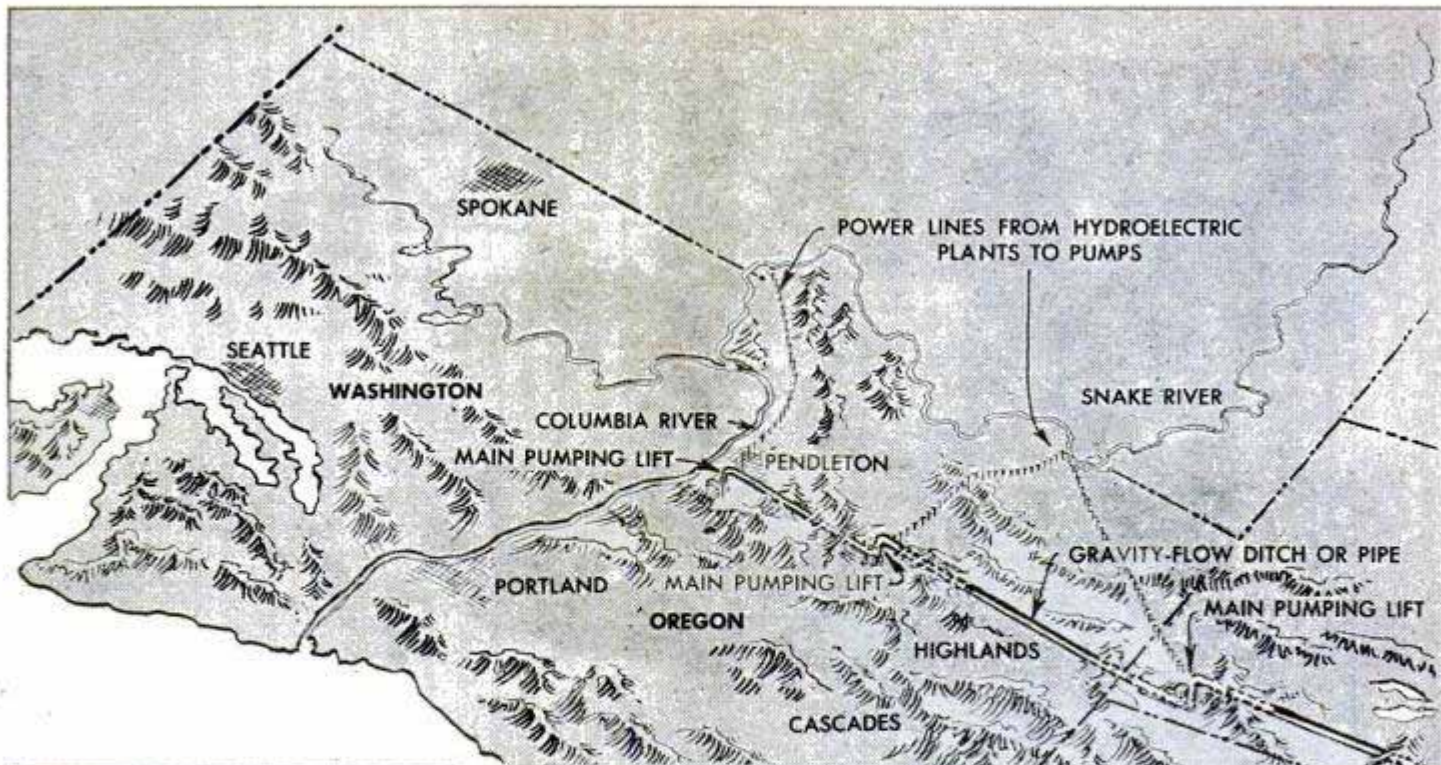
terns are made for cutting the sheet steel. When bent to the proper curve, the sheet-metal sections fit together to form the desired sphere.

## Jungle-Vine Drink Takes Place of Breakfast

Fatigue and hunger are delayed for hours by a nonintoxicating drink made from the bark of a jungle vine. Called yocco, its use is restricted to a few small Indian tribes in Colombia. Dr. Richard E. Schultes, Department of Agriculture plant explorer who visited the tribes, says it is their custom to eat nothing until noontime, but to take a cup or two of the beverage each morning. A tingling of the fingers and a

general feeling of well-being are noticeable 10 minutes after drinking the yocco which, it is reported, has a high content of caffeine. Doctor Schultes has sent specimens of the vine to the Smithsonian Institution.

Ⓛ During seven months of 1949, sales of four-place aircraft accounted for 69.5 percent of the total number of light planes sold, compared to only eight percent in 1946.



By Thomas E. Stimson, Jr.

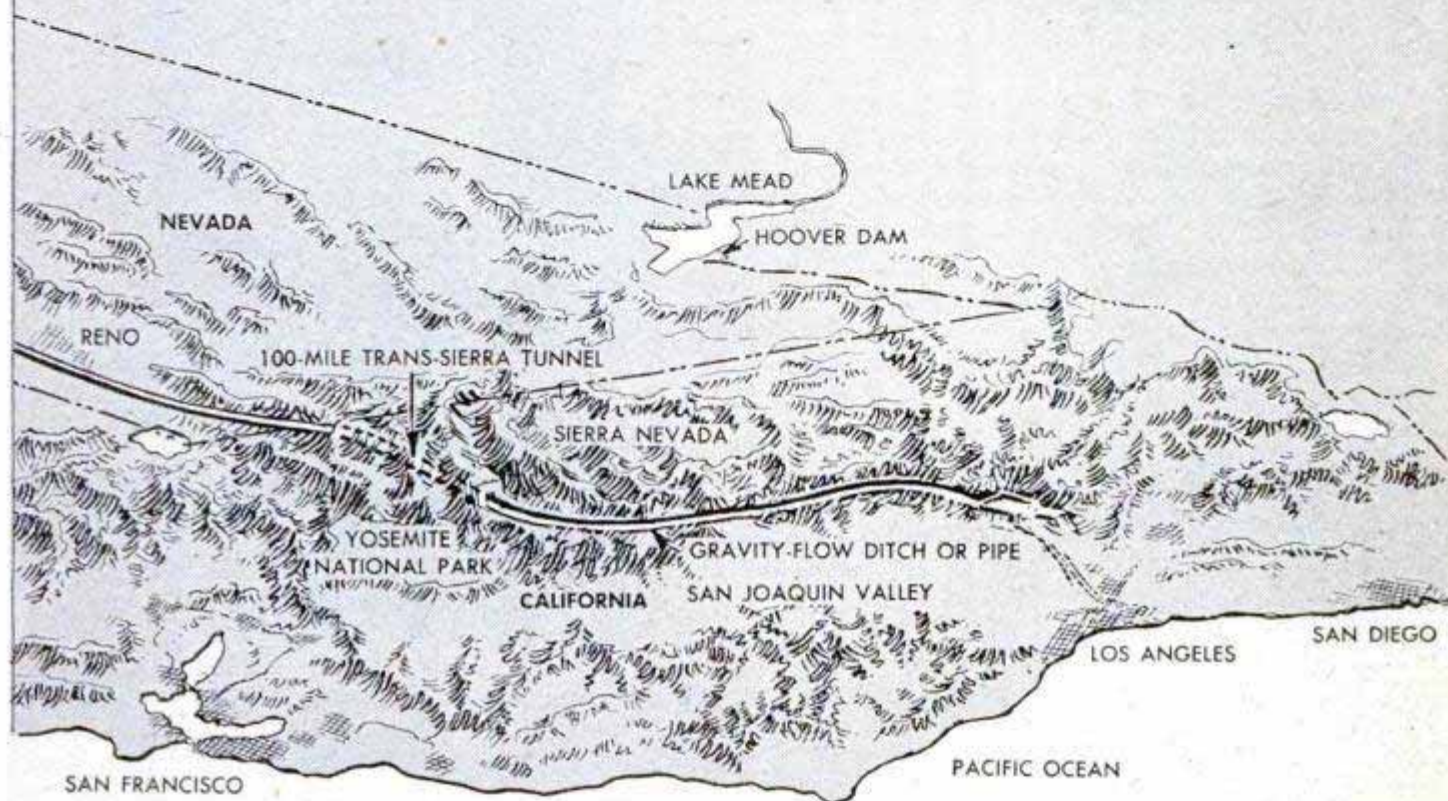
**S**OME YEARS from now a thirsty housewife in Los Angeles may turn on the faucet, fill her glass and take a long drink of cool water piped down to her home from the glaciers of Canada. It will be a mighty long drink, for it will have flowed perhaps a thousand miles, along river beds and over mountain ranges, through tunnels and across deserts to quench her thirst.

This is the latest proposal in an effort to bring water to the great Southwest. The thirsty housewife, of course, will be getting only a trickle of

All-American Canal carries Colorado River water through a mountain to the Imperial Valley

California looks enviously at the Columbia River and talks of a 1000-mile pipe line to bring its parched valleys a

# LONG DRINK OF WATER



the water piped down from the Northwest to spread blossoms and crops across the dry desert.

At the century's pivot point, the West is taking stock of its resources and making long-range plans for the future. Engineers and agricultural experts are taking an inventory of the available water plus the vast acreages of dry desert that could support flourishing farms if water were delivered to them. Eventually, a master plan will be worked out to deliver all surplus water to the areas that need it most.

One fact stands out: the Pacific Northwest has an excess of water, the Southwest has a deficiency. The difference in volume is 100 to 1. The outflow of water from the state of Washington, including the Columbia River, adds up to some 243 billion acre-feet per year as compared to only two million feet per year from the entire California coast south of San Francisco Bay. An obvious suggestion is to pipe surplus water from the north to the thirsty south.

Engineers are considering a great coastal aqueduct that would siphon off part of the

Proposed pipe line would siphon off Columbia River water and carry it across deserts and over mountains to California. This route is only one of many ideas

flow from the Columbia and carry it 750 or 1000 miles south. If such an aqueduct is ever built, the residents of San Francisco or Los Angeles might then be supplied with drinking water that came from a melting glacier in Canada.

To investigate whether such a project is feasible, the Bureau of Reclamation has established in Salt Lake City a United Western Investigations office with S. P. McCasland as the engineer-in-charge. McCasland's assignment is to weigh all engineering and economic aspects of the proposed aqueduct and determine whether it could be built and how well it could do its job.

Building such an aqueduct would be an unprecedented engineering feat. Even though tunnels might be drilled through several of the mountain ranges, the water still would have to be lifted thousands of feet with gigantic pumps. The cost of the

project would be tremendous, so a trickle of water wouldn't be worth while. A huge volume of sparkling liquid would have to be moved or none at all. And this brings up added complications, for in long stretches of open canal the loss of water by evaporation alone would be considerable.

At present, the bureau engineers simply are trying to decide whether the project is possible and practical. If they decide it is, the next step will be to survey the best routes. Many factors will figure in such a survey. For example, a good spot to tap into the Columbia River would be in the vicinity of Portland because the existing water rights along the river would not be disturbed. On the other hand, if the aqueduct intake should be located several hundred miles upstream, the huge pipe line could serve the dry eastern half of Oregon on its way south.

Undoubtedly, many of the existing ideas of water rights will go overboard when a master plan for watering the West is set in operation. Today, for example, San Francisco receives much of its water from the west slope of the Sierra Nevada, while the city of Los Angeles draws part of its supply from the east slope of the same range. Fertile Owens Valley, on the east slope, bereft of water that now goes to the City of Angels, has become a desert.

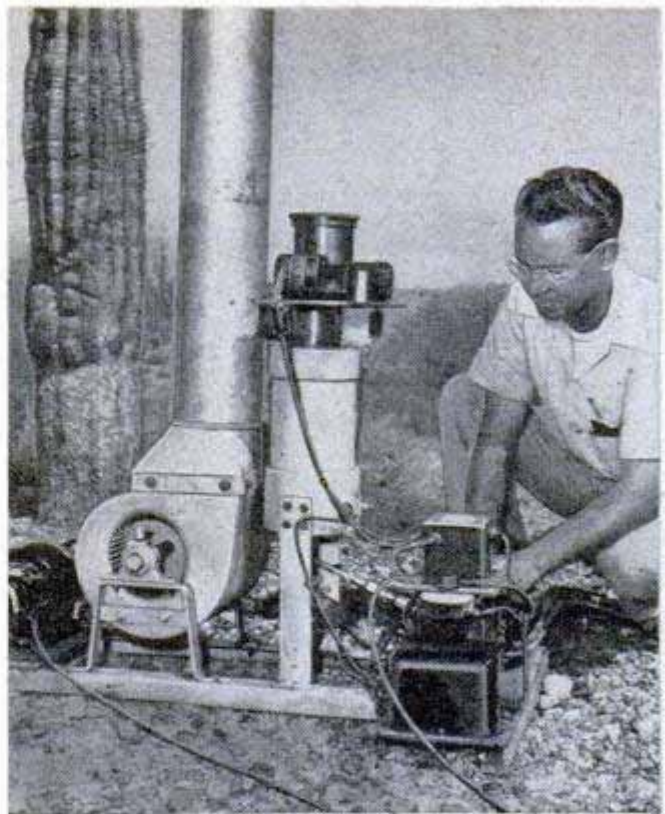
Bringing in water from the north could change this entire picture. If San Francisco were supplied from the Columbia, Los Angeles then could tap the west slope of the Sierra for much of its supply. This would release vast amounts of water on the east slope that could be returned to irrigate Owens Valley plus a considerably larger desert area.

Too, Los Angeles and other southern California cities now get part of their water from the Colorado River on the California-Arizona border. If and when other sources are tapped, the Colorado's excess flow could be turned back eastward to irrigate large tracts in Arizona.

Miracles of water distribution have already been wrought in the West, and others are in the offing.

"This is a mighty special well, you might say a magic well," a farmer of Santa Ana, Calif., tells visitors. "You see that water? It comes from Colorado. Yep! My well here is connected direct to the Rocky Mountains a thousand miles away!"

In a sense the farmer is right. A portion of the Colorado with its headwaters in the Rockies is diverted by an existing aqueduct to southern California's Pacific slope. There, as an experiment, aqueduct water that isn't needed otherwise is allowed to seep into the earth at the upper end of the Santa Ana River channel. The purpose is



Cloud seeder discharges minute particles of silver iodide into air which serve as nuclei for raindrops

to replenish the underground water supplies in the river valley. The water table definitely has risen. Some of the water that the farmer pumps out of his well really does originate in the Rockies.

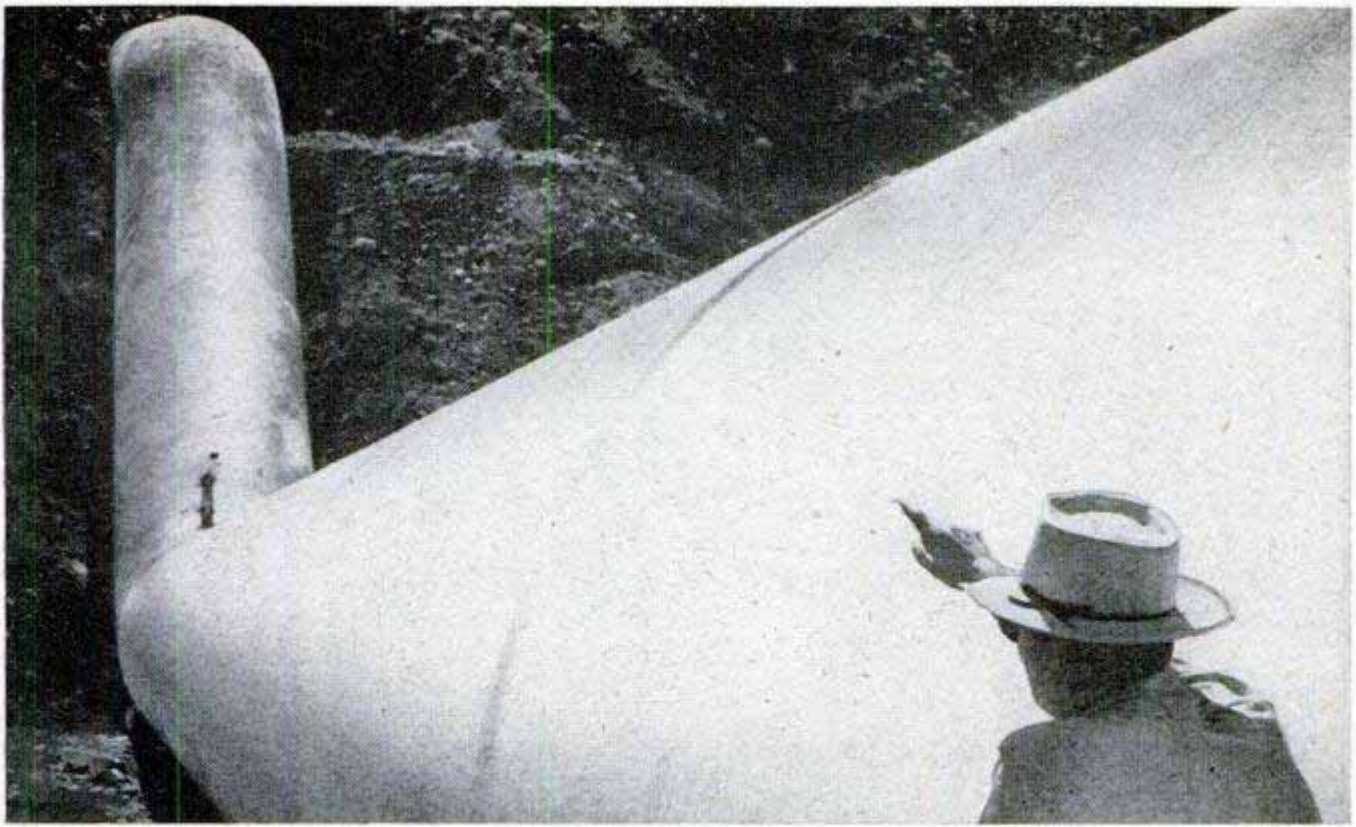
But even with such water distribution systems, and even if a long pipe line should be built from Washington to southern California, there never will be enough water in the West to irrigate all of its lands. That's no stumbling block, many meteorologists believe. They are convinced that virtually any amount of water that may be needed can be drawn down from the clouds.

Scientific rain making is striding ahead so rapidly that even the latest reports are stale news by today. The biggest advance is seeding clouds from the ground instead of aircraft. Ground seeding is safe, much less expensive and can be a continuous operation. And most important right now, the results can be measured positively.

Usually, the seeder is a silver-iodide furnace or generator which discharges billions of tiny silver-iodide crystals into the atmosphere. The crystals serve as nuclei to collect particles of moisture, finally growing so large that they are precipitated in the form of rain or snow.

When the seeder is placed on a mountain slope where a natural updraft exists, the silver-iodide crystals are carried upward into the clouds just as efficiently as though they had been dropped into the clouds from above by an airplane.

In an informal way the meteorology staff of the University of Washington tested the



Huge siphon of Metropolitan Aqueduct carries water through canyon on way from Colorado River to Los Angeles

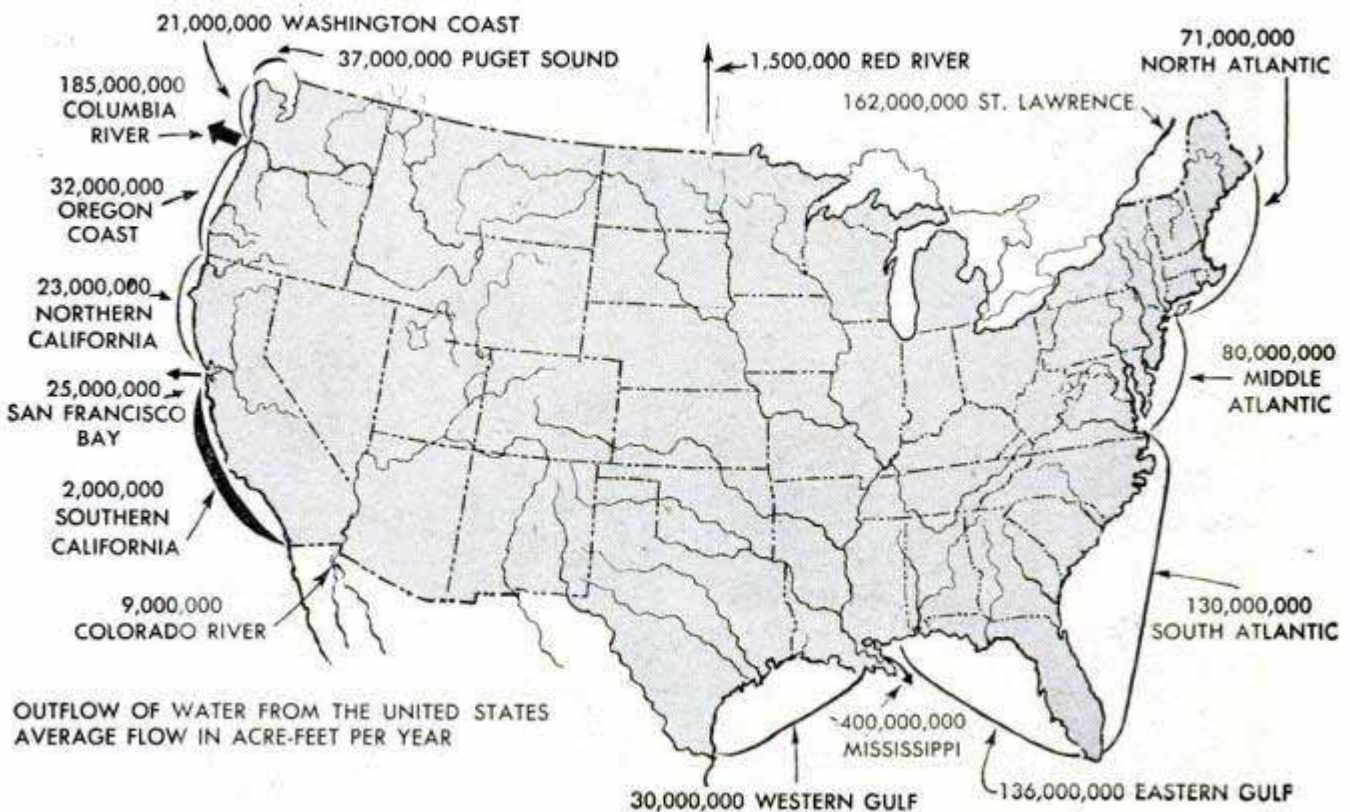
idea some time ago. Instead of silver-iodide particles, they used Dry-Ice pellets. These were simply scattered along a mountain ridge during a snowstorm in subzero weather. The experimenters soon observed that the snowfall within the area had increased materially although along neighboring ridges its rate was unchanged.

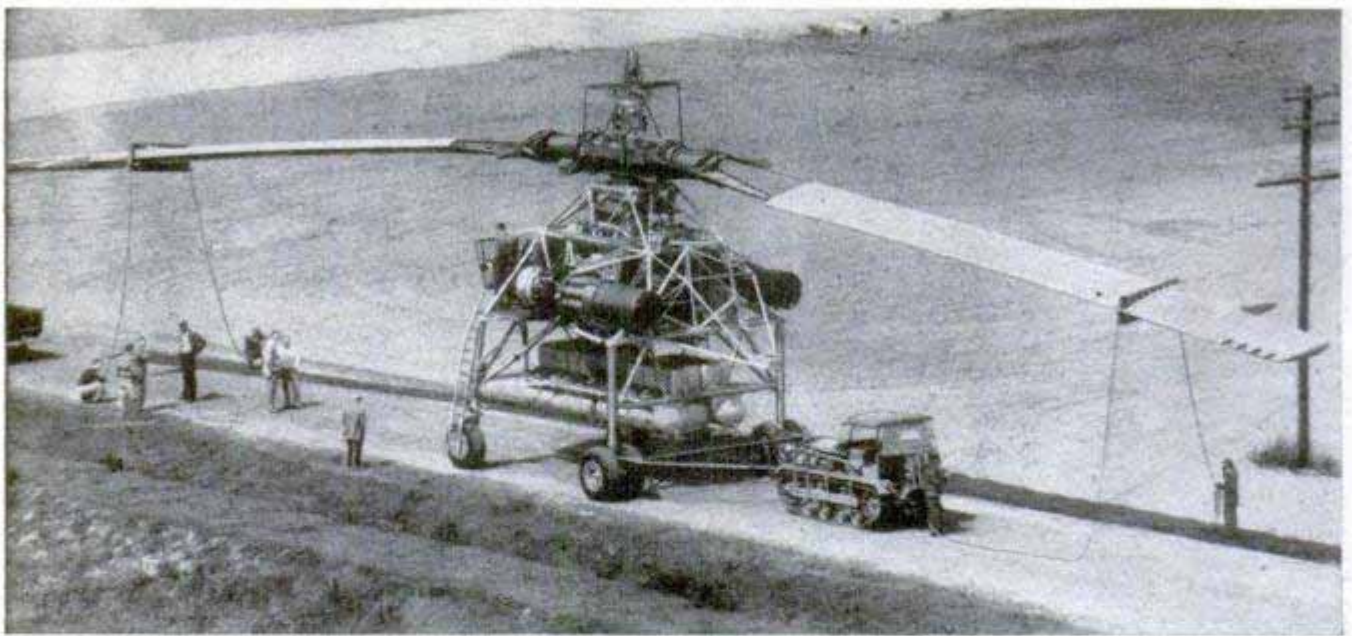
Since then the U. S. Weather Bureau has conducted ground-seeding experiments at

Colfax, Calif., on the west slope of the Sierra Nevada range, under the direction of Dr. Ross Gunn, chief of physical research. The silver-iodide furnace was turned on for seven hours, then left off for seven hours whenever clouds were present. The data that was obtained is now under analysis and the results will be announced soon by the bureau.

(Continued to page 222)

Map shows runoff of water from United States. Note difference between Washington and southern California

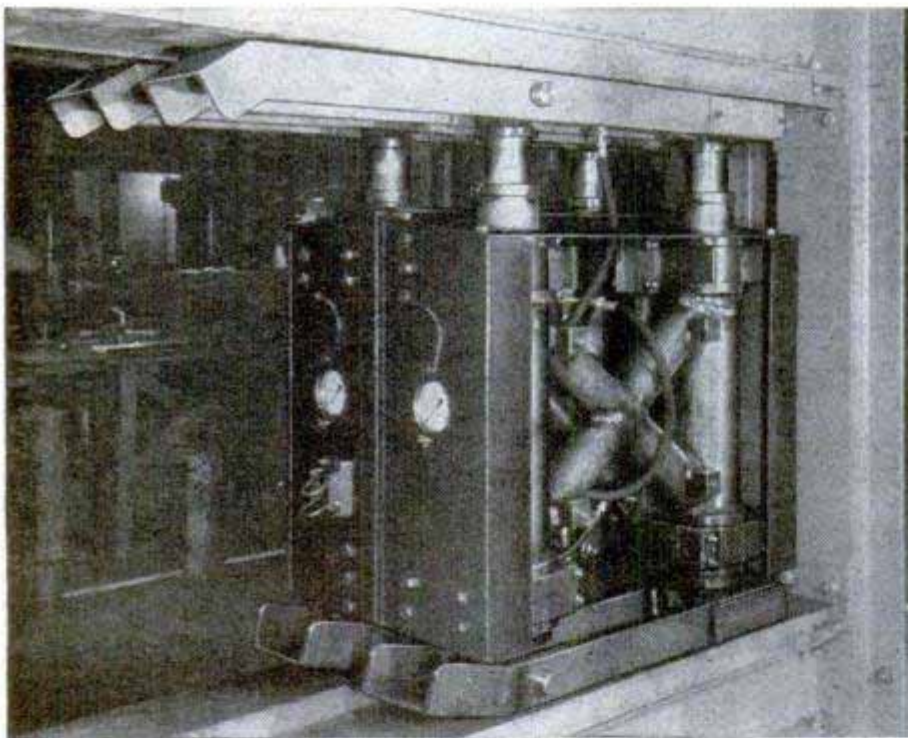




## Flying Crane

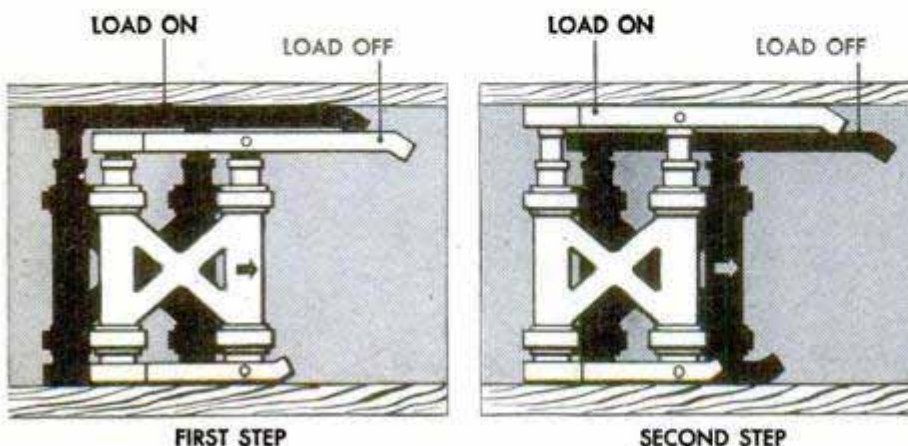
Though not ready to fly, the power units of Howard Hughes' massive twin-jet helicopter have been wheeled out for static tests. When completed, the 40,000-pound

flying crane is designed to straddle a heavy load, such as a field gun or tank, and lift it up for short hauls. The rotor blades measure over 100 feet from tip to tip and the jet engines are mounted on each side of the tubular structure.



## Walking Props For Mine Roof

Walking forward on hydraulic legs, a mobile roof support, developed in England, boosts coal-mine production by eliminating most of the time previously spent in timbering the shaft. The mobile chock consists of two legs, which move forward alternately without releasing the 50-ton upward pressure on the roof. The sequence of movement is controlled by an automatic valve and hydraulic pressure for the chock is maintained by a pump driven by electricity.

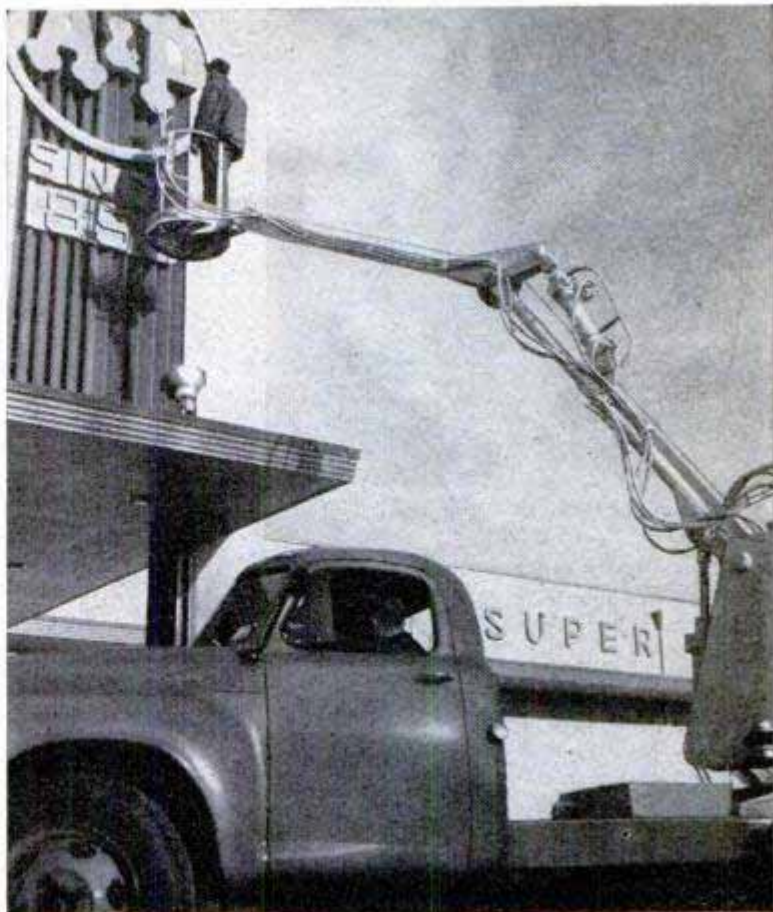


Popular Mechanics provides two sources of further information concerning articles published in each issue: the **WHERE-TO-BUY-IT INDEX**, starting on page 12, and the **WHERE-TO-FIND-IT LIST**, which is available to readers without charge. For a free copy of the list, just send your request to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

## "Crow's Nest" on Boom Lifts Maintenance Man

With its "crow's nest" mounted on a double-jointed boom, an elevating maintenance platform rises to its full height of 33 feet in six seconds. Useful in servicing traffic and street lights, signs and electrical lines, and for trimming trees, the platform reaches any point within a 180-degree swing and a radius of 20 feet. Operated by three finger-tip controls from the crow's nest, the device is powered by the hydraulic power of any truck of one-ton capacity or larger. A self-leveler keeps the operator's cage at even keel at all times.

Guided from nest, boom raises serviceman to repair sign. Below, self-leveler keeps platform level as the operator lowers it



## Sliced Ceramic Aids in Submarine Sound Detection

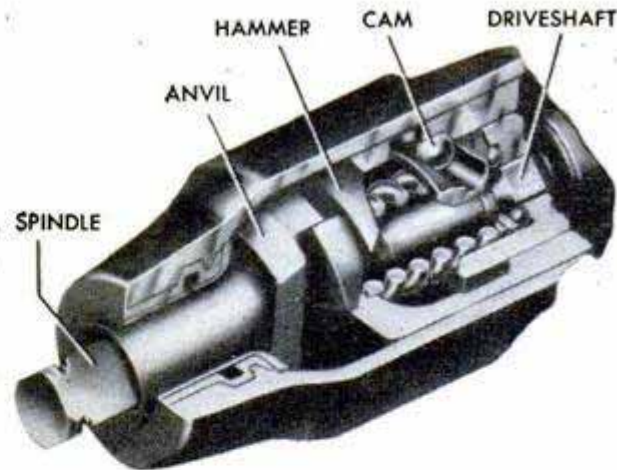
Barium titanate, whose atoms show a remarkably quick response to minute changes in pressure, temperature or electrical field, will soon be replacing other crystals in submarine sound detection. When treated as a ceramic, it resembles

porcelain and can be made in the extremely thin slices needed for condensers. Barium titanate's dielectric constant—its ability to increase the electrical capacity of charged plates—has been estimated at as high as 5000, compared with about seven for mica.

## Buy a Roll of Film and a Camera Comes With It

Just because you don't have a camera is no reason for not taking pictures now that a camera-film combination is available. When you buy an eight-exposure roll of film, it comes packed in a cardboard-and-wood box that is really a camera. At one

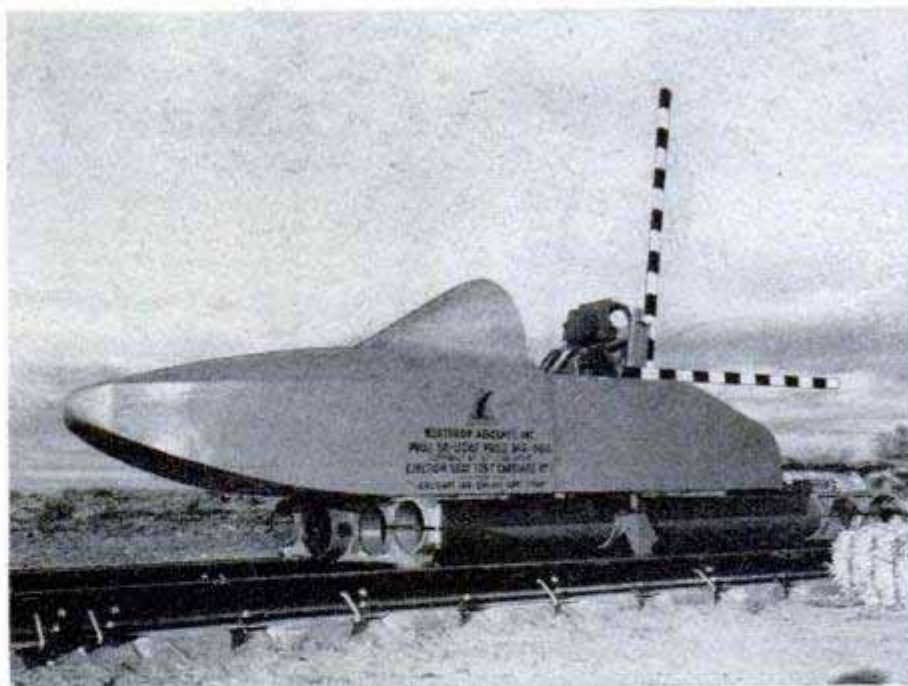
end of the box is a lens and a  $\frac{1}{25}$ -second shutter. You snap the eight pictures, print your return address on the box, stick on a stamp and mail to the camera company. In a few days, the prints are returned to you at no extra charge.



## Electric Impact Tool

By converting the torque of the motor into rotary impacts, a power tool can handle a variety of jobs from driving a wood drill to removing frozen studs. When running free or with little resistance, the tool

operates just like an electric drill. As soon as sufficient resistance is developed, the motor operates a hammer that pounds a built-in anvil 1900 times a minute to overcome the resistance. It is impossible to burn out the motor by overloading. Even if the spindle stalls, the motor continues to run. There is no torque reaction or twist as there is on a standard electric drill. As soon as a stall develops, the motor changes over to its trip-hammer action. With standard accessories, the tool will ream, tap and drill into steel, wood and masonry, drive and remove screws, studs and nuts and do hole-saw work. Its reversible electric motor operates on standard house current.



Northrop Aircraft Co. photos

## 1100-Mile-an-Hour Railway

Airplane ejection-seat designs are being tested on the world's fastest and straightest railway. At Edwards Air Force Base, Calif., they are catapulted from a 2300-pound rocket sled that slides over a two-mile track at speeds up to 1100 miles an hour. The seat, with its 150-pound dummy occupant, is triggered at about the halfway

mark and the vehicle stopped by reverse-firing rockets. The track is built on concrete and the sleds ride on metal slippers that grip the rails, instead of wheels. Ejection seats are needed at very high speeds, because the pilot cannot jump clear of the airplane's tail section. Some seats have already proved successful at 555 miles an hour and the tests will show whether they are safe at greater speeds.



## Metal Arm Jerks Line When Fish Strikes

Still-fishing has been endowed with a device that eliminates the need for fast action when a fish strikes. After casting, the fisherman attaches the line to the end of one of two small metal arms, then runs it up and over a pulley at the top of another arm. When a fish takes the bait, the arm with the pulley is pulled forward, releasing the other arm which is flipped backward by a spring to hook the fish. The line pulls loose from the arm when the fish is hooked. T. A. Harper, the inventor, who lives in Bloomington, Ill., reports that it will fit any casting rod and reel and will hook fish weighing from one ounce to 25 pounds.



## Auto Tray

Automobile trays which hold food or note paper swing out of the way when not in use. The 6 by 12-inch tray is mounted on a 10-inch arm which can be adjusted to any position. When the tray is no longer needed, it can be swung beneath the dashboard. A rear-seat model pivots flat against the back of the front seat and swings out into any desired position.

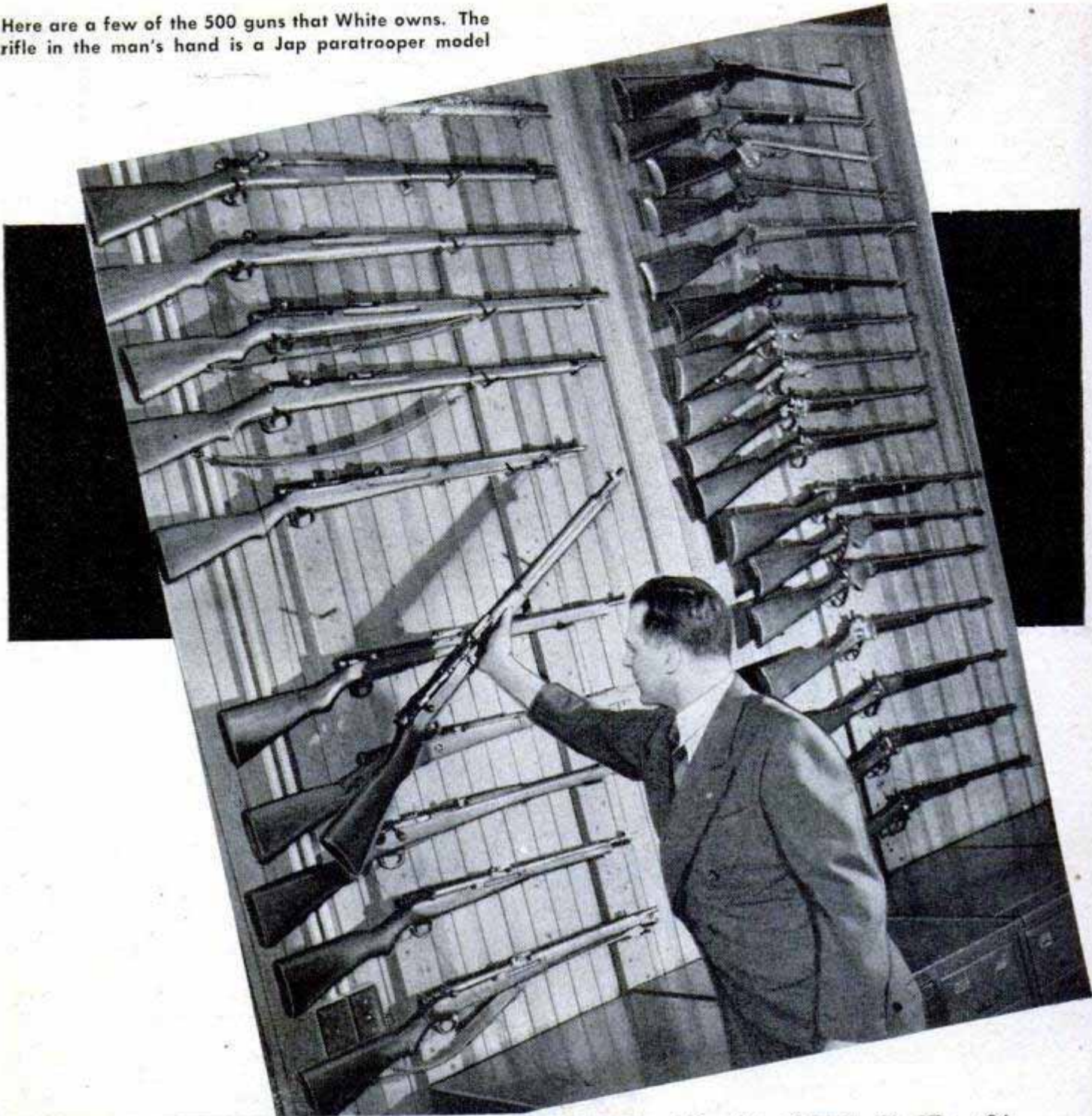
## Quicksand Pumped Dry To Support Railroad

When a bed of quicksand 350 feet wide blocked a track extension of the Union Pacific Railroad at Richland, Wash., the contractor decided to pump the bed dry. Since quicksand is sand of uniform grains "floating" in a bed of excess water, the contractor, J. A. Tertling and Sons, reasoned that by getting rid of the excess water, the sand would become firm enough to support the trackage. Two lines of pipe were stretched across the bed with vertical pipes running downward every five feet into the quicksand. The pumps were started and continued pumping steadily for 25 days, removing an estimated 150 gallons a minute. When pumping was stopped, the water table had been lowered



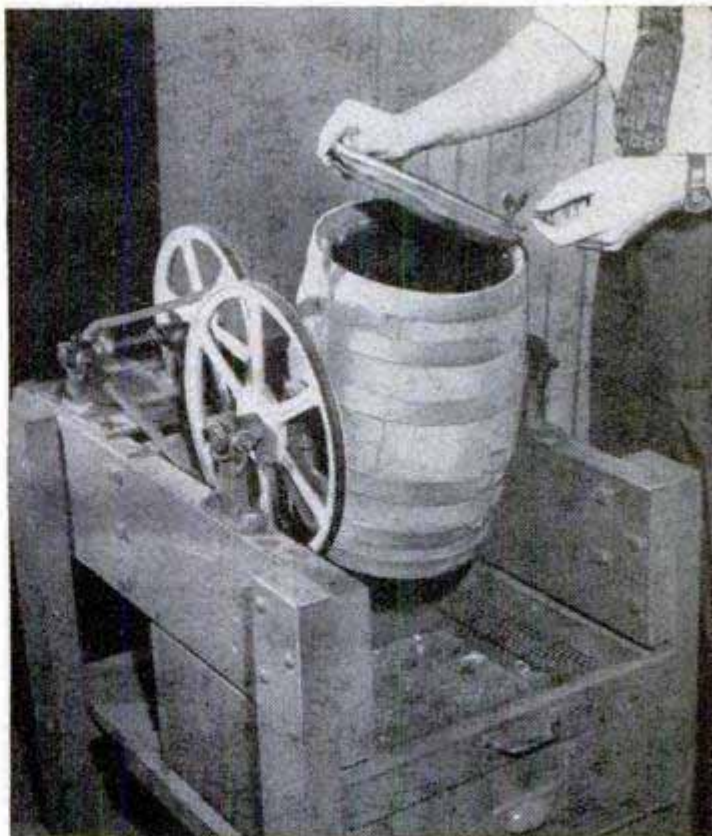
to about one third of its original depth of 20 feet and the bed was firm enough to support the required fill on which the trackage was laid.

Here are a few of the 500 guns that White owns. The rifle in the man's hand is a Jap paratrooper model



# DOCTORS of BALLISTICS

Among the pistols in White's collection are this palm pistol and the .45 dropped to the underground in the war



Left, with this hand-loading device, the gun experts can duplicate any of thousands of cartridges to make laboratory tests. Right, the tumbling machine that helped solve the mystery of the exploding freight car

### By Arthur R. Railton

**G**OT A MURDER you'd like solved? Or a war souvenir pistol that you'd like tested? Or are you just one of the thousands of gun fans who can't ever get enough data on cartridges, bullet speeds and chamber pressures?

Whatever you want to know about guns, it's a good chance that you'll find the answer in an old sandstone stable in Cleveland. Filled to overflowing with test equipment, the stable is the home of the H. P. White Company, research engineers on small arms and explosives.

When a Railway Express car blew up, killing three men, the White Company was given the job of placing the blame. There was nothing left of the car except the steel shell—and very little of that! Damage claims added up to \$250,000. The puzzler tossed in the lap of the White staff was: What caused the car, standing in the station, to explode?

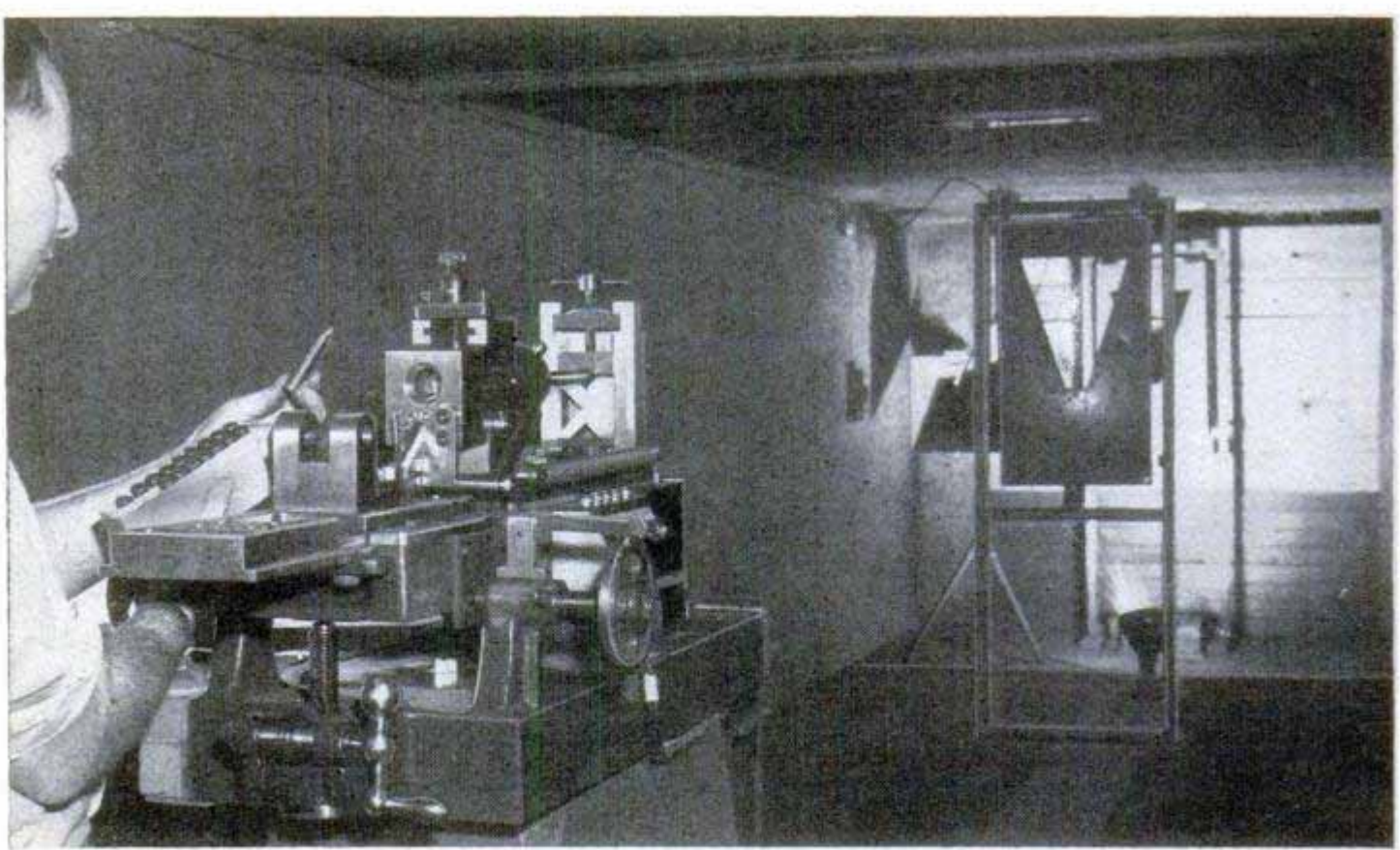
A list of the car's contents included some dangerous-sounding items: 160 gallons of lacquer thinner; 200 gallons of dry-cleaning fluid; and 1872 practice hand grenades on their way to an Army training center.

First to be "accused" were the grenades. Strictly for training use, the grenades had no steel shell, but they did pack a potent punch, being made like aerial fireworks. The White researchers put the grenades through exhaustive tests to discover how much it would take to set them off acci-

dentally. They were jostled in their packing boxes, had bullets fired into them, were scraped across a cardboard to see if they could have been set off by the train's vibrations, and were tumbled in a wooden drum. After weeks of testing, the grenades were found "not guilty." As in any good mystery story, the obvious suspect was not the murderer.

Questioning everybody who had been near the car during its fatal trip, the engineers located one person who had noticed a faint odor coming from the car. The odor was traced to the dry-cleaning agent. With true detective-story deduction, they theorized that a container must have sprung a leak allowing the highly explosive liquid to escape. Heavier than air, the vapors from the liquid settled along the floor of the car. It was entirely possible, they reasoned, that the man unloading the cargo had kicked the iron threshold and a nail in his shoe produced the spark that ignited the vapors. An explosion resulted and set off the grenades, laying the car wide open. The theory was substantiated by testimony that showed there had been two explosions, the second being the grenades going off.

But most of the work at the White laboratory is on firearms and, in the basement firing range, tests are run almost daily on weapons of every type. Recently, the firing range was in continuous use for 10 days as thousands of cartridges were tested to



In the basement firing range, cartridges of all types are tested. Photoelectric screens can be seen in rear

find velocities and pressures. Each cartridge is fired in a special "gun" that looks more like a precision machine tool than a weapon. The bullet speeds through triangular openings in a pair of photoelectric screens and its time of flight is clocked automatically to 1/100,000 second. As it passes through the first screen, the shadow of the slug actuates a supersensitive photocell, starting the electronic timer. Speeding

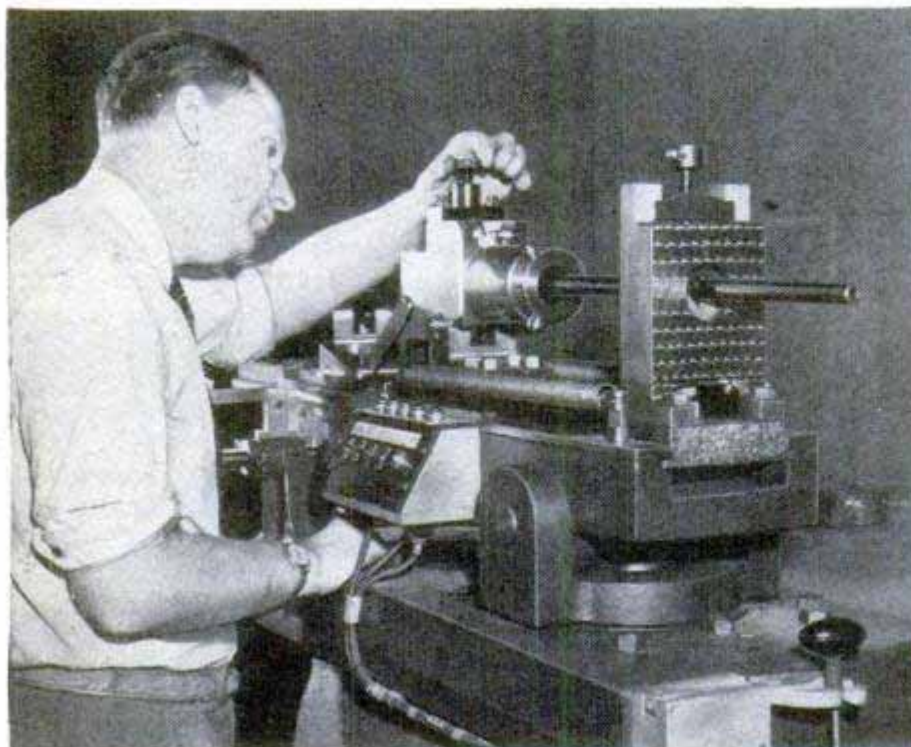
through the second screen, about 10 feet away, it operates another photocell, stopping the clock. Instantly, in an adjacent instrument room, a chronograph flashes the time of flight on a series of lights. A conversion chart changes this figure into velocity.

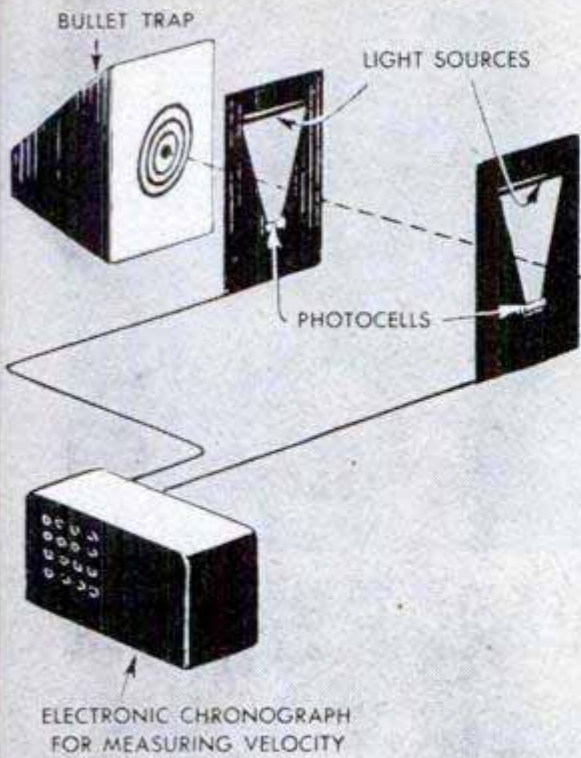
Chamber pressure at the instant of firing is "recorded" by a copper block clamped over a hole in the barrel. When the gun is fired, the block is compressed slightly by the gas pressure. Carefully measured with a micrometer, the block provides a means of determining the pressure inside the chamber at the instant of firing.

From thousands of similar tests, White engineers are compiling a comprehensive library of cartridge data. Periodically, these facts are published in book form to provide an accurate reference aid for gun enthusiasts, police departments and the military forces.

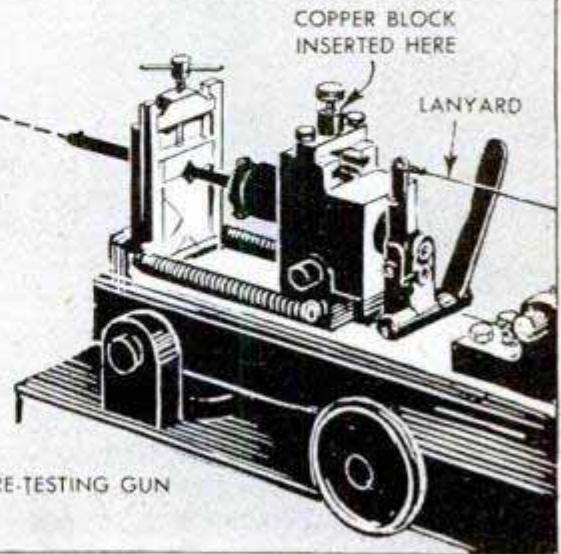
The White organization began back in the depression years of the thirties, when Henry P. White, fresh from Cornell, couldn't find a job in his field of engineering.

Munhall places a test block in position for measuring pressure. Lights in panel above his right hand show that everything is ready for firing





When a cartridge is fired in this testing gun, the pressure compresses a small copper block, providing a measurement of pressure inside the chamber. Speed is measured by the chronograph that is started and stopped by the bullet's shadow on the two photocells



Having inherited the old sandstone stable, he decided to fill it with material he had accumulated in his years of gun collecting. Burt Munhall, another cartridge and gun fan who was looking for a job, began working with him and they were soon converting the stable into one of America's finest storehouses of small-arms information.

Today, the walls of the stable are paneled in knotty pine and every available inch is covered with guns or lined with books on the subject. There are over 12,000 different cartridges on file in what was once the carriage room. Each is precisely described and indexed. In one set of cabinets (converted from old printer's type cases), are the complete cartridges. In another set are duplicate cartridges broken down to show their components: bullet, powder, primer, shell and other materials. A third set of cabinets contains all the identification labels packed with the cartridges at the factory. A smaller cabinet holds a complete index file of essential information on every one of the 12,000 cartridges, all cross-indexed for quick reference.

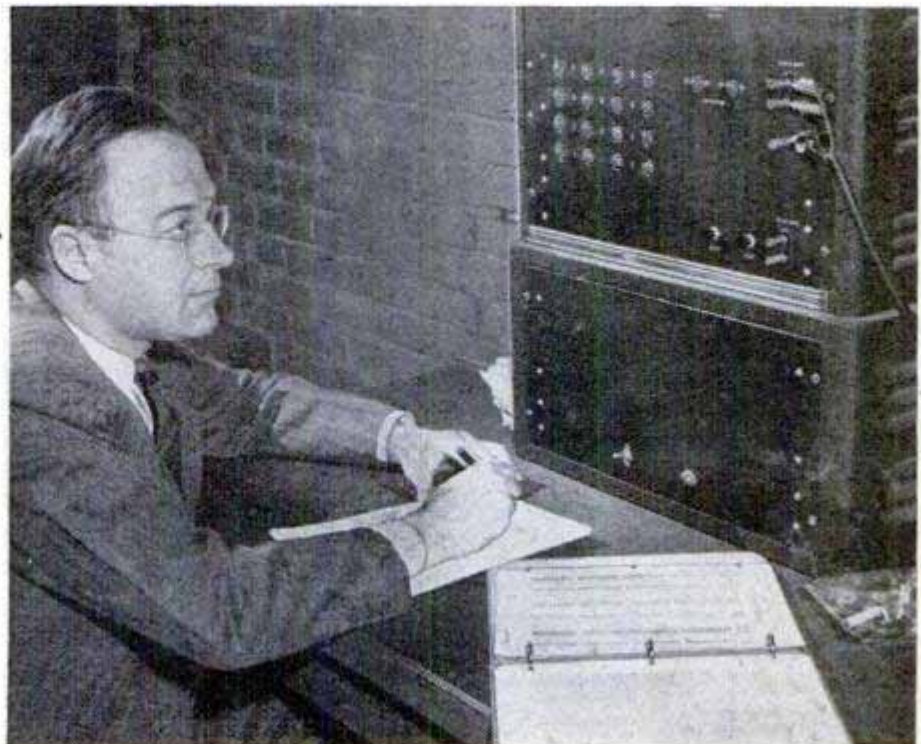
But cartridges are only part of the story. There

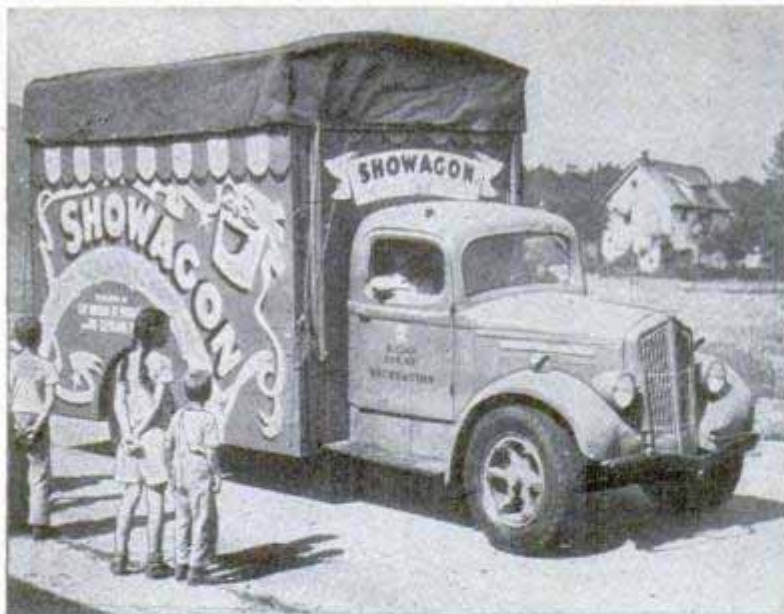
are rifles, pistols, machine guns, signal-flare pistols. Every gun is in firing order and is cleaned on a regular schedule. Every gun is ready to fire because there is no way of knowing when it may be needed.

At a target range a revolver suddenly blew up during a practice session. Fortunately, nobody was hurt, but it threw a scare into the marksmen. Because they were using hand-loaded cartridges to save money, the sharpshooters were naturally

(Continued to page 236)

White, founder of the company, watches the lights on the chronograph as it measures the time it takes the bullet to pass between the two screens

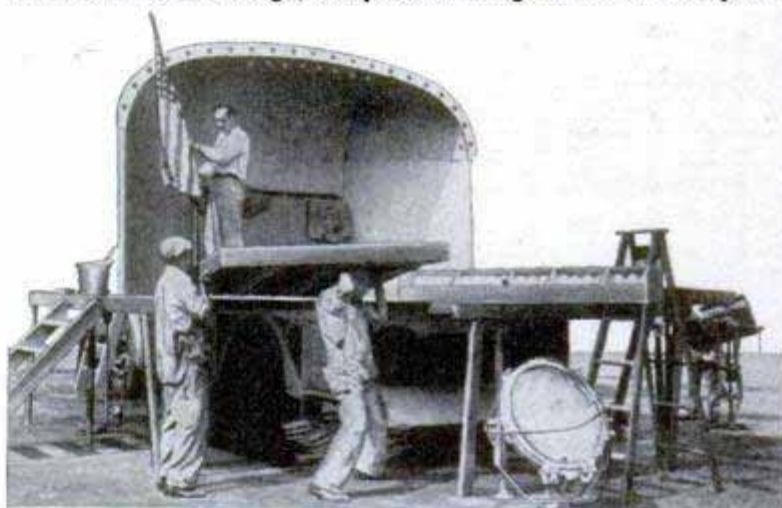




## Motorized Vaudeville

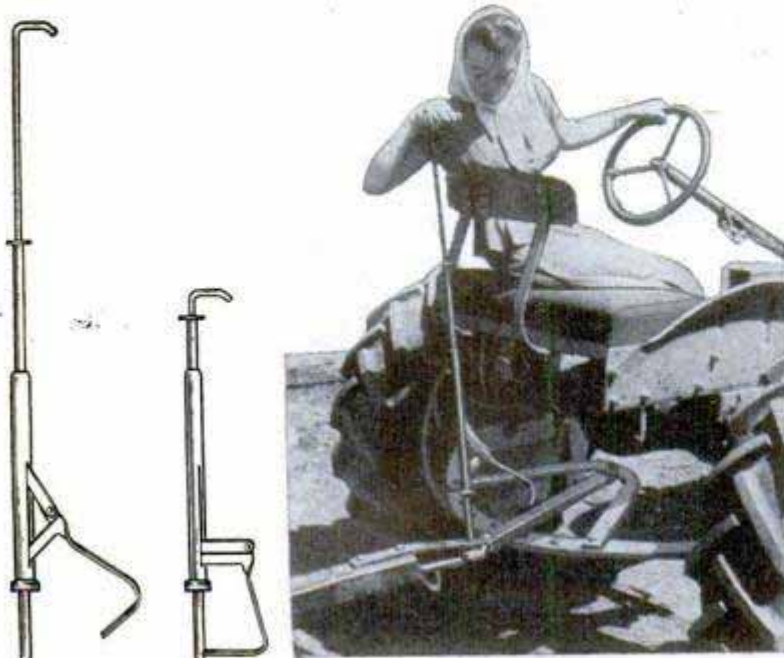
Like a 20th-century version of the Wandering Minstrels, a motorized vaudeville theater brings a stage show right to the front doors of Cleveland residents every summer. A collapsible stage that comes apart to stack neatly inside a truck body for traveling converts the back of the truck into an 18-foot platform on which acrobats, jugglers and dancers cavort nightly. Sponsored by the Cleveland Press in conjunction with the city's Division of Recreation, the shows consist of young amateurs selected in annual competitive auditions. Every night during the summer months, the mobile theater stops at a different section of the city and a crowd gathers to watch the acts. After the show,

Left, when this truck drives up, the kids know what's coming! Right, a typical crowd enjoys the show. Below, the truck body unfolds to form a stage, complete with lights and sound system



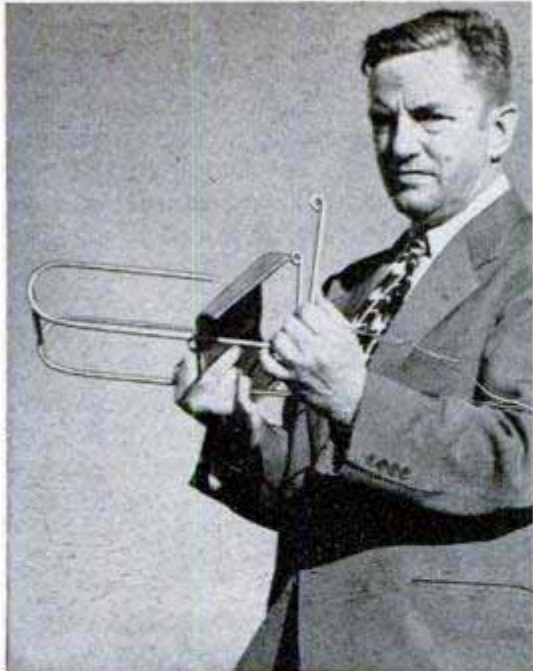
an orchestra plays as the audience takes part in street dancing. Last year, about 160,000 persons saw the shows.

## Tractor Operator Hitches Up Wagon by Remote Control



Wagons and implements are hooked to a tractor by a telescoping hitch pin that makes it unnecessary for the operator to leave his seat. The handle end of the pin is used as a hook to lift the tongue into position over the hitch. Then, the pin is reversed and the opposite end inserted in the hole to serve as the hitch pin. When the handle is pushed downward, telescoping it to half its original length, a locking arm swings down against the base of the pin to prevent it from working loose.

☐ Copper wire, the standard electrical conductor, can now be made heat and corrosion-resistant by a thin coating of nickel.



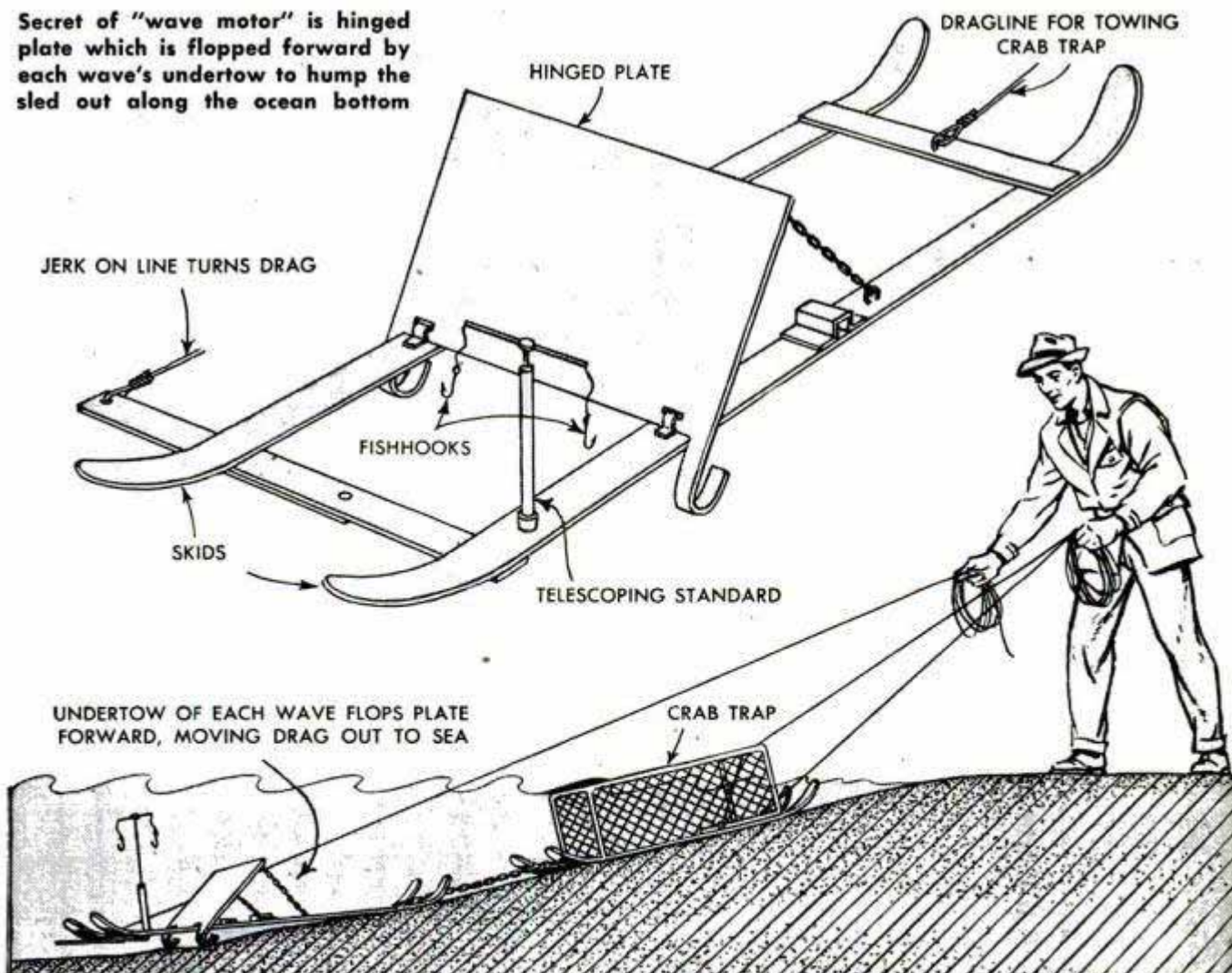
Smallest wave sled can carry several baited hooks 800 yards offshore. Right, sled drags lobster trap to sea

## Ocean-Bottom Sled

WAVES furnish the power for a sled that humps along the ocean bottom to drag fishing lines and lobster traps far out from shore. The sled is propelled by a metal flapper plate, hinged so it can fall toward the rear but not forward. Incoming waves push

the plate down and pass over it, but outgoing waves force the plate up and push against it, moving the sled along in jerks. Fishing lines can be attached to the sled, or a crab trap can be towed along the bottom. The sled can be turned around and hauled back to shore by a separate line attached to the bow.

Secret of "wave motor" is hinged plate which is flopped forward by each wave's undertow to hump the sled out along the ocean bottom





Brunswick-Balke-Collender photo

## Bowling-Ball Elevator

Bowling balls are lifted automatically from the pit floor to the return track by a mechanism which speeds the work of the pin setter. The ball-return unit can be installed in new or old alleys. The pin boy merely kicks the ball into an opening in the kickback, where it rolls onto a platform. This triggers a lever which swoops down, slips handlike grips around the ball and lifts it to the top of the return track. Each mechanism, powered by a  $\frac{1}{3}$ -horsepower motor, serves two alleys.

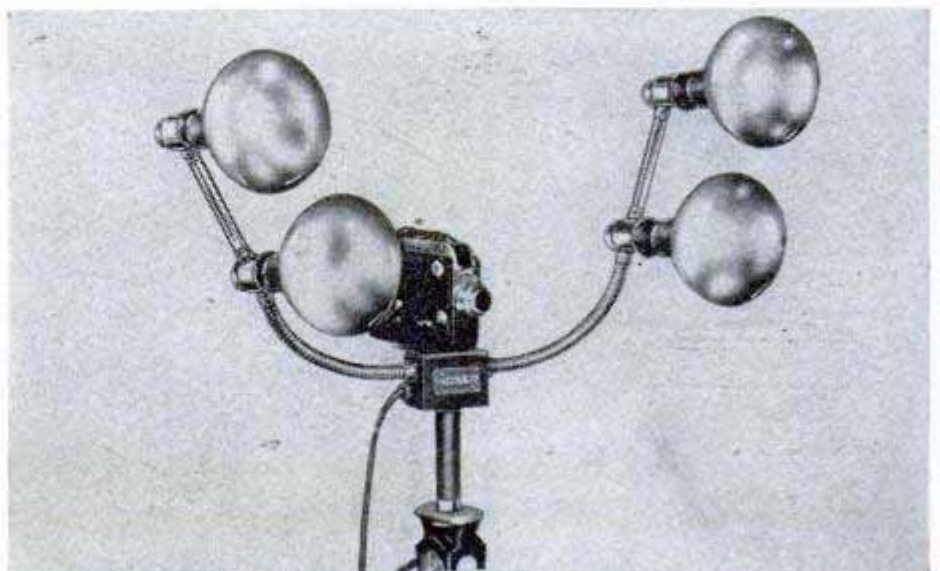
## Spray Delays Blossoms

By spraying fruit bushes with a chemical, nurserymen can delay the blossoming as much as 10 days to prevent early blossoms from frost damage. The chemical is diluted with water to prevent it from burning the foliage. Both strawberries and raspberries have been treated successfully with the chemical without any permanent effect on general growth.

## Camera Light Unit For Movie Makers

Amateur movie photographers can take indoor action scenes without worry about shadows and inadequate lighting with a four-light unit that attaches to the camera base. Two types are available: One is a bar unit that holds four flood-lamps in a straight line; the other has two flexible arms, each supporting two lights, which can be bent in any direction. Both units feature a pair of switches for control of light output. The flexible model can be packed in a gadget bag.

Wire less than one-tenth the thickness of a human hair is made by passing larger wire through a chemical bath in which an electric current polishes away the wire's surface.







Durable enough to withstand any weather conditions, these concrete tiles come in many colors and designs

## ❖ PATTERNS IN TILE ❖

**D**OWN in Mexico there's a small tile factory that is becoming famous north of the border for its colorful concrete tile. This long-lived tile, made by hand with a minimum of machinery, is produced in a multitude of designs and colors and will not lose its brilliance even after years of exposure to weather.

Used extensively in its native country for interior and exterior work, the tile is often seen in homes, but in this country its use has been limited generally to large public buildings such as the Ambassador Hotel and Union Station in Los Angeles.

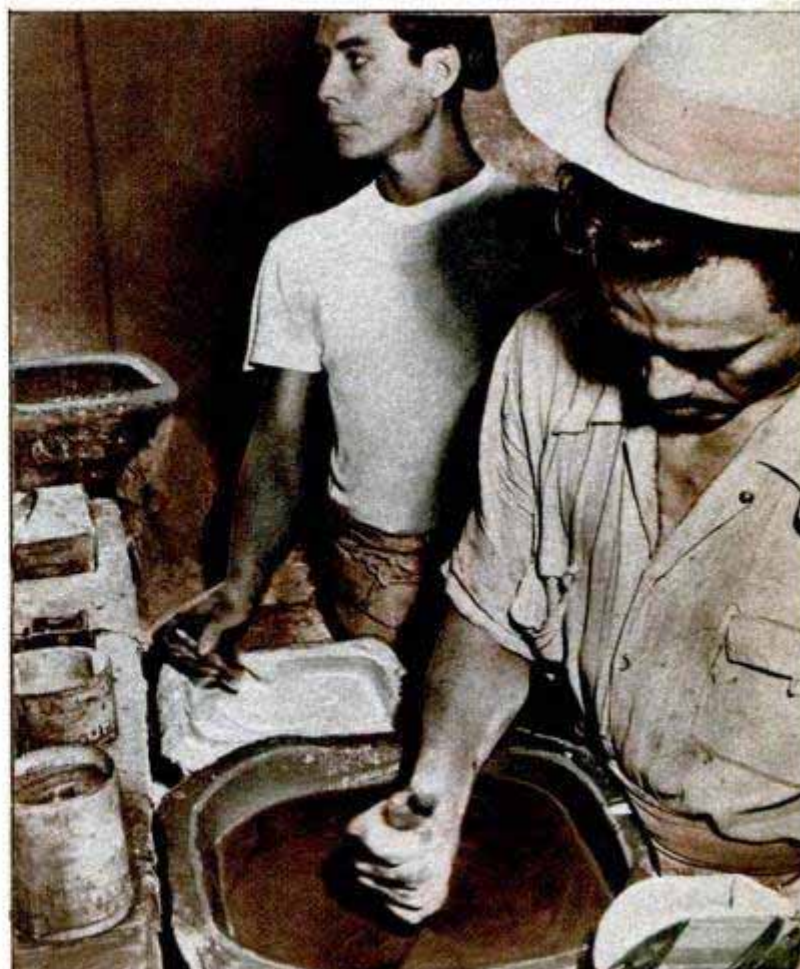
Each tile is made in three layers with the color and design being present only in the top layer, which consists of cement, silica sand, marble dust, sand and oxide colors. These ingredients are mixed thoroughly and poured into forms as a thick liquid. They are weighed carefully for each new design so that exact copies can be made later if desired.

The middle layer is a mixture of one part cement and two parts sand; the bottom layer is one part cement and four parts sand.

The three layers, all in one metal form, are placed in a hydraulic press and subjected to a 60-ton pressure, bonding them together into a single tile. Removed from the form, the tile is air-dried for 12 hours and then placed in a bath of water and salicylic

acid for 24 hours before being taken to the aging room. Interior tile can be used the next day, but exterior tile has to be aged for 26 days with frequent wettings during this period.

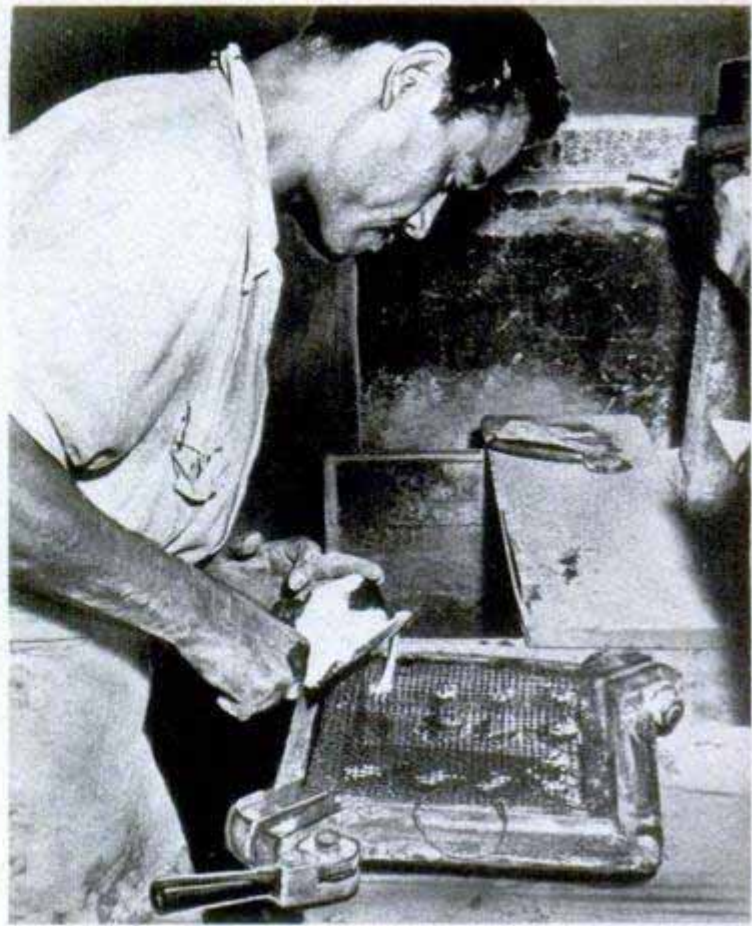
A picture story of the process is presented on this and the following two pages.



As carefully as a cook mixing a party cake, workers stir the colorful mixtures for the tile's top layer



To prevent the tiles from sticking, the steel faceplate for the form is carefully polished and oiled



First layer, in liquid form, goes into mold. Pouring the white through a screen creates the marble effect



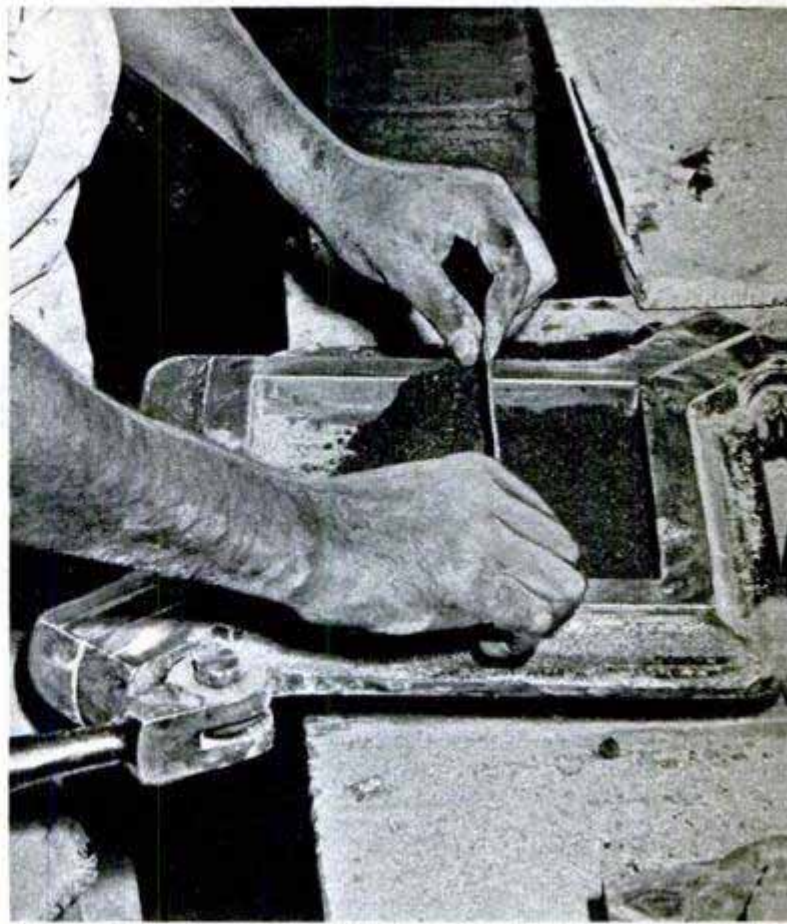
In this hydraulic press, the tile is subjected to a 60-ton pressure. The hydraulic pump is hand-operated



Its three layers now compressed into one, the tile is removed from the form. This is a marbled design



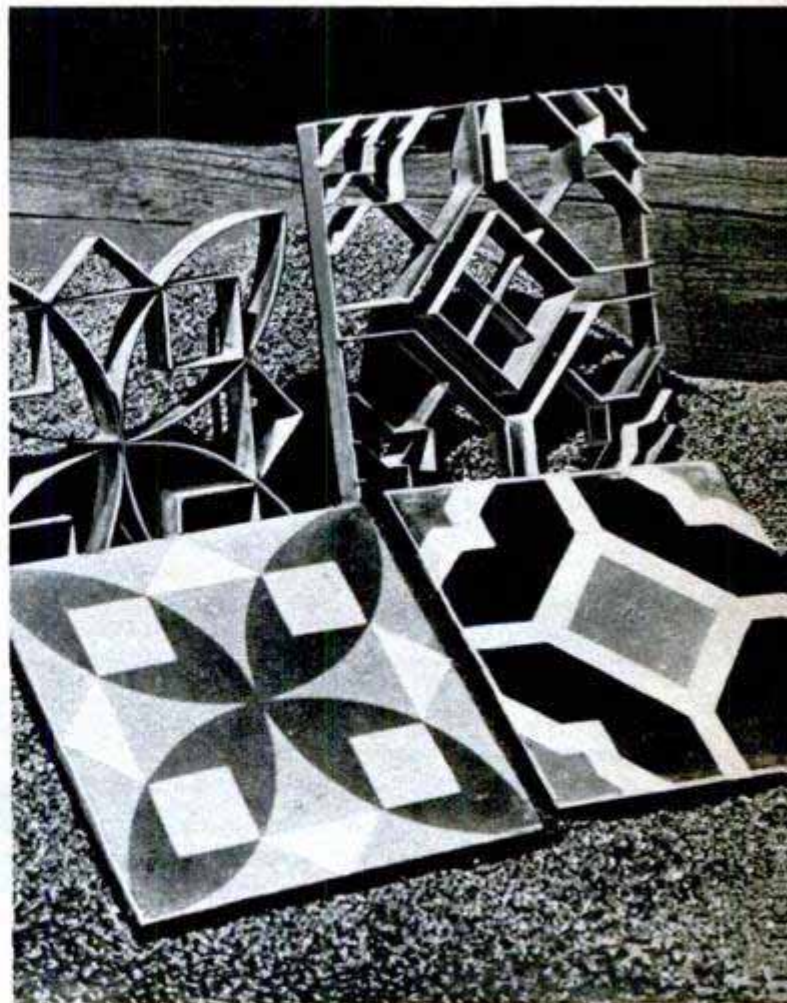
After the first layer, which has the colors and the design, the dry middle layer is placed in the mold



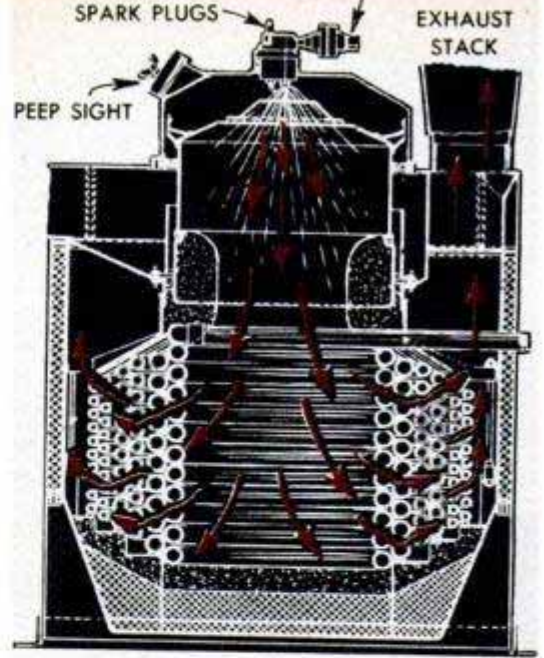
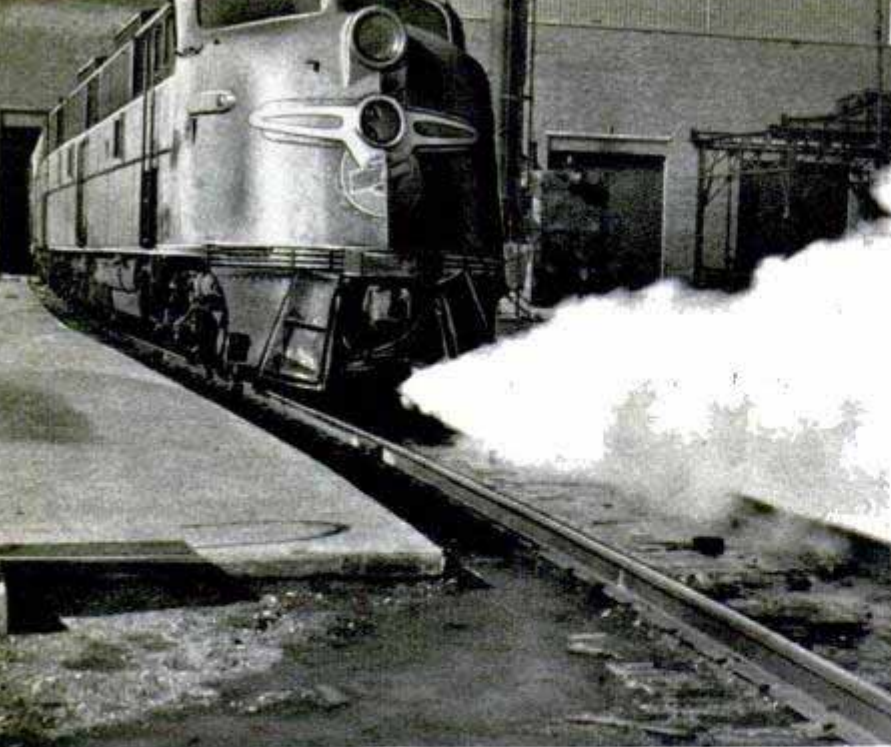
Then, the bottom layer is added and leveled to the desired thickness. The tile is ready for the press



After a 12-hour period of air-drying, the tile goes into a bath of water and salicylic acid for 24 hours



Steel forms are used to produce various designs in the tile. Exposure to weather will not fade colors



Left, steam from a diesel! Its generator could heat nearly 100 homes. Right, firebox of a steam generator

## IT TAKES A LOT OF STEAM TO RUN A DIESEL!

**D**IESELS may be pushing the steam locomotive into retirement, but they're doing it with an assist from the old champ. Without steam, the streamlined diesel passenger train would be as unpopular as an open-air taxicab in a heavy rain.

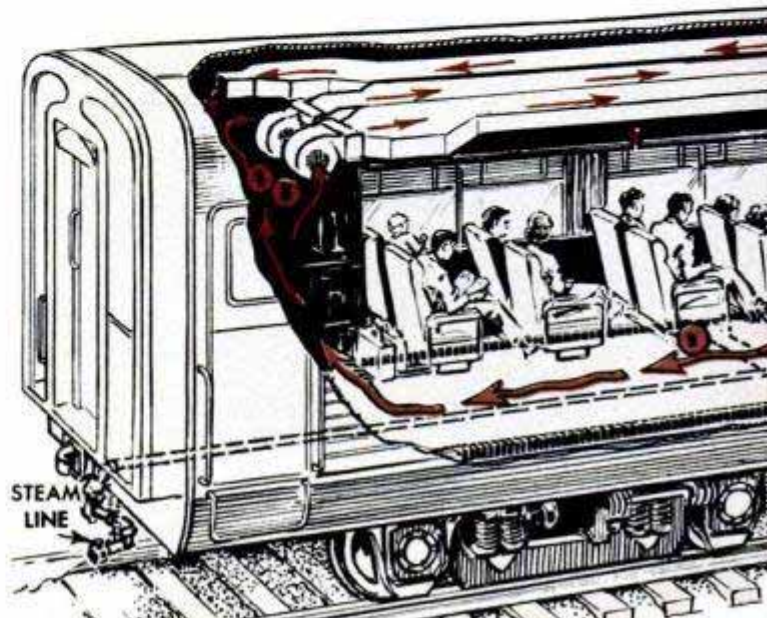
Without steam — lots of it — the streamliner would be cold in winter and hot in summer. It's steam that keeps today's train comfortable regardless of the weather. Tucked away in a corner of the diesel locomotive, where not even the most curious passenger can see it, is a compact steam generator. No bigger than the furnace in your home, it produces enough steam to heat 96 five-room houses in zero weather! It takes that much steam to keep a long train comfortable as it speeds across the country. This quick-acting generator, the unsung hero of the diesel revolution, reaches its full operating capacity in two minutes from a cold start. Try that trick on your furnace some time.

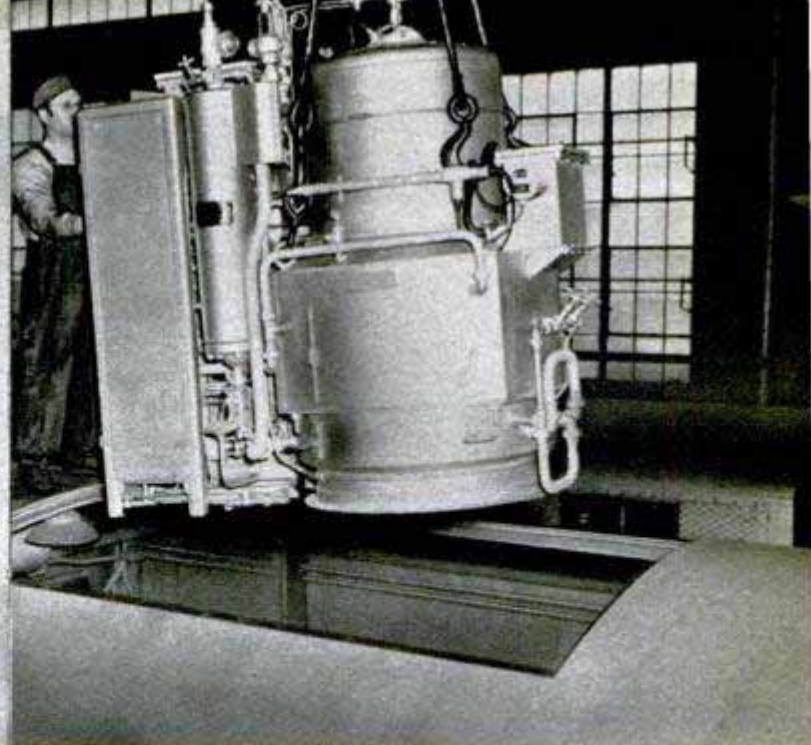
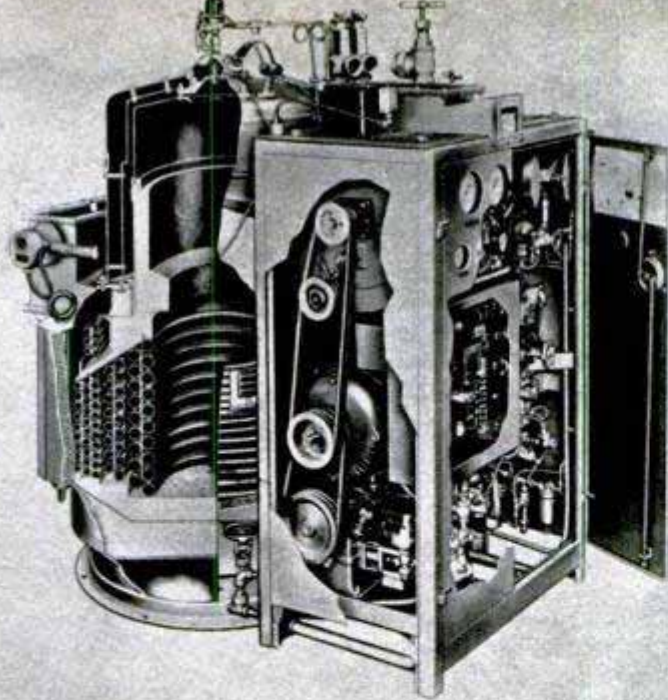
Train heating is so complicated that it makes the heating problem in a home look like child's play. Speeding over shiny rails, the streamliner is buffeted by a 90-mile-an-

hour gale. When the train stops, the wind dies down. The heating system has to respond instantly to prevent overheating. A few minutes later, the train is again zooming along at cannon-ball speed and the heater pours in the BTUs to replace the tremendous heat loss that is unavoidable at such speeds.

On compartment trains, the heating problem is complicated by a score or more passenger tastes. Obviously, what is hot enough for the thick-blooded outdoorsman in Roomette 4 is downright chilly to the sun-tanned blonde in Roomette 8, just returning from two months on Florida's

There are 12 thermostats in this dome car. Can you spot them? In addition, two solar disks in windows prevent overheating on the sunny side. Radiator is a pipe-within-a-pipe. Condensate runs off outer pipe





Vapor Heating Corp. photos

Left, cutaway shows complex control mechanism of heater. Right, lowering unit into rear end of a locomotive

beaches. There are as many tastes in heating as there are passengers and the system has to satisfy everybody. Individual thermostats and radiators in each compartment do the job. Passengers select their own temperatures and get tailor-made heat simply by turning a dial.

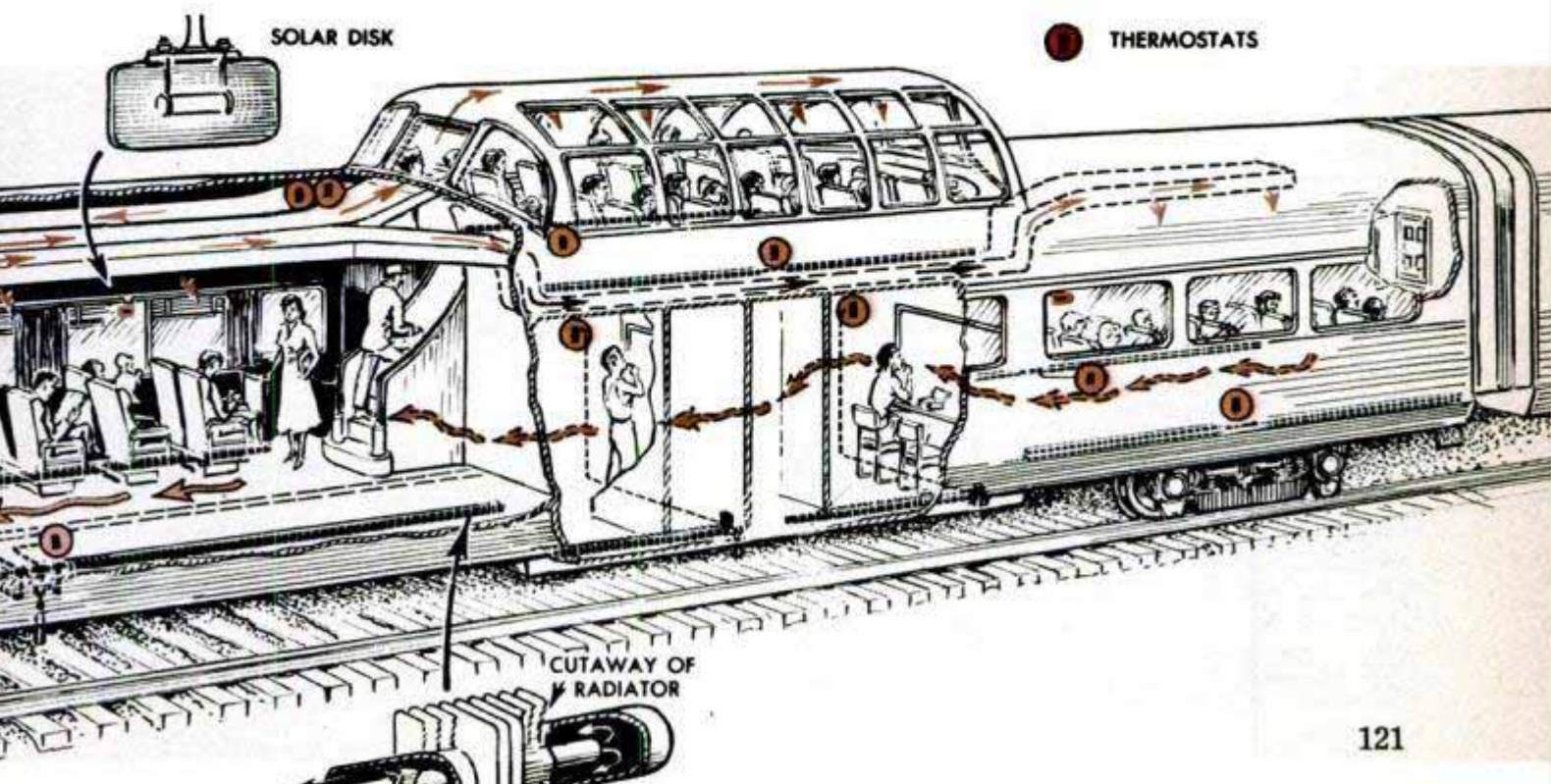
Railroads have discovered that men prefer their lounges a few degrees cooler than the rest of the coach. Women, on the other hand, want theirs a little warmer. So that's the way the lounge rooms are heated—sensitive thermostats take care of that.

Passengers on the sunny side require less heat than those in the other half of the coach. To keep the sunny-siders from being too warm, there is a tricky device called

a solar disk that compensates for the sun's radiant heat. These disks are mounted on a window, one on each side of the coach. When the sun shines on them, they cut down the heat that goes into the radiators. These brand-new heat "detectives" work overtime in dome cars. Without them, you would roast when the sun was shining or freeze when it went behind a cloud.

Unlike your house, trains never stay in one climate very long. Today, they may be in the frigid North and tomorrow in the sunny South. The heating system doesn't care. It's prepared for anything. When the weather gets warm enough, the boiler automatically operates the air-conditioning

(Continued to page 234)



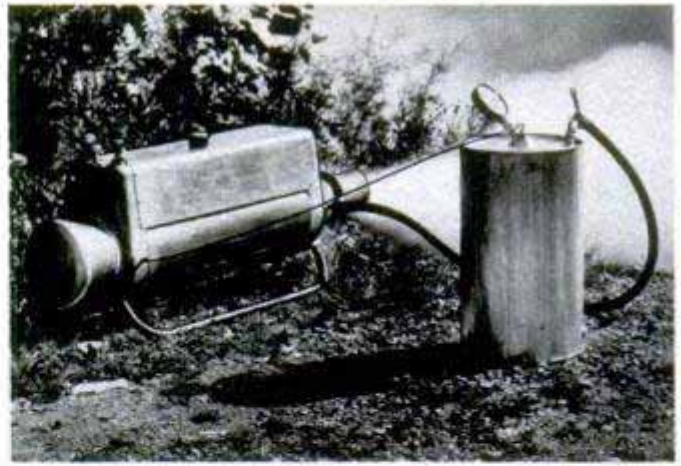
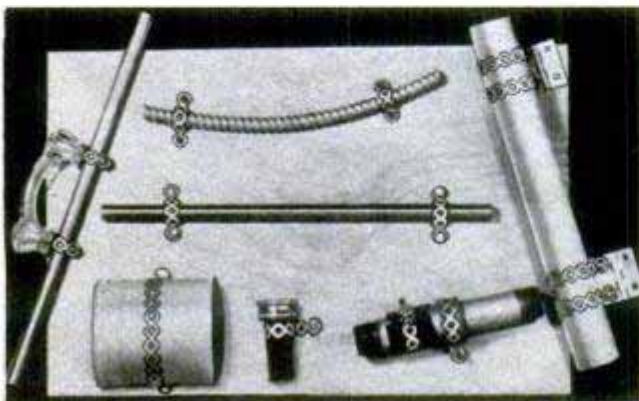


### Foot-Operated "Bosun's Chair"

Painters and maintenance men "pump" themselves up the side of a building with bicycle pedals in a new "bosun's chair." The framework of the hoist is made of tubular steel. The operator works from a bicycle seat, raising the platform by cranking the pedals to wind up the cable on a drum. Whenever the pedal action stops, a brake takes hold automatically. The rated capacity of the hoist is 625 pounds.

### Flexible Fastener

Flexible metal strips punched with ornamental diamond-shaped holes can be used for many repair jobs around the home or shop. The holes accommodate bolts, screws, nails or eyelets. The strip is bent to shape, then held by the desired fastener. Some uses for the strip include hanging cables, wires and pipes, making brackets for shelves and supporting flowerpots and bird cages. Each strip is  $\frac{1}{2}$  inch wide and 15 inches long.

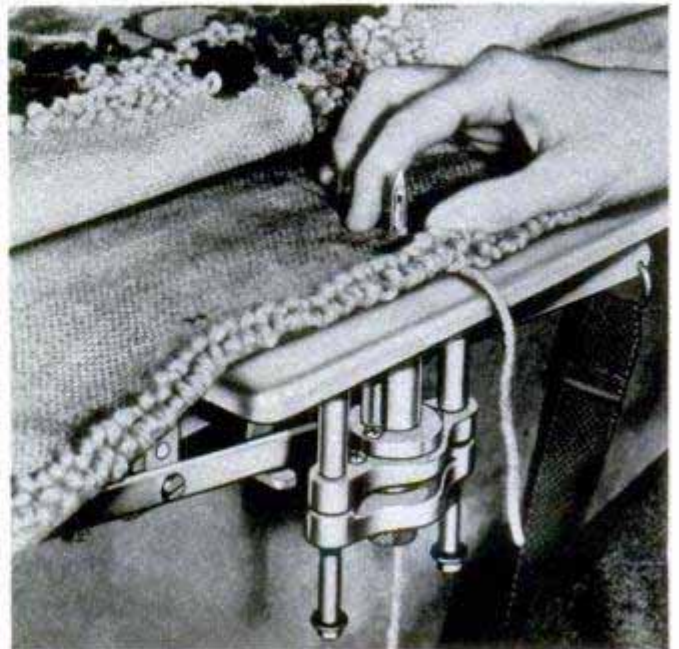


### Jet-Powered Insecticide Sprayer

Miniature jet engines, similar to those which whisk military planes through the air, now are powering fog generators that disperse deadly clouds of insecticides. The use of jet power in the generator eliminates many of the moving parts required by a gasoline engine plus a blower and pump. In the entire jet fog generator there are only three moving parts, no rotating parts and no surfaces requiring lubrication because there are no bearings. The jet machine weighs 100 pounds and is designed to be carried on a light truck or Jeep while it spreads insect-killing fog across large areas.

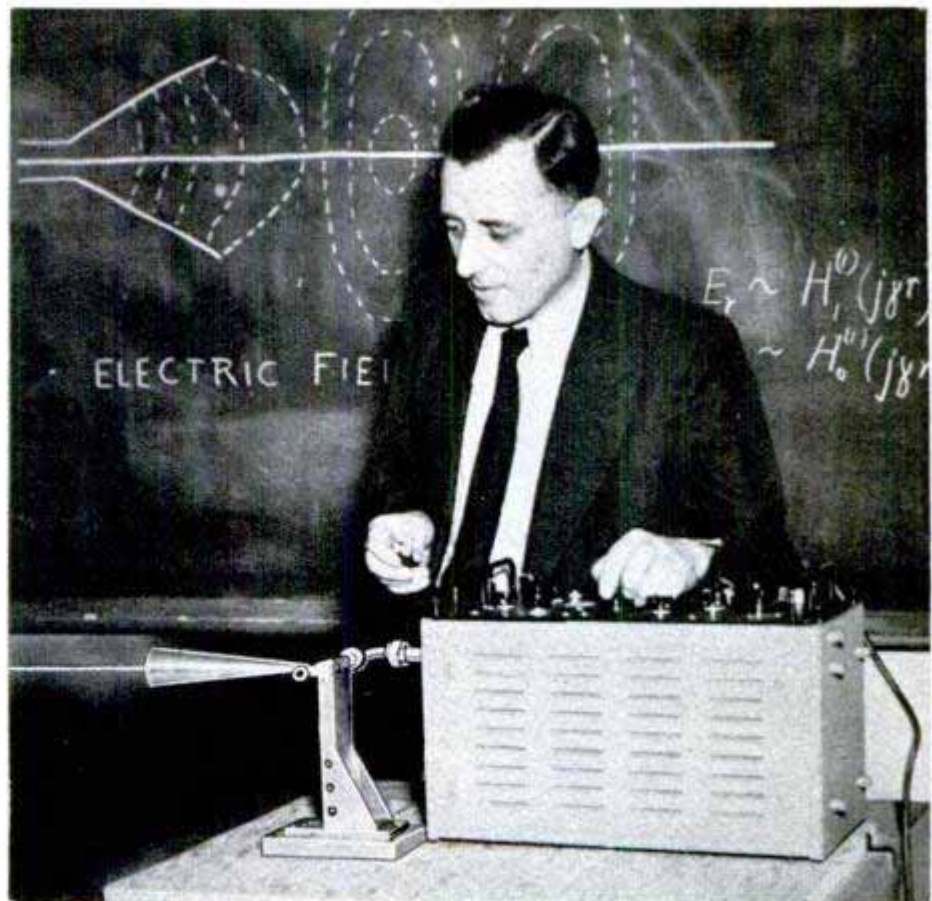
### Hooked-Rug Maker

Hooked rugs are turned out quickly with the aid of a foot-operated instrument which punches the yarn or cloth through the backing. The rug-maker can be clamped to most tables. When the operator pushes down the right foot pedal, the needle punches the yarn up through the material. The left foot pedal pushes a tongue through the needle to hold the loop to the desired height.



## TV's "G-String" Cuts Cable Costs

Remote areas, denied television reception because of the high cost of coaxial cable, may soon enjoy video broadcasts "piped" to local stations over an inexpensive transmission line developed by the Army Signal Corps. The new conductor, called the "G-string" after the initials of its inventor, Dr. Georg Goubau of the Signal Corps Engineering Laboratories, is a single wire with special insulation and funnel-shaped terminals. Made at a fraction of the cost of coaxial cable, the G-string may also make practical the videophone, which will enable you to see as well as hear the person on the other end of the telephone line. It could carry a hundred such conversations simultaneously, whereas today's single coaxial cable can carry only one. The new line may also be used to distribute tele-



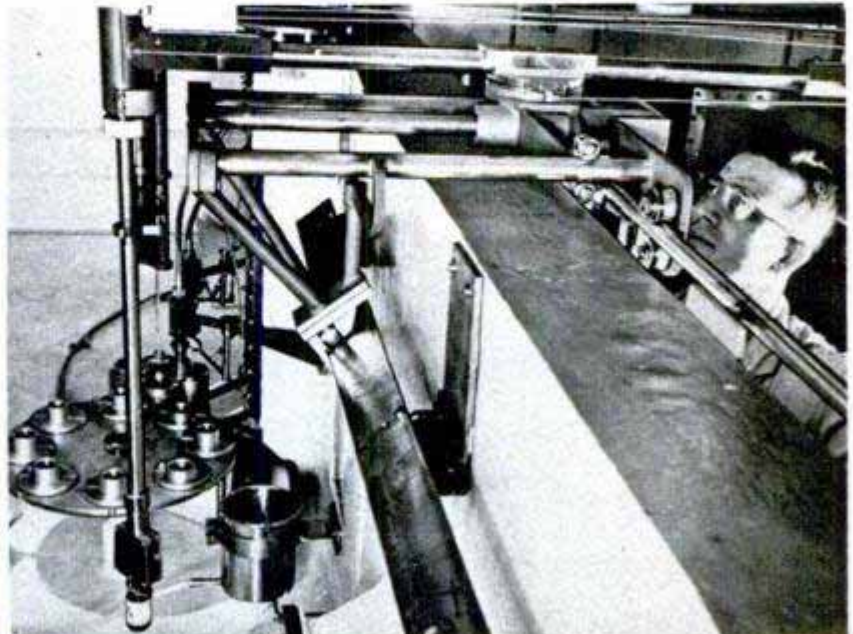
vision programs inexpensively into city homes by wire, assuring the reception of perfect pictures regardless of local outside interference.

## Atom Center at Oak Ridge Operates by Remote Control

Handling radioactive materials at the Oak Ridge National Atomic Laboratory in Tennessee is done by elaborate remote-control devices. Complex mechanisms to protect the workers are set up to handle such simple operations as removing and replacing bottle caps on the containers. The uranium chain reactor, or pile, has a

seven-foot-thick concrete shield. Samples are placed in the pile to become irradiated—useful for scientific research but dangerous to man. They are removed by tongs through a lead tunnel. Laboratory technicians work from behind shields and use overhead systems of mirrors and periscope devices in order to see what they are doing.

Left, remote-control tongs lift a bottle from radio-isotope storage area. Right, mirrors aid the operator





# PINK Gold Strike in the Gulf

For generations the shrimp off Dry Tortugas fooled the fishermen and their grounds were a secret until a lucky accident

*By Cleland van Dresser*

Stopping on route between the new fishing grounds off Key West and Northern markets, the fresh-caught shrimp are washed, weighed, iced, packed in boxes

Below, these boats along with about 200 others form the shrimp trawler fleet operating off Key West. One boat can carry 3500 to 4000 pounds in ice-filled hold



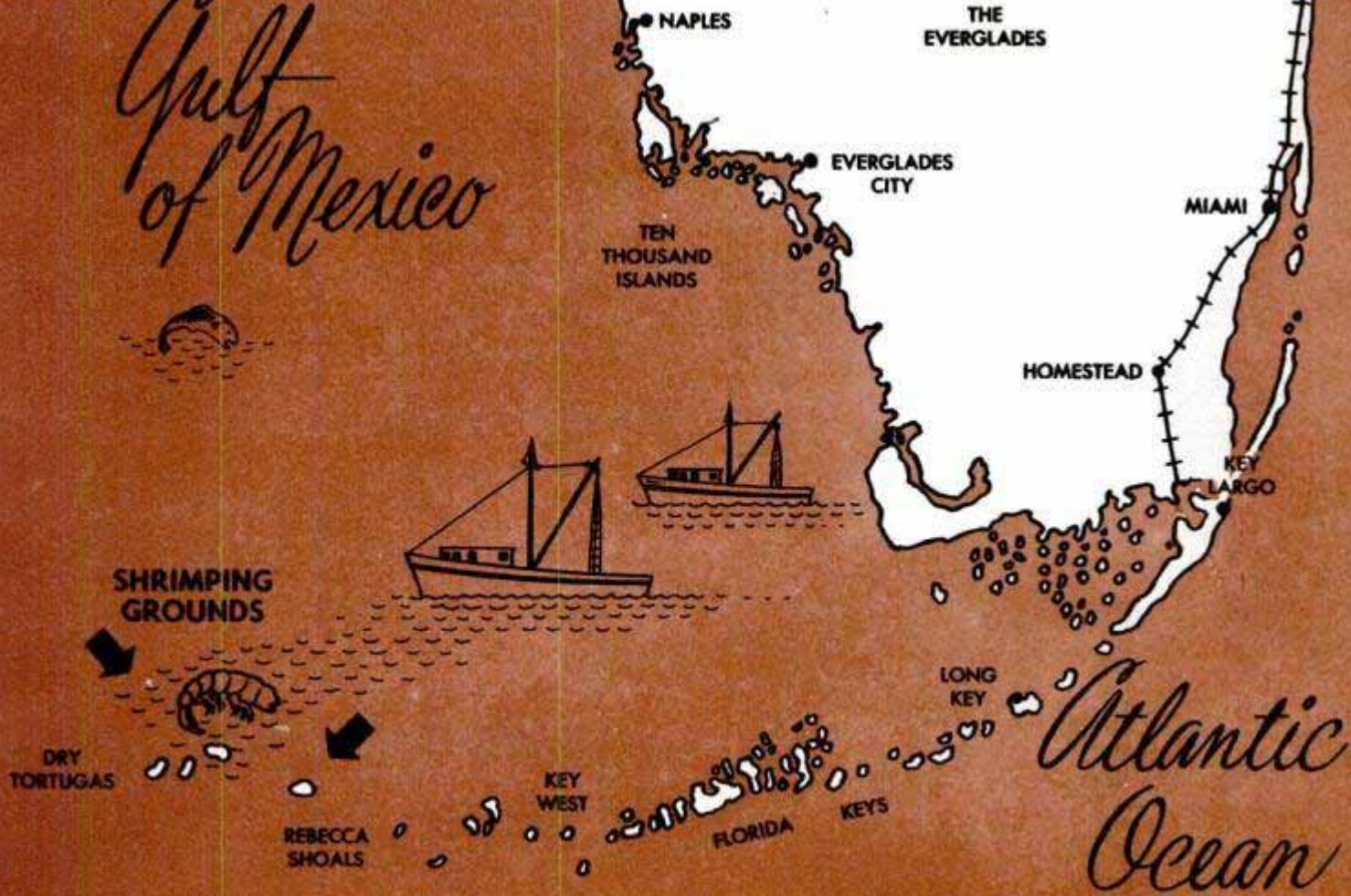
**B**ECAUSE a wandering fisherman had an unquenchable curiosity concerning a certain section of the Gulf of Mexico not far from Key West, Fla., the dining tables of America are more plentifully supplied with one of the most prized of all marine delicacies—shrimp.

Coming at a time when the shrimp fisheries of the nation are suffering from serious depletion due to offshore pollution and overfishing, the recent discovery, 70 miles from Key West, of vast, untouched beds, is regarded as a godsend to the industry. These new fields are termed by fisheries experts and scientists of the Federal Fish and Wildlife Service as perhaps the most productive ever located off the coastal waters of the Americas.

When news of the discovery broke a short while ago, there wasn't a shrimp trawler in Key West. Within three weeks, every foot of dockage space was taken up by trawlers from North Carolina, the northern part of Florida, Georgia, Mississippi, Louisiana and Texas. A month later five new packing houses had been built, local wharfage was extended to the limit and big diesel-powered truck-trailers began to roll down from the mainland to transport the iced catch to the Northern metropolitan centers.

This sleepy island town, which had been dormant since the war with the exception





Fishing experts believe the new shrimping grounds 70 miles from Key West may extend north as far as Naples

of President Truman's occasional visits and the activity of the Navy air and marine bases, suddenly woke up to find itself the shrimp center of the United States.

A careful checking reveals that the new shrimp beds are regarded as no flash in the pan. Rather they are looked upon as a long-range proposition—a great natural resource that will exercise an economic uplift on the nation as a whole and the commercial-fishing industry in particular. This opinion is shared by Jack Watson, regional Fish and Wildlife Service field man; Joseph Knight, local Florida Conservation Commission official, and the commercial fishermen themselves, among whom is E. J. Toomer of Thunderbolt, Ga., veteran of 30 years of shrimp fishing.

Key West presents a scene of great activity, as deep-sea trawlers from the far away North Carolina and Georgia reefs snuggle cheek by jowl along the overcrowded docks. Winches creak and groan as load after load of the iced "pink gold" is hauled from the vessels' holds to be packed in 100-pound containers and whisked north.

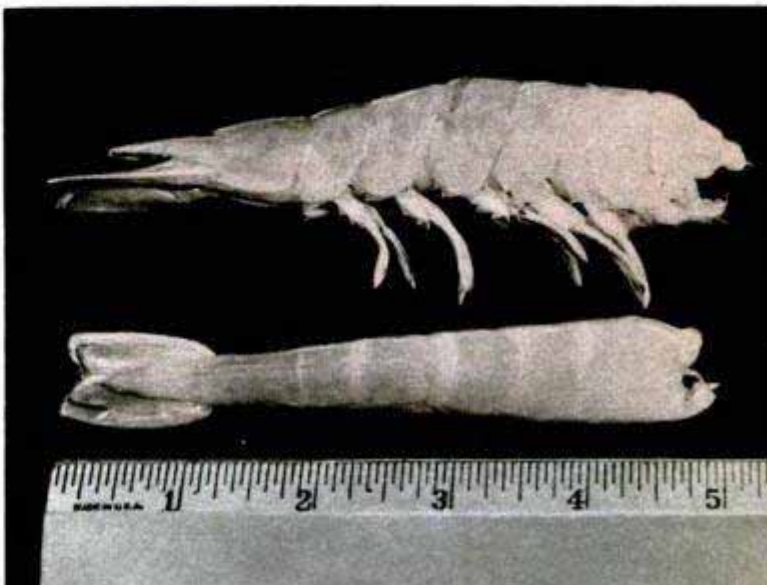
One wonders why the beds were not discovered before—the central location is but 70 miles from Key West and their existence had long been suspected by local fishermen. For many years around the Dry Tortugas they had been catching red snapper and

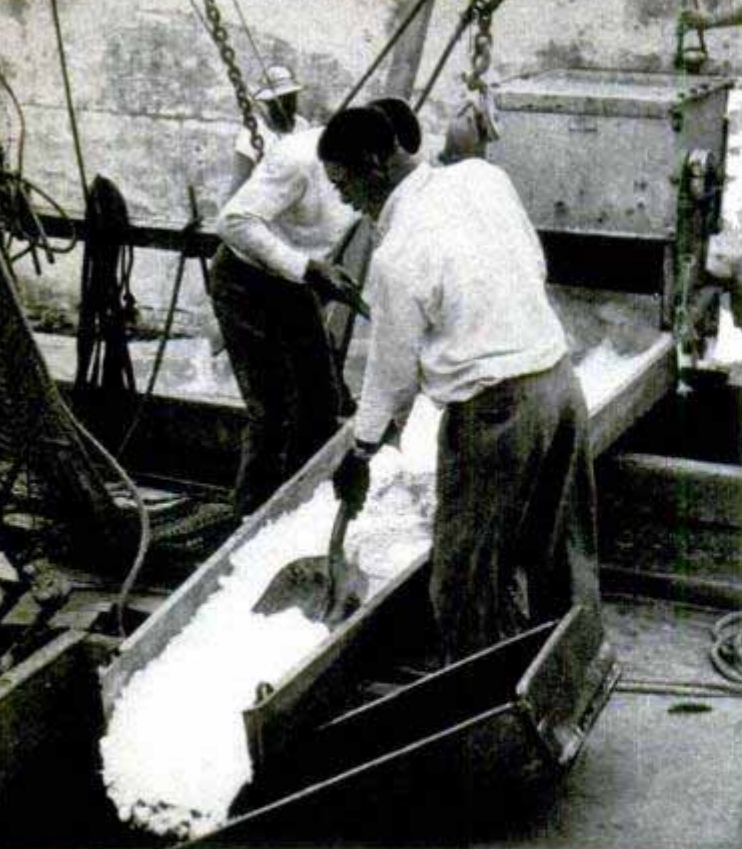
grouper whose stomachs were loaded with big shrimp.

Repeated efforts to locate the suspected beds failed, but there was a reason. Finally, the wandering fishermen came up with the right answer. The bottom of the area was gray mud, in which the shrimp buried themselves in the daytime to escape their enemies. They came up at night to feed, and were discovered quite accidentally by an alert fisherman.

When this news reached the commercial-fishing world, the great influx began. Every

Key West shrimp are big fellows—a boon to Gulf fishermen in a region where many beds are depleted





Handling crushed ice is big business in Key West. Here it is being loaded into hold of a shrimp boat

available map of the Coast and Geodetic Survey, Coast Guard, and Fish and Wildlife Service was scrutinized. It was learned that shrimp beds comprising the initial discovery were roughly 100 square miles in extent, and with every indication that they continued northeastward 140 miles toward Fort Myers, on the west coast of Florida. The potential wealth of these as yet untouched beds is tremendous.

Within an incredibly short time after the discovery, approximately 200 shrimp trawlers were in operation off Key West with

Coral reefs off Dry Tortugas play havoc with nets of the fishermen who must repair them between hauls



Salty, pet raccoon of the trawler fleet, puts his own stamp of approval on a juicy shrimp fresh from sea

more arriving from the north every day. So anxious were their captains to reach the fabulous new grounds that scores of fishing craft ran aground coming south on the Inland Waterway and had to be hauled free by U. S. Army engineers.

These ships, 60-footers with diesel power, take on six tons of crushed ice per trip. Mechanically driven crushers demolish a 500-pound cake of ice in seconds, and movable chutes direct the flow into the holds of the trawlers. A voyage to the Dry Tortugas lasts between two and four days, depending upon the rapidity with which the catch is made. All fishing is done at night.

Constant radio communication is maintained between ship and shore, thus enabling the captain at sea to inform his dock master of the progress made on the banks. No time is wasted, for as soon as a trawler reaches Key West, a huge refrigerator truck is waiting to take on the load and rush it northward.

There is no rest for the hard-working trawler crews—four men on the larger boats, three on the smaller craft—and precious little for the hard-working shore crews. Shrimp is a highly perishable commodity, and speed is of the essence in the fresh-sea-food business.

The catch is "headed" at sea, a process which corresponds to cleaning a fish. Then it is dumped into the ice-filled hold. When the vessel obtains a capacity load, usually around 3500 to 4000 pounds, it heads for Key West. Cleaned shrimp brings around

(Continued to page 230)

## Bucking Tractor Lifts Front Wheels

Rearing like a bucking horse, a new German tractor lifts its front wheels high into the air. The driver's object is to prevent the front wheels from bogging down in loose soil. The larger, rear wheels will carry the tractor over most uneven spots. Exhibited at a motor show, the tractor costs about \$1550 and is part of a bid by the German car-building industry to regain control of its home market.

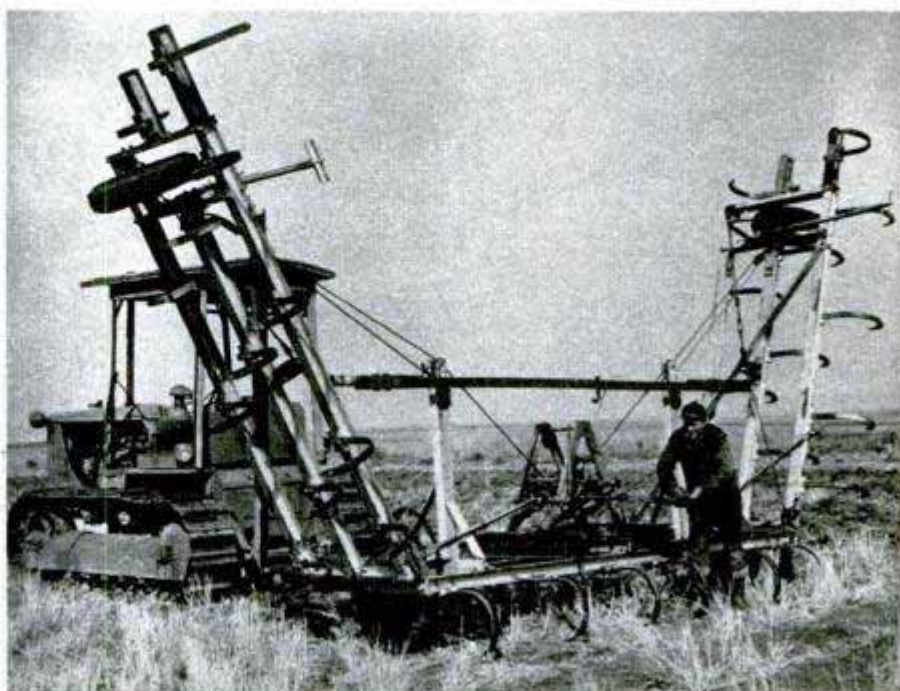


## Lighter Touched to Metal Is Ignited By Battery

Small batteries provide enough heat to ignite a new table lighter. The batteries are in the base of the unit and the wick and fluid are in the torch. To light the lighter, the brass tip of the torch is pressed against a metal ring while the body of the torch touches an aluminum groove. The current from the batteries then makes a resistance wire red hot, and the lighter-fluid vapor increases the heat until the wick ignites. The process is virtually instantaneous—as soon as the torch touches the two metal contacts the wick is ignited. Worn batteries can be easily replaced by removing two screws in the bottom of the base.

## Chisel Plow Has Folding Wings

With a pair of hinged outer sections, a 40-foot chisel plow "retracts" to make it easier and safer to move from one location to another. Built by L. R. Talley, New Mexico farmer, the chisel consists of three 13-foot Hoehme plows. The end sections are pulled upward by a hand-operated winch and steel cable. A brake and cog arrangement locks the wings upright. The three-plow combination chisels 160 acres a day at a depth of four to six inches.





Dense smoke of this practice fire is dissipated by a fog nozzle as volunteers move in to put out the blaze

## ***BELLS ARE RINGING AT THE FIREMEN'S SCHOOL TO CALL OUT THE VOLUNTEERS!***

Demonstrating the wrong way to fight magnesium fires. Stream of water causes an explosion. The fog nozzle should be used



**W**HEN the fire alarm sounds in a typical small town, the butcher, the baker and the television salesman immediately drop their work and become fire fighters, handling hoses, axes and ladders with the skill of professionals. These volunteer firemen, who are as rabid about their "hobby" as the most enthusiastic sports fan, save millions of dollars worth of property and hundreds of lives annually.

It takes more than just enthusiasm to fight fire and many volunteers learn the tricks of the smoke-eating trade in state-operated schools. One of the nation's best schools is conducted each summer by the Pennsylvania Department of Public Instruction. Last year, more than 600 men took the course. After graduation, they go back to their companies to teach other volunteers the newest techniques.

The photographs on these four pages show some high points of the week-long training period.

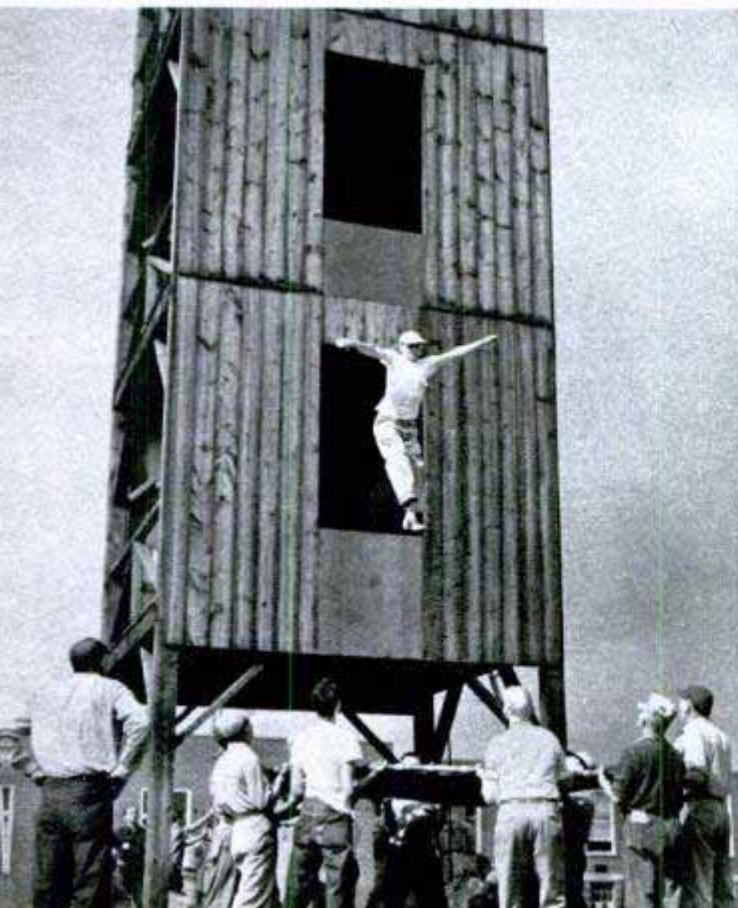


Above, with the fire, opposite page, under control, firemen enter the building to rescue this "victim"

Above, right, "victim" is a display dummy, but she is given first aid as carefully as if she were real

Right, student fire-eaters are shown the latest in equipment during their week's period of instruction

Below, this is practice in net handling. Good firemen don't get caught in places that require a jump





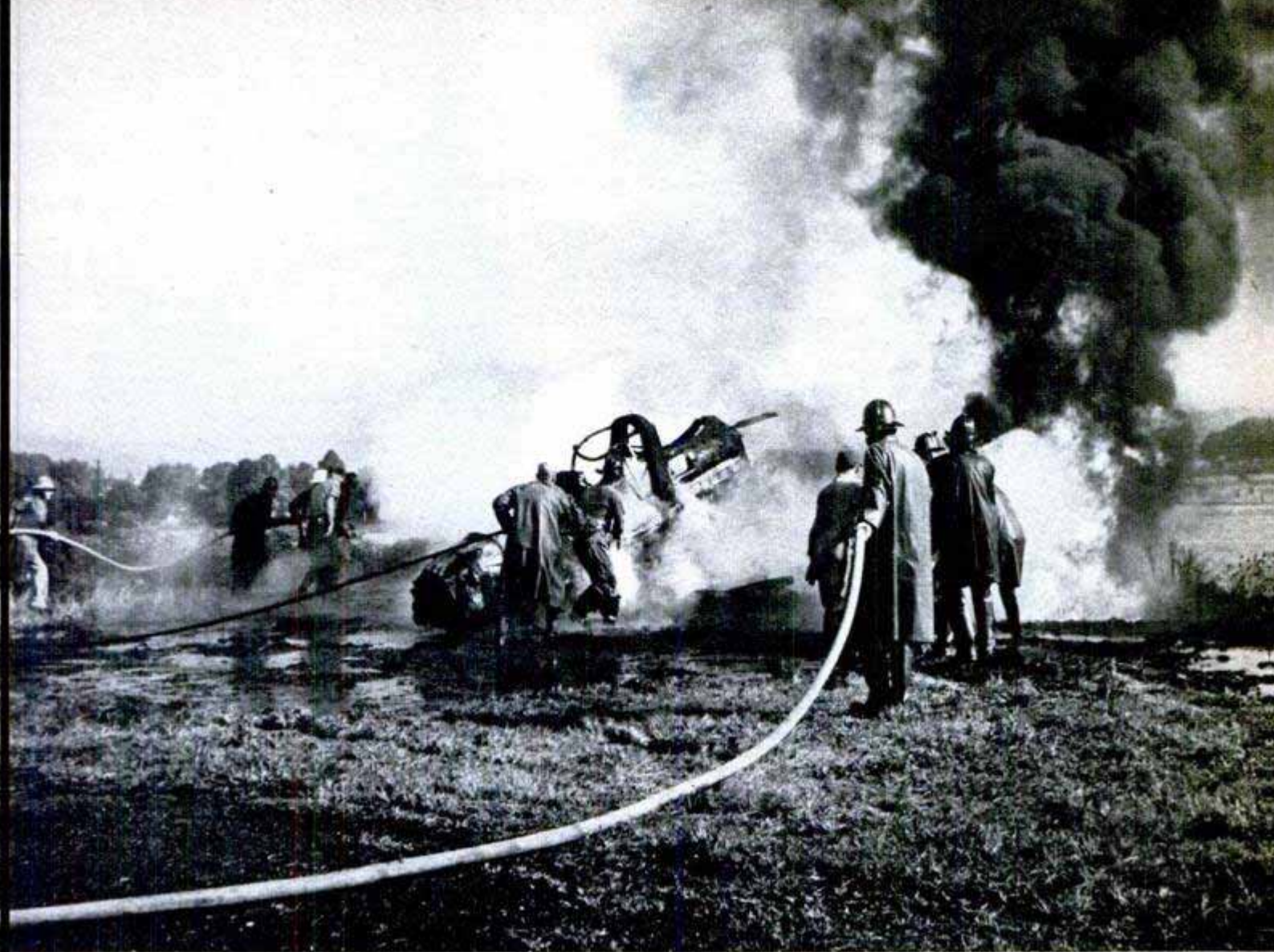
It takes courage to go up the outside of a building on a slender scaling ladder and volunteers have it



Unconscious victims can be brought down the ladder without carrying them with this "sliding" technique

Volunteer firemen are taught to use a safety line when searching for fire victims and never to go in alone



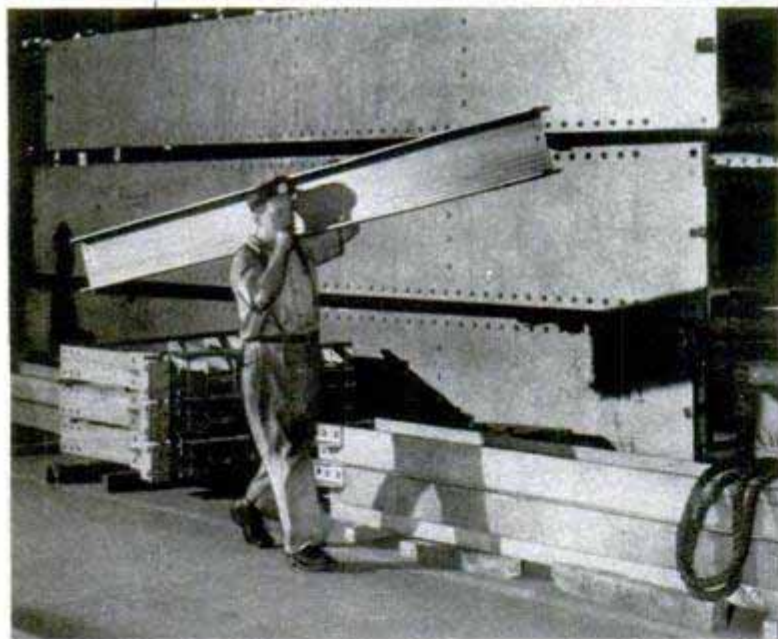
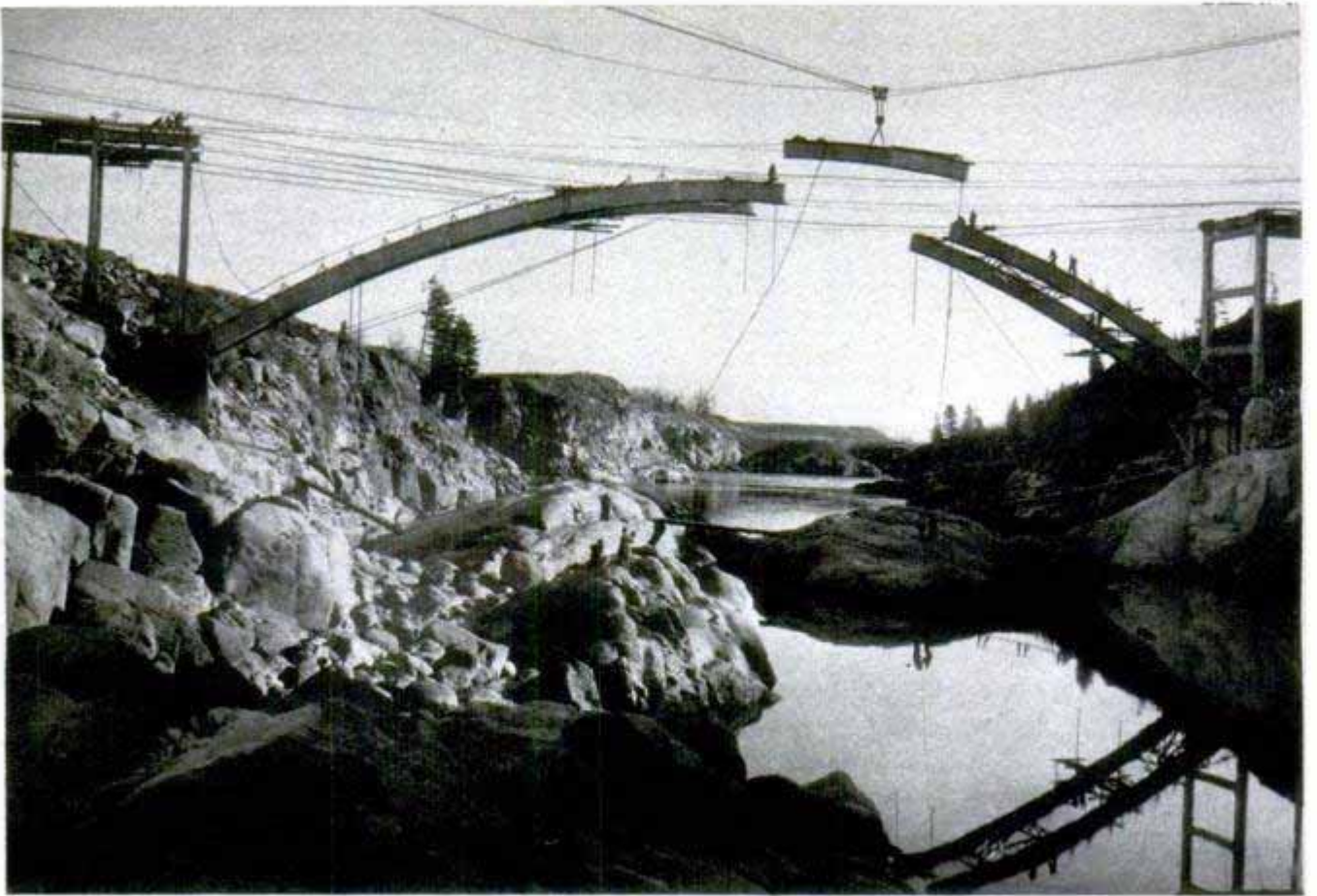


Even such specialized techniques as fighting airplane fires are studied by Pennsylvania's volunteer firemen

Below, with a safety belt and snap, a fireman lowers himself to the ground. His right hand controls speed

Firemen learn the art of bringing a victim down to earth with nothing but a rope and two safety belts





Big aluminum girder swings into place, supported only by light cables. Left, a workman carries I-beam section easily

## Aluminum Bridge

Weighing only half as much as a similar steel structure, an aluminum bridge was recently built at Arvida, Que., with a minimum of cranes and other heavy equipment. Workmen handled many of the large beams with ease. The 504-foot bridge, of arch construction, carries highway traffic across the Saguenay River. The entire structure, except for stone and cement foundations and a concrete roadway, is built of aluminum weighing only 400 tons.

## Carbon-Treated Soil Lengthens Growing Season

Farmers may have a longer growing season, if an inexpensive process is found for using carbon black as a soil warmer. In tests at the Massachusetts Agricultural Experiment Station, carbon-treated soil showed maximum daily temperatures 3.4

degrees higher at a two-inch depth than those of untreated soil. It averaged two degrees warmer at the surface. Carbon black, which runs from 3.5 to 7 cents a pound, was mixed in the top two-inch layer of soil at a rate of two tons per acre for the experiment.

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# They Teach You How to Crash and Live

By Ewart Thomas

**I**T WOULD BE SAFER to throw a child out of an airplane 1000 feet above a deep snowbank than to let the youngster stand on the front seat of a car while you bump into a wall at only 10 miles per hour.

Falling into the snowbank, the child probably would live. But he wouldn't have a chance when pitched against the solid instrument panel of a car.

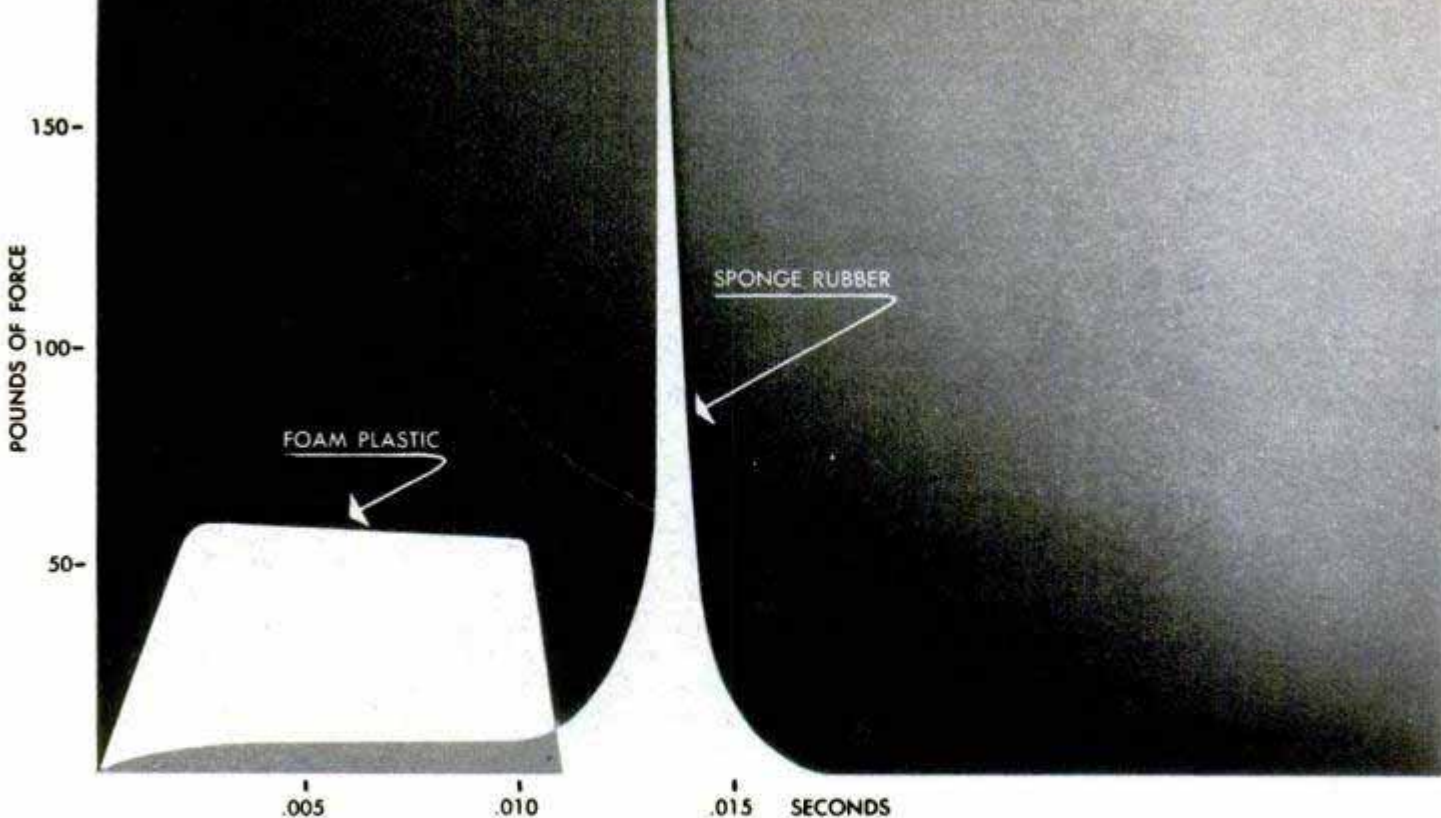
That's the conclusion of scientists who take accidents apart to study the forces involved and find better ways to protect against them. Most of the present research in "human stress analysis" is for the benefit of aircraft personnel, but practically all of it can be translated into greater protection for everyone. Basically, there's no difference between an airplane crash, an automobile collision or a blow on the head.

At Edwards Air Force Base, Muroc, Calif., the Air Force is manufacturing synthetic but deadly crashes by suddenly applying the brakes to a rocket-propelled vehicle that carries dummies or human volunteers at 150 miles per hour along a 2000-foot track. A series of clasp-type brakes produces any rate of deceleration up to 50 times the force of gravity. An ordinary automobile when braked to a sudden emergency stop has a deceleration equal to one half of one G.

At the University of Southern California, meanwhile, Prof. Charles F. Lombard and his associates are using a new human cyclic centrifuge in somewhat similar studies for the Navy. The centrifuge is a huge arm that whirls around and around. Out toward the end is attached a seat or other support that can be rotated in either direction at various speeds, independent of the motion of the main arm. Accelerations or decelerations

Reactions of a volunteer going through a 35-G crash in the decelerator. Gauges hooked to his helmet and chest measure the forces set up. In lower photo he is removing protective rubber plate from his mouth





Graph illustrates the superiority of foam plastic over sponge rubber in absorbing heavy blows of same force

as great as 40 Gs can be built up in the main arm at the same time the cyclic seat duplicates some of the turning and twisting movements that are present in almost every accident. These movements greatly complicate the usual analysis of crash forces.

From information gained with the centrifuge, Professor Lombard explains why some spectacular accidents are not always fatal and why some seemingly trivial blows can kill.

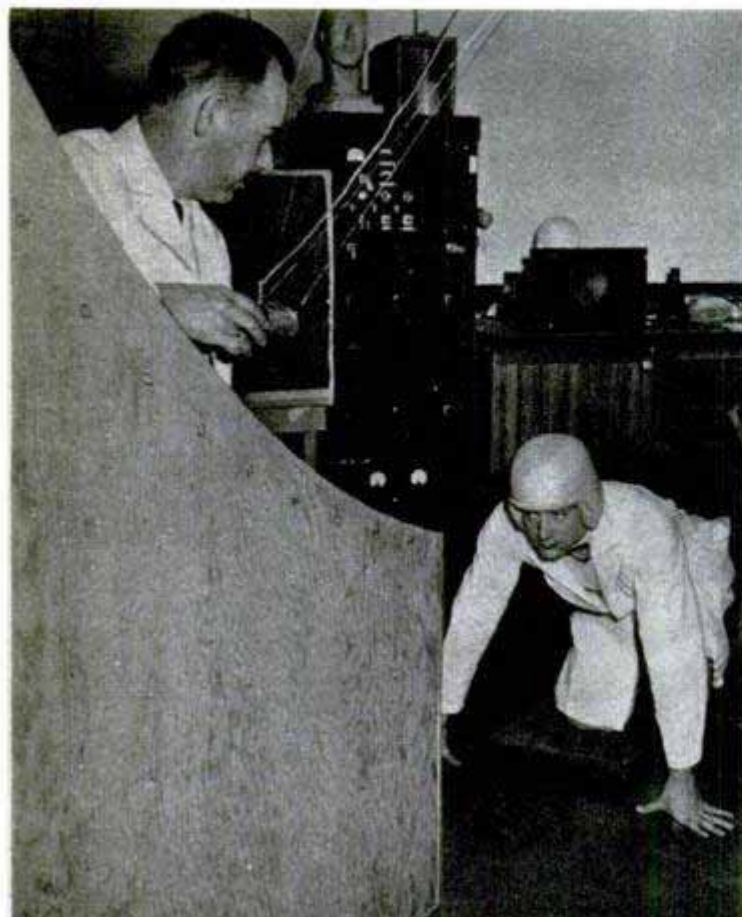
"People actually have fallen out of air-

craft and lived because they happened to land flat on soft, marshy ground or in deep snow," he says, "and others have died just because their heads hit the instrument panel of a car in crash stops, even at very slow speeds.

"The load factors in each case show what happens. Suppose a 200-pound man falls free into a yielding snowbank and the load factor reaches 200 times the force of gravity, giving the man an effective weight of 40,000 pounds. If he happens to land prone,

Blows from swinging 10-pound pendulum bob helped test protective values of aviation crash helmets

When bob strikes, below, a layer of crushable plastic and foam-rubber padding will absorb worst of impact



each of his 648 square inches of contact surface absorbs about 62 pounds of force. This is below the survival load, which probably is something less than 100 pounds per square inch.

"Yet when a person's head is pitched into an instrument panel, even from only a couple of feet away during an abrupt stop, the deceleration can amount to 1000 times the force of gravity. It depends on how much, if any, the panel yields under the blow. Since only a few square inches of the person's head comes in contact with the panel, each square inch has to absorb an excessive amount of force. Obviously, the brain may be seriously damaged and even the skull may be crushed."

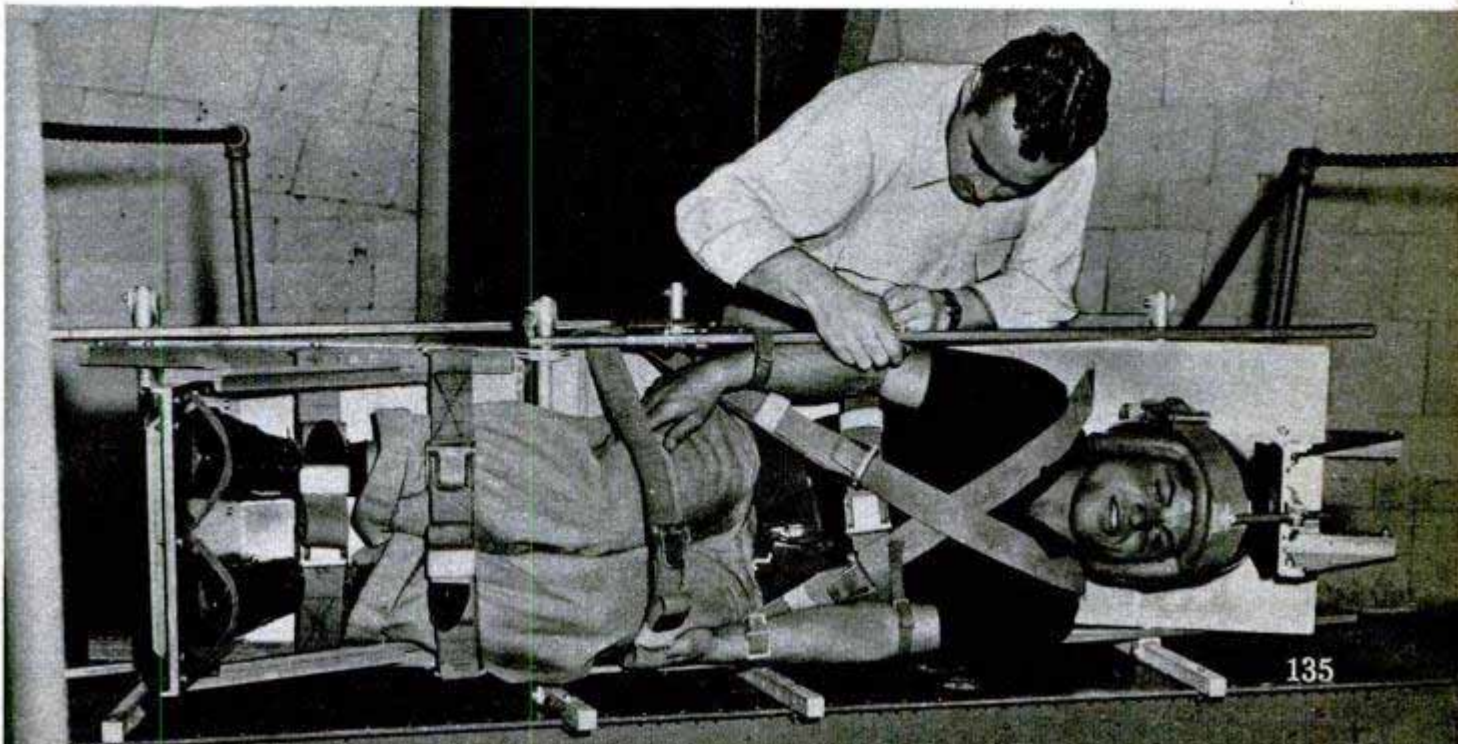
As part of its Navy research, USC recently investigated the effectiveness of ordinary football helmets and reached the conclusion that the present hard-shell suspension-type helmets leave much to be desired. Figures show that 69 percent of all football deaths are caused by head blows and that more than 200 players have died from head injuries in the last 18 years.

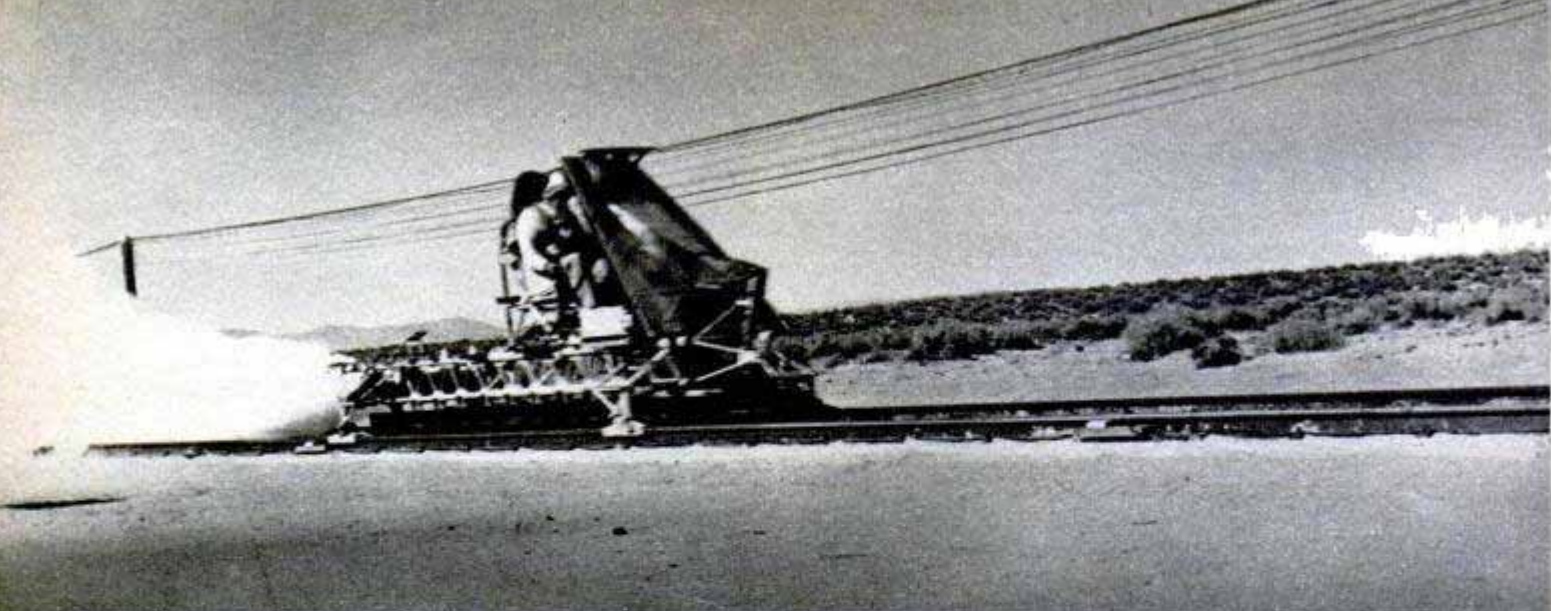
The first thing that was done was to measure the force that can be applied by a player's knee, since an accidental blow by an opponent's knee is a quite common football accident. Motion pictures were made of a running player and from these the research staff measured speeds and forces. The studies showed that a player's knee may travel at the rate of 30 feet per second on the upstroke and can deliver 417 foot-pounds of energy against a stationary object. No unprotected human head could



Two kinds of head harness, right and above, tested for prone-position flying proposed for future high speeds

Lying on his side and held by 14 straps, volunteer will be whirled on his own axis at the same time centrifuge arm to which he is attached is whirling around. Maneuver simulates forces that occur in a high-G crash





**Blast from four solid-fuel rockets propels Air Force sled along short track at speed of 150 miles an hour**

absorb that amount of punishment with any degree of safety.

Next a volunteer put on an ordinary football helmet and crouched on the floor with his head in the path of a 10-pound pendulum bob. This weight was released from various heights to crash against the side of the helmet. In no case were the blows as heavy as might actually be received by a player on the field. Accelerometer instruments contained in the pendulum and attached to the helmet measured the forces that were set up and high-speed cameras were used to make motion pictures of the experiments.

Watching a movie of a typical test you can see, step by step, just what happens to a player when his protective helmet receives a blow. In a side-blow sequence, the weight crashes against the side of the helmet and the helmet dents slightly and then moves away from the impact. Next, the bony structure of the player's head moves

over and finally the soft flesh of the face moves over likewise. The nose wags almost like a dog's tail in slow motion.

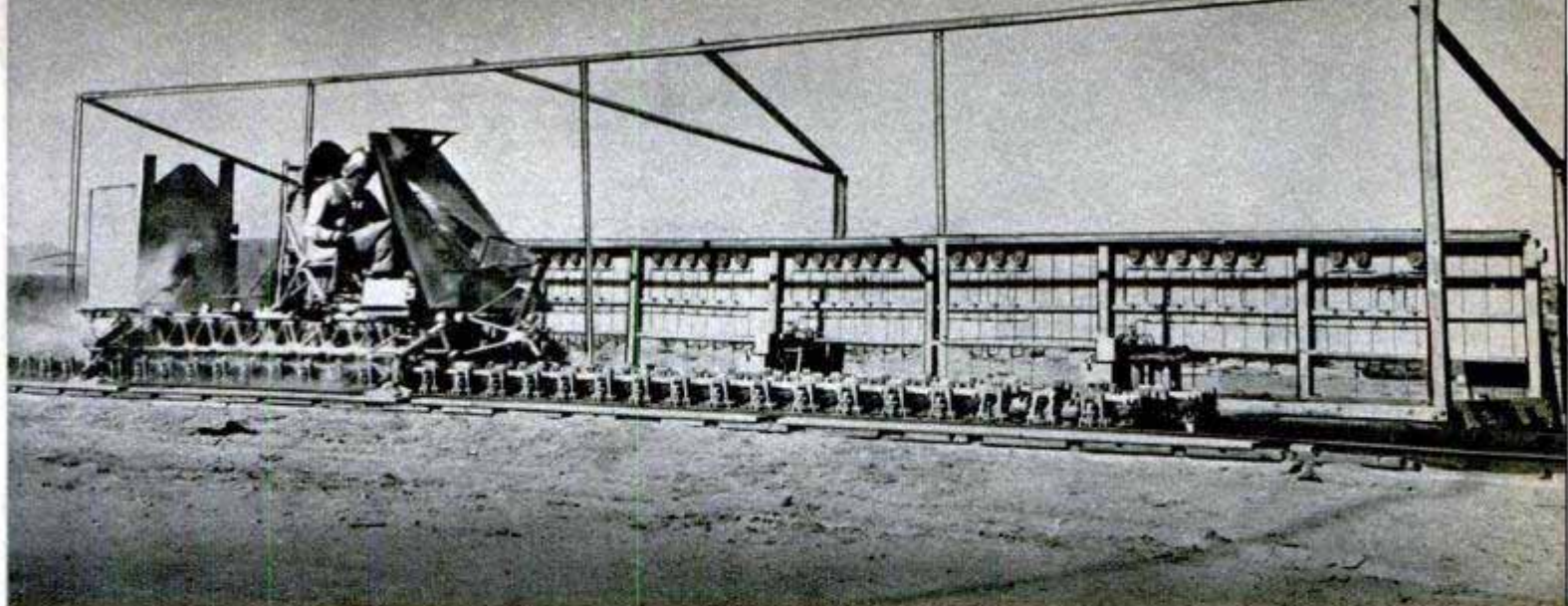
The recorded comments of a volunteer under increasingly harder blows ran typically like this: "That was O.K." "Jarred my teeth that time." "That was a real slug. Felt it in my Adam's apple." "That's enough. I'm a little groggy." The last comment was made after a pause during which the volunteer apparently was speechless.

In most cases, the ordinary football helmets did little to soften the blows. But when the same tests were repeated with aviation-type crash helmets, much of the energy was absorbed by the helmets and little was passed on to the head. The aviation helmets owe their protective value to a thick layer of crushable cellular cellulose acetate, plus foam-rubber padding.

The tests suggest that not only can typical football helmets be improved, but that many types of industrial "hard" hats that

**Left, for greater safety, the 1950 Chrysler has a crash pad on the instrument panel. Right, Nash further indicates trend to adopt aircraft safety devices to automobile use by featuring safety belt for passengers**





When sled slams into series of brakes set between rails, it slows from 150 to 75 miles an hour in 24 feet

are worn for safety can likewise be improved without adding to weight or bulk.

Generally speaking, any abrupt change in velocity is dangerous and any gradual change in velocity is safe. In a train wreck, for instance, a person is quite unharmed during the time he is being hurled toward a partition. It is the abrupt change in velocity that occurs when he hits the partition that injures him. Most of today's efforts toward reducing vehicular deaths and injuries are along the lines of slowing a person down gradually, either by slowing him down in place by an adequate safety belt, or at the point of impact by means of padding. An instance of each is the safety belt provided in 1950 Nash cars and the padded projection above the instrument panel in 1950 Chryslers.

Not yet taken advantage of by vehicle manufacturers are the new foam-plastic materials used in aviation crash helmets. Stiff enough to withstand ordinary usage, they have the best energy-absorbing property of any material. Instead of resisting or transmitting a heavy blow, they crush under impact. You can hold a panel of the material up against a steel girder and smash your fist into it with all your strength, without any discomfort.

Rubber padding reacts similarly as long as the blow is light, but it bunches and becomes hard under a heavy blow. Layers of both materials together probably will be used considerably in future protective sports equipment and for insulating the dangerous portions of the interiors of vehicles.

Dummy form of "Captain G" (for gravity) kneels near sled as it is readied for run

Aviation studies of acceleration and deceleration led to the development of the antiblackout suits by which pilots can retain consciousness during high-G maneuvers, and to the present crash helmets that protect pilots from high-speed buffeting and in crashes. Current studies include the designing of capsule-type cockpits that resist crushing back on the pilot in a crash, and improved restraining harnesses that hold pilots safely in their seats. Ordinary lap belts are not enough. Many pilots, in addition to most military pilots, also wear harnesses that hold their shoulders in contact with the back of the seat.

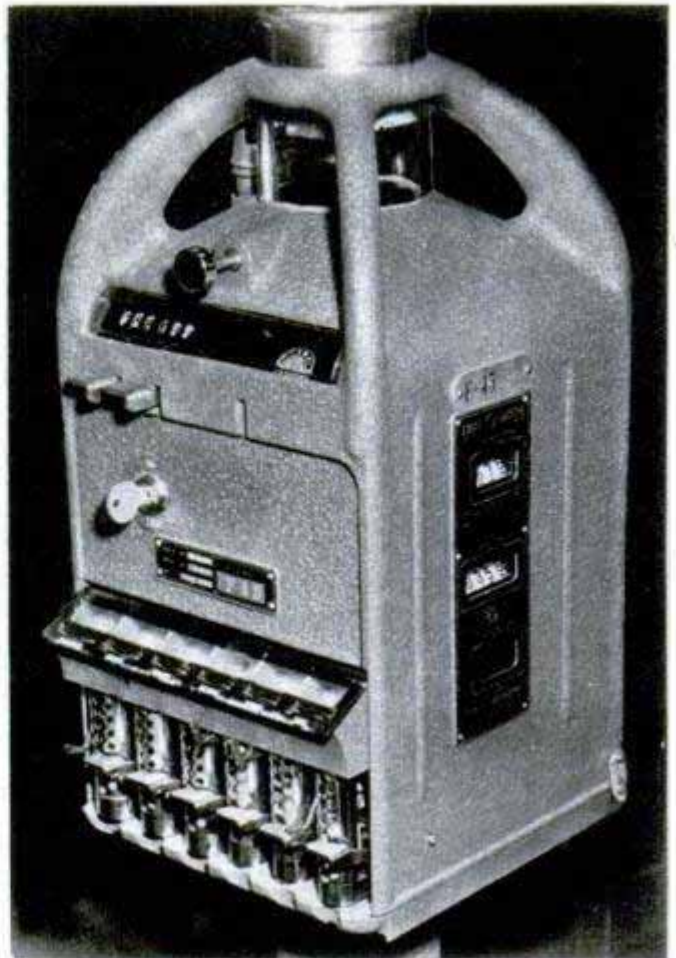
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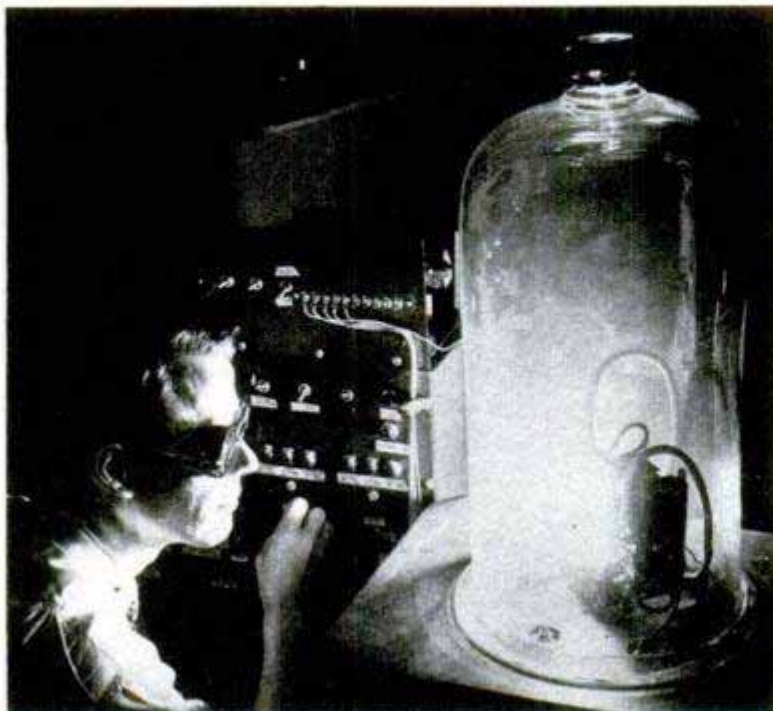
### Cold Coils Dehumidify Basement

Refrigerated coils are used in a new electric dehumidifier to reduce moisture in basements and storerooms. The machine is a cylinder 14 inches in diameter and less than three feet high. Inside are the cold coils, a fan and a container for receiving the water. The fan in the top of the cylinder sucks air up over the coils, where the moisture condenses and drips down into the container. The air, with excess moisture removed, is discharged through openings in the top. The dehumidifier is designed to reduce moisture damage in any confined area up to 8000 cubic feet.



### Automatic "Conductor" For City Bus Lines

Bus drivers in Chicago are testing a mechanical helper that takes the fares, counts and sorts the coins, dropping them into a change-making device automatically. The helper, actually a king-size fare box, accepts the fare in any combination of coins. It also takes tokens, ringing them up separately from the coin fares. A 12-volt motor operates the coin sorter and tabulator.



### Electrical "Wind Tunnel" Tests Airplane Parts

All the components in the complex electrical systems of modern aircraft are "flight tested" in a laboratory that serves as an electrical "wind tunnel." Actual flying conditions at all altitudes and speeds are reproduced in the lab, allowing engineers to test parts before construction of new planes begins. In tests of the Boeing B-47 Stratojet, every wire, switch, motor, gauge and other component of the bomber's electrical system was reproduced in the laboratory. High-altitude conditions are simulated by placing equipment in a bell jar from which air is exhausted to reproduce conditions like those at 50,000 feet altitude.



## Hand-Cranked Propeller Drives Small Catamaran

Swimming and boating are all one when you go for a cruise on a hand-powered catamaran. You are in the water as in swimming, but a hand-cranked propeller forces the tiny craft through the water like a motorboat. The two aluminum pontoons are buoyant enough to keep several persons

afloat, making the catamaran an excellent piece of life-saving equipment. The operator lies prone on a comfortable support between the two pontoons. The feet serve as a rudder. By reversing the hand cranks, you can stop the craft or back it up. Almost entirely aluminum, it weighs 50 pounds.

## Clamps Attach Lights to Camera for Shadowless Photos

Photographers can mount two or three extra extension flash units on their camera with positive locking clamps that screw into tripod sockets. A mounting flange is available for attachment to the camera box for additional light. With several lights arranged around the camera lens, the photographer can get shadowless pictures without limiting his mobility. The adapter also clamps tightly to any light stand for off-the-camera lighting.



## Once-Wasted Propane To Power Busses

Propane, once a waste product in oil refining, will be used to power a new line of passenger busses. The vehicles have a special engine designed to burn propane, which is cheaper than gasoline or diesel fuel. Conversion to propane is expected to reduce fuel costs up to two cents per mile. In addition, propane leaves very little carbon deposit, thus doubling the time between overhauls, and is odorless.



Hot notes on a glass trombone? No, this girl glass blower fashions intricate chemical equipment for a lab



## ***She Plays Tunes***

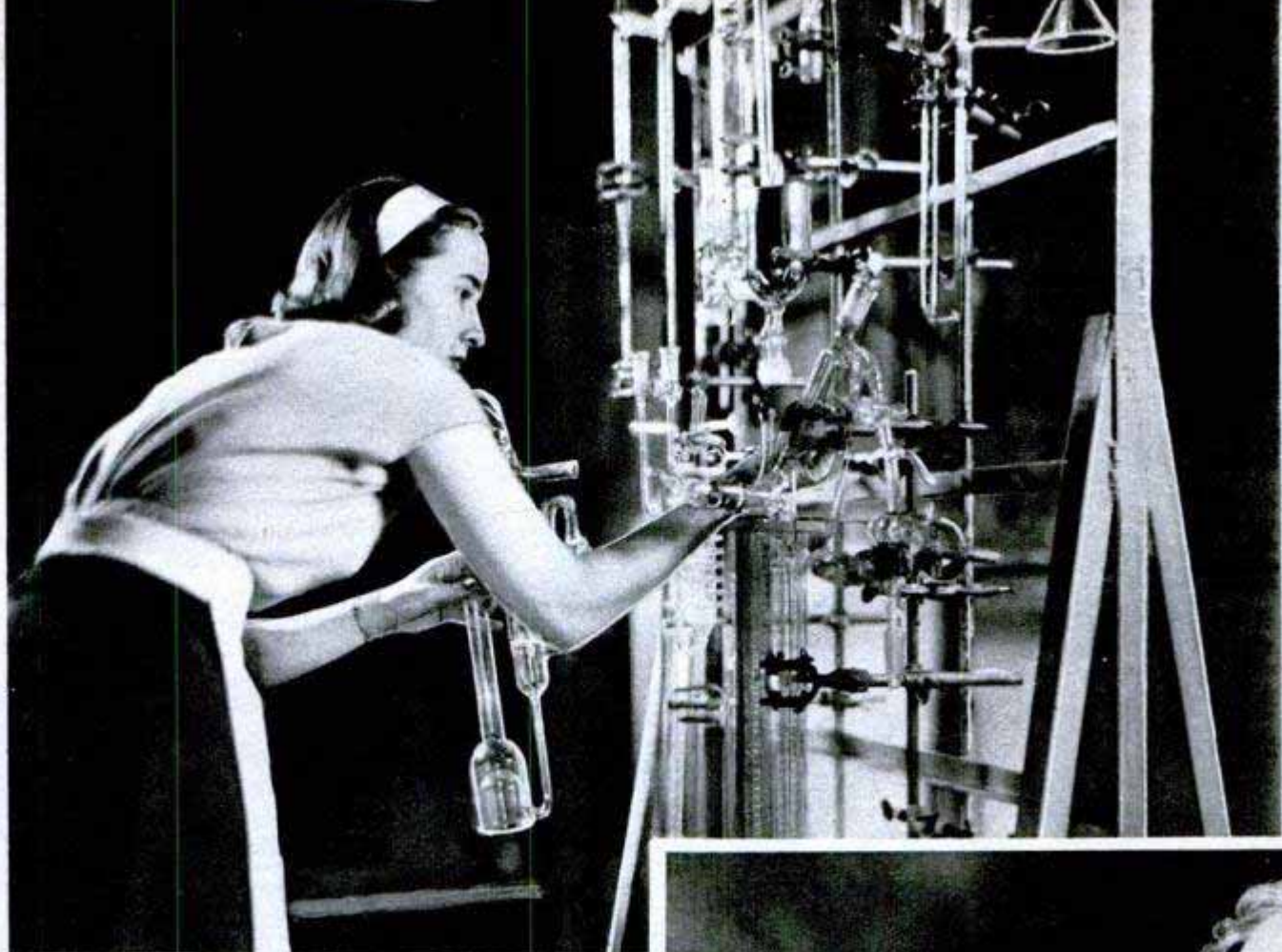
**M**ET Dorothy M. Langstaff, a girl who blows through a tiny mouthpiece to create symphonies in glass. Just 25 years old, she is the only girl glass blower in the Gulf Oil Corporation's laboratories and, so far as her co-workers know, the only girl who blows glass for any commercial lab. There's not much that she can't do with a glob of glass and a gas burner. She can du-

PLICATE an entire pilot plant in crystal—a setup that may occupy the wall of a big room—or blow a graceful dancer atop a tiny glass bell. Miss Langstaff spends her working day making glass stills and boilers. After hours, she fashions exquisite collector's pieces from the day's scrap. Her tools are glass tubing, special burners—and most important, her precisely controlled breath.

Below, Fritz meets Adolph. After hours, the young glass blower makes some exquisite collector's items from the day's scrap. Right, she adjusts a special battery of flaming gas burners, called a cross-fire







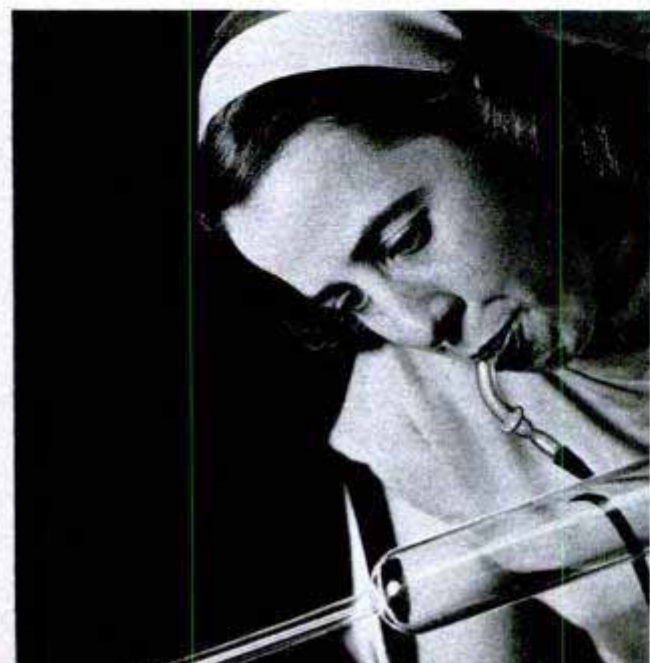
This rackful is her production for a single day

## ***in Glass***

Right, she shows off her latest hobby creation, a ship made entirely of glass including the rigging

Below, right, using a rod of glass, she adds a foot to the ballet dancer pirouetting atop a small bell

Below, fashioning a joint in a piece of laboratory apparatus, she blows gently through the mouthpiece





### Boy Builds Own Car

For a cost of only \$175 a 17-year-old high-school youth has built himself a car. Stuart M. Moule of Holden, Mass., started with parts from a motor scooter. The streamlined body now sports headlights and coil springs. The youth says the car hits 30 miles an hour and carries him 63 miles on a gallon of gas. There's only one thing wrong—the car won't back up. Stuart is working on that important detail now.

### Brushes Slipped Into Sink Revolve To Wash Dishes

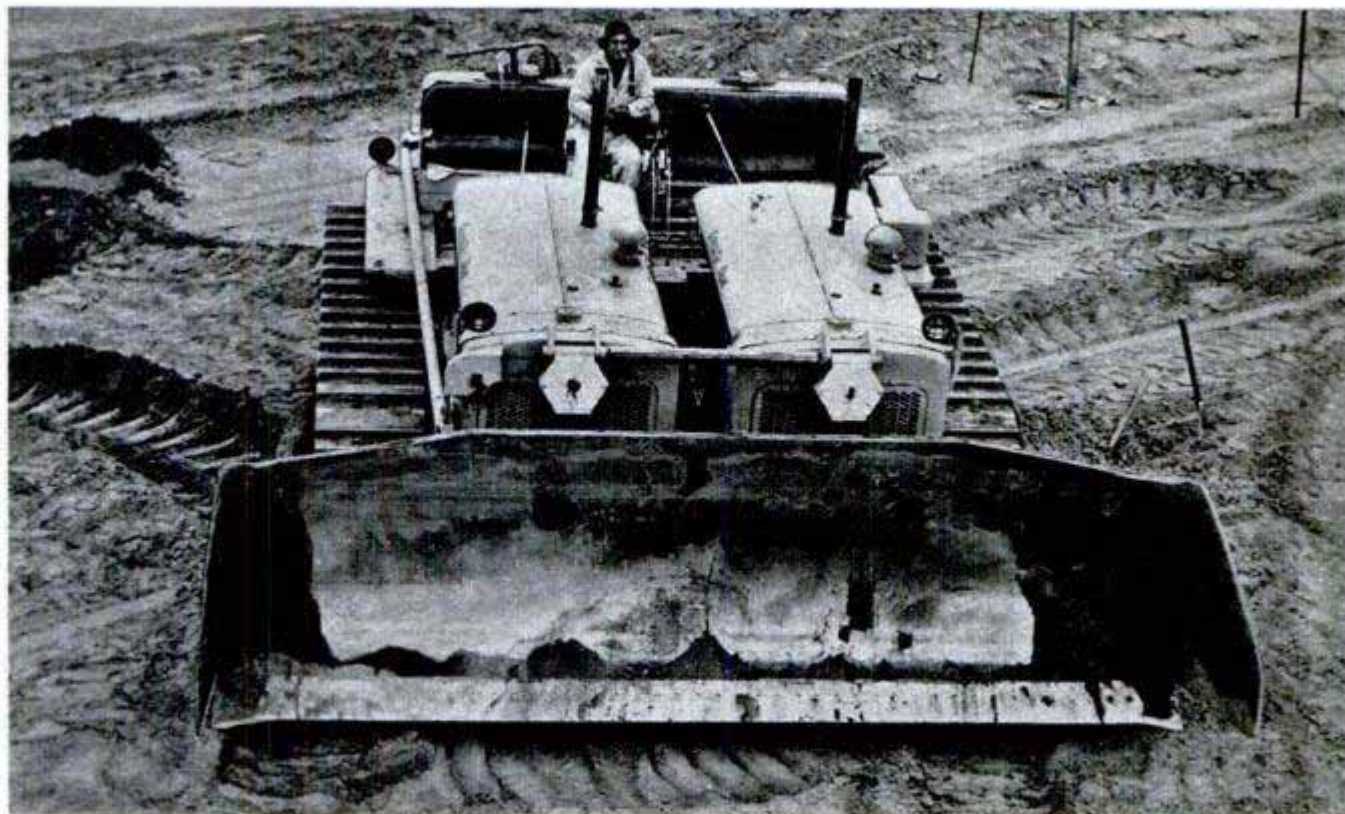
Housewives can slip a new mechanical dishwasher into place in a few seconds, do the dishes, then store it away again, leaving the sink free for ordinary service. The new washer, developed in England, has two nylon brushes which revolve underwater to scrub away the dirt. A roller spins the dishes between the brushes. Cups and glasses are washed by holding them over the end of one of the brushes, which are driven by a small electric motor. The washer is manufactured as a complete sink unit or as a washer only, which can be adapted for use with any stainless-steel sink provided it is at least eight inches deep.



### Folding Boat

Sturdy but light, a portable boat is built of aluminum and Vinylite-treated duck. It measures 4 feet by 6 feet when set up and is 38 inches in height and 20 inches wide when folded. The boat weighs 26 pounds and can be easily stowed in the luggage compartment of an automobile.

ⓘ Unless tires are switched regularly, the right-rear tire will wear out twice as fast as the left-front one.



### "Siamese Twins" Bulldozer

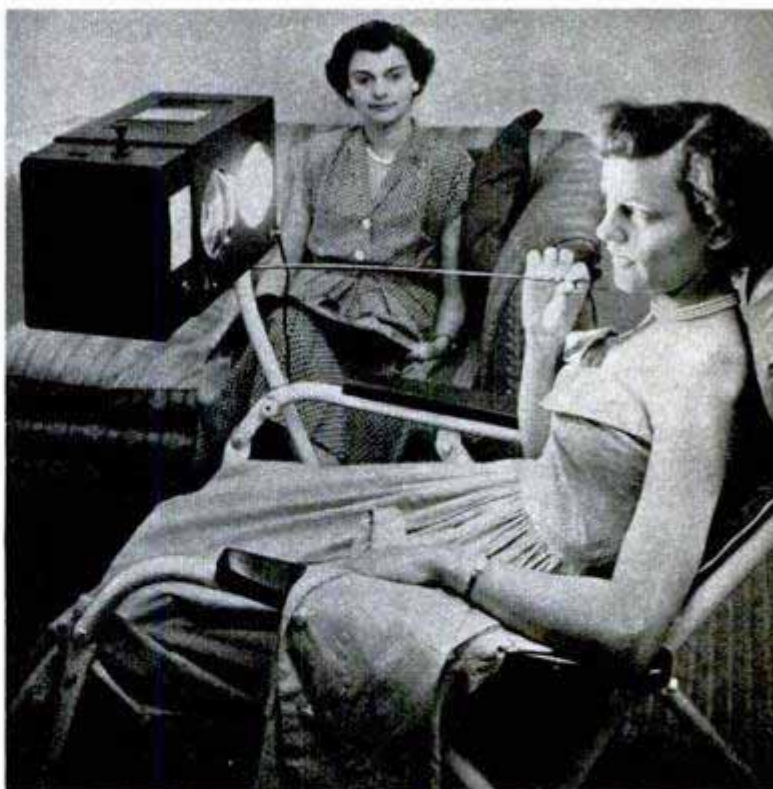
Two tractors hitched in tandem and run by one man helped speed the leveling of hills and valleys for a California housing project. The experimental dozer, made by joining two conventional Caterpillar trac-

tors side by side, moves up to 1200 cubic yards of earth every eight hours. Each unit runs on a single track, making it possible to turn the dozer around in a circle with a radius of just over half a tractor length. The two machines can be readily converted back to separate use.

### Presto—Deep Sun Tan At the Drop of a Coin

Soon you may be able to acquire a sun tan while waiting in a doctor's office, a hotel room or a railroad terminal. An experimental machine, coin-operated, combines heat and sun lamps to produce a sun tan. The heat lamp causes a mild perspiration, conditioning the skin for the sun lamp. The machine includes a timer for turning off the lamps automatically and a built-in tape measure for determining the proper exposure distance from the lamps.

Scientists of the American Museum of Natural History predict that the coming half century will see a 50 percent increase in world's population and the exhaustion of all accessible mineral deposits.



#### VALUABLE FREE INDEX TO POPULAR MECHANICS NOW AVAILABLE

Your useful free copy of the new six months' index to Popular Mechanics, January through June 1950, will be mailed to you upon receipt of your order and 10 cents to cover handling and mailing. Just address your request for the index to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

**G**OLD IS where you find it." This well-worn truism now has new significance. Gold is actually found, and the bright flecks are panned out and carried away by thousands of persons who visit a unique mine located, of all places, on a busy boulevard in southern California.

The mine is at Knott's Berry Farm, 22 miles from Los Angeles, and is open to the public the year around. Visitors are invited to inspect the workings, walk through the long tunnel, see the gold-flecked quartz in a cross drift and then pan for themselves the yellow grains of pure metal from the sand in the sluice box. And the treasure, resting in the bottom of that round pan, is theirs to take home.

The "mine" of course is only a replica of a desert gold mine. But it is faithfully reproduced in every minute detail. It is maintained for the education and amusement of the public. It is one of the latest major additions to a fabulous enterprise. The Knott's Berry Farm, which expanded from a roadside stand to one of the largest and most popular eating places in the Southwest, entertains its patrons in true Western style.

As many as 7000 dinners are served here daily. The tables seat about 1200. A major problem of how to entertain the waiting diners was solved in unique style by Walter

Knott. An extensive "ghost town" was built among the giant eucalyptus trees on a part of his 200-acre ranch. Here are faithful reproductions of buildings and activities of every phase of life in the "gold days" of the Old West.

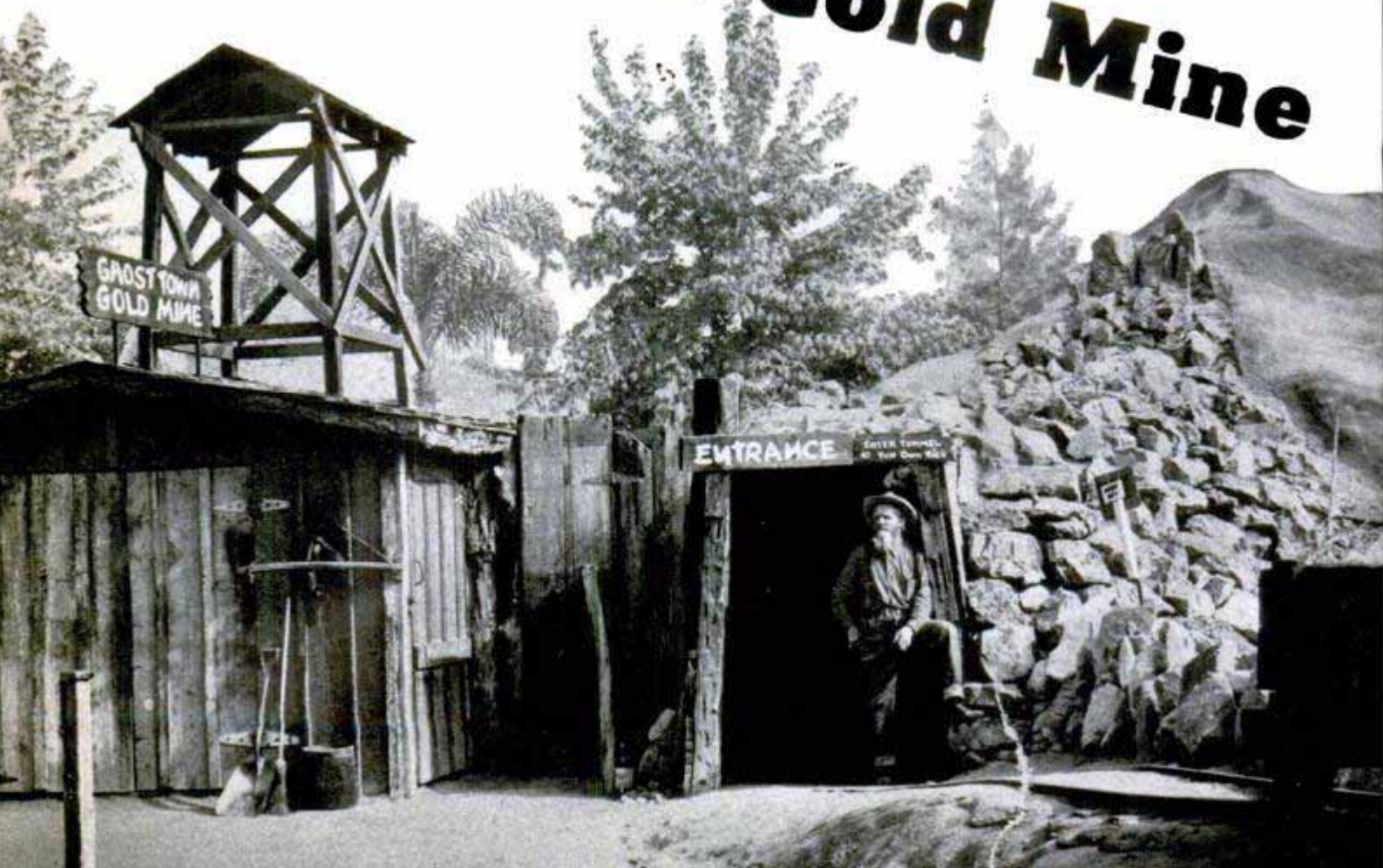
And to round out a true picture of a mining camp, Walter Knott "just had to have a real mine." So here it is, complete in every detail and "working" daily. It occupies an area 90 by 150 feet. You find an old miner, lounging at the tunnel entrance, which leads you through the workings deep beneath the "desert" hills.

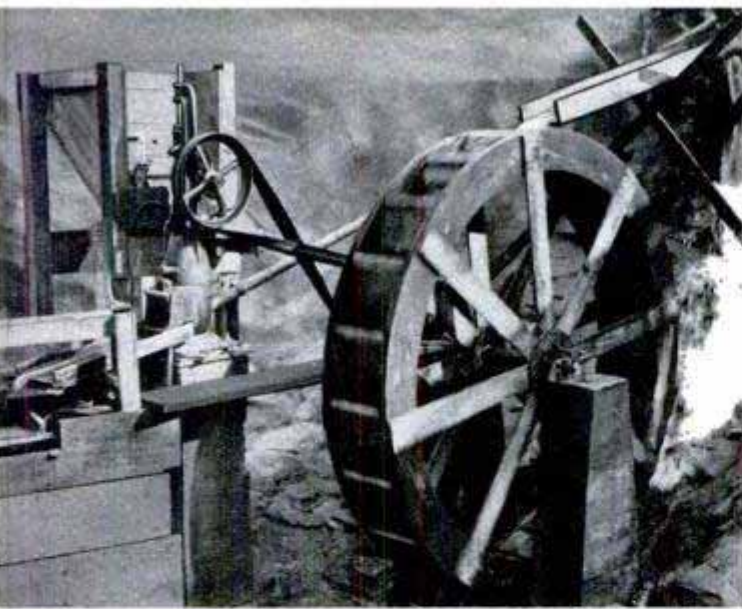
At a cross drift in the tunnel, lighted for your inspection, gleams a vein of rich gold ore, but this is one place you can't mine. Emerging from the tunnel, you see the milling operations. Here is a small stamp mill of the type used in a laboratory for sampling ore or by miners for transporting on their burros to their desert workings. Its capacity is 75 pounds of ore an hour.

The hard rock, after being pulverized to flour consistency under the pounding stamp, is sent down a riffle board and into the long sluice box. A steady stream of water flows over the fine sand, from which the gold flakes are panned. And here a real old miner, with seamed and weathered face, explains the details of the workings and

Old-timer stands ready to show you through the transplanted "diggin's" on busy California boulevard

## It's a Gold Mine



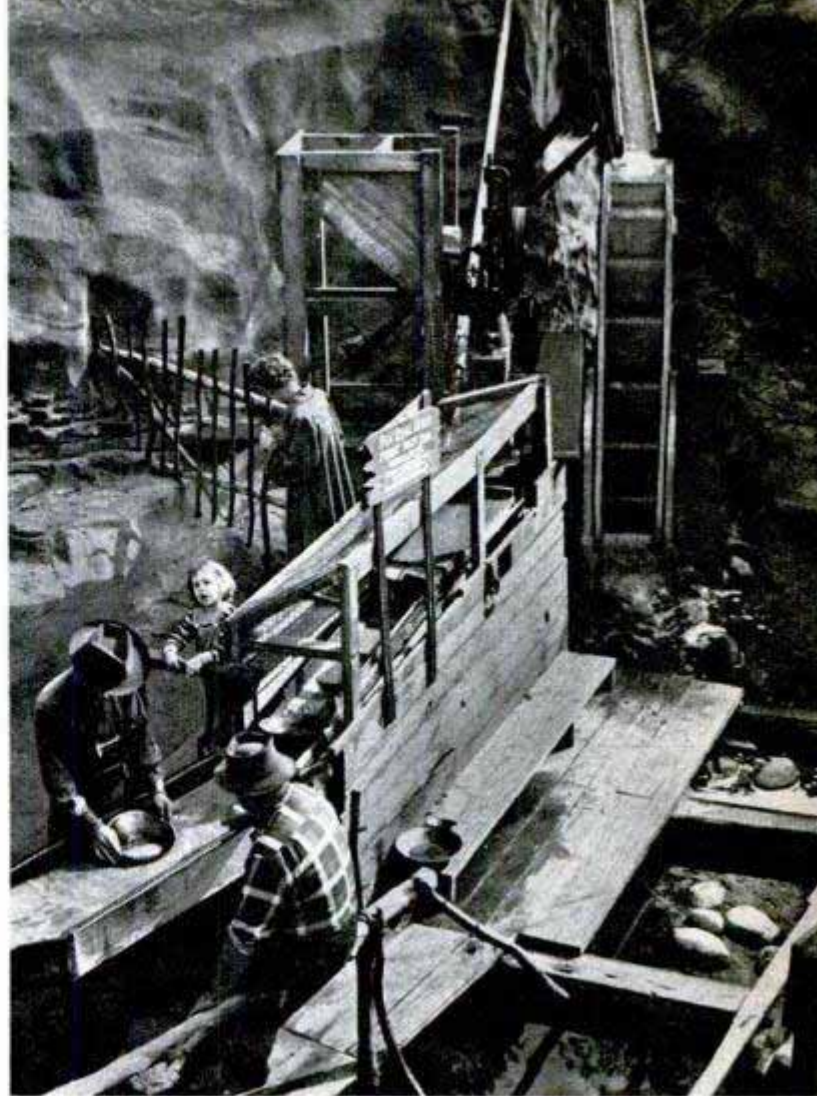


Water turns an old wheel to power the stamp mill, which feeds the crushed ore over the riffle board

shows you how to pan out your own gold. In true miner's fashion, he tells you of his own mine, far out in the desert, where he is working a rare mineral.

Panning is done by dipping up the fine sand, covering it with water, and rocking the pan with a circular motion to throw off the material, leaving the few grains of pure gold at the bottom. You may "work" as many pannings as you like, and each tailing will be put in a small bottle for you to take home.

In the miner's shack near by there are relics of the early days, and over behind the sluiceway stands the typical desert pack burro. His saddle hangs on a dead tree, along with pots and pans for use in

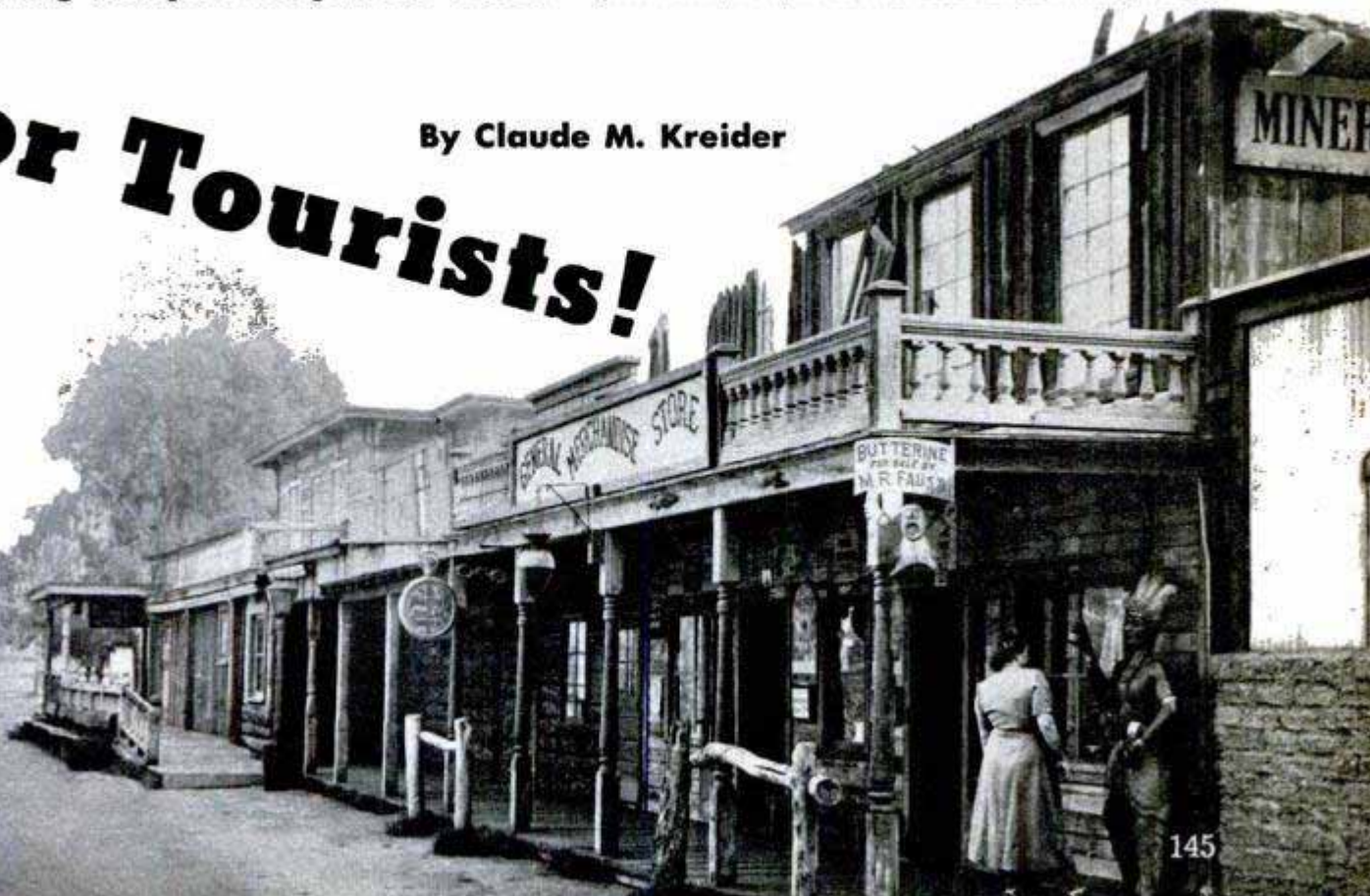


Visitors pan their own treasure from the sluice box. The gleaming flecks of gold are theirs to take home

Tourists absorb the flavor of the Old West in the ghost town, a replica of an abandoned mining village

# for Tourists!

By Claude M. Kreider





Below, not enough to make a man rich, but the flecks are pure gold panned from rich sand in the sluice box

Above, miner teaches visitors panning technique of old-timers. Behind him rises an artificial canyon wall



cooking over a fireplace that has been hollowed out of the "rock" cliff.

Mining engineers have marveled at this complete reproduction of a real desert mine. Geologists have chipped the serrated flagstone of the "canyon" wall, amazed to find it manufactured rock, made here. Some 2000 sacks of cement and 16,000 sacks of sand and gravel went into the building of the "desert hills" and the rocky wall of the canyon. Greasewood and cactus grow upon the slopes.

To complete the authenticity of the project, rich gold ore is brought from a desert mine and ground in the mill. But, when the supply is exhausted and the yellow grains no longer fleck the sand on the riffle board below the stamp, there's still gold in the sluice box. How it gets there is Walter Knott's secret. But 'tis said that sometimes a small—and heavy—package arrives from the mines at Fairbanks, Alaska.

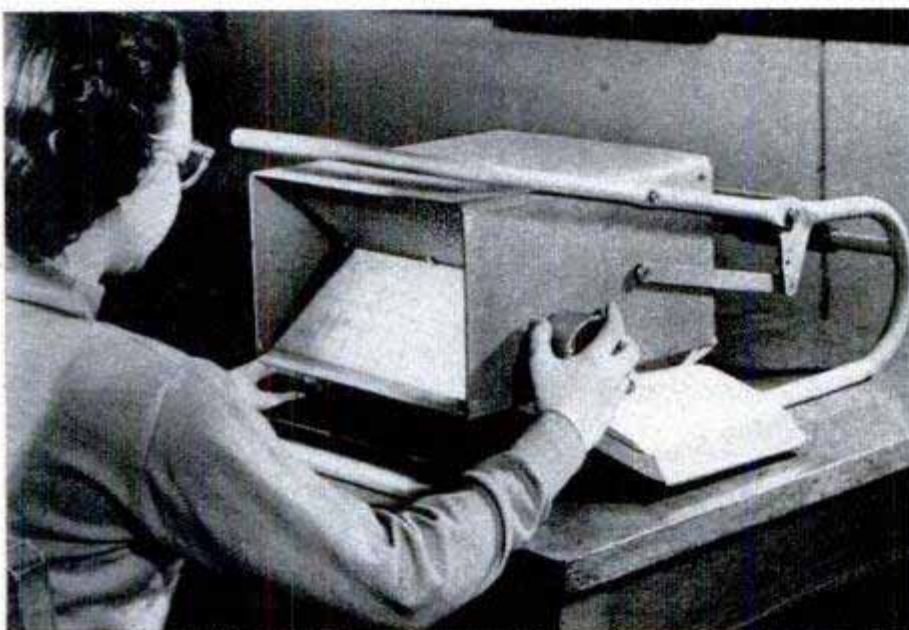
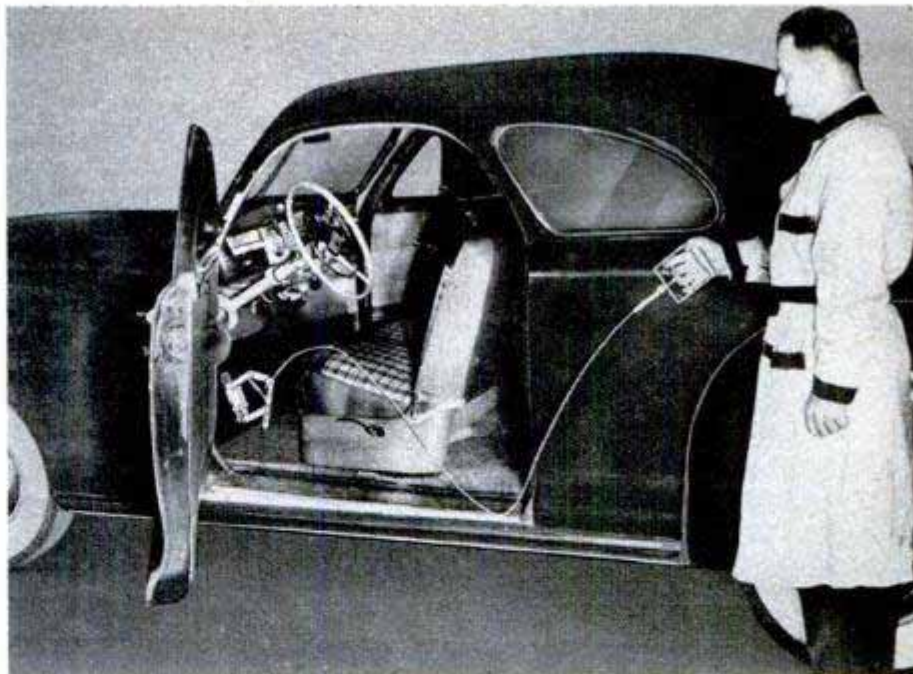
And that rich quartz, embedded in the walls of the cross drift? Well, no one seems to know how it got there. But "salting" a mine is an ancient and well-known technique—and Mr. Knott is wise in the ways of the desert.

Here's a scene you might find anywhere in the desert. A few feet from a busy Western highway the miner camps with his little pack burro



## Extension Throttle Speeds Car Repair

One man does two men's work with a remote accelerator-pedal depressor that provides a means of controlling engine speed from outside the car. A long flexible cable operates a pedal depressor that is easily attached to the accelerator of any car or truck. The squeeze-type control can be set to keep the engine running at any desired speed. It simplifies such operations as engine tune-ups, rear-wheel balancing and under-car inspections.

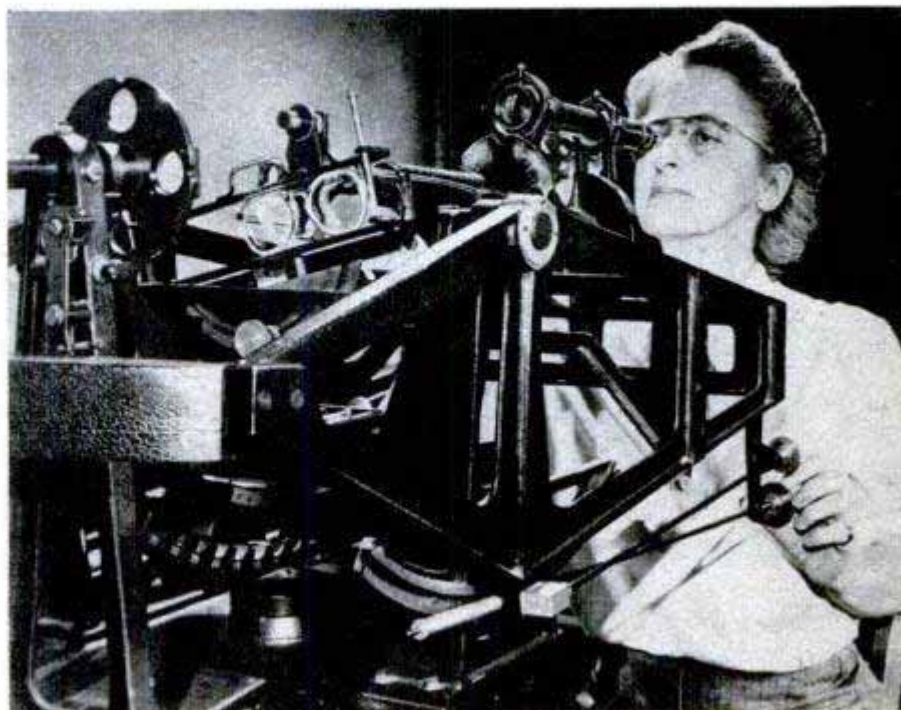


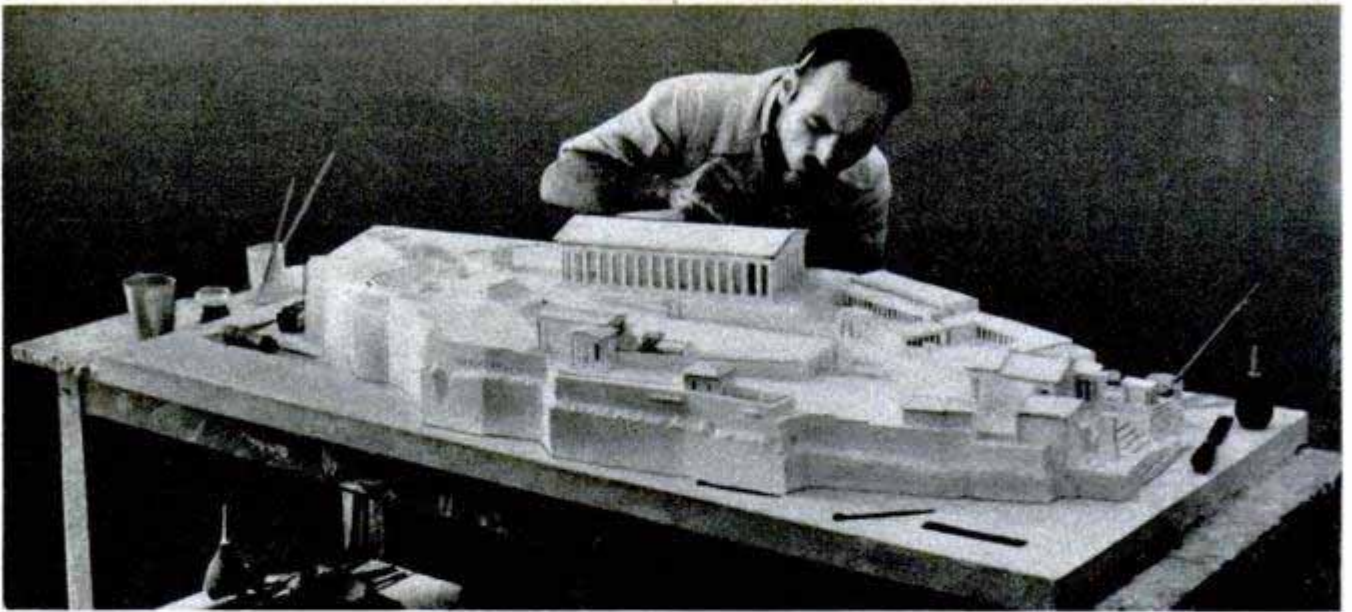
## Reading Machine

Print is magnified to five times its original size by a new projector for personal use. Developed at the Franklin Institute in Philadelphia, it is designed to permit persons with extremely limited vision to read newspapers, magazines and books. The screen is large enough to carry a full newspaper column and for scanning across wider pages the lens is controlled by a knob. A lever moves the reading matter up or down under the lens.

## Dipto-Eikonometer Tests Lens Design

You probably don't know what a dipto-eikonometer is, but don't worry about it because there is only one in the world. The instrument measures the accuracy of lenses that are used to correct aniseikonia, an unusual defect in which the images seen by the two eyes are unequal in size. Miss Ethel E. Spooner of the American Optical Co. designs the corrective lenses for victims of aniseikonia and then tests them for accuracy on the complicated dipto-eikonometer.





Skillful Greek plasterer adds a detail to the majestic Parthenon, the principal temple of the Acropolis

## Scale Model Gives Ancient's-Eye View of Acropolis

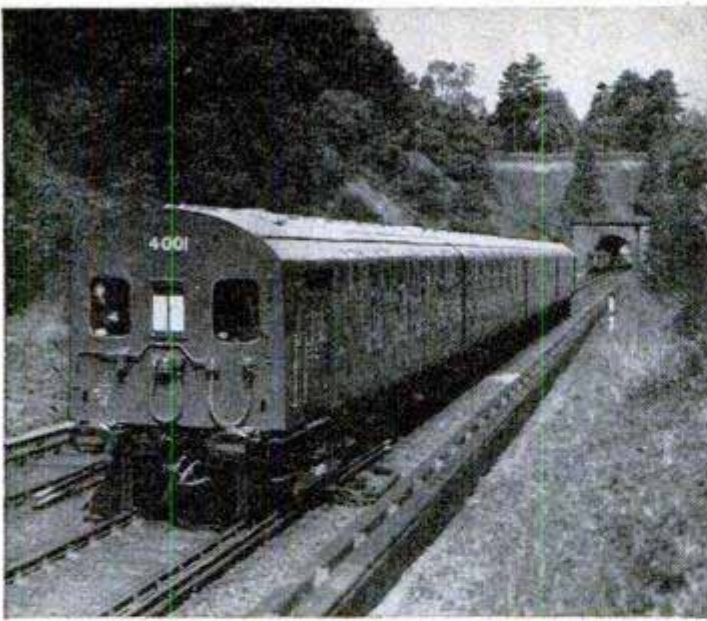
Visitors to Athens will be able to visualize the full beauty of the Acropolis when they study a scale model of the ancient Greek temples as they were during the first century B.C. Made by Gorham Phillips Stevens, former director of the American School of Classical Studies at Athens, the plaster model is the result of 26 months of work. Stevens prepared 126 drawings of the various buildings before construction was started. The complete model is made

of a special plaster to a scale of 1:200. The cornices were formed with 63 tiny templates, each of a different design. Molds were used for identical columns. There are 21 different column designs in the model. Making molds and templates took a third of the work time. Hundreds of small monuments had to be made, many of them based only on literary sources. The model will be given to the Acropolis Museum to serve as a guide to visitors.

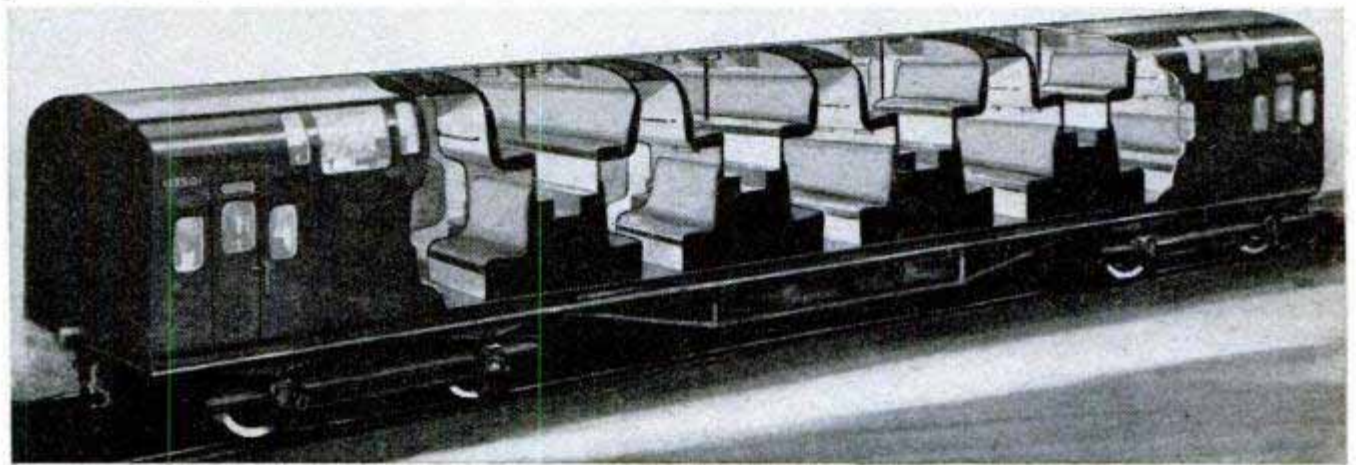
Over-all view of the model clearly shows the precise craftsmanship that went into the plaster reproduction







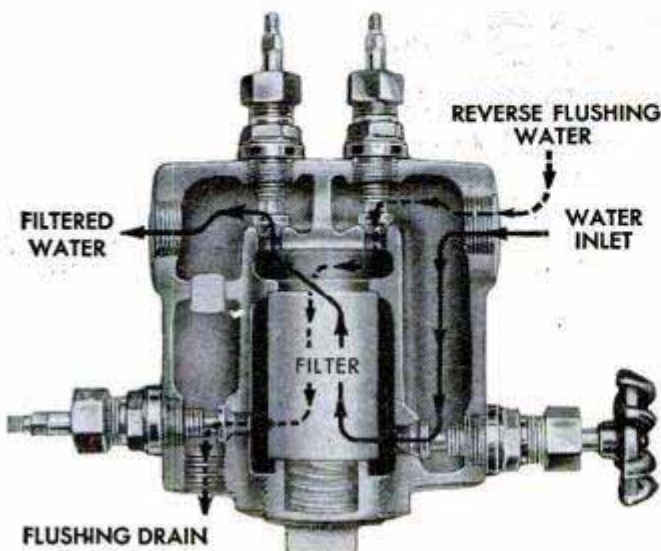
Eight of the experimental double-deck cars have been built and are being tested in two sections of four cars each. Total capacity of the cars is 1104 passengers, a substantial increase over eight conventional cars. Right, each compartment seats 11 below and 11 above. Below, diagram shows layout of car's interior



## Double-Deck Train

All eight cars of a new electric train in England have a double-deck seating arrangement which substantially increases the passenger capacity. The eight-coach train, with a total capacity of 1104, seats four passengers for every three on an ordi-

nary British electric train. Despite the additional revenue space, the train weighs no more than existing trains, and the coaches are only 4½ inches higher. The upper seats are directly above the lower seats but face in the opposite direction. Luggage space is provided above the upper compartments and below the main-floor seats.



## House Water Filter Flushes Itself Clean

All the water in a house is filtered of foreign matter by a compact filter unit that is quickly attached to the main water line. Rust, scale, algae, sand and other foreign matter as small as .0002 inch in diameter are screened by a porous bronze filter element that cleans itself by back-flushing. The filter elements come in three grades.

☞ Locusts stay "on the beam" in flight by means of short hairs on their heads which bend in the wind, the angle of bend telling the insect when it is flying straight.

# HOME-BUILT ENGINES



**By G. W. Arthur-Brand**

*Associate Editor,  
The Model Car News, London*

**T**HE OPERATION of gas-powered miniature race cars was already in an advanced stage of development in the U. S. when a group of British model enthusiasts "discovered" the sport as a new means of relaxation. That was back in 1942, during the wartime shortage of materials.

One might naturally assume that the British pioneers of the sport would follow in the footsteps of their American counterparts, but such was not the case. The first engines which powered their cars probably came from the grounded fuselages of model airplanes or the depths of assorted junk boxes. The chassis may have been built from the component parts of various instruments of war, and the bodywork carved from what had been wing fillets or undercarriage fairings of training planes. A

handful of enthusiastic would-be auto designers succeeded in altering various scrap parts with imagination, and almost overnight a new sport was born.

Perhaps it was because of these early struggles and the Englishman's love of creation that the trend in home-constructed designs has remained unchanged. Today, at any meet in Britain, although American Dooling, McCoy and Hornet racing engines have found great favor because of their consistently brilliant performances, by far the greater percentage of the miniatures are equipped with power plants constructed on home workbenches. In the increasing quest for speed, some enthusiasts have purchased American proto kits, yet these superbly finished, factory-produced jobs must be expertly handled if they are to keep pace with cars from home workshops.

Holder of the British record, Gerry Buck's Topsy is a typical example of the high degree of realism which can be attained in the scale replica racing car. Streamlined rear-view driving mirrors, a steering wheel and an exhaust pipe add that touch of realism which immediately raises the model above the standard of the purely functional racer without detracting

# POWER BRITAIN'S MODEL RACERS



Above, English enthusiasts line up with their cars before big race. Most models are home-constructed

Right, Ray Flower makes last-minute adjustments on his McCoy 29 just before breaking the English record



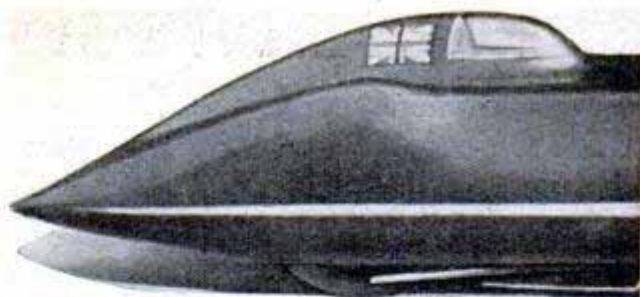
Below right, contestant shoves car to start it. Some cars have clutches permitting stationary warm-up

noticeably from the car's performance.

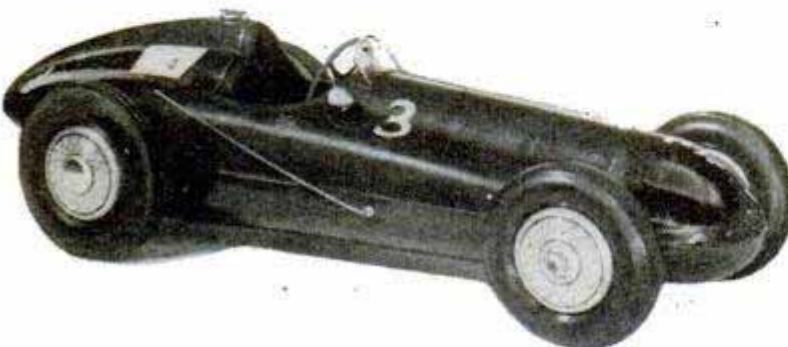
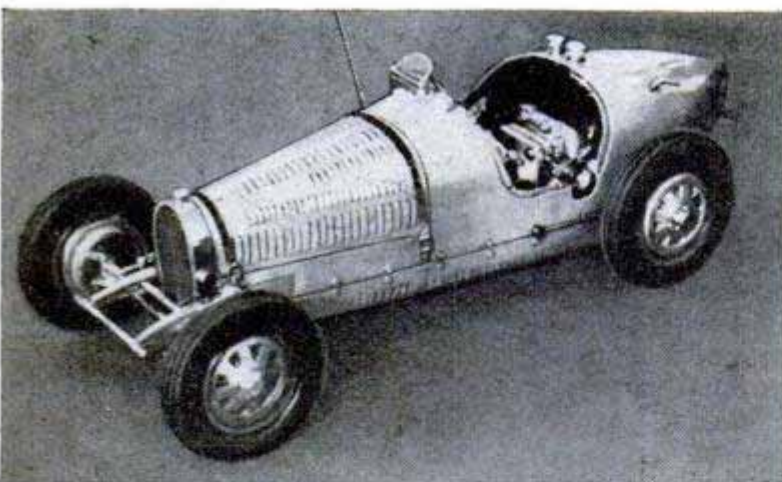
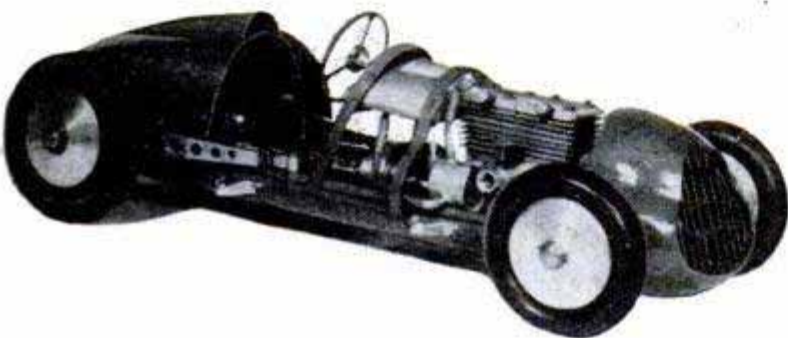
Topsy's engine, a Buck 60 Special, was designed and constructed entirely by Buck, a job which required about three years of spare-time work. That a really first-rate job had been done was proved when it became the first car of any type to exceed 100 miles an hour in Britain.

Home constructors are continually at work, improving some fitting here, taking a bit more weight off there or carrying out some new modification which might make just enough improvement in performance to capture the cup at the next meet. Appearance, finish and correctness to scale all play important parts, as the majority of contests award points for these factors. Judging calls for a thorough knowledge of the model's full-size counterpart and the acceptable practices in miniature design. The author, having judged hundreds of cars, never ceases to find fascinating new details at each succeeding competition. (A glance at the workmanship incorporated in the front suspension of "Jonah" Jones' Bugatti will give some idea of the near perfection which has been attained.) Points are given, too, for originality in the adaptation of engine layout for a difficult scale





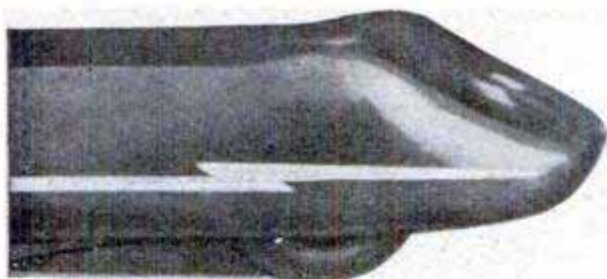
Left, the author, who frequently judges the events, inspects one of the little 100-mile-an-hour cars. Below are three different styles of British racers including, from top down, an experimental car with a twin-lung motor driving through a centrifugal clutch and gearbox; a model scaled in every detail to its counterpart; and the Topsy, a record holder complete with rear-view mirror and an exhaust pipe. Above, a 23-inch-long model of the famous Goldie Gardner car tips the scales at 6¾ pounds



outline, and here again, as in Buck's Topsy, may be seen the clever way in which the spur-gear unit has been installed. With a speed in the 90s, the "Bug" is a consistent performer and has won many cups.

Britain's veteran race cars, though long outdated by the new Ferraris, Maseratis and Alfettes, continue to capture honors in some of Europe's major events and carry on the tradition of the true racer of the prewar era. It is easy to understand, then, why such a car was selected as a subject by so adept a craftsman as A. F. Weaver. A pioneer of the British movement, he has produced a model second to none for magnificence of finish, and one which is complete in almost the tiniest detail. Yet improvements are continually being made. He recently has cut louvers in the bonnet, and now is planning spoked wire wheels. The homemade engine of this car is properly positioned under the bonnet and drives through a centrifugal clutch and bevel gearbox. A fire screen divides the engine compartment and the well-equipped, leather-upholstered cockpit. The exhaust pipe and springing are both functional.

The centrifugal clutch used in this type of car is in itself an ingenious piece of mechanism, allowing the model to accelerate with the realism of its big brother. When the motor is cut at the end of a run, the rear axle becomes



**Models at right, from top down:** According to the author, the most ambitious chassis yet attempted in England, this car has two gearboxes for four-wheel drive; model patterned after a prewar racer even has an upholstered seat for the driver; stripped-down Bugatti has a rear-mounted magneto and a steering mechanism that isn't just ornamental—it really works; front end of the Bugatti, always a favorite with racing fans, has plated parts and tiny but functional shock absorbers for easy riding

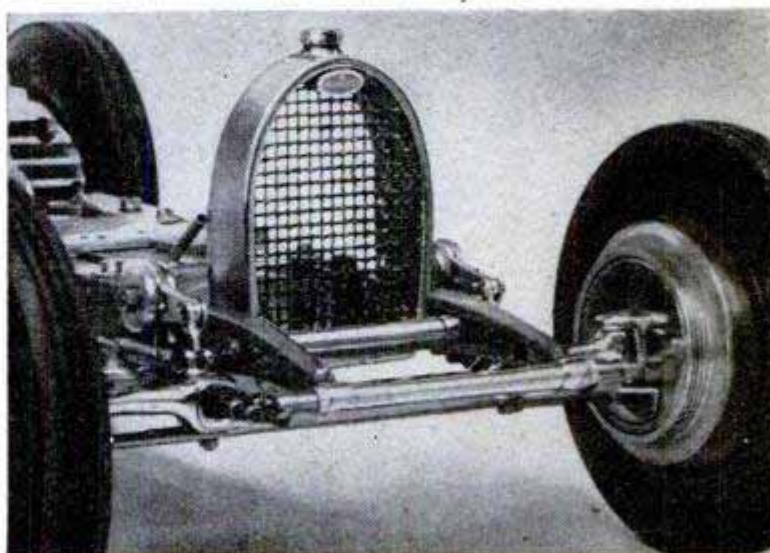
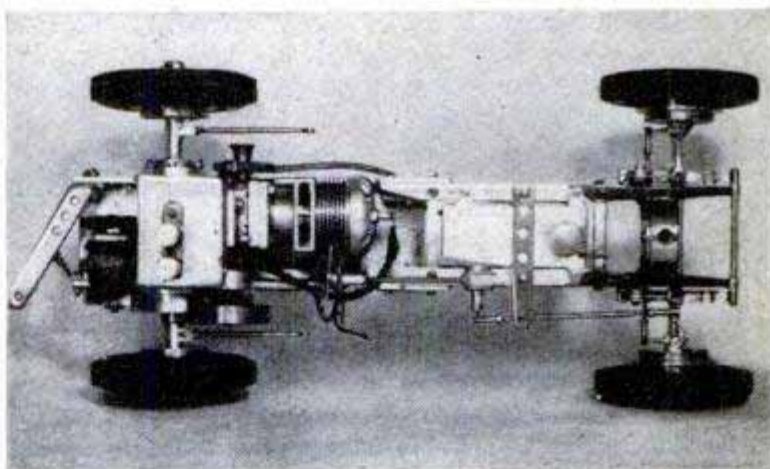
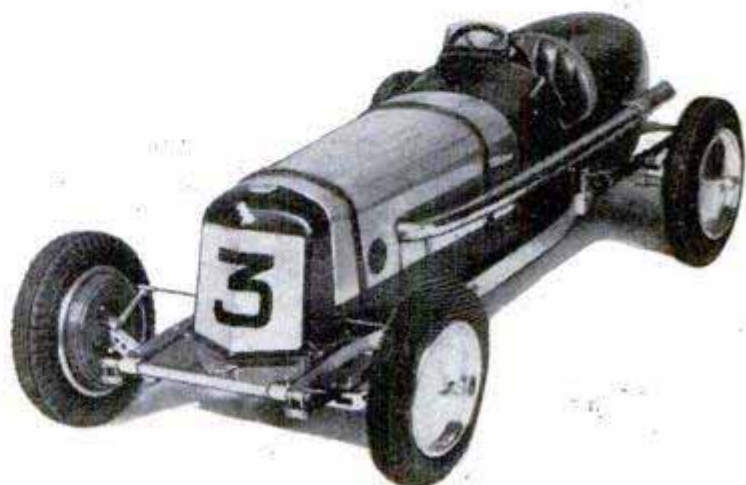
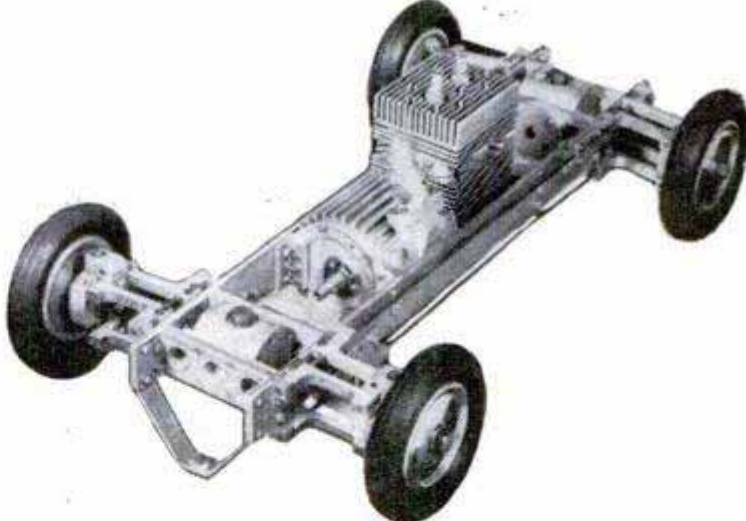
disengaged from the engine and the car coasts to a stop after a further two laps. The whole device is extremely simple, consisting usually of three spring-loaded shoes fitted to the face of the flywheel running inside a clutch drum which is located on the propeller shaft. As the speed of rotation of the flywheel increases, the shoes overcome, by the action of centrifugal force, the tension of the springs, causing their faces to grip the inner face of the clutch drum, thus transmitting the drive via the gearbox to the driving wheels. When the engine is cut, the tension of the springs causes the shoes to return to their closed position, allowing the car to freewheel.

The advantage of the clutch over direct drive is largely in starting, as it allows the motor to be warmed up immediately prior to the "take-off" and the car launched on its run without the need of a push.

Record cars are not without their share of fans. The neat and perfectly scaled Goldie Gardner world record-breaking job, modeled by Bill Moore, is a typical example. Powered by a Lapwing 60 motor and fitted with magneto ignition, it holds the British five-mile record at a speed of 69.77 miles an hour, which, considering the size of the model and its weight, is remarkably fast.

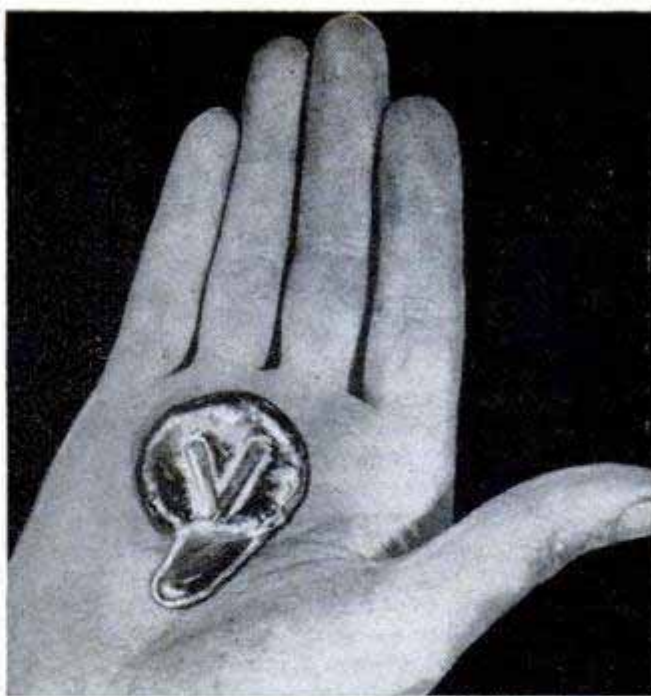
An interesting feature of the Gardner miniature is a unique

(Continued to page 222)





"Frozen" gallium takes the form of crystals with a distinctive leaf shape. Above 85 degrees, it melts



Eagle-Picher Co. photos

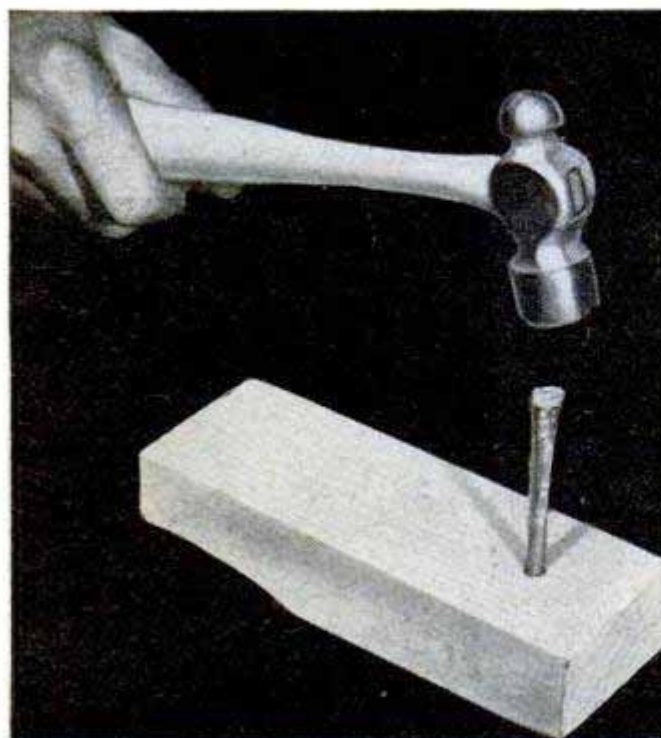
Gallium money would really run through your fingers like water! Warmth of the hand turns it into liquid

## Gallium—The Metal That Stumps the Experts

AS ECCENTRIC as a hermit, a little-known metal, gallium, has been stumping the experts for years. They can't find a job for it because it can't make up its mind whether to be a solid or a liquid. Made into the shape of a coin, it looks like a nickel or a quarter, but when you pick it up, it melts in your hand! Strong enough to be made into nails, it softens and melts like a burning candle on the first hot day.

Gallium melts at 85 degrees Fahrenheit.

Here's a good trick at \$1300 a pound! Nails formed of gallium can be pounded into wood like this, but . . .

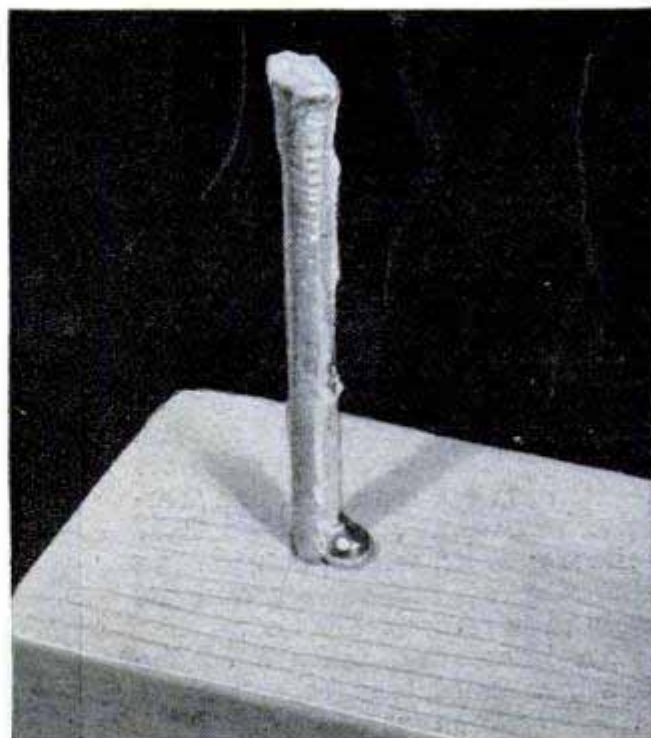


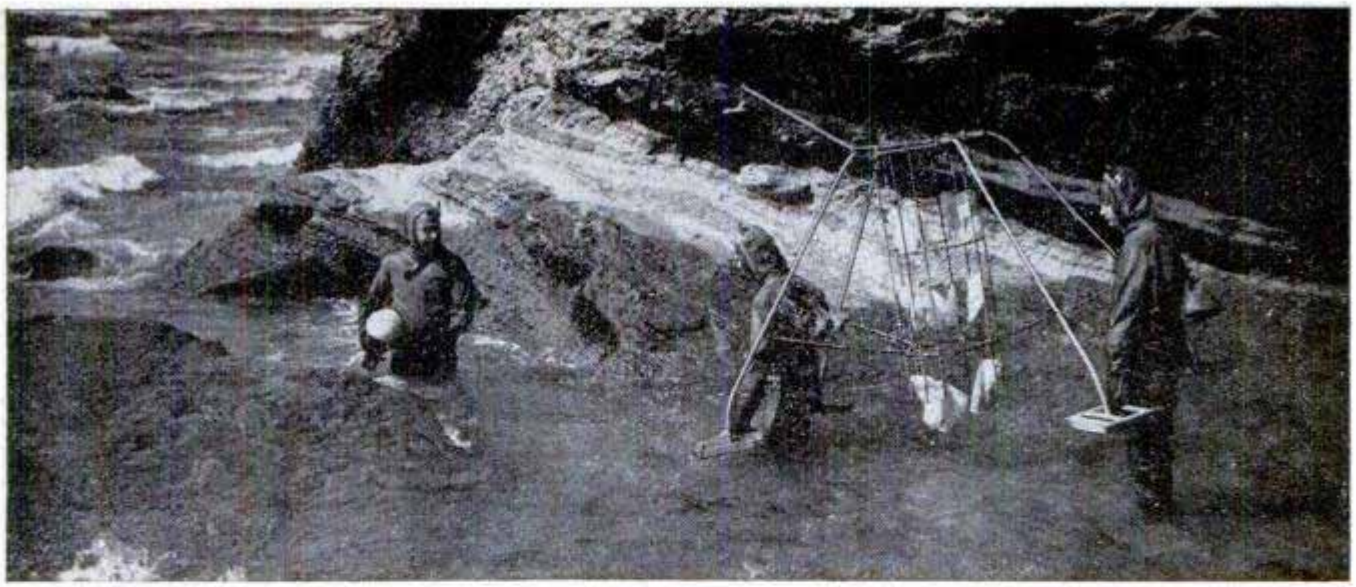
Solidified, it looks like silver; melted, it looks like mercury.

It's an expensive curiosity: \$1300 a pound. Never found as a free metal, its fabulous price reflects the expensive process of extracting it from lead and zinc.

Right now, it's the rich but unemployed member of the metal family. But it may have to go to work soon—after all, only a few years ago there wasn't much work for uranium either!

When the sun comes out, the nail melts like a burning candle with drops of metal rolling down the side

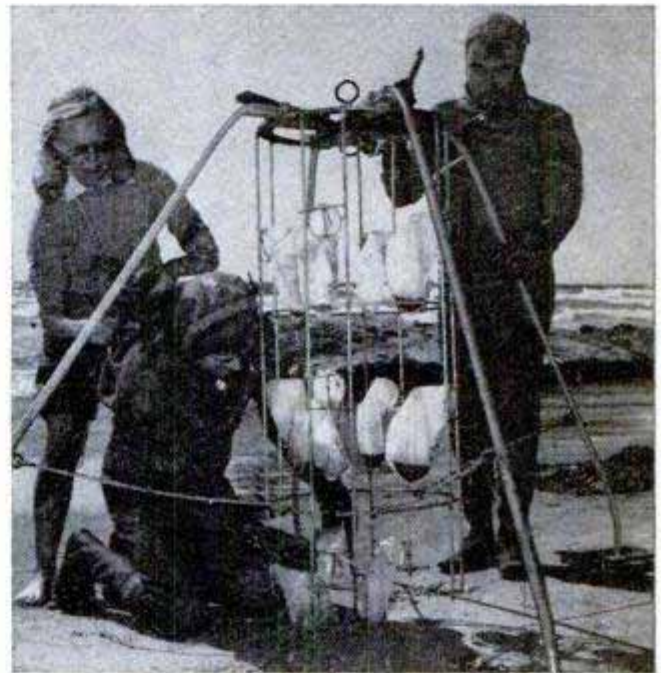




## OCEAN SAND TRAPPERS

DRESSED in rubber suits for protection against the cold, a group of "sand men" of the Scripps Institution of Oceanography, La Jolla, Calif., spend part of their time setting underwater traps in the surf to catch samples of waterborne sand. The usual trap is a frame from which open-mouthed cloth bags are suspended. After a measured length of time in the water, the amounts of sand deposited in the various bags give an indication of the amount and direction of sand transported by currents and wave actions. In studies of the direction and velocity of bottom currents in the surf and immediately offshore the sand men use a weighted volley ball, very slightly heavier than sea water, attached to a long line and reel in the hands of an operator on the beach. Rolling easily along the bottom, the volley ball responds to any current that exists. Since some beaches build up when a breakwater is erected near by, while others are scoured away, the studies will aid in selecting sites for breakwaters that will provide the least amount of disturbance.

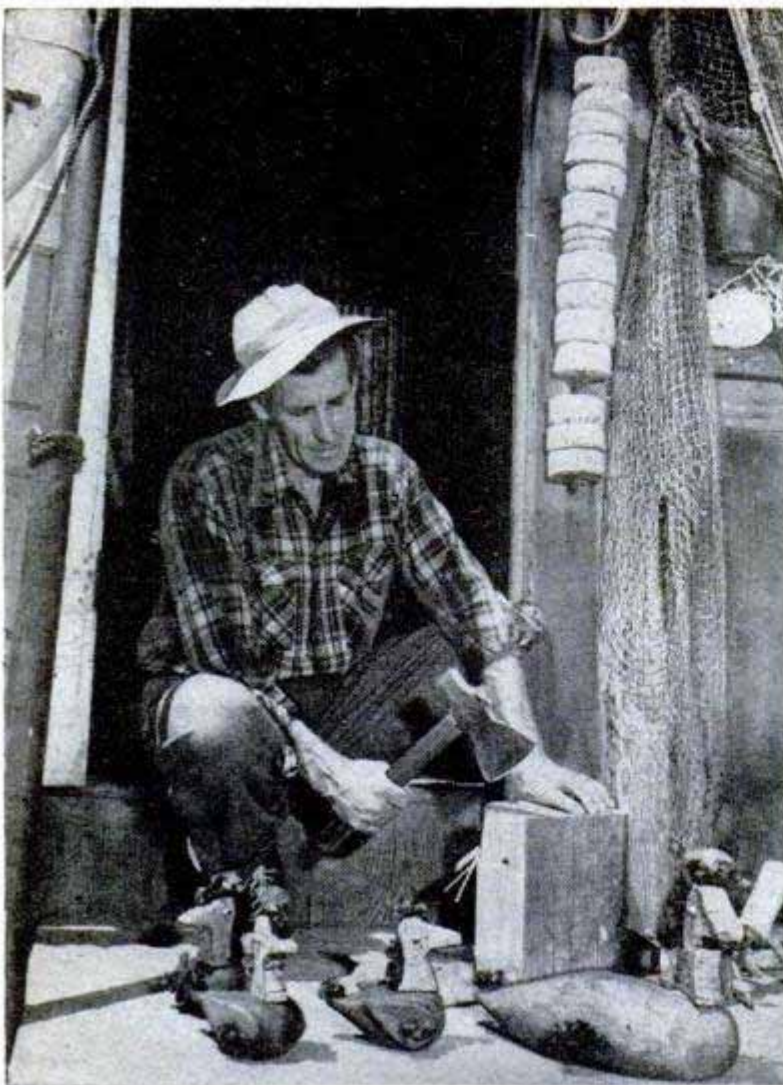
"Sand men" carrying a trap out into the surf. One holds a weighted ball that measures bottom currents



On beach, above, sand removed from open-mouthed cloth bags indicates amount and direction of sand shifted by waves and currents. Below, an amphibious "duck" helps in studies of offshore beach erosion



# BEACHCOMBER DE LUXE



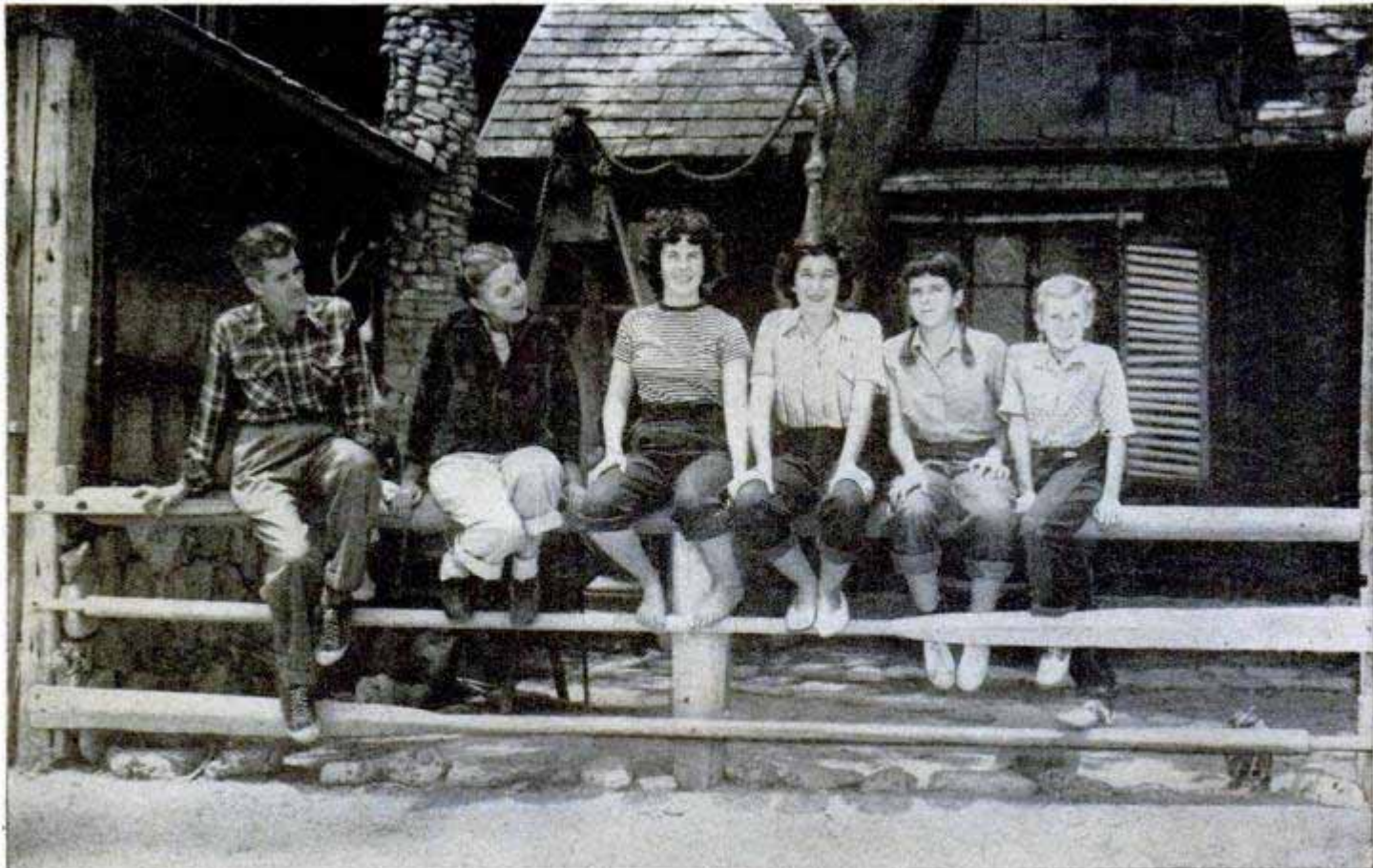
Above, sitting in his workshop doorway, Hedley splits up some driftwood to make novelty ducks, foreground. Below, the happy beachcomber and his family outside their home by the seaside

**B**EACHCOMBING is an occupation that appeals to every one at some time in his life. But most of us, for better or worse, never take it up.

Out in California, however, there's a fellow who makes a living from the flotsam and jetsam washed up on the beach. And it's a mighty comfortable living that the Pacific waves wash ashore for him and his family.

He is Eli Hedley of San Pedro. His fertile imagination and deft fingers convert the ocean's cast-offs into unusual items that sell for handsome prices to Hollywood celebrities and ordinary folk alike.

Helped by his wife and four daughters, Hedley turns saki bottles into goblets, ship wheels into chandeliers, glass Japanese net floats into attractive lamps and odd bits of sea-etched driftwood into furniture and decorative novelties. In the summer, the Hedleys drive north to comb the beaches of Oregon and Washington on their "vacation." Such is the life of a beachcomber!







**Above, staves from a barrel that drifted ashore from who-knows-where were reassembled into this beautifully polished chair**

**Daughter Marilyn helps her father as he works on his net collection. The Hedleys use nets as draperies in their living room**

**Below, right, with the waves of the Pacific forming a background, Hedley sorts a day's collection of colorful seaweed and shells**

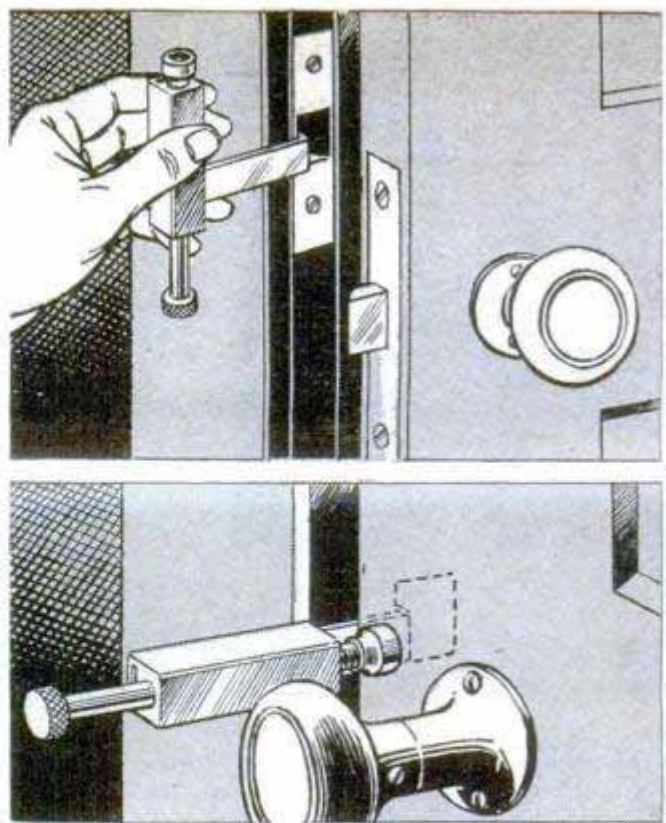
**Below, these toothpick-studded driftwood horses are hors-d'oeuvre servers. In foreground is a hurricane lamp with cork base**





### Mica "Grows" As Furnace Cools

Synthetic mica, with essentially the same properties as natural mica, has been "grown" successfully by scientists at the National Bureau of Standards. The raw materials, quartz, magnesite, bauxite and a fluorosilicate compound, are placed in a platinum-lined crucible and melted in an electric furnace with a heat of about 1400 degrees Centigrade. As the furnace cools, mica crystals grow from a tiny "seed" at the bottom of the crucible. The mica thus formed is able to withstand high temperatures much better than the natural material, an essential item in this country's electrical and electronics industries because of its splendid insulating properties.



### Portable Door Lock

Travelers are assured of privacy in a strange room when they use a portable lock that fits any standard door. Small enough to be carried in a pocket or purse, the lock has a thin metal strip that fits across the jamb and hooks into the latch-bolt opening. The door is then closed and another section of the lock pivots down into place against the door. By turning a bolt, the traveler can fasten the lock tightly against the door. Thus, anyone trying to enter, even with a key which fits the conventional lock, is pushing against the metal arm hooked inside the jamb.



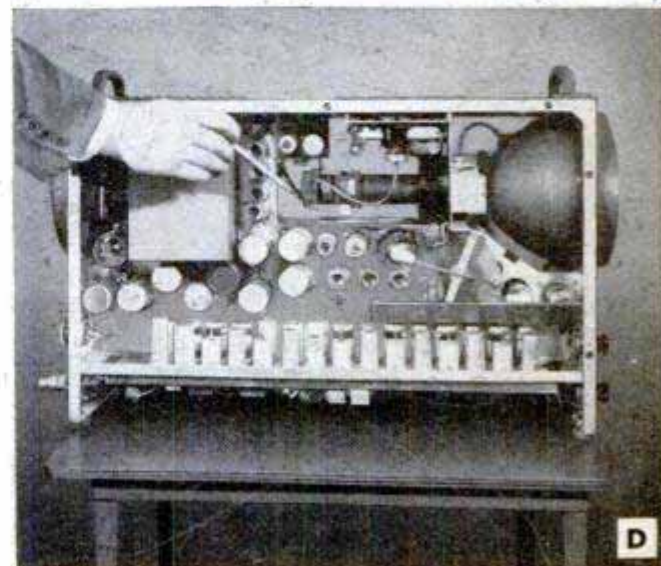
### Automatic Coupler For Farm Tractor

Farmers can hook wagons to tractors without risk of crushed fingers when they use an automatic coupler. Bolted to the tractor drawbar, the coupler has a funnel-shaped casting to guide the tongue into the socket. A trigger in the socket drops the hitch pin at the proper moment. The wagon tongues are provided with a chain and spring to hold them up off the ground at the correct level. A pull cord permits the operator to uncouple without leaving his seat.

## Ultra-Compact Television And Radio Units

EXTENDING sight for aid to science, industry and education, this TV system, reported by RCA in technical papers at the 1950 convention of the Institute of Radio Engineers, is described as the smallest and simplest system ever devised for nonbroadcast industrial television operations. The new system produces excellent black-and-white pictures at normal light levels, and can be adapted to produce pictures in natural colors. With duplicate cameras and picture tubes, three-dimensional effects are possible. Photo A shows the two-unit system consisting of a TV camera about the size of a 16-mm. movie camera, and a master control unit no larger than a suitcase. The system is based on a small TV pick-up tube known as the "Vidicon." It is less than a tenth the size of the image orthicon used in commercial telecasting, as indicated in photo B. The tube is claimed to transmit pictures at normal light levels, attaining a resolution of more than 500 lines; it operates on the principle of photoconductivity, rather than employing photoemissive cells as used in the image orthicon. Interior of the master control unit with 7-in. monitoring picture tube is shown in photo D.

The tiny "personal" type radio receiver shown in photo C, also reported by RCA, is claimed to be the smallest superheterodyne set incorporating a loudspeaker.



# URANIUM SURVEY METER

ORIGINALLY described for construction in the February 1949 issue of *Popular Mechanics*, this Geiger-Mueller uranium survey meter has been of unusual interest to prospectors, students and a large number of persons on vacations in localities where valuable uranium-bearing ores might be located. This instrument was highly sensitive and the response to radiations emanating from radioactive substances such as uranium and radium was very satisfactory. However, there has been an insistent demand from builders for the addition of an audio amplifier to obtain greater volume for working in noisy locations, and for persons with impaired hearing. Some experienced builders have added amplifiers for classroom demonstrations.

This new instrument, in answer to these requests, includes all of the original parts except the .01-mfd. 600-volt fixed condenser. The 3V4 amplifier tube assembly is made on a strip of plywood and then mounted by means of two small wood screws through holes in the back of the case. Photos A and D show the completed

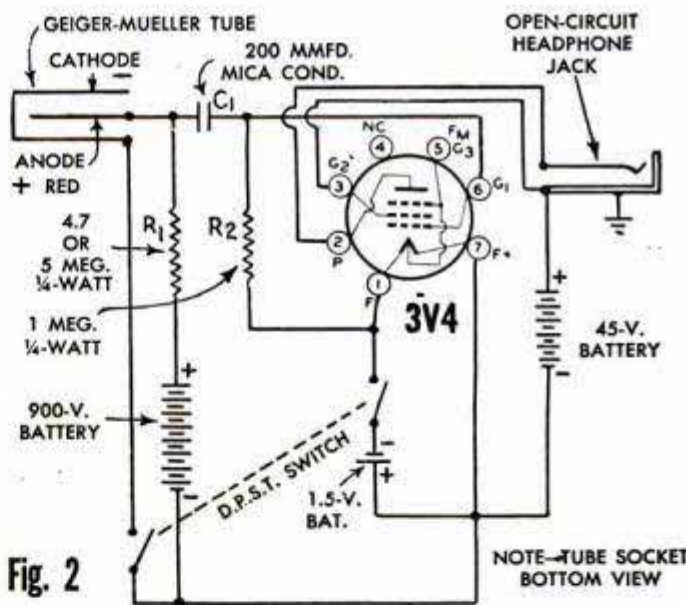
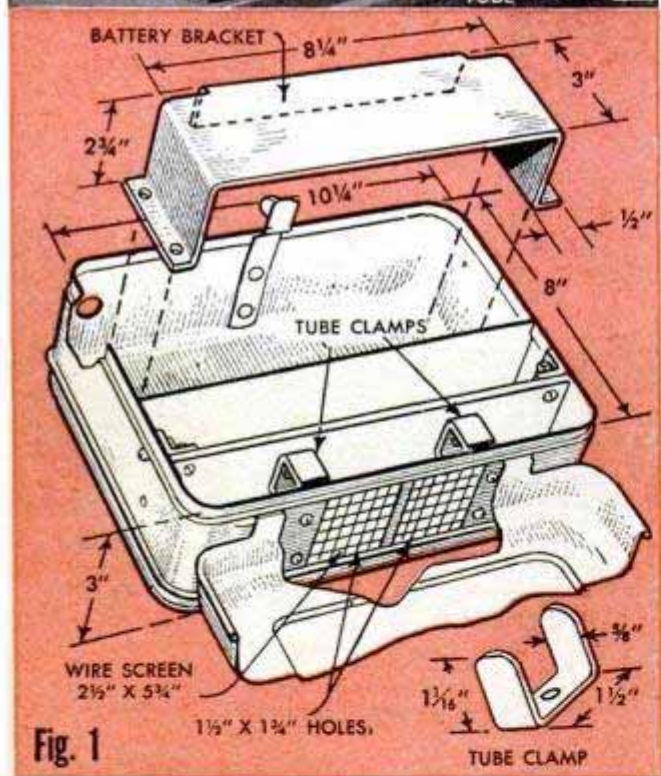
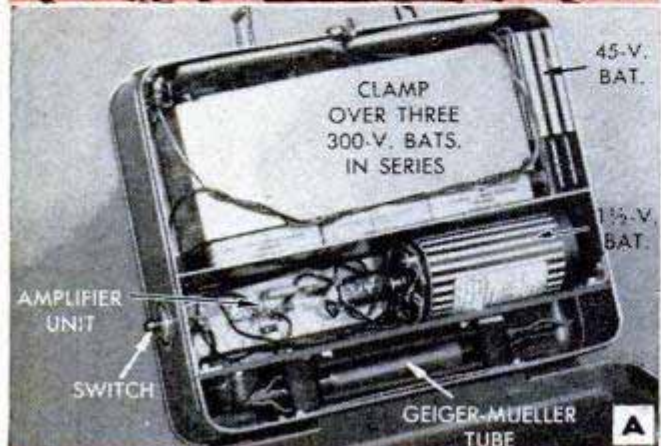


Fig. 2

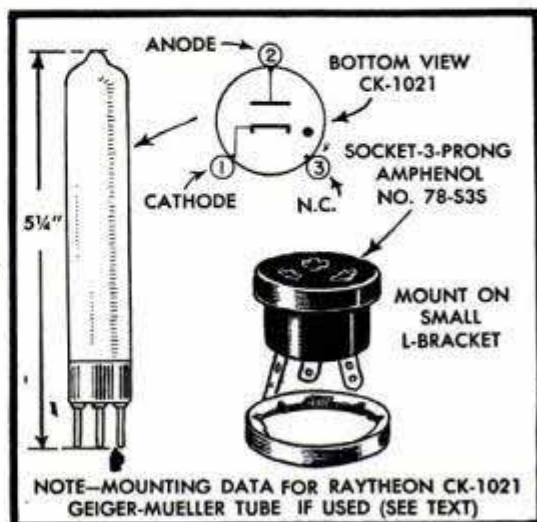


Fig. 3

# WITH AUDIO AMPLIFIER

assembly; photo B illustrates a test made by holding the new instrument near a watch having a radium-illuminated dial. With the headphones on the table, signals were audible across the room. Photo C is a close-up of the amplifier chassis-base assembly with all wiring connected ready for mounting in the case. The case is an ordinary metal lunch box of the type having a compartment for a Thermos bottle, as illustrated in Figs. 1 and 4. The original K-EX-Gem Geiger-Mueller tube is shown and those who built the original model need not disturb it. However, this tube is no longer made; it has been replaced by the new Kelley-Koett model K-23 which sells for \$7.50. Mounting details for the tube are on page 218. This tube is now available from radio parts houses. Those who wish to use the Raytheon CK-1021 G-M tube can do so by mounting a three-prong Amphenol socket on an L-shape bracket near the red and green binding posts. The tube base symbol is shown in the sketch below the schematic circuit diagram in Fig. 2. The terminal numbering sequence on the

(Continued to page 218)

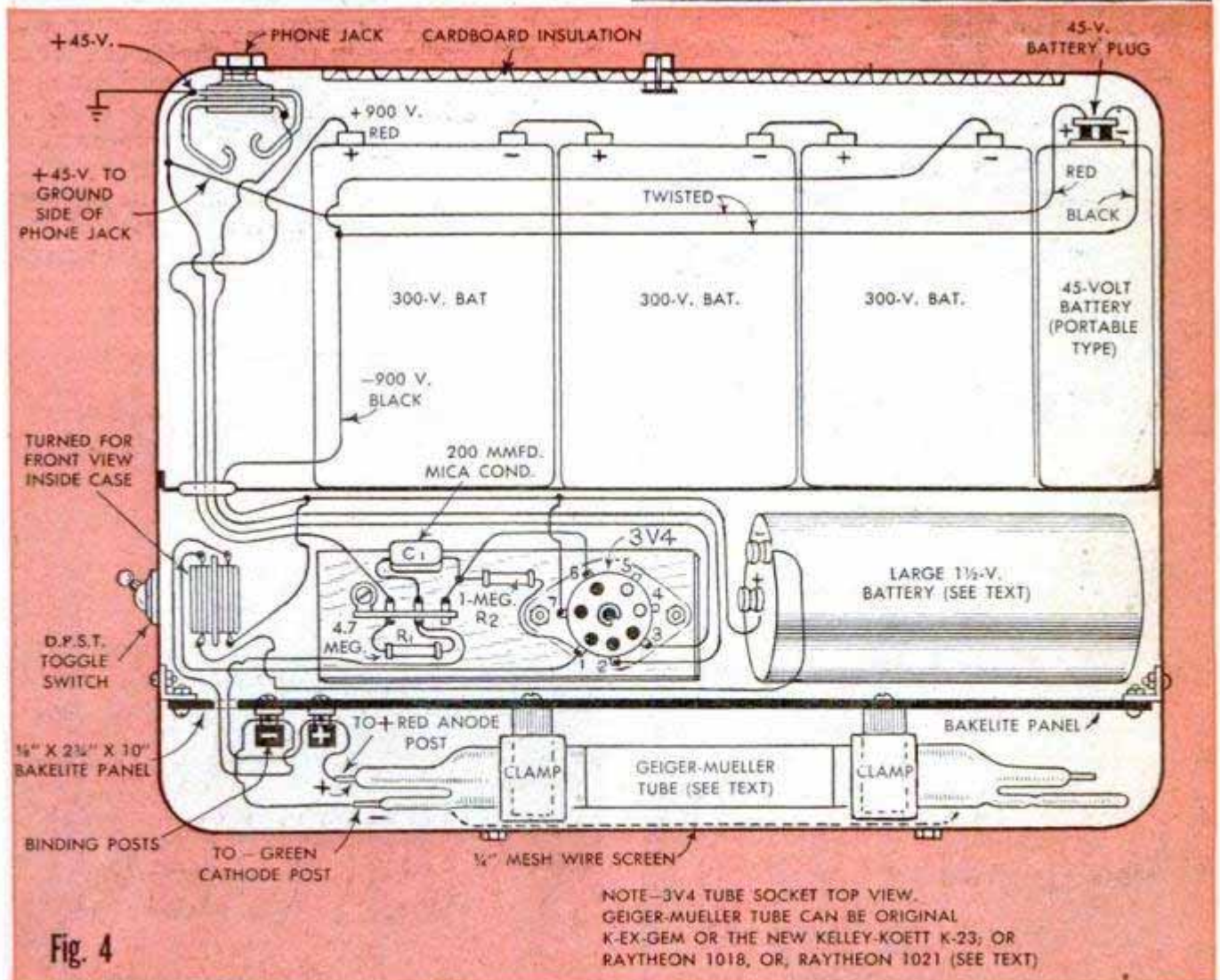
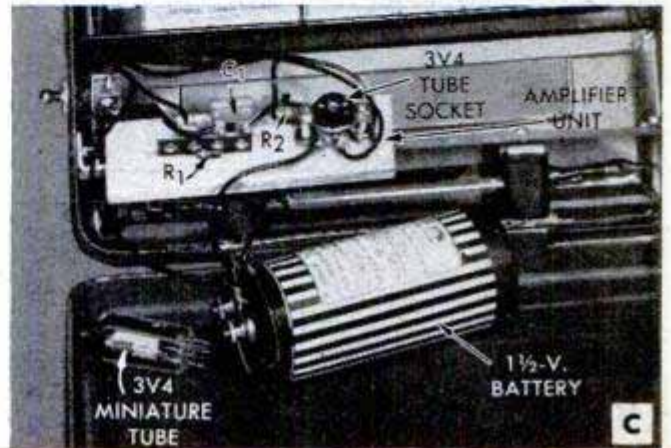
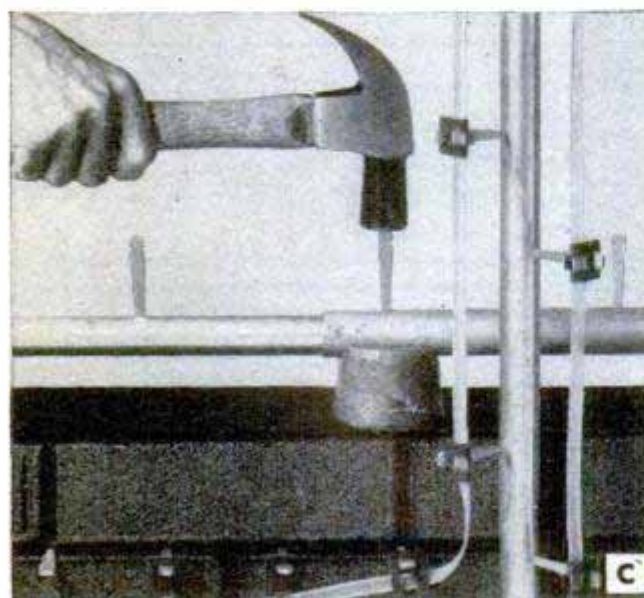
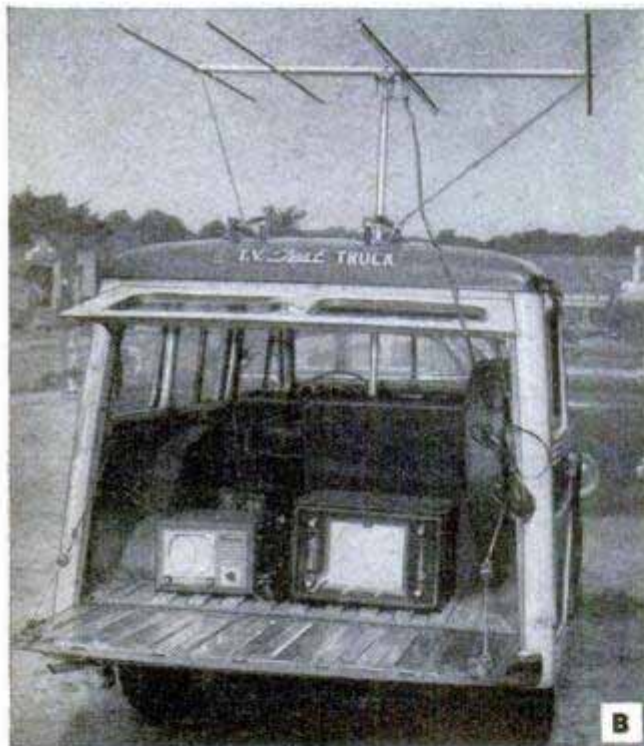


Fig. 4

## Television Sales and Service Hints

WITHIN five minutes after this South Carolina television salesman arrives at his customer's home with his specially equipped TV test truck shown in photos A and B, he is giving a convincing television demonstration. The retractable TV antenna mounted on the truck is a "Yogi" type and it can be rotated to beam on the stations selected for the test. Using a portable TV set attached to a length of 300-ohm twin-line, tests can be made at any location in the home. In this way the customer gets a very good idea of what he can expect when his new set is installed. This enterprising salesman also has several late-model TV receivers in his truck as shown in photo B. Servicemen can make good use of the same idea. Frequently a second TV set can be sold in this manner, as well as new TV antenna installations.

The TV antenna lead-in from a roof-top antenna has always entailed drilling holes into wood and mortar and screwing in standoff insulators. A special hardened-steel flat nail with a small piece of low-loss polyethylene lead-in insulating strip provides a timesaving solution for this problem, as illustrated in photo C. It is easily driven into mortar or wood, or metal masts when the pipe is backed up with a lead weight. The polyethylene strip is forced over the nail and the lead-in placed under the loop. Photo D shows a quick method of reducing glare from the TV screen. From a roll of thin filter film, a piece is cut slightly smaller than the TV screen. To do this it is best to cut a paper pattern first. The screen is moistened with plain water and the film applied. It absorbs the reflected light from lamps or windows. It is claimed to assure clear, soft pictures viewed from any angle, day or night.

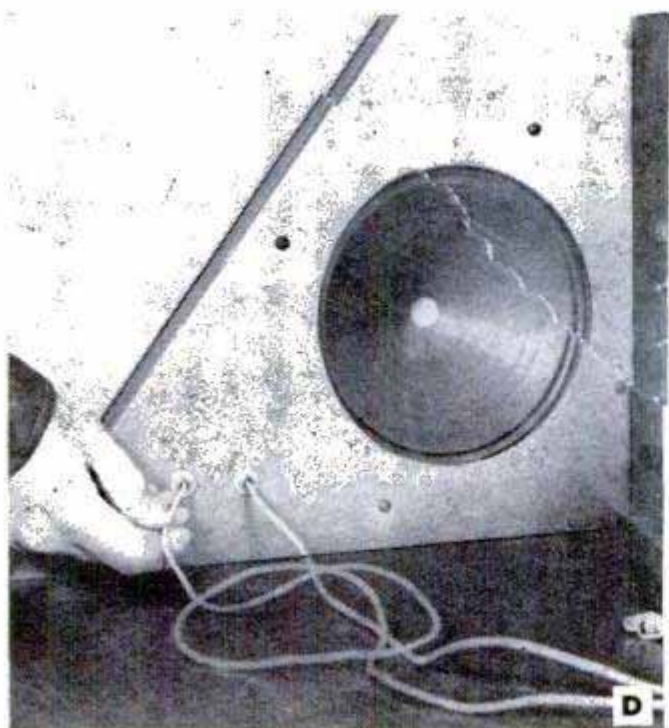
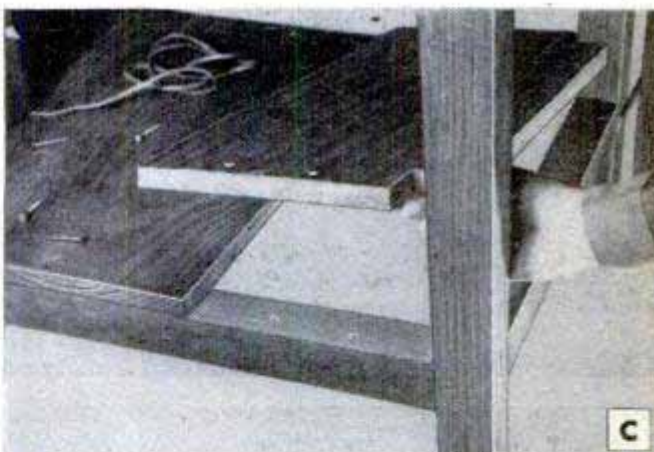
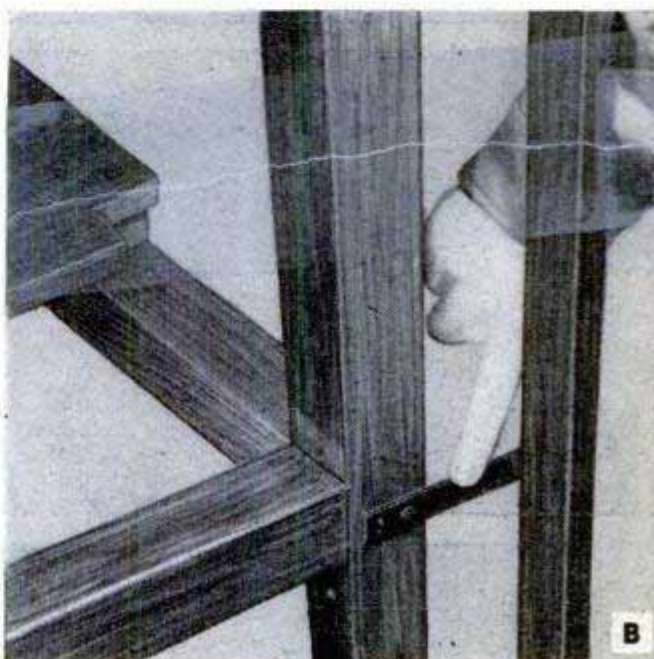


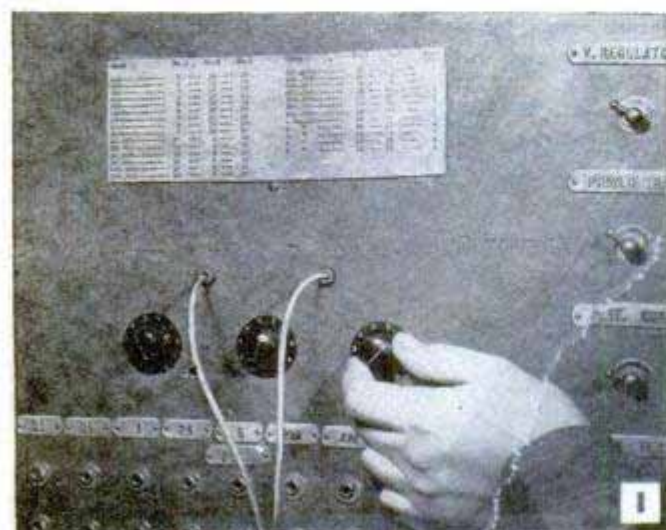
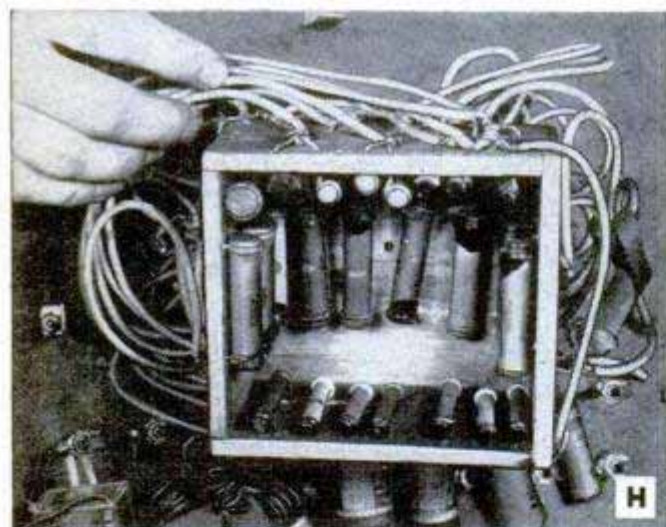
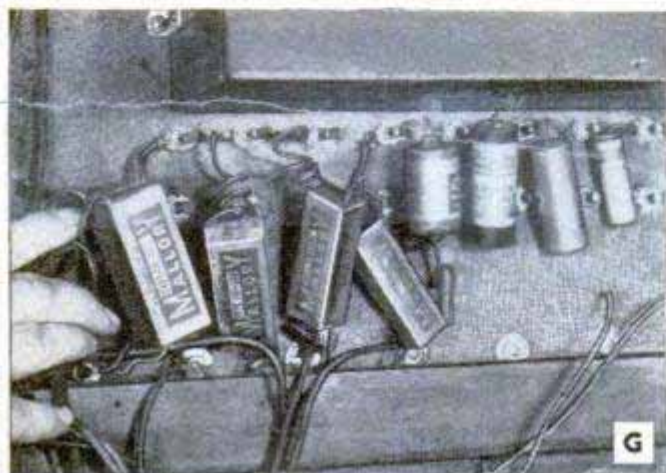
# RADIO WORKBENCH

By H. Leeper

**T**HAT old flat-top desk that is gathering dust in the attic can be made into a good radio workbench which will be useful in handling repair work or tests and experiments of various kinds. Any ordinary sturdy wooden table of similar size may be used. The completed bench shown in photo A serves many useful radio and electronic testing purposes and it was built around a secondhand flat-top desk about 4 ft. long, 27 in. wide and 29 in. high. A piece of  $\frac{1}{8}$ -in. hardboard, 4 ft. long and 2 ft. wide, is used for the back panel. This panel was reinforced around the edges with 1 x 2-in. wood strips at the rear and then nailed to the desk top. In order to make the back panel rigid, the two vertical wooden strips were extended to the floor and attached to the desk legs with flat iron as illustrated in photo B. The panel mounting was further strengthened with triangular side pieces of hardboard and wood strips. One of these supporting side pieces is used to mount a permanent-magnet-type loudspeaker as illustrated in photo D. Test leads are connected to the speaker through pin jacks.

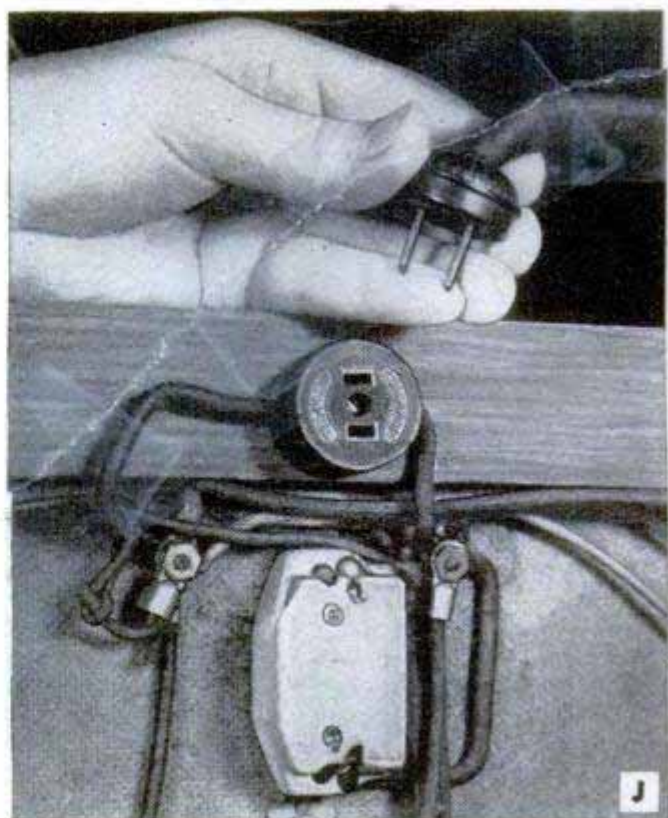
The desk legs are braced with 2 x 2-in. wood supports all the way around, using angle-iron brackets and screws. A covering of 1-in. lumber was then installed as indicated in photo C, thus providing shelf space for tool kits, power-supply units and portable testers. A B-voltage supply unit is located on this bottom section and it is wired to a control switch and terminal





posts for various B-voltages on the panel front. An eliminator for testing auto radios is also included; a heavy-duty toggle switch is mounted at top center to control the entire panel. This switch is fed from an outlet to which is attached a plug with a heavy cord extending to a wall outlet, as illustrated in photo J. In order not to leave the bench energized when not in use, a red panel lamp is located in the front of the desk frame and connected across this main panel switch. Outlet receptacles on the desk front are for connecting sets, testing equipment and soldering irons. These are installed as indicated in photo F. The desk top may be covered with a large sheet of hardboard if desired, as illustrated in photo E. This will protect the top, and also provides a good working surface.

For convenience in testing, a number of fixed condensers, from .01 to 16 or 20 mfd., were mounted on the back panel and wired to pin jacks, accessible from the front as illustrated in photos G and I. A number of fixed resistors were likewise arranged on the rear of the back panel as shown in photo H and these were connected through rotating switches to two pin jacks or tip jacks mounted on the front of the panel. Photo I shows test leads plugged into these jacks. The charts show the values of the various rotary switch settings in ohms. Other equipment on the test panel includes a watt-hour meter wired to an outlet on the desk front. This is used for checking current consumption of appliances. Other units on the panel include a tube tester, condenser tester, ammeter, milliammeter, ohmmeter and various switches and terminal strips.







For the Homeowner - 10¢ (48¢ per year)

### Featuring

Team-Racing Model Planes	- - - -	174
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Painting Dresden figurines. See page 166 for full instructions

*By Dorothy Thomas*

**N**O MATTER how busy dad pretends to be in his basement workshop he soon will lay down his tools to join the whole family in taking up the popular craze of painting Dresden figurines. It's a hobby that requires no special artistic talent. Even your first results will amaze you, and there's spare-time money to be had in painting these pieces for your friends and neighbors. You buy the plain plaster castings and start from there, decorating them with special paints which produce a beautiful glazed finish closely resembling real kiln-fired china.

Porcelain-like lace on the figures actually is cloth lace which is cemented to the casting and then stiffened by painting. The examples pictured here in full color are but a few of the many different plaster figures available on store counters, and serve to suggest to the beginner possible color schemes to follow in painting initial pieces. The dainty colonial figures shown to the left and below come under the classification of Dresden figurines. However, there are many plain objects available in the form of lamps, cigarette boxes, Oriental figures, etc., that are less difficult to decorate and easy even for the small boy or girl to attempt. It's this utter simplicity, plus the professional-looking results, that has caused this once little-practiced hobby to become universal almost overnight.

**Selecting your castings:** An important preliminary step is the selection of the casting. Examine it carefully to see that there are no major flaws in the plaster, such as air bubbles, chips or pitted areas, and that

Wine, powder blue, powder pink and white are the colors used to decorate the whispering couple pictured at the left. Base scrollwork, vest and coat lining, as well as edges of lace, are done in gold  
Figurines courtesy Thomas Art Co.



## *Painting Dresden Figurines*

America's No. 1 hobby of the moment—the fascinating and profitable pastime of decorating plaster figures to produce beautiful replicas of Dresden china without actual firing or baking





features, hands, ruffles and other lines in the casting are clean cut. This will get you off to a good start, resulting in less work and a much better finishing job. If there are a few tiny nibs here and there in the plaster, take the time to sand them down with fine sandpaper. A smooth painting surface is important.

**Application of lace:** While the design of the figure determines to some extent where lace can be applied, there's no set rule as to where it must go—you can add it wherever you like, whether it be at the neckline, the

Here are examples of plain "figurine" painting in the form of lamp bases. Note the before-and-after views of the matching emperor lamp. Chartreuse, red, gold and black are predominant colors for Oriental figures

sleeves or the hemline of a skirt. Applying the lace is very easy. Usually you'll find a ruffle line in the casting which serves as a guide to follow in cementing the lace around the figure. The lace is first gathered or shirred by drawing a top thread. This provides a natural ruffle effect. Now, using regular quick-setting household tube cement, apply a line of cement completely around the casting. Then, starting at the back of the figure, place the top edge of the lace in the wet cement and hold it in position momentarily with a toothpick until

The group below are typical examples of Dresden-type figurines characterized by the lace trimming and the soft pastel coloring. Pearlizing treatment, the final step, produces the fired look of real Dresden china





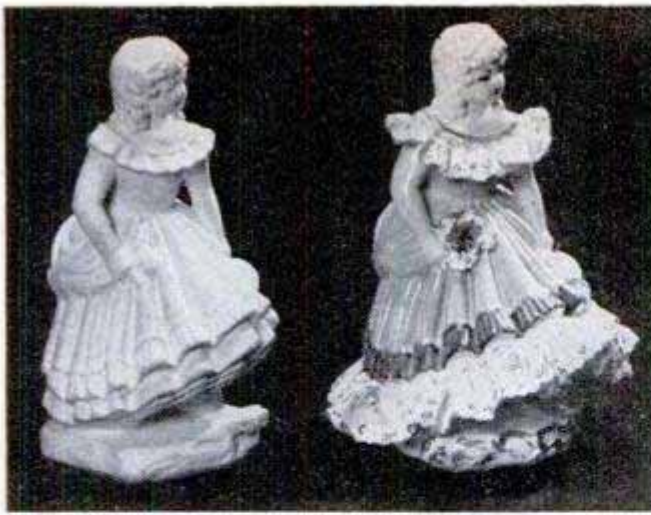
the cement begins to set. Although the cement sets quickly and requires working fairly fast, there is time to adjust the lace as you want it. Remember to make the join in the lace come at the back of the figure. When all the lace ruffling is applied, add any small bouquets or ribbons you plan to use for additional daintiness. All the trimmings must be in place before you start to paint.

**Undercoating comes next:** When the lace, flowers and other bits of trimming have been cemented in place, the entire figure is given a generous coating of undercoater. This is applied over everything—lace, flowers, ribbons, etc. In applying it to the lace, avoid closing up the mesh by blowing

through it as you continue to paint. Best results are obtained by blowing through a soda straw. This is an important step—keeping the lace open—and one which results in a better looking figurine. If one coat does not make the lacework stiff enough, apply a second, and even a third coat if necessary, the idea being to make the lace look and feel like a part of the casting. The undercoat is fast-drying and you can start coloring your figure almost immediately. Ready-mixed paints are available in shades ready for direct application—others require mixing to obtain the right tint. Stick to the pastel shades as these take on a richer look than dark colors when pearled in the final step. Pop-bottle caps are ideal containers for mixing small quantities of paint, and mixing deep colors with white will produce pastel tones of

**Oriental figures are very popular.** The grouping below, as well as the couple shown at the right, are some additional examples of plain figurine painting





Before-and-after views of colonial Dresden figurine

delicate hues. If you are undecided as to what colors to use, refer to the chart on this page which lists combinations of three harmonious colors. First, flesh tones are applied to face, hands, arms and shoulders, then the other colors are added, all except the gold trimming which is applied last. In painting the lace with the finish coat, remember to blow through the material as before. When all of the colors have been applied, let the figurine dry for about 12 hrs.

**Pearling follows painting:** Pearling is the step that gives the fired look or porcelainized finish. This is done by dusting the figurine sparingly with a special "magic" pearl powder and then buffing briskly with a soft cloth or wad of cotton. The pearling changes black to a lovely iridescent finish and makes white look like mother-of-pearl. After the pearling step is completed, parts to be done in gold are painted. Do not make the mistake of pearling the gold as this will dull its rich color.

**Features are last:** Adding features, eyes and mouth, requires practice and it's best to practice by painting them on paper. To paint eyes, first draw a small circle to form the pupil. Then with a small brush, No. 0 or 00, draw a narrow line across the top of the pupil to represent lashes. Study the eye illustration in the drawing on page 170.

**Blending Primary Colors**

Red + blue = purple	Purple + blue = violet
Blue + yellow = green	Green + blue = aqua
Yellow + red = orange	Green + yellow = emerald
Purple + red = magenta	Orange + yellow = ocher
Orange + red = vermillion	Red + blue + yellow = brown

**Pleasing Color Combinations**

- Purple — lavender — salmon
- Lavender — gray — yellow
- Powder blue — powder pink — white
- Old rose — powder blue — white
- Wine — lime yellow
- Chartreuse — forest green — red
- Brown — old rose — gray
- Wine — turquoise — white
- Turquoise — yellow — brown

(The above colors are standard ready-mixed shades)



Common cotton lace which is cemented to the plaster figure is first gathered or shirred by pulling the top thread in the lace and ruffling it uniformly



Above, quick-setting household cement is used to attach the lace to the figure. This is applied all around the ruffle line cast in the figure. Below, toothpick is ideal for holding the lace in place and adjusting it for position. Blowing on cement hastens setting





To prevent the network of the lace from filling up with paint, blow through the lace as you apply the paint. A soda straw will be ideal for this purpose

If you make a mistake in adding the eyes to the figurine, you can wipe them off and make another attempt. Eyes with black lashes and brows are generally used, although the iris can be gray, brown, blue and even lavender. Nostrils are eliminated as they are difficult to apply. Lips should be kept soft in color and are easily applied by following the contour of the mouth.

**Plain figurine painting:** When painting a figurine that has no lace trimmings, start by applying the undercoater. Then add the flesh tones and follow with the rest of the colors. Here, you can paint a figure at one sitting, as one color of china enamel can be painted close to another wet color without its running or bleeding. Even though the enamel is dry to touch after two or three hours, remember that it should be allowed

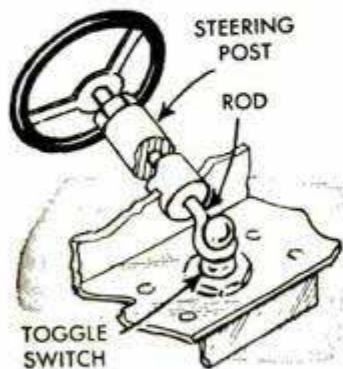


These designs serve as patterns to follow in adding eyes and floral sprays to your figurines. The iris of the eye shown as white often is painted lavender

to dry for at least 12 hours before pearling. If the finish is not thoroughly dry, the pearling step will "ruffle" the enamel coat. If you wish to blend colors, apply a color such as pink to the inside of crease lines in the casting and blue to the top. Then, using enamel thinner, blend the blue and the pink. This will give a pleasing taffeta-like effect, appropriate for colonial figures.

**Antiquing your figurine:** Antiquing or staining gives your figurine an aged look and produces a beautiful finish. To antique a figure, let the undercoat dry for approximately 15 minutes and then apply antique freely, letting it run on the figure. Let this set for 5 minutes and then wipe off lightly with a soft cloth. This high-lights the figure leaving it dark in the creases and folds and light on the surfaces, thus adding depth.

## Hidden Switch for Model Speedboat Controlled by Steering Wheel



Instead of marring the realistic lines of a scale-model speedboat with a starting switch, one modelmaker mounted a toggle switch inside the hull and controlled it with the dummy steering wheel. So that

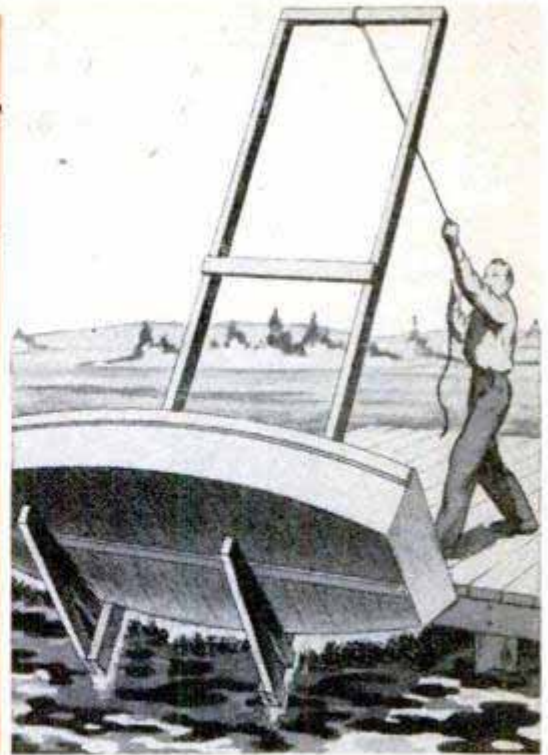
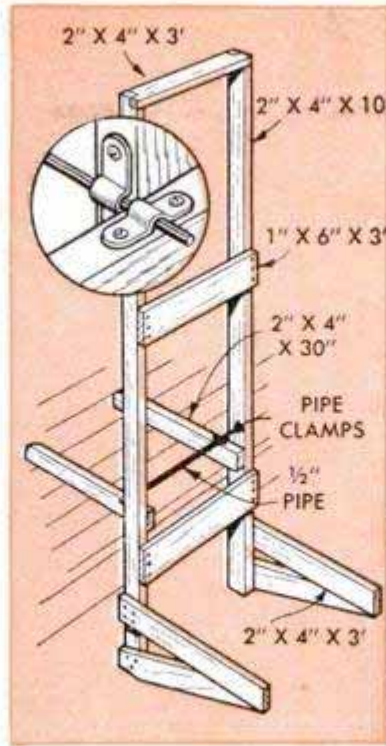
pushing or pulling on the wheel would operate the switch, a length of stiff wire was used for the steering rod. The wire, which is a sliding fit in the steering post,

is bent to form a loop at the lower end, the loop fitting over the end of the toggle-switch button. The wheel is then soldered to the upper end of the steering rod. As this switch control is subject to considerable use, be sure to make the installation sturdy. The steering post can be a length of dowel drilled to take the wire rod, or it can be simply a length of brass tubing. It is best to mount the switch so that pushing on the steering wheel turns the motor on and pulling on the wheel turns the motor off.—Charles Erwin Cohn, Chicago.

☐ Lead filings sprinkled over the threads of a pipe will help produce a tight joint.

# Lever-Type Hoist Raises and Tilts Small Boat

There is nothing to dumping and cleaning a small rowboat if it is brought out of the water and tilted on its side in one operation by using this lever-type hoist. Hinged to the edge of the pier, the hoist is raised by pulling on a rope which is tied to the top cross member. The rope is lashed to a ring or mooring cleat to hold the hoist in the raised position. A length of  $\frac{1}{2}$ -in. galvanized pipe provides the hinge pin which is passed through pipe clamps screwed to the hoist uprights and the mounting brackets as shown in the detail. The brackets are lengths of 2 x 4 which are bolted or spiked to the pier so that their ends overhang the edge sufficiently to permit hinging the hoist. The latter should be located to position the lifting



arms underwater about an inch deeper than the draft of the boat. The arms should slope gently away from the pier.

Clinton R. Hull, Costa Mesa, Calif.

## Light Covered With Red or Blue Cellophane Does Not Attract Insects

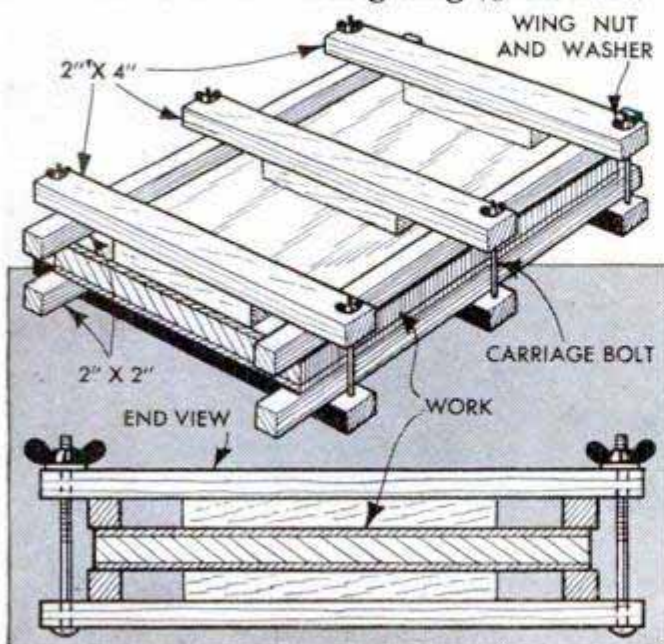
Covering the lens of a flashlight or electric lantern with red or blue cellophane will keep large moths, mosquitoes and other insects from buzzing around the light while you are fishing. Use a rubber band to fasten the cellophane so the covering can be

removed quickly if full power of the light is needed. As insects are not attracted by red or blue light, similarly covering the lamps in your summer cottage will minimize the nuisance of flying insects.

R. A. Jenkins, Los Angeles, Calif.

## Clamp for Built-Up Flush Doors Improvised From Wood

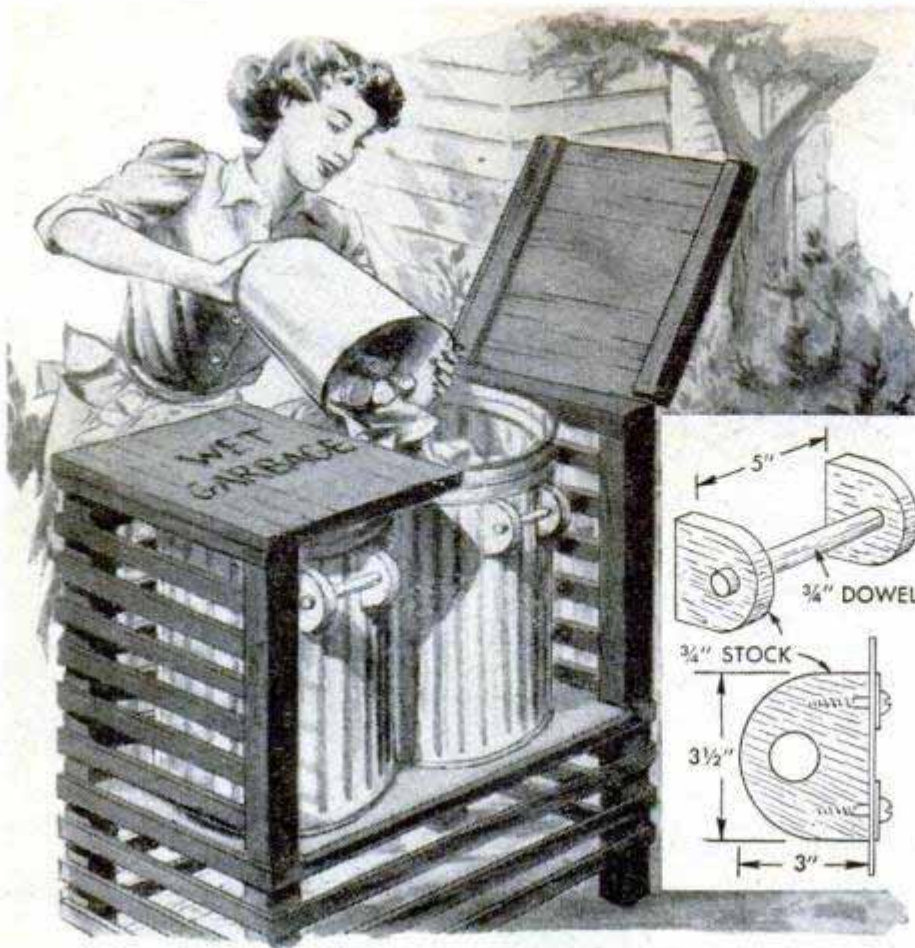
Few craftsmen ever have enough C-clamps, and this problem recently confronted me when I was gluing  $\frac{1}{8}$ -in. hard-



board to each face of an open framework which I was using to make cabinet doors. With C-clamps quite expensive and needing many of them for the job, I decided to improvise a clamp of wood, using 2 x 2 and 2 x 4 material, plus six 12-in. carriage bolts. The drawing shows how I positioned the various pieces to bring equal clamping pressure to all gluing surfaces of the framework. If the cleats which are placed under the crosspieces are planed to a slight crown on the lower edge, adequate pressure is assured at the center of the work when the wing nuts on the bolts are drawn up tightly. On 5-ft. doors, I used six 2 x 4 clamps, but on the shorter ones only two were needed. Best of all, I could get as many as three complete doors into the clamp at one time, and I found in using this clamp that the finished doors were perfectly flat and straight. The latter is something that I was unable to accomplish with C-clamps.

David B. Fullerton, Minneapolis, Minn.

# Garbage Cans Stored Neatly on Wooden Rack



The problem of keeping garbage cans at the rear of the yard from becoming an eyesore was solved by one homeowner who made this attractive latticed enclosure. It holds two cans, one for wet garbage and the other for glass, paper, etc. The garbage cans do not require lids, as the enclosure has two covers which swing open from the center. It is a good idea to fasten galvanized sheet metal over each cover to keep rain from entering the garbage cans. Slats at the sides, front and rear of the enclosure permit growing vines to improve the over-all appearance. To aid the garbage collector in removing the cans from the rack, an extra handle is fitted to each can as shown in the detail.

## Bait Worms Carried in Ice-Cream Container Remain Alive Longer

Excess dampness of the earth in which bait worms are carried will cause them to die quickly, especially in warm weather. To keep the worms alive for as long a period of time as possible, place them in light soil or leaf mold which is just slightly damp.

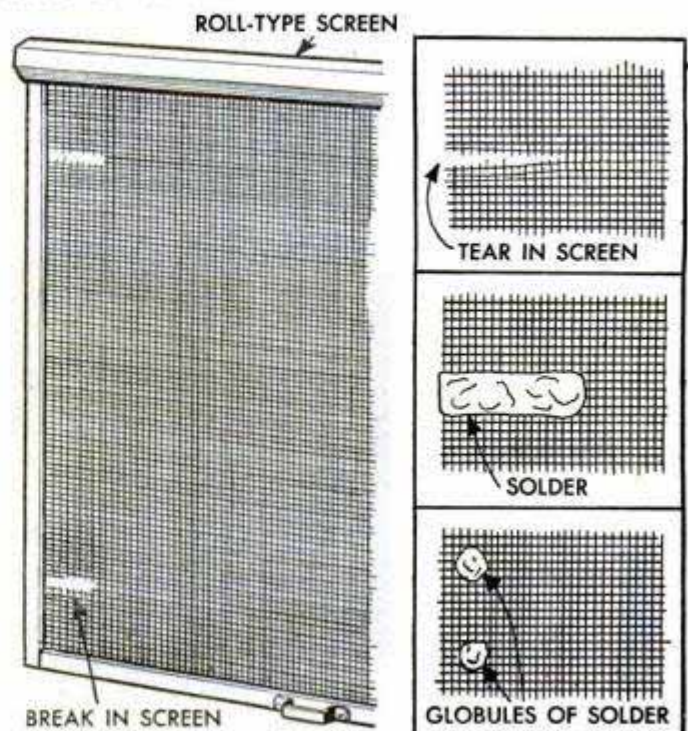
A cylindrical ice-cream container provides a better holder for the worms and soil than an ordinary tin can, as the paper container, being somewhat porous, allows a certain amount of water evaporation which tends to keep the worms in better condition.

## Repairing Roll-Type Screens With Beads of Solder

Bronze and copper screen wire in a roll-type window screen sometimes frays and breaks at the outer edges as a result of wear in the channel guides. It's a simple matter to repair these spots with small patches of solder. If the wire is torn, a bead of solder is run the length of the break after first brightening the spot with fine sandpaper. Small holes in the mesh can be repaired, in most cases, merely by cutting off a small piece of wire solder, placing it over the hole and then hammering it flat to mat it in the mesh. This is usually sufficient for a good bond, although a hot iron can be touched to the spot. If the thickness of the solder at the repaired places causes binding in the guides, file the solder patches flush with the surface of the screen wire.

N. R. Bangert, Sacramento, Calif.

Use a solution of washing soda and hot water to restore the brightness of tinware.



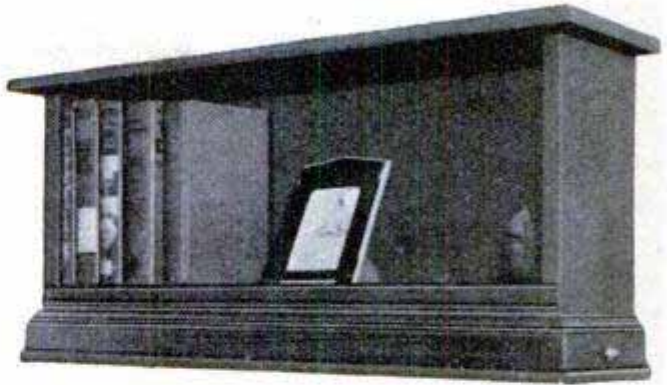




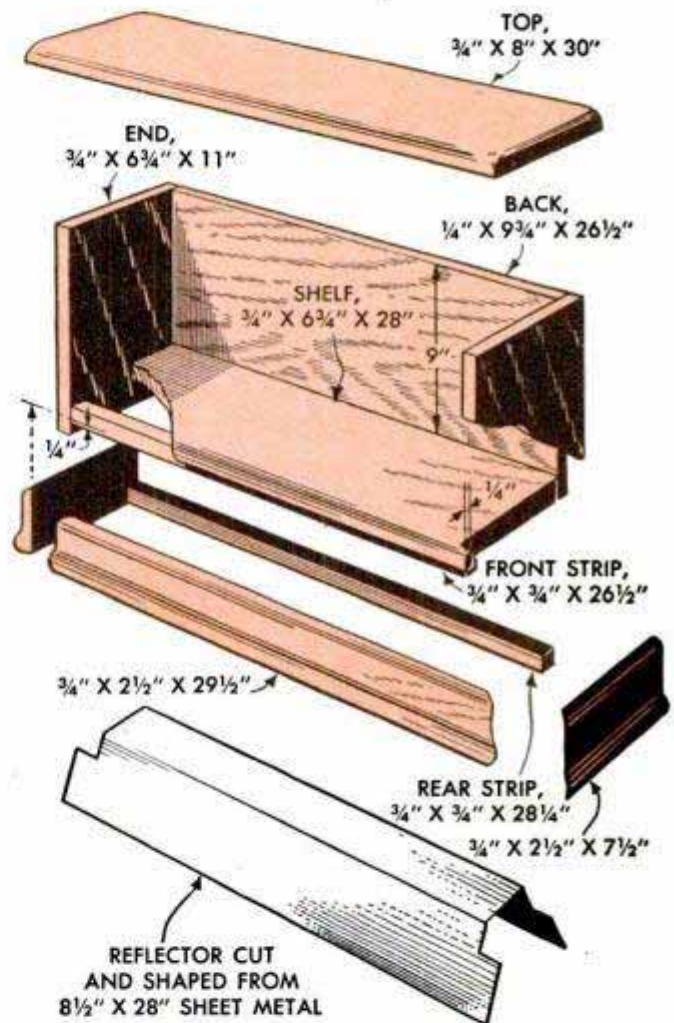
By W. C. Farley

STORAGE space for more than 20 books along with plenty of soft light for reading or writing are the features of this attractive shelf-light which is conveniently mounted on the wall right over a desk. The shelf is of simple box construction, the ends of the bottom piece being cut so that the front edge extends across the edges of the sides. Note that the distance between the underside of the shelf and the lower edge of the light-canopy molding must be at least 3 in., which is the depth necessary to conceal the 20-watt fluorescent tube. The sheet-metal reflector is bent lengthwise, as shown, the bend at the front of the reflector being about  $3\frac{1}{2}$  in. from the edge and the bend at the rear about  $2\frac{1}{4}$  in. from the edge. The rear bend should be rather sharp, almost at right angles if desired, and the front is bent just enough to spread the reflector across the depth of the shelf. The fluorescent lamp is wired as in the diagram and a canopy-type switch is installed in the end molding. The transformer, or ballast, is bolted to the rear of the reflector so it fits beneath the bookshelf as in the lower right-hand photo. After the sockets and starter are attached to the reflector with machine screws, the reflector is screwed to the shelf bottom, the lower edge of the front molding and to the rear strip.

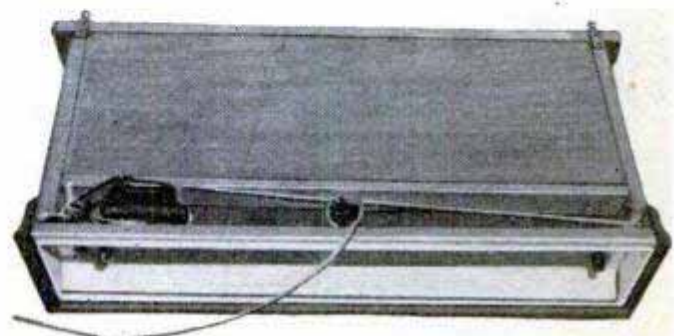
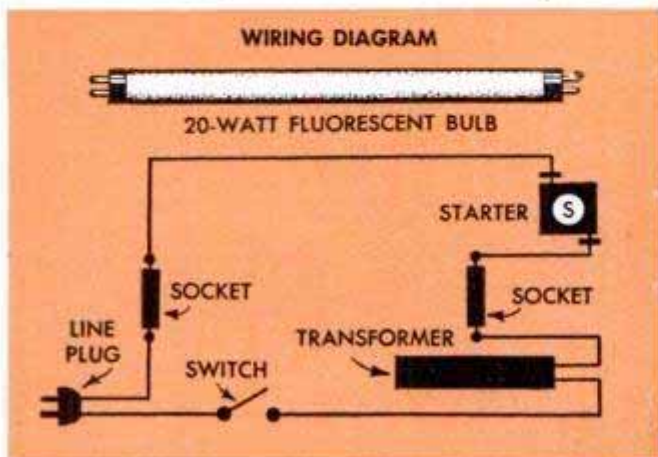
# SHELF-LIGHT

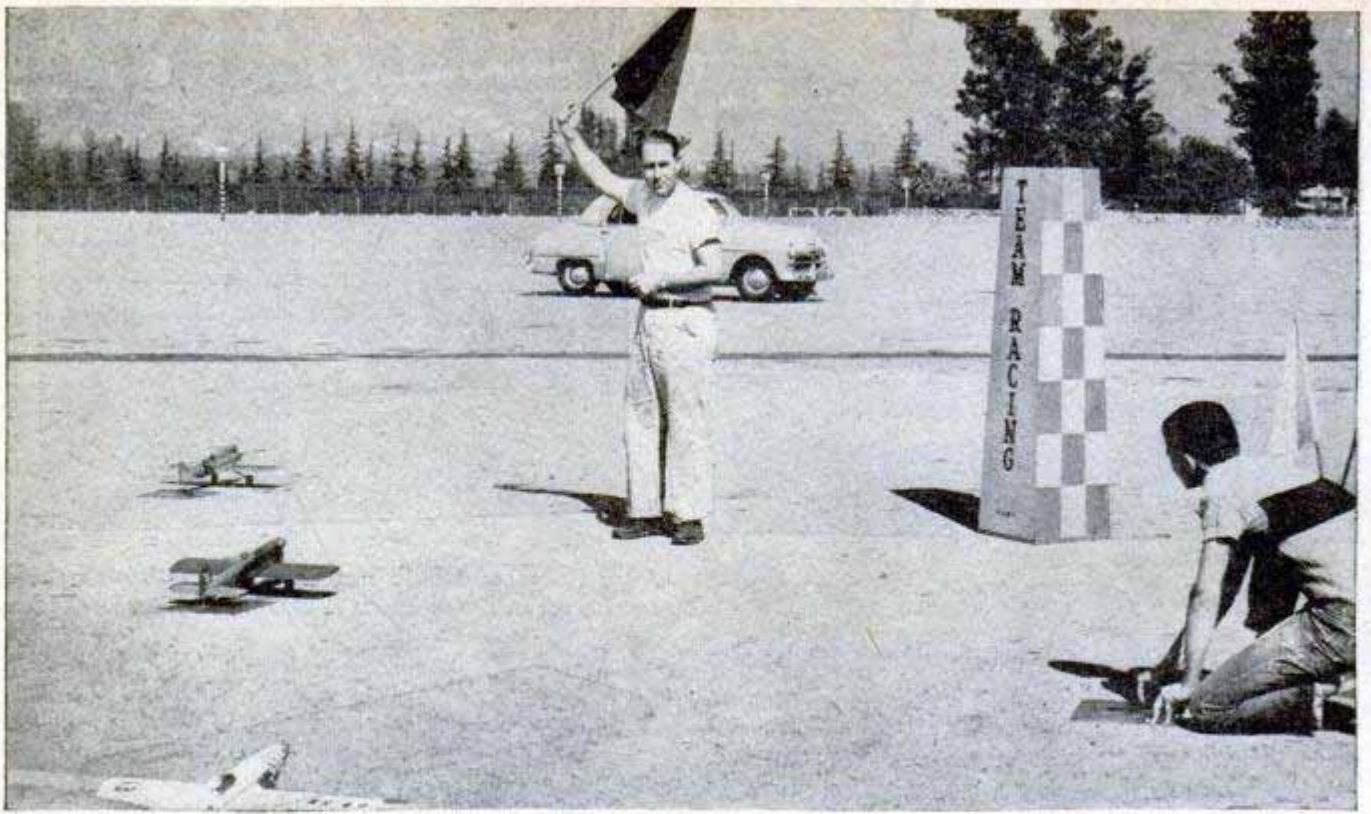


After fluorescent bulb has been removed, wall shelf can be set under window to double as floor bookcase

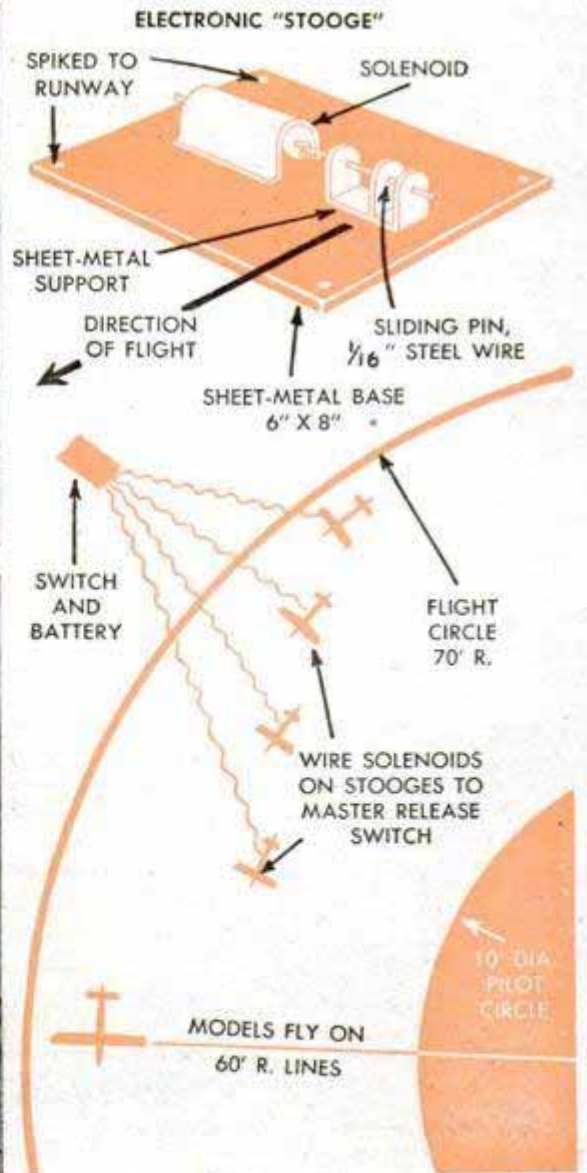
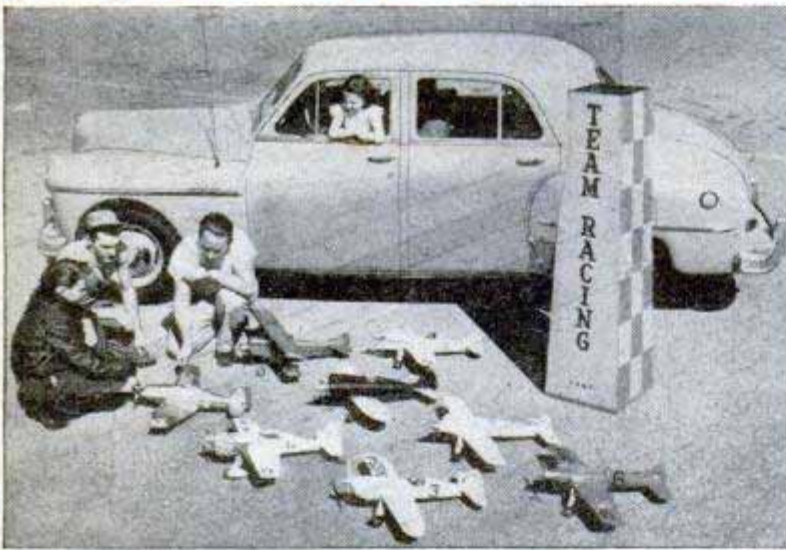


Baseboard outlet shown in center of the canopy, below, provides connection for an electric desk clock





# TEAM-RACING MODEL PLANES





**TEAM-RACING**, as shown above, latest spectacular addition to the popular model-plane hobby, was developed in California and will be featured at Plymouth Motor Corp.'s Fourth International Model Plane contest at Detroit, August 14 to 21. Five hundred of the world's best model-plane flyers will be invited to compete at the International as a result of records established in local, regional and state model-plane meets sponsored by Plymouth dealers. Participation is open to boys and girls in four different age groups: novice, 13 and under; junior, 14 and 15; senior, 16 to 20; and open, 21 to 25. Entry blanks for this Olympic Games of model flying are available at Plymouth dealer showrooms everywhere

**L** EADING a field of four with only 11 laps of a 140-lap feature race to go, a tiny racing plane with a wingspread of less than 36 in. flies smoothly toward victory on a circular course at the end of a 60-ft. control line. But only a short distance behind, another pint-size air speedster steadily shortens the lead of the pace-setter. Still farther back on the circular flightway, two other racers vie for third place. That's team-racing, the newest development in model-plane contests. Pilot members of southern California's "FAST" club (First All Speed Team) are generally recognized as the originators of this new angle in model-plane racing. Team-racing rules have been refined by the club over a period of four years and proof of the wide acceptance of this new development is the favorable response among pilots and spectators alike. Model-plane team-racing features race-horse starts, fuel and pit stops, direct competition, the use of realistic models fitted out with racing-plane structural details and dummy pilots, and all the ground fanfare and paraphernalia of any big race.

Racing rules have been carefully planned to minimize the advantage of "hot" engines and other design details which con-

tribute to extreme air speeds, and to stress and encourage special considerations of plane performance and refinements of such design characteristics as stability, operating economy, ease and speed of servicing, smooth take-off and landing qualities. The word "team" in the name of the sport refers to the teamwork of the racing crew assigned to each plane. The crew consists of a pilot and not more than two mechanics. The pilot does his job from the pilot circle at the center of the flight circle (see the detail at the left) and the pitmen are responsible for starting the model and for all repairs and fuel changes during the pit stops. Mechanical releases, or "stooges" as they are called, are used to hold the planes in position on the starting line. These devices (see upper detail at the left) operate by holding the tail-skid hook by means of a sliding pin operated by a solenoid. In regular practice several of these release units are wired to a single control panel, enabling the starter to release all planes on the line simultaneously for take-off. A release unit of this type is shown in use in the upper photo on the preceding page. Note that each solenoid release is anchored to runway with spikes driven through holes drilled in the base.



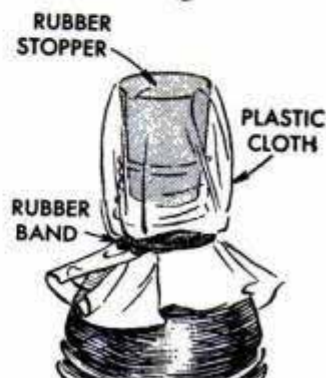
## Old Brass or Copper Jardiniere Forms Twin Plant Holders

A pair of interesting wall brackets for plants or trailing vines can be made quickly from an old brass or copper jardiniere. First, cut the pot in half with a hacksaw and then cut backplates from sheet copper to fit across the open sides of the brackets. To permit hanging, punch two small holes in each backplate about an inch down from the upper edge and solder the plates securely to the jardiniere halves, making sure that the joint is watertight.

Wesley Umphrey, Menlo Park, Calif.

## Plastic Covers for Seasoning Bottles Keep Contents From Leaking

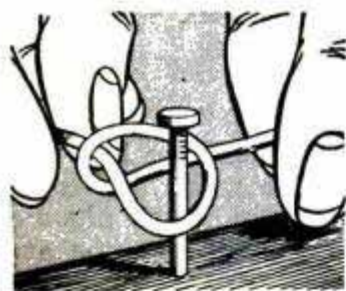
To make sure that bottles of catchup, steak sauce and other seasonings do not leak when they are carried on a picnic, cap them with a rubber stopper and sheet plastic. After moistening the lower portion



of the stopper with warm water, press it tightly into the bottle. Then cut a disk from the plastic cloth and place it over the stopper, fastening it around the neck of the bottle with a rubber band. If the picnic lunch is likely to receive an unusual amount of jolting during the trip, an added precaution can be taken by pouring warm paraffin around the stopper before applying the plastic cloth.—Helen Lemberger, Chicago.

## Loop Knot Fastens Chalk Line Taut

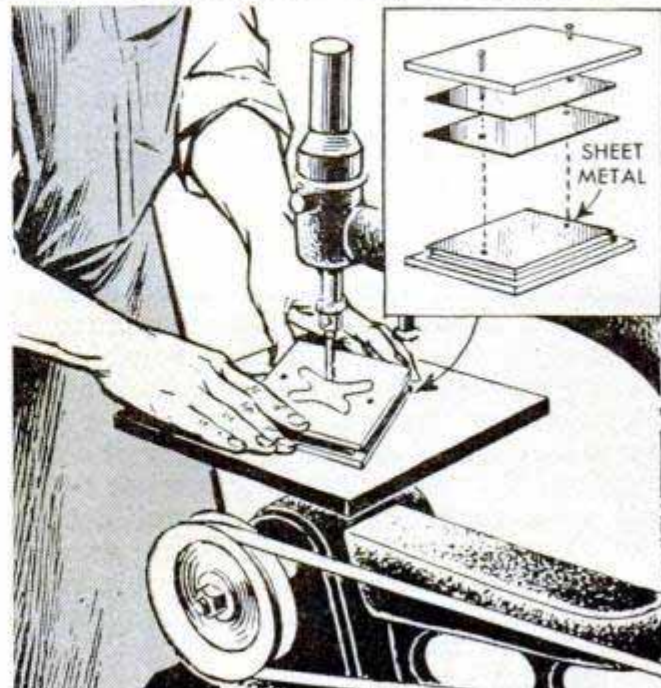
This simple loop knot permits holding a chalk line taut with one hand while fastening the end of the line to a nail with the other hand. After forming the loop,



the line taut and roll it between the thumb and forefinger to flip the loop over the top of the nail. Then pull the loop tight and repeat the knot.—T. P. Ilari, Louisville, Ky.

## Sheet Metal Sandwiched Between Wood Facilitates Sawing Templates

Sandwiching one or more blanks of sheet metal between two pieces of hardwood and nailing the pack together is an excellent way to jigsaw escutcheons or templates. Even when only one piece is to be cut, this method permits smooth sawing without kick up and produces a minimum of burring. The nailing of the pack is done in the waste areas of the design and flush with the top so that the nailheads do not interfere with the work hold-down. If a stack of metal is being sawed, screws are better than nails for holding the stack together as they can be drawn up to clamp the pieces tightly in place. A pattern drawn on the wooden top of the "sandwich" is much easier to see and follow than a line scribed on metal.—Louis Porter, Detroit, Mich.



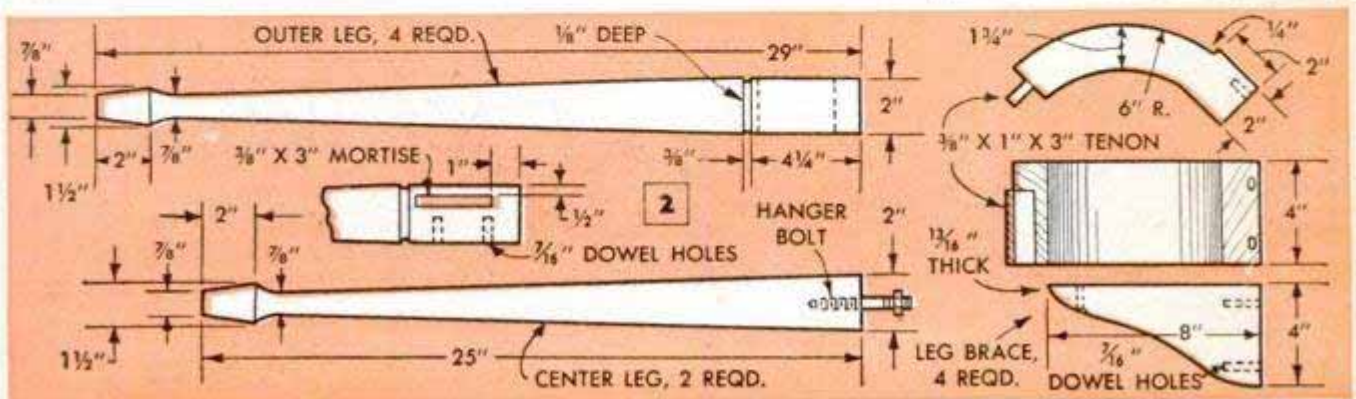
☞ Dip old pen points in household ammonia to remove dried ink and brighten them.

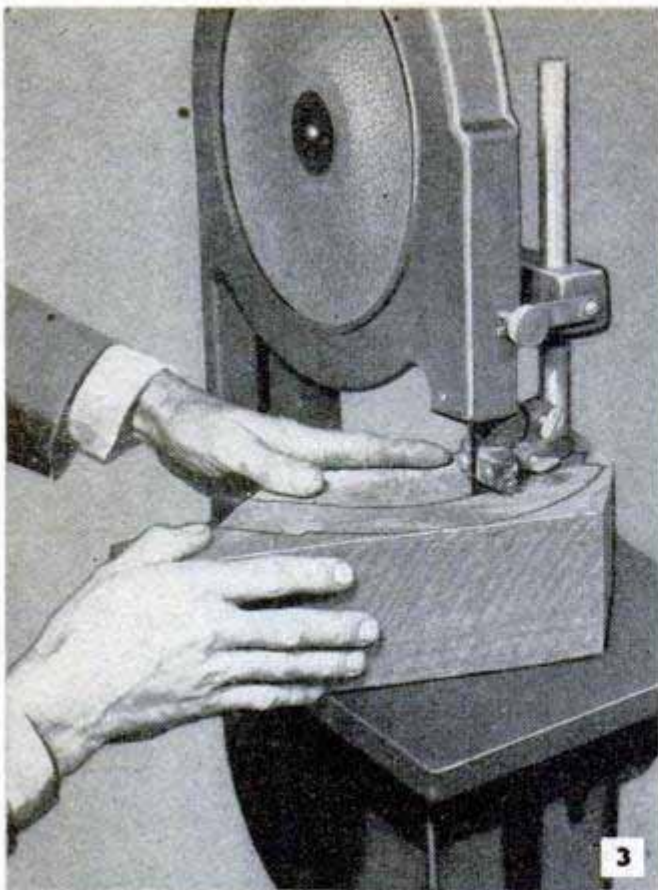


# SHERATON DINING SUITE

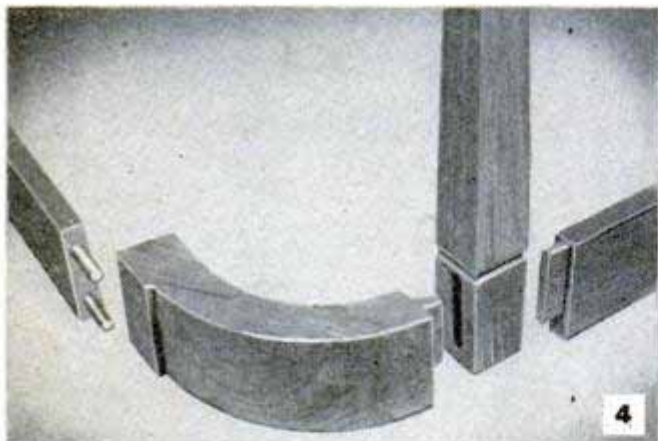
By Benjamin Nielsen

TO HOME CRAFTSMEN with a liking for truly fine furniture of period design, building this Sheraton dining suite can add up to a lot of pleasure and profit. Although the general lines and design contours of both the table and chairs are characteristic, the construction details have been modified to make the assembly as simple as is consistent with good, sound construction. While most period furniture of this type is worked in mahogany with contrasting woods used rather sparingly as inlay and overlay accents, this dining suite is made throughout of solid walnut without any added decoration. The table is of standard size and the top is fitted with slides so that it can be opened for insertion of

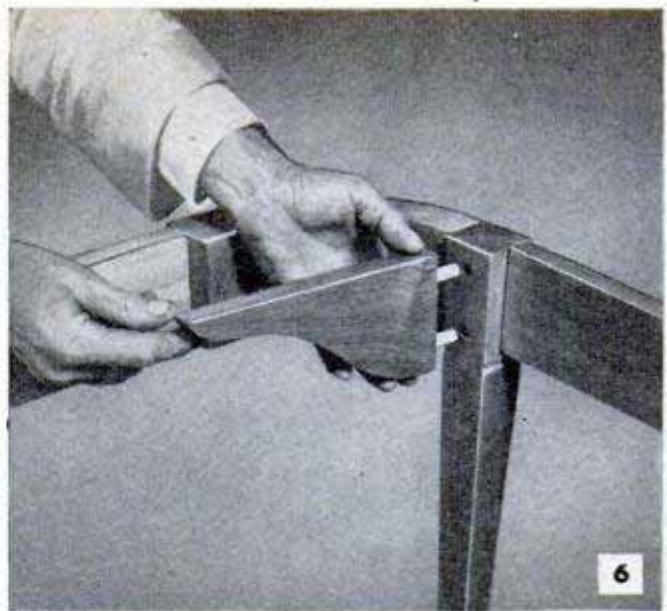
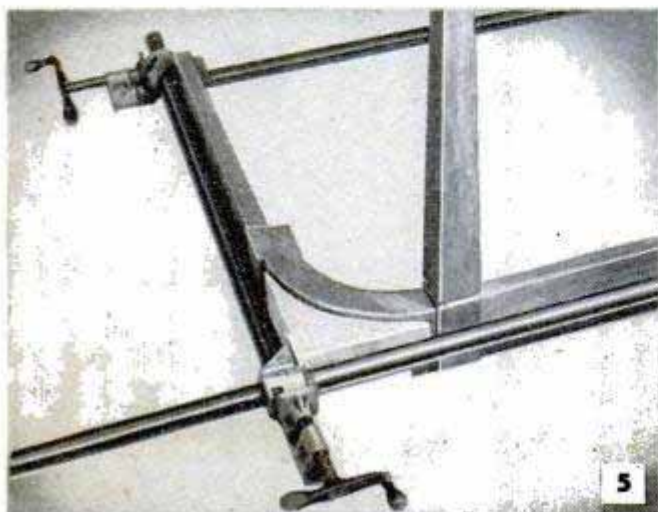




Curved corner sections of the table apron are bandsawed from solid stock. Three cuts form outer curve



Above, make a trial assembly of all the parts to check fit of joints. This assures a rigid table. Below, when clamping the parts, pressure must be applied in two directions because of curved member

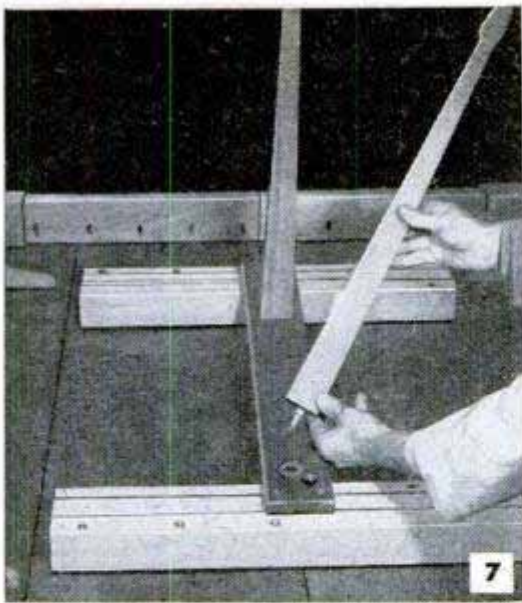


After assembly of the aprons and legs, the leg braces are glued in place. Clamp until the glue sets

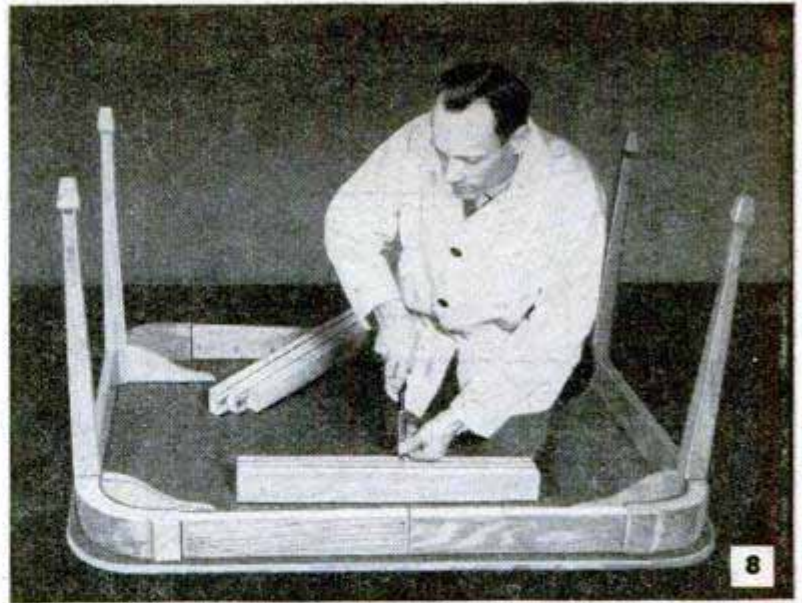
separate leaves. The top is glued up in two sections, each dimensioned as in Fig. 10. Use narrow pieces and select them carefully for matching grain and color. Joint the meeting edges of all pieces square with the face and use three  $\frac{3}{8}$ -in. spiral dowels in each joint. Although not essential in this type of construction, waterproof glue is preferable. After the glue is thoroughly dry, sand both faces of each top half smooth, cut the corner radii on the bandsaw and sand the edges. Then, drill holes for the aligning pins in the inner edges of the table-top sections. Cut the pins for the holes from  $\frac{3}{8}$ -in. dowel, taper one end of each and glue in place in one of the halves. Make sure that the halves will close tightly. If the pins are too long, file them shorter.

Next, bandsaw four outer legs and two center legs from 2 x 2-in. stock, following the details in Fig. 2, but keeping in mind that sizes given in Fig. 2 are finish dimensions. Make allowance on all four faces for sanding out the saw marks. The curved corner sections of the apron, Fig. 3, and the leg braces, the right-hand detail, Fig. 2, are bandsawed from 4 x 4-in. solid stock. Note the offset in the outer curved face of the apron section. This must be bandsawed in three separate cuts, the first one being run in from the outside to form the shoulder. Mortise the outer legs and drill each one for  $\frac{7}{16}$ -in. dowels as in the center detail of Fig. 2. Now, work out the end and side apron pieces and the supporting cleat for the center legs as in the right-hand details in Fig. 10.

Now, with all holes drilled and mortises and tenons made as detailed, the table is ready for assembly. The apron and leg are assembled at each corner as in Fig. 4 and glued and clamped as in Fig. 5. Make a trial assembly before applying glue, to



Center legs are bolted to a hardwood cleat screwed to the slides. Use hanger bolts



When assembling, the table top is turned upside down on level floor so that the legs and aprons can be accurately positioned

check the fit of all parts. After the final assembly has been made and the glue is dry, glue the leg braces in place as in Fig. 6. Next, turn the table top upside down on a level floor and invert the leg-and-apron assemblies over it as in Fig. 8, making sure the parts are properly positioned. Then attach the slides and center legs as shown in Figs. 7 and 8. The slides are of the ready-made type and are easily obtainable at nominal cost. The aprons can be attached to the table top by either of two methods: By means of what are known as screw pockets—holes drilled at an angle into the back face of the apron and through the top edge—or by means of triangular glue blocks reinforced with screws driven into the top and apron. On

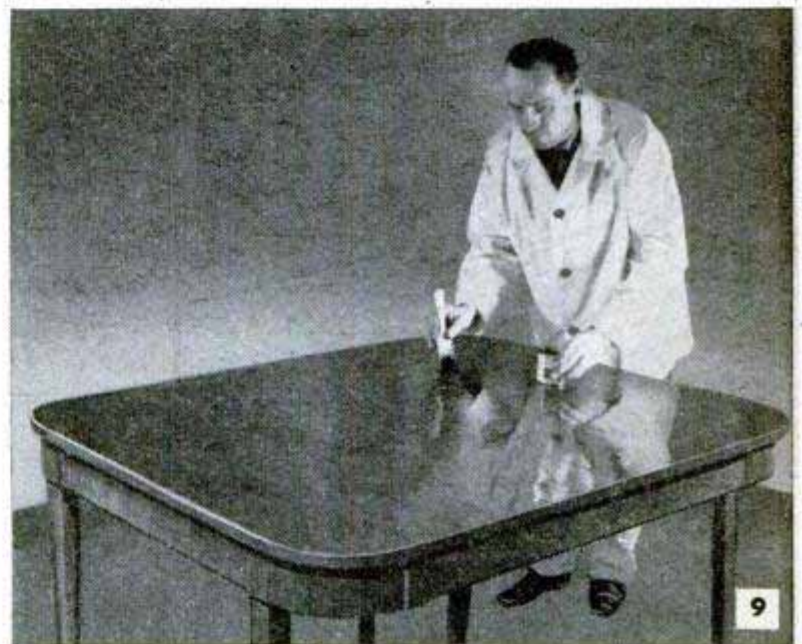
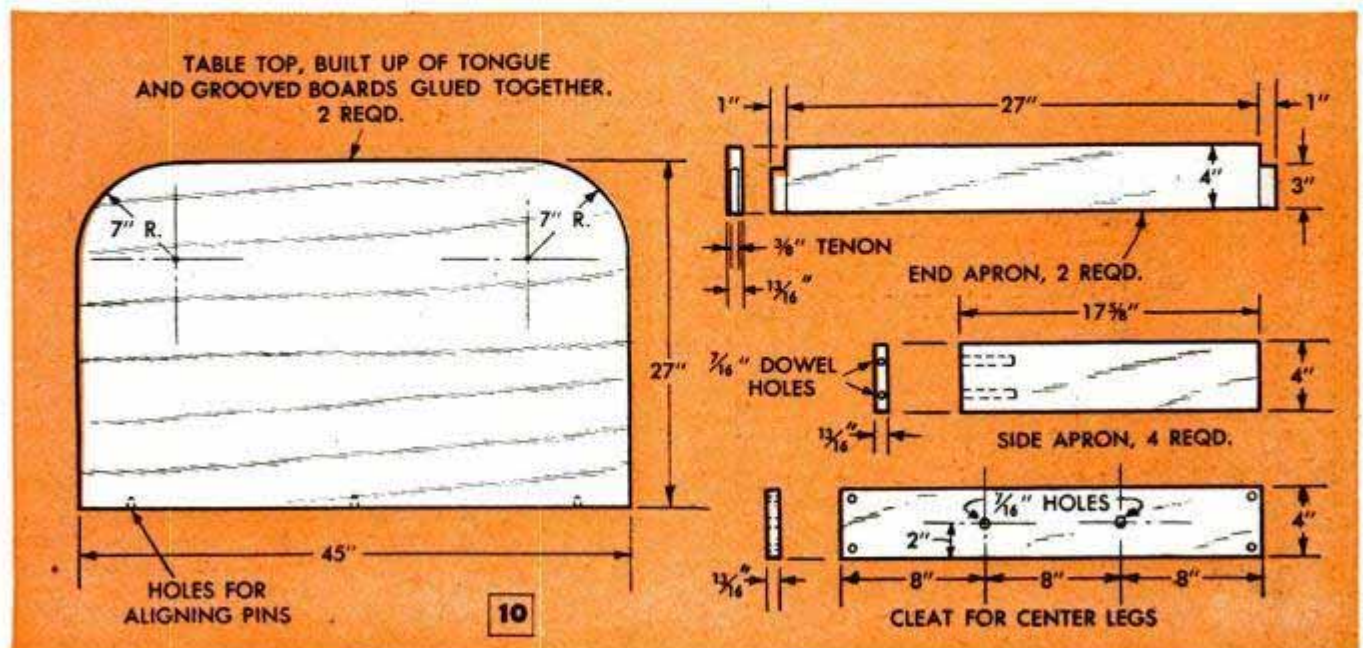
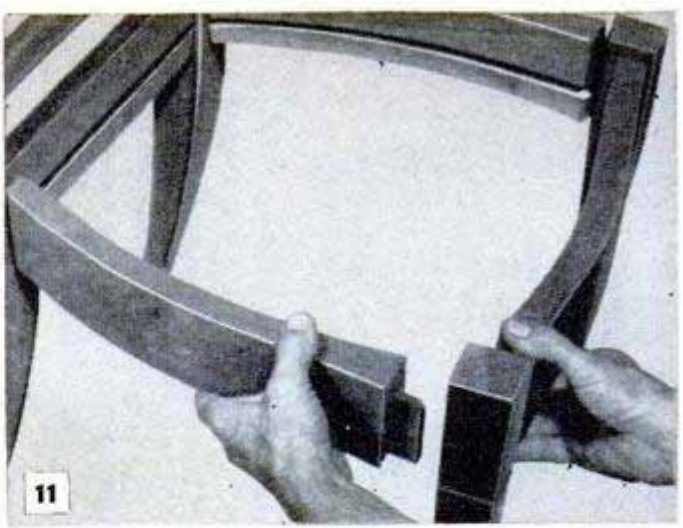
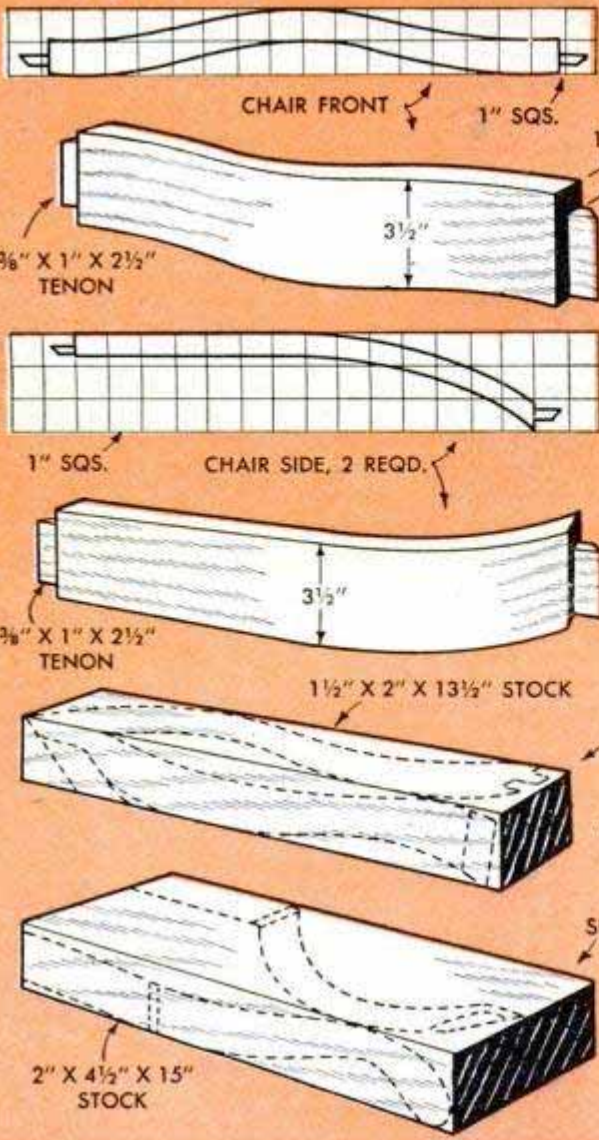
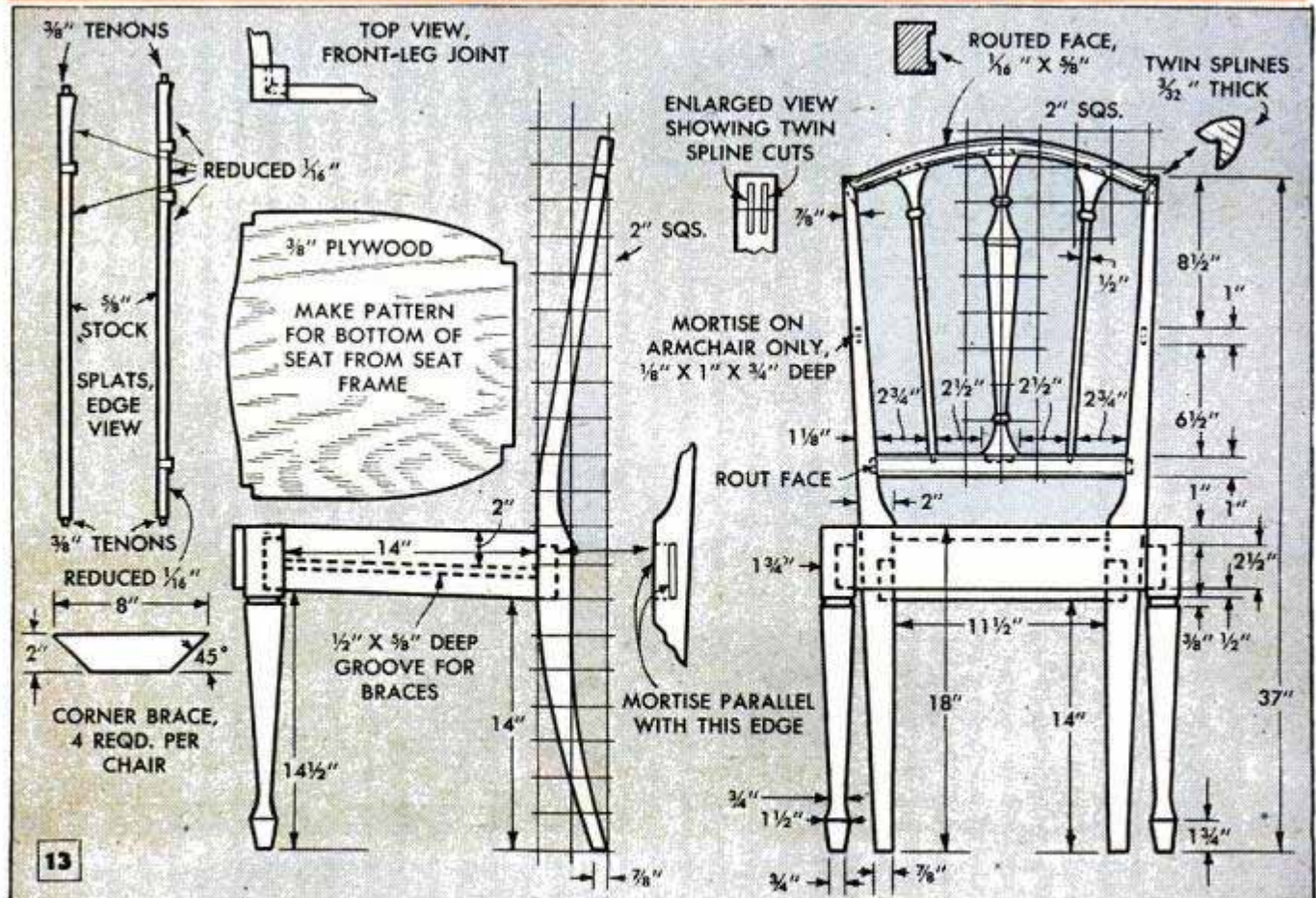
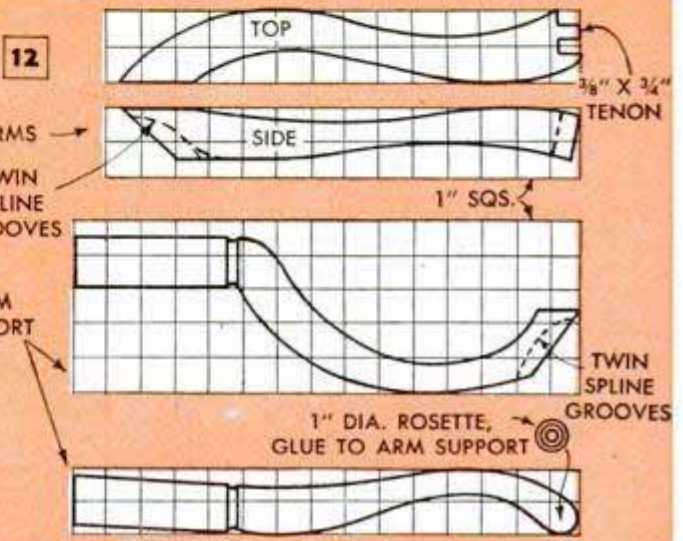


Table and chairs are finished in the natural color of the wood with a colored filler, sealer and then either varnish or wax

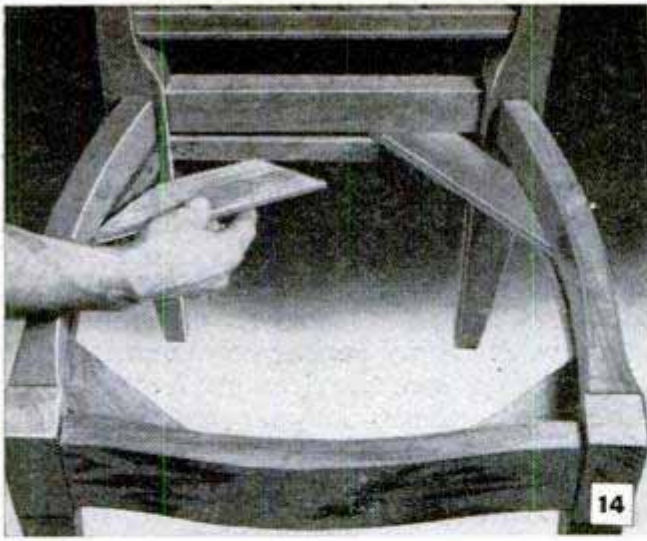




Both the straight and curved chair rails are joined to legs with tightly fitted mortise-and-tenon joints







Assembly of the chair frame showing how diagonal braces are glued into the grooves cut in the rails

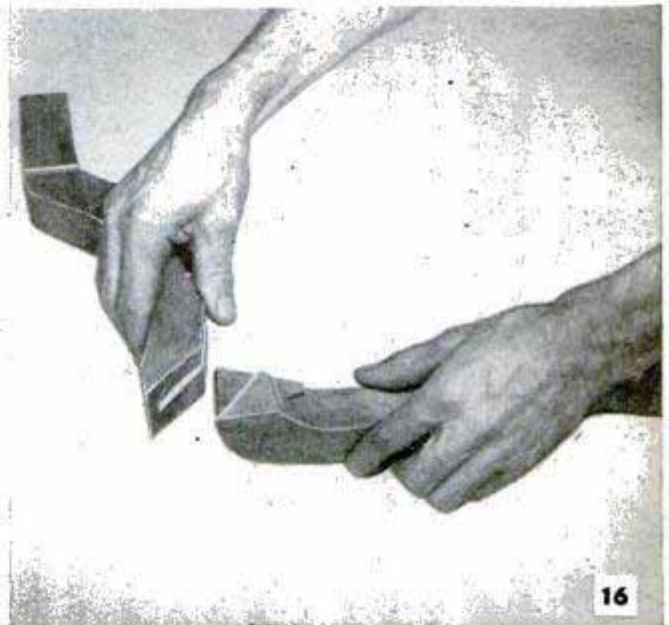
the original, the top was attached by means of equally spaced screw pockets which you can see on the apron in Fig. 7. The pockets are made by first drilling with a special bit having a circular cutting edge to form a seat for the head of the screw, then counterboring with a small bit for the body of the screw. However, this is not practical unless you have a drill press and special bits available. Lacking this equipment it is better to use triangular glue blocks.

Dining suites usually include a host's chair having arms, Fig. 1. Other than the arms for the one chair, the construction of all chairs for this suite is simply duplicating the parts detailed in Figs. 11 to 13 inclusive. Assembly of the chair frames and the simple upholstery of the seats is detailed and pictured in Figs. 13, 14 and 15. In some instances, the assembly can be simplified even more than that shown. For example, Fig. 14 pictures the use of corner braces fitted into grooves cut in the rails. If equipment is not available for routing the groove in the curved rails, the braces may be omitted and metal corner braces substituted. In the right-hand detail, Fig. 13, the routed face in the upper and lower back rails can be omitted without impairing the symmetry of the chair backs. Also, the beads on the back splats can be omitted if desired. The lower details in Fig. 12 show how to cut the chair arms from solid stock and Figs. 16 and 17 picture the assembly of the arm. Keep in mind that both right and left-hand parts must be cut for a pair of arms.

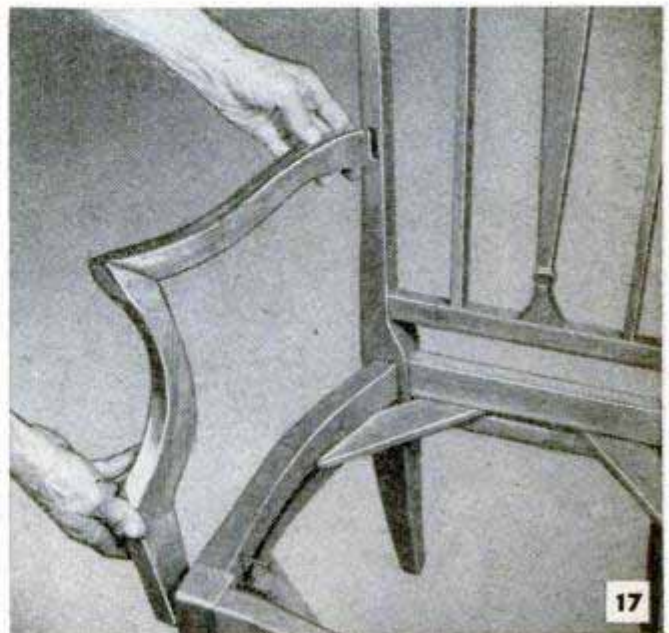
The original suite was finished, Fig. 9, in the natural color of the walnut, using a filler colored to match the wood. After filling, apply a sanding sealer. When dry, sand this coat smooth and apply two coats of varnish, or apply paste wax over the sealer and polish. If only a two-coat varnish finish is applied, sand between coats.



Upholstery is a simple padding over plywood base and covered with fabric or tapestry of your choice



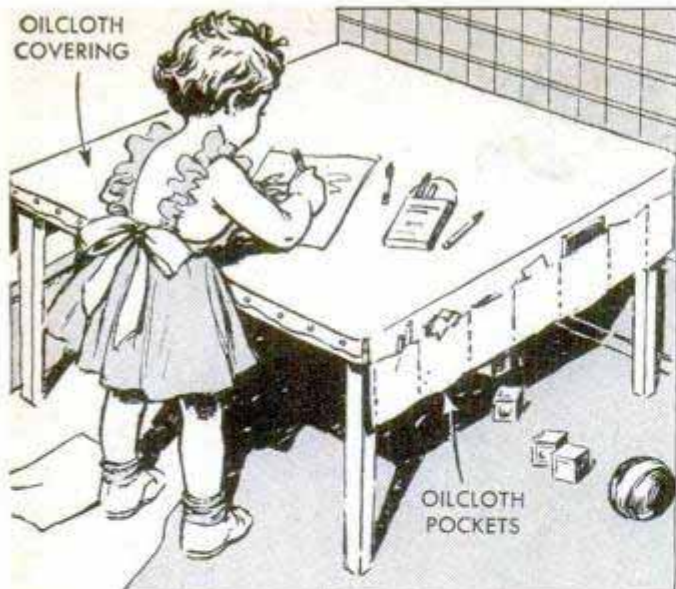
Above, two-piece arm of the host's chair has a splined joint for added strength. Below, arm is mortised into back leg and attached to front leg with screw



## Assembling the Machinist's Toolbox

DESIGNED and built for carrying machinist's tools both compactly and in an arrangement that permits quick selection of any particular item, this sheet-metal toolbox also provides a handy repair kit for the homeowner. The box is divided into four separate sections, two of them being sliding drawers for such tools as wrenches and clamps. A roomy center compartment immediately above the drawers has space for hammers, pliers, snips, etc., while the fourth section consists of a removable tray which fits over the center compartment directly beneath the lid. The ends of the tray are triangular in shape so that a handgrip can be cut into a sheet-metal partition which divides the tray lengthwise. If the tray is to be used for bolts, screws and other small parts, U-shaped inserts may be fastened to the tray with small iron rivets, thus dividing each compartment into three smaller ones as in the pull-apart detail.

The bottom and sides of the toolbox are bent from one piece, as in the lower right-hand detail, except that the top edges at the corners are not crimped over tightly until the endpieces are soldered in place. After these parts have been assembled, the angle-iron drawer rails and mounting brackets for the bottom of the center compartment and top tray are soldered to the sides and ends. The drawers are cut and bent from sheet metal, the ends being crimped around the corners and soldered. A small brass pull is fitted to the front end of each drawer, and a hinged cover, which is locked with a turn button, holds the drawers in place. Note that these hinges are soldered in place. When bending the lid, or top, the two lower edges are crimped over to form  $\frac{3}{8}$ -in. seams. These seams and the ones along the top edges of the box sides are important, as they add considerable rigidity to the box and also eliminate the sharp edges. The wooden handle, which is reinforced with sheet metal, is fitted over the ridge of the toolbox lid. The flanges formed by the ends of the sheet metal provide brackets for riveting the handle in place. The lid is attached to the box with a length of piano hinge by riveting one leaf of the hinge to the lid and fastening the other leaf to the side of the box with sheet-metal screws or solder. The projecting tips of the screws are filed down a little on the inside of the box. A hasp and staple for a padlock are riveted to the lid and front of the box. If a bending brake for the sheet-metal work is not available, one can be improvised by sandwiching the metal between two hardwood strips and holding it in position with C-clamps. The sheet is located so that the bend is at the edge of the wooden clamp.



### Card Table Covered With Oilcloth Forms Play Surface for Child

An old card table, with the legs sawed off so that it is just the right height for a small child, makes an excellent play table that will help to keep toys from being scattered over the floor. The table is covered with oilcloth, the cloth which overhangs at two sides being doubled back and sewed to form pockets for crayons and small toys.

### Bait Jar Has Escapeproof Cover

Fitting the neck of a large-mouth jar with a length of inner tube provides a handy container for live bait such as grasshoppers and permits them to be removed one at a time without danger of any of the bait escaping. In addition, the fisherman can tell at a glance just how much bait remains in the container. Tie one end of the inner tube over the jar mouth with cord and clamp the other end shut with spring-type clothespins as shown in the photo.

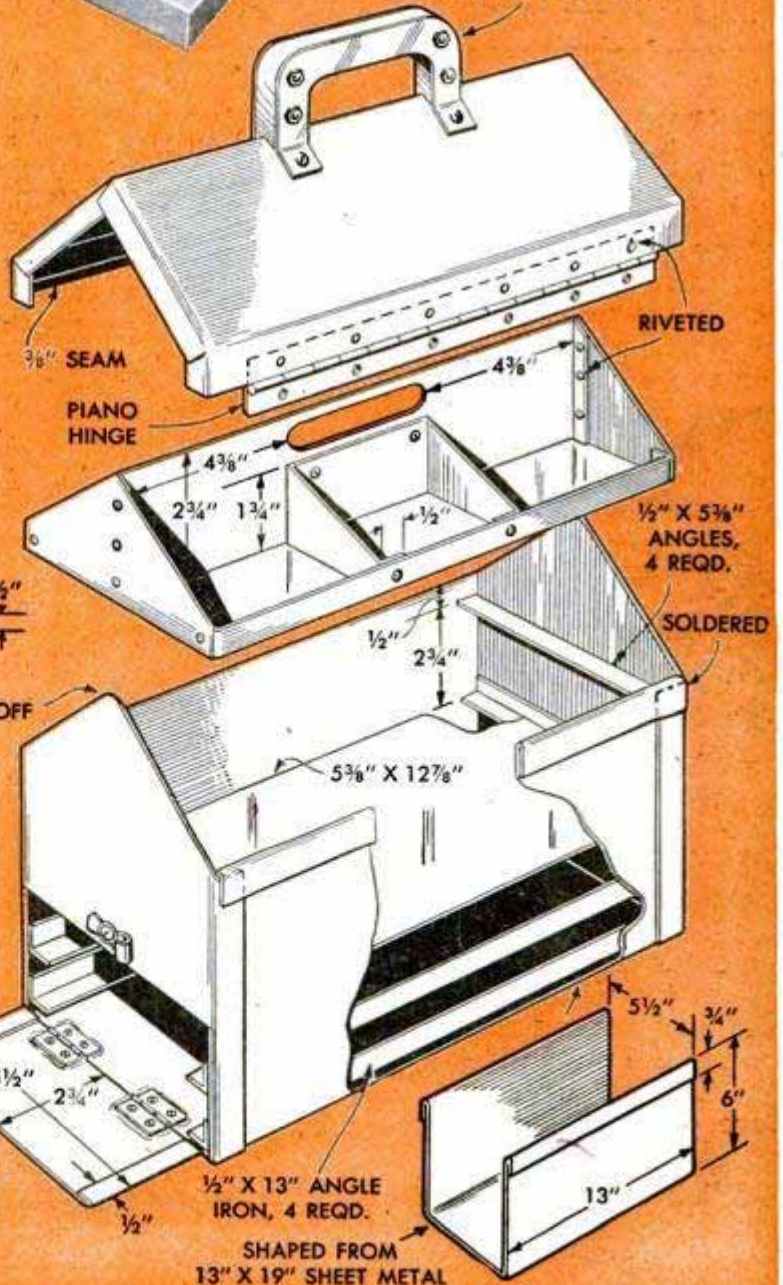
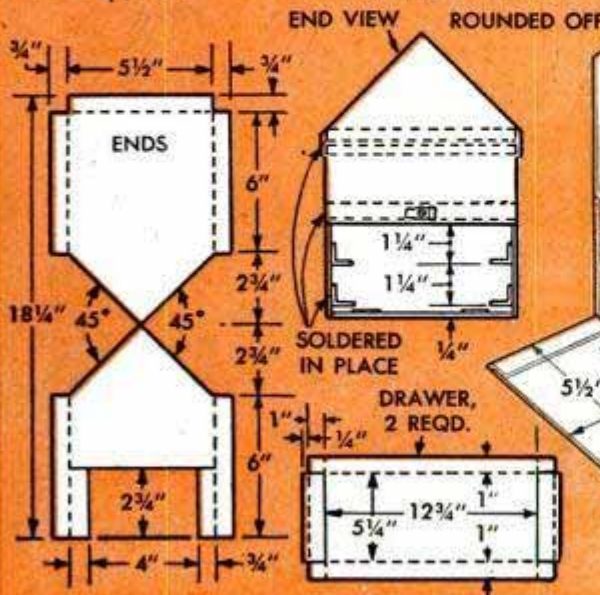
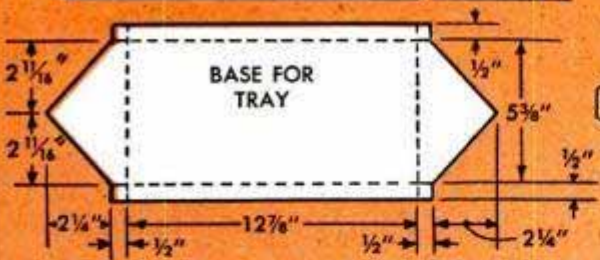
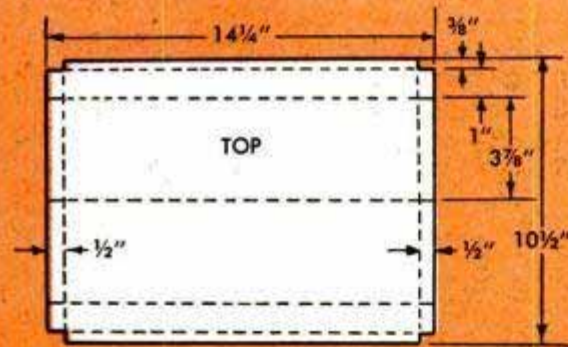


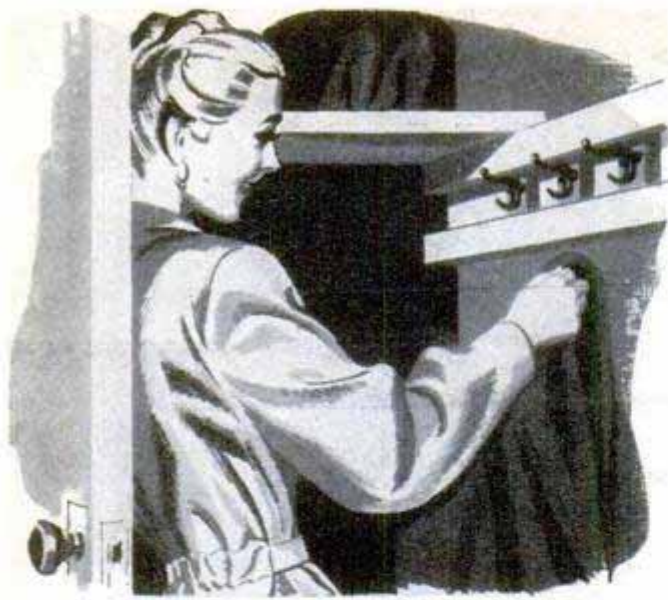
# Machinist's TOOLBOX

By James J. Kane



WOODEN HANDLE REINFORCED WITH SHEET METAL

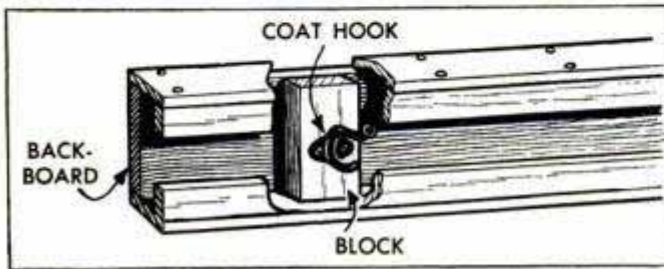




## Hooks Fastened to Wooden Blocks Slide in Closet Wall Rack

If the coat hooks in your closet never seem to be positioned where you want them, solve the problem by installing this sliding coat rack. Instead of being fastened directly to the wall, each coat hook is screwed into a wooden block which slides in a channel extending the full length of the wall. The channel is made by mounting two lengths of angle over the edges of a backboard. The angles can be made of wood by nailing two strips together or rabbeting a single strip, or they can be of aluminum angle or angle iron which is drilled and screwed to the backboard. The wooden blocks should be a loose fit in the channel so that they will not bind when moved. Waxing the inside surfaces of the channel will assure smooth operation.

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



## Worn Steering Wheel Repaired With Plastic Wrapping

Auto steering-wheel rims become cracked and worn after years of use and, to cover the unsightly breaks and worn spots, one car owner wrapped the wheel rim with a colored plastic cover of the type supplied for use on telephone cords. This material is available in a variety of colors, from

which one usually can be selected to match the wheel. Attach the starting end of the wrapping to the underside of the wheel rim with a small self-tapping metal screw having a flat head. Then simply unwind the spiral covering onto the



wheel rim, being careful to maintain a uniform tension on the wrapping and to keep the separate turns neatly spaced closely together but not overlapping at any point. When the winding has been completed all the way around the rim, attach the finish end to the underside of the rim adjacent to the starting end, using a metal screw as before.—R. C. Schneelock, Tulsa, Okla.

Wicker furniture, baskets and straw hats can be cleaned by brushing with a lukewarm soap-and-water solution containing a tablespoonful of liquid oxalic acid.

## Leather Sheath for Pen and Pencil Hung From Trouser Belt

Ideal for both school children and workers whose jobs require carrying a fountain pen and automatic pencil, a leather sheath made from a pocket-comb holder will keep the pen and pencil set intact and afford maximum protection. The holder is slit, as shown, and slipped on the trouser belt, the clips of the pen and pencil holding them securely in place in the sheath.—Frank Shore, New York City.



## Clamp Forms Glue-Bottle Holder

Narrow-base glue bottles are easily tipped, often resulting in a tedious job of cleaning up the workbench top, project or both. This won't happen if a small C-clamp is tightened around the lower portion of the bottle to form a sturdy, nontip base. Be sure to tighten the clamp only enough to hold it in place, as too much pressure will, of course, crack the glass.

John J. Rea, Urbana, Ill.



Having a fondness for barbecued chicken but hesitating to spend a couple of hours turning the spit on my barbecue grill by hand, I decided to motorize the spit in the least expensive way possible. I had an old electric fan and found that the oscillator drive revolved at about 18 r.p.m. which was just right for the spit. To obtain a linkage so that the drive shaft would turn the barbecue spit, I used a screen-door spring and a couple of sheet-metal brackets. One bracket was bent L-shape and two holes were drilled in one arm of the bracket to register with the screw holes in the end of the drive shaft. The fan motor was tilted so the shaft was horizontal, the original linkage which oscillates the fan was disconnected, and the L-shaped bracket was screwed to the end of the shaft, as shown in the upper detail. Then I bolted a piece of sheet metal over the handle of the spit, as in the lower detail, locating it so the handle arm projected between two bolts, thus keeping the bracket from slipping.

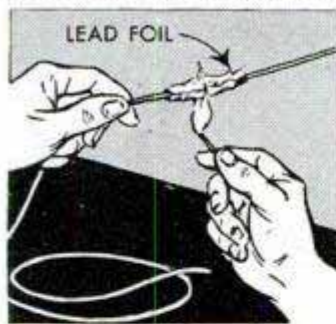
## Barbecue Spit Turned by Electric-Fan Motor Utilizes Screen-Door Spring as Drive Shaft



After this, I simply hooked one end of the screen-door spring in a small hole in the L-shaped bracket and hooked the other end of the spring in a hole in the outer end of the bracket bolted to the spit handle. When the fan motor is turned on, the oscillator shaft rotates slowly and the motion is transferred to the handle of the barbecue spit through the spring linkage.

C. S. Lloyd, Lakeland, Fla.

## Lead Foil "Solders" Wire



When splicing wires together without access to a soldering iron, the wires can be soldered by using lead foil and an ordinary match. Be sure that the splice is clean, smear some soldering flux around the joint and then wrap the splice tightly with the lead foil. With the flame of a match, candle or cigarette lighter, heat the foil as shown in the drawing so that the lead will melt and flow into the joint. You can distinguish between lead foil and aluminum foil by rustling it. The aluminum will make a "tinny" sound while the lead will make practically no sound at all. Lead foil is used as an inner wrapping for some brands of friction tape.

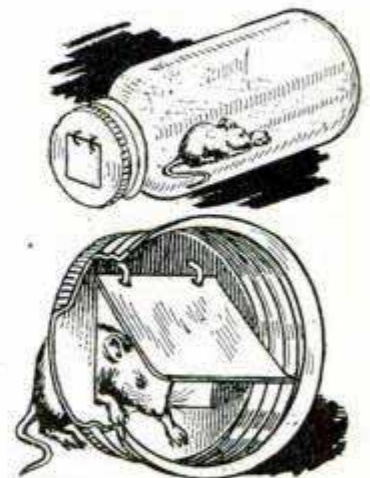
Andrew Vena, Philadelphia, Pa.

Ⓒ In building his own garage, one car owner installed a concrete servicing pit. The pit was drained into a storm sewer.

## Live Trap for Mice or Gophers

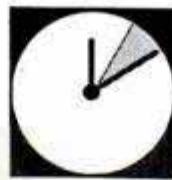
Quickly made from a fruit jar having a solid cover, this novel trap will catch mice and gophers alive. After a 1-in.-square hole has been cut in the cover, a one-way door cut from sheet metal is hinged to the inside of the cover.

The door, which is 1½ in. square, is hinged with two pieces of wire which are bent to form small rings, and the bottom edge of the door is bent slightly away from the cover to aid the animal in pushing it open. After assembling the door, place a little grain or other bait in the jar and then screw on the cover. The mouse or gopher can reach the bait by entering the jar through the slightly open trap door but, as the sheet-metal door swings inward only, the animal cannot escape from the jar.





home from work



clear the deck



## "Pickaback" Week-End Trailer

By Roland Cueva

DESIGNED expressly for the owner of a small pick-up truck who likes to get in all the fishing or hunting possible over a week end, this pickaback house trailer is "ready to go" on a moment's notice. As soon as you're through for the day, slip the trailer into the truck bed, and you're all set to head for that favorite lake or trout stream. The trailer includes all the accessories necessary for real comfort, such as storage lockers for food and clothing, gas stove and supply tank, toilet and bed.

Dimensions of the center section allow 66 in. of headroom. Of course, by simply lengthening the frame uprights it is possible to increase the headroom to 72 in. or more, but the proportions of length and width to height would lack the symmetry of the original design. Also, any increase in the over-all height would make the unit less adaptable to travel on narrow roads or trails in the back country.

You get a good idea of the construction from the cutaway view in Fig. 1. Note that the walls and ceiling are of approved trailer-type construction with a blanket-type insulation between inner and outer wall coverings. Note also how the floor is offset

at the sides to form a ledge, or seat, at each side of the center section. Because of variations in the size of the bed on various makes of pick-up trucks, some of the dimensions given in the details may have to be altered to fit the truck bed. Be sure to take careful measurements of the width, length and the height of the sides of your truck bed before cutting any materials. When finished, the body frame should slide easily in and out of the truck bed without binding at any point.

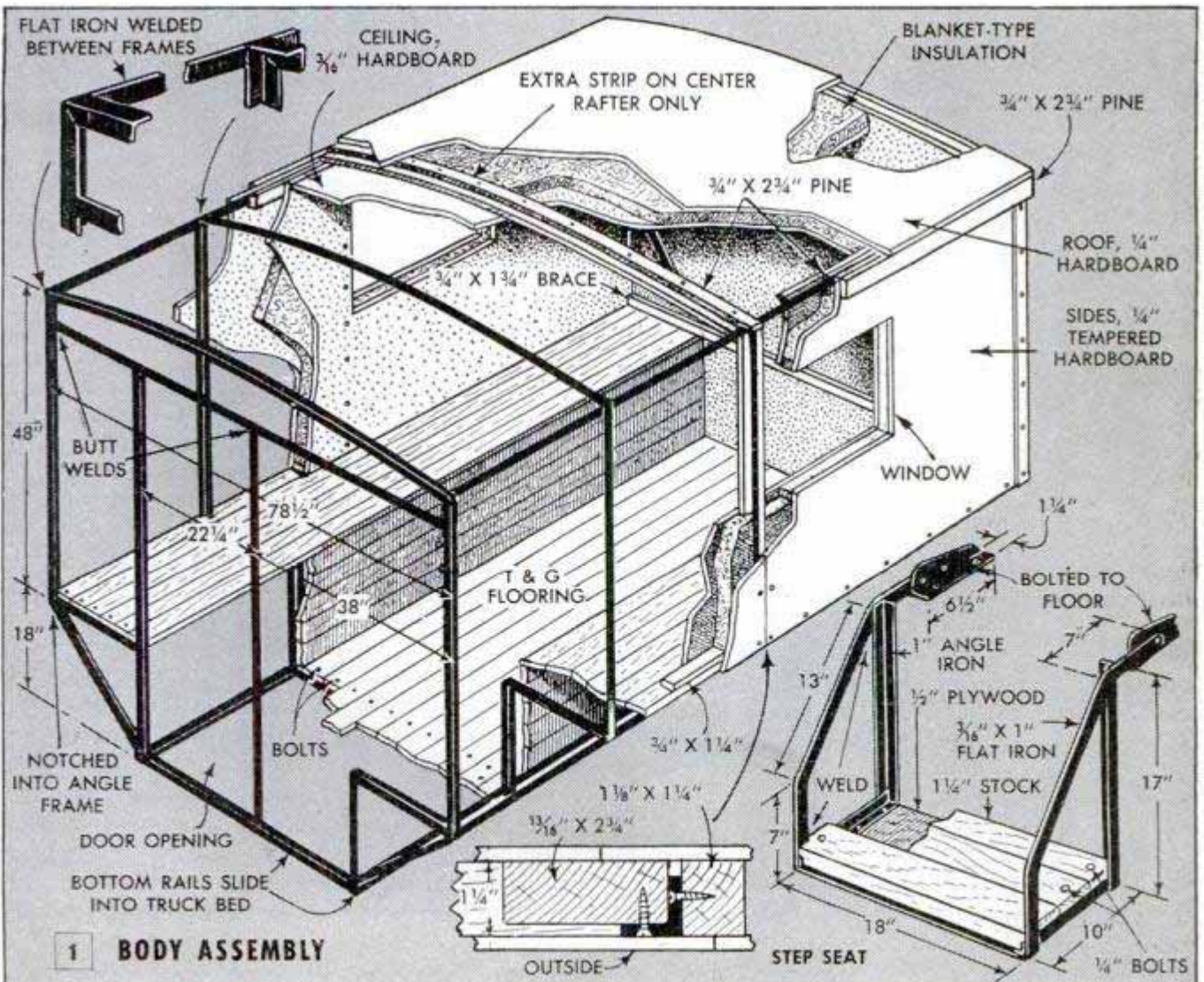
The frame is made of welded angle iron and consists of five vertical members joined across the top by carlins, or rafters, curved to a 3-in. crown. Spaced on 24-in. centers, the five frames give an over-all length of just over 8 ft. As you will see from study of the details and the accompanying photos, the frames are joined longitudinally at the bottom corners by 1½-in. angle-iron rails, detail C in Fig. 2, which serve as stiffeners and also as sills, or runners, for sliding the unit on and off the truck bed. At the upper corners, ¼ x 1½-in. flat-iron strips are butt-welded to the frames, upper left-hand detail in Fig. 1. Note that each frame is welded as a separate unit before welding

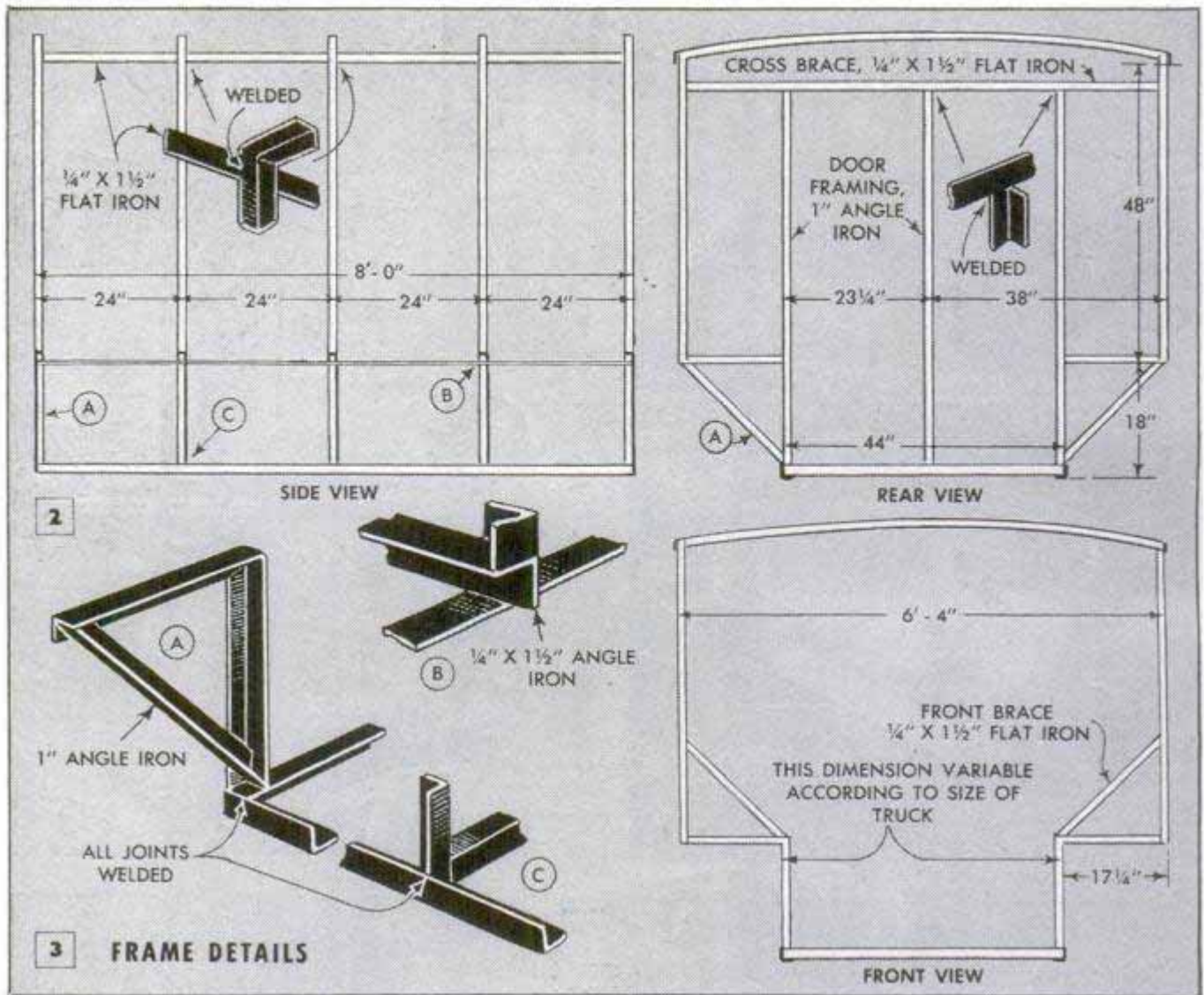


"saddle up"



enjoy life





Above, novel step-seat folds inside to form a comfortable seat, thus making use of all available space. Below, underneath view of body offset and the angle-iron framing which fits inside the bed of the truck



on the bottom rails and the flat-iron strips, or plates. In welding the frames, the bottom U-shaped member is made by bending A-frames from angle iron, V-notching one leg at the point where the bend will come. Then, after bending, the meeting edges are welded. The A-frames are welded to the bottom crossrails and the uprights are butt-welded to the outer ends. Then the curved carlin, or rafter, is welded in place to finish the individual frame. Care must be taken in welding to get frames of a uniform size. Use of a welding jig will assure uniformity. If the builder is not an experienced welder, it will pay to have all welding done by a professional. Now, note that a flat-iron strip is welded to the A-frames under the overhang on both sides, detail B in Fig. 2. These strips run the full length of the body frame and serve the dual purpose of making the frame more rigid and at the same time providing a convenient rack for lashing a tent, tarpaulin or other extra equipment for some special purpose. Two extra uprights and one full-width horizontal member make the door frame as shown in Figs. 1 and 2. The uprights are of 1-in. angle iron and the cross member is of flat iron, as indicated in the rear view, Fig. 2. Also, two



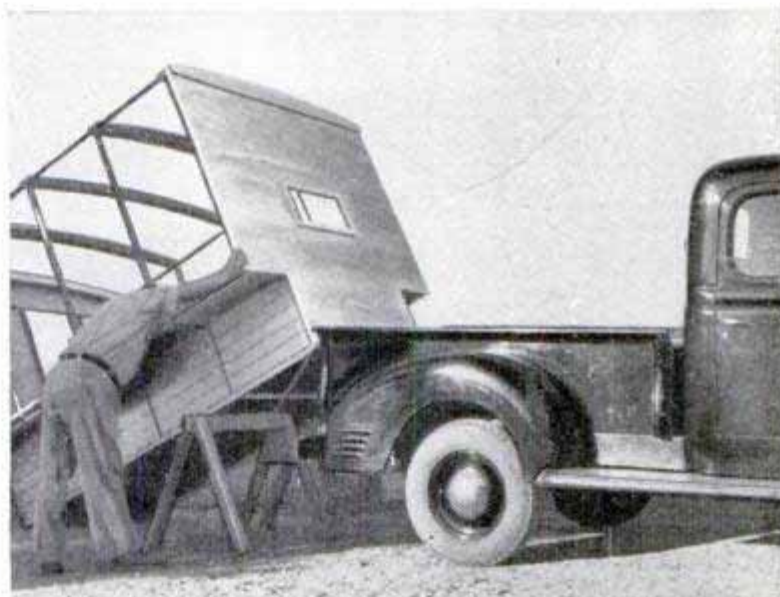
diagonal angle-iron braces are welded across the A-members of the back frame, detail A in Figs. 1 and 2. Note especially that the same braces at the front of the frame are placed above the overhang as in the front view, Fig. 3, and that flat iron is used instead of angle. It is necessary that the front braces be placed in this position to prevent interference when loading the body onto the truck bed.

After all metal parts of the frame have been welded together to form a unit, the next step is to install the tongue-and-groove flooring. Lay the center section first, and then carry the flooring up the vertical sides and across the overhang on each side as in Fig. 1. Because of the metal "joists" the flooring must be attached with 1 $\frac{1}{4}$ -in. 8-32 machine screws with nuts and lock washers. The clearance holes for the screws are drilled through each flooring board and through the angle iron. Use one screw at each frame, drilling through the center of the board. Be sure that the boards are drawn tightly together as they are laid. It's a good idea to shellac the boards before laying to prevent absorption of moisture. Next, install the front and back panels, Fig. 4. These are cut from  $\frac{1}{2}$ -in. waterproof plywood and are attached to the angle-iron framing with machine screws of the same size as used for the flooring. After installing the front and back panels, measure and cut an opening for the front window. This is centered in the body frame and is at the same height as the rear window in the truck cab. Note also the position of the rear windows, one in the door and the other in the body panel, rear view in Fig. 4. These three are unit sash and are not adjustable. Placing the sash in this position enables the driver to see the road through the rear-view mirror in the truck cab. However, as an added precaution it's a good idea to install a truck-type extension mirror on the cab.

At this stage, the body frame can be loaded onto the truck for completion of the job. The first thing is to attach wooden strips to the angle-iron frame members at the sides and across the roof carlins so that the outer and inner wall panels can be screwed in

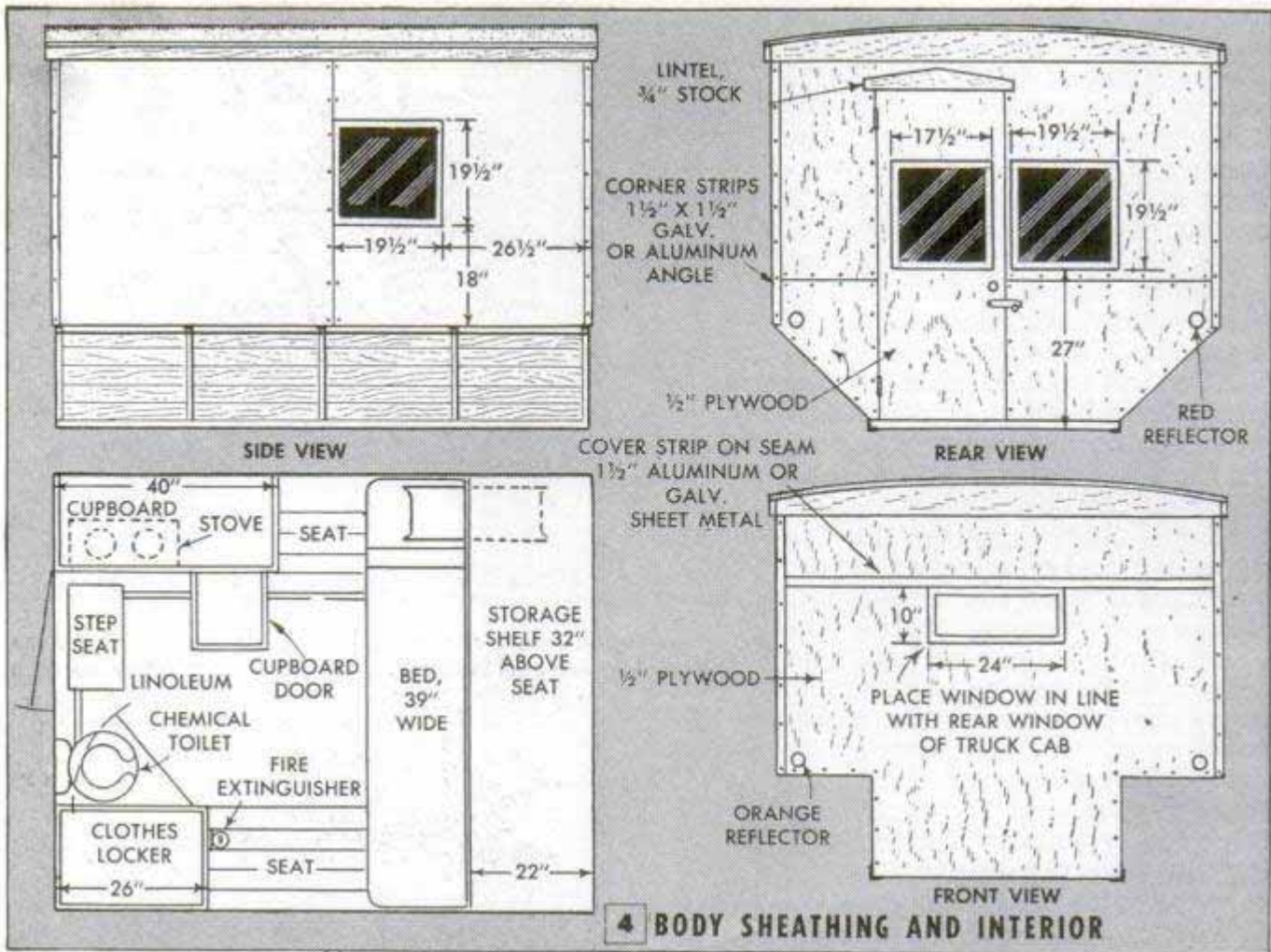


The angle-iron frame of the "pickaback" trailer body with the floor and front panel installed. Note the front window opening



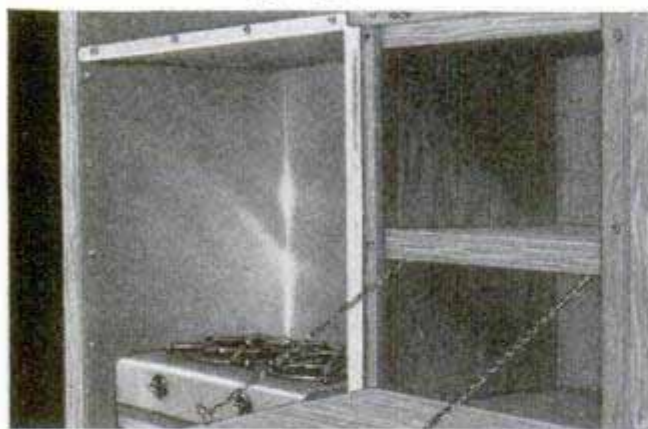
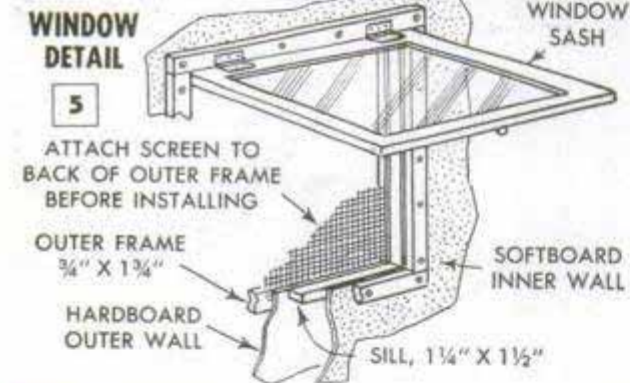
Above, loading the unit is made easy by supporting the front end on sawhorses. Below, roof carlins, or rafters, are curved to form a watershed. Rafters are faced with wooden strips





uprights. The wooden roof strips are centered over the curved carlins. Next, attach the side panels which are cut from 1/4-in. tempered hardboard. The joint on both sides is made over the center upright as in the side view, Fig. 4. It should be set in waterproof glue and fastened with two rows of screws which are equally spaced 4 to 6 in. apart. Now, attach the trim strips, or nailing strips, across the front and back and the sides as in the side, rear and front views in Fig. 4. Note that the front and back strips are bandsawed to the curve of the roof carlins. The top edges of the side pieces are beveled to meet the curve of the carlins to get a smooth, tight joint between the sides and the roof covering. The top panels also are of 1/4-in. tempered hardboard and are joined on the center carlin. Use waterproof glue in all the joints and fasten with flat-headed wood screws equally spaced in straight rows. Allow the top panels to project 1/16 to 1/8 in. all around to allow for inequalities in fitting. The projections are planed flush after the roof is finished. Finally, the four aluminum angles are attached. These protect the corners of the body and help to prevent leaks.

Next, cut openings for the side windows, Figs. 4 and 5, and you're ready to finish the interior. Nail in 3/4 x 1 1/4-in. strips to form sills as in Fig. 1, then apply insulating material to the walls and ceilings. Cover walls



place. Note the lower center detail in Fig. 1, which shows how a wide wooden strip is attached to the center frame to back up the joint in the inner wall covering. All the other strips are attached to the front side of the frame members. Either wood screws or machine screws with nuts can be used to attach the wooden strips to the angle-iron

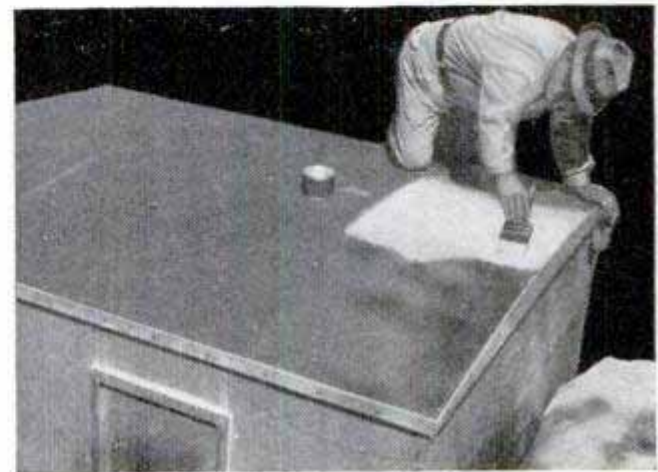
and ceilings with  $\frac{3}{16}$ -in. softboard, or birch plywood of approximately the same thickness. Use cup washers and oval-headed screws for attaching the interior finish. Fig. 5 details the window framing. Only the side-window sashes are hinged; the others are stationary. On the side windows, screen wire is attached to the inner side of the outer frame, or casing, before it is screwed in place. The hinged sashes are held open by a light chain attached to the ceiling with a screw eye. Trailer-type window units also can be used instead of the type detailed in Fig. 5. These are furnished as a unit complete with screen and metal frame ready to install in the window opening. Lintels over the windows and door are cut from  $\frac{3}{4}$ -in. stock and the top edges are beveled to form a watershed. The parts are attached to the framing with screws.

The back door is a simple unit made from waterproof plywood. This is hinged to swing outward and is provided with a night latch. The novel step-seat, Fig. 1 and the photo below Fig. 3, provides not only a handy rear step but an extra seat when folded inside. The frame of the step is built up by bending and welding angles and flat iron together to form the supporting frame as in the lower right-hand detail, Fig. 1. The short angles to which the step is pivoted are shaped as shown by sawing and filing and are bolted to the floor of the center section. They must be located so that when the step is folded outward the vertical members of the frame will bear against the outer edge of the doorsill as in the photo below Fig. 3. Cover the bottom of the step—this forms the seat when the step is folded—with  $\frac{1}{2}$ -in. waterproof plywood.

No construction details of the interior fittings have been included, as the arrangement of the cabinets and accessories has been left to the discretion of the builder. However, the lower left-hand detail in Fig. 4 suggests a typical arrangement of the interior. If desired, the center-section floor can be covered with linoleum or rubber tile and the exposed portions of the overhang

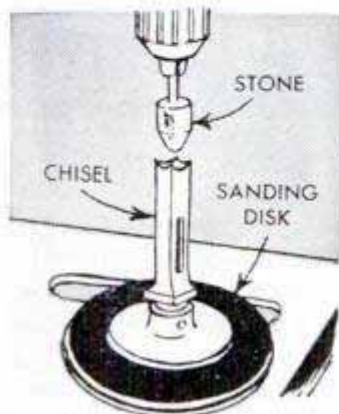


Above, top edges of the door and window lintels are beveled to form drip caps. Below, prime-coat the roof, sides and ends with one coat of aluminum paint



on both sides can be upholstered to form two comfortable seats. Paint the outside of the body with one coat of aluminum paint as a primer, then finish with two coats of outdoor enamel in whatever color you desire. If the inside has been finished with birch plywood, give it two coats of varnish in the natural color. The unit should be fastened in place on the truck bed by two  $\frac{3}{8}$ -in. bolts passing through the floor underneath the bed and through the metal bed of the truck. Locate the bolts so that they are easily reached from the underside of the bed and use lock washers to prevent the bolts from loosening.

## Sanding Disk Supports Mortising Chisel for Sharpening

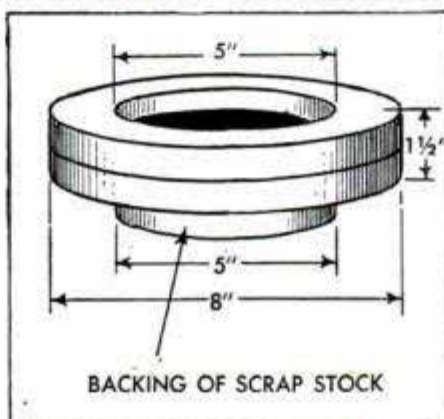
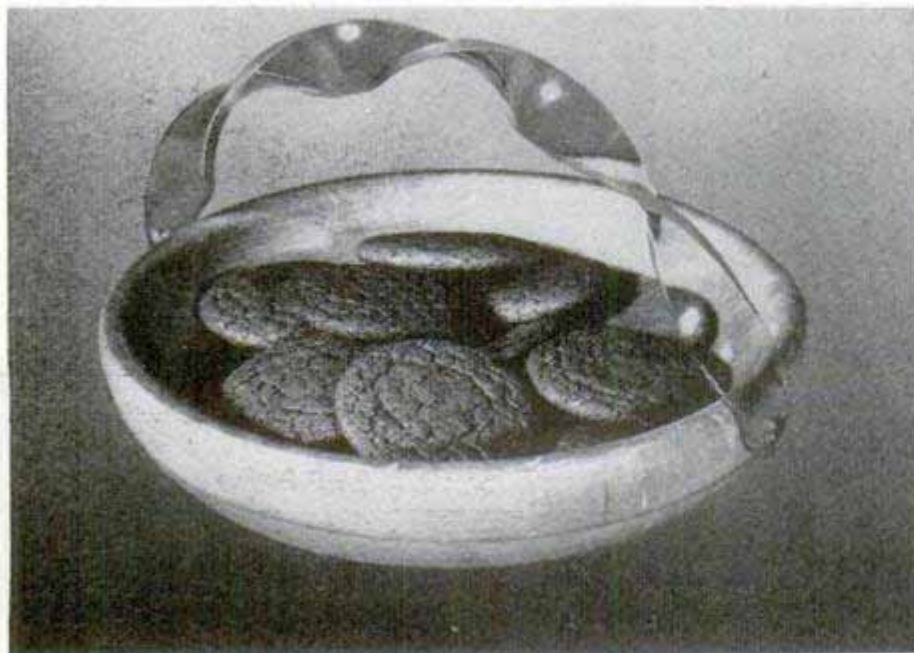


A mortising chisel can be sharpened quickly and accurately in the drill press if it is supported directly under the sharpening stone by means of a sanding disk or V-pulley. Place the tongue of the chisel in the hub of the

disk and tighten the setscrew on the hub. Then set the chisel upright under the sharpening stone, using the disk as a base. Before starting the drill press, bring the stone in contact with the cutting end of the chisel to be sure that the work is centered correctly for sharpening. — Raymond L. MacLean, Highbank, P.E.I., Can.

☐ If your wristwatch is not the waterproof type, it can be protected from moisture while fishing by wrapping it tightly with cellophane from a cigarette package.

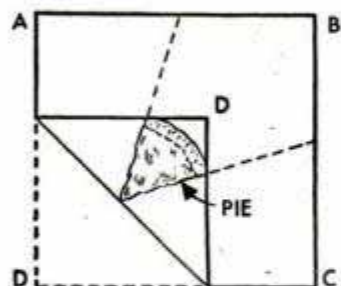
## Hardwood Bowl Has Interesting Spiral Handle Twisted to Shape From Strip of Colored Plastic



Turned from two disks of  $\frac{3}{4}$ -in. hardwood, this graceful candy or cookie bowl is decorated with a colorful plastic handle. The center portion of one disk is cut out and then the two are glued together. A backing of scrap stock is glued to the bottom disk to permit mounting on the lathe faceplate, a piece of paper being sandwiched between the disk and scrap stock to facilitate removal. The handle is a strip of  $\frac{1}{8}$ -in. plastic, 12 in. long and  $\frac{3}{4}$  in. wide, and after forming, it is fastened to the bowl with round-headed screws. The ends of the plastic are rounded and drilled and then it is heated in an oven at 250 deg. F. until pliable. The strip can be shaped by holding the ends with spring-type clothespins as in the lower left-hand photo. If the first attempt at twisting the plastic is not satisfactory, reheating it in the oven will restore its original shape. — Elma Waltnier, Hurley, S. D.

## Pie-Wrapping Method Prevents Leakage

Wrapping a piece of pie as shown in the detail and packing it in the lunch box pointed end up will prevent the juice from running out of the wrapper and getting the other contents of the box sticky. After tearing



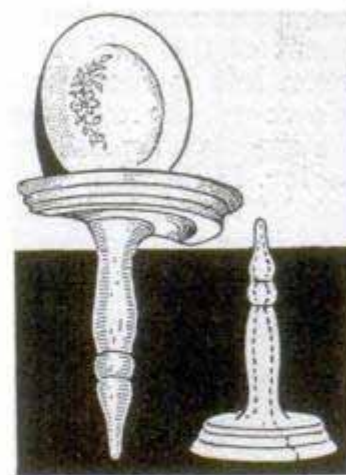
ing a square of wax paper from a standard-size roll, fold back one corner, D, far enough to form a double thickness of paper for the pie to rest upon. Then fold corners A and

C inward along the dotted lines so that they overlap across the top of the pie. Tuck in the edges at the outer crust, as in wrapping a package, and bring the corner B over the folds formed by A and C. The pie is now fully enclosed in two or more thicknesses of wax paper except for the point, which is held together with a paper clip.

Neil H. Jenkins, Gary, Ind.

## Lamp-Base Turning Split Vertically Forms Matching Wall Brackets

There is still some life in an old turned lamp base that probably has been gathering dust in the attic. Instead of throwing the base in the scrap heap or woodpile, use the hardwood turning and base to provide a pair of matching wall brackets for small



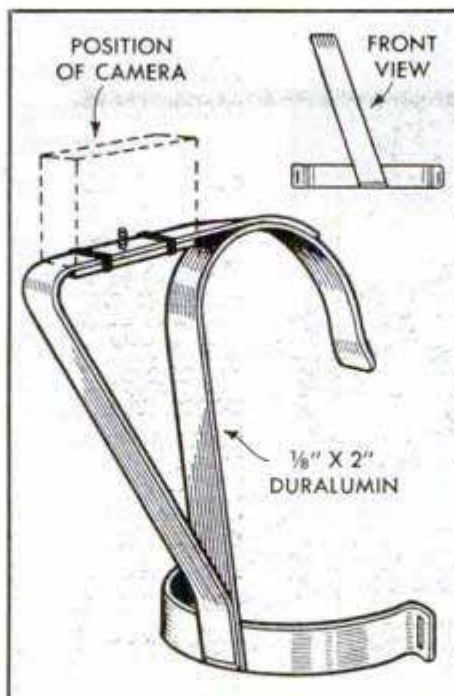
potted plants or figurines. Just cut off the standard, round the end and saw through the piece vertically, as indicated by the dotted lines. Refinish the halves and mount them on the wall, using the underside of the base to serve as the shelves.

☛ If you want a sure-fire bait when fishing for crappie, try small tadpoles.

# Movie-Camera "Tripod" Worn Over Shoulder

Originally designed for stalking wild game and shooting outdoor scenes from a canoe, the "shoulder pod" allows the movie cameraman maximum freedom of movement while still affording the steady camera support of a regular tripod. In addition to its many advantages for the professional cameraman when covering news stories and sports events, it helps the home-movie photographer to obtain better action and scenic shots by enabling him to shoot from interesting angles which would be impractical or impossible

to do with a tripod. Made of  $\frac{1}{8}$  x 2-in. Duralumin to suit the individual, the frame will accommodate any 8 or 16-mm. movie camera. Note that an extra piece of metal directly under the camera mount gives additional thickness for the tripod screw, and two wrappings of friction tape at this point



provide a nonslip surface for the camera. Although slots in the waistband permit fastening the frame to the body with a belt or strap, it has been found that, in most cases, the shoulder pod will stay in place without securing the waistband.—Claude A. Conlin, Jr., Los Angeles, Calif.

## Cleaning Developer Stains



Potassium permanganate, a chemical often used in formulas for reducing overexposed or underdeveloped negatives, leaves a stain on the fingers which is almost impossible to wash off with mere soap and water. It does

come off in a hurry, however, by immersing the hands in a 10 percent solution of sodium bisulphite, or by placing them in hypo that is used for fixing films and prints.

Virginia Hanson, Santa Monica, Calif.

## Inexpensive Darkroom Graduates

Glass and plastic measuring cups of the type used in the kitchen provide suitable darkroom graduates which can be purchased at the cost of only a few cents. Should you buy these cups for the purpose of measuring darkroom chemicals, be sure to get those which are graduated in ounces as well as fractions of a cup.

Arthur Trauffer, Council Bluffs, Iowa.

## Cut Film Washed in Shallow Tray Without Removing From Hanger

If you use cut-film hangers having hinged tops, it is an easy matter to wash the film thoroughly in a shallow tray without removing it from the hanger. Fold the top portion of each hanger back as far as it will go and set the hangers in the tray. In this way, the film is held at an angle which allows the water to circulate freely on both sides for thorough washing.

Louis Hockman, Sherman Oaks, Calif.



# DAYLIGHT TANK

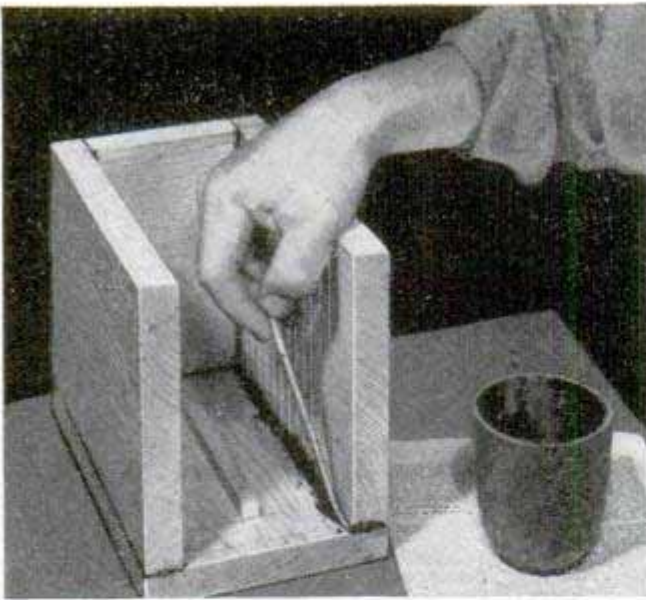
It's built almost entirely of wood and is made watertight with asphaltum varnish. Details also show how to make your own custom-size print trays out of plywood

*By Robert Hertzberg*

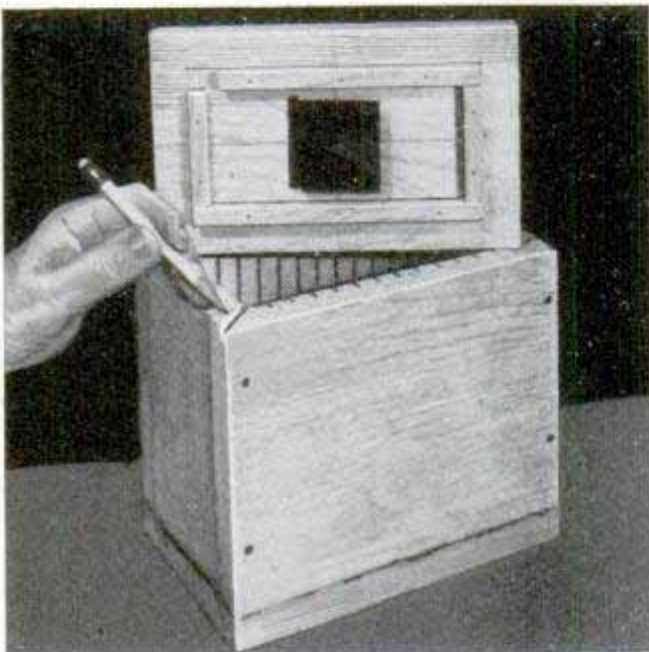
**I**F YOU WORK with 4 x 5-in. cut film and are starting to equip a basement dark-room at minimum expense, here's how you can save on the cost of a commercial daylight developing tank and the print trays you'll need by making them of wood. In addition to holding 12 sheets of film, the tank features a nozzle to which a rubber hose can be attached for rinsing the film after developing and for thoroughly washing the film right in the tank after fixing. The tank is filled through a hole in the top and emptied through a drain slot provided at one corner. Saw-cut grooves in opposite sides of the tank hold the film on edge and prevent the sheets from touching each other. The film rests on a cleat in the bottom of the tank to assure complete circulation of water during washing.

While the tank is dimensioned to take 4 x 5-in. film, either cut or from a film pack, the size can be altered to handle 3¼ x 4¼-in. or 2¼ x 3¼-in. film, as well as the larger 5 x 7-in. size. The tank is nothing more than a box, consisting of four sides, a bottom and a removable cover as detailed in Fig. 1. All the parts, including the ⅜-in.-square strips for the underside of the cover, can be cut from a 1 x 8-in. board, 41 in. long.

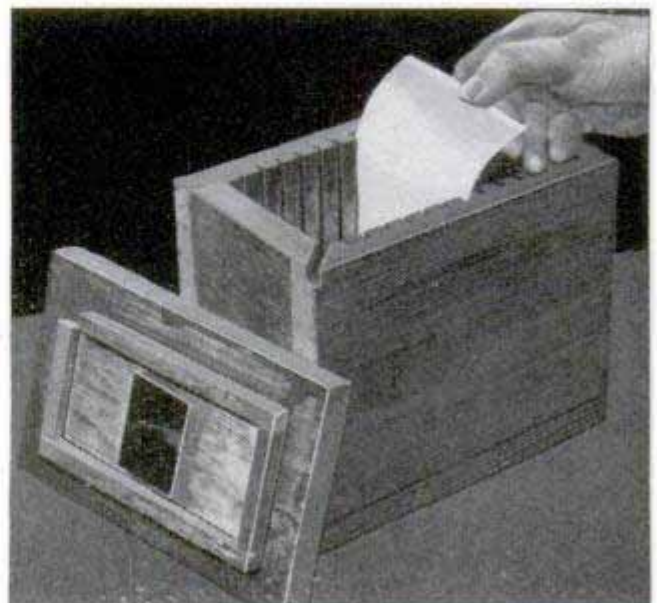
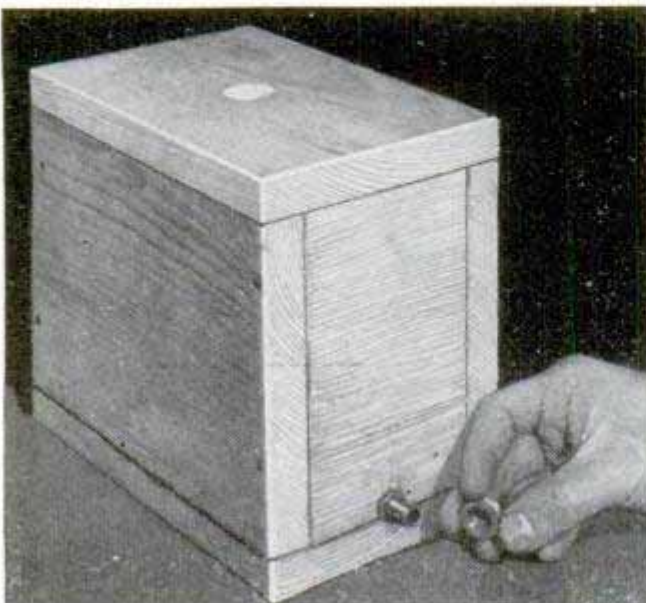
Each sheet of film is inserted in grooves in the sides of the tank and is thereby separated from other sheets. The film rests on a strip at the bottom of the tank to permit complete circulation of water in washing



A fillet of waterproof glue is run along all inside corners of the tank to assure a leakproof assembly



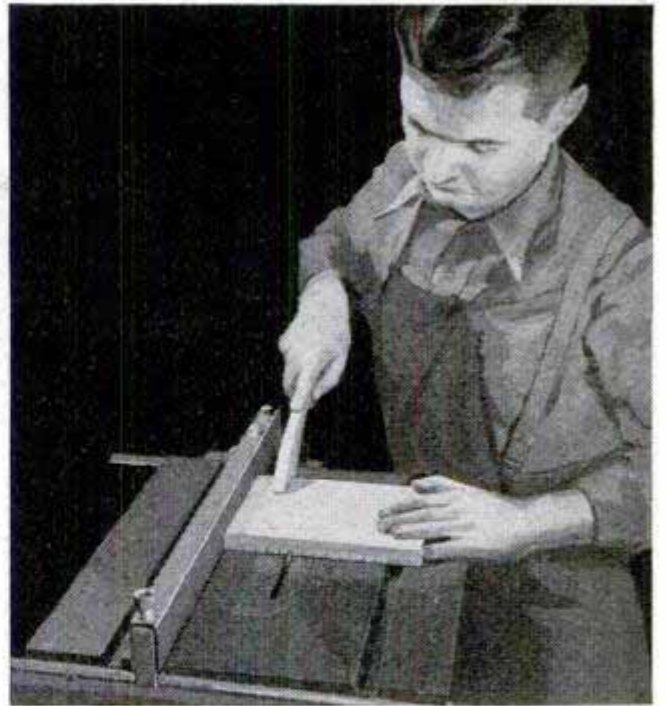
Above, here the tank is completed ready for waterproofing with asphaltum varnish. Note drain at upper corner. Below, a nozzle at the bottom of the tank permits attaching a hose for a thorough washing job



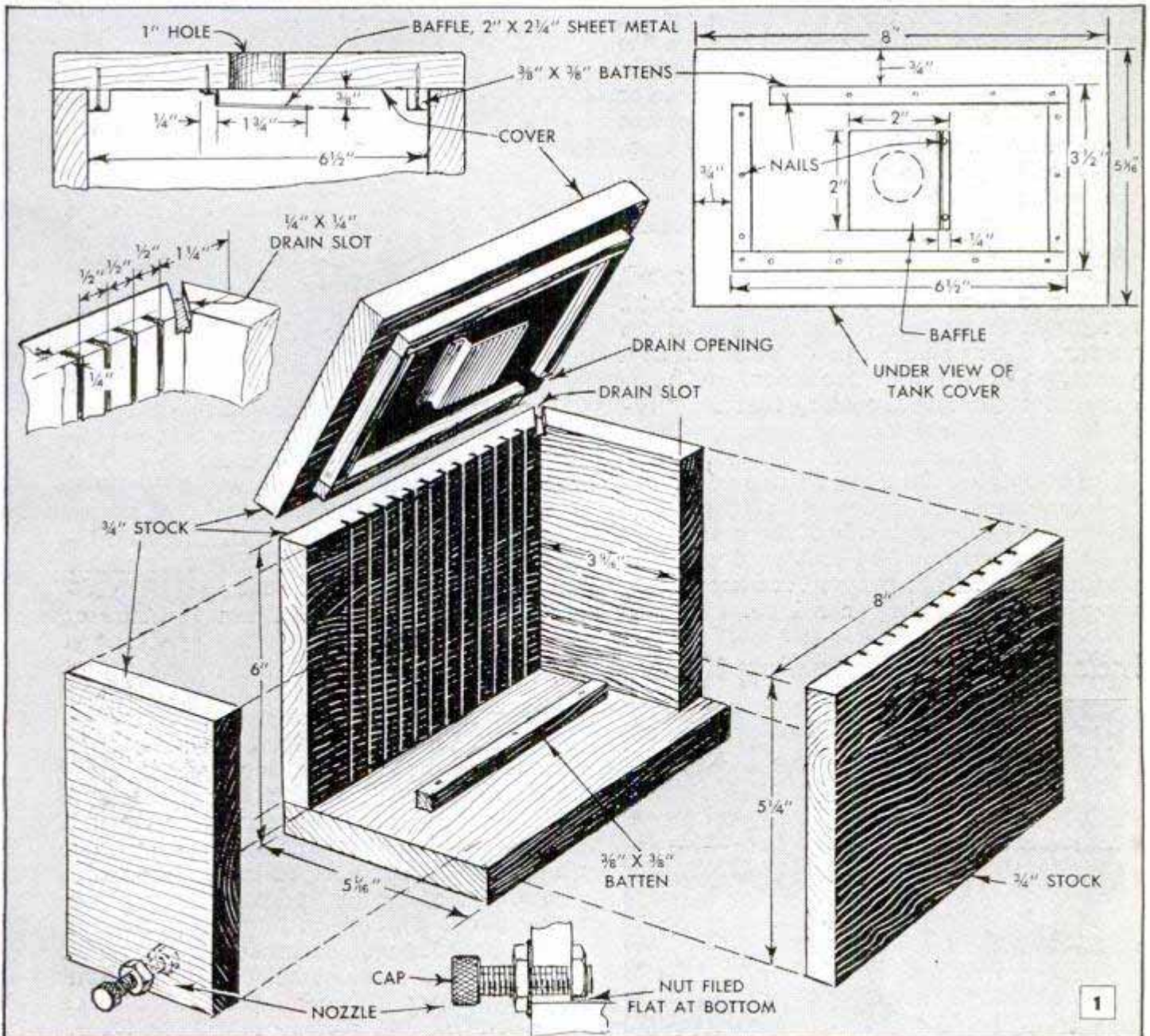
# FOR CUT FILM

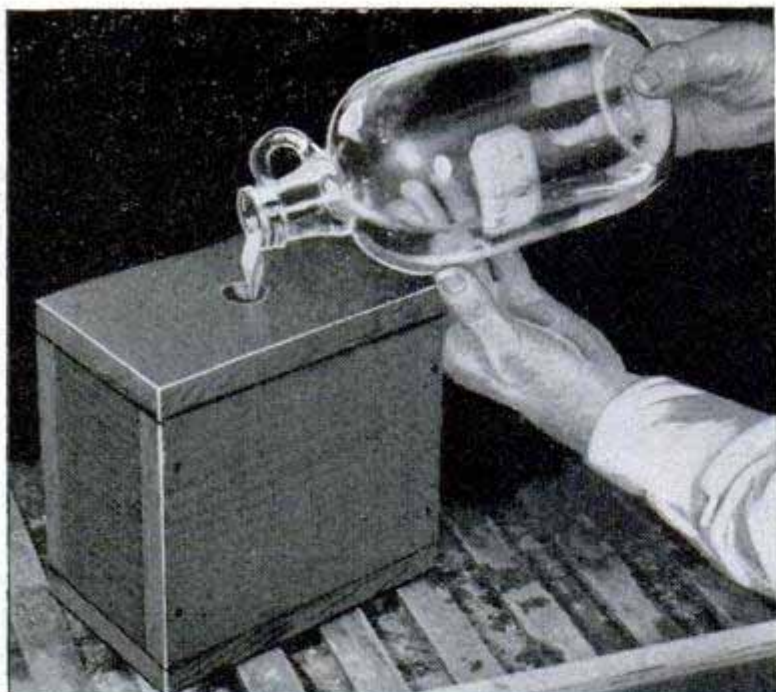
A thin-gauge saw blade on your power saw is ideal for making the  $\frac{1}{4}$ -in.-deep grooves for the film. In sawing the ends of the tank to size, cut them a scant oversize and then clamp the assembly together temporarily so that a trial fit can be made to see if the film slides in and out of the grooves easily.

In assembling the tank, apply a generous coating of waterproof glue to all joints and run a bead of glue all along the inner corners. The nozzle, which is a  $1\frac{1}{2}$ -in. length of  $\frac{3}{8}$ -in. threaded electrical pipe, is installed in one end of the tank and as close to the bottom as possible. Two hex nuts are used to hold the nozzle in place, one being soldered right on the pipe and then filed down on one side until it is flush with the threads of the pipe. This is done to permit inserting the nozzle in the hole from the inside. A small cork gasket is used to seal



With the blade set for a  $\frac{1}{4}$ -in. cut, a circular saw makes easy work of cutting the grooves for the film





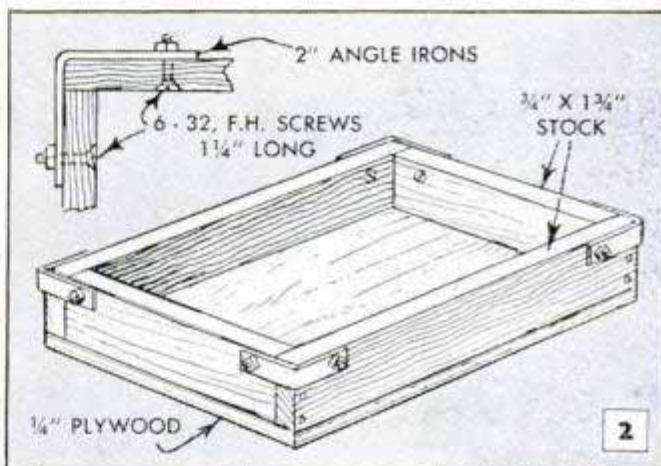
When tank is loaded, safelight can be used and developer poured through filler hole. Drain slot acts as air vent. The tank should be agitated occasionally



In emptying the tank, be careful that the cover does not come off. This is not apt to happen, but a large inner-tube rubber band will provide a safeguard

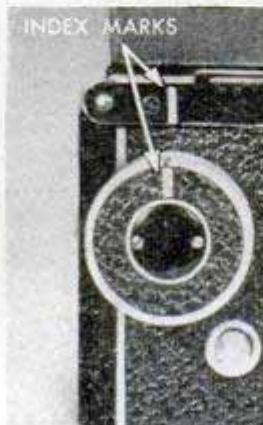
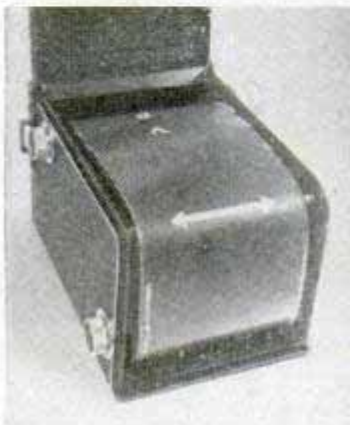
the hole under the fixed nut and a second nut is used on the outside to tighten the nozzle in place. A standard threaded cap is fitted to the end. The filler hole in the cover of the tank is covered on the underside with a metal baffle which serves as a light trap, and the  $\frac{3}{8}$ -in. strips, which are nailed to the underside of the cover, are positioned to provide a snug fit, with allowance being made for the waterproof coating.

Now for waterproofing the tank: All metal and wooden surfaces, inside and out, are given three heavy coats of asphaltum varnish. This usually can be obtained at a photo, paint or hardware store, and produces a smooth, hard coating that is not affected by ordinary developers or fixing chemicals. Let each coat dry thoroughly before applying the next, and do not overlook painting the underside of the metal baffle and even the inside of the nozzle. All metal surfaces must be protected with asphaltum varnish to prevent contaminating the photo-developing chemicals.



Custom-made trays of salon-print size (11 x 14 or 16 x 20 in.) can be made completely of wood in a similar manner. The bottom, which is  $\frac{1}{4}$ -in. plywood, is glued and nailed to  $\frac{3}{4}$  x  $1\frac{3}{4}$ -in. edging strips. Corners are reinforced with small L-brackets as shown in Fig. 2. Then the entire tray is waterproofed by coating it both inside and out with asphaltum varnish.

## Index Marks on Winding Knob Aid in Loading Film



When loading my Rolleicord camera in dim light, I found it difficult to see the first number on the film in order to set the automatic counter. To solve this problem, I now insert the film in the camera and wind it until the double arrow on the film lines up with the first roller, as in the left-hand photo. Then, I paint index marks on the camera and winder, as in the right-hand photo, close the camera and turn the winding knob  $6\frac{1}{2}$  turns. This brings the film in position to set the counter.

Cecil Charles, West Los Angeles, Calif.

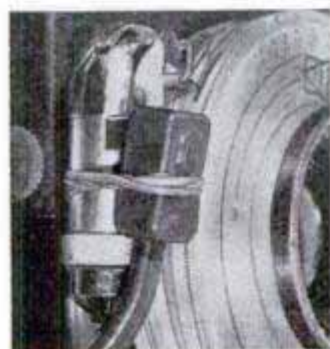


## Flashlight Beam Played on Print Darkens Corners of Enlargement

Many photographers prefer that the corners of their prints be somewhat darker than the rest of the picture, particularly when a vignette effect is desired in the case of portraits or other artistic shots. One way to do this with consistent uniformity is to expose the picture as usual and then play the beam of a small flashlight over the corners. The amount of light necessary to darken the corners to suit can be determined by experiment, and the hand can be used as a shield to keep the light from affecting the rest of the picture. The hand must be kept moving constantly to prevent the darkened area of the print from forming a definite line.

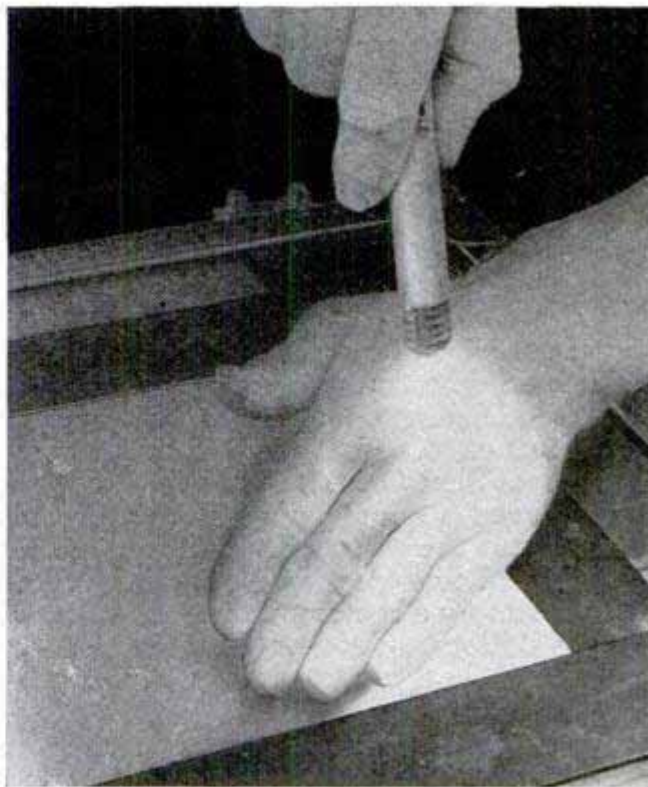
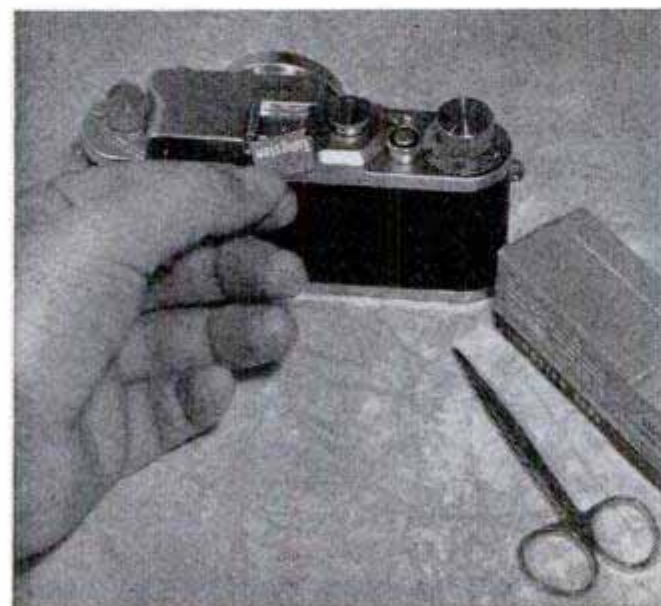
## Rubber Band Holds Tripper Wire To Camera Synchronizer

Flash bulbs are frequently fired without tripping the camera shutter because the wire has worked loose from the synchronizer connection.



To prevent this waste of bulbs and the possible loss of a good picture, use a rubber band to fasten the tripper wire securely to the synchronizer. After inserting the tripper wire into the synchronizer connection, simply

double the rubber band several times and snap it over the parts as shown in the photograph. Not only will this method serve the purpose but the wire is easier to disconnect than when fastened with more complicated arrangements.



## Ice Pack Cools Developer Solution

A tray of developer solution can be kept at the required temperature in warm weather by immersing a rubber glove filled with ice cubes in the solution.

After placing a few cubes in the solution. After placing a few cubes in the glove, close the top with a spring-type paper clip. Then lay the glove in one corner of the tray, removing and replacing it as necessary to keep the developer constantly at the right temperature.



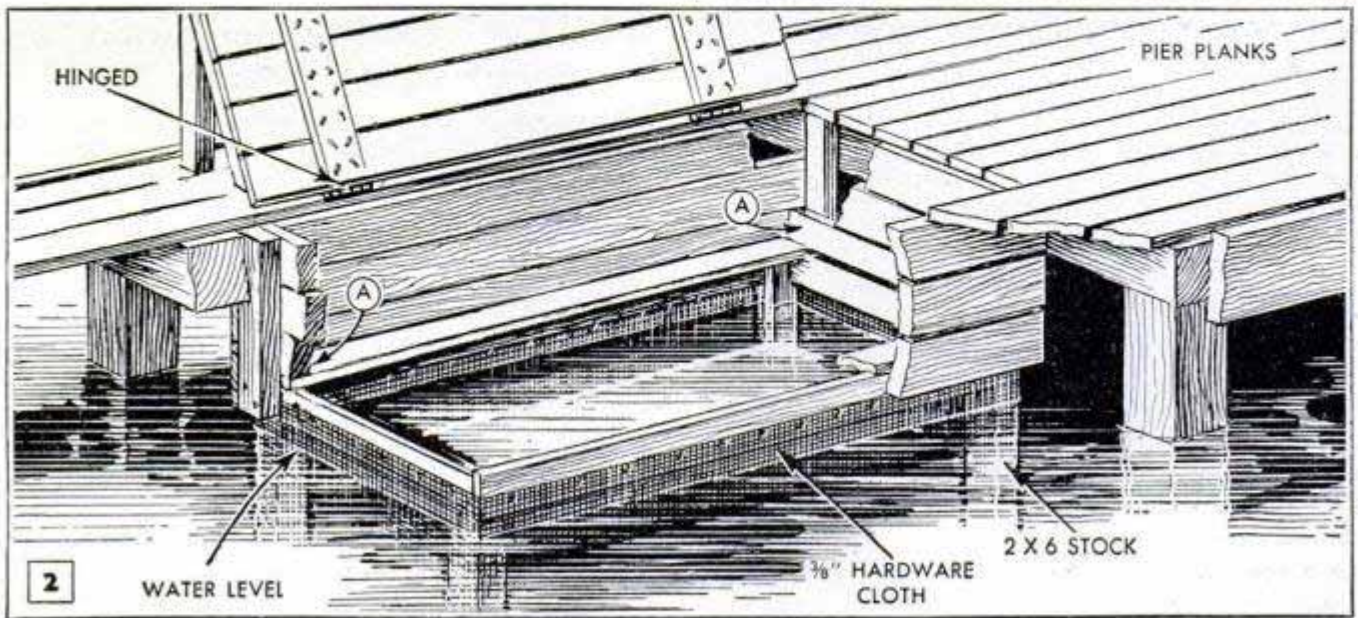
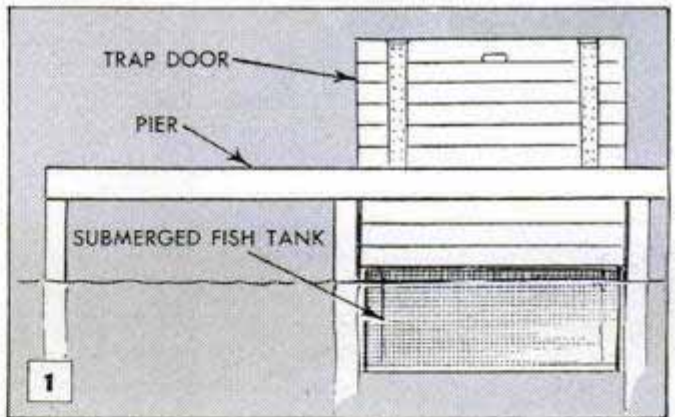
## Label Cut From Original Carton Identifies Film in Camera

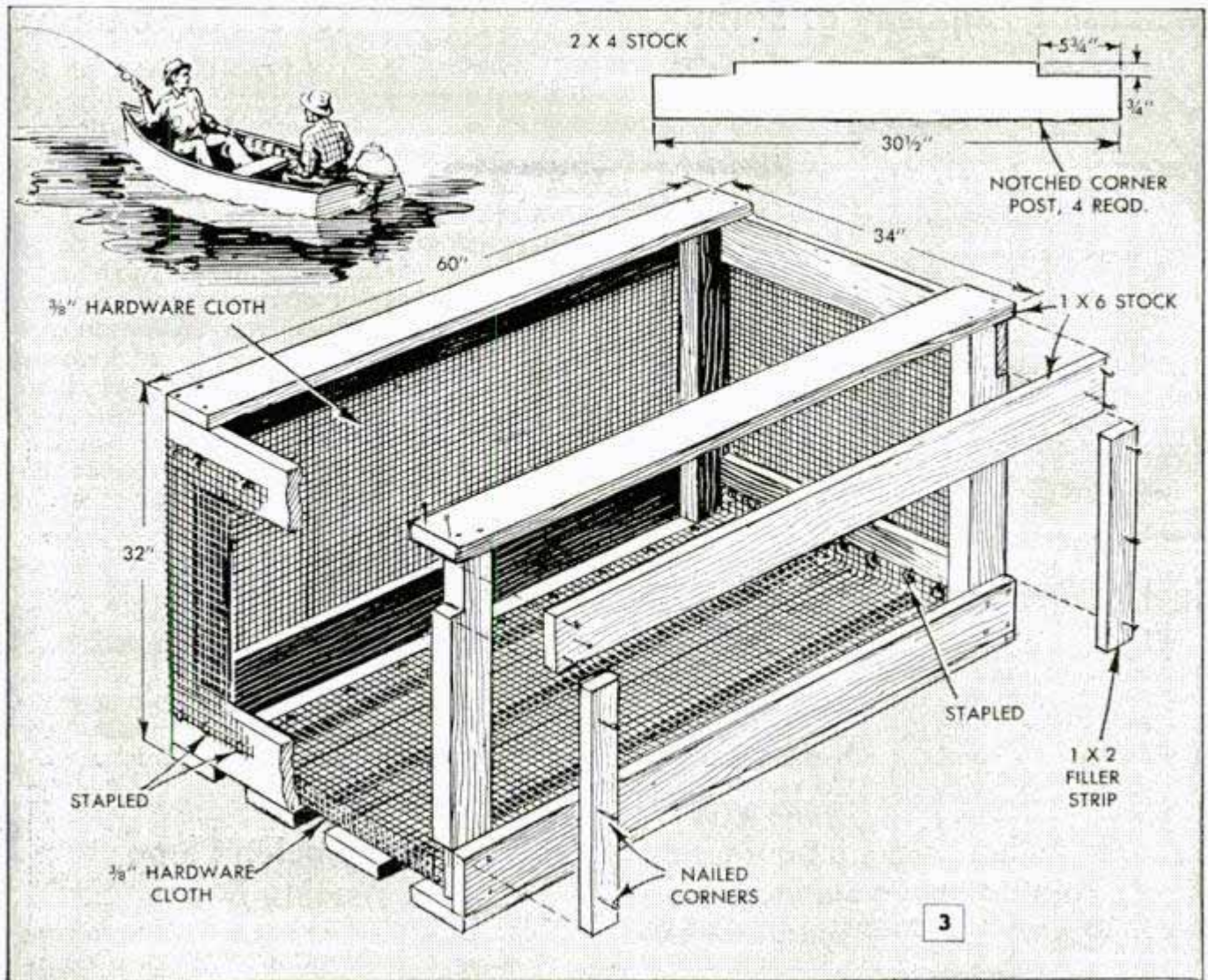
Owners of 35-mm. cameras who take pictures on several different occasions before the roll is completely used may find it difficult to remember from time to time the type of film in the camera. However, if the camera is of the type which is equipped with a clip for a flash attachment, a positive way of identifying the film is to make it a practice to cut the label from the original carton and slide it in the clip. Then, when an interval of a week or two passes between shots, you will be able to tell at a glance whether the camera is loaded with tungsten or daylight color film, or Super XX, Verichrome, etc., without having to trust to memory.

# LIVE-BAIT STORAGE

By *Elon Jessup*

OWNERS of all-season fishing camps, as well as bait suppliers and individual fishermen who can get away regularly on week-end fishing trips, will find use for this novel fish cage, or tank, which is built under a boat pier. Once it is in operation you are assured a supply of fresh fish or bait throughout the season. Figs. 1 and 2 show the general construction quite clearly. The tank is simply a rectangular frame covered on the bottom, sides and ends with  $\frac{3}{8}$ -in. hardware cloth as detailed in Fig. 3. The completed cage is sunk in a well, or casing, built beneath an opening cut in the pier as in Fig. 2. The lower edge of the casing should be about 6 in. above the water line. Over-all dimensions of the cage in Fig. 3 are only suggestions; it can be made any convenient size. Frames for small cages, such as that detailed in Fig. 3, can be made of 1 x 6-in. stock, or even 1 x 4-in. stock. Cypress is the best wood to use, with white pine the second choice. For tank frames larger than that detailed in Fig. 3, use 2 x 6-in. stock as indicated in Fig. 2. When the whole thing is completed, the cage is sunk by simply up-ending it in the casing and forcing it downward until the ends lock under the lower edges of the casing as indicated at A in Fig. 2. Note that the lower ends of the vertical cleats project below the lower edges of the endpieces of the casing. These projections, located on all four corners of the casing, hold the cage securely in position after it has been sunk and floated into place. It is essential that the





cage fit loosely in the well as otherwise it may swell and stick in the opening, making removal difficult without damage. It's a good idea to determine the size of cage you want, then construct the well first. In this way you can take the measurements for the cage directly from the well. The trap door should be supported on heavy cleats nailed to the inside of the opening so that when closed the door will support the weight of

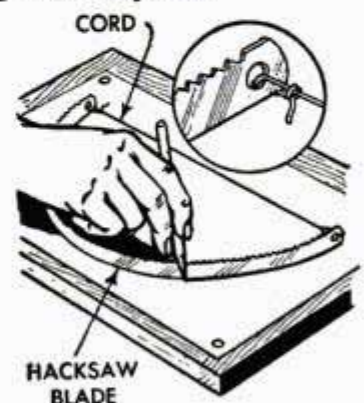
several persons. Back supports for the door should be securely attached to the pier and adequately braced. The supports should be high enough so that they are readily seen when the door is closed. Many kinds of game fish and live baits, such as crayfish, minnows and snails, can be kept alive in the tank for long periods of time by feeding at regular intervals throughout the season with prepared fish foods.

### Fish Kept Fresh Without Ice By Wrapping in Dry Grass

When fishing in localities where no ice is available, the best substitute for keeping the fish fresh and sweet is to protect them from moisture and air. Clean the fish as soon as possible after they are caught, but leave the scales on until just before you cook them. Cut off the head and gills, and clean out the cavity, scraping every trace of congealed blood from the backbone. Do not wash the fish but, instead, use a clean cloth to wipe out the cavity and dry the scales. After filling the cavity with dry, green grass, wrap each fish separately in grass and then in paper. Wrapping the packages in a blanket or tarpaulin affords additional protection.

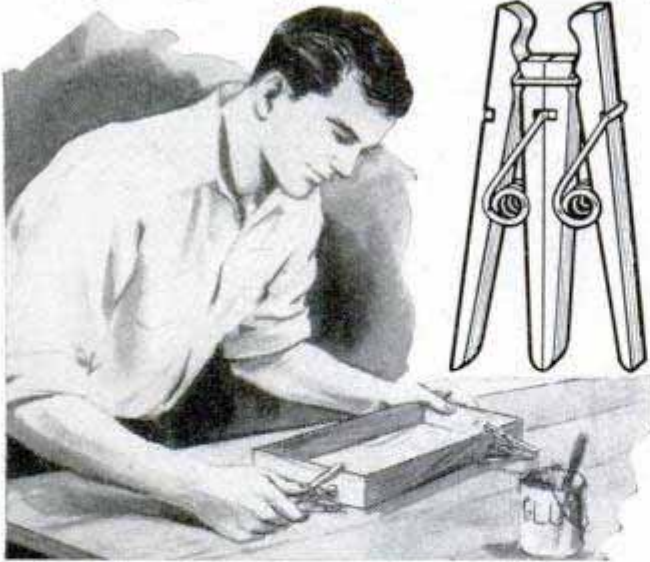
### Hacksaw Blade Bowed With String Doubles for Large Compass

If you happen to be laying out a pattern for band-saw or scrollwork and do not have a compass large enough to draw in the desired curve, you can improvise a guide for drawing the curve by using a hacksaw or meat-saw blade.



Bow the blade to the proper radius by tying the two ends together with a length of cord and position the blade on the layout.

## Increasing Capacity of Spring-Type Clothespins for Gluing Clamps



If you use spring-type clothespins as small gluing clamps for modelmaking and should find that the individual pins do not have sufficient capacity for a particular job, you can increase the capacity of the jaws by fastening two of the pins together. Using wooden clothespins, cut off the end of one arm on each pin, as shown in the detail. Then wire together the two shorter arms to form a single clamp. Although this will give the jaws a spread of an inch or more, depending on the size of the clothespins, greater capacity can be attained simply by inserting a wooden spacer of the desired thickness between the arms of the clothespins before wiring them together.

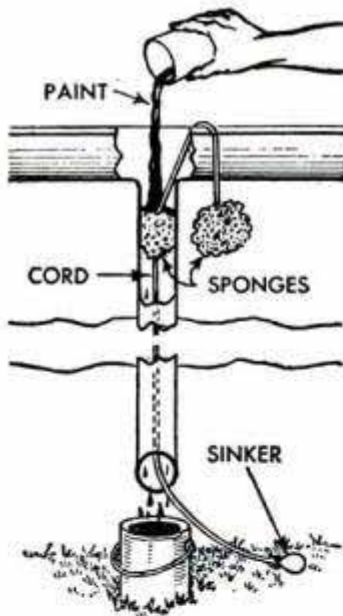
Frank Palisi, Bridgeport, Conn.

## Soaking Metal Lures in Potato Water Removes Tarnish

When metal fishing lures become tarnished, their polish can be restored by soaking them overnight in water in which potatoes have been boiled. Remove the lures from the water, rub with a damp cloth and then wipe dry. To remove rust

spots from nickel, cover the lure with lard and allow it to remain for a few days. Then wipe off the lard and the rust along with it by using a cloth dipped in ammonia. You can keep nickel spoons from tarnishing by coating with fingernail polish.

## Sponges Pulled Through Downspout Apply Paint to Inside Surface



Added rust protection is given to a downspout if the inside surfaces are painted. The paint can be applied quickly by using two sponges and a length of cord which is several feet longer than the downspout. First tie a heavy fishing sinker to one end of the cord and then tie the two sponges to the other end, spacing them about 1 ft. apart. Lower the

sinker through the drop outlet of the eaves trough, checking to make sure that it comes out of the end of the downspout. Press the first sponge into the outlet, as indicated, and pour a pint of paint over the sponge. Grasping the sinker, pull the cord through the end of the downspout. The paint which is carried by the first sponge will be spread evenly over the walls of the pipe by the second sponge which follows through the downspout. A paint can or pail set beneath the end of the downspout will retrieve any excess paint as the sponges are removed.

## Playhouse at School-Bus Stop Forms Snug Waiting Room

This cozy little playhouse is the waiting room at a school-bus stop in one rural community. It shelters the youngsters from disagreeable weather and its dollhouse lines make it a spot where they enjoy playing while waiting for the bus. The house is built on skids so it can be towed well away from the road with a tractor when school closes for the summer months.

A. M. Wettach, Mt. Pleasant, Iowa.



# GARDEN BARROW

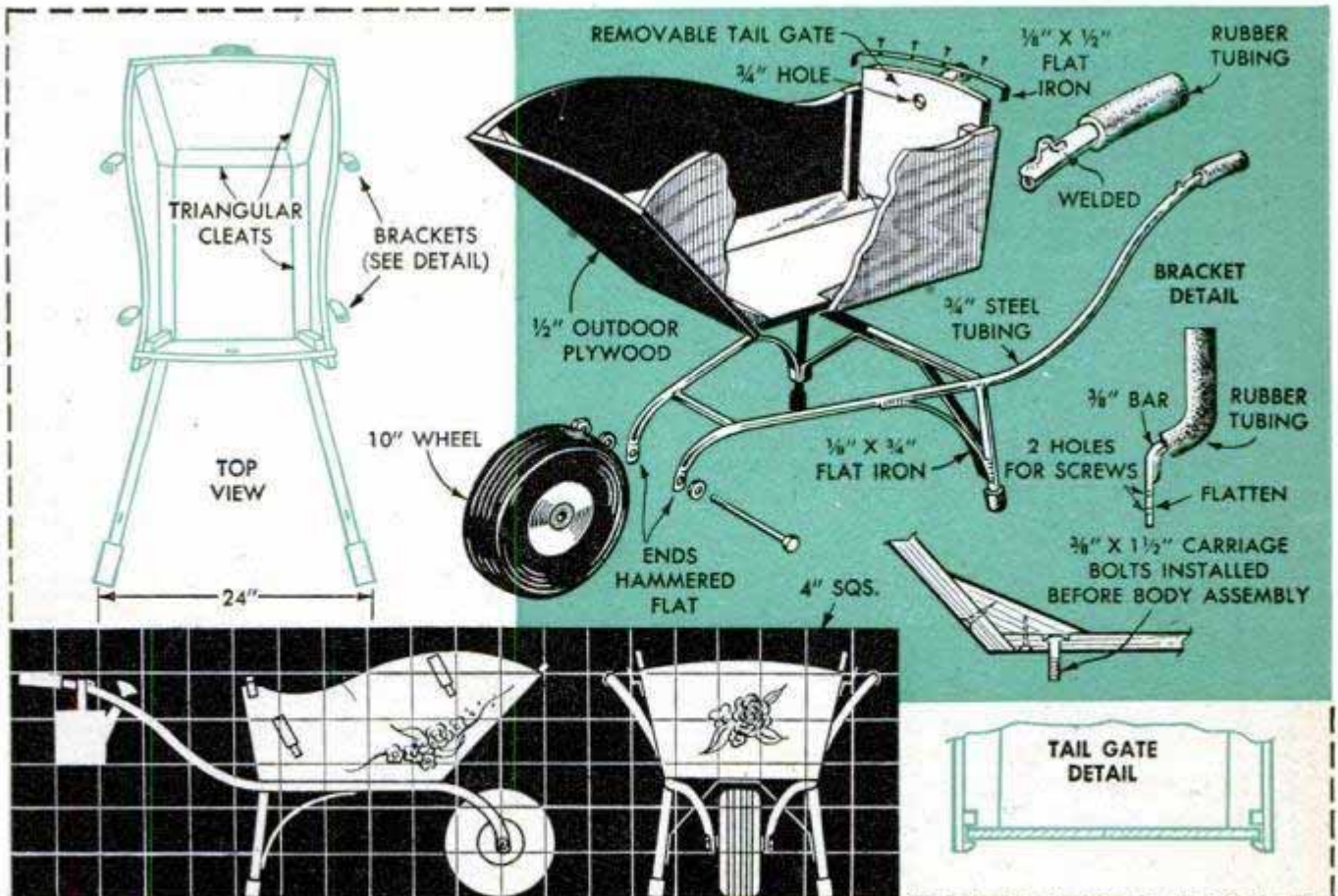
By Hi Sibley

ESPECIALLY designed for the housewife who enjoys spending her leisure hours puttering in the garden, this lightweight wheelbarrow is exceptionally easy to handle. The frame is sturdily constructed of seamless steel tubing and is fitted with a 10-in. ball-bearing wheel of the semipneumatic type. Rubber-sheathed brackets for carrying a rake and hoe or spade are mounted on the sides of the body, and lips welded to the tubing near the handles provide hooks for sprinkling cans or baskets. Comfortable handgrips are had by pressing short lengths of rubber tubing over the ends of the handles.

The frame is of welded construction, utilizing  $\frac{3}{4}$ -in. tubing, and each of the two side members is a single length of tubing which runs from the wheel yoke back to the handle. The ends of the tubing at the yoke are hammered flat and drilled for the axle before bending. To bend the tubing, pack with dry sand and heat in a forge or

with a blowtorch. Then bend the heated tubing around a wooden form.

The body of the wheelbarrow is made of  $\frac{1}{2}$ -in. outdoor plywood and is assembled by fastening the front, sides and bottom to triangular-shaped cleats with glue and screws. Note that the rear of the body is fitted with a removable tail gate which slides in a groove as shown in the lower right-hand detail. The body is attached to the frame with carriage bolts which are installed in the plywood bottom before the body is assembled. An attractive finish can be had by painting the body and frame and decorating with bright decals.



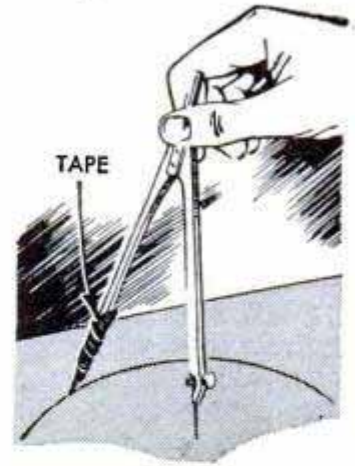


### Rear-View Mirror for Trolling Mounted on Boat Transom

Facing the stern of a boat while rowing sometimes makes it necessary for the oarsman to turn around frequently and look over the bow in order to see where he is headed. This is especially true when trolling along an uneven shore line which requires almost constant maneuvering of the boat to keep the desired distance from the shore. To eliminate this nuisance of having to turn around, one fisherman made a rear-view mirror from an old dresser-type hand mirror and mounted this on the transom of the boat. In this way, a glance into the mirror gave him a clear view of the water ahead. To mount the mirror, he simply wired it to a strip of wood and then fastened the strip to the boat transom so that the mirror was supported at eye level. The strip can be held with pipe clamps for easy removal.—Hallie H. Holt, Springfield, Ill.

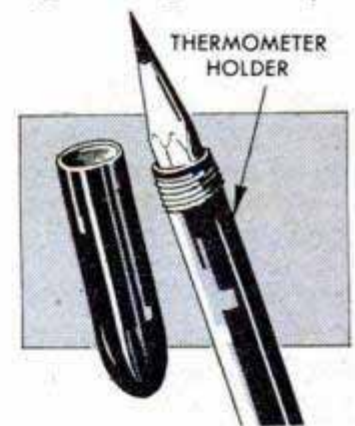
### Automatic-Compass Refills Held in Place With Tape

For emergency use when lead refills of a large enough size cannot be obtained for an automatic compass, use cellulose tape or masking tape to hold the undersized leads in place. Cut the tape into a strip about  $\frac{1}{4}$  in. wide and  $1\frac{1}{2}$  in. long and wind it diagonally, starting around the arm of the compass and passing around the upper portion of the projecting piece of lead. If the lead is much too small for the compass, the tape will hold it in place, but only light pressure can be applied when drawing the circle.

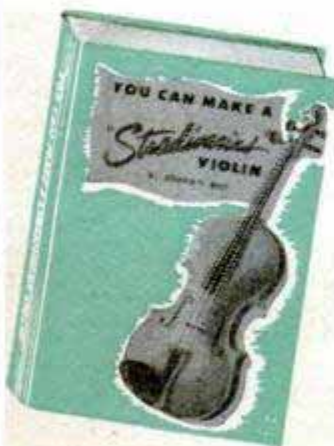


### Thermometer Case Sheathes Pencil To Protect Handbag Lining

If you would like to carry a pencil in a handbag or trouser pocket except for the likelihood of the point becoming snagged in the cloth, use a discarded fever-thermometer case to provide a covered holder for a pencil.



## Informative Books For The Craftsman



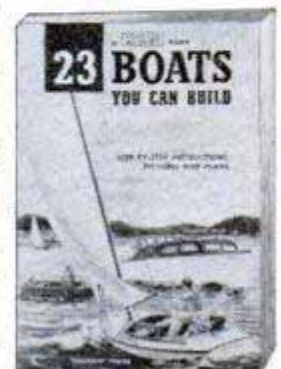
Hot summer days are just the time to get at some of that long delayed work you have been planning to do in your workshop. You won't find a cooler place than your basement shop. Besides, if you are busy there isn't time to think about the heat.

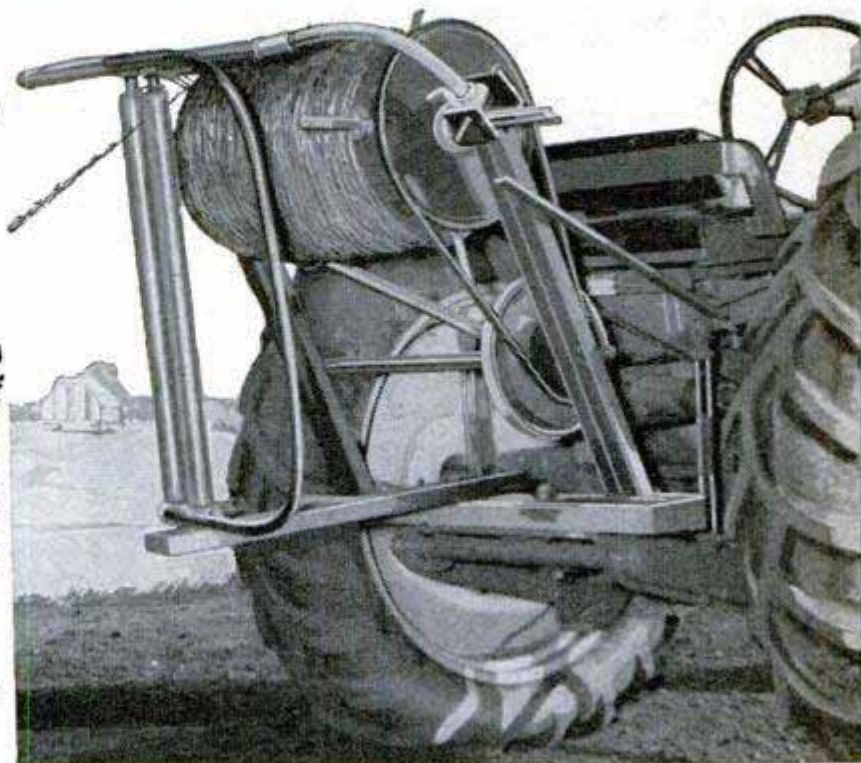
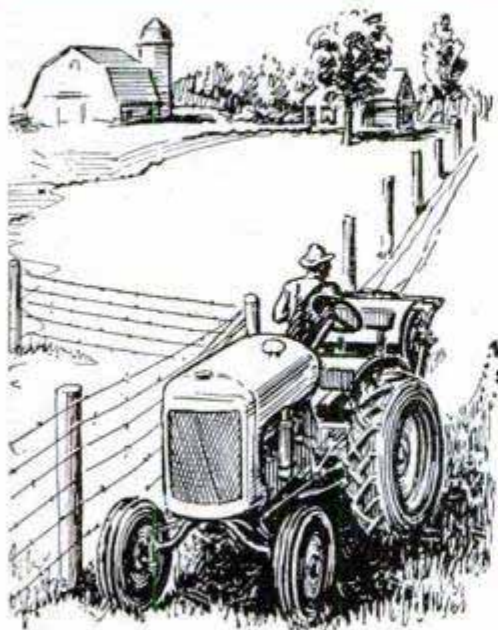
For the man who is looking for something to test his skill as a craftsman, Popular Mechanics book entitled "You Can Make a 'Stradivarius' Violin" will give him a project to really "get his teeth

into." Only a limited number of tools are needed for this project, and any man with average craft ability can produce an instrument equal in quality and tone to many that can be purchased. In the book, Joseph V. Reid, maker of hundreds of fine violins, tells you how to make a violin patterned after one of the most famous models

of Antonio Stradivari who has been acclaimed for centuries as the master of violinmaking. In addition to step-by-step instructions, there are eight large plans in a pocket inside the book cover. Book and plans are \$3.50.

Popular Mechanics book entitled "23 Boats You Can Build" is the answer to your problem of owning a boat, no matter whether you desire a cruiser, a speedboat or just a rowboat or dinghy. The book contains more than 500 photographs, plans, diagrams and step-by-step instructions for building all kinds of boats. These include a 35-ft. cabin cruiser, sailboats, outboard and inboard motorboats, rowboats, and several novelty craft for exciting water sports. Construction of boats is a rewarding occupation that can be learned by any home craftsman. The book is a "must" for every home library at \$2.00. All books are available from Popular Mechanics Book Dept., 200 East Ontario St., Chicago 11, Ill.



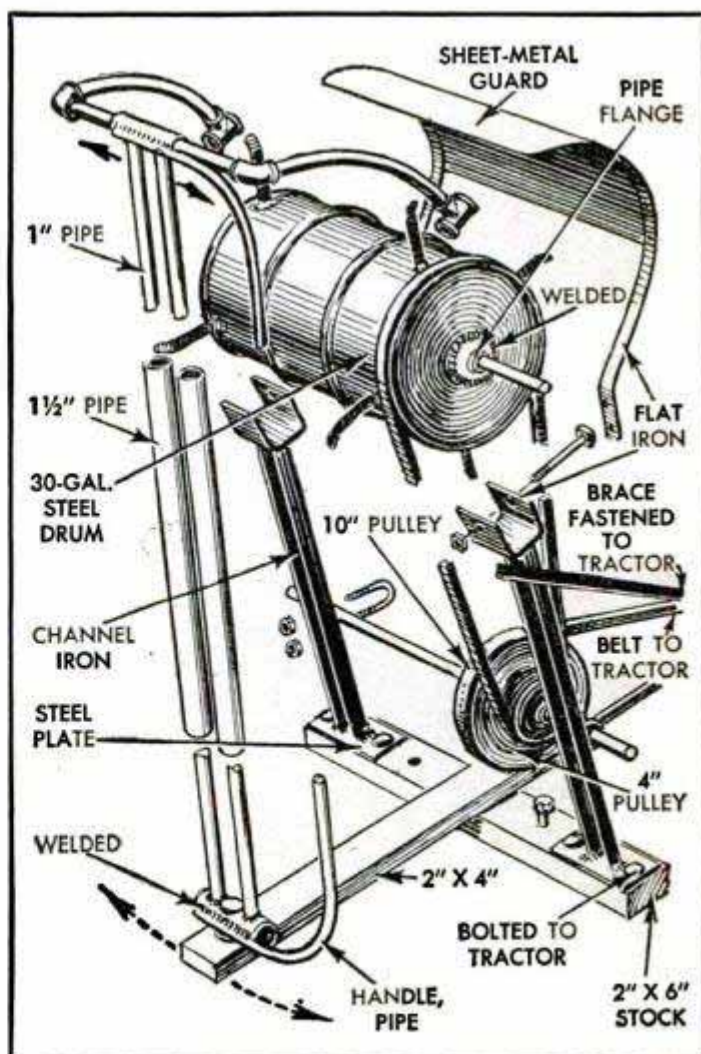


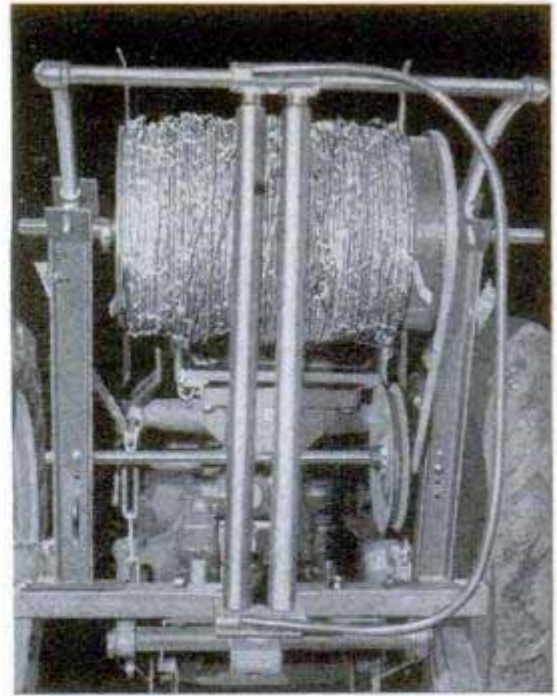
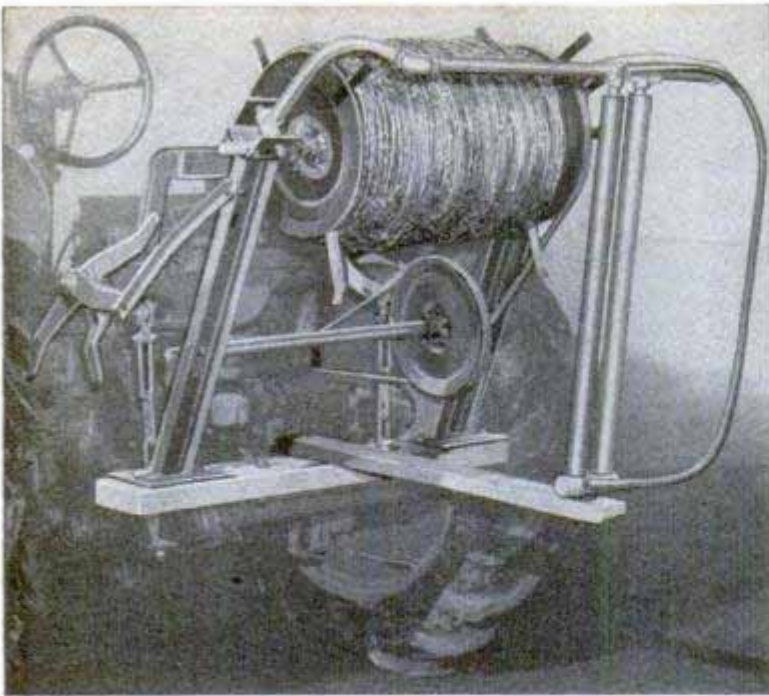
## Tractor-Powered WIRE REEL

By Grover Brinkman

**H**ANDLING barbed wire is one job most farmers dislike. Not only is the work slow and tedious, but the sharp barbs can cause serious injury unless one is extremely cautious. On stock farms where there is considerable temporary fencing to be done, it will pay to make the tractor-powered wire reel pictured above. A 30-gal. steel drum, a few pieces of channel and angle iron, three V-pulleys and belts and some pipe include most of the materials needed for the job. The detail at the right shows how these materials are assembled into a unit that can be adapted for use on nearly all tractors having a rear-mounted hydraulic lift or rear-mounted belt pulley. Short spindles, consisting of an 8-in. length of 1-in. pipe and a flange, are welded to the ends of the drum. One end of each of the channel-iron supports is cut at an angle of 15 deg. and mounting pads cut from steel plate are welded on. The pads are drilled at each end for  $\frac{3}{8}$ -in. bolts. Short lengths of deep channel are welded to the opposite end of each support to form bearings for the drum spindles. These are drilled transversely for a  $\frac{5}{16}$ -in. bolt, or pin, which holds the spindle in place when the drum is

With this rig it is possible to wind up 20 to 30 rods of barbed wire into a tight coil without handwork and without moving the tractor





mounted. The assembled supports, or bearings, are then bolted to a length of 2 x 6-in. hardwood. Next, a jackshaft, consisting of a length of  $\frac{3}{4}$ -in. shafting and two V-pulleys, is mounted on the support assembly, using two U-bolts for bearings as indicated in the detail. This assembly is now mounted on the tractor in order to determine the length of the V-belts. Angle-iron braces are fitted to hold the unit securely in place on the tractor.

The assembly of the wire guide is clearly shown in the detail on the preceding page and in the photos above. The rollers between which the wire passes as it is being reeled up are lengths of  $1\frac{1}{2}$ -in. pipe slipped over uprights of 1-in. pipe. The latter are accurately spaced and the ends are welded to short lengths of  $1\frac{1}{4}$ -in. pipe. The guide is supported on a U-shaped frame made from pipe and fittings, the side members of the U being bent as in the detail.

This arrangement permits the guide to slide freely back and forth so that when the unit is in operation the wire can be laid uniformly on the drum as it is reeled up. The guide is operated by means of a handle bent from  $\frac{3}{4}$ -in. pipe into a wide U-shape, the ends being welded to the guide as shown in the detail. Although not shown in the photos of the original unit, the sheet-metal guard detailed on the preceding page helps to protect the operator from injury should the wire suddenly kink or break as it is being reeled up. After the drum has been filled with water or steam-cleaned, lugs can be welded on the ends to increase its capacity. The drum can be lifted off the drive unit by simply slipping off the V-belt and pulling out the pins, or bolts, which release it from the bearings. If desired, several drums can be made for storing large quantities of wire or for transporting it from place to place about the farm.



### Special Ear-Corn Chutes Aid in Filling Cribs

In large corncribs of the type having a grain bin directly over the center driveway it is sometimes difficult to fill the side cribs "square" full because of a lack of sufficient drop, or fall, for the elevator discharge spout. One farmer solved this problem by building special ear-corn chutes into each side of the grain bin as pictured. By running the elevator discharge spout directly into the chutes, ear corn is discharged into the side cribs below the gambrel-roof plate with sufficient momentum to carry it to the outside wall, thus saving much hand labor and preventing possible clogging of the elevator discharge spout. In large bins the chutes can be permanently built in.



## Electrical Contacts Improvised From Ignition Points



When it is difficult to obtain new contact points for electric switches and motor starting windings, a serviceable substitute can be had by using discarded ignition points from auto distributors. Although the points may be pitted and unsuitable for use in the car,

they can still be used for making electrical repairs. To slip the points from their holders, file off the peened end of the shank flush with the holder. In this way, enough of the shank will remain to permit re-mounting the points in the switch.

Richard Hanscom, Elmhurst, Ill.

## Die Stock Adapted for Taps



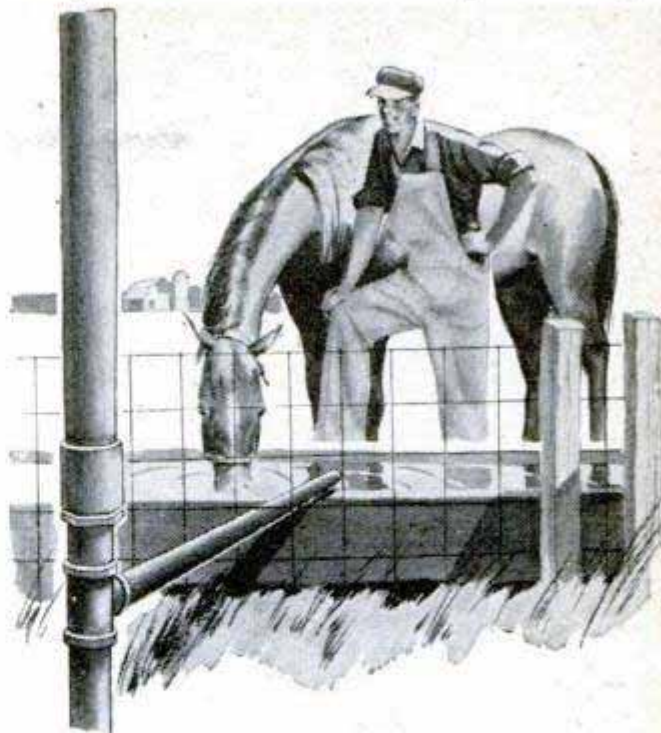
With the addition of a slotted steel disk, an ordinary die stock will handle taps as well as dies, thus requiring only one wrench for both jobs. To make this addition, first cut or turn the disk to fit the die stock. Then drill holes

for the shanks of the taps along the center line of the disk and file them square. Drill a  $\frac{1}{8}$ -in. hole near the edge of the disk and in line with the tap holes, and cut a slot through the tap holes so that it enters the  $\frac{1}{8}$ -in. hole. Drill a shallow hole in the edge of the disk to receive the end of the die-stock setscrew. With the disk in the stock and a tap inserted, the setscrew is tightened to close the slot, resulting in a firm grip on the tap.—W. B. Goodrich, Somerville, Mass.

## Axle Jacks Support Pneumatic-Tired Farm Machines in Storage

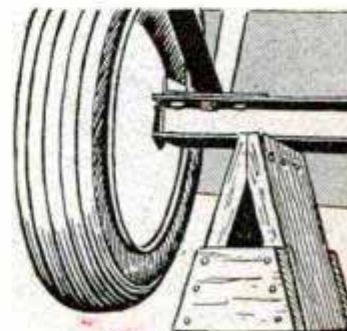
Heavy pneumatic-tired farm machines, such as combines, balers and corn pickers, should never be stored for long periods of time with the full weight of the machine resting on the tires. Some farmers remove the wheels at the end of the season and store them separately, but where time is limited, a better way is to support the weight of the machine on hardwood axle jacks as shown. Simply raise the axles and

## Simplified Windmill-Pump Hookup



To reduce friction to the minimum and at the same time simplify the conventional windmill-pump drive, one farmer dismantled the well pump and retained only the cylinder and plunger rod for use in the new installation. In the latter, the pump cylinder is located below the well curb in the regular way and the vertical discharge pipe extends through the well curb to the height of the discharge spout on the original pump body. A pipe tee is then screwed to the top end of the discharge pipe and a horizontal pipe reaching from the well to the water tank is screwed into the side of the tee. Then a pipe assembly consisting of a short nipple, bushing and coupling and a 6 or 8-ft. length of pipe, is screwed into the top end of the tee to form a guide for the windmill rod. In some cases, it may be necessary to extend the pump rod above the top end of the guide by welding on a length of iron rod of the same size and shortening the windmill rod accordingly. If the windmill is some distance from the farm buildings, installing an automatic control operated by a tank float will save many steps to and from the windmill.

slip the jacks underneath as indicated. The jacks should be made for each individual machine so that they are high enough to permit the tires to clear the ground.

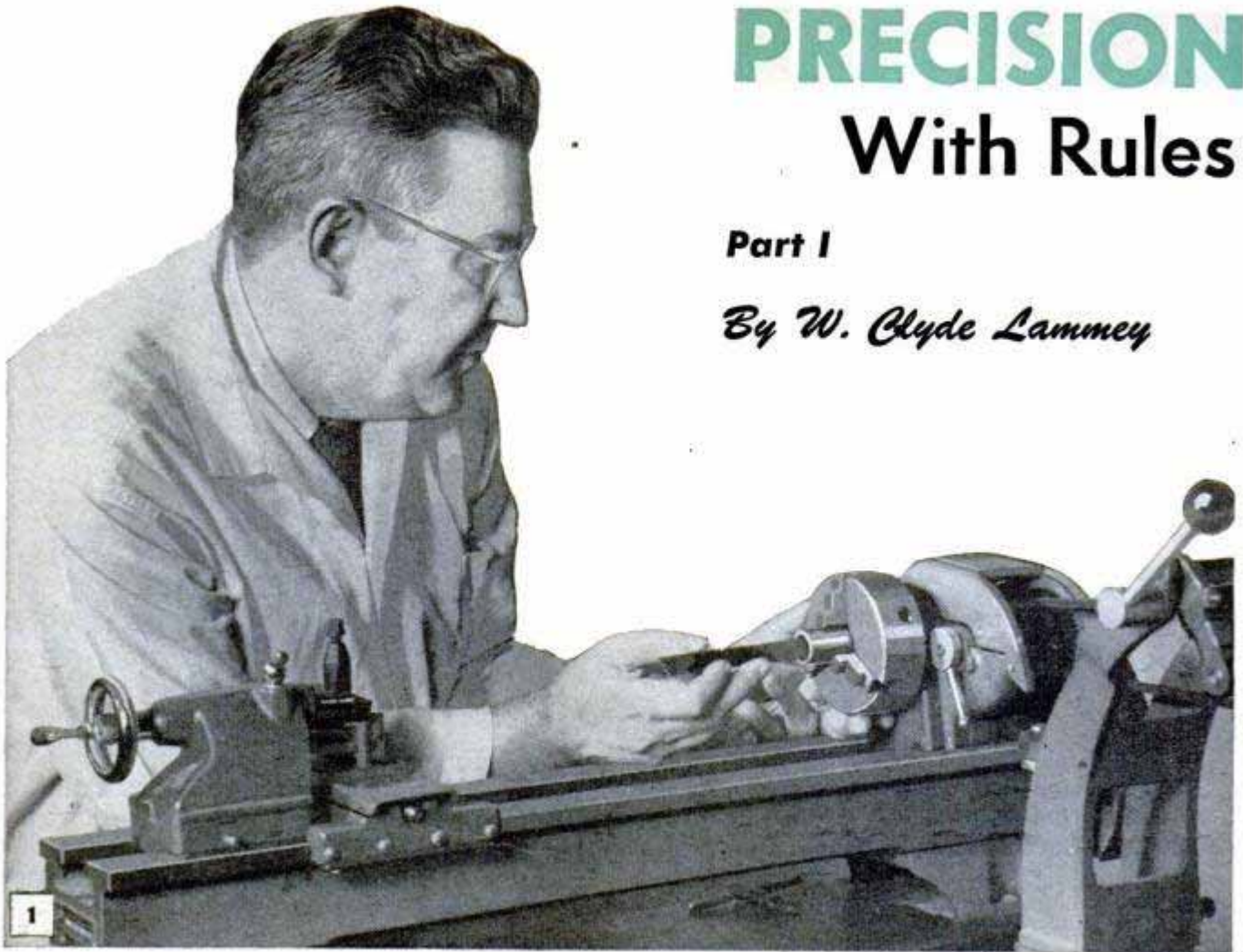


# PRECISION

## With Rules

### Part I

*By W. Clyde Lamme*

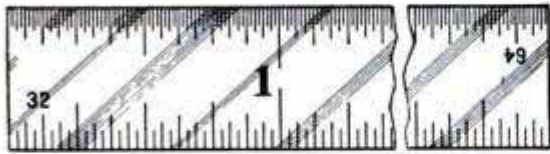


**I**N JOB MACHINE shops and in production work it is possible to be too accurate in both measuring and machining. For practical purposes, accuracy should be thought of not as the extreme in precision, but rather as accuracy within the limits prescribed for the work in hand. If the specifications call for working within .005 in., it is wasteful of both time and effort to attempt to hold the same job consistently within .001 in. What is necessary is the measuring-tool equipment and the ability to produce work rapidly and consistently to an established standard. This simply means that size relationships between duplicate parts selected at random from a lot are held within the limits specified. All the parts made to these specifications will interchange in the assemblies for which they are intended.

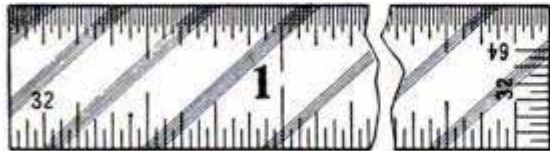
Most of the measurements in ordinary machine-shop practice are measurements of length and diameter. That's why machinist's precision-tool kits always are well supplied with a variety of rules and calipers. Precision measurements with these simple tools are dependent not only on the precision manufacture of the tool but also upon the skill of the user. Experienced machinists develop a high degree of skill by making full use of the senses of sight and touch. An acute sense of touch is essential

when making measurements with a contact measuring tool such as a caliper, Figs. 6 and 7, or a caliper rule, Fig. 3. An untrained user of calipers, Fig. 6, may miss errors in the work measurable in common fractions of an inch, but an old hand at the trade will detect variations in dimension as small as .0025 in. This is due to a highly developed sense of touch and a knowledge of how to hold the work so that variations in frictional contact of the calipers with the work will be transmitted to the finger tips. Wherever possible, the work and the calipers are held lightly and so balanced that they swing free from the finger tips or in such a way that at least a part of the weight is supported on the finger tips, Figs. 8 and 9. If either the calipers or the work, or both, is held in the palms of the hands, the sense of touch will be so greatly reduced that it can no longer be relied upon. Calipers usually are set with a rule as in Fig. 4 and where a very close measurement is required many machinists use a magnifying glass or eye loupe so that the width of the lines on the rule can be clearly seen. Transferring measurements with ordinary calipers can be a delicate job if a high degree of accuracy is required. On jobs calling for a high degree of precision, machinists generally use measuring instruments which can be read directly in thousandths and ten-thousandths

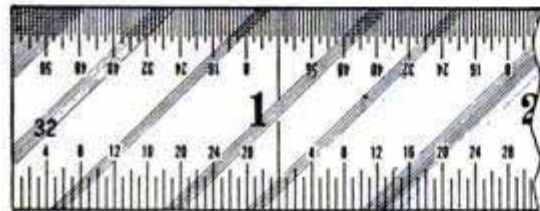
# MEASURING and Calipers



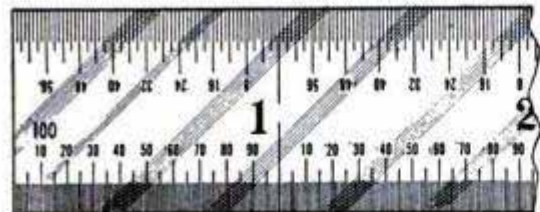
A LENGTHS, 1" TO 48" INCL.



B GRADUATED END



C QUICK READING, 1" TO 24" INCL.



D GRADUATED TO HUNDREDTHS

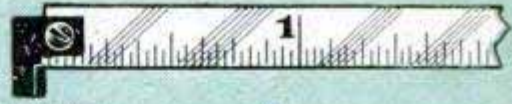


E QUICK READING, FLEXIBLE

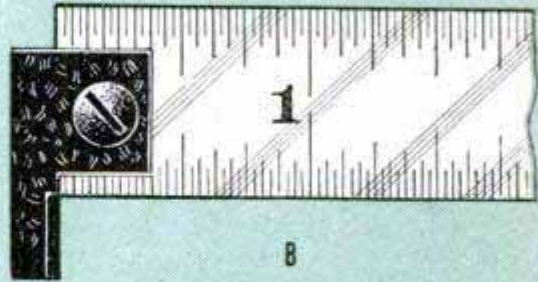


F 1" WIDE BLADE, RUSTPROOF

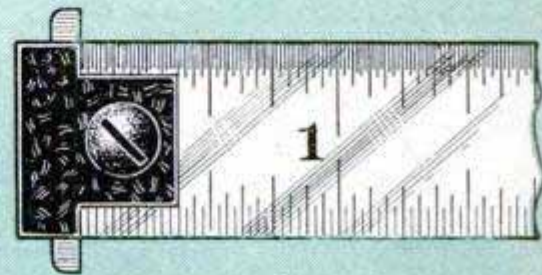
**2** STEEL RULES



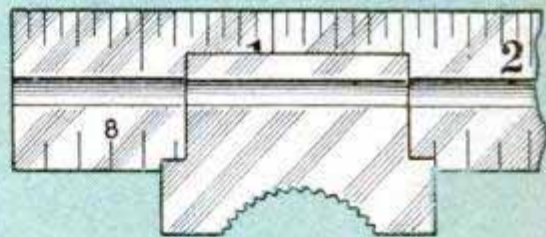
A



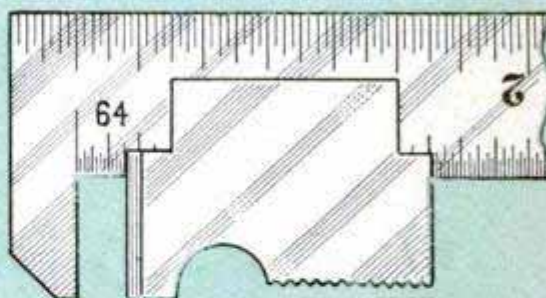
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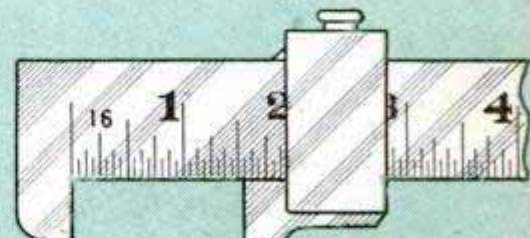
C



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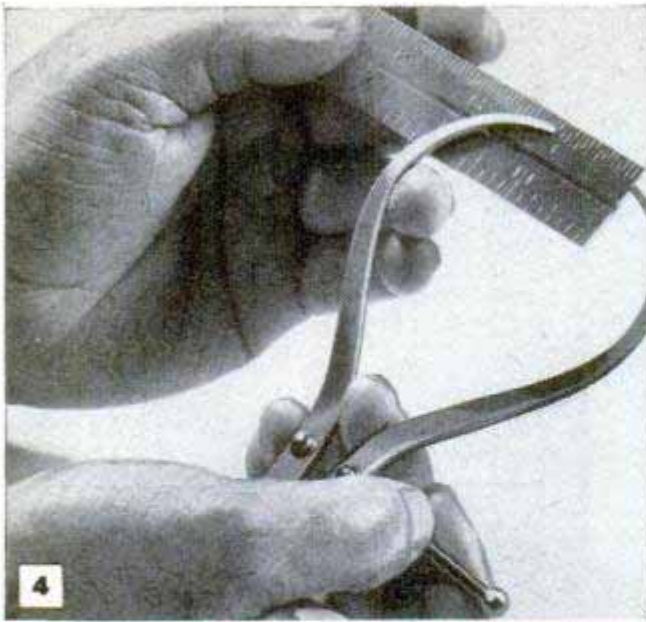


E



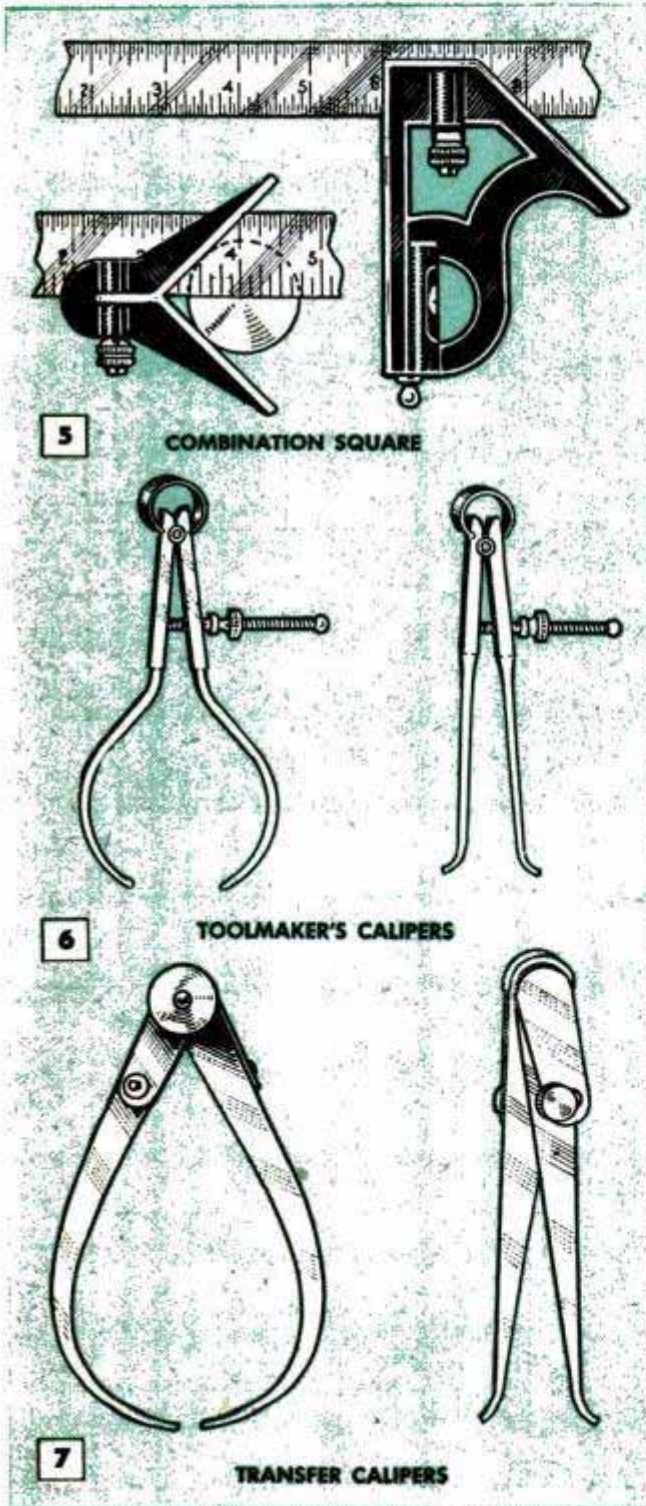
F

**3** HOOK AND CALIPER RULES



of an inch. However, variations in sizes much too small for the eye alone to detect can be readily felt through a caliper and retained in memory for precise comparison between the work and the standard, or master part. When calipers are set to the work, care is taken to bring the points of the legs into contact with the surfaces without excessive pressure but with just sufficient friction so that the pressure can be felt through the finger tips with certainty. Then where it is desired to check the distance between the points the measurement is transferred to a steel rule where it can be read direct. Measurements made in this simple way can be transferred with extremely slight errors.

On common work where the allowable error equals or exceeds the thickness of the graduation line, ordinary steel rules are used in making linear measurements. Figs. 2 and 3, A to F inclusive, show representative selections of steel rules and also give a good idea of the variety of types available. Of course, these rules shown in Figs. 2 and 3 are not all-inclusive of the range of sizes, as these run from  $\frac{1}{4}$  in. to 12 ft. in length with a variety of widths and graduations available in addition to those detailed. Steel rules also are graduated in the English and metric systems and sometimes graduations for both systems are provided on the same rule. Also the graduations run as fine as hundredths of an inch, D in Fig. 2, while metric graduations run to one-half mm. The hook rule is regarded highly by most experienced machinists as the hook provides an accurate stop at one end of the rule for setting calipers and dividers and it also permits accurate linear measurement where it is not possible to see one end of the rule. An example of the application of this rule is shown in Fig. 1, where it is necessary to measure the length of a bushing which is being faced off for a special purpose. The hook end of the rule is passed through the bushing and then withdrawn until the hook engages the inner face. With the rule in this position, it is possible to determine the exact length of the bushing, or how much material to remove to bring it to the required length without removing from the lathe chuck. The rule shown in detail D, Fig. 3, is used when measuring against a shoulder and is especially handy for determining the width of collars or flanges. The thumb-slide is removable. The caliper rule, E, also is widely used for measuring thicknesses. The special rule shown at F in Fig. 3 is furnished with or without the sliding head. It usually is made of brass and the end opposite the hook is shaped to form a handle. A refinement of the caliper rules is the type shown in Fig. 12, made for taking accurate inside and outside measurements. Another type of



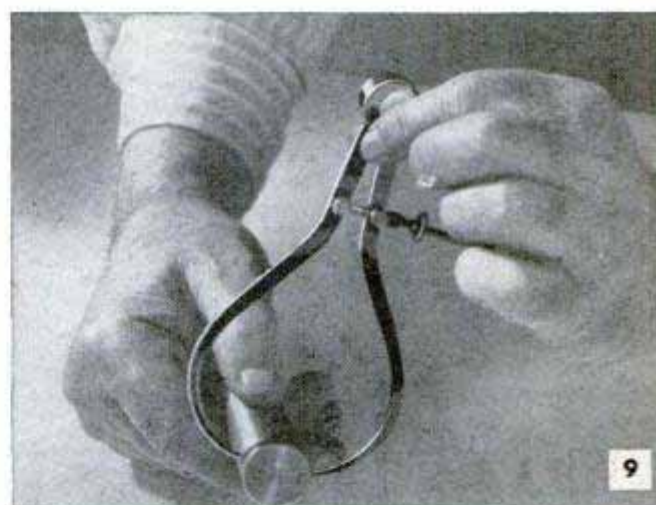
steel rule, made especially for taking measurements in counterbores and measuring distances from a shoulder, is pictured in Fig. 10. This is supplied as a set consisting of several sizes measuring from  $\frac{1}{4}$  to 1 in. The set is complete with the special holder shown in the photo. Still another variation of the steel rule is the novel key-seat rule shown in Fig. 11. This rule is a necessity in laying off accurate measurements on round work and for scoring lines parallel to the axis of the work when laying out keyways. The rule is fitted with a detachable straightedge so that when in position it lies parallel with the axis of cylindrical work as shown in Fig. 11.

The combination square, Fig. 5, is a simple steel rule developed by means of various attachments to a high degree of utility. Basically, it is a steel rule fitted with a sliding try-square head that combines a 90 and 45-degree face with a spirit level. The basic tool can be fitted with a centering head and a protractor for accurate layout of angles. Completely equipped with the separate heads, this measuring tool may be used to determine depth accurately within the limits of the graduated blade, also squareness, flatness and angularity as in detail B, Fig. 13. With the centering head, it is used to lay out centers on cylindrical work as in the lower detail, Fig. 5. The rule, or blade, is grooved along the full length at the center so that the square head, center head and protractor will slide to any point along the length of the blade. The three attachments can be used individually, in combination, or all three can be removed entirely and the blade used as a rule.

Other variations of the steel rule are the shrink rule and several types of simple depth gauges which consist of a steel rule fitted with a sliding head having one surface, or face, at right angles to the graduated scale. The sliding head is fitted with a

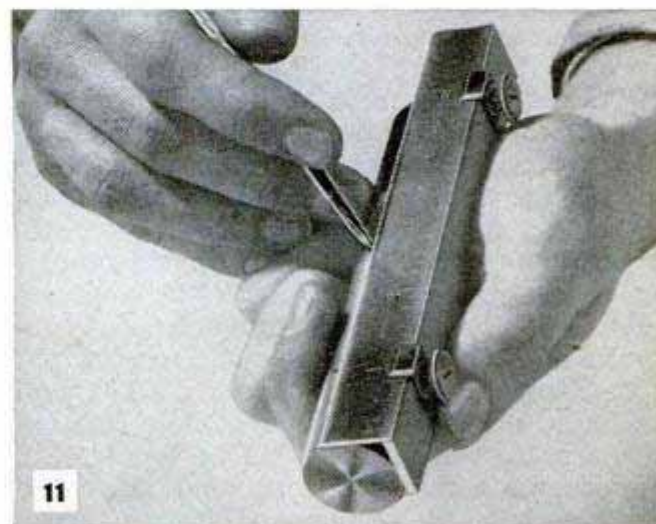
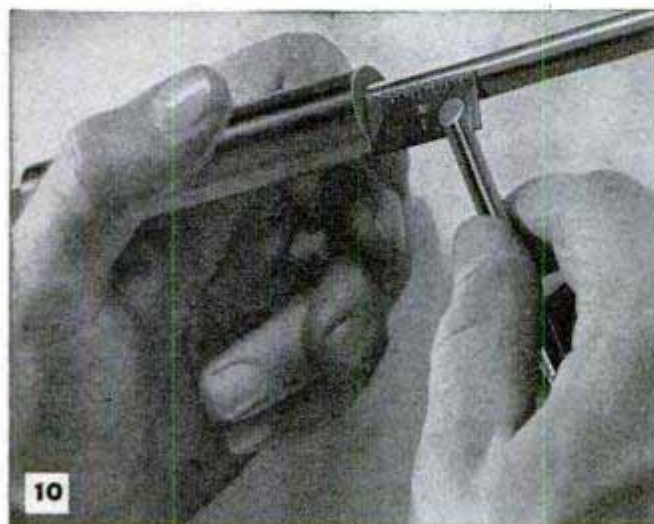


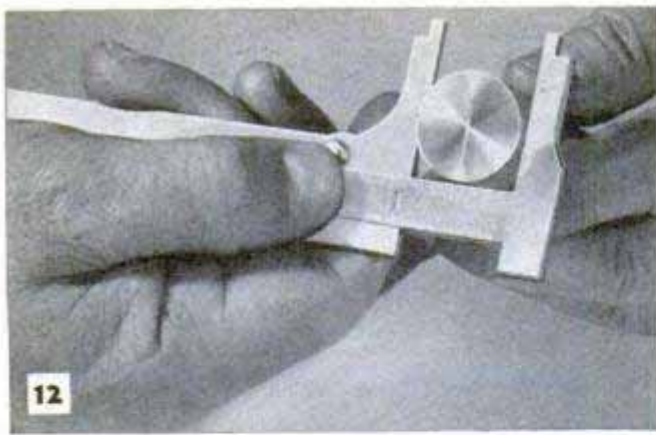
Above, always stop the lathe before checking the size of the work with calipers. Below, when transferring measurements with calipers, hold the tool so that the fingers are in contact with the legs



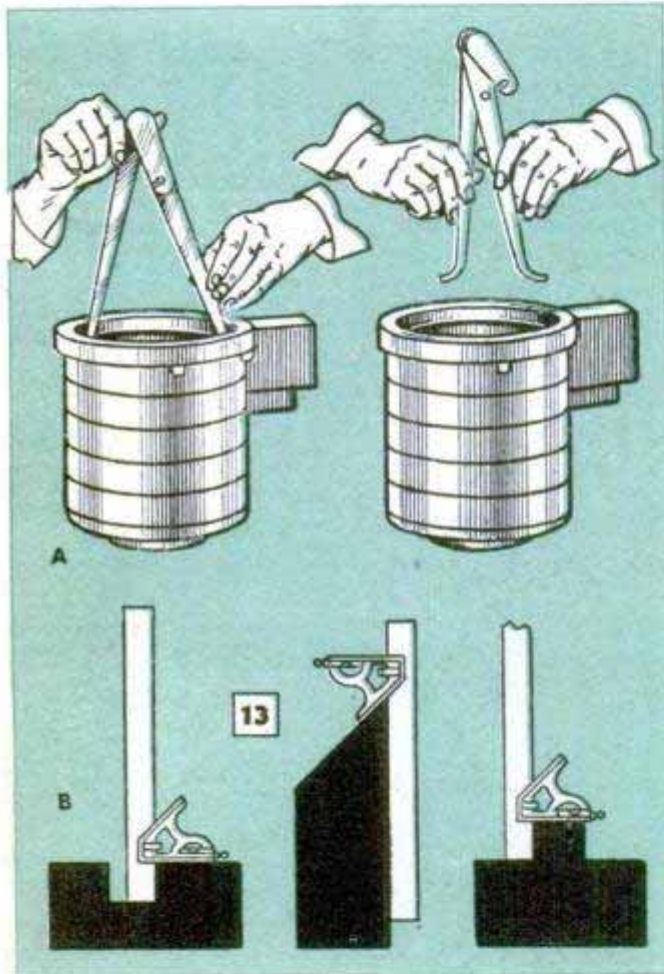
The keyseat rule is used for accurate layout of keyways or splines. The rule is fitted with straightedge

Short steel rules with holder are used for measuring in counterbores and checking distance from shoulder





Above, the caliper rule is handy for measuring inside and outside diameters, also thickness of flanges. Below, details show uses of transfer calipers and square



positive lock so that when the measurement has been taken the head can be locked securely in place for taking an accurate reading. The shrink rule is used chiefly by patternmakers for laying out patterns and core boxes. Shrink rules are graduated oversize to make correct allowances for contraction, or shrinkage, of various metals in the casting process, thus relieving the patternmaker of the necessity of making a separate calculation for shrinkage on each measurement. Double-shrink rules are used when a working pattern is cast from a master pattern and allowance must be made for two shrinks. Although steel rules for special purposes are made as long as 12 ft. these are rarely used by machinists due to the

storage problem. Steel tapes, which are another form of the flexible steel rule, are used in most shops for making linear measurements greater than 1 to 6 ft. Steel tapes are graduated in both the English and metric systems of measurement and are supplied with quick-reading figures. On some types the foot graduations appear beside each inch mark, making it possible to read the linear measurement in feet or inches as desired. The tapes are supplied with a special holder, or reel, on which the tape is stored compactly when not in use.

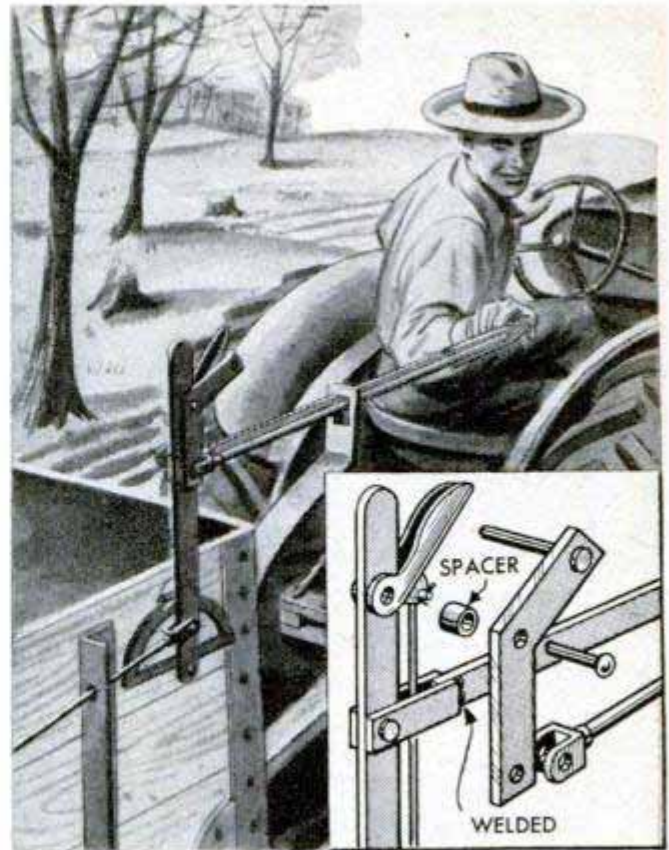
Rules and calipers go together in the machinist's tool kit because the caliper either is set with a rule or the size of the work is transferred to the rule to obtain the reading of the transferred measurement in inches or fractions of an inch. Various forms of the bow caliper are most commonly used for inside and outside measurements. Only two types are shown in Figs. 6 and 7. Toolmaker's calipers of the type shown in Fig. 6 usually are screw-actuated, that is, the legs are adjusted by means of a knurled nut running on a threaded spindle pivoted on one leg. The firm-joint caliper, of which the transfer calipers, Fig. 7, are one variation, is made in both the inside and outside types and in a wide range of sizes. A variation of the firm-joint caliper is the lock-joint type. It is made in the same way and is of the same general appearance, except that it is fitted with a locknut for locking the legs firmly when set. The ordinary firm-joint caliper is dependent on friction alone to hold the legs in position when set, although most types are fitted with a nut which can be tightened to compensate for wear. Transfer calipers are used by the machinist to measure work of the type shown at A in Fig. 13. Here it is necessary to measure the inside diameter of the work below a flange. The transfer caliper is placed inside the work and the legs opened to contact the sides of the bore. Then the nut at the joint is tightened and the other which binds the leg to the auxiliary leaf, or arm, is loosened. This frees one leg so that the caliper can be closed sufficiently to clear the flange as in the right-hand detail A, in Fig. 13. After the caliper is lifted clear, the loose leg is moved back into its original position against a stop. When the distance across the span of the legs is measured with a hook rule, or by other means, it will give an accurate measurement of the bore diameter below the flange. Hermaphrodite calipers, another variation of caliper types, combine a straight divider leg and a curved caliper leg and are used for scribing parallel lines from an edge and for locating the center of cylindrical work.

[Certain technical information courtesy L. S. Starrétt Co.]

(To be continued)

## Improved Extension Lever Facilitates Controlling Rate of Spreader

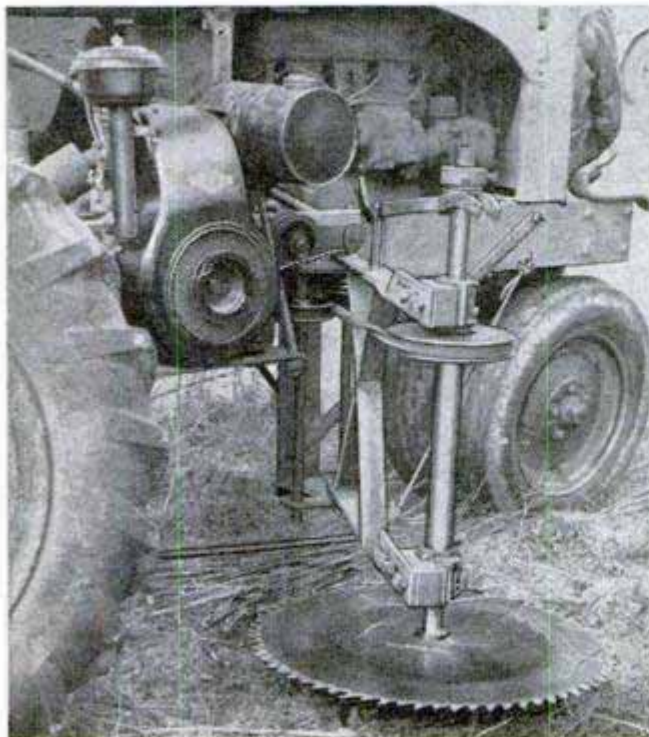
When spreading lime, compost or natural manure with an older type spreader, it is an advantage to the operator to be able to vary the rate of application without stopping the tractor or leaving the seat. With the idea of saving time as well as wear on the equipment resulting from continuous stopping and starting, one farmer improvised an extension control lever by adapting an extension lever taken from a discarded tractor plow. First, he made a flat-iron bracket and attached it to the front of the spreader. Then he cut the ratchet rod on the plow extension lever to the required length and welded on a small yoke as shown in the detail. Next, the extension lever is passed through a squared opening in the supporting bracket and is attached to the spreader-control lever by means of a built-up yoke. Then the palm-latch rivet is removed from the spreader lever and a longer pin is substituted. This pin is of sufficient length to project far enough beyond the lever to support a bell crank made from flat iron. A spacer between the bell crank and the spreader lever gives the required clearance. When the parts are assembled in the manner pictured, a pin in the outer end of the bell crank engages the palm latch on the spreader lever when the extension, or push-pull lever, is operated. This move-



ment releases the spreader-control lever from its ratchet and enables the operator to change the setting at will by moving the extension rod forward or backward.

## Brush Saw Is Mounted on Tractor for Speedier Work

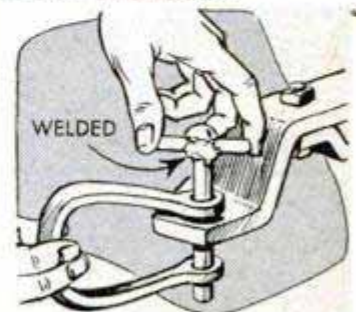
For clearing brush-grown pasture lands, cutting tree stumps flush with the ground and felling small trees or hedges, a brush saw mounted on the tractor saves a lot of time and hand labor. The saw blade is

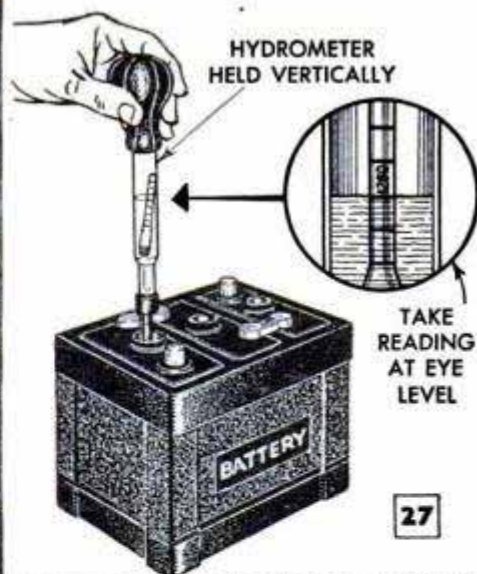


mounted on a vertical arbor and is driven by a 5-hp. air-cooled engine supported on a bracket bolted to the tractor frame as pictured. The drive is through a half-crossed V-belt passing over idler pulleys mounted on vertical shafts, one of which also serves as a pivot for the swinging frame on which the saw arbor is mounted. The arbor is arranged to slide vertically in the bearings so that it can be raised and lowered from the tractor seat by means of a lever which actuates a chain-and-yoke linkage attached to the upper end of the arbor.

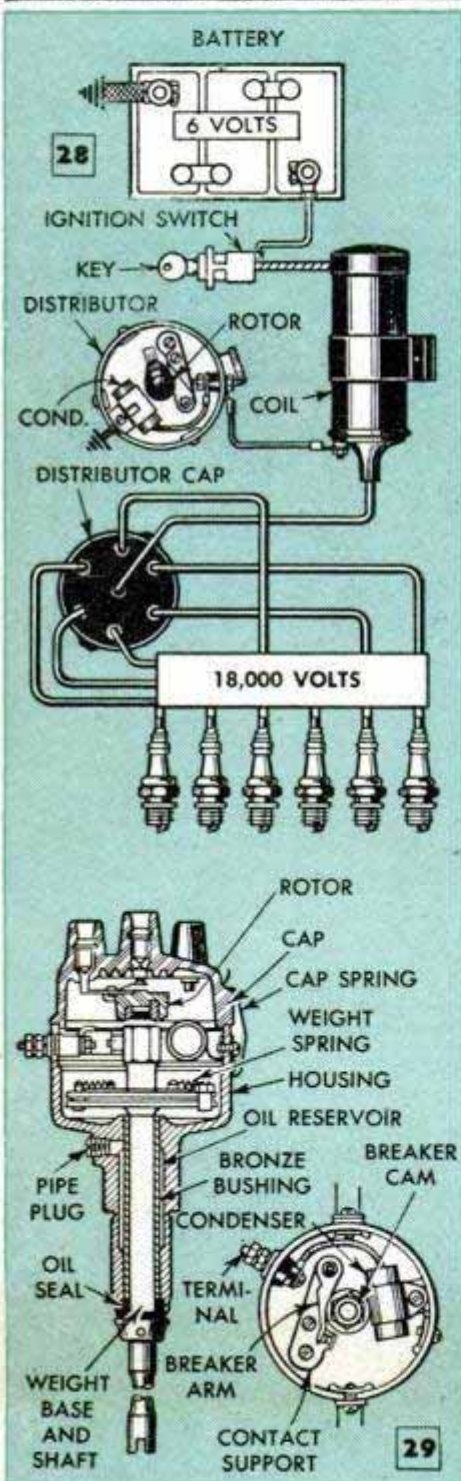
## Rod Forms Clevis-Pin Handle

Welding a short length of rod across the top of a tractor clevis pin provides a convenient handle to speed inserting and removing the pin. In addition, the pin is less apt to bounce out of the hitch when traveling over rough ground, as the weight of the rod helps to hold it in place.





JUST ENOUGH ELECTROLYTE IS DRAWN IN TUBE TO PERMIT FLOAT TO CLEAR BOTTOM



# MOTOR TUNE-UP

Good auto mechanics never overlook the ignition when tuning up an engine. Regular checks begin with the battery

*By C. E. Packer*

## PART III

### Ignition System

**D**ID YOU KNOW that 6-volt current from the battery in your car is stepped up as high as 18,000 volts at the plugs, and that in an 8-cylinder car the electrical system steps up the current 12,000 times for every mile you travel? When you cruise at 45 miles per hour, 150 high-voltage sparks are formed at the spark-plug electrodes each second. This allows  $\frac{1}{150}$  second for distributor points to close and open for current to build up in the coil and be delivered to the plugs.

Such a mechanism, Figs. 28 and 29, requires periodic attention at least every 5000 miles. There are several simple checks that any car owner can make in the home garage and thereby head off serious trouble. By thoroughly familiarizing himself with the parts of the ignition system and how they work, he can assure himself a good deal when buying the essential service. It pays to own a battery hydrometer and use it regularly, Fig. 27. The best battery performance is had when the state of charge, as indicated by the hydrometer, ranges between 1.270 and 1.300 on the hydrometer scale. A variation of 20 to 25 points in the readings between the cells indicates that trouble is developing which will require an immediate investigation to determine the cause. Another simple battery service that the motorist can perform himself is keeping the battery and terminals clean. Wash the battery case and holder occasionally with a soda-water solution to neutralize acid. Rinse the parts immediately with clear water and dry them. See that the terminals are clean and the cable clamps are tight. Then coat all the parts with an anti-corrosion compound

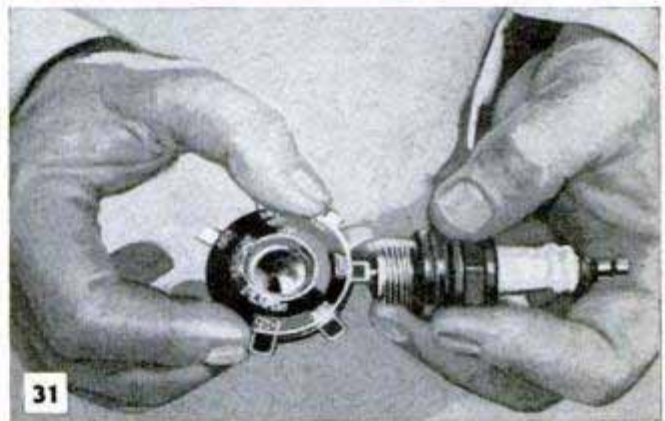
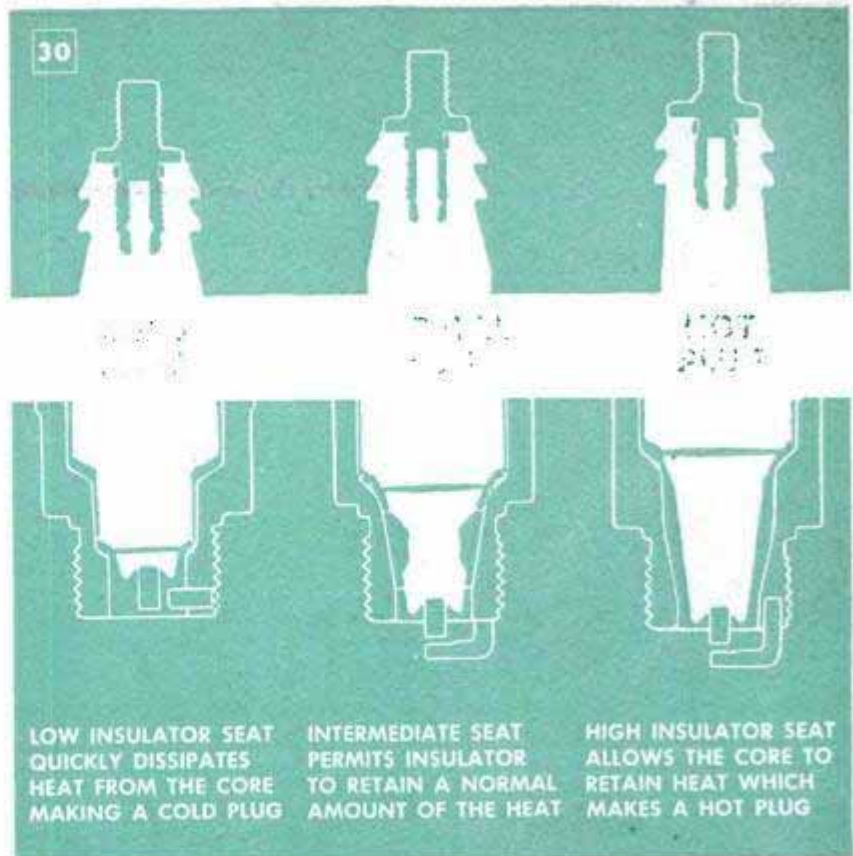


suitable for this purpose.

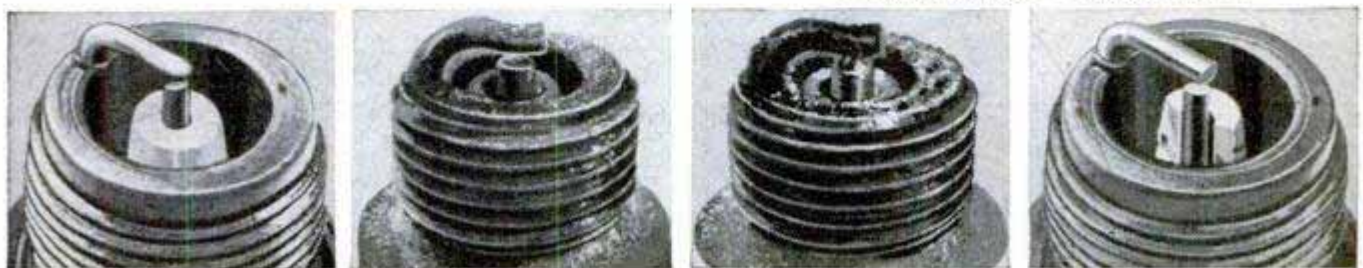
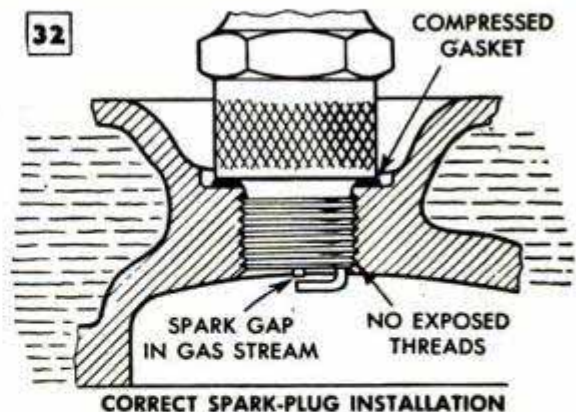
It's good economy to replace spark plugs every 10,000 miles. The four photos at the bottom of the page show the usual history of a worn plug and also why plugs should be replaced at regular intervals. Besides going through regular stages of deterioration, which are readily apparent on careful examination, the plugs also are good indicators of the general condition of the engine and the ignition system. For example, the fouled plug indicates to a practiced eye one of two possibilities: Either the cylinder from which the plug was removed is in rather bad mechanical condition, or that some defect in the ignition system is causing this particular plug to foul. When a plug misses, it does not burn off the oil vapors which come in contact with it in the normal cylinder. Hard carbon deposits quickly build up to the point where the plug no longer fires, even intermittently. If this condition is neglected, even for a comparatively short time, a scored cylinder will result.

The center electrode of the plug is the hottest point in the engine. Note the difference in the shape of the porcelain insulator in the cold, normal and hot plugs detailed in Fig. 30. Most passenger-car engines are designed for the normal plug. The cold and hot plugs are designed for use in engines which must operate under extreme conditions. Cold plugs give the best service in cars which are driven at high speeds on long, steady runs in warm weather. Hot plugs are best where the service requires frequent starts and long periods of idling.

When cleaning and adjusting the plugs, use the simple gap gauge shown in Fig. 31. Always install new gaskets when replacing plugs which have been removed from the engine for servicing. Slight gas leakage at the gasket will cause the plug to run hot and may shorten its useful life by as much as half. When replacing the plugs, wrench torque should be just sufficient to compress



Above, always use a gap gauge in setting spark-plug electrodes. Below, tighten plug to compress the gasket

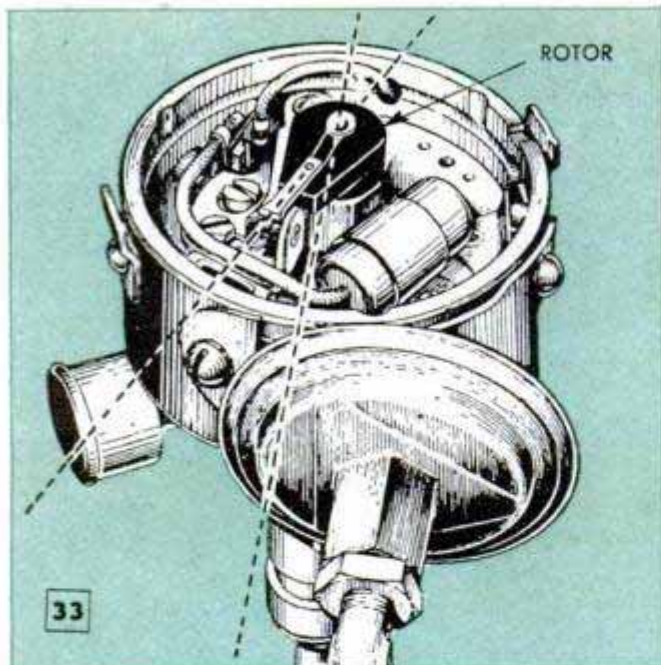


WORN

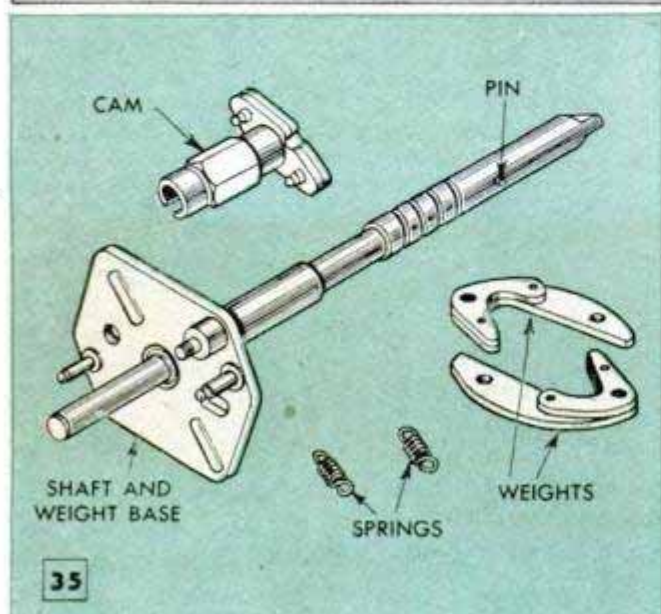
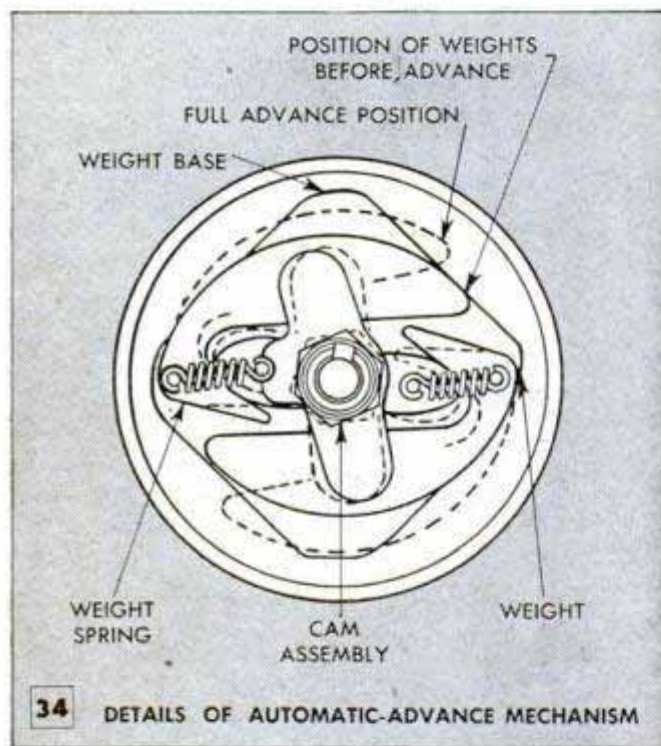
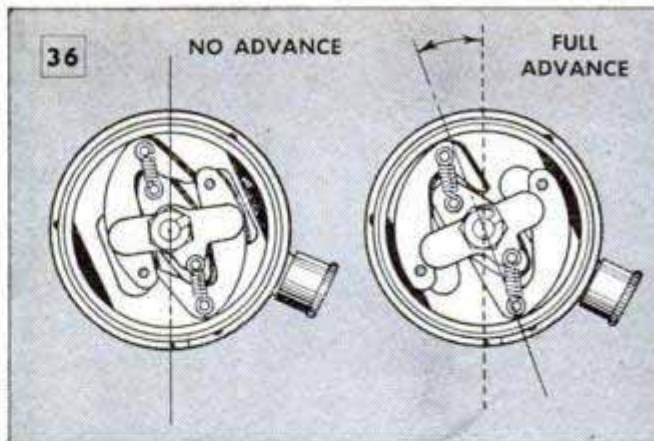
DIRTY

FOULED

CRACKED AND BROKEN



Above, move distributor rotor to check spark advance. Below, forces acting on the weights pull them outward



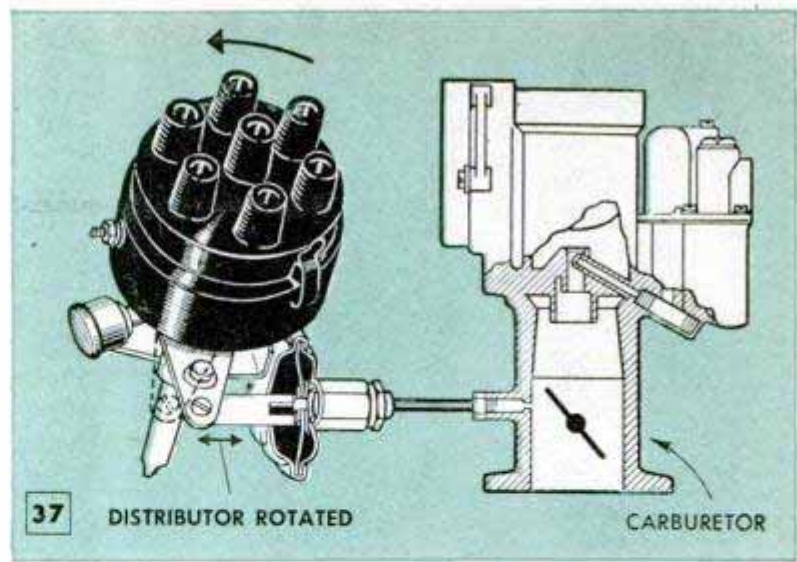
the gasket, Fig. 32. Manufacturers furnish data sheets giving the correct wrench torque for each type and size of plug.

Figs. 33 to 39, inclusive, detail the various parts which make up the distributor and spark-advance mechanism. Whenever the engine speed changes, parts of the automatic spark-advance mechanism move as in Figs. 34 and 36, changing the relative positions of the cam and distributor shaft as indicated by dotted lines. Because of this movement, lubrication is necessary to assure uniform operation of the spark-advance unit. Lift off the rotor, Fig. 33, to expose the felt wick in the hollow end of the cam, Fig. 35. Place a drop or two of light oil on the felt. In distributors having an oil reservoir, or a grease cup, Fig. 33, add light oil, or grease, at intervals of 20,000 miles. Don't fail to check the supply of lubricant whenever the distributor is overhauled. Always avoid over-oiling or greasing, as any excess may find its way into the distributor housing and cause arcing and burning of the parts. A quick and fairly reliable check of the automatic-advance mechanism can be made by removing the distributor cap, gripping the rotor lightly between the thumb and index finger and turning it a few degrees in the normal direction of rotation as in Fig. 33. When released it should snap back to its original position. As detailed in Figs. 34, 35 and 36, the automatic-advance unit consists basically of two weights, Fig. 35, the outward movement of which is resisted by two accurately calibrated coil springs. As the engine speed increases, centrifugal forces acting on the weights pull them outward against the resistance of the springs to the full-advance position shown in Fig. 36. As the engine slows to idling speed, or when it is stopped, the parts automatically return to the no-advance position. In modern cars kept in good condition by periodic servicing, this unit rarely gives trouble. It should never be removed or tampered with unless the nature of the trouble necessitates removal.

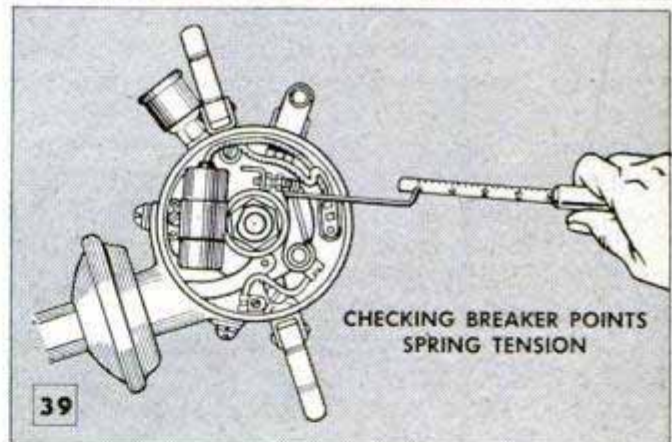
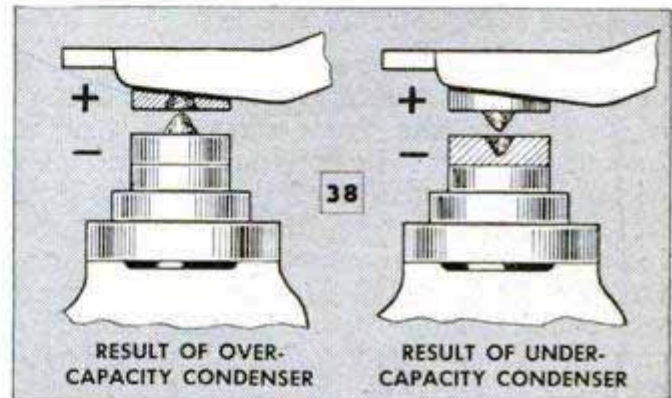
The vacuum-advance mechanism works in correlation with the automatic advance

and controls spark position in accordance with engine load. Fig. 37 shows how it works. Movement of the diaphragm is controlled by manifold vacuum. The diaphragm is connected to the distributor by means of a short link. Movement of the diaphragm rotates the distributor, changing the relative positions of the breaker arm and cam. Checking spark advance according to vacuum and speed is a job for experienced servicemen with specialized equipment.

The two details in Fig. 38 bring up a point often overlooked in distributor servicing. As a rule the defect shows up more frequently in heavy-duty units, but it can occur in any distributor in which the wrong condenser is used. If the electrical system has a negative ground, a deep pit in the moving-arm contact point indicates the use of an over-capacity condenser, but if the pit is in the grounded point, or negative side, as in the right-hand detail, the condenser capacity is inadequate. If this condition is noted when servicing the distributor, the parts should be replaced and the condenser checked and renewed. Otherwise, smoothing the breaker points on an oilstone will be sufficient to remove shallow pits. When installing after smoothing on the oilstone, make sure that the points make the maximum contact. If one or both points have been distorted in the smoothing process so that only the edges make partial contact, they will quickly burn and pit. When the points are removed for any reason, it is worth while to check the tension of the breaker spring. Although there are various methods of doing this, a sufficiently accurate check can be made with a simple spring scale reading in ounces, Fig. 39. The tension, in ounces, should agree with the specification in the instruction book accompanying the car. If the tension is less, the spring should be renewed. Too little tension will permit the points to rebound, especially at higher speeds, and cause irregular ignition. Too much spring tension causes the fiber block on the moving arm to wear rapidly. Also, when servicing the distributor, be sure to check the distance the points open. The recommended distances vary considerably, so be sure that the opening checks exactly with that specified for the car. If it does not, then the points must either be adjusted to the correct opening, or replaced if they are badly worn. Finally, after all routine distributor checks have been made, rub a very small quantity of grease on the breaker cam and place a drop of light oil on the breaker spring to prevent rust. Never more

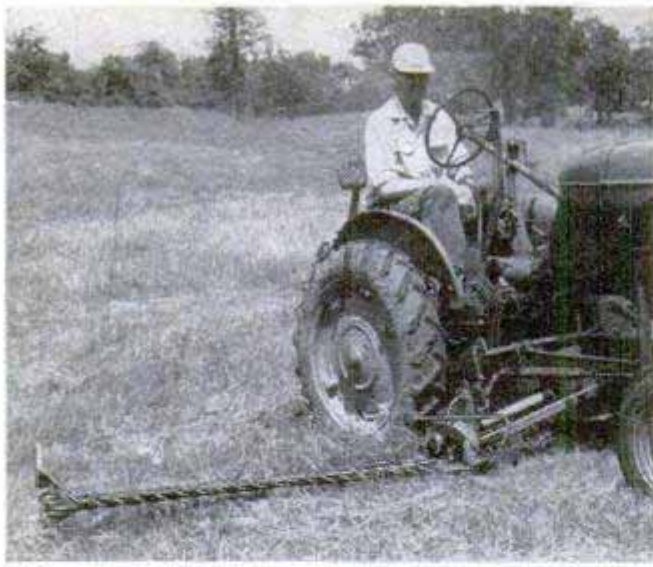


Above, vacuum advance rotates the distributor. Below, the details show results of using over and under-capacity condensers



than a drop of oil is permissible for it should be remembered that any excess of oil or grease in the distributor is likely to cause trouble. Some experienced servicemen do not recommend it at all. However, if carefully applied, the minimum quantities of oil and grease on the parts specified will prevent rust and undue wear. Always wipe the inside and outside of the distributor cap and be sure it is locked firmly in position when replaced. Check the contact of the high-tension cables to the plugs and to the coil and check the cables to make sure there are no breaks in the insulation. If the metal terminals at the ends of the cables are cracked or otherwise damaged it will pay to renew the cables.

(The End)



### Front-Mounted Tractor Mower Utilizes Horse-Drawn Unit

Farmers who have a considerable amount of mowing to do each season soon develop a liking for the front-mounted tractor mower because of its convenience and ease of handling. Because of the simplicity of the front, or between-the-wheels, mounting of this type of mower, it is comparatively easy to build. The mower pictured was constructed by utilizing parts of a discarded auto frame, the sickle bar and pitman-drive assembly from an old horse-drawn mower and also the drive shaft from a Chevrolet car. The drive shaft is used to transmit power from the tractor power take-off to the pitman, and the whole drive assembly is supported in a section of the car frame which is mounted directly under the tractor. Normal cutter-bar thrust is taken by an adjustable brace. This is fitted with a heavy turnbuckle and mounted at an angle, one end being attached to the mower frame and the other to the tractor frame at the rear. All parts are welded to assure sufficient strength and rigidity. The sickle bar is raised and lowered by a conventional linkage which is connected to a lever and rack mounted on the tractor within easy reach of the operator.—L. H. Houck, Jefferson City, Mo.

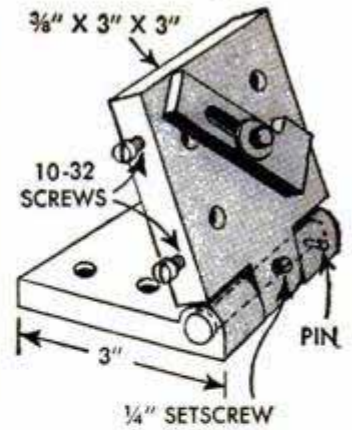
12 LINDEN DRIVE

### Sliding Door Provides Temporary Shelter for Young Pigs



### Angle Plate Has Movable Square

Adjustable to any angle from 0 to 180 deg., this easily made plate has a movable square attachment for machining compound angles. The two pieces of metal forming the plate and base are hinged with a steel dowel so that they fold together compactly for storage. Note that the dowel is pinned to the hinge portion of the base to keep it from rotating and that a setscrew is used to lock the plate in the desired position.—Emil Gassmann, New York City.

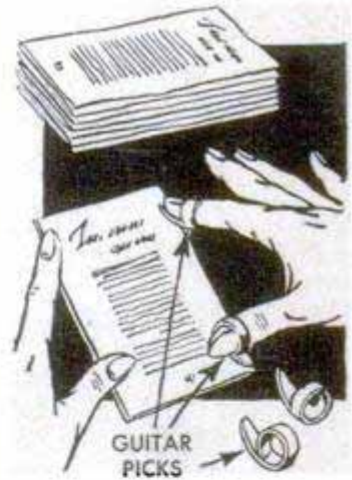


### Drilling Stainless Steel Simplified With Epsom-Salts Coolant

Using a coolant consisting of Epsom salts, 1 part, and water, 12 parts, permits drilling the toughest of stainless steels. Clean both drill bit and machine carefully after using. Arthur W. Larson, Winona, Minn.

### Guitar Picks Speed Folding Paper

Instead of using a regular folding bone on small jobs, one printer finds that ordinary guitar picks crease the fold and, in some cases, actually do a faster job. The thumb and forefinger picks are used as indicated in the drawing, and the operation is done rapidly, as there is nothing to pick up or lay down after each sheet is folded.

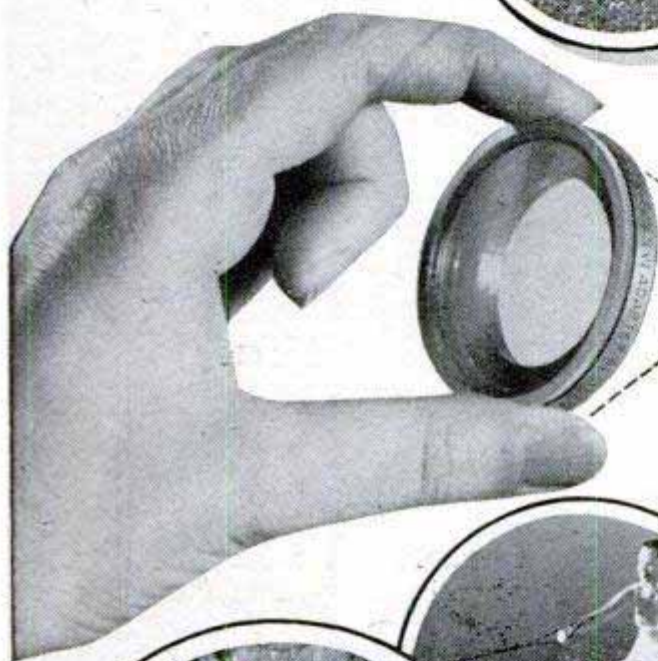


Mrs. Joseph E. Brown, Indianapolis, Ind.

FOLLOW-UP ARTICLE WILL APPEAR IN FEB. 1951 ISSUE.

**New KODAK SKYLIGHT FILTER**—Warm up your color scenes, taken in open shade and on overcast days, with this new filter. (Requires no change in normal exposure.) Also decrease bluish cast in mountain and marine color pictures, snow scenes, distant landscape shots. Available in series IV, V, VI, VII, and VIII Kodak Combination Lens Attachment sizes, as well as in 2-inch and 3-inch gelatin film squares.

For regular black-and-white shots, you'll find the medium yellow KODAK FILTER K-2 just what the picture ordered. The K-2 puts the *right tone* in blue sky, pops up clouds, and cuts haze for *clearer* shots.



For even more vigor and contrast in black-and-whites, it's the deep yellow KODAK FILTER G. You'll get beautiful results in seascapes, where it darkens both *sky and water*. Also excellent for striking studies of architectural subjects.

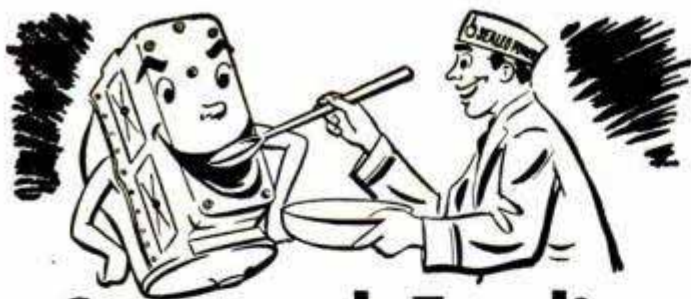
For improving shots of green foliage, you'll like the KODAK FILTER X-1. Emphasizes clouds and foliage in black-and-white pictures without altering rest of scene.

And for the most dramatic shots of all, it's the red KODAK FILTER A. It darkens blue skies with a startling effect. And with *Infra Red Film* you'll get the most amazing pictures you ever saw—white foliage, black skies—terrific contrast!

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**Kodak**  
TRADE-MARK



# Care and Feeding of Engines

BY S. P. CORP

## WHEN KING BOLT ABDICATES

When the front end shimmies or wanders, when tires wear on the sides and wheels get out of alignment—check the king bolt. A loose king bolt affects the camber of the wheel.

Jack up front of car so both wheels are free. Then grasp top and bottom of wheel as shown. If top of wheel moves over  $\frac{1}{8}$  inch, tighten wheel bearings—after checking for wear and repacking if necessary. (Be sure to replace cotter key.)



CHECKING KING BOLT

After wheel bearings are tightened, reinspect wheel movement. If wheel still moves more than  $\frac{1}{8}$  inch, king bolts and bushings should be replaced.

## VALVES ARE VITAL

If a compression reading indicates faulty valves, inspect valve stem for peening. If bottom is peened, remove burrs with a fine file before attempting to pull stem through guide. Always identify valve with its own guide, for convenience in replacing.



PITTED VALVE FACE

Clean valve by electrolyte process if possible, or scrape carbon off with knife, then brush with soft wire brush.

Look for pitting, grooving, cracking, burning and guttering on valve head. If warped or dished, if there is a crack between head and stem, or if stem is bent, discard the valve.



GROOVED VALVE FACE

Pitted or grooved valves are caused by blow-by at the exhaust valve. Reface them with a wet refacer after checking manufacturer's manual for correct angle. Be sure resurfac-

er is O. K., and that you have enough metal to permit resurfacing. Otherwise you're wasting time!

## FOR EXTRA RING MILES

To be sure of thousands of extra miles from a ring job, use Sealed Power Piston Rings. The Sealed Power MD-50 Steel Oil Ring is the greatest oil ring ever built. It is the only ring with a Full-Flow spring.

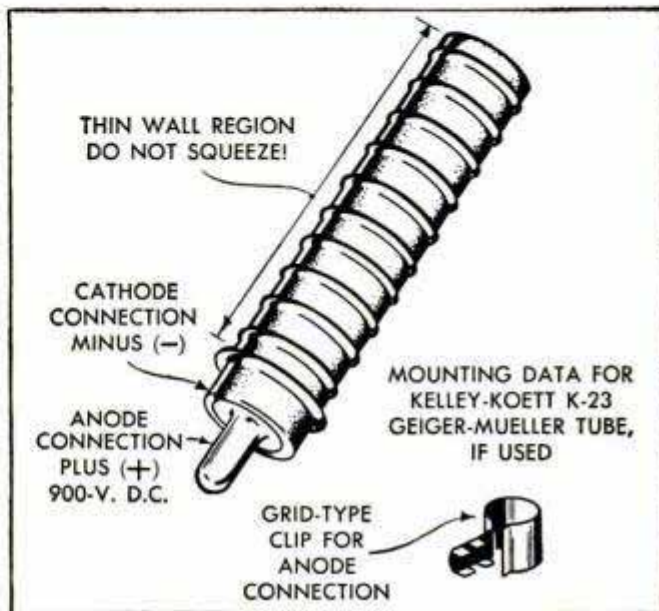
Your dealer has Sealed Power Rings or can get them for you. They save gas, save oil, restore original engine power. A postal card to Sealed Power, Dept. G-7, Muskegon, Mich., will bring you free a helpful booklet: "7 Ways to Save Oil."

## Uranium Survey Meter

(Continued from page 161)

Amphenol socket is not to be followed. The isolated terminal is the anode 900-volt positive connection and the other terminal is the cathode or negative side.

The pictorial wiring diagram, Fig. 4, shows all connections clearly. When rebuilding the original model remove all wiring and start from scratch. The large  $1\frac{1}{2}$ -volt filament battery is a Burgess type 44 or



similar. All parts values are given. Note that the positive lead from the 45-volt battery is grounded at the phone jack. This means that the negative is "floating." Therefore, when installing this battery and the  $1\frac{1}{2}$ -volt battery, be sure that no screws in the case tear through their outer paper



covering. The three No. 493 Eveready 300-volt batteries are now available from radio parts houses for \$7.85 each. Never touch the "hot" anode connection on the Geiger-Mueller tube when the unit is "on." In wet weather provide a waterproof cover for the case. Detailed student material list R-391 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

WHEN YOUR WHITTLING  
TURNS OUT LIKE THIS...  
IT'S TIME FOR A WHETSTONE

and

IF YOUR CAR FEELS LIKE THIS  
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CHASSIS LUBRICATION



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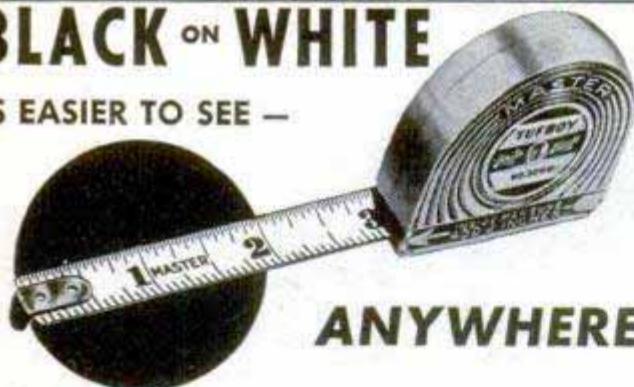


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## They Teach You How to Crash and Live

(Continued from page 137)

In two otherwise similar aircraft accidents one pilot was killed and the other suffered no more than a few bruises. The first pilot wore safety belt alone. While this held his hips firmly in place, it allowed his head and shoulders to pitch forward into the instrument panel. The second pilot wore belt and shoulder harness. Although he dove into the ground at 75 miles per hour, at a 50-degree angle, the harness held him away from contact with the panel. His hurts were only superficial.

Crash speeds, like top speeds, are on their way up. At Edwards the new rocket-propelled "air crew decelerator" is testing harnesses that are designed to give crew members maximum protection in crashes that formerly were lethal. The vehicle, designed and built by Northrop Aircraft, is powered by four solid-fuel rockets firing from the rear of the carriage. Forty-five pairs of clasp brakes installed in the road-bed grasp onto rails attached to the vehicle and can be set to slow the vehicle in 1/5 second from an original 150 to 75 miles per hour, within 24 feet. Accelerometers attached to the vehicle and to its rider measure the forces that are created during a run and transmit the information by radio to recording equipment.

One of the first experiments made with the decelerator was to tie a dummy to its seat with an ordinary safety belt and harness, get the vehicle up to speed and then bring it to a 35-G stop. The sled slowed down, but the dummy kept on going. It tore loose from its harnesses, crashed through the front door of the sled, and hurtled on down the track for a distance of 789 feet.

Human volunteers are now taking the same kind of ride and experiencing the same crash force with no more than moderate and temporary discomfort. They are held in place with six belts of double nylon webbing that also serve to distribute the shock over a wide area of the body, preventing localization of the force. Provided that the volunteer rides backward, braced against an adequate backstop, he can go through a 35-G stop with safety belt alone.

The Air Force doesn't expect to find a way to prevent death when an airplane crashes at 600 or 700 miles per hour, but it does expect that it will be able to save more lives in crashes at ordinary speeds. They believe that in many cases jet pilots who ride their crippled planes to earth will be able to get out and walk away after they crash.



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You've got a *new* thrill coming!  
A touch of the throttle and you're off like a comet! Hills melt away like magic! Rough roads fly beneath you with hardly a quiver of the handlebars. Steering is feather light. Braking is smooth and sure. Day-long riding leaves you fresh and ready for more fun as you take in exciting races, hillclimbs, delightful gypsy tours and club events. Easy payment terms bring you this finest Harley-Davidson of all time. See your Harley-Davidson dealer today. Mail the coupon now!

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Send for *free* copy of ENTHUSIAST Magazine filled with motorcycle action pictures and stories; also literature on new 1950 models.

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Eyes  
tired?



Two  
drops

Quick  
relief



**MURINE**  
FOR YOUR EYES

## Long Drink of Water

(Continued from page 105)

Another test with ground seeders has proved that precipitation from winter storms can be increased three or fourfold over the amount that would fall naturally. Early last year, the Salt River Valley Water Users' Association in Arizona conducted ground-seeding operations on the mountain slopes of the windward side of its watershed. Rain gauges showed that precipitation downwind from the seeders was invariably higher than in the uninfected portions of the air stream.

Dr. Irving P. Krick, meteorologist who served as forecaster and coordinator for the Arizona ground-seeding experiments, thinks that coastal mountain ranges can be turned into veritable rain barrels which will collect from the clouds just as much water as the West will need. He foresees the time when hundreds or thousands of silver-iodide furnaces will be placed at strategic sites on windward slopes. Aside from summer servicing, they would never need to be touched.

The Western empire has 40 percent of the nation's land, 35 percent of its natural resources, yet it supports no more than 15 percent of the population. One reason is that the West doesn't have enough water in the right places to support many more people than are living there now. Nevertheless, people today are marching westward at a tremendously accelerated rate.

A great many worried men are wrangling with the problem of watering this large and fertile area. Many of them believe that a pipe line from the north and rain making from the clouds are two possible answers.

## Home-Built Engines Power Britain's Model Racers

(Continued from page 153)

compound chassis, made of aluminum alloy in two sections, front and rear. The sections overlap and are bolted together at the center of the car and locked by another bolt and nut in a radial slot. This allows the whole chassis to pivot about the center line, thus insuring that both front and rear axles change their angles equally.

The body was built up from bits of hard balsa block and cigar-box wood, then covered with a single piece of parachute nylon. The finish consists of nine coats of full-strength glider dope, six coats of filler and 16 coats of green cellulose, each coat being well rubbed between applications!

Just after the racing season comes to a close, fingers begin to fidget once more in

(Continued to page 228)



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**UNIVERSAL  
RETHREADING  
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reclaims damaged  
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Rethreads bolts 1/2" to  
5" dia., and pipe 1/4"  
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A striking example of how motorists benefit through engineering research and constant improvement is the Chevrolet valve-in-head engine. In 1937, when the 216.5 cu. in. model was introduced, its maximum horsepower was 85. The improved 1950 engine, although there has been no increase in displacement, develops 92 horsepower—a gain of 8.2 per cent.

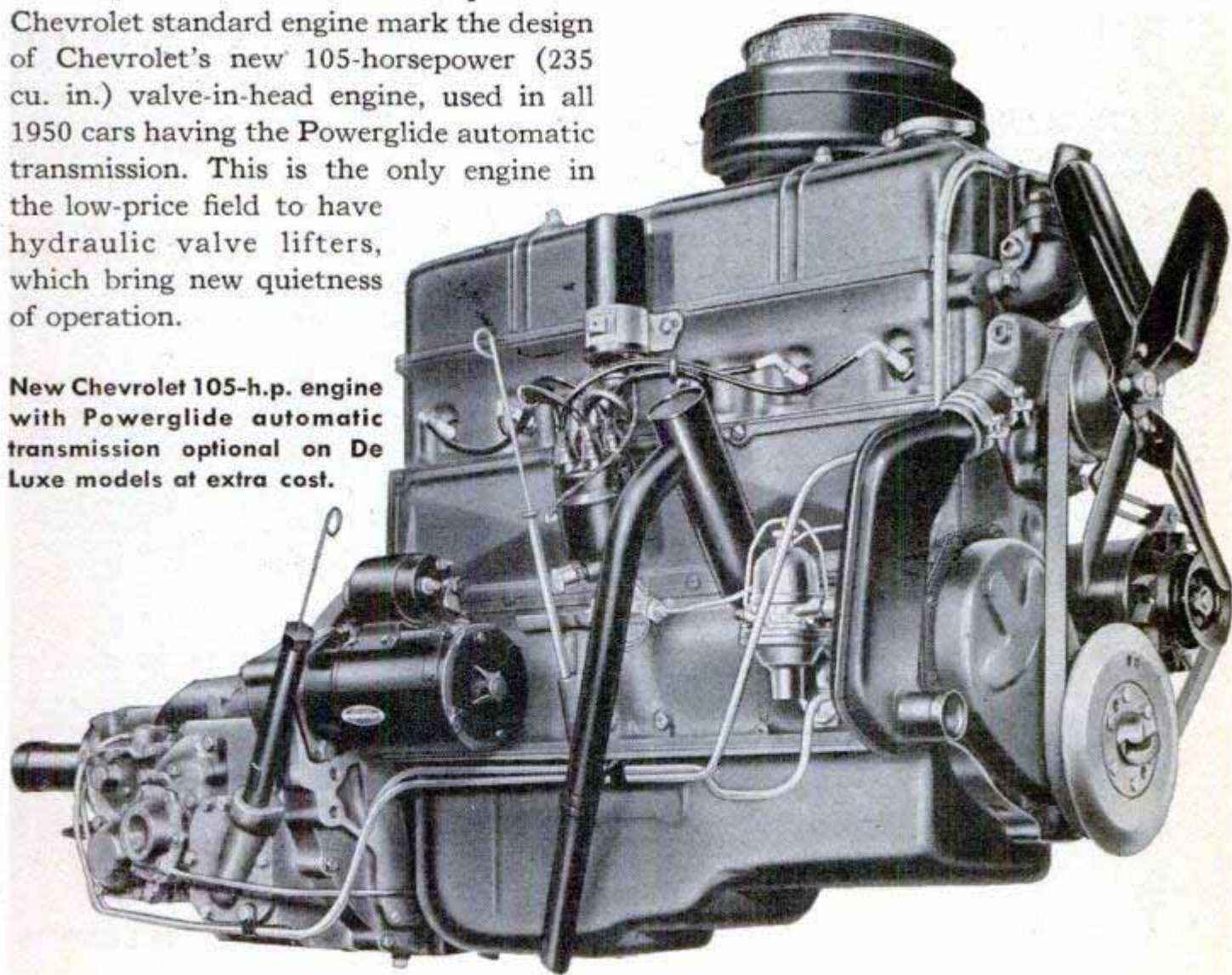
The advanced engineering principles that have boosted the efficiency of the Chevrolet standard engine mark the design of Chevrolet's new 105-horsepower (235 cu. in.) valve-in-head engine, used in all 1950 cars having the Powerglide automatic transmission. This is the only engine in the low-price field to have hydraulic valve lifters, which bring new quietness of operation.

**New Chevrolet 105-h.p. engine with Powerglide automatic transmission optional on De Luxe models at extra cost.**

Both these valve-in-head engines, equipped with the new Chevrolet Power-Jet carburetor, are notably smooth in their response to the throttle. And valve-in-head engine design is but one of *many* fine-car features exclusive to Chevrolet in the low-price field.

You are invited to see and drive the 1950 Chevrolet at your Chevrolet dealer's.

**CHEVROLET MOTOR DIVISION**  
*General Motors Corporation*  
DETROIT 2, MICHIGAN



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## Clinic



## for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

### Tight Storm Sash

Q—My storm sash are quite old and fit the frames rather loosely, leaving an opening of 1/16 to 1/8 in. all around. I'm planning to replace these with new sash. I want the new sash to fit tightly to avoid air leakage. I'd thought of beveling the edges of the sash frame so that it wedges in tightly. Is this advisable?

M.C., Albany, N.Y.



A—We'd say that your storm sash fit remarkably well after years of service! Why replace them? Perhaps if you scrape off all the old loose paint and apply new putty where needed they will be as good as new after repainting. At any rate, we cannot recommend the procedure you outline for wedge-fitting the new sash which you propose to install. Even though the sash frames are carefully primed and painted with two coats of oil paint, they are certain to swell during the first season and wedge so tightly into the window opening that you cannot possibly remove them without serious damage. Rather we would recommend that you fit the new sash at least 1/8 in. less than the full measurement of the opening and then seal them with strips of 1/8 x 1/2-in. felt tacked along the edges of the inner face of the frames. Use turn buttons as fasteners, rather than hangers. Draw the turn buttons up tightly after the sash are in place.

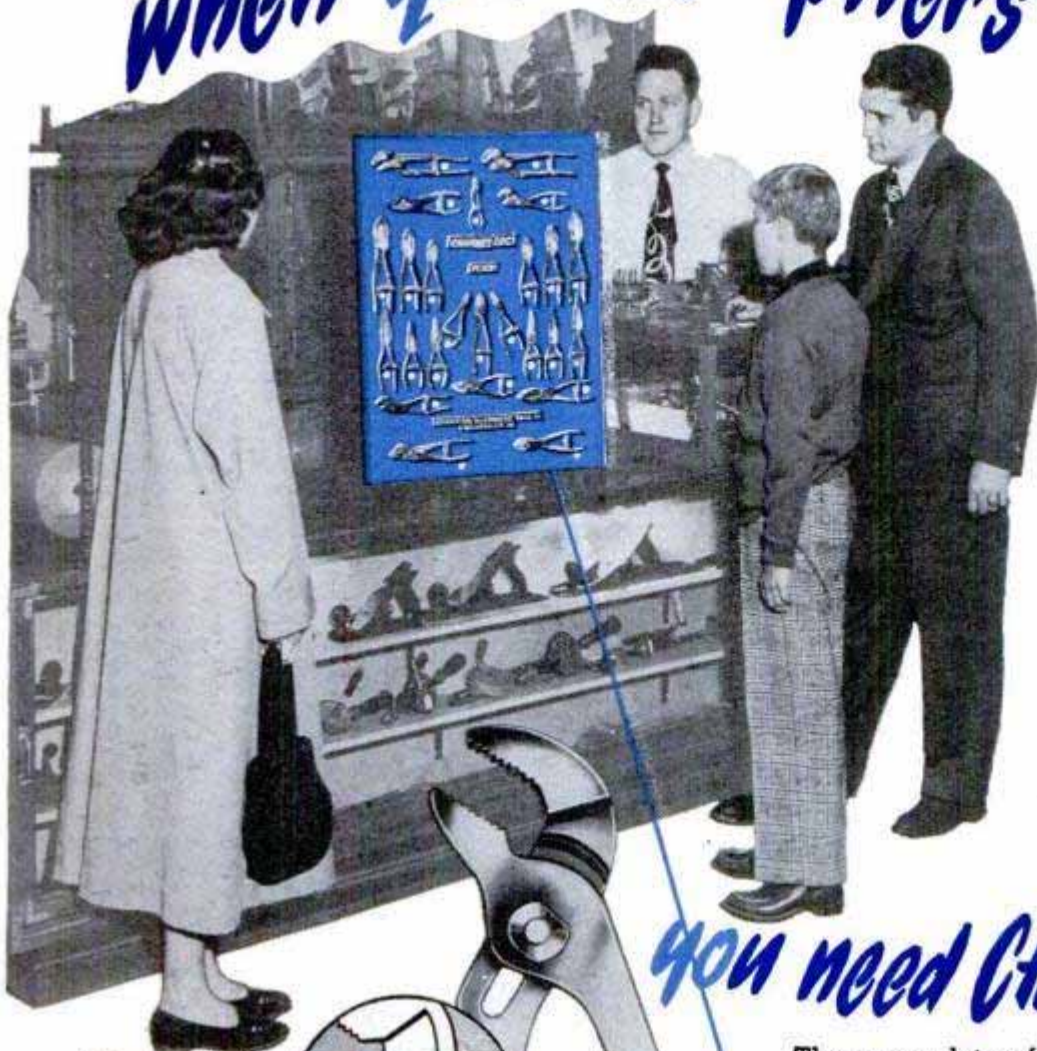
### Condensation in Prefabricated Home

Q—I'm thinking of building a small prefab home but I'm at a loss to know which type of wall construction is best. According to the information I have, several types are offered. I've also been advised there is danger of prefab walls drawing moisture. Is this true and, if so, how can I prevent the moisture coming in? What type of wall should I use?—B.W., Kansas City, Kans.

A—Although you did not say, we assume you are planning to build, or have built, a prefab home of the basementless type. Also, in your use of the term "drawing moisture" you undoubtedly are referring to the problem of moisture condensation in tightly constructed dwellings. Space does not permit a full explanation but, stated briefly, moisture condenses on the inner surface of the

(Continued to page 226)

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Greater Strength, Longer Wearing, Self-Cleaning, Closely-spaced Adjustments, Visible Adjustment, No Wear on Joint Bolt.



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THE SIMONIZ COMPANY, CHICAGO 16, ILL.

(Continued from page 224)

walls, or within the walls, for essentially the same reason that it condenses on the surface of a glass tumbler filled with cold water and placed in a warm room. All air contains moisture in varying amounts and usually the air outside the wall, during the colder months especially, contains less moisture than that inside the building. As a result of what is known as vapor pressure, air from inside the building normally passes through the walls, carrying the moisture with it. Insulation in the walls tends, in effect, to slow this transfer of air from the warm side of the wall to the cold side. The usual result is that, in passing through the wall, moisture-laden air from the inside is cooled to the dew point before it reaches the outside and the moisture in the air condenses within the wall. This causes rusting of nails or other fasteners, rotting of the framing members and a slow deterioration of the insulating material. However, prefabricated homes of several types and architectural styles now are supplied with vapor seals, approved insulating materials and also combinations of materials used in the walls have been carefully worked out to prevent trouble from moisture condensation. We believe you will find the product of reputable manufacturers and builders in this field entirely satisfactory.

## Insulating Pipes



**Q**—I have an old warm-air furnace and I would like to renew the insulation on the warm-air pipes and also on the sheet-metal furnace jacket. I've thought of removing the old wrapping and putting on several layers of asbestos paper but I find that this not only will be quite expensive but is rather difficult to apply. Do you think it would pay to do it? Or, do you advise some other method?

A. W., Rochester, Minn.

**A**—Recent experiments tend to show that any tightly compressed covering material having a high degree of density is of little value in insulating warm-air pipes against heat loss. Hence, the gain to be had by applying several tightly cemented layers of the same material would appear to be negligible. However, there are insulating materials of a cellular structure available which are suitable for covering warm-air pipes. These have measurable insulating value when properly applied.

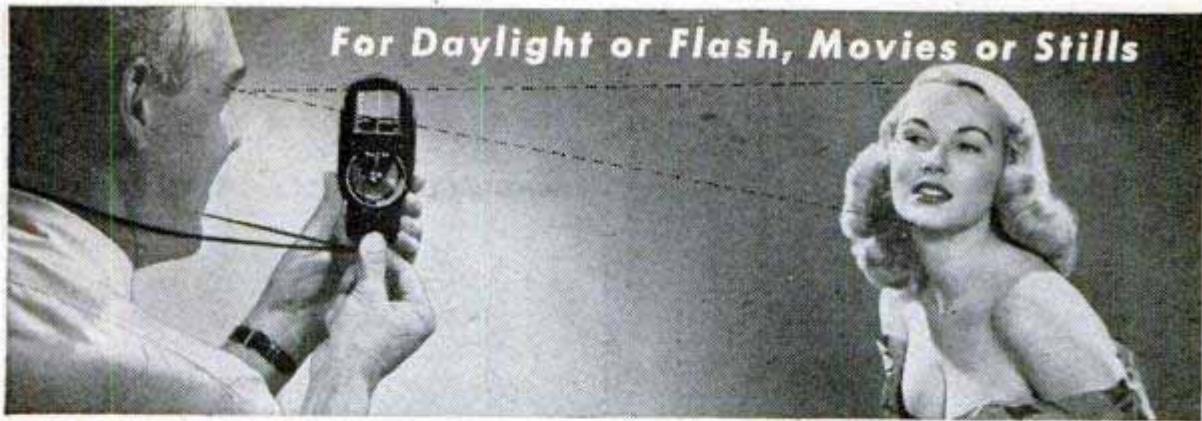
## Repairing Ceilings

**Q**—The plastered ceilings in my home are in poor condition, the surface cracked and wavy and apparently quite porous. In some places the edges of the cracks are offset as much as 1/4 in. I'd like to repair the ceilings but don't know what is the best procedure, or what materials to use. Can you advise?

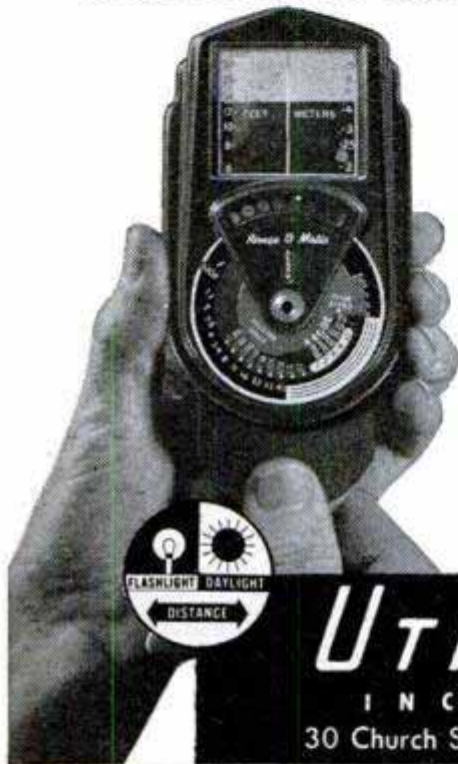
G. M., Wausau, Wis.



**A**—One recommended procedure is plastering the entire ceiling over metal lath. A much faster and less expensive repair can be made by applying furring strips at right angles to the joists and then applying plasterboard. This material is supplied in large sheets having depressed edges. After the sheets have been fitted and nailed in place over the furring strips, the depressed joints are taped and filled flush with a special compound made for the purpose. Both the tape and compound can be supplied by the building-materials dealer from whom you purchase the plasterboard.



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anticipation of nights in the basement, the attic or wherever the workshop is located. Perhaps the kitchen table is the only available space for some enthusiasts, but this seems to make very little difference in the quality of the models they turn out, and each year they return to the tracks to display to their friends and the fans the results of their winter's work. There is always work to be done, modifications to be made. A new motor, maybe, or a change of gear ratio, larger or smaller wheels, adjustments to suspension, a new tank; in fact, dozens of odd jobs suggest themselves during the course of the long dark evenings of the off-season, and each one is carefully weighed and sifted, just as the operators, mechanics and drivers of the giant Grand Prix cars prepare for a season's racing on the circuits throughout Europe.

Some of the men who participate are not content to follow in the footsteps of their predecessors. Their creative instincts urge them on to produce supercharged units with four-wheel drive and torsion-bar suspension—a "free lance" design; or perhaps it's a twin unsupercharged unit to power a perfect scale replica. But whatever the subject, and however simple or complex the design, the home constructor is the only really true modeler.

## Beneath a Live Volcano

(Continued from page 75)

they would have time enough to backtrack.

Following this tube in an uphill direction for 1½ hours, the men came to a large room which they estimated to be about 250 feet long and 100 feet wide. From this room they started down another tube, but the flame didn't draw, and they returned to the central room. Here, behind a large rock, about 35 feet square, they found another tube. Going uphill for another two hours, they finally decided to turn back as their exploring time was up. The flame was drawing very strongly, however, and Harry felt that they might have found another exit. Although they hiked for miles, they never came to the end of any tube.

Taking their pictures and a collection of stalactites, the men returned to Honolulu with proof that such large tubes do exist under active volcanoes and can be found. Dr. Thomas Jaggar, world-recognized authority on volcanoes, looked at the photos and declared the tubes were extremely unusual in size and perfection and hopes this whole volcano area and tubes may be opened to the public some day.

As for Danny, he says: "That last half mile down Mauna Loa was the longest five miles I ever hiked."

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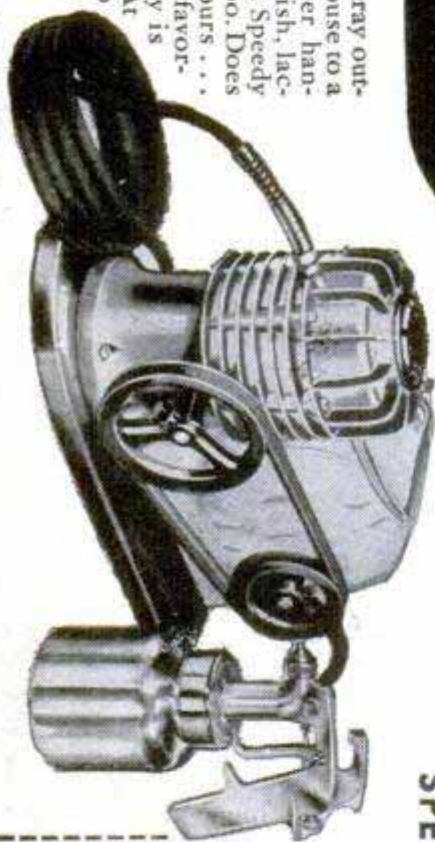
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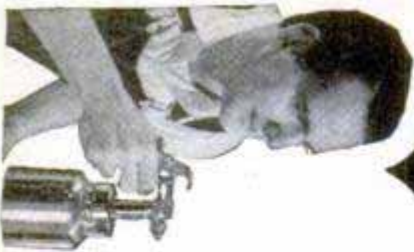
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Here's a real "professional" spray outfit that paints anything from a house to a toy! In addition, Speedy Sprayer handles any material—enamel, varnish, lacquer, calcimine, insecticide, etc. Speedy Sprayer saves time and money, too. Does any job in *minutes* instead of hours... makes paint go further. It's the favorite sprayer whose dependability is proven by 20 years of usage. At hardware, paint, lumber or auto supply dealers.



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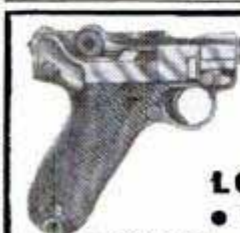


## STOP DRIP

caused from condensation on cold water pipes. Turn idle basement space into play or work rooms. Keep store rooms dry. Just wrap cork-filled

**NoDrip TAPE**

NoDrip Tape around pipes and joints. Do it yourself. Clean and easy to apply. Roll covers about 10 feet of 1/2" pipe, \$1.69. Higher west of Rockies and Canada. Get at Hardware, Department Stores, or sent postpaid. Write for free circular. J. W. Mortell Co., 522 Burch St., Kankakee, Ill.



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REPLACES IDLE ADJUSTMENT SCREW IN YOUR CARBURETOR HOLES FOR AIR FLOW



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INSTALL IT YOURSELF in a Few Minutes

ABOUT 1/2 MILLION NOW IN USE!

Up to 25% MORE MILEAGE, EASIER STARTING, FASTER PICK-UP and SMOOTHER IDLING are reported by many users of this new SENSATIONAL Automotive Product. (Hundreds of such letters have already been received.) However, they do not show improvement in some cars—Therefore we want you to try them in your car AT OUR EXPENSE. TRY BEFORE YOU BUY.

Just mail card or coupon below and TRY THEM FREE for 10 days. Then check your mileage and engine performance. If satisfied, send only \$1.50 per needle (8 cyl. cars take 2). If not entirely satisfied—just return them and YOU OWE US NOTHING—FAIR ENOUGH? - TRY BEFORE YOU BUY

MAIL TODAY SEND NO MONEY PAY POSTMAN NOTHING



NATIONAL AUTOMOTIVE RESEARCH CORP.

Dept. J-7, Venice, California

RUSH Gane "Air-Flow" Needle for my FREE TRIAL. I SEND NO MONEY—I PAY POSTMAN NOTHING. I will try them for 10 days in my car. Then, if satisfied, I will send only \$1.50 per needle (8 cyl. cars take 2). If NOT SATISFIED, I will return them and I OWE YOU NOTHING.

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Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Make of Car \_\_\_\_\_

Year \_\_\_\_\_

No. of Cylinders \_\_\_\_\_

Make of Carburetor \_\_\_\_\_

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4-Cycle, heavy-duty engine

Adjustable height handles

Cushion rubber tires



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ESTABLISHED 1928

## SICKLE BAR MOWER

36" high speed sickle

Mows farm lawns.

Harvest small crops. Clears electric fence lines of high grass. Shears bushes, shrubs, thickets. Cuts grass, weeds and brushwood on cemetery, golf course, industrial and institutional grounds.

James Cunningham Son & Co.  
Rochester 8, New York  
Please send complete details on the Cunningham Sickle Bar Mower.

Name.....  
Street.....  
City.....Zone....State....

## Pink Gold Strike in the Gulf

(Continued from page 126)

50 cents a pound on the market (shrimp is the second most expensive sea food. E. J. Toomer has a fleet of 11 boats which not infrequently brings in 37,000 pounds of shrimp over a single week end.

Shrimp fishing off Key West resembles the operation performed by the deep-sea trawling fleet of the New England commercial fishermen. A "drag net" is towed slowly along the bottom until filled, then hauled to the deck by winches. The 2 1/4-inch mesh permits the escape of much of the trash and smaller shrimp. As Florida conservation laws prohibit the taking of shrimp that run more than 55 to the pound, most of those of illegal size escape the net. As it is, the catch averages about 30 to the pound, in the "jumbo" class, considered above the average by the industry. The meat is delicate pink, whereby the name "pink gold" got its inception. Depth of the average haul is from 16 to 22 fathoms.

Every day the docks present a scene of constant activity as "operation shrimp" is in full blast. Boats just arriving from the banks are unloading. Winches with wire-net baskets dip the frozen shrimp out of the holds, where they are rushed to the packing plant. There they are washed and repacked with ice in 100-pound boxes. Then the trucks are loaded and rumble off up the keys to the mainland. Ships waiting to go out are cargoed with crushed ice.

The loads are re-iced about four times en route up the East Coast to New York, Philadelphia, Baltimore and Washington, and five times on the run to Chicago. Fresh crushed ice is blown over the top layer only, as the bottom layers remain solidly packed in ice. Upon arrival at their destinations, the loads are then deep-frozen for packaging, sold fresh or steamed.

So fantastic has been the growth of this new industry that the normal facilities of Key West have been unable to cope with it. The ice plants on the island cannot begin to supply the demand for preserving the catch. Ice is shipped down by truck from plants on the mainland 130 miles via the Overseas Highway. Even at that, the mainland plants are taxed to the limit, for the shrimp fishermen located at Key West are demanding every pound the mainland can produce.

A big business in wooden boxes in which the shrimp are packed has sprung up. The boxes are shipped by truck from mill yards in northern Florida and Georgia by truck. They are knocked together in Key West by local help.

(Continued to page 232)

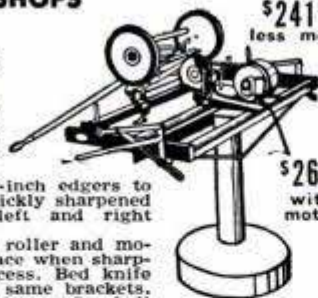
# MODERN LAWN MOWER SHARPENER

FOR LAWN MOWER SHOPS  
FIX-IT SHOPS

GOLF COURSES • PARKS  
101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang • 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed.

All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist blades.



PRICE  
\$241.50  
less motor

\$263.00  
with motor

Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets. Grinding head rides on five ball bearing races. Easy to operate.

Also sharpens chisels, joiner knives, planer blades. Big profit maker. Own your own business. Send Today for FREE Illustrated Bulletin No. 10-C

ORDER NOW

Immediate Delivery

MODERN MFG. CO. 160 N. FAIR OAKS AVE.  
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## NEW PACKAGED BOATS



17 models, 8'-16'; Tredonics racers, cruisers; Outboard, inboard, skiffs. Assembled frames; Tri-Keel construction; Tredronic bottom; spray rails; easy to build!

SEND 25c FOR CATALOG!  
Catalog and booklet "Plywood Boats", \$1.00

## BOAT PATTERNS-BLUE PRINTS

1950 Catalog—100 designs by naval architects. Racing classes, cruisers, inboard, outboard, sail, 6 to 35 ft. Plywood—Steel—Plank. Construction plans, full-size patterns. SEND 35c FOR CATALOG or \$1.00 for catalog and booklet on "Boat Building."

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POSTPAID ANYWHERE IN U.S.A.

WE FURNISH ALL MACHINED METAL PARTS, EVERY SCREW, NUT, BOLT, WASHER, AND COMPLETE PLANS FOR THIS...

## BIG 10" POWER SAW



\$10.95 FULL REFUND IF LESS GUARD NOT SATISFIED & WOOD IN 10 DAYS

COMPLETE PLANS 10c  
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PIPE TAPS & DIES  
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SAY YOU SAW IT IN POPULAR MECHANICS

## NOW DADO ANY WIDTH

WITH DA-DALL!  
Pat. Pend. U.S.A. & For

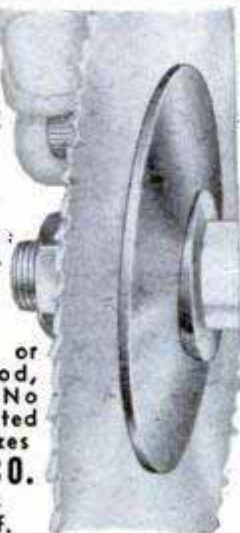
A simple turn of a screw adjusts your saw to any desired Dado cut! DA-DALL cannot slip, is self-tightening, self-adjusting, of all-steel construction, does a clean, true job!

ONLY \$4.95

DA-DALL cuts hard or soft wood, plywood, without chipping! No blades or complicated dials. All arbor sizes  
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# BRIKCRETE

# PEEL OFF PAINT

WITH KLEAN-STRIP

**Amazing new-type remover  
is fast, safe, easy-to-use**

Klean-Strip changes any finish into loose, wrinkled film. Use only a brush or putty-knife to peel off all layers of the old finish at one time.

Klean-Strip leaves the surface clean, smooth and dry. No sticky mess to wash off, no waxy residue to scrape. And Klean-Strip is absolutely safe: will neither burn nor explode.

Klean-Strip is brand new . . . not like any paint remover you've ever used. Takes all the danger and drudgery out of refinishing. Buy Klean-Strip whenever you buy paint. Available at better paint, hardware and department stores, everywhere.

Product of  
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**New! No-Wash!  
Non-Inflammable!**

**Keep your tools in order, in full  
view and in easy reach with**

## **NEW! TOOL LOCATOR PRINTS**



Get tools out of drawers and boxes where they are hard to find, where they get dull and rusty. Get them up in plain view, in easy reach on TOOL LOCATOR PRINTS.

Two 27" x 42" layouts containing every tool in every size used by average hobbyists; 150 tools all compactly arranged in logical order.

Tack or paste your prints up at the back of the bench or in any convenient spot. Screws or nails driven through the prints hold tools in place.

Each tool easily replaced after use. A glance tells if any tools are missing and which ones.

A set of TOOL LOCATOR PRINTS will save many times its small cost in added convenience, tool protection and time saved.

Set of Two Prints **\$2.50** Post Paid  
Check or Money Order. No COD's please  
*Alabama residents add 2% sales tax*

DEVALL COMPANY  
Box 1165, Birmingham, Alabama

Please send me a set of Tool Locator Prints. I enclose \$2.50.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

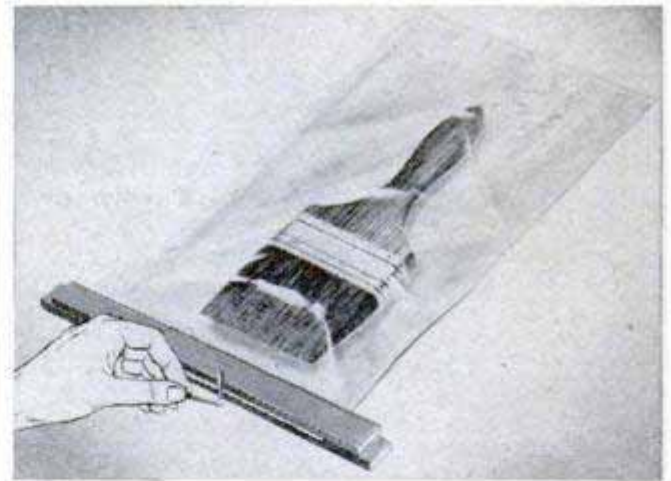
One of the chief obstacles to the entire fishing operation is torn nets. Coral reefs are interspersed with the mud banks of the fishing grounds, and out-of-state trawler men, unfamiliar with local conditions, frequently damage their gear. Such damage is repaired at sea or at the Key West docks.

The stretch of the Gulf of Mexico around the Dry Tortugas is famous for its treachery. It is comparatively shallow in places, and even a moderate wind can kick up a rough sea in short order. When a big blow comes, wrecks are far from uncommon as the "bones" of many ships that foundered off the Florida Keys testify. So the fishing boats stick pretty close together, keeping in constant radio communication with one another and with shore.

Fish and Wildlife Service scientists, as well as officials of the Florida Conservation Commission and long-experienced commercial shrimp fishermen now in Key West, are practically unanimous in their belief that it will be a far day before the new beds will suffer the decline now afflicting the shrimp fields of north Florida, Georgia, North Carolina and Louisiana.

Old-timers say that "operation shrimp" at Key West is the greatest marine find since the discovery of the Alaska salmon.

## Sealed Paintbrush Bag



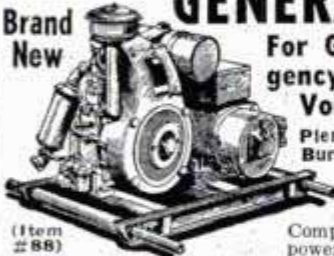
Wet paintbrushes can be sealed and kept soft for years in a special plastic bag. The bag is sealed by placing the open end between two straight-edge pieces of wood and fusing it closed by running a lighted match along the full length of the exposed edges. It isn't necessary to clean or dry the paintbrushes first and the bag can be used repeatedly.

As the first bomber able to change the position of its wing in flight, the triple-jet Martin XB-51 takes off and lands while virtually horizontal, instead of in the usual nose-up attitude.

# GROBAN'S WAR SURPLUS SPECIALS

All items brand new

Brand New



(Item #88)

## AUXILIARY ELECTRIC GENERATING PLANT

For General Utility and Emergency Use • 2500 Watts • 115 Volts • 60 Cycles A.C.

Plenty of current to operate your: Oil Burner, Sump Pump, Refrigerator, Home Freezer, Power Saw, Lights, Radio and Television, Home Water System Pumps.

Complete integrated heavy duty electric power plant. Signal Corps Model PE-75, driven by Briggs & Stratton, one cylinder 6 1/2 H.P. Model ZZ, 4-cycle engine with killer button, oil bath air cleaner, governor, muffler, starting rope, and radio interference filter.

The self-excited Leland or Westinghouse generator is rated 2500 Watts, 115 Volts, 60 Cycle A.C. single phase, belt driven, with guard and duplex receptacle.

When generator is not in use, you can use the engine separately to power other equipment.

Mounted on adjustable steel skids, notched for carrying poles. Net wt. 310 lbs. Shpg. wt. 440 lbs. Dimen. 36"x19 1/2"x24". 12 month guarantee. \$726.00 value. NOW... F.O.B. Chicago

295.00



(ITEM #63)

## G-I STAINLESS STEEL TANK

Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light, shatterproof. 450 P.S.I. Aviator's Breathing Oxygen bottles, type G-1, 2100 cu. in. (approx. 9 gallons) int. vol. 24"x12". 1/4" threaded openings at ea. end. Wt. 19 lbs. (ITEM #63) Price..... F.O.B. Chicago

4.95

## UTILITY ROTARY VANE PUMP

Perfect For Water, Oil or Insecticides

Sprays DDT, 2-4D, sulphur compounds, etc. Pressures to 150 lbs., 15 gals. per min. at 1200 RPM using 2 HP. As vacuum pump for milking machines, lab use, etc., delivers 20" vacuum, 4.5 cu. ft. per min. at 1500 RPM using 3/4 HP. Rotate either direction, 1/2" pipe thread ports, 1 1/2" standard shaft, 4 ball bearings. Easy angle bracket mounting—Ready to run. Shpg. wt. 13 lbs. (ITEM #51) F.O.B. Chicago.



(ITEM #51)

16.50

## NEW STATIONARY OR PORTABLE D.C. ARC WELDER

250 AMPS. MODEL 252  
FOR ANY WELDING JOB, LIGHT OR HEAVY  
Stop Costly Repair Bills, Weld It Yourself and Save



(ITEM #65)

Designed for many years of trouble-free service. Handles anything from light gauge sheet metal to 1/2" plate. This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it. The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over \$300.00. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16" to 1/4" rods. Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7 1/2 H.P. electric motor or a 10 H.P. gas engine. Use two V-belts, or flat belt (on pulley). Continuous welding rating—200 amps.; intermittent rating—250 amps.; 0-30 volts. NOW... AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Shpg. wt. 107 lbs. Only one or two jobs will pay for entire welder..... F.O.B. Chicago

99.50

## A.C. LIGHT PLANT GENERATOR

750 Watts • 115 Volts • 60 Cycles

Manufactured by Ecor, rated 750 watts at 1800 R.P.M. Complete with voltmeter regulator; 1" shaft, with keyway for direct or belt drive supported by two ball bearings. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping wt. 60 lbs. F.O.B. Chicago.



(Item #67)

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## Aircraft Quality HYDRAULIC CYLINDERS

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes... including double action cylinders, control valves, tanks, pumps, fittings, hose, and data on hydraulic applications. Use these positive, highly efficient, smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #4—All steel double action hydraulic cylinder, 1 1/2" bore, 27 1/2" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. F.O.B. Chicago. 4.95

ITEM #33C—Double action hydraulic cylinder, 1 1/2" bore, 41 1/2" stroke. Clevis mountings at both ends. Uses 1/4" pipe fittings. Postpaid. 8.95

ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A \$45.00 value. Postpaid. 10.95

ITEM #41—Double action hydraulic cylinder, 2" bore, 6" stroke, clevis mounting at base and end of shaft. Overall length closed 12 1/2". Has 3/4" stainless steel shaft, uses 1/4" tubing fittings. Will lift up to 3100 lbs. with 1000 P.S.I. line pressure. Weight 7 lbs. Postpaid. 12.50

ITEM #16—Double acting cylinder, 1 1/2" bore, 27" stroke. Will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 8 lbs. A \$55.00 hydraulic cylinder value for only Postpaid. 12.95

ITEM #15—Double acting cylinder, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder will lift up to 7000 lbs. with 1000 P.S.I. line pressure. Wt. 12 lbs. A \$78.00 value. Postpaid. 19.50

ITEM #31—Double acting cylinder, 3 1/2" bore, 11" stroke. Will lift 9600 lbs. with 1000 P.S.I. line pressure. Wt. 15 lbs. A \$92.00 value. Postpaid. 22.50

ITEM #46—Double action, 3 1/2" bore, 20" stroke. Rated lift capacity 9600 lbs. with 1000 P.S.I. line pressure. Clevis mounting, aluminum alloy barrel with 1 1/2" stainless steel shaft and piston. F.O.B. Chicago 25.00

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 P.S.I. line pressure is 12,500 lbs. Ship. wt. 30 lbs. AN EXCELLENT VALUE for F.O.B. Chicago. 32.50

HI-PRESSURE FITTINGS for cylinders and valves available at 35c ea. for 3/8" pipe and 50c ea. for 1/2" pipe.

## Hydraulic Control Valves

ITEM #24. Four-way control valve with built-in relief valve, for use with one double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic systems to open and close hydraulic cylinders. Ship. wt. 8 lbs. A \$38.00 value. Postpaid. 7.95



ITEM #26. Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A \$60 value. Postpaid. 10.95

## VICKERS HYDRAULIC TRANSMISSION

MODEL AA16801A  
Ideal for lathe drive, miniature cars, power machinery, gearing, etc. Rated 2 HP maximum input at 3750 RPM. Output speed continuously variable from 0 to 1 1/2 of input speed in either direction. Self contained reservoir. All controls external. Even power at all speeds. Complete with two 1/2" shafts with flat for pulley attachment. Shpg. wt. 20 lbs. Gov't. acquisition cost \$325.00. A tremendous value at F.O.B. Chicago (ITEM #85). 25.00



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## PUROLATOR OIL FILTER

PERMANENT TYPE

The perfect oil filter to keep your motor oil or hydraulic fluid clean at all times. Protect your pump or engine with this unit. Just turn the handle and the element is clean. Standard 3/8" inlet and outlet ports to accommodate 12 gallons per minute. Shipping wt. 4 lbs. A \$13.00 value. (Item #70)..... 4.95 postpaid



## DIRECT CURRENT GENERATORS

For welders, plating, truck and marine use, D.C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #89—Type M-2, rated 50 Amps.—24 Volts. Mfd. by Leece-Neville Co. Shpg. wt. 32 lbs. Gov't. Acq. Cost \$176.00. F.O.B. Chicago..... NOW ONLY 16.50

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't Acq. Cost \$300.00. Shpg. wt. 54 lbs. F.O.B. Chicago..... 22.50

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't Acq. Cost \$380.00. Shpg. wt. 70 lbs. F.O.B. Chicago..... 35.00

Each individually packed in wooden box.

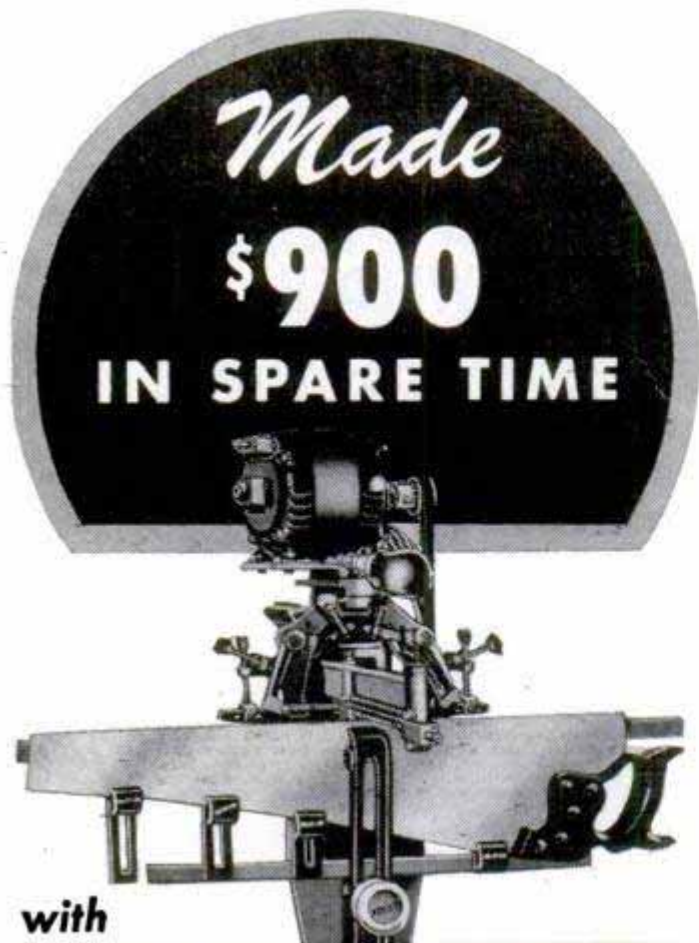
## LOGAN HEAVY DUTY HYDRAULIC PUMP

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 HP. Has 1/2" pipe thread ports, 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value. FOR ONLY 22.50 F.O.B. Chicago



(ITEM #29)

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## FOLEY\* automatic SAW FILER

\*Trade Mark Reg. U. S. Pat. Off.

"I did very well last year with my Foley equipment, about 950 saws and 240 lawn mowers, in my spare time. About \$900 for me." Leo H. Mix. Len Crego says: "I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."

Make up to \$2 or \$3 an hour in Spare Time. With the high prices of food, clothing and everything else, just think what you could do with extra money every week! With a Foley Automatic Saw Filer you can file hand, band and circular saws better than the most expert hand filer. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. Cash business, no canvassing. No eyestrain, no experience needed.

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Shows just how you can start at home in spare time in your basement or garage. Just think—with a small investment, no overhead, no stock of goods to carry, you can get right into a cash business—and later on develop into a full-time repair shop. Send coupon today. No salesman will call.



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## It Takes a Lot of Steam To Run a Diesel

(Continued from page 121)

system. The same steam generator that heated you in the North, cools you in the South. And, strangely enough, it takes a third more steam to keep you cool than to keep you warm. The steam operates an evaporator that keeps passengers comfortable when the outside temperature hits 78 degrees or higher.

On the Santa Fe Chief, for example, passengers are kept pleasantly cool by the steam as the train speeds across the desert. Then, as the train climbs the mountains and the temperature drops, the sensitive thermostats flip the cooling system over to heating and the coach temperature remains unchanged. When the train comes down the other side of the mountains, the outside temperature goes up and the system goes into "reverse" again, cooling the inside air.

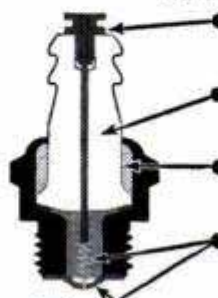
Steam provides hot water for the washrooms and showers as well as for the diner. Storage tanks are not used. A fast-working heat exchanger makes the cold water hot as it is drawn.

The almost magical heating plant that provides steam for the diesel produces a million BTUs per cubic foot of firebox. It gives off as much heat as the jet engine on a modern fighter plane. Water, pumped continuously through hundreds of feet of coil inside the firebox, is instantly converted to steam. There is no reservoir or steam dome. Every minute, ten gallons of water go into the coils and come out in a continuous stream of high-pressure steam. An automatic valve system under each car reduces this pressure to only a few pounds for safety before it enters the radiators.

Next time you see a diesel purring along the rails, proud of its victory over the old iron horse, just remember that it still takes plenty of steam to run a railroad—even though the diesel is now wearing the champion's belt!

## CHAMPION V-GLOW PLUGS

for model engines only



● **CHAMPION TERMINAL**—assures better center electrode seal and provides sturdier electrical connection.

● **CHAMPION-CERAMIC INSULATORS**—proved dependable in millions of Champion Spark Plugs.

● **CHAMPION SILLMENT SEAL**—prevents excessive compression leakage between insulator and shell.

● **CHAMPION "THERM-O-FLEX" CONSTRUCTION**—longer element life, more dependable performance.

Follow recommendations of plug types and fuels approved by engine manufacturer.

**CHAMPION SPARK PLUG COMPANY, TOLEDO 1, O.**



*Hi-level needs water  
only 3 times a year!*  
In Normal Car Use

# prest-o-lite hi-level

70% longer average life\*!

**A**VOID battery failures, get longer battery life, with the new Prest-O-Lite Hi-Level Battery that needs water only 3 times a year in normal car use. Helps prevent a major cause of battery failure. In addition, Hi-Level gives you Fibreglass mats to keep power-producing material in the plates for longer life. Make your next battery a Prest-O-Lite Hi-Level.

**PREST-O-LITE BATTERY COMPANY, INC.**  
Toledo 1 Ohio



\*In tests conducted according to S.A.E. Life Cycle Standards.

## \$1.00 MAKE IT YOURSELF

ONLY TAKE ICED BEVERAGES ALONG  
BRING ICED FISH  
BACK SAFELY



Make this handy picnic refrigerator and iced shipping carton from our plans and instructions. Genuine Ultralite, the textile-type fibre glass insulation, the heart of the refrigerator. INCLUDED in the \$1.00 kit.

Double the pleasure of outdoor occasions by making this easy-to-build, inexpensive picnic refrigerator. Send only \$1.

LEESON PRODUCTS CO., 618 Quincy, Topeka, Kans.

## Ball-Bearing SPEED WHEELS



JUVENILE WHEELS		(No bearing, solid tires)	
4" . . . . .	.40c	6" . . . . .	.65c
5" . . . . .	.45c	7" . . . . .	.75c
(Semi-pneumatic tire, ball bearing)			
8 x 1.25 . . .	1.85	10 x 1.25 . . .	2.20
8 x 1.75 . . .	1.95	10 x 1.75 . . .	2.30
8 x 2 . . . . .	2.20	10 x 2.00 . . .	2.65
12 x 1.75 . . .		3.45	

### INDUSTRIAL WHEELS

Lug Base, Semi-Pneumatic tire		Smooth Base, Pneumatic tire and tube	
5 x 1.75 . . .	3.65	10 x 2.00 . . .	6.10
6 x 2 SW . . .	3.45	10 x 2.75 . . .	5.15
6 x 2.00 . . .	4.00	12 x 2.00 . . .	6.90
8 x 2.00 . . .	5.20	12 x 3.00 . . .	9.20
8 x 2.50 . . .	5.40	16 x 4.00 . . .	15.15
8 x 3.00 . . .	11.00	12 x 4.00 . . .	12.10
10 x 2.75 . . .	6.80	4.00 x 8 . . .	13.10
10 x 3.50 . . .	10.55	14 x 4.50 . . .	13.40

Dealers, Jobbers, and Manufacturers! Our new prices will interest you.

No c.o.d. orders.

Available Now—CASTERS  
Write for circulars on all wheels.  
Prices F.O.B. our plant.

**JIM BROWN TOY COMPANY**  
1093 HOME AVENUE AKRON 10, OHIO

JULY 1950

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- Powerful Lift
- Small Size
- Hinged Handles

Perfect for retrieving iron and steel objects, such as bolts, nuts, washers, cotter pins, etc., that fall into small places.

9" Size \$1.00  
Lifts 8 oz.

16" Size  
Extends to 27" \$1.95  
Lifts 24 oz.



### DIRECT THRUST HACKSAW

One-piece steel tube back is fitted into a precision-machined cast-aluminum handle. With 10" blade . . . \$3.95

\* T.M. REG. U. S. PAT. OFF.

## SNAP-ON TOOLS

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28th Ave.  
Kenosha,  
Wisconsin

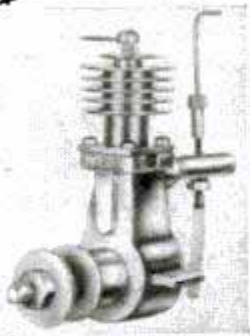
I enclose  Check  Money Order for the following tools:

Pick-up Tool  9",  16"  
Hacksaw Frame, blade   
Add Local Sales Tax

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

OUR 286th ADVERTISEMENT

# REAL DIESEL ENGINE!



## \$2.95

You can't beat this price!

- Ideal for planes, boats, midget cars
- Actually runs at 7500 RPM, produces 1/7 HP
- Precision machined for smooth operation
- Comes to you completely assembled, ready for operation

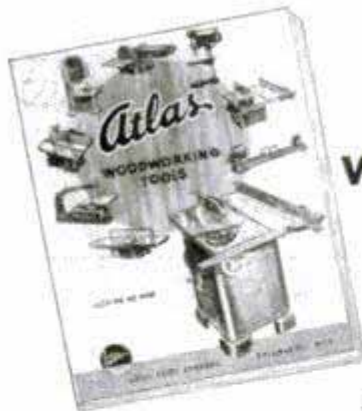
**MAYBE WE'RE CRAZY**, giving away a precision diesel engine, complete with cylinder and piston, carburetor, crankshaft, connecting rod, etc. for ONLY \$2.95. But we're selling thousands of DEEZILS all over the world, and that keeps our production costs down. DEEZIL is streamlined, compact, rugged. Starts quickly, easy to install, runs for years! Fast delivery if you ORDER DEEZIL TODAY!

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## Just off the Press

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## Atlas WOODWORKING CATALOG

Gives you complete information and operating views of these "industrial quality" tools for home shops. Atlas tools can help you this summer on your home building, improving.

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**ATLAS PRESS COMPANY**

743 N. Pitcher St., Kalamazoo, Mich.



**MATCHED PRECISION TOOLS FOR WOODWORKING AND METALWORKING**

## Doctors of Ballistics

(Continued from page 113)

suspicious of careless loading. Perhaps the loaders had used the wrong powder or had packed too much in the shell. The marksmen lost confidence in the ammunition and their scores suffered.

The White experts were called in. From their collection of pistols they pulled out one similar to the gun that had exploded. Firing it remotely in a clamp, they used cartridges with every possible powder mixture. They deliberately made "mistakes" so great that nobody could possibly have made them on the range. Still the gun didn't blow up. Finally, in desperation, they put in a charge powerful enough "to fire a cannon" and did succeed in exploding the gun. But, they decided, it was impossible for a loader to have made such a gigantic error and the gun must have been faulty. When the marksmen learned this, their confidence was restored and bull's-eyes soon returned to their scores.

Police are White's best customers. Most departments have neither the personnel nor the need for maintaining a large laboratory. The White organization, which keeps informed on all developments in small arms, supplies expert service to the law-enforcement bodies.

Recently, Texas police were holding a murder suspect on the basis of a pistol found in his possession. The pistol was the same caliber as the death weapon, but the police had no ammunition of the necessary low-velocity type to fire for rifling tests. They wired White for help. In the files, the gun "doctors" located the data on the gun and ammunition. Quickly, they made up some cartridges and shipped them to Texas where they helped solve the case.

Being rabid gun enthusiasts, the White engineers can spin fascinating yarns about every gun in the place, and since there are 500 of them lining the walls, that adds up to a lot of stories. One panel of rifles shows the changes in gun design during the period from 1860 to 1890, said to be the most prolific in the history of small arms. An adjacent panel includes all types of rifles used by the Japanese during World War II, including a paratroop model that folds in half.

There is a last-ditch rifle of the Nazis, the Volksturm rifle. Mass-produced with no attempt at precision, the rifle is a crude weapon intended for use by civilians as they defended their homes.

There are pistols made in Spain that so carefully copy American designs it's hard for the inexperienced eye to spot the difference. One copy of a Smith and Wesson

(Continued to page 238)



## DREMEL'S STRAIGHT-LINE ACTION

# GUARANTEES SCRATCH-FREE SURFACES

Here's fast cutting, finish sanding at its best. Dremel introduces a new electric sander, sturdily built to withstand hours of continuous use. It is light in weight... will not tire operator. Its straight-line (non-rotary) action leaves no scratches, no rotary marks—just satin-smooth surfaces ready for any type finish. Here, for the first time, is an electric sander built for years of faithful service—all at the remarkably low price of only \$24.50.

### A POWERFUL, FAST CUTTING TOOL FOR CRAFTSMEN, HOME and INDUSTRIAL USERS

Craftsmen find this new Dremel model has the extra stroke and power needed for heavier woodworking projects such as cabinet-making, boat building and refinishing, garden furniture, etc. Home-owners say it's just the tool for preparing surfaces for painting and varnishing—for refinishing walls, woodwork, furniture, dry wall joints, siding and other surfaces. The Model 2000 also does a professional job of polishing waxed surfaces—eliminating all the back-breaking labor on cars, furniture, floors, stairways, etc. Industrial users likewise find this new Dremel Sander a faithful performer in furniture, cabinet, building and body shop operations.

### RUGGED DESIGN and PERFORMANCE FEATURES

- Only two moving parts—requires no oiling.
- Reciprocal (straight-line—non-rotary) action leaves no marks... cannot burn surface.
- 21 square in. sanding surface speeds production... 14,400 cutting strokes per min.

- Cam-type holder permits changing paper in seconds.
- Die-cast aluminum housing with moulded Bakelite cover... Light weight, only 5 pounds... Over-all size 3 1/8" wide x 4 1/2" high x 7" long, 8 ft. Underwriter's Approved cord... operates on 110-120 v. A.C.

ONLY \$24.50  
WITH STEEL CARRYING CASE AND COMPLETE ACCESSORIES

14,400 Sanding Strokes per Minute



(Patented)

### PRICE INCLUDES STURDY CARRYING CASE

Perfect portability of Sander, cord, abrasives, and polishing pads is provided in this sturdy, 3-shelf metal storage case. Price also includes 25 assorted sheets abrasive paper and a high-grade sheepskin polishing pad.



### DREMEL Model "A" SANDER-POLISHER

Over 200,000 Now In Use!

A lighter-capacity Sander that takes all the work out of home or hobby projects. Popular with women for polishing furniture, etc. Same design and construction features as larger model. Furnished in attractive cardboard box. If your dealer can't supply order direct from factory.



\$14.85

### MOTO-TOOL — THE POCKET-SIZE MACHINE SHOP



Don't confuse Moto-Tools and Accessories with so-called "bargain offers". Compare Dremel feature for feature with competitive tools. If our products are not superior in every way, we don't want you to buy.

Portable DRILL PRESS

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MOTO-TOOL KIT NO. 2 With 23 Accessories (High Speed Steel Cutters, Grinding Wheels, Polishes) — \$23.50  
MOTO-TOOL NO. 2 (only) with one emery wheel point — \$16.50

Moto-Tool is the most versatile tool you can own—grinds, routs, drills, carves, engraves, polishes, etc. Look at these features: Approx. 27,000 R.P.M. • Dynamically balanced armature eliminates vibration. Oilless (oil-sealed) bearings • Dust-filtered air-cooling system • Weighs 13 oz. • Uses 110-120 v. AC • Used in plants of General Electric • Ford • Remington Arms • Nash-Kelvinator, etc.

### WHERE TO BUY DREMEL TOOLS



Dremel Tools are sold everywhere. If your dealer cannot supply you, send remittance in full and we will ship postpaid. Or send only \$2, and pay postman balance plus postage and fee. Money back if not delighted after 5 days' trial.

DREMEL MFG. CO., Dept. 110-G, Racine, Wis.

### DREMEL Electric COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS



BLADE FACES 4 WAYS

Only \$5.85 with 3 saw blades

JUST GUIDE IT!

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For home, hobby, repair work—no other tool pleases so much for so little cost. Works in any direction—delivers 7,200 strokes per minute smoothly, effortlessly. Saws through 3/4" medium-hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Only 2 moving parts, never needs oiling. Uses 110-120 v. A.C.

... for 6 useful projects packed with each saw

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of floor space—all  
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## \$150 PER WEEK CLEAR PROFIT

If you are aggressive, and follow a few simple rules, you can make that much each week. Hundreds, thousands of others have, so can you. Popcorn is the national favorite—Billions of bags are sold annually. Write today for the big book that tells how—"How to make BIG PROFITS FROM POPCORN." Be your own boss. Send 25¢ (coin) to cover mailing costs. A Manley Location Analyst will help you pick the best spot.

### MANLEY ...THE BIGGEST NAME IN . . . POPCORN

That's why the Saturday Evening Post, Reader's Digest, and Life have all carried full-length articles on the big profits in Manley popcorn.

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Enclosed is 25c (coin). Please send me the big  
popcorn book and have a Manley man call on  
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even has a useless firing-pin rivet set into its hammer although the hammer and pin are all one piece. This was done to make it appear to be a Smith and Wesson model which has a separate firing pin held in place by a rivet.

They have a single-shot .45 pistol with a smooth bore that was dropped behind enemy lines to resistance forces. Made in this country for about a dollar apiece, the guns are formed almost entirely of steel stampings and are effective only at close ranges. The crude-looking weapon weighs about a pound and was dropped in packages containing ammunition and a drawing to show how it works. There were no markings on the gun or package to identify its origin and some GIs brought them back as souvenirs claiming they were proof of the cheap guns used by the Germans.

Probably the most unusual bullet in the White collection is a square one that was actually fired. It happened when Munhall was testing barrel obstructions. He hammered the barrel of a Spanish revolver down to a narrow slit and loaded it. Clamping it in a holder, he stepped back behind a shield and fired it with a long lanyard, expecting the gun to explode. Instead, the bullet was fired quite normally. Amazed, Munhall dug into the cotton bale in which the bullet was embedded to find out what had happened. The bullet was almost square. Apparently, the barrel was soft enough to expand as the slug was forced through it, forming the lead into a square shape.

"I don't recommend that you try it," Munhall cautioned. "But now at least I know what the answer might be if somebody wants us to help solve a murder involving a square bullet!"

### Rubber That Comes in a Tube

Packaged in a tube like toothpaste, rubber in a water emulsion can be used to repair everything from garden hose to hosiery. The liquid dries quickly to form rubber as flexible and elastic as an inner tube. It is excellent for mending breaks in automobile tires and convertible tops. Having all the properties of rubber, it is waterproof and has excellent insulating qualities. To mend a hole in a stocking, you simply spread a thin layer of the liquid over the break and allow it to dry. The rubber fills in the hole and locks the broken threads in its grip, leaving a smooth, long-wearing patch. It can also be used to provide extra wear on run-down rubber heels and inside edges of trouser cuffs. The liquid sticks to almost any fabric as well as to rubber.

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**WRITE  
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### EMEROL CHASSIS OIL

A waterproof Lubricant for all chassis work. Clings, penetrates and protects against rust, despite hard rains. Will not affect car finish in any way.



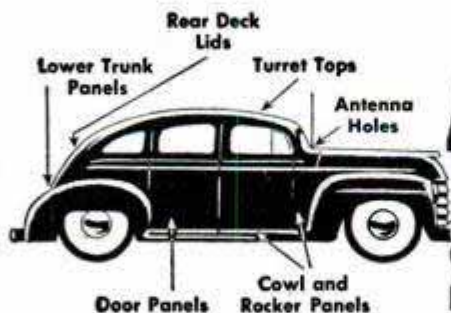
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NO FUSS! NO MUSS!  
SAVE TIME WITH THIS  
PERMANENT COLD SOLDER!**

Apply METALUME with putty knife—thin for brush or spray. Dries hard as metal, sands smooth. Strong, will not crack, check or peel. Takes any paint finish. \*CELASTIC a colloid-treated, hard-drying fabric—a backing for METALUME in repairing large holes, etc. Molds easily. METALUME and \*CELASTIC adhere permanently to clean, dry surfaces of all metals, wood, leather, fabrics, etc. Feather-edges perfectly. Complete kit job—ready with easy instructions.

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Gas Tanks	Rain Gutters	Pots & Pans	Plumbing
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Send me.....Repair Kits at \$1.69 each postpaid.

I enclose: Check  Money Order  COD

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at home, office, and shop  
(IDEAL GIFT, TOO)

So handy to keep nuts, bolts, screws, nails, parts, washers, stamps, hobbyists' needs, etc., at your fingertips.



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Stop searching, get a 32 or 64 drawer Jiffy to keep those small items that usually get mislaid. Spot welded steel, gray enamel finish, metal drawer guides. Dividers included with aluminum drawers make possible three compartments per drawer. Looks good anywhere. Send check or money order, please—no C. O. D.'s. Prices below. Your money refunded if not satisfied. Dealers write for quantity discount.

SPECIFICATIONS	WITH ALUMINUM DRAWERS	NEW SPECIAL!
<b>32 Drawer Unit</b> 6" Deep 12 3/4" Wide 15 1/4" High	<b>Dividers and Index Cards included</b>	<b>ONLY \$2.95</b>
<b>64 Drawer Unit</b> 6" Deep 25 1/2" Wide 15 1/4" High	One piece rustproof aluminum drawers for heavy service—good for work bench and industry use.	<b>8 DRAWER UNIT (24 compartments) ONLY \$4.95</b>
<b>Drawer Size</b> 1 1/4" Deep 2 3/4" Wide 6" Long	<b>32 drawer - \$8.95</b> <b>64 drawer - \$15.95</b> OHIO ORDERS ADD 3% SALES TAX Marproof Rubber Feet included with all cabinets POSTAGE PAID	<b>16 Drawer Unit \$4.95 (48 compartments)</b> <b>SPECIFICATIONS</b> 6" Deep—8 1/4" High 8 Drawer 6 5/8" Wide 16 Drawer 12 3/4" Wide POSTAGE PAID

KAYTEE PRODUCTS, Dept. M, Box 588, Canton, O.

# America Weaves a Defense Net

(Continued from page 95)

to adjacent filter centers to alert them. The third, or "radar teller," relayed the information to the nearest Ground Control Intercept Station, the tactical unit of the system, manned by Air Force men. All that took about 60 seconds.

At the secretly located GCI station, a plotter with headphones connecting him with the filter tellers, plotted the track of the enemy planes on a big vertical Lucite map. This track was in blue chalk. In different colors he made other tracks—from information off the GCI radar screen, and from reports from early warning radar outfits serving the area. If the spotters were accurate, and the radar was on the beam, the plots on that Cape Cod wave should have coincided. They did.

A GCI controller, watching the plots and radar screen, instantly contacted fighter operations: "Hello, Charlie blue. Scramble 16 fighters to 5000 feet. Rendezvous at York Mike 5436. Contact MEATBALL (code name for the GCI radar interceptor who would continue to vector the fighters after they were flying).

Simultaneously with this rapid-fire operation, a GCI teller flashed his telephone operator and passed the information along an instantaneous connection to an Air Defense Control Center, covering the area toward which the planes were flying: "Station 6, aircraft flash, track number 17, Yoke Queen 7437, 12 four-engine, military foreign low south. Scrambled." Total time elapsed since the first spotter warning: about 110 seconds.

At ADCC, the track was plotted on another vertical map. A civil air-raid-warning officer copied it on a specially scaled "memory board" or grid-map of the area. Over the track he placed a plastic template, with two concentric semicircular lines—red and blue—curving around its forward end. Every town within the inner red line, which encircled an area about eight minutes from the bomber wave, receives a red alert. The next area, forward to the blue line, gets a blue alert, etc. A yellow warning for more distant areas is seldom an ADCC concern, since areas that far ahead will usually get their own warning in plenty of time from the filter centers.

The officer grabbed his phone, called the ADCC switchboard and, referring to his map to see which cities were encompassed by the lines, snapped: "Red alert New Bedford, Fall River, Newport, Providence. Blue alert Hyannis, Boston, Riverhead, New London and Hartford."

(Continued to page 242)

**7x50 BINOCULARS**  
With COATED LENSES and PRISMS  
Precision Optics **\$30\***  
BRAND NEW

Highest optical performance. Over twice the light transmitting power of any 8x40, 10x50, 7x35 or 6x30, three times that of any 8x30, and eight times that of any 6x15 binocular. Fully corrected, needle sharp achromatic optics with wide angle of view. Lifetime aluminum alloy construction, leather covered.

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**A PORTABLE SAW**

**9.95** Can Be Used With One Hand!  
Any 1/4" or 3/8" Drill a Powerful Saw in ONE MINUTE

"ARCO-SAW" is a rugged tool with right angle gear drive (no clumsy, dangerous, direct drive with drill sideways). Works like a high priced Portable Saw.

CUTS 1-3/16", or 2x4 by turning over

**ONLY ARCO GIVES YOU ALL THESE FEATURES:** Safety-yoke assures rigid connection and absolute safety—Big handle affords firm grip for two-hand operation—Precision one-piece gear box—Self-lubricating lifetime bearings—Wide shoe-plate for straight, square cuts—90-day Factory Guarantee.

"HYCARBON" REPLACEMENT BLADE (Crosscut) . . . . . \$1.60

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**MOVEMENT**

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• **BENRUS**  
• **GRUEN**  
• **WALTHAM** or  
• **ELGIN**  
**WATCHES**

Choice  
**\$16.95**



Genuine Bulova, Benrus, Gruen, Waltham, Elgin and other famous wrist watches in latest style Yellow Gold Cases. You get these unredeemed 5-year guaranteed lifetime quality **FAMOUS MAKE WATCHES** now at truly enormous savings because we bought out **SURPLUS STOCKS** of leading New York and Maryland Jewelers. Order now while they last. State make preferred. Order men's or ladies'.  
**TRIAL OFFER! WEAR AT OUR RISK!** Money back in 5 days if not delighted! **SEND ONLY \$1** down payment with order. Pay balance to postman on arrival plus postage. Or we pay postage if you enclose \$16.95, plus \$1.70 tax.

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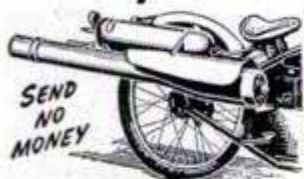
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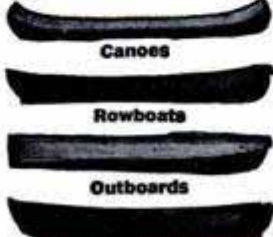
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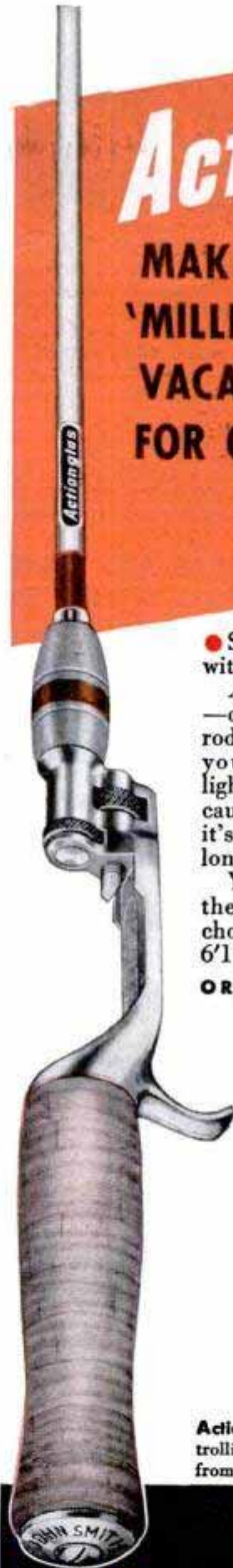


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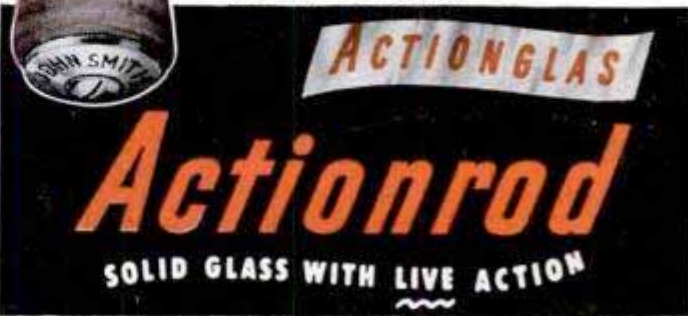
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**ON GUARD DAY AND NIGHT  
DON'T GAMBLE WITH FIRE**

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**Stickleback Drilsaw**  
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ONE TOOL DOES BOTH  
DRILLS and SAWS  
IN ANY DIRECTION**  
any shape hole in any  
lumber, ply, plaster walls

**THE SAW THAT DRILLS ITS OWN HOLE!**

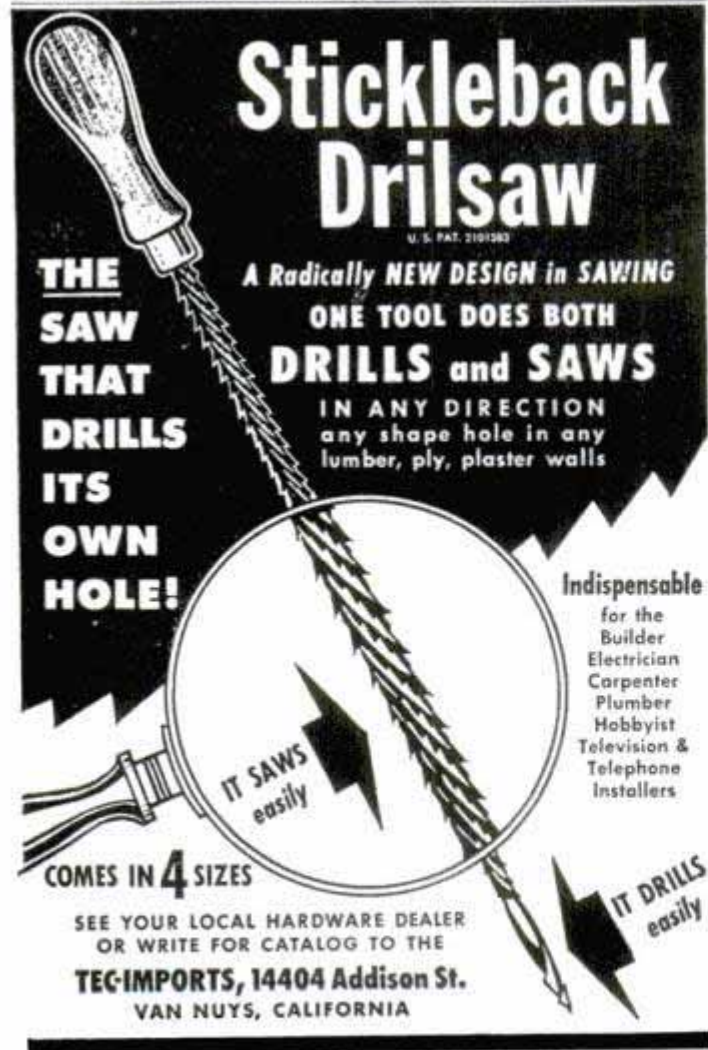
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**COMES IN 4 SIZES**

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VAN NUYS, CALIFORNIA**



The operator immediately began ringing designated firehouses, hospitals, police stations—Key Point Air Raid Warning Centers—in the cities named. Her rings went out over special warning lines, designated for each type of alert. In New Bedford centers, for instance, calls went out on the red line. In firehouses, hospitals and police stations, telephones with a row of red, blue, yellow and white ("all clear") lights along the base, began to flash red. In the other cities, getting the blue warning over the blue line, blue lights flashed on the Key Point Warning Center telephones. Back at the Control Center, tiny red and blue lights on the memory board began to flash as the operator rang each of the cities—so that the air-raid-warning officer knew his messages had cleared through. As the warning-center men acknowledged the calls, the lights stopped flashing and burned steadily.

Total time elapsed: about four minutes.

During Operation Lookout, the relay chain stopped at the Key Point Centers for good reason. The job of these agencies is to alert factories for shutdown and to send people scurrying for cover. "When you carry this out," points out the Air Force, "people get panicky. Expectant mothers have babies in the streetcars and old men die of heart failure."

Just the same, it all went off like clockwork up to that point. After the bombers had been knocked from the skies by interceptors, all warning telephone and memory-board lights in the affected areas flashed white—the "all clear" signal.

What about those interceptors? They are the most vital operational part of the whole business. That's why they're alerted within seconds after observers have made their reports. Usually, fighters are in the air two minutes after the order is received.

Everything is in readiness at secretly designated air bases. Squadrons are on alert duty, four pilots to each plane, relieving each other on a 'round-the-clock schedule in one-hour shifts. One hour is about all that any modern pilot, wearing 80 pounds of gear for high-altitude jet work—pressure suit, headpiece, oxygen tanks, helmet, etc.—can stand. Previously, "ready" pilots sat in their planes all hooked up, idling, and ready to go. That would be pure murder for the jet boys. At Langley Field, for instance, where the temperature ranges over 100 degrees, men can't stand the broiling jet cockpits in their heavy gear. And at northern bases, they'd freeze. Idling jet engines would consume all the fuel before they were off the ground, and therefore cockpits of waiting jets can't be heated.

(Continued to page 244)

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Amazing safety device. Fits inside any automobile! Know grade percentage climbing or descending. 2" reading dial—handsome plastic & steel case. Money-back guarantee! \$2.95 postpaid. COD postage extra. **MAHAR CO., 502 NORMANDY, SANTA ANA, CALIF.**



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FOR CABINS, TRAILERS, CONTRACTORS, BOATS

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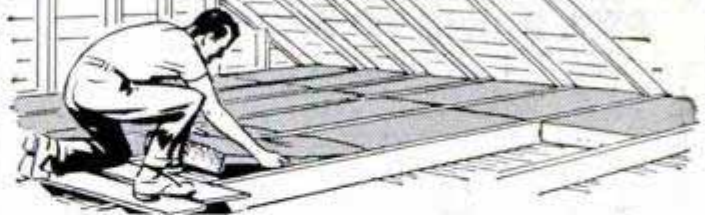
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ATLAS  
KEEN  
MOWERS



ONLY  
\$39.95

So, the men stand by in shacks near the line, with pressure suits on but unzipped, helmets in hand, phone sets ready to clamp on. Out on the line, power units for starting the jets are plugged in and ready to whirl.

In comes the message from GCI: "Fox-trot from Danceteam—scramble blue and green flights—vector 290 degrees—angels 35—contact Blueboy (code for a GCI station) for flight vectoring."

Seconds later, men are racing for planes, zippering suits and clamping headgear as they go. The horrendous roar of fired jets cascades across the airport. Another minute and they're following each other into the sky at blurring speed, while replacements tear toward the shack, and new planes wheel on the line, to maintain the endless chain of alert.

Once in the air, squadron commanders contact "Blueboy"—the GCI man who is watching his scope and tracks, and providing constant vectoring data on the enemy's progress. Vectoring must be accurate, so the interceptors can hit the invader from the proper angle. With bombers speeding in excess of 350 miles per hour, and interceptors doing twice that, fighter pilots will get only one pass before the enemy is gone. Fighters like to come in high or low from the side. It's almost impossible to get an advantageous crack at a fast bomber from behind. Head-on attack means a sweep-around. By the time a 600-mile-per-hour jet makes the circle, his target may be over the horizon. Hence, pilots are always shrieking for jet-fighter pilots, who know the ropes, to man the GCI-center controls.

Misses are not always GCI's fault, though. Visibility of enemy planes at 35,000 feet is often tough. On a high pass, for instance, it's hard to spot an aircraft below you. At that height, the earth is a perfect brown, black and gray camouflage.

The biggest factor for success in the modern spotter program depends on pin-point accuracy of observer reports, since near-sonic speeds of the engaging planes means they can make only seconds of contact. Those seconds must count.

Round numbers are no good, and may mess up the whole works. Suppose the filter center gets a plot timed at 0905, at location Xray Oboe 09—a four-engine plane going east. Actually the time was 0907 and the plane was going southeast—a 45 degree and two-minute difference. By the time two other observers come in with correct reports, which must be triangulated on the filter-center map to determine the error of the first report, five full minutes will have been wasted and the enemy will be a good 35 miles closer to his target!

(Continued to page 246)

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BOAT KITS**

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### 2500-Watt, 110-Volt, 60-Cycle

• Your last chance to own Army's finest power plant — at tremendous saving! Genuine PE-75, brand new, in original crate with spare parts and tools. Cost Gov't over \$600.

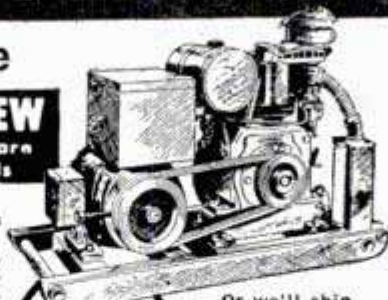
• Ideal for contractors, filling stations, cabin camps, carpenters, utilities, businesses, farmers, ranchers, etc. Use full-time or as emergency when regular lines fail—to operate lights, refrigerator, oil furnace, motor, etc.

• Will stand substantial overload. Voltage remains constant from zero to full load. Filter prevents radio noise. Comes complete—no extra equipment to buy.

**SPECIFICATIONS:** 2500-watt, 110-volt, 60-cycle single-phase generator. Genuine 6.5 h.p. model ZZ Briggs engine. Uses little fuel. Use engine for other purposes when not operating plant.

**BRAND NEW**  
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Kit contains gaskets, ignition parts, spark plugs, valves, rings, wrenches, wheel putter, pliers, etc.

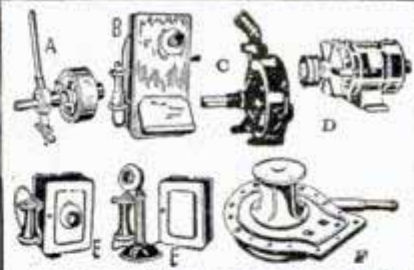


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**WE PAY ALL SHIPPING CHARGES**

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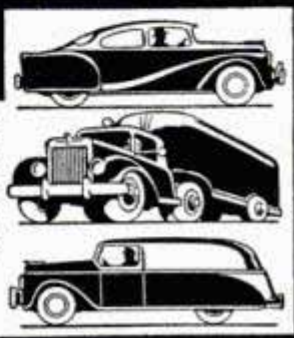
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Everyone loves to cook and eat outdoors. For a fireplace that costs less and works right, just fit masonry to this Model OF-28. 21" high, 26" long, 13 1/2"

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. . . can the inside face and edge of the stationary blade, as well as the reel blades, be ground to proper clearance **ALL IN ONE SET-UP**, without removing any blade from either hand or power mower. **Send Today for Free Details.**  
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**\$1.00 BRINGS YOU BOTH CANS!**

Yes sir—give your car the glow that rests your elbow! Use LACQUER CLEANER, the amazing pre-wax cleaner, and LACQUERWAX, the famous car finish protector. It's 5 times faster and easier to apply than ordinary paste waxes. **One treatment lasts 4 to 6 months.**

LACQUERWAX contains no lacquer, but this hard, liquid wax is **CLIMATEPROOF!** Its brilliant luster shines right thru hot sun and driving rain. You can't wash it off—it won't spot! It brings out and *preserves* the full beauty of your car's finish. Use the LACQUER CLEANER first to remove dead paste wax and dirt, then LACQUERWAX for the beauty treatment. **BOTH 10 oz. cans for ONLY \$1. Mail coupon NOW!**

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Gentlemen: My dollar bill, check or money order is enclosed for the 2 ten oz. cans — LACQUERWAX & CLEANER.

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(Inside Diam.)	1 1/4 in.	1 1/2 in.	1 3/4 in.
Length	25 ft.	40 ft.	30 ft.
Price	\$8.75	13.75	13.75

If specified we will send special hose for gas or oil at same prices.

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INSIDE DIAM.

1/4"—40c per ft., 3/8"—50c per ft., 1/2"—70c per ft., 5/8"—90c per ft.

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Everyone must be on his toes to make it work.

Officials noted one amusing thing during Lookout. The quickest, most efficient reports were logged at GCI centers when they were coming from young, sultry, female voices at filter-center teller phones.

In spite of potential bugs, Lookout's planners were highly pleased with results of their network. Telephone operators working the complicated system through regular lines were trigger-quick. Observer calls to filter centers as much as 350 miles away went through in a few seconds, and spotters logged 2701 calls per hour! The entire net costs only \$1,500,000 a year to operate—the price of a single one of the thousands of intermediate radar stations that would be needed to back-stop the early warning "fence."

New devices are constantly being explored to increase the net's efficiency. Alert receivers—which look like portable radios—for key-point warning centers, can register a broadcast warning by light, bell or buzzer. Trickiest part of the gadget, however, is that the coded message is for its "ears" alone. At any broadcasting station, the code (in seven seconds) is slipped into any program to which millions of Americans may be listening. No one hears it but the civil wardens monitoring the special receivers, which are pretuned to the right station. It would back up the complex job of the phone operator at ADCC.

Another instrument, under study for use by the observer himself for transmission of reports to distant filter centers, consists of a radio like the Mae West crank signal set used in air-sea rescue during the war. The observer simply sets his 10 items of data on 10 dials across the front, and pulls a one-armed-bandit type handle on the side. The generator turns, broadcasting the preset code information instantly, repeating as often as necessary.

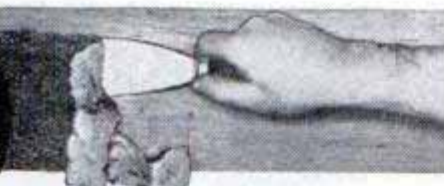
It can be used as a radio transmitter, or a line can be thrown across a telephone wire and the message will go via the Bell system.

If everything continues to move forward on schedule, we'll have a net capable of snagging any enemy who tries to bring us noisy presents via the sky.

### Enameled-Steel Window Sills

Window sills made of steel with a porcelain-enameled finish now are used in kitchens and bathrooms. Substances which frequently stain the surface of wood sills can't penetrate the acid-resistant finish of the steel ledges. The sills are made in a variety of sizes and in many colors.

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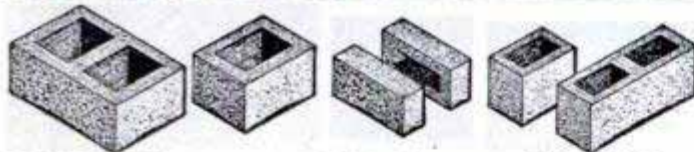
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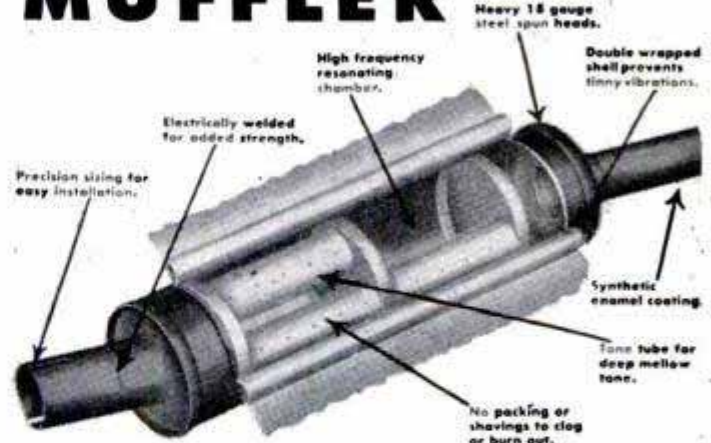
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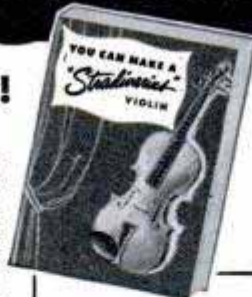
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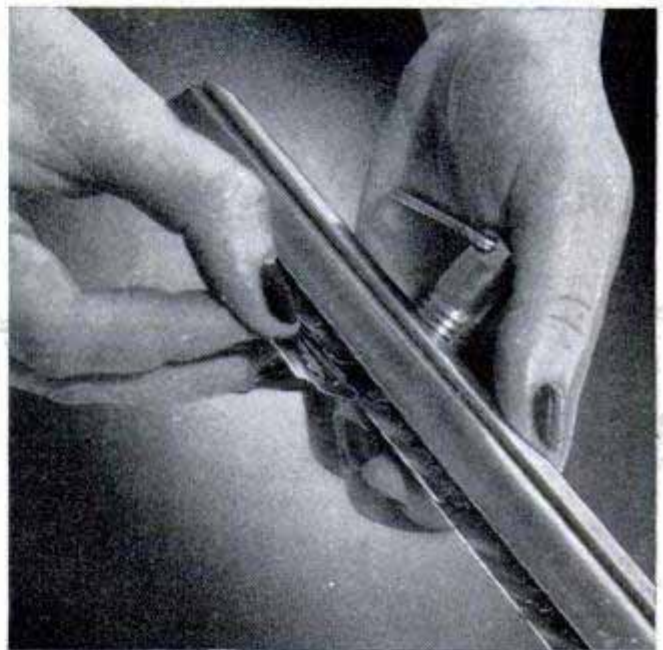
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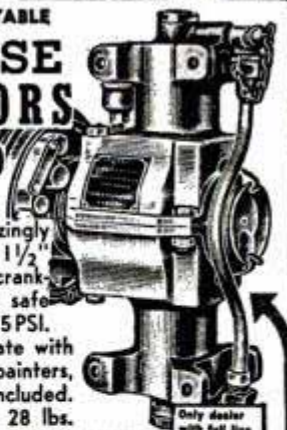
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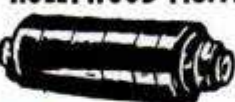
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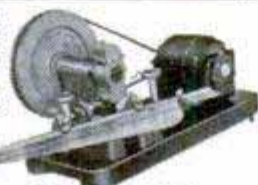
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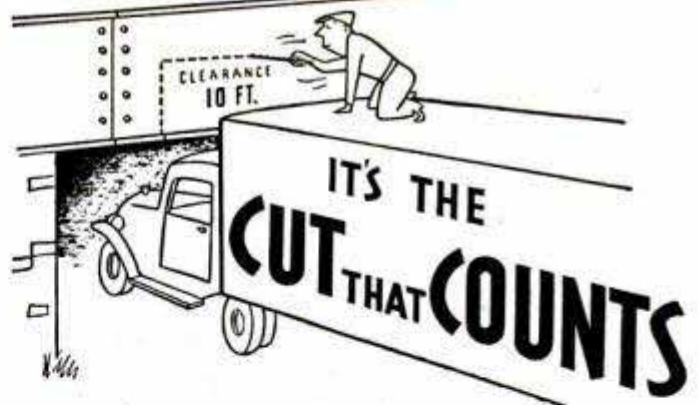
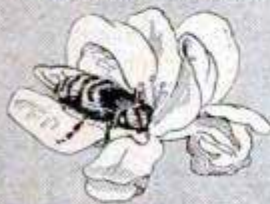
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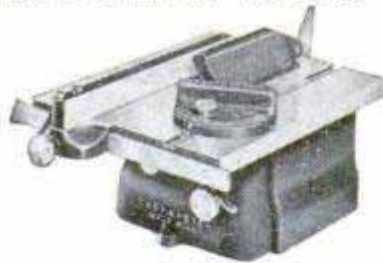
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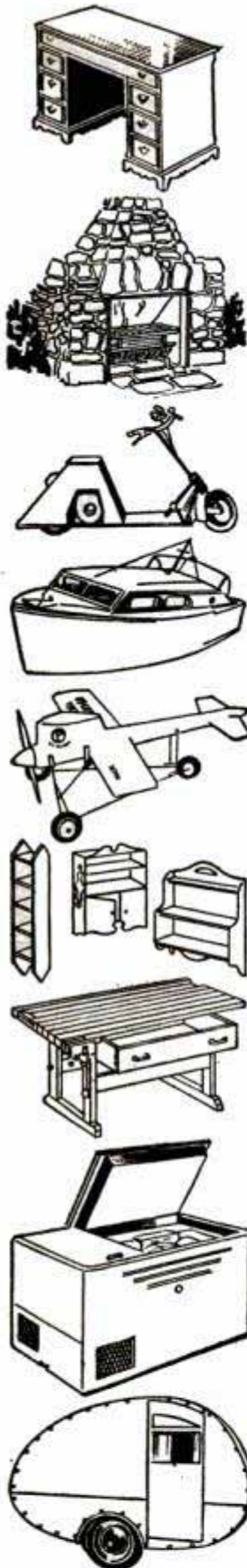
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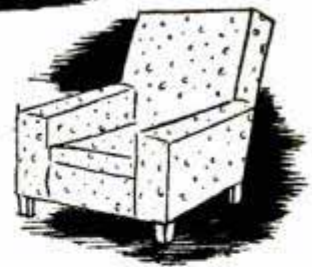


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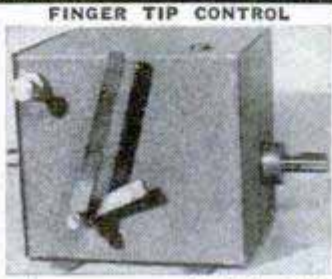
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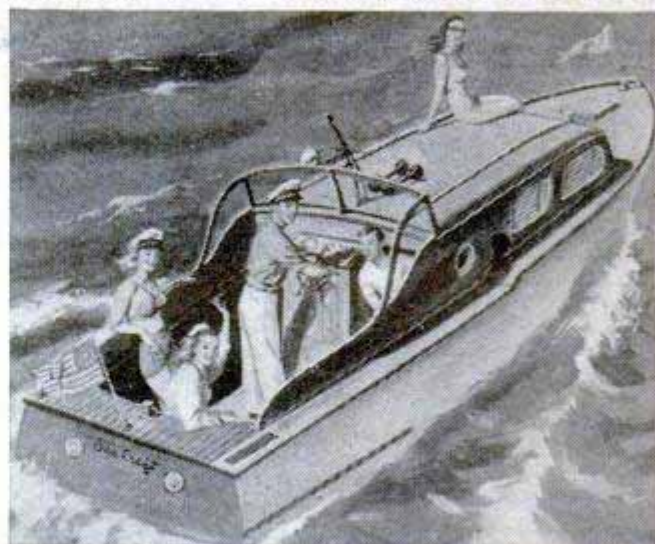
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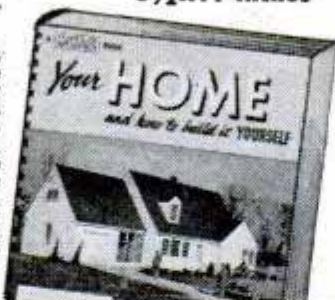
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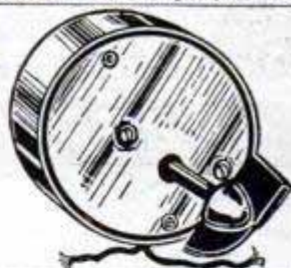
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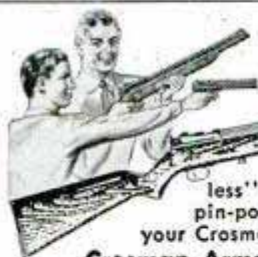
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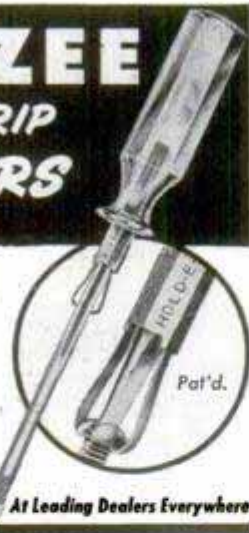
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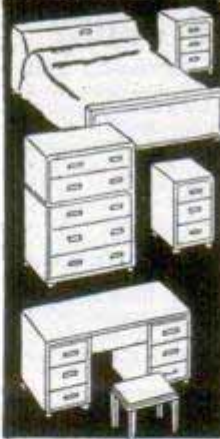
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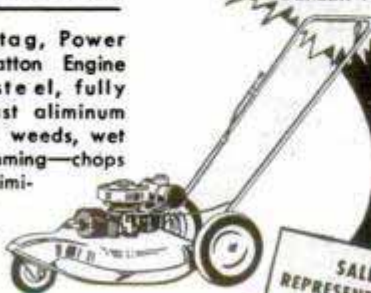
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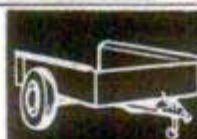
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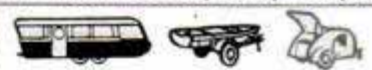
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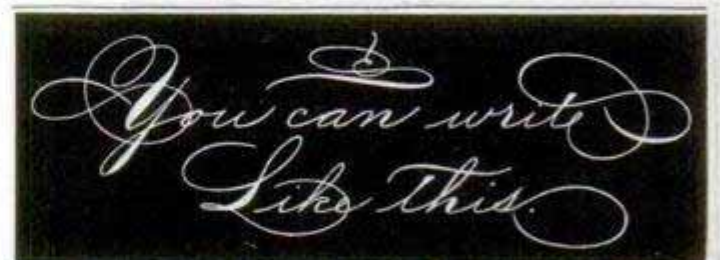
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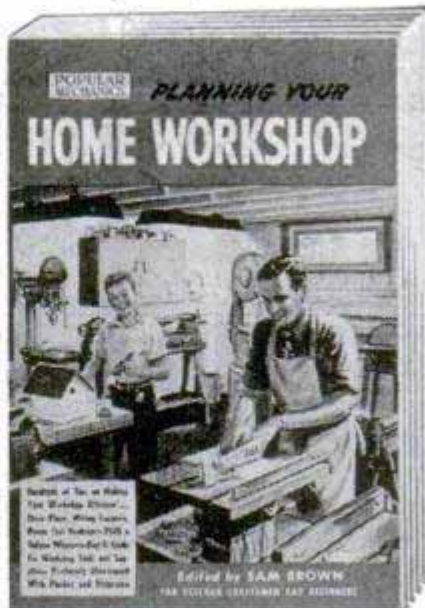
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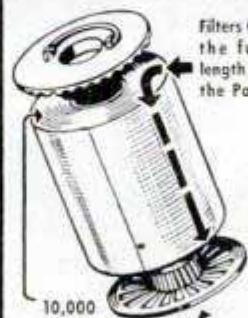
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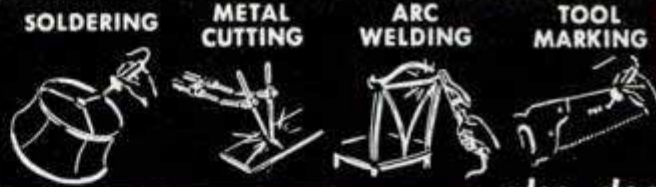
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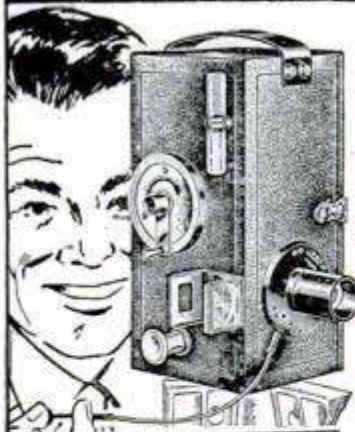
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700-20 10.90	750-20(10) 13.25	1100-20 17.00	1100-24 17.00
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**MILITARY \*\*\*\*\* GUAR. 30 MOS. (Supers 14 Months)**

600-16 \$5.75	SUPER \$7.74	SUPER \$7.95	RUGGED 45,000
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RUGGED 7.75	RUGGED 11.25	RUGGED 14.50	MILES

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Compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. COMPLETE OUTFIT, wt. 52 lbs.

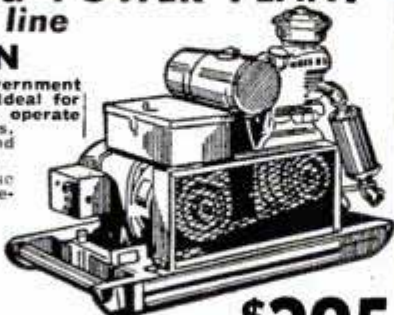
Equipment less Compressor, \$12.50. Compressor separately, \$21.50. Compressor has 2" bore, 1 1/2" stroke, ball bearing, 3.27 CFM at 600 R.P.M. Capacity up to 6.54 CFM. Size 9"x11 1/8"x6 3/8". Wt. 26 lbs. Ideal for spraying paints, insecticides, etc., inflating tires, operating air tools, and other uses. All new equipment. U.S. government surplus. Replacement parts available. Amazing buy. Don't miss it.

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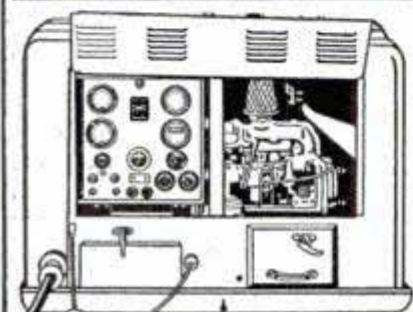
Advantageous purchase from U. S. government enables us to offer this great bargain. Ideal for farms, homes, garages, shops, etc. Will operate oil burner, deep freeze units, compressors, saw, pumps, radio and sound systems and general lighting.

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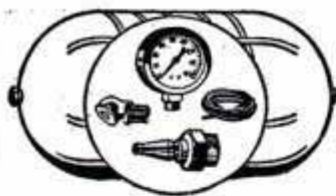
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Spare parts and tools furnished with unit. Shipping wt. 1200 lbs. \$1500.00 value

**\$495.00**

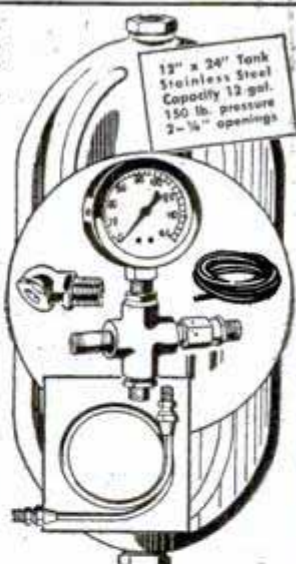
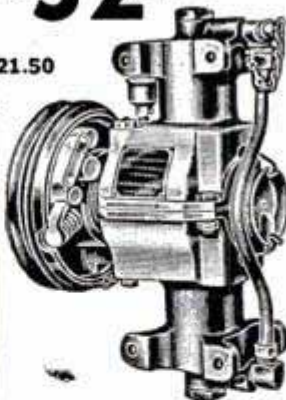
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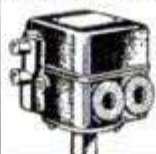
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**6 DIFFERENT TYPES 6**  
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Adjustable Jaw - Opens to 4"  
Drop Forged. Auto Type.  
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Any length of . . . . . **29c per ft.**

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Formerly used in aircraft electrical circuits. Have many uses around home & shop. All brand new!!  
1 3/4" x 1 1/2" x 4" . . . . . 0.64 Alum. **\$2.75** ea.  
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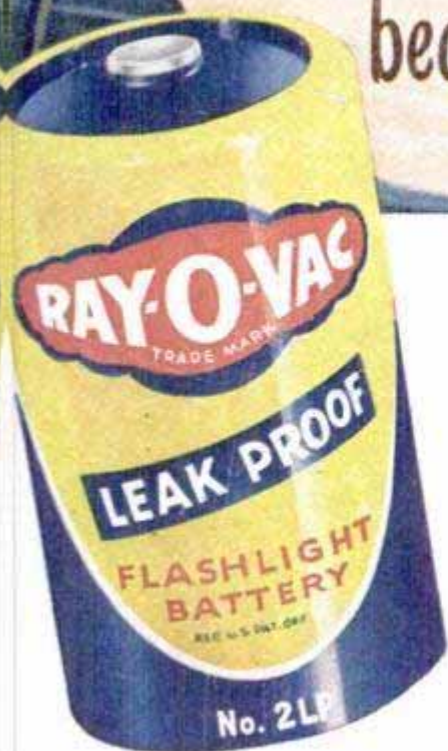
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