

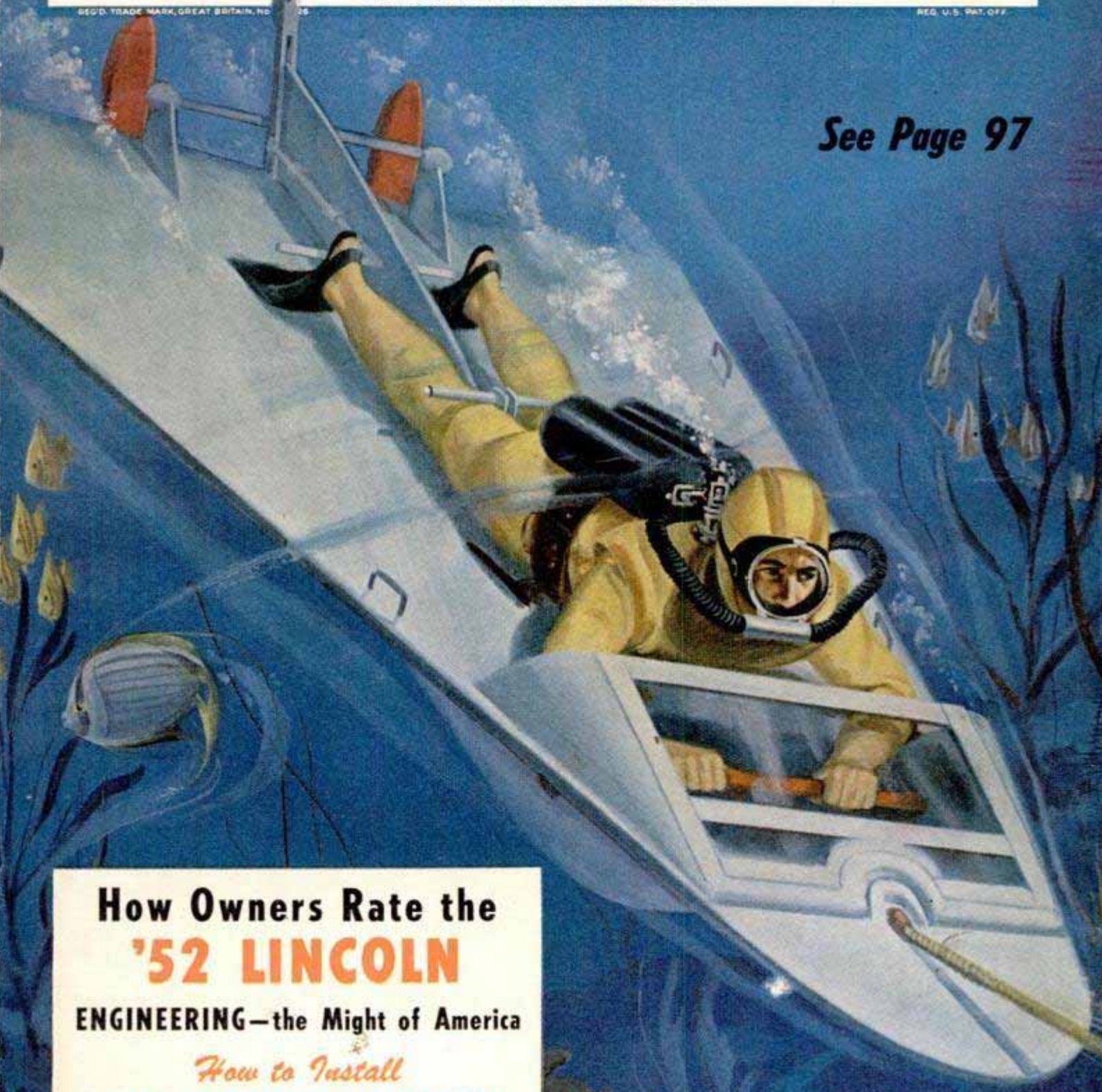
# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, NO. 25

REG. U.S. PAT. OFF.

*See Page 97*



**How Owners Rate the  
'52 LINCOLN**

**ENGINEERING—the Might of America**

*How to Install*  
**WARM-AIR PERIMETER HEATING**

Spark Plugs that Perform **LIKE THIS** —

**178.497** **M.P.H. ON WATER**

will make **YOUR CAR** Perform *Better!*



"Flying on water" describes the new world's speed record set by Stanley S. Sayres in his Slo-mo-shun IV.

Mr. Sayres wired . . .

*"Slo-mo-shun IV continues to be the world's fastest boat . . . set new world's record of 178.497 miles per hour . . . 24 Champion Spark Plugs performed perfectly in her Allison engine . . . thanks for everything and congratulations."*

This sensational and extreme test of spark plug performance clearly points the way to the best spark plugs for your car. For it is from such an exceptional test as this that our engineers gain experience and knowledge that can be obtained in no other way. We constantly use such findings—to improve the quality and dependability of all Champion Spark Plugs. So, if you want a better performing engine in your car, **DEMAND CHAMPIONS!**

Owner and pilot, Stanley S. Sayres, set the above new world's speed record on Lake Washington, Seattle, on July 7th, hitting 185 m. p. h. on one run!



**FOLLOW THE EXPERTS**

*Demand*  
**CHAMPIONS**

**FOR YOUR CAR!**

# How your gas savings will pay for your oil

(YOU CAN CUT COSTS ON YOUR CAR)



1

"Want to save money on the up-keep of your car?"  
"Naturally, who doesn't?"



2

"Well, here's how. Change to Macmillan Motor Oil from any oil you have been using, and you'll save enough on gas to pay for a fill of Macmillan."



3

"How is that possible?"  
"Because hundreds and hundreds of road tests on cars like yours showed that motorists got an average of 8% more power from the same amount of gasoline after they changed to Macmillan Oil."



**8% SAVING IN GAS**

4

"That 8% more power means 8% savings in gas. With gas at 25¢ a gallon, that is a 2¢ saving or \$2.00 over a normal period between changes. That's enough to pay for a re-fill of Macmillan."



5

"Wait a second. How can a motor oil save that much gas?"  
"Because at 40 miles an hour on a level road, half of your gasoline is used up overcoming engine friction."



6

"So if you can find something which reduces that friction, it will make your car go farther or faster or climb a steeper hill. And, brother, that something is Macmillan Ring-Free Motor Oil!"

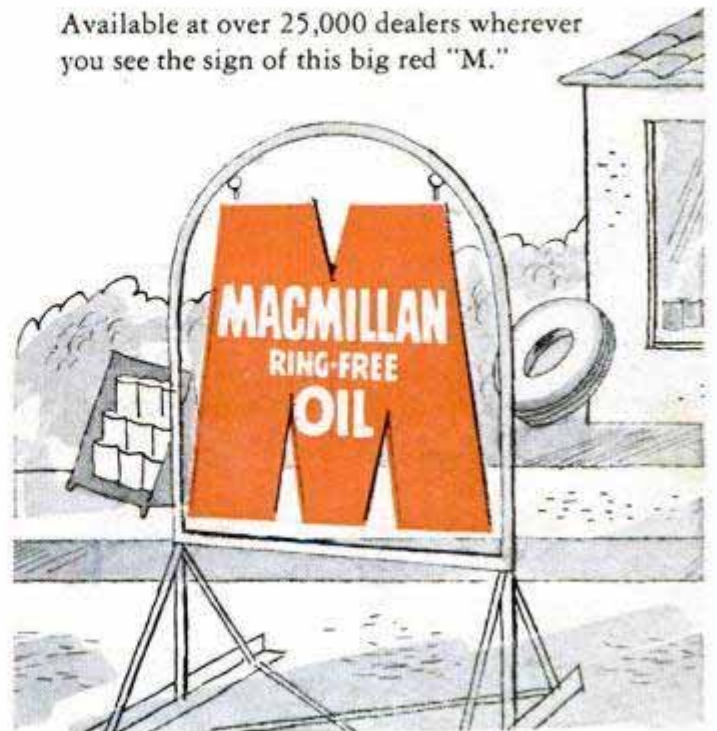
And, of course, this economy isn't the whole story, either. For while it's reducing friction, Macmillan Oil reduces deposits of carbon, gum, and sludge in the engine — giving you higher compression, better piston seal and less likelihood of ping — lower repair bills. It keeps your car newer longer.

Start using Macmillan Ring-Free Motor Oil in your car now—at any of the 25,000 independent service stations, garages or car dealers where you see the big, red "M" sign. Write me personally if you can't locate one quickly. I'll reply at once.

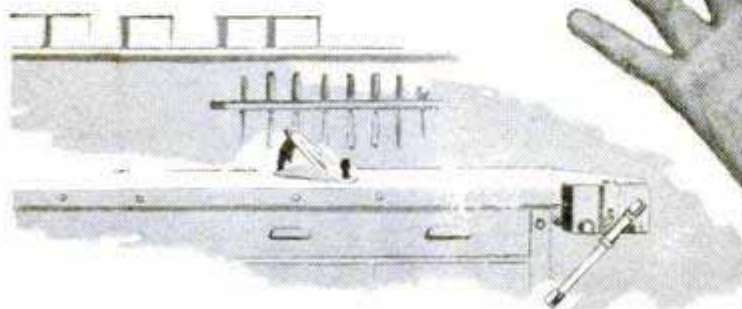
*Macmillan*  
President

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Well!"



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sure to be "the HIT of Your Kit"

## The SARGENT PARALLEL-ACTION PLIER!

(The Mechanical Hand)

What a plier! Actually *three* tools in one  
... plier, wrench, and wire cutter.

You'll quickly discover this Sargent to be  
the most useful tool you've ever had for  
jobs around the house.

Look what it does:

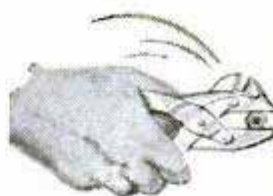
### 1. Grips like a vise

... compound leverage multi-  
plies power along entire length  
of the parallel jaws.



### 2. Cuts wire easily

... outside cutters cut wire  
even when it tightly hugs a  
flat surface.

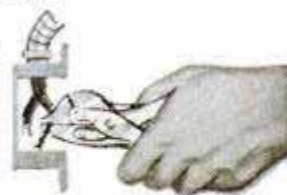


### 3. Holds nuts like a wrench

... powerful parallel jaws and  
extra leverage prevent round-  
ing corners.

### 4. Gets into tight spots

... and gets you out of them.  
Small nose permits probing  
in close quarters.



### 5. Unkinks wire

... open throat permits run-  
ning the wire between jaws,  
from either end, to straighten  
or pull it.



Go to your hardware dealer . . get  
your hands on one of these sturdy,  
all-purpose tools. You'll never let  
it go . . . especially when you hear

its price. You'll be delighted with  
your low-cost investment in a high-  
grade plier. Available in 4½",  
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# Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, *Founder*

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



## this month's cover

LIKE A GIANT Manta ray, the strange craft glides swiftly, silently, down toward the floor of the ocean, a weirdly dressed man lashed to its back. This submarine version of a high-flying glider can bank and soar, dive and hedgehop to give its pilot all the thrills of a barnstorming aviator. The undersea wing is the brain child of Pierre Vanlaer, who enjoyed exploring the ocean bottom but wasn't satisfied with slow speeds. His graceful craft, towed by a powerful speedboat, now gives him the speed of a darting fish. Turn to page 97 for all the details of the Manta and the tale of how it once rebelled, soared up on a Riviera beach and deposited its master in the middle of a busy thoroughfare. The painting was done by 23-year-old Bill Johnson, one of the best in the business and no newcomer to our covers despite his age. Bill admits he's no deep-sea diver; his favorite sports are swimming and fishing

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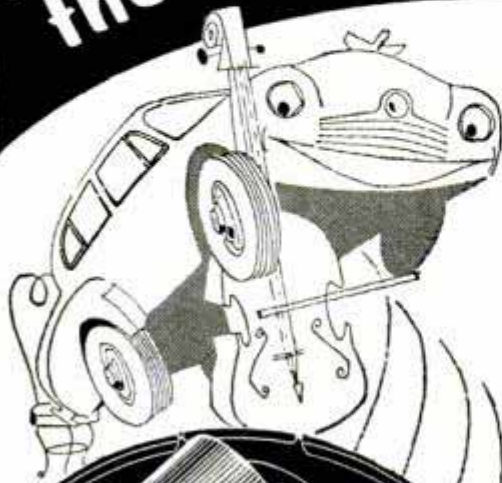
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**Your tune-up will last  
thousands of miles longer with**



# Blue Streak

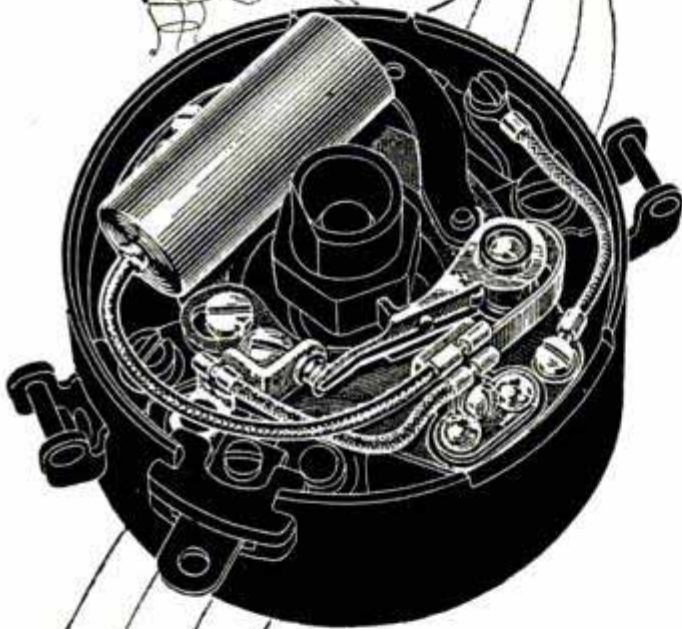
## heavy-duty ignition parts

**GET A TUNE-UP NOW** that will stay "in tune" for thousands of extra miles. Have your mechanic install **BLUE STREAK** heavy-duty points and condenser.

The **BLUE STREAK** point has a longer "life-span" because it carries more current, it dissipates heat faster. Its high amperage tungsten with a contact area that is 55.4% larger than regular points makes this possible. The **BLUE STREAK** condenser is hermetically sealed against its worst enemy: moisture.

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**AUTO MECHANICS:** **BLUE STREAK** will better your business. Write on your billhead or sales slip for the name of your nearest **BLUE STREAK** jobber. Standard Motor Products, Inc., Dept. G, Long Island City 1, N. Y.



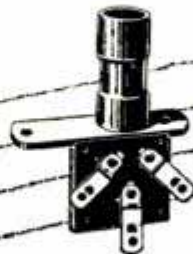
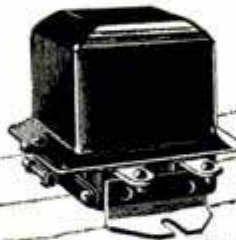
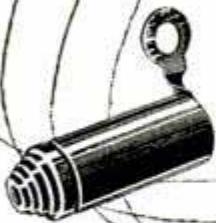
"FIRST" (1934)  
HERMETICALLY SEALED  
CONDENSER

"FIRST" (1937)  
HEADLIGHT RELAY

"FIRST" (1938)  
COMPLETELY SEALED  
DIMMER SWITCH

"FIRST" (1940)  
TRIPLE-PROTECTION  
TOP COIL

"FIRST" (1946)  
VINYLITE AUTO CABLE



Tune up for those thousands of extra miles. Take your car to the Registered **BLUE STREAK** Shop in your neighborhood. Look for this sign.



# Blue Streak

**pioneer in heavy-duty ignition**



**“Company pays \$1200 for cost-cutting idea!”**  
**“Employee wins \$350 for suggestion!”** Ever wonder how *you* can cash in on *your* company’s suggestion system? Check these Bostitch case histories. There may be an idea here for *you* — and *your* company.

**BUSINESS:** Cabinetmaker  
**SUGGESTION:** Fasten bottoms and sides of small chests with Bostitch foot-powered stapling machine and  $\frac{3}{8}$ " staples.  
**RESULTS:** Five times faster than old method of nailing. Stapling more secure. Workers like it better.

**BUSINESS:** Gasoline Pump Manufacturer  
**SUGGESTION:** Instead of solder, use  $\frac{3}{8}$ " staples to fasten No. 8 mesh on foot valve bottom of pump.  
**RESULTS:** Production jumped from 20 an hour by soldering to 90 an hour with Bostitch.

**BUSINESS:** Tile Contractor  
**SUGGESTION:** Instead of nailing metal lath to wood studs and joists, use Bostitch hammers and tackers.  
**RESULTS:** One man can now lath 4 bathrooms in 2½ hours compared to 5 hours the old way.

**BUSINESS:** Garage Door Manufacturer  
**SUGGESTION:** Metal stitch aluminum panels together with Bostitch wire stitcher. Old method: drill and screw.  
**RESULTS:** Plant turns out 500 doors a day as against 50 before. Stitcher and special table jigs for positioning panels save space, material.

**BUSINESS:** Vacuum Cleaner Manufacturer  
**SUGGESTION:** To fasten metal discs inside fiber cylinders, use Bostitch metal stitcher instead of punching holes and riveting.  
**RESULTS:** Manufacturer saved \$6250 the first year.

**BUSINESS:** Frozen Food Locker  
**SUGGESTION:** Replace cellophane tape with Bostitch desk-type stapler for fastening ends of frozen food packages.  
**RESULTS:** Labor and material costs cut 50%. Bostitch method gives tight, permanent seal. Unlike tape, will not loosen at low temperatures.

**TO HELP YOU** find ways to apply Bostitch savings to *your* business, send for the 16-page illustrated booklet, “Time and Money-Saving Case Histories.” It’s *free*—and full of cost-cutting ideas!



**BOSTITCH** 550 Mechanic Street, Westerly, R. I.  
 Please send me a free copy of the Bostitch book of case histories.

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_  
 Company \_\_\_\_\_

This One



962P-6BG-YP25

# FOR A BETTER "INSIDE JOB" — USE PYROIL

You may spend time and money in keeping your car polished, gleaming and color-bright on the outside. But what about the inside—the expensive "heart" of your car—the motor? Are you sure that's giving you the best performance at the lowest possible maintenance cost? One way to be absolutely sure is to use Pyroil. Pyroil won't take any of your time or effort—and costs just a few pennies. Pyroil improves lubrication. Pyroil prevents friction between cylinder surfaces and piston rings. Pyroil prevents clogging, caused by carbon deposits and rust. Pyroil cleans your motor, and keeps it clean.

For a better "inside job," add Pyroil—add miles to your car.

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

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

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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.

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in this corner.....

## THE EDITORS



### Letter to the Editor:

Ranch houses are very modern and convenient—for adults. For children, there is something lacking. No stairs to climb!

My friends, the Carl Moores of Elkins, W. Va., became concerned about this. When their youngsters, Luanna and Randy, visited grandmother's they were fascinated



by the staircase, but they were always being warned to stay away from the stairs for fear of accident. Since child-development experts say children need to climb, and ordinarily have learned the adult manner of step climbing by four years of age, the Moores decided to do something about it.

The result is a practice staircase built of scrap lumber by Mr. Moore for each of his children. Narrow enough that they can be carried indoors or out, the stairs are sturdy and safe, and can be placed back-to-back for an up-and-down staircase.

Sara Ann Brown,  
Associate Professor,  
Home Economics Education,  
West Virginia University,  
Morgantown, W. Va.

### Letter to the Editor:

You'll have an invasion of indignant Germans if you aren't careful. Just for the record, Mercedes cars are made by Daimler-Benz A. G. of Stuttgart, Deutschland. So please, in the interests of accuracy, don't

(Continued to page 8)





How these 18 Experts can help you

# Get into a High Pay ACCOUNTING CAREER

LaSalle's famous staff of Accounting authorities are helping thousands prepare for fast promotions and bigger pay. They can do the same for you!

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You see on this page a panel of experts who know Accounting from A to Z . . . all the way from simple bookkeeping, on up through advanced accounting, cost accounting, auditing, income tax, and coaching for the C.P.A. degree. These are only part of LaSalle's instruction staff. But what is most important to you . . .

... THESE C.P.A. EXPERTS KNOW HOW TO IMPART THEIR KNOWLEDGE TO OTHERS... HOW TO HELP YOU PREPARE QUICKLY YET THOROUGHLY FOR SUCCESS IN THIS VERY LUCRATIVE FIELD

The proof? What stronger proof could there be than



more than 3,500 Certified Public Accountants (approximately 10% of the U.S. total) who have trained with LaSalle? Or the hundreds of thousands of men and women whom LaSalle has helped qualify rapidly for more money, a brighter future, in a high-pay-lifetime career? These thousands came to us with different backgrounds of experience and varying degrees of ambition. Many have reported raises and promotions after only a few weeks of training. Thousands of them have written to say they are now earning 50% more—even double their former incomes—often in less than a year. These letters are published in book form for your inspection. They were written by real people, with real income, problems and ambitions—people who might be your next-door neighbor.

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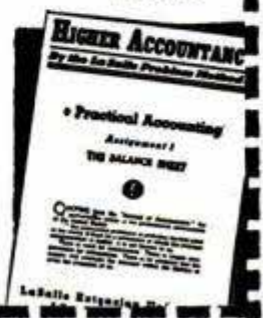
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 A & E Combined with Private Pilot
- Check One  Veteran  Non-Veteran

TRAIN IN MIAMI - AIR CAPITAL OF THE WORLD

(Continued from page 6)

put Mercedes under the heading of "Italian speedster" (page 101, August 1952). No doubt half the population of the U.S.A. has already pointed out your error.

You may like to know that we (the family) all appreciate *Popular Mechanics*... there is no magazine in this country of quite the same type. It is a pity your magazine can't penetrate the Iron Curtain.

Antony G. Bannister,  
Padston, Cornwall, England

*We blush. Not quite half the population detected the error. This German-made Mercedes was being groomed for an Italian race.*

The Editors

#### Letter to the Editor:

You might be interested in this picture of one of the tables in your *What to Make for Children*, built in Indonesia by the young fellow pictured here. His name is Machmoed and he is on the Toko Li Store staff,



Djakarta, Indonesia. He made the little table for the child of his boss, John Li [who] purchased the book from Indira, the Indonesian bookstore through which we are featuring and selling American books and magazines, including *Popular Mechanics Magazine* and your books, in Indonesia.

Alvin Grauer, vice-president,  
Pacific Book & Supply Corp.,  
New York City

#### Letter to the Editor:

In the July issue, Kenneth M. Hazen, Alliance, Ohio, in his letter to the editor stated: "The thermostat usually slows circulation. Have it removed for hot summer

(Continued to page 10)

# Tired of the same old job?

Sure, you are. Anybody gets tired of standing still in the same place. But don't get the idea that just quitting your present job and going somewhere else will take you out of the rut.

The trouble may be *inside yourself*. You're restless because you want to get ahead—make more money—do more interesting work. All right—why not?

Look around you. The men who are advancing are the trained men. They've learned special skills that bring them higher pay. It's the men without training who stick in the same old job.

What are you going to do about it? Just wait and hope for something better to come along? If you really *want to succeed*, you can get the necessary training by studying at home in your spare time.

International Correspondence Schools offer you a course in practically any field you choose, giving you the practical plus the bedrock facts and theory. You'll earn while you learn. Students report better jobs and more pay within a few months.

Read carefully the list of subjects in the coupon below.

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(Continued from page 8)

driving." There are several manufacturers using double-acting or two-way thermostats with bypass-type circulation in which the bypass is open for circulation during warm-up periods and then closed by one valve of the thermostat as the other valve opens for circulation through the radiator. Under these conditions, removal of the thermostat impairs circulation and may cause local hot spots to develop and valve seats to crack at the rear cylinders.

There are also engine designs where hood and side panels are a definite part of the air circulation for engine cooling. Opening the hood or removing the side panels [as Mr. Hazen suggested—Ed.] will tend to cause overheating rather than cooling of engine.

I do not question Mr. Hazen's results with his particular car, but believe the information may give other drivers trouble with their cars.

Austin M. Peters,  
Fayetteville, N. C.

### Letter to the Editor:

In the June issue [this] paragraph on page 83 is incorrect: "They are the first theaters aboard ship to have sloping floors for visibility." [The SS *United States*.]

Your source of information did not realize that the *Queen Elizabeth* has had a sloping theater since it was built . . . there is also a sloping theater on first-class on the *Queen Mary*, although it is not as fully perfected as the one on the *Queen Elizabeth*.

William P. Wreden,  
Menlo Park, Calif.

Mr. Wreden is correct. The SS *Caronia* also has a similar, sloping-floor theater for first-class passengers.

The Editors

### Letter to the Editor:

I have read with great interest of your plywood house (*Popular Mechanics*, May 1951). I have been advocating the use of plywood for houses right along, but due to the inertia of the public here in using other conventional materials such as brick, bamboo, stucco, wood sidings, etc., my efforts have not been too successful in convincing the public. The design, particularly with the build-it-yourself design, looks so unique and economical that it would fit very nicely into the poor economy of my country just now as many people are lacking of homes . . . [Could you] send me a set of the drawings of this ideal house with details?

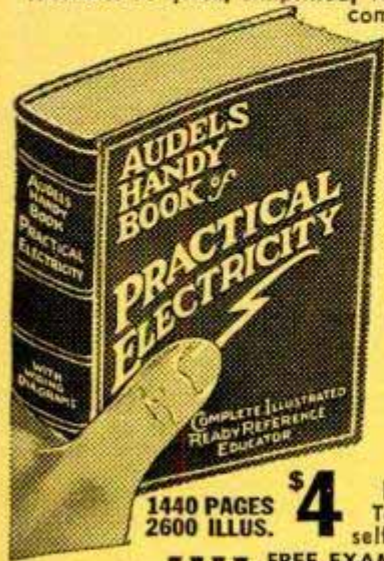
K. P. Hu, president,  
Yangtze Wood Products Co.,  
Taipeh, Taiwan, China

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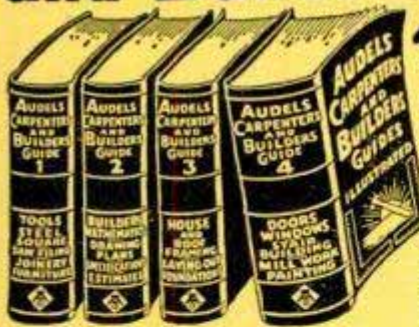
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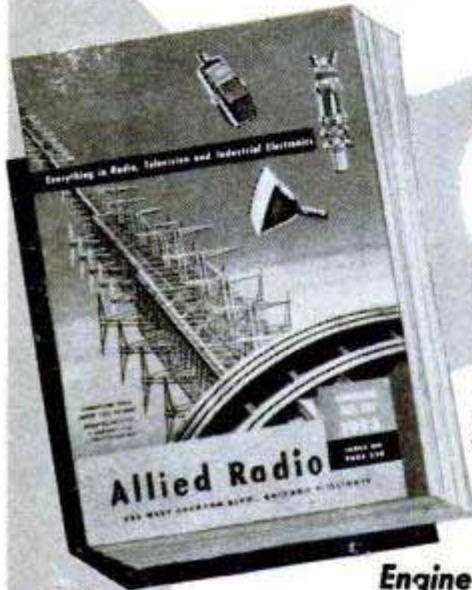
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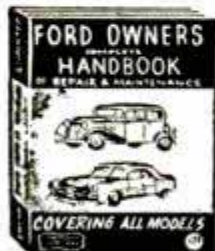
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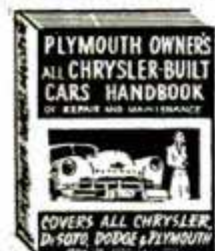
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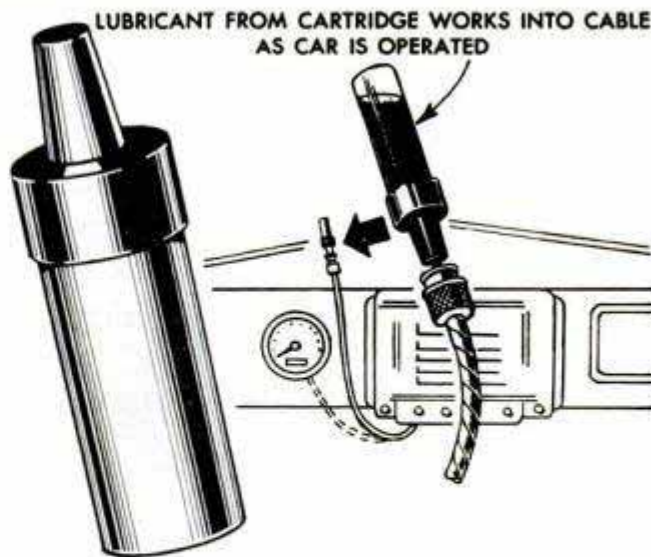
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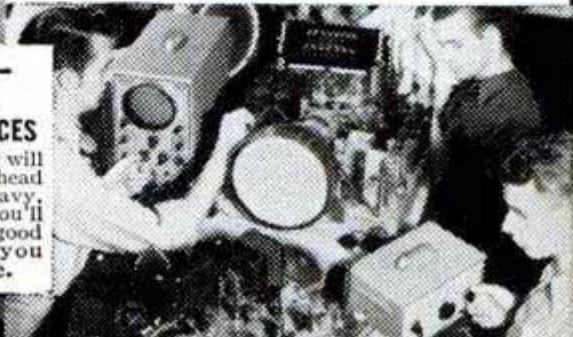


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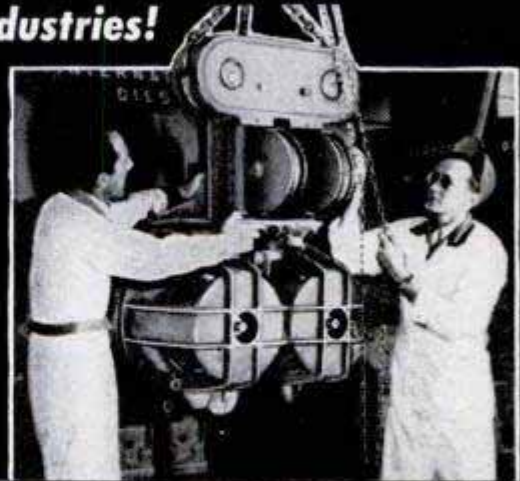
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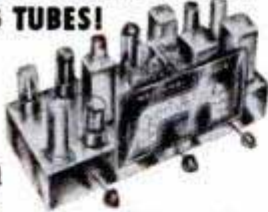


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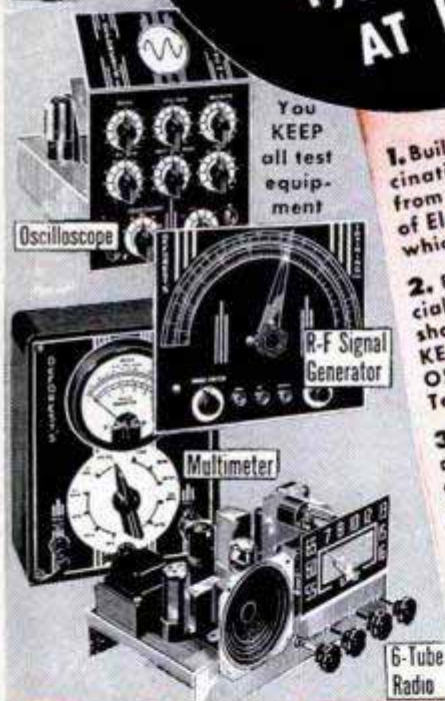
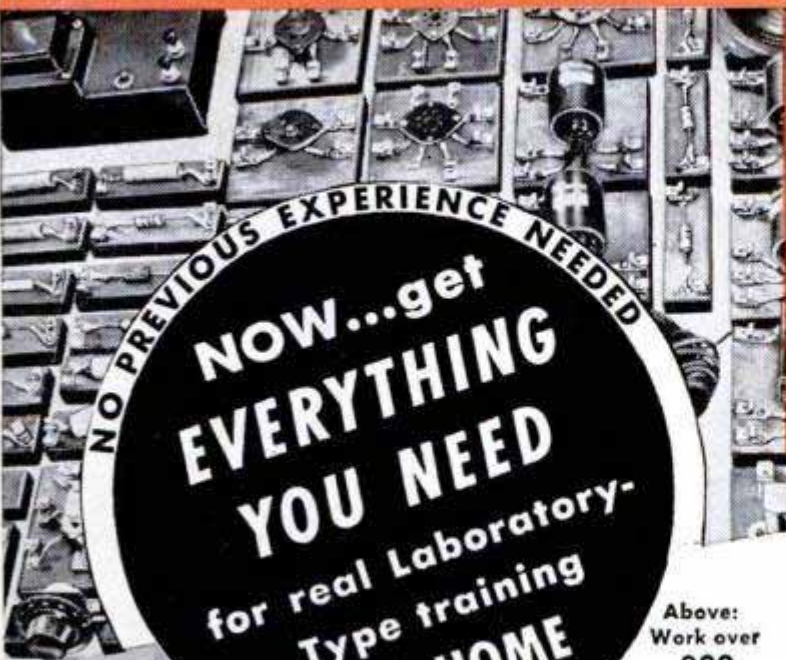
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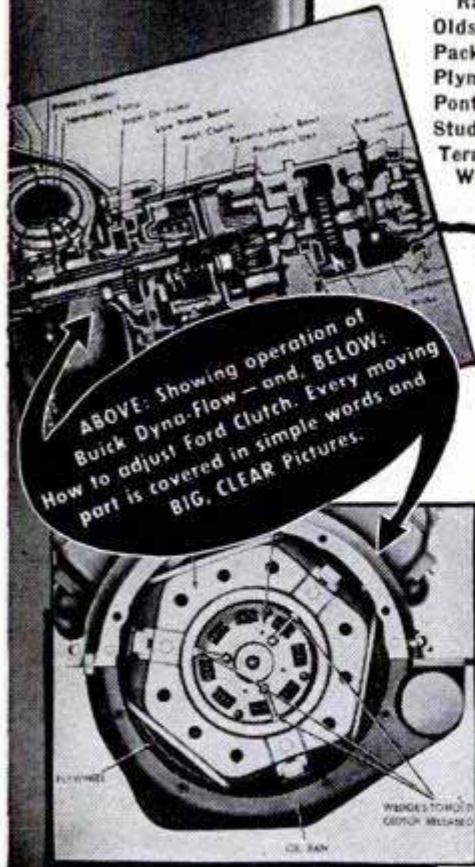
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C. S. Melious

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"The 'natural' of this decade is the PRESTO FIRE EXTINGUISHER . . . because it is handy in size, simple to operate, and in the right price range. For every hour I have devoted to PRESTO I have earned an average of \$15.20 an hour."

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"PRESTO is the fastest money-maker ever produced. If a man demonstrates intelligently, sales follow automatically. I have made an excellent living with the PRESTO, having made over \$1000 a month."

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H. J. Kerr

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R. H. Taber

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C. Kama

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Presto contains an amazing new chemical—"Chlorobromomethane" or "C.B." The Germans developed "C.B." as a secret defense against fire during the war. After the war, a famous American firm, The Dow Chemical Company, acquired the formula from the U. S. Government and began manufacturing it here. Then we (Merlite Industries) designed a handy—yet amazingly effective—fire extinguisher to contain and release this new wonder-chemical.

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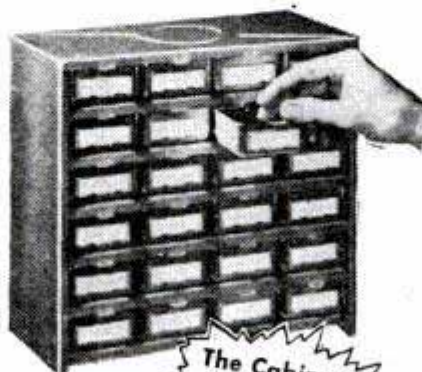
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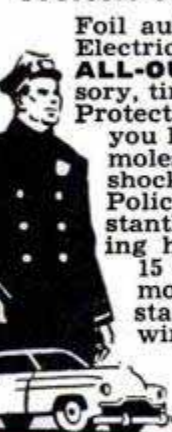
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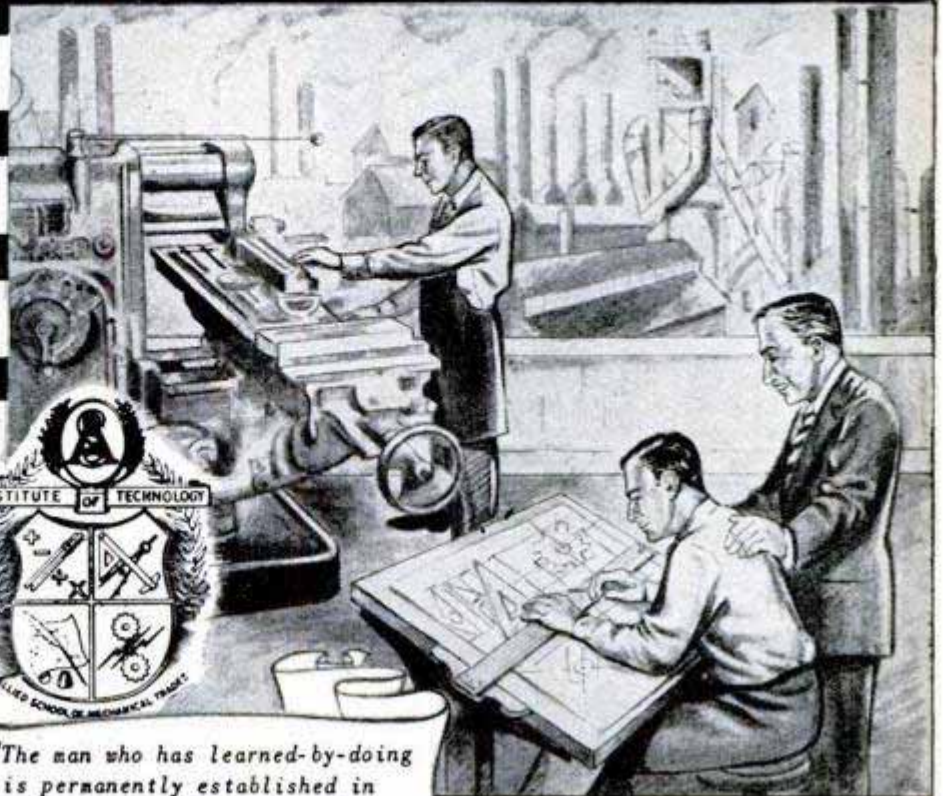
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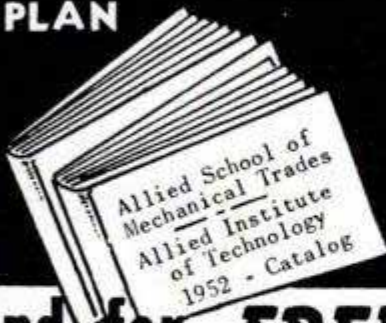
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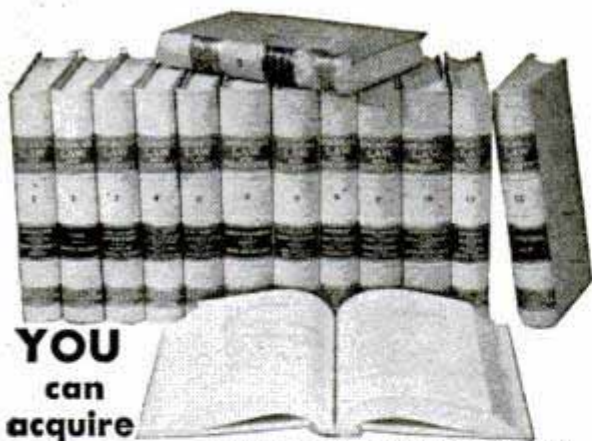
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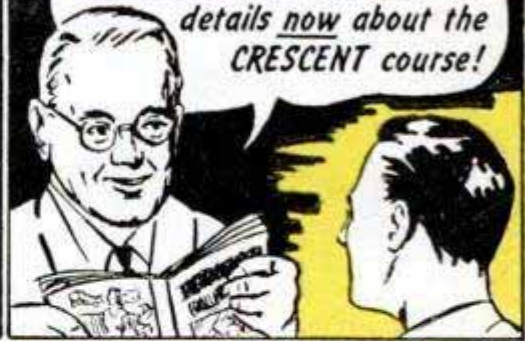
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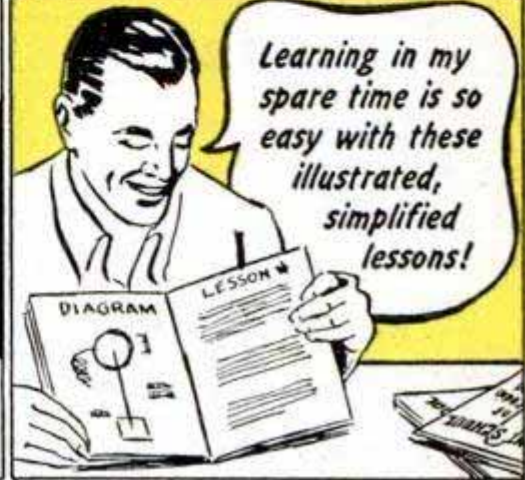
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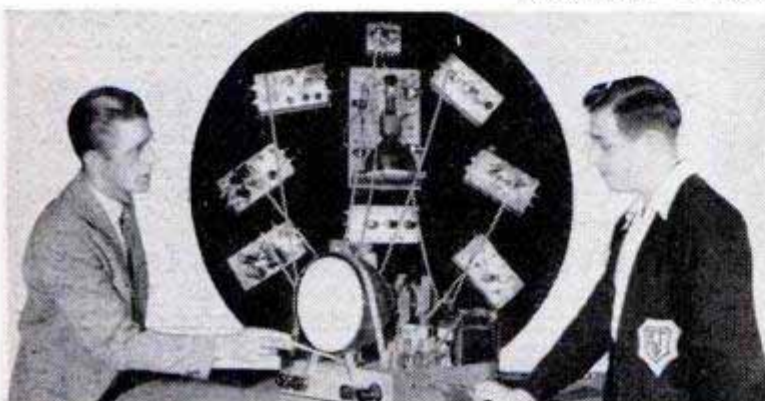
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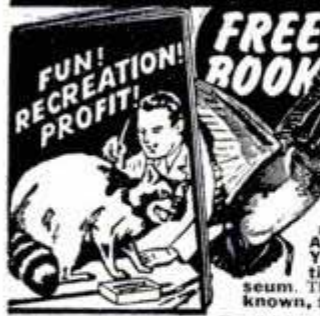
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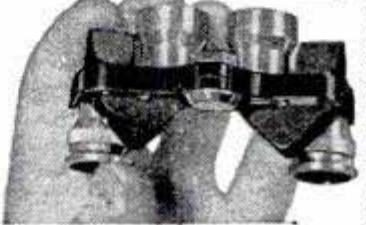
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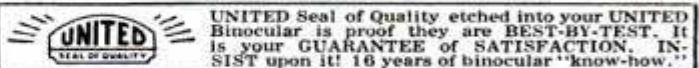
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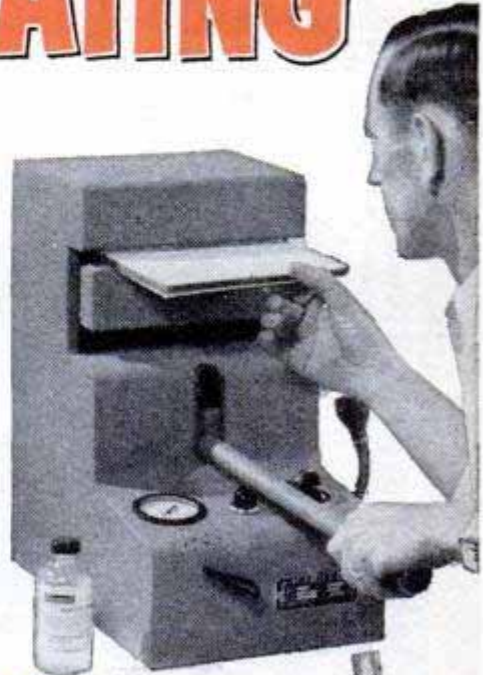
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**NOTHING Free.** Just good stamps reasonable. Send dime for seventy-four page catalog. Ben's Stamp Shop, 31 N. Clark, Chicago 2.

**WOW! 203 All different Germany 10c!** Zeppelins, semipostals, airmails, high values, etc. to new customers. Jamestown Stamp, Jamestown 512, New York.

**WORLD'S Largest stamp (7 1/2 x 14 inches).** A real curiosity! Retail for 50c, only 3c to approval applicants. Tatham Stamp Co., Springfield 30, Mass.

**ANTIQUES, RELICS, INDIAN GOODS, CURIOS**

**4 PERFECT Arrowheads \$1.00;** perfect pipe \$2.50, \$5.00; tomahawk \$3.00; knife 50c. Catalog 10c. H. Daniel, Lamar, Ark.

**PRECIOUS STONES, MINERALS**

**GEMOLOGY Books,** catalog 10c. Atlantic Books, Lawrence Avenue, Charlestown 29, Massachusetts.

**GEMCUTTING,** Silvercraft authority. Illustrated magazine tells how. Cut rocks, make jewelry. 150 ads illustrating equipment, offering gems for collectors, cutters. Postal brings literature. Lapidary Journal, Drawer B, Palm Desert, Calif.

**"GENUINE"**—Red Arizona rubies (garrets). Send quarter for packet. Bitner's, Box 1025, Scottsdale, Arizona.

**MINERALS** And rocks analyzed by former states geologist. Prospecting and Geophysical Office, 38-14 218th Street, Bayside, L.I., New York.

**JADE,** Agates, tiania, gems, hobbyists supplied, gem cutting machines. Free list. North West Gems, Box 305, Tacoma 1, Washington.

**GEMSTONES,** Mineral specimens. Every variety. Lowest prices. Postcard brings free booklet. Plummer's, 4720 Point Loma Ave., San Diego 7, Calif.

**FIND Tungsten, mercury, uranium** with Mineralight. Free brochure. Write Dept. PM8 Ultra-Violet Products, South Pasadena, California.

**GEMS,** Precious and semi-precious, genuine, from world-wide sources. Deal direct, no overhead, save money. Catalog 10c. Hill Co., 5450-G Portland Rd., Salem, Oregon.

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**AMAZING Hobby**—Collect authentic armed forces insignia, ribbon bars, embroidered patches, naval rates; fascinating assortment of 57 for only \$1; special gift free with order. Pritt Co., Dept. M-10, 16 West 27th Street, New York City.

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**50 DIFFERENT Army embroidered patches \$1.** Other bargains. Insignia Mart, 703A Broadway, New York 3, N. Y.

**JOIN Today's fastest growing hobby club.** Write for details. "Peoples Hobby Club-A," Box 171, Biloxi, Mississippi.

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**FREE Photographic bargain book** packed with hundreds of sensational values in still and movie cameras, lenses and latest accessories. Super savings for you in new and used equipment. No money down—Up to 15 months to pay. Liberal trade-in allowances, too, on your own equipment. Write now for your free copy to Central Camera Co., Dept. 9L, 230 S. Wabash Ave., Chicago 4, Ill. (Photographic Headquarters Since 1899.)

**500 CAMERA Repair parts \$4.95.** Catalog free. Leshko, 88-11 No. Munn, Newark, N. J.

**DOLLAR Brings candid camera.** Uses 328 film. Beewood Company, Box 615A, West Hyattsville, Maryland.

**WHOLESALE Photographic supplies.** Cameras, films, projectors, enlargers. Write for free catalog. Capitol Photo Supplies, 2428 Guadalupe, Austin, Texas.

**TERRIFIC Value!** Genuine pro camera, complete with film. Send \$2.00. Star Bureau, 234 Clinton Place, Newark, N. J.

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**ADD "Spice"** to home projection shows with colorful old-time Nickelodeon slides. 2x2. Write for free list. Nickelodeon Co., 25 E. Eldon, Bldg. Portland 5, Oregon.

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**GIANT Size** deckle album prints. 8 exposure roll, 35c, 12 exposure 50c. Send money. Free mailers. Dowl Photo Co., P.O. Box 2077, Ft. Worth, Texas.

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**8 CONTACTS 30c, Jumbos 40c, 12, 45c; jumbos 55c. Reprints 4c; Jumbos 5c.** Western Photo, Dept. PM-102, Box 298, San Francisco 1, Calif.

**ENLARGING**—5 x 7—15c, 8 x 10—20c. Don's, 4307-12 Ave., Brooklyn 19, N. Y.

**CUSTOM Photo finishing.** Absolutely guaranteed jumbo album prints—8 exp., 35c; 12, 50; 35mm, \$1.00. Free mailer. Flash Foto, Box 36-M, Brooklyn 4, N. Y.

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**CUSTOM Photo finishing guaranteed.** 8 exposures 35c; 12, 50c. Bound in beautiful plastic ringed album. Special! 35mm., 36 exposure \$1.00. Free mailer. Flash Foto, Box 36M, Brooklyn 4, N. Y.

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**GUARANTEED Quality.** Fast service. Eight jumbos in beautiful super pak plastic ring binder albums only 35c. Send for free mailers and particulars of our complete photo finishing service. Grand Fotos, G.P.O. Box 1410, New York 1, N. Y.

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**BEAUTIFUL Enlargement** from each picture on 8 exposure roll 35c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

**TWO Beautiful prints** from each picture on 8 exposure roll 35c. Thirty-one years of satisfied customers. Quick service. Lens Photos, Dept. J-4, Janesville, Wis.

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**FREE Movies.** Thousands of subjects, interesting, entertaining. Fascinating, new directory only 50c. National Cine, 50 Dayton Ave., Toms River, N. J.

**5000 NEW-Used 8-16mm. silent-sound films.** International-B, 2120 Strauss, Brooklyn 12.

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**"ENTIRE Life Story of Christ"** 8 mm., 16mm., sound and silent, purchase or rent. Hemenway Film, 31 Church St., Boston 16, Mass.

**RENT 8MM. movies** 19c reel. Details dime. Cooper's Mart, Eaton, Ohio.

**WE Have it!** Send 10c for special listings and sample film strip. Reyelle, Box 12, Dept. PM, Hammels, N. Y.

**WILD Life films—Exciting.** Dramatic action in the natural habitat of fierce beasts of the jungle and forest. In 8mm. or 16mm. and 2"x2" slides. Gorgeous color or B. and W. Write for free illust. literature. Wild Life Films, 5-5-A Strohm Ave., North Hollywood, Calif.

**BARGAINS 16MM. sound films.** Also for exchange. Bedner, 5300 So. Talman, Chicago.



**PRICED Like wholesale and just released, these new 1-reel Blackhawk movies. 16mm. sound (300'), \$11.95 plus 25c postage. 8mm. silent (150'), \$2.98 plus 15c postage. Four railroad films: "Super Chief," "Western Pacific Fast Freight," "Golden Arrow" (London-Paris), "California Zephyr." Hundreds new-used 16mm. sound, silent, 8mm. bargains. Good used 16mm. sound projectors—Bell and Howells, Ampros, Victors—Often available \$129.95. Reels, cans, supplies like wholesale. Big new 24-page catalog free! Blackhawk Films Inc., 1215 Putnam Bldg., Davenport, Iowa.**

**LEARN Free lance, educational, Hollywood, and television film technique at home. State licensed. Write for free catalog. Motion Picture Institute, Birmingham 4, Michigan.**

**8-16MM. Silent-sound films. Complete rental library. All latest subjects. Free catalogue, sample film 10c. Garden Film, 317 West 50th, New York 19.**

**RENT 16MM. sound films, 50c reel. Large selection; free catalog. Film Service, 128 Chestnut St., Roselle Park, N. J.**

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**LEARN Piano, singing, songwriting, professionally, with our amazingly easy self-taught courses. Also, music written to your poems. Music Teachers' Associates, 26 Potters Lane, Great Neck, N. Y.**

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**ELECTRIC Guitars, accordions, amplifiers, wholesale, free catalog. Carvin, Baldwin Park, Calif.**

**MUSIC Printing. For samples, rates, write Auto-Litho, Jensen Beach 3, Fla.**

**PLAY Piano by ear. Simplified. Particulars. Box 475-G, Lomita, California.**

**SONGWRITERS—Learn to write your own melodies. Simplified copyrighted course will teach you how in the shortest possible time at very small cost. Information on request, no obligation. Albert Koch, 2302 Milwaukee Ave., Chicago 47.**

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**POEMS Wanted for musical setting on percentage basis. Broadcast consideration. Sooner Song Co., 22-PM North West 8th, Oklahoma City 2.**

**POEMS Wanted! Opportunity knocks! Nationally known song writer composes music to your song poems. Send poems today for free examination and free copy of "Song Writing Secrets." Melody House, Dept. PM, Box 19007 La Tijera Station, Los Angeles 43, California.**

**SONGWRITERS—Competition demands modern harmony and singable melodies. Send poems for creative evaluation. Jimmy Seaver, Room 410, 203 N. Wabash, Chicago.**

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**POPULAR Songs. How to write and sell them. Write for free booklet Successful Songwriting. Gateway Songs, Box 2470, Hollywood 28, Calif.**

**SONGWRITERS! Protect your ideas! Hold all songs; poems! Write for Safe Correct Procedure first! Song Service, Dept. P, 333 W. 56th St., New York 19, N. Y.**

**SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PM, New York 23.**

**WANTED! Poems for musical settings. Write Songwriters' Service, Clifton, N. J.**

**POEMS Wanted to be set to music. Free examination. Send poems. McNeil, Master of Music, 510-PM S. Alexandria, Los Angeles, California.**

**WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.**

**SENSATIONAL Free booklet, "How To Write And Sell Songs." Get the facts first. Poems examined free. Reliable Music Service, Box 430-P, Hollywood 28, Calif.**

**1952 ACCORDIONS — Wholesale. Free catalog. American Accordion Center, 5329 Belmont, Chicago.**

**POEMS Wanted for musical setting. Send poems for free examination. Five Star Music Masters, 630 Beacon Bldg., Boston, Mass.**

**LYRICS Set to music and recorded. Free examination. Cherrier Recording, 732 So. Norton, Los Angeles, California.**

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**FREE 236 Page 1953 television-radio-electronic catalog! World's largest stocks, lowest prices. Complete supplies for builders, experimenters, amateurs, servicemen. Latest television, radios, phonos, recorders, sound equipment. Thousands of parts, tubes, test instruments, books, diagrams. Top quality money saving values. Get yours now! Allied Radio Corp., 833 W. Jackson Blvd., Dept. 34-K-2, Chicago 7, Ill.**

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**TELEVISION Self-service. Faster than local service. Savings. Protect yourself. Read Reader's Digest, June. Details: Cyward Television Service, West Point Pleasant, New Jersey.**

**DEALERS, Servicemen, agents wanted: We seek men in all parts of the country to sell radio and television tubes. All those selected will be given the best prices and warranty deal. We want active people on our side! The Rose Co., 98M Park Place, New York 7, N. Y.**

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**EXCLUSIVE Distributors. Amazing new DDT moth-resistant genuine crushed redwood cedar! Prevents moth damage to clothes, fabrics. Makes fragrant cedarized closets, drawers. Applied like paint; laboratory tested. Hardware, paint, building supply dealers, contractors buy quantities. Tremendous profit potential! Low priced; attractively packaged. Write for details. Millenco, 90-G Summit, Brookline, Mass.**

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**FABULOUS Florida. Cool in summer—Warm in winter. Fast-growing Florida has business opportunities. If you are interested in going into business in fast-growing Florida, write State of Florida, indicating type of business you are interested in and stating your specific requirements. You will be put in touch with communities where opportunities exist. Get complete information, without cost or obligation. Write today. State of Florida, 4217C Commission Building, Tallahassee, Florida.**





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**TIE-Breaker** picture puzzles exposed, \$2.00. Wenograd, Box 1495, Philadelphia 5, Penna.

**SCHUHMACHER** Matmakers. Convert old tires into dollars. Devote full or spare time. S and S Patents, Inc., 1307 North Clark St., Chicago 10, Ill.

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**"HOW To Buy A Used Car."** See Automobiles—Classified.

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**AMAZING** Values. Best, latest formulas. Catalog free. Nelko, 3462-P Merchandise Mart, Chicago 54.

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**NEW** Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for wholesale catalog and new sales manual showing how to make money at home. Castolite, Dept. L-101, Woodstock, Illinois.

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

**LUCITE,** Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", \$1.20; 1/8", \$1.40; 3/16", \$1.75; 1/4", \$2.08. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

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**SAVE** Money! Supplies catalog, 20c refundable. Laboratory Sales, Box 161-E, Brighton, Mass.

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**NEW** Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

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

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

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**SHINE** Shoes without polish. New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 176, Akron, Ohio.

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**MEN!** Make extra money in your spare time. No house-to-house canvassing required. New car given as bonus. Amazing nylons guaranteed as long as 9 months depending on quantity, against runs, snags, holes, or replaced free. Rush name and hose size for simple money making plan. Lowell Wilkin, 17210 Wash., Greenfield, Ohio.

**THEY** Sell like hot cakes on a cold a.m. An easy \$25-\$50 day. More than 160 top selling, eye appealing Xmas and all occasion greeting card assortments. Every stop a push-over for sales and repeats. Line includes Xmas cards, gift-wrap sets, personalized stationery, notes, napkins, wide selection fine gifts and costume jewelry. We're sure and confident, that's why our sensational exclusive credit terms to outstanding producers. Write to-day for profit-making "on approval" kit. Modern, 71-A2 Fanshaw, Yonkers 5, N. Y.

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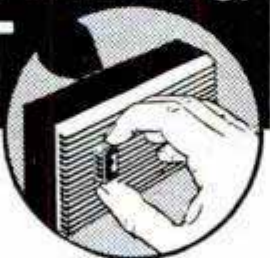
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650-16	5.72	670-15	5.12	700-17	10.72	750-20(10)	16.12
650-16(6)	6.42	710-15	6.62	750-17	11.62	825-20	18.32
700-16	6.42	760-15	5.82	750-15	14.02	900-20	17.32
750-16	6.92	808-15	6.52	825-15	16.02	1000-20	17.82
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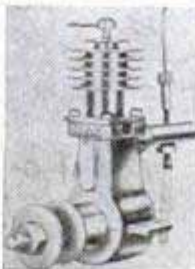
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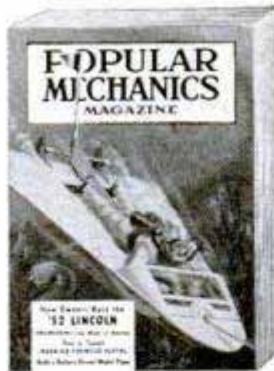
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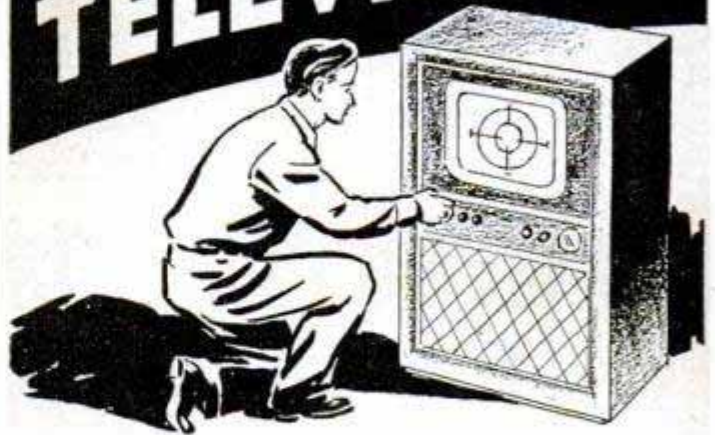
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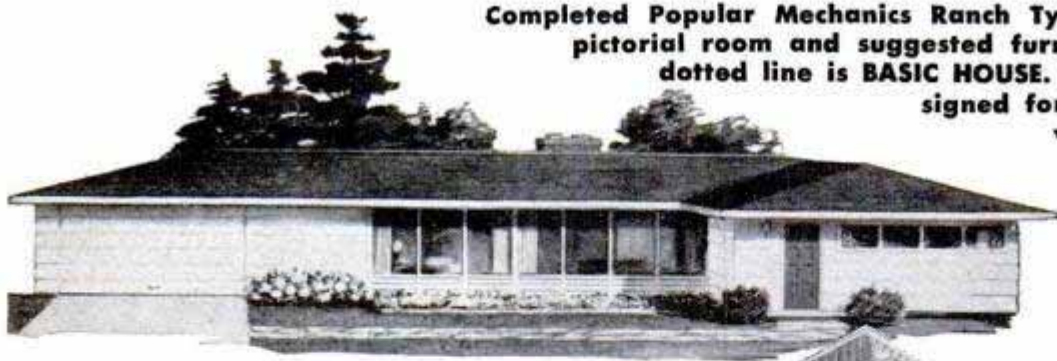
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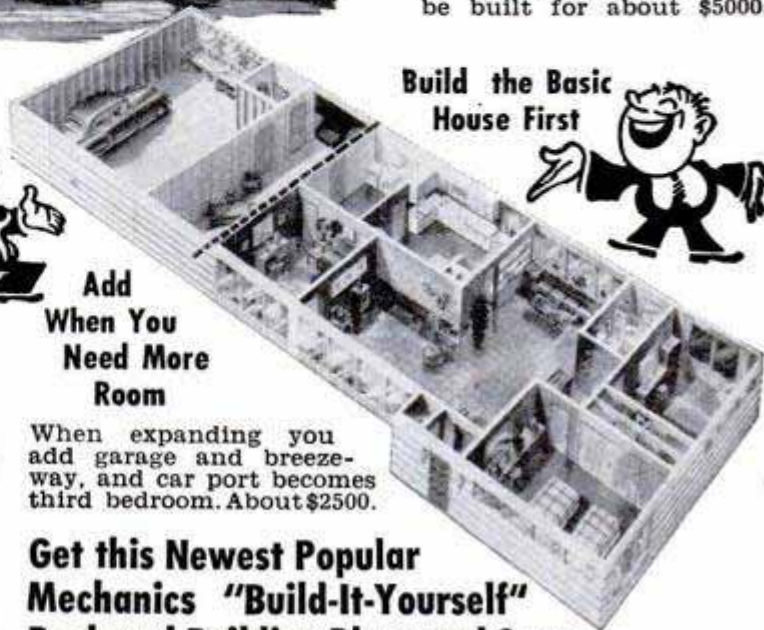
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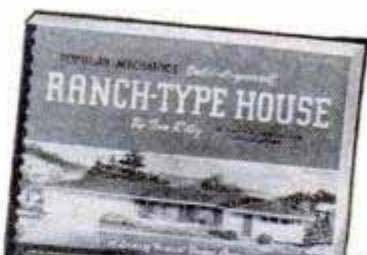
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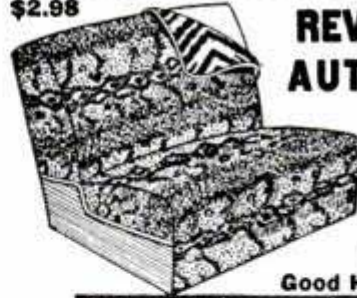
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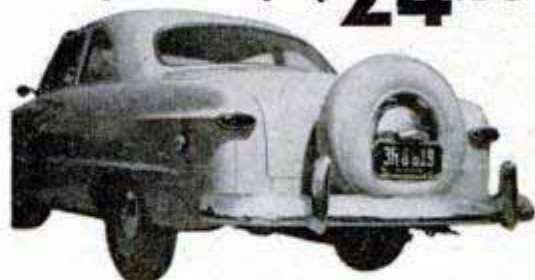
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OCTOBER 1952

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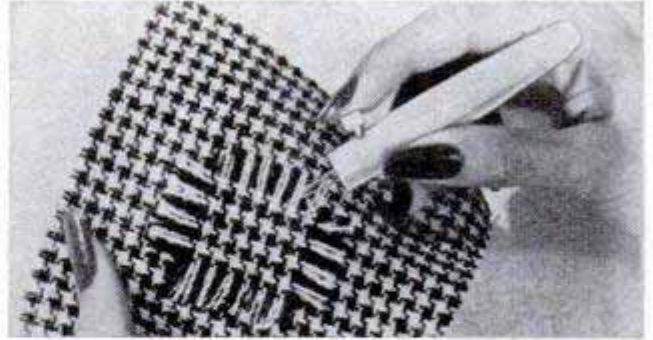


For boats,  
outdoor  
furniture, etc.

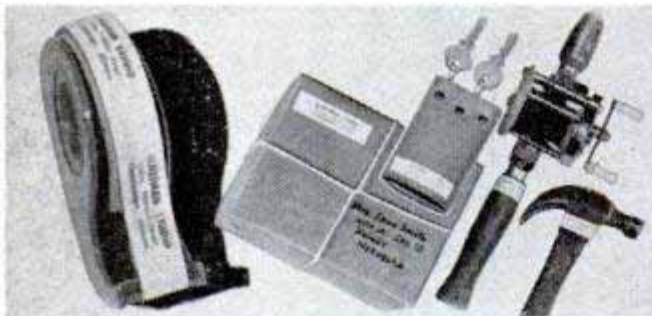
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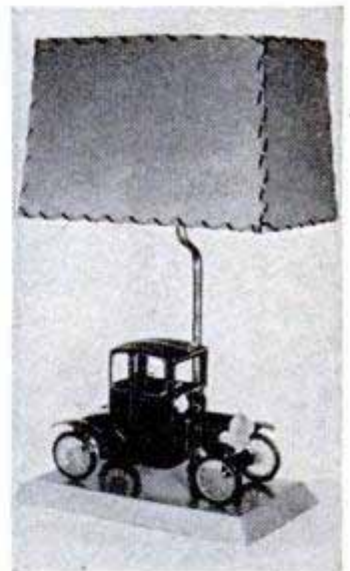


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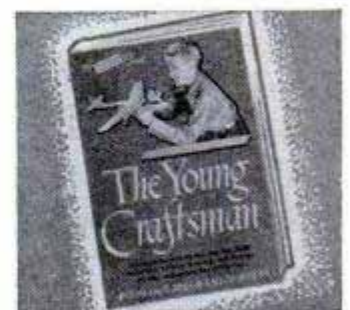
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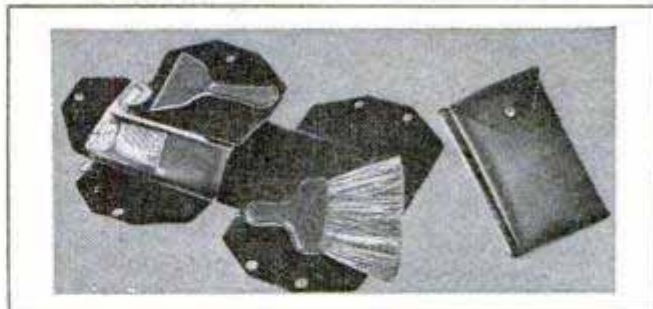




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### Farmer's Handbook

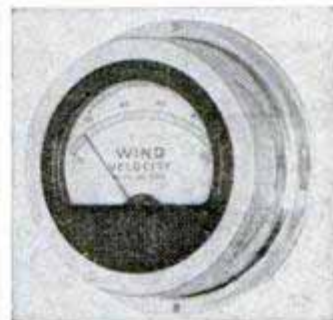
—Over 100,000 farmers are using this book to save and make money. It has hundreds of articles and practical ideas for every farm. It covers farm operation and the farm home. It tells how to use short cuts and labor-saving ideas—gives methods that simplify the day's work and lighten chores. This book steps up farm efficiency, and saves time, labor and money. 284 fact-packed pages. Illustrated. \$3.00 postpaid. Popular Mechanics Press, Dept. SG 3, 200 E. Ontario Street, Chicago 11, Illinois.



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### Wind Velocity Dial

—For the amateur weatherman to hang on the wall beside his barometer. The handsome 4" polished brass dial shows every gust and lull in the wind, recording up to 100 m.p.h. Tells at a glance indoors how hard the wind's blowing outdoors. Complete with 3-cup anemometer; easily and quickly mounted on your roof, or television antenna; costs nothing to operate because it generates its own current. Fully guaranteed, with 50 feet connecting wire. \$49.95, ppd. Cape Cod Wind Indicators, Harwichport 1, Cape Cod, Mass.



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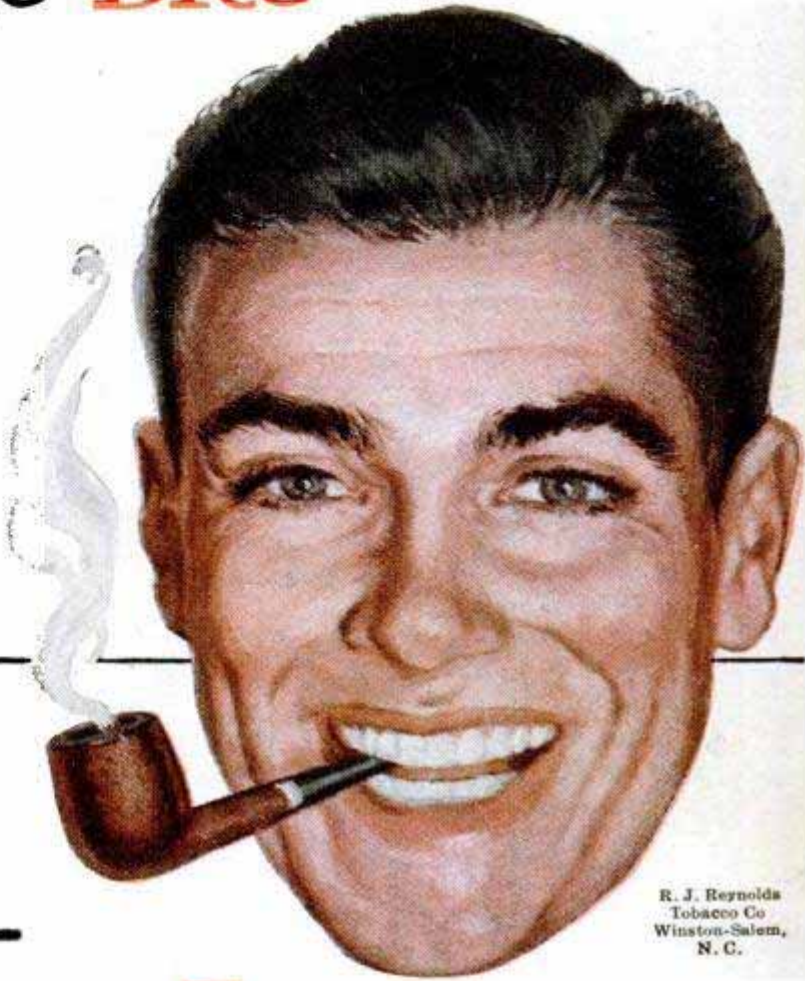
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"BITE" in tobacco is never any fun! Prince Albert is specially treated to insure against tongue bite!

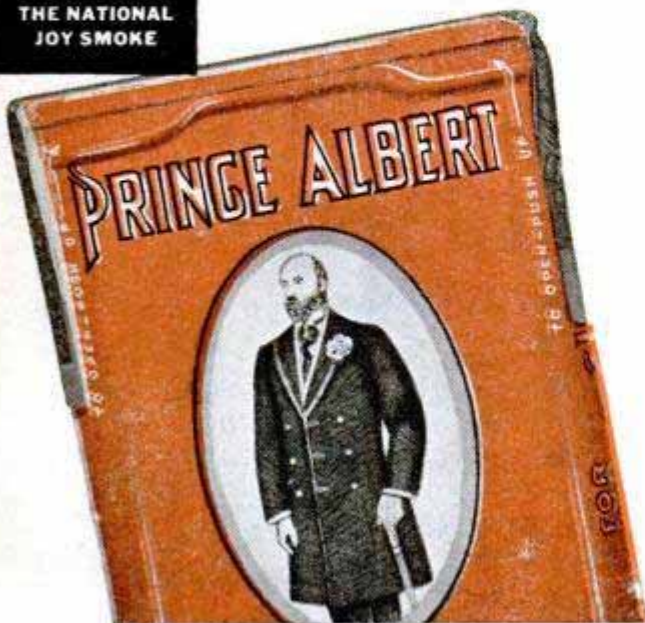


R. J. Reynolds  
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## Bite's Out Pleasure's In

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● Once you've tried P. A., you'll never want to smoke any other tobacco! Crimp cut and mild, Prince Albert is treated with the patented\* "No-Bite" process to assure you of greater smoking comfort! Whether you smoke a pipe or roll your own, you'll enjoy every puff of P. A.!

\*Process patented July 30, 1907

**MORE MEN SMOKE**

**PRINCE ALBERT**  
THAN ANY OTHER TOBACCO

Tom McHugh went along for the ride with two forest rangers on a rugged midwinter tour of duty in the Wyoming wilderness. Here is his story . . .

# POPULAR OCTOBER 1952 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 98 NO. 4

**H**OW'D YOU like to go on a Sno-Cat trip?" comes the invitation over the phone. "Just a short jaunt—three days to go 45 miles up Wyoming's Gros Ventre valley and back again."

The everyday tone of forest ranger A. K. Wogensen conceals the fact that our short jaunt will develop into a five-day battle against the worst blizzard of the season, a trek into a snowbound mountain valley with all the thrills of a roller-coaster ride.

Graying, winterwise Wogensen—"Wogy" for short—is anxious to make a winter check on his snowbound district. Forest ranger Val Simpson, five years out of college, will go along to survey the condition of the big game in the valley.

We shove off in the Sno-Cat on the twisting canyon road up the Gros Ventre valley.

It is cut cleanly into the canyon wall in summer, but snow has now drifted in to make the road almost indistinguishable from the hill.


Imagine yourself in the back seat as we edge our way over these treacherous side-hills. The cab in which you're riding is pivoted to the base of the tractor for greater flexibility. Right now, that magnifies your tilt. Val, who is driving, throws one hand over the door to keep from sliding onto Wogy in the seat alongside.

Val keeps asking you, "How much clearance do we have on the canyon side?"

You don't even have to lean out to see, for the "cat" is tilted; you can glance through the window and note how closely the tracks are creeping along the edge of the road.

## I RIDE THE SNO-CAT

by Tom McHugh



Angry at the trespassers, an elk defies the "cat" to advance. Seconds later, the elk bogged down in snowdrifts

You also can look a quarter mile beyond the tracks for an unexcelled—and unwanted—view of the canyon floor.

The Sno-Cat has a short turning radius because the front pontoons turn left when the rear ones turn right. Right now, that's a disadvantage. "I don't dare turn the steering wheel," Val says. "Before the cat swings away from the canyon edge the back end might swing out over the precipice."

Clattering over a steep hill, we surprise a herd of seven elk. Six flounder their way out of our path, now treading the snow crust, now plunging belly deep in the new powderlike snowfall.

One bull is fooled by a large drift of soft snow. Val yells, "There he goes!" as the bull's forelegs plummet into a quagmire of snow and the rest of his body follows in one grand lunge.

Too weak to rise, he lies there gasping for breath through a snow-powdered nose. Finally, he gathers enough energy to stand, and stand defiantly he does. Even the approach of the Sno-Cat fails to budge him.

A moment later, the bull's knees start to waver a little, then give way completely as he collapses into the snow. As we chug on up the valley, the bull is still lying on the ridge. Ravens circle overhead.

Val knows that omen only too well. At frequent intervals on this trip he stops to examine the available forage. He finds little grass and very few fresh, palatable twigs.

"There are so many elk in this country they've mined out their lode of food," he remarks. "If we can't reduce the size of the herd we'll have nothing left but a ghost town."

As we roll into Goosewing Ranger Station, Val starts supper while Wogy and I head off on skis toward the snow-measurement course. Wogy screws together three hollow aluminum cylinders. He then plunges this tube into the snow at intervals on the course. The average weight of these cores of snow is a measure of the water content. Water is liquid gold to the Jackson Hole and Snake River ranchers in the valleys below. Snow-survey predictions will tell them whether to expect a drought or an abundance of water during the summer.

Next morning the Salt Lake City radio forecasts snow. The dry crackle of snow static over the ranger-station phone also tips us off on the approaching storm.

Grinding on up the valley the Sno-Cat, at 10 miles an hour, roars mightily across the quiet snow. Two moose turn around and gawk at us as if we are an expedition from another planet. Wogy takes note of them for his game census.

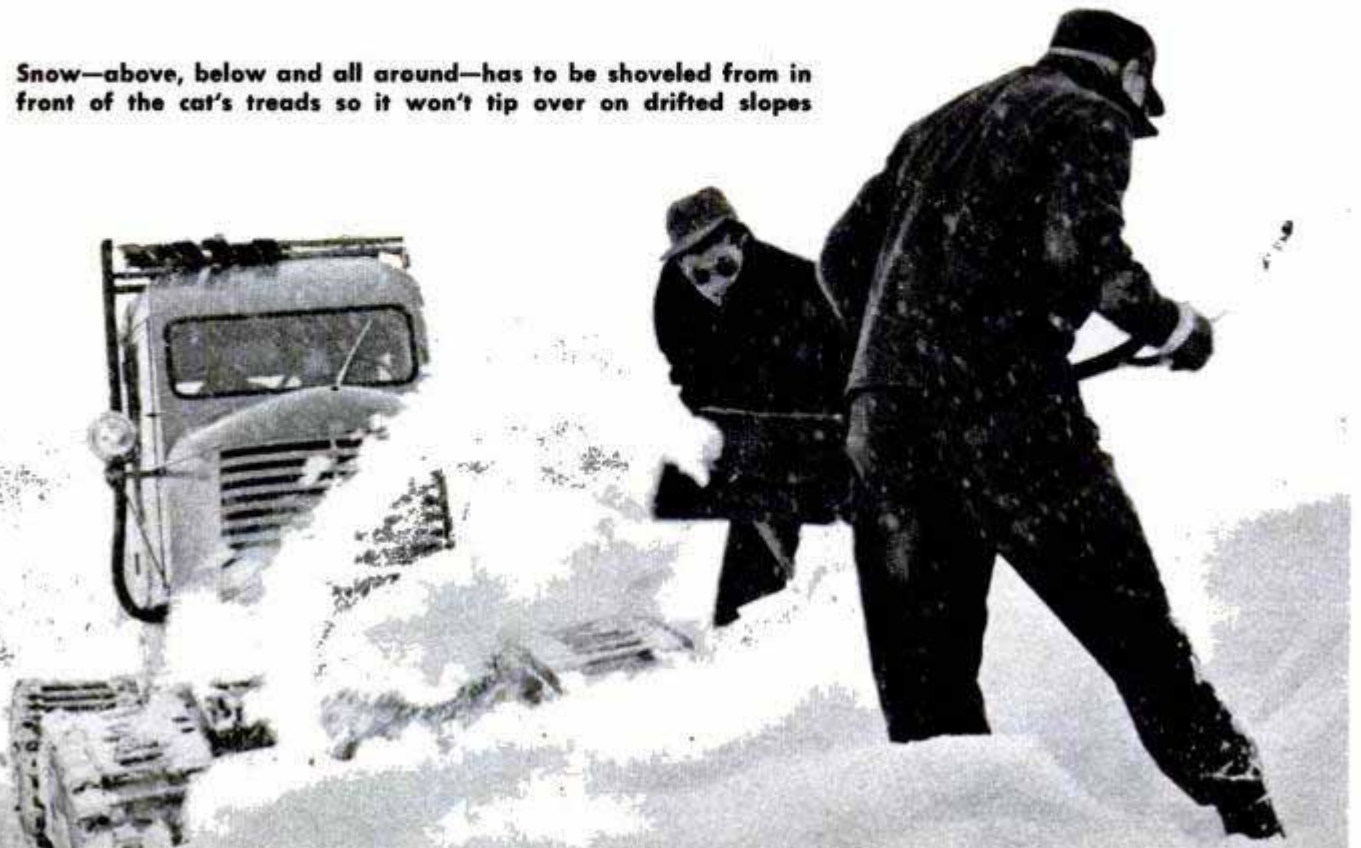
The cat furrows its way toward a series of treeless, rolling hills. We barely push into this open area before the blizzard roars in at its worst.

Visibility drops to zero. The hills become a mass of blank white. "There's no difference to the eye between a level spot and a vertical bank," Wogy complains, "but to the cat there's a great difference: One's easy going, the other'll roll us over if we hit it sideways."

"No landmarks to guide us here," Val says. "I think we're lost. Glad I'm in a Sno-Cat and not flying an airplane right now."

We stop until visibility clears a bit. Then Wogy steers off in a different direction. "I'm not lost," he reassures us, "but I have

**Snow—above, below and all around—has to be shoveled from in front of the cat's treads so it won't tip over on drifted slopes**





These are the three who made the trip. Left to right: ranger Wogensen, author McHugh and ranger Simpson

a heck of a time going where I want to go."

All windows except the driver's are now plugged with snow.

As the pontoons seek firm footing in the powder snow, I get a bottomless feeling. My stomach keeps playing Ping-pong with my tonsils.

"Let's take no chances with visibility," Wogy says to Val. "Tom and I'll ski ahead to blaze a safe route for you to follow in the cat." At times the blizzard thickens so much that Val cannot see us through the pelting snow, even though we are but 30

feet in front of him. Worse yet, if we ski out of sight of that cat, we're "gone turkeys."

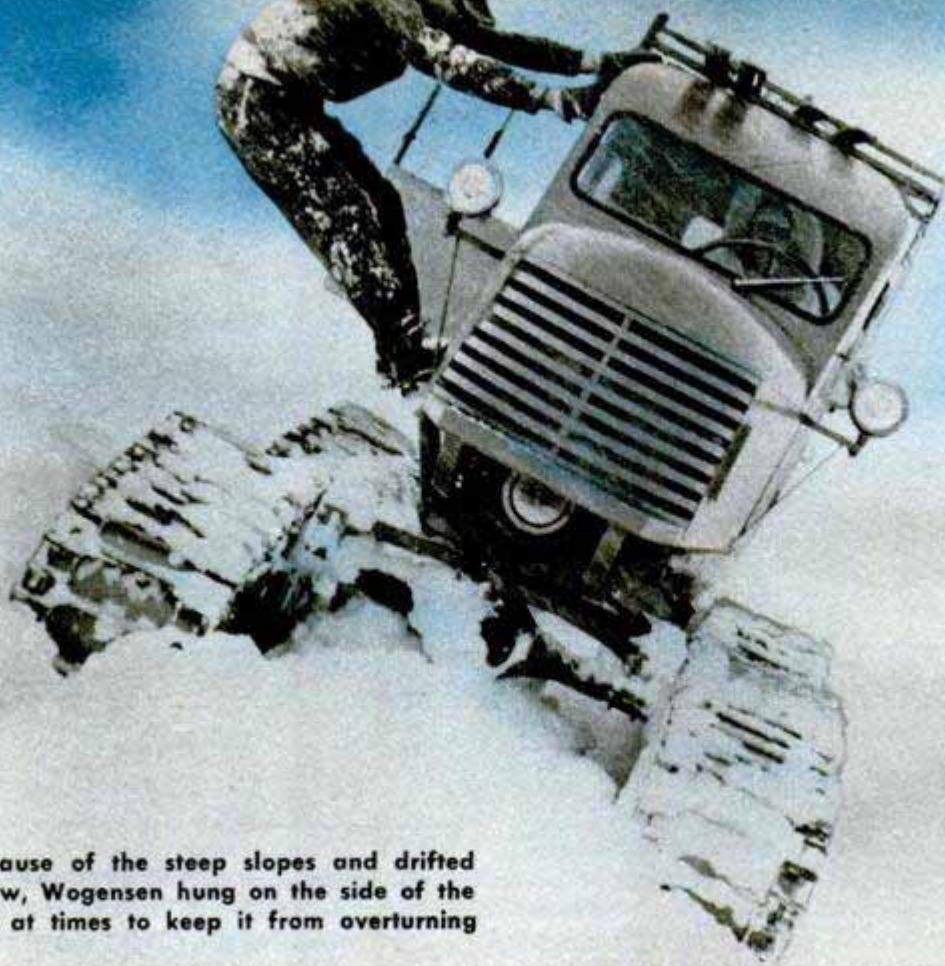
As we inch our way down a steep-walled valley, Wogy suddenly waves us to a stop.

"No soap," he shouts. "Too much new snow piling up on these steep slopes. Avalanche danger! We'd better head for the open country."

No sooner has he said this than we're startled by a quick crunching noise. Whoomf! We look up just in time to see the snow on the valley wall opposite us disintegrate in a tangle of cracks and roll toward

An incidental duty during the 90-mile trip was to deliver mail to snowbound ranchers like Otto Miller





Because of the steep slopes and drifted snow, Wogensen hung on the side of the cat at times to keep it from overturning

the place where our party might have been. The snow slide loses momentum on the valley floor.

The route now leads over some treacherous willow bottoms—treacherous because the ice on the stream might have air pockets. "We'll cross only on the still waters," says Wogy. The ice is two feet thick there.

Finally, the cabins of the Robinson ranch loom out of the winter dusk. We weave through the gate just before darkness, the cat's engine roaring.

The Robinsons never expected to see beast or Sno-Cat in this dense blizzard that heaped drifts as high as a man. It took us nine hours to go nine miles. That's even slower than snowshoeing, but a man on snowshoes would not last long in that storm.

After supper, Bob Robinson talks with Wogy about some timber he'd like to cut on the forest land.

The final lap of our journey leads up through towering pines. The trail was built for horses, yet Jeeps might possibly make it

In a state feeding area, the travelers watched a workman throwing out hay for elk visible on horizon





Weighing a core of snow, a ranger predicts how much water will be available in spring



Snow and ice freeze around sprocket wheels of the cat and have to be melted away by heat from an extension of the exhaust pipe

in summer; we are out of the size class of either but we'll try it anyway. To negotiate some sharp curves we have to back up and go forward several times.

The steep hills give us even more trouble. Because of the loose powder snow, hills only 40 feet long may take a dozen tries. The cat pushes ahead, packs the snow for another three feet, and then slips in the loose powder.

By this time my stomach is rebelling at the bouncing of the cab as we move up and down hills, the tense moments as we skirt canyons and the bounces as we rock over fallen logs.

By now the Sno-Cat has carried us safely over 44 miles of rough country. It seems ungrateful of us to abandon it, but with only a mile to go to the final stop we are halted by fallen trees and snow slides.

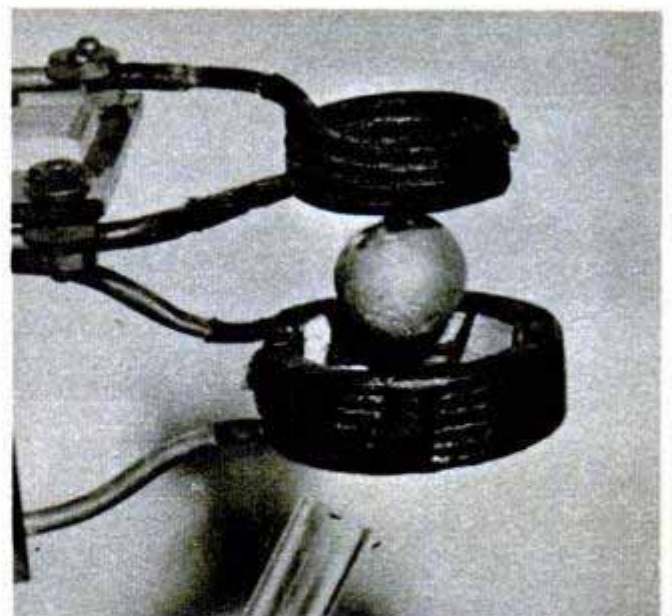
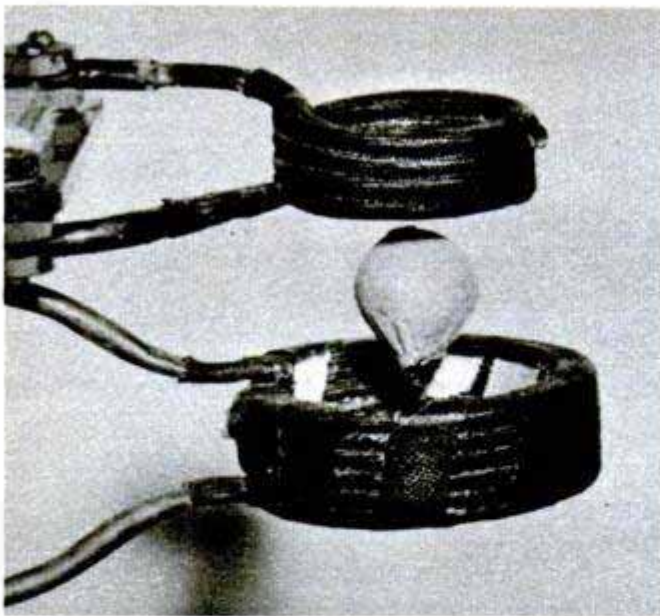
"Five hours of sawing and shoveling to go one mile—it just isn't worth it," Val says. "We'll ski the rest of the way."

As we break over the top of the next hill, we come into sight of Phil Norton's ranch. His 15 malamutes spot us and bark and yowl a welcome—or at least we hope it's a welcome. We are the first outsiders they have seen in four months.

(Continued to page 262)

Guests for dinner! The Robinsons welcome their first visitors in three months as the cat arrives at ranch





## Metal Floats in Air During Melting Process

Lumps of metal are melted electrically while suspended in air by a magnetic field in a process developed by Westinghouse. Because it eliminates the use of a crucible, the process prevents contamination by impurities in the crucible itself. Two conical coils generate electromagnetic fields to support the metal in space. Chunks up to 4 inches by 2½ inches and weighing up to 19 ounces have been melted successfully by

the process. The actual melting is done by induction heating. Currents used go up to 1200 amperes at 9600 cycles. The molten metal is held together by an oxide film or, where such a film does not form (as in a vacuum), by surface tension. By adjustment of the current, the molten metal can be drained into a receptacle or in some cases the whole melt can be dropped out of the magnetic field at will.

## Feeder Lines Connect Planes to Central Air-Conditioning

Passenger planes waiting to take off from the Greater Pittsburgh Airport will plug into a central air-conditioning and heating system. Trap doors on the apron where the

aircraft park will cover hoses for fresh air as well as for gasoline and oil. Reconditioned air will be pumped from the lines and through the ventilation ducts of the planes.

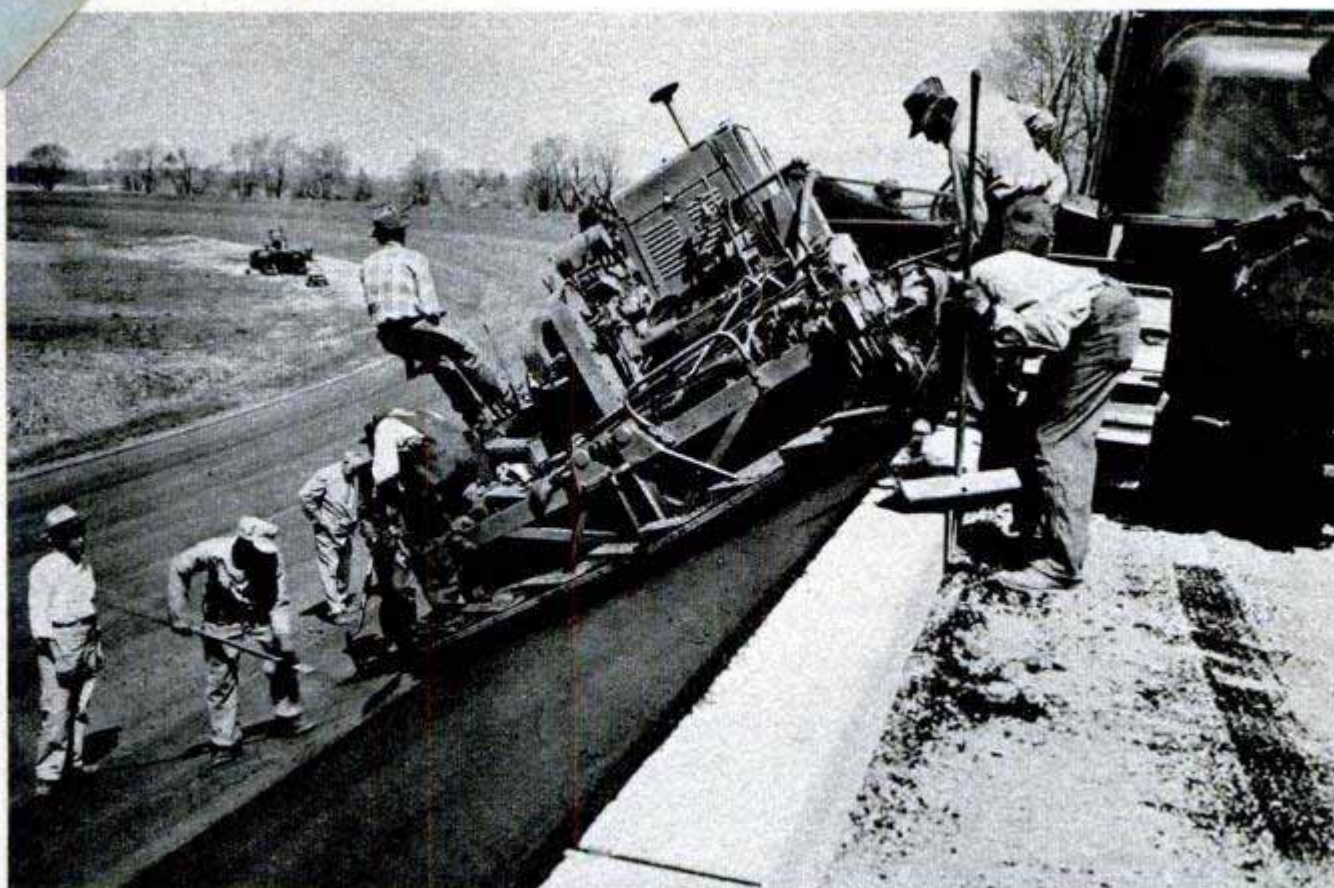


## Versatile Armrest Stores Accessories

Lessening driving fatigue, a triple-purpose armrest provides a handy compartment for driving and personal accessories. At the end of a trip, the unit and its contents can be carried like luggage into the hotel or home. It is held in place by a U-shaped wire that fits between the seat and the seat back.

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





## Proving-Ground Engineers Solve Difficult Paving Problem

Confronted by the problem of paving steeply banked test-track turns, engineers at General Motors' proving ground were forced to devise a new system of road building for on-the-slant operations. Conventional paving equipment could not operate on the saucer-shaped turns, which at some places achieved angles of 37 degrees. Roads were built adjoining the outside of the three turns and a foot-high concrete curb installed. A tractor on this roadway held

the finishing machine in place on the slope by means of a cable attached to its built-in winch. The massive 11-ton roller, shaped to fit the average contour, was fastened by a cable to a specially equipped truck on the roadway. The truck had four extra wheels, two of which rested vertically upon the top of the curb and two others, mounted horizontally under the truck, which bore against the side of the curb. Carburetion and lubrication systems were altered.

## Military Tests Coaxial Helicopter

Able to carry seven persons in commercial use or three litter patients and a medical attendant during rescue work, a new coaxial helicopter is being tested for military use. More compact than other helicopters, it features fewer parts, simpler control and a higher payload in proportion to gross weight. It will cost less than similar craft, according to the manufacturer. The two rotors spinning in opposite directions eliminate the necessity for a tail propeller to counteract torque pull, thus simplifying design. The resulting auto-like shape of the craft explains the fact that



only minor changes would be necessary to transform it into a "convertiplane" suitable for ground and air travel.

# You Name It!

Things are not what they seem. Take a look through the camera's eye and sometimes even the commonest objects appear strange and weird. See how many you can identify, then check your list with the answers on page 242

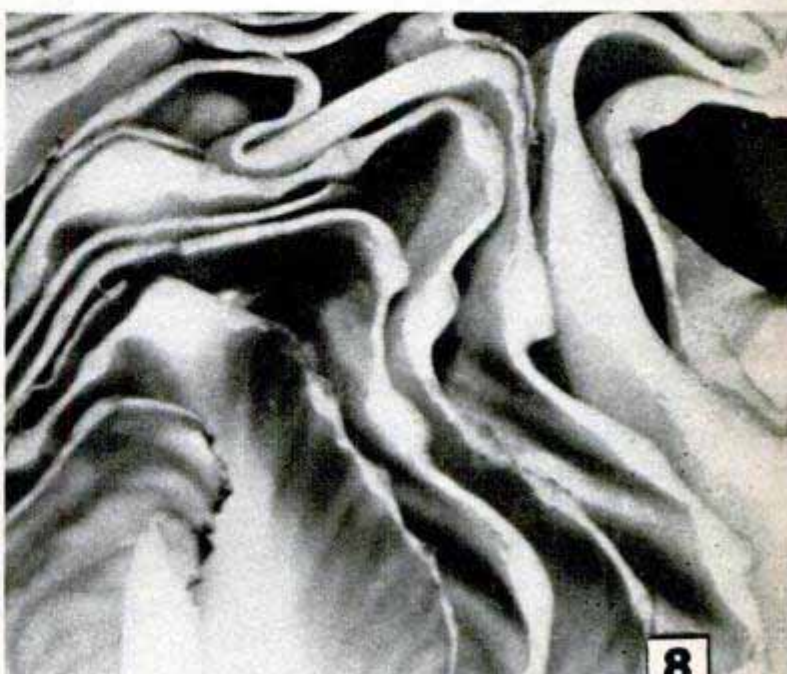
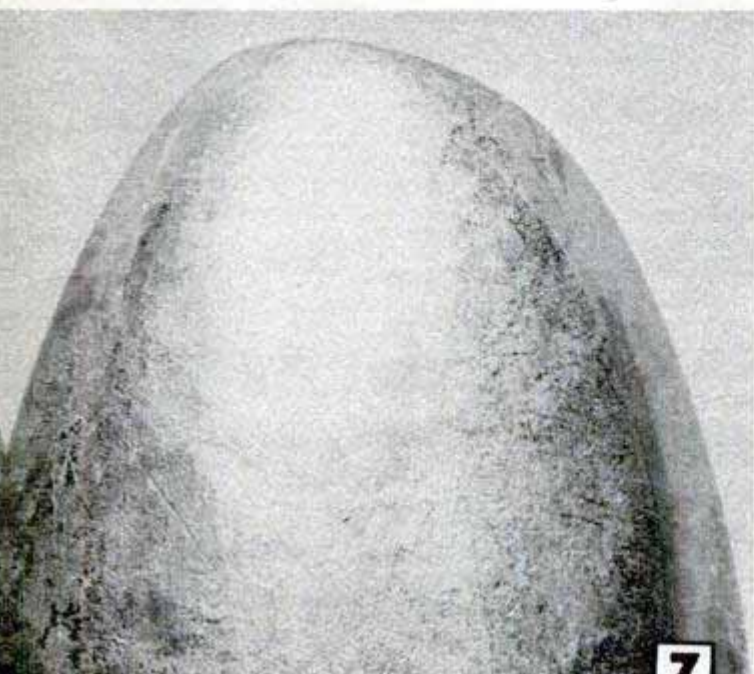
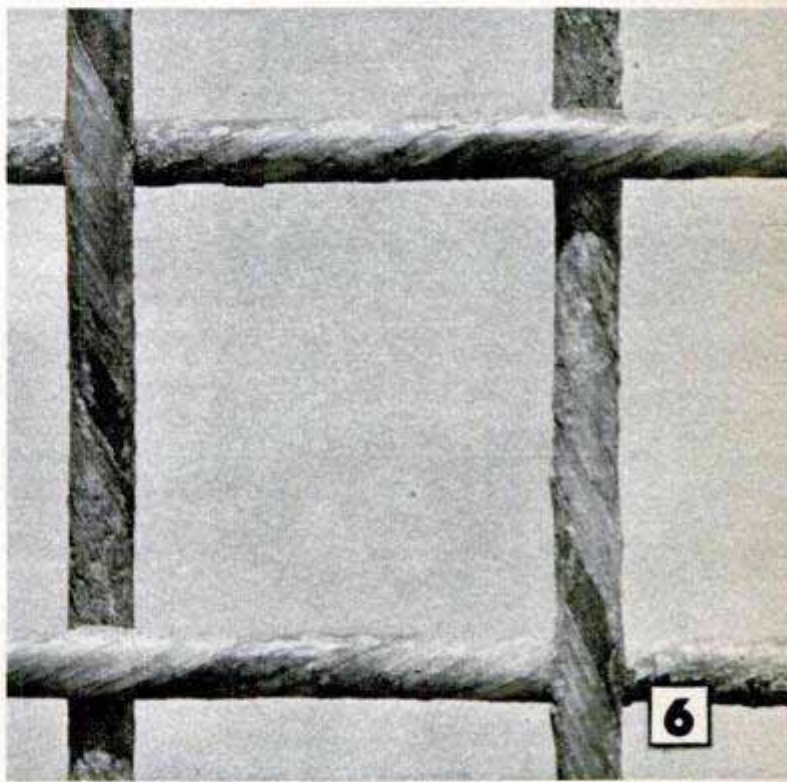
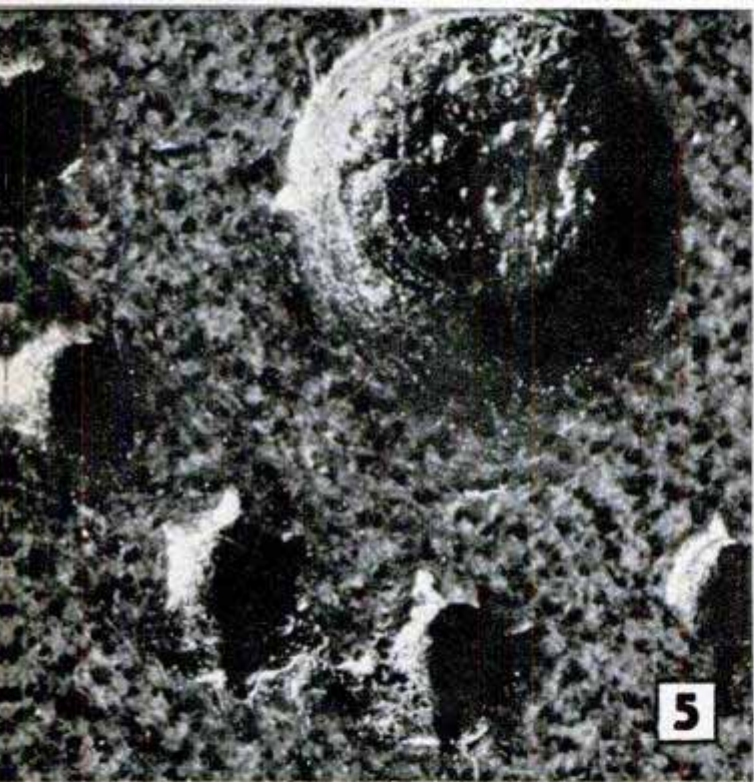
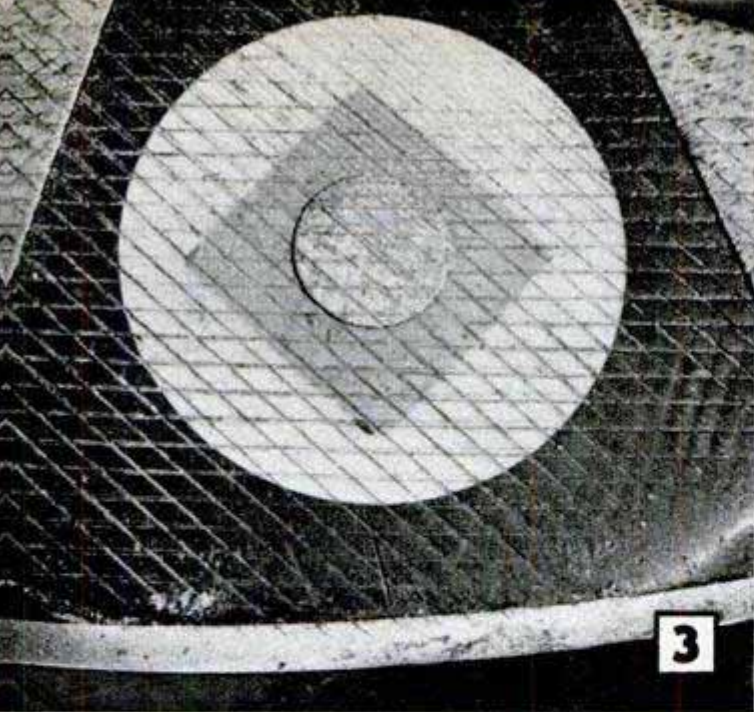
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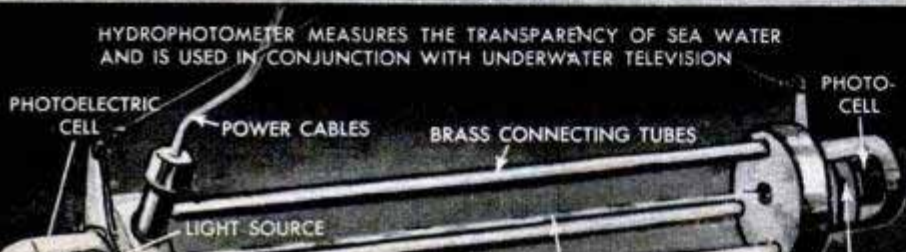
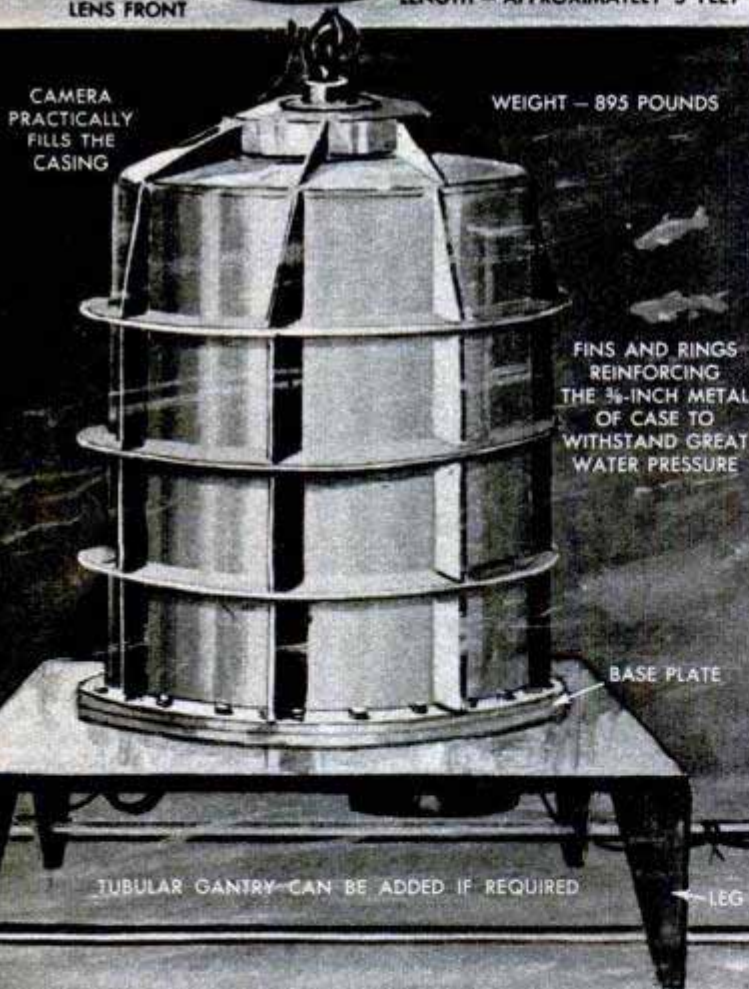
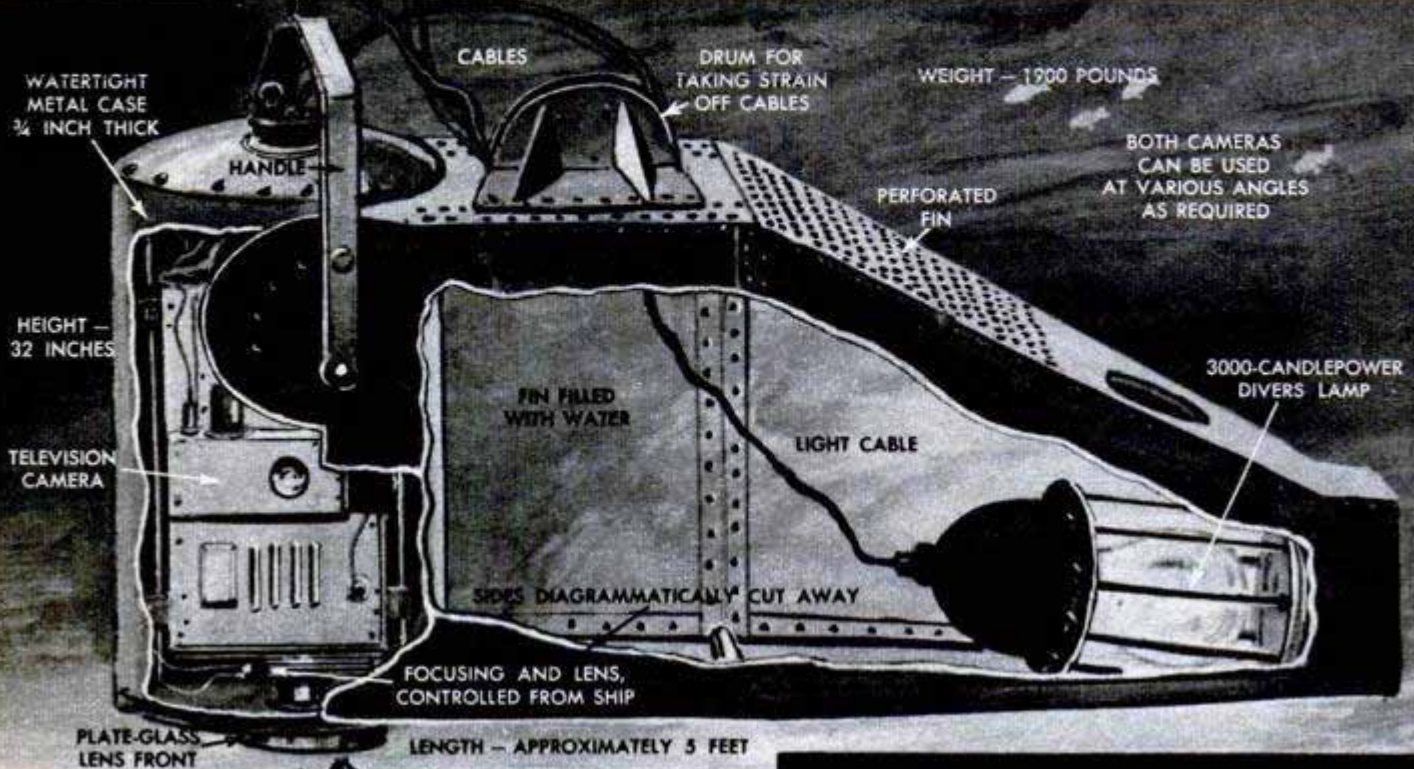
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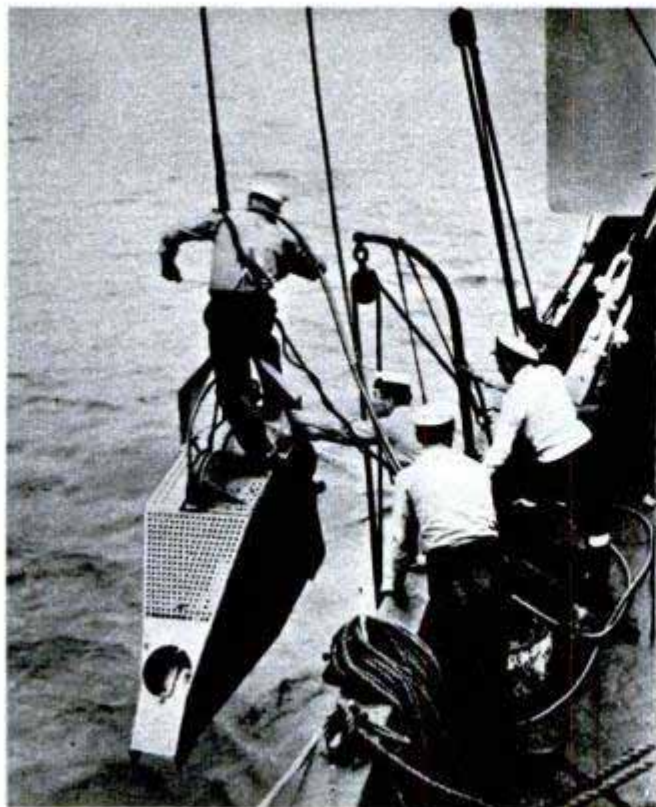


# UNDERSEA TELEVISION for



TELESCOPIC LEGS  
USED WHEN  
EXAMINING SEA BED

# BRITISH NAVY



British seamen prepare to lower underwater-television camera over a sunken ship in Falmouth Bay

**TELEVISION** cameras in watertight steel cases are now probing ocean depths of 1000 feet for the British Admiralty. The cameras can be controlled and focused from the surface and the picture is observed on a screen on board ship. Light for the camera is supplied by a 3000-candlepower lamp that penetrates murky waters in which a diver could not operate. The British Admiralty Research Laboratory, which developed the camera, first used underwater television in the search for the sunken submarine *Affray* last year. An ordinary television camera was enclosed in a metal drum. Later, the big model at the top of the opposite page was built. It proved bulky to handle and is being replaced by the lightweight model. The lenses on both cameras are remotely controlled for close-up and wide-angle views. Scores of uses for underwater television include salvage operations, the inspection of the hulls of ships (saving time and money now spent in dry dock), harbor surveys and in any capacity where the eye of man must go underwater.

Eventually a TV broadcast from a ship may be hooked up with a relay system to bring to home screens a fascinating picture of the underwater deep-sea regions. A great advantage of the underwater camera is that it is operated without risk of life from the safety of a ship's deck.

OCTOBER 1952

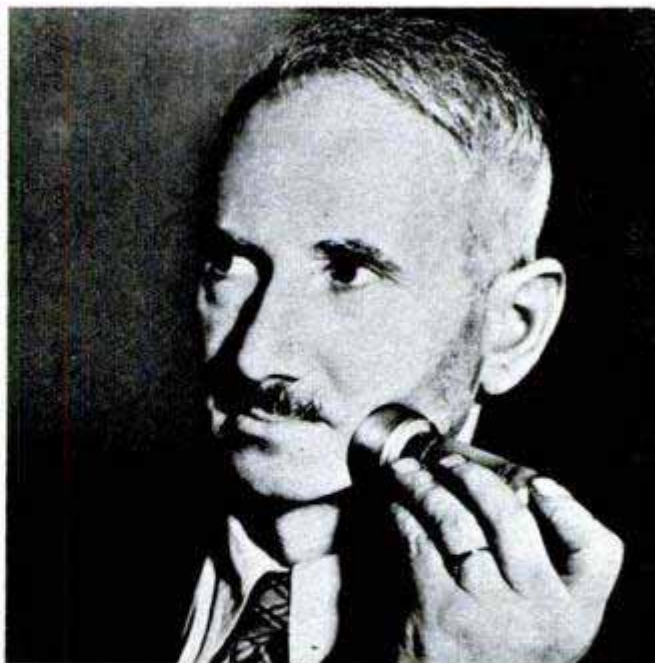
## Window Spray Stops Fading

Sprayed from a pressurized container, an invisible coating for windows reduces fading of fabrics by bright sunshine. The coating keeps the inside of the windows sparkling clear, too. A fingertip valve on the container controls the fine spray.



## Cigarlike Pipe Can't Spill Ashes

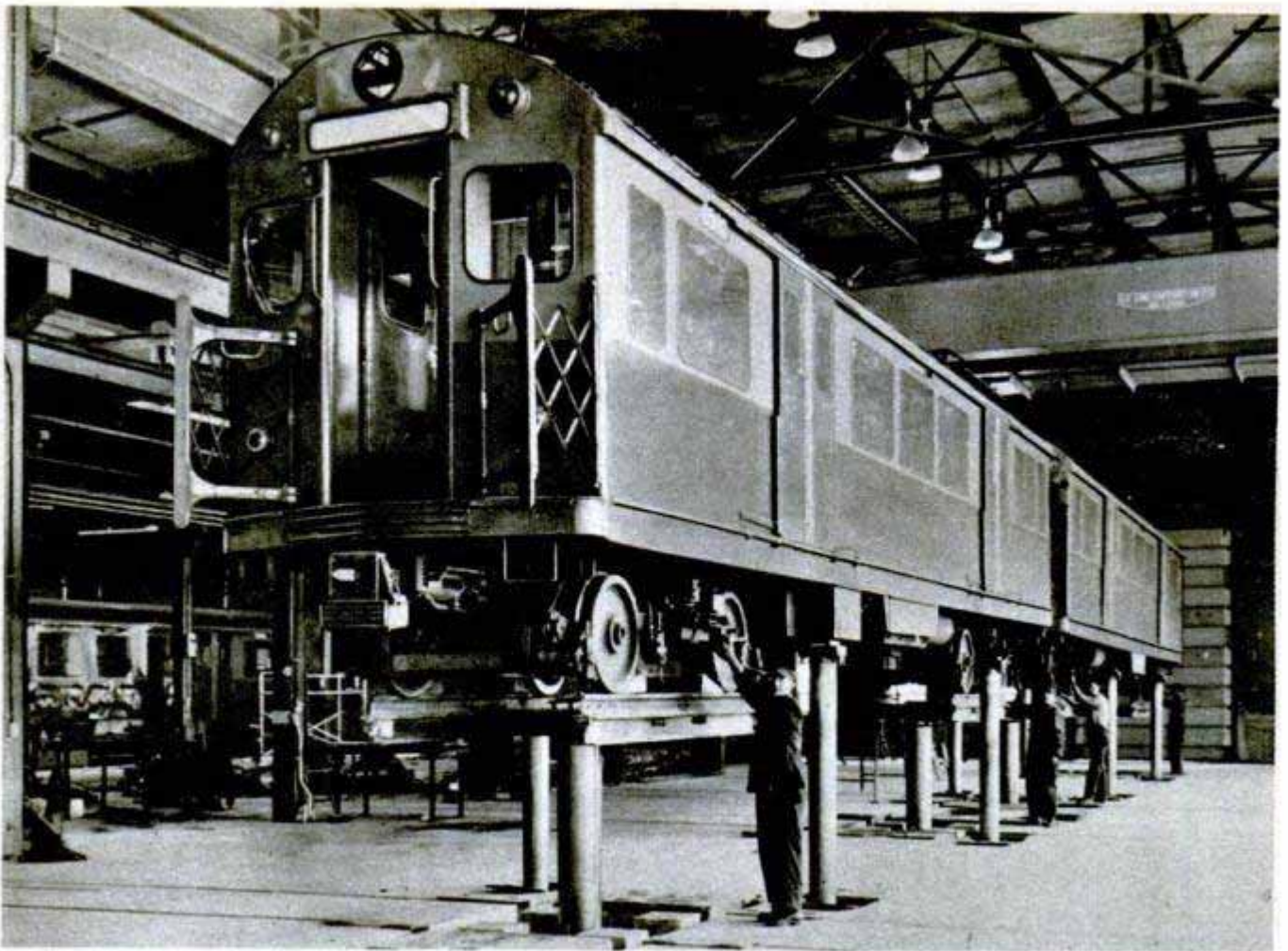
Shaped like an oversize cigar, a new pipe burns the tobacco in an enclosed chamber that prevents spilled ashes and permits smoking in the wind and rain. The tobacco bowl holds the usual amount of tobacco and screws to the end of the pipe. A small air inlet keeps the pipe burning. A metal pagoda-shaped filter is easily cleaned and provides a clean, dry smoke.



## Dry Shaver Uses No Electricity

It takes only three minutes to give yourself a shave with a rotating razor that uses no electricity, water or soap. Invented by an Englishman, the razor was introduced at the British Industries Fair in London. The razor blades are self-sharpening.

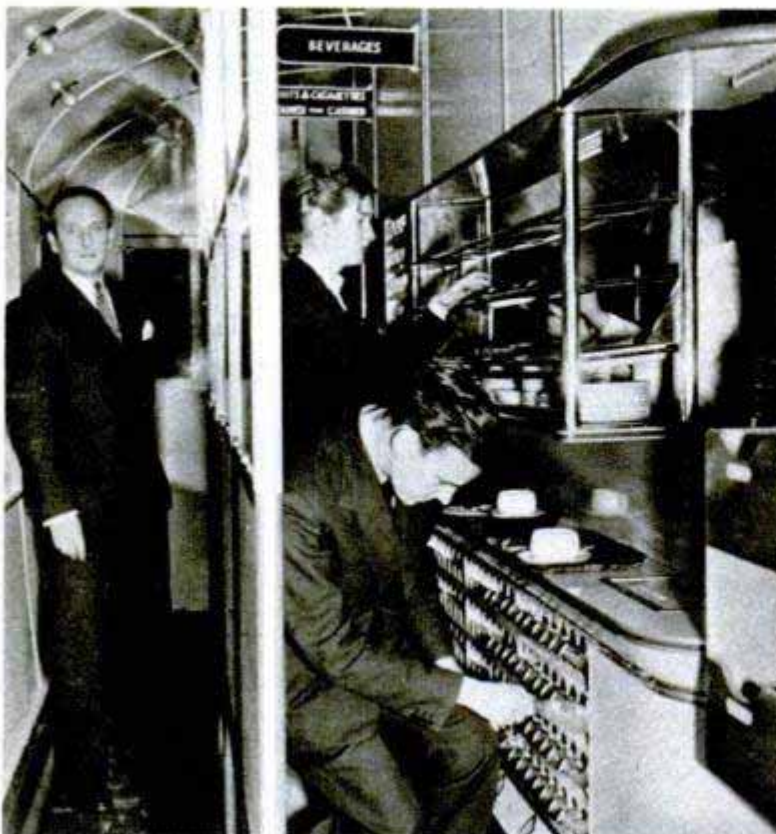
91



## Hydraulic Hoist Lifts Subway Train

Massive subway cars in an East Boston, Mass., repair shop are hoisted like automobiles by a set of hydraulic rams. Four rams are employed to lift a 45-ton two-car train off the tracks. Another set of eight rams supports the train while the first set is used

to lower the disengaged truck assemblies and swivel them around in line with tracks leading to another section of the shop. Horizontal leveling is near-perfect. The method is much faster than the former system which used overhead cranes.

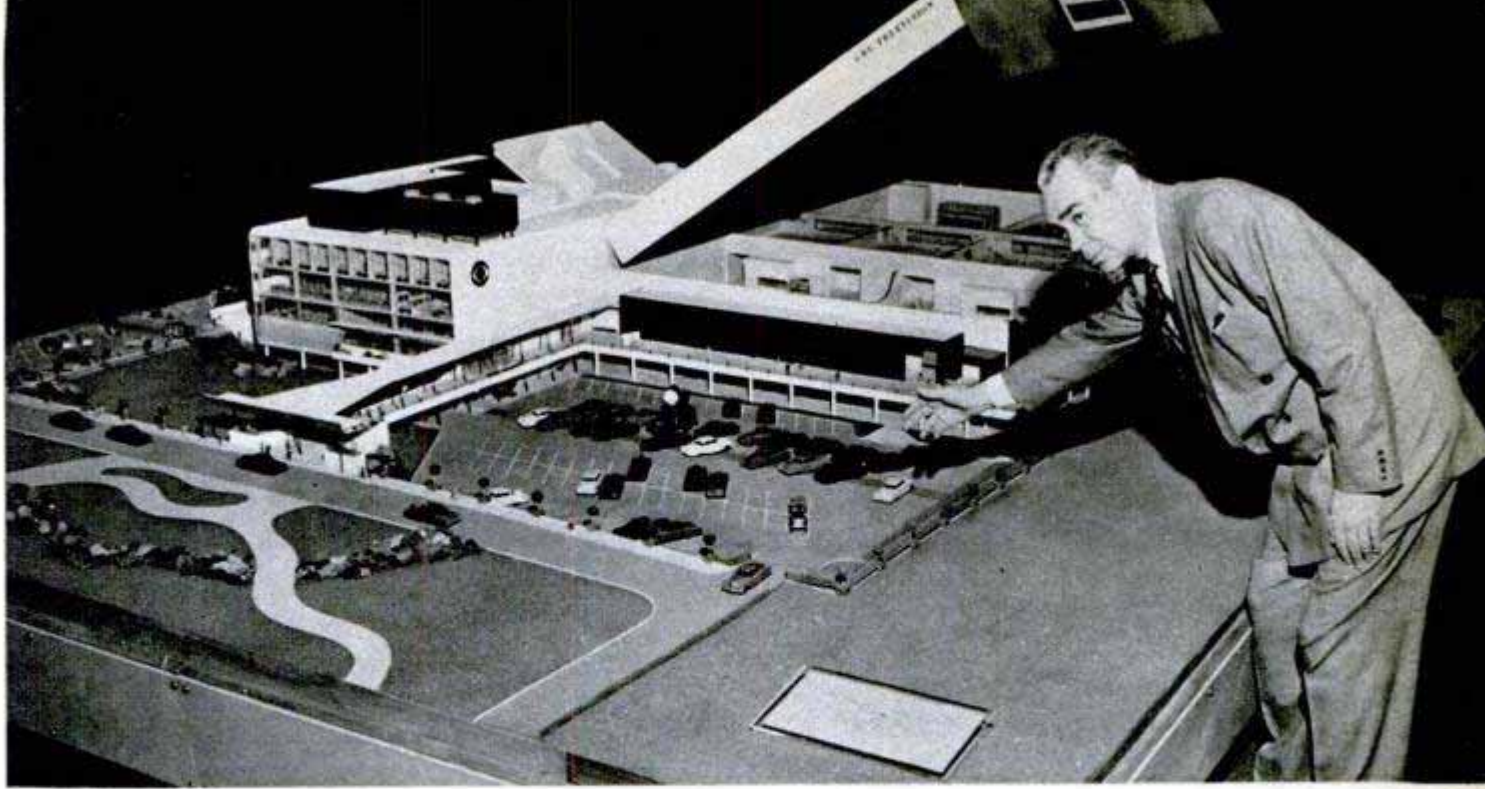


## Cafeteria Dining Car Displayed in England

Recently displayed in Victoria Station, London, an experimental self-service dining car is being tested by British Railways. Although the only one built to date, it may serve as the model for an entire fleet of cafeteria cars. The car contains, besides food and equipment, tables with tip-up seats for 48 passengers.

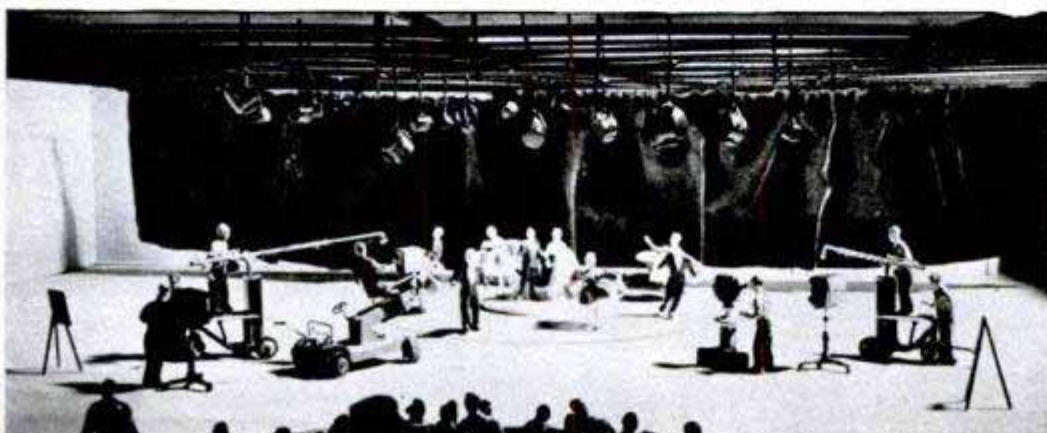
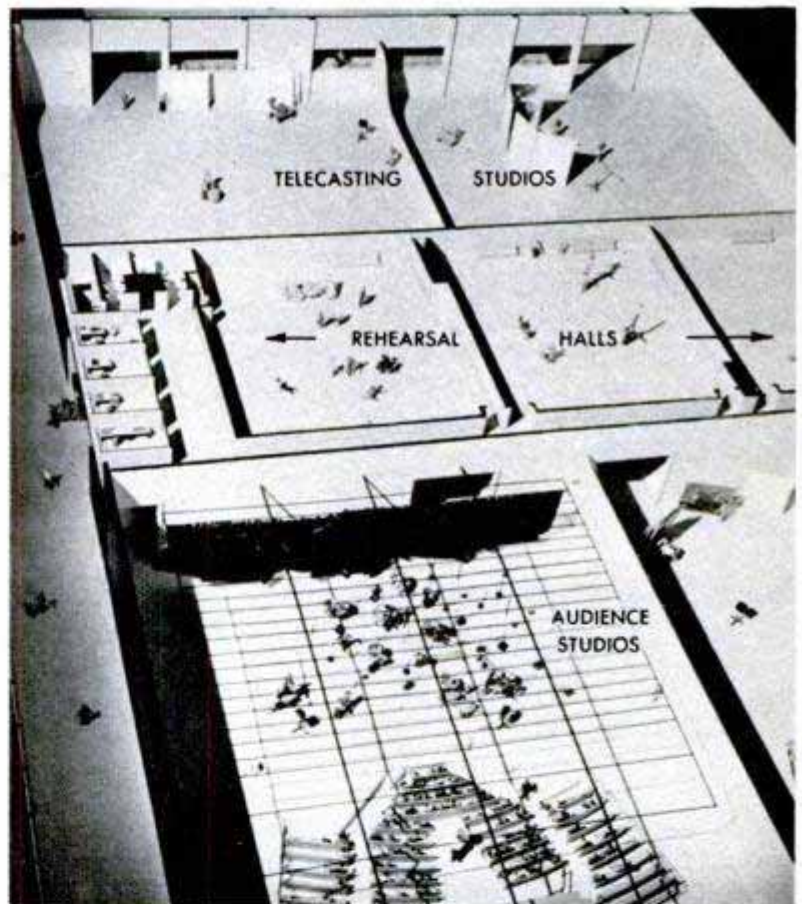
## Gas-Filled Golf Ball

Extra-sensitive, a practice golf ball containing thousands of non-connecting gas cells helps the golf enthusiast to improve his game. Made of an expanded cellular plastic, it is like a real golf ball in size, color and appearance. Because it is only  $\frac{1}{13}$  as heavy as its model, however, it can be used safely indoors and outdoors.



## "Television City" Constructed in Miniature

All the facilities of a huge television center are built into an elaborate scale model for public exhibit. The Columbia Broadcasting System now is constructing the real "Television City" in Hollywood. The precision-built model measures 15 feet long and 14 feet wide, and is complete with landscaping, parking lots with automobiles, miniature equipment, furniture and 200 lead figurines, each 1½ inches tall. Electric controls lift the roofs, move the walls and operate lights to give viewers a detailed inspection of the big building. A revolving stage in the model contains pirouetting dancers. There's even a spinning record turntable, with a record about the diameter of a cigarette. The initial unit of the real building will have four giant studios, each with 12,100 square feet of floor space. Eventually the company hopes to build a total of 20 studios in Hollywood's Television City.



With roof lifted, the model shows rehearsal halls and studios. Audience studio in foreground even has overhead grid for hanging the draperies for the scenery. Left, people are 1½ inches high, equipment cast to scale



**P**HOTOGRAPHERS recently have been "painting pictures" in the air with lights, using batteries and film to produce startling photos. To make the pictures on these pages, photographer George Pickow attached four electric lights to two young ballet stars. The lights were powered by batteries strapped to the dancers. Then, with the camera shutter open, Pickow photographed the light patterns made by the dancers as they went through the classic movements of the ballet. As soon as a dancer completed her performance, Pickow touched off a flash from strobe lights to catch her in the final position. The resulting photos show the ballerina in every movement of her dance—how high she leaped, how many times she leaped, how regular her movements were. Thus the pictures provided interesting studies of value to the dancers. ★ ★ ★

## *Ballet with Lights*





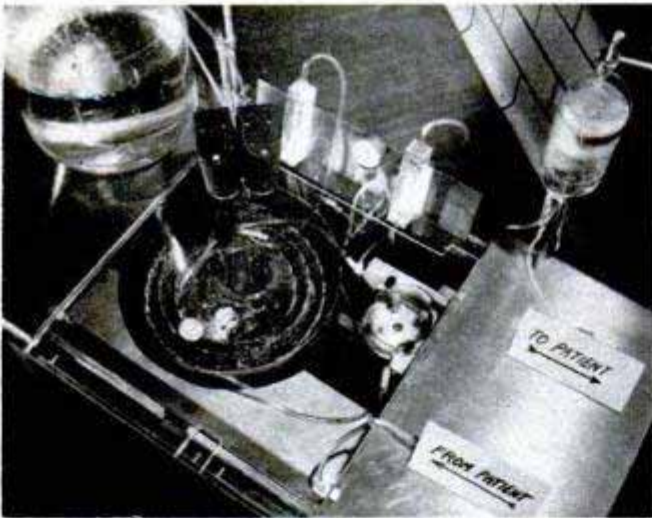




Blood from patient passes into cabinet of the artificial kidney, where impurities are drained off. It then passes back into patient through opening in a vein. Above right, key element is plastic tubing which filters out impurities. Below, top view of kidney shows tubing coiled around three wire-mesh cylinders

## Artificial Kidney Purifies Human Blood

Completely tested and now in successful operation, an artificial kidney takes over when normal kidney functioning fails or is inadequate. The instrument, developed by Westinghouse engineers in cooperation with medical authorities, is about the size of a console radio and can be easily moved from one hospital to another. The principal element is a 50-foot length of plastic tubing similar to the material used for sausage casings, which is wound around three cylinders made of fine mesh wire. Blood is drawn from the patient's arm and passed through the tubing. The plastic contains microscopic holes which filter out the impurities. The impurities are drained off, while the purified blood returns to the patient through a venous opening in the other arm.

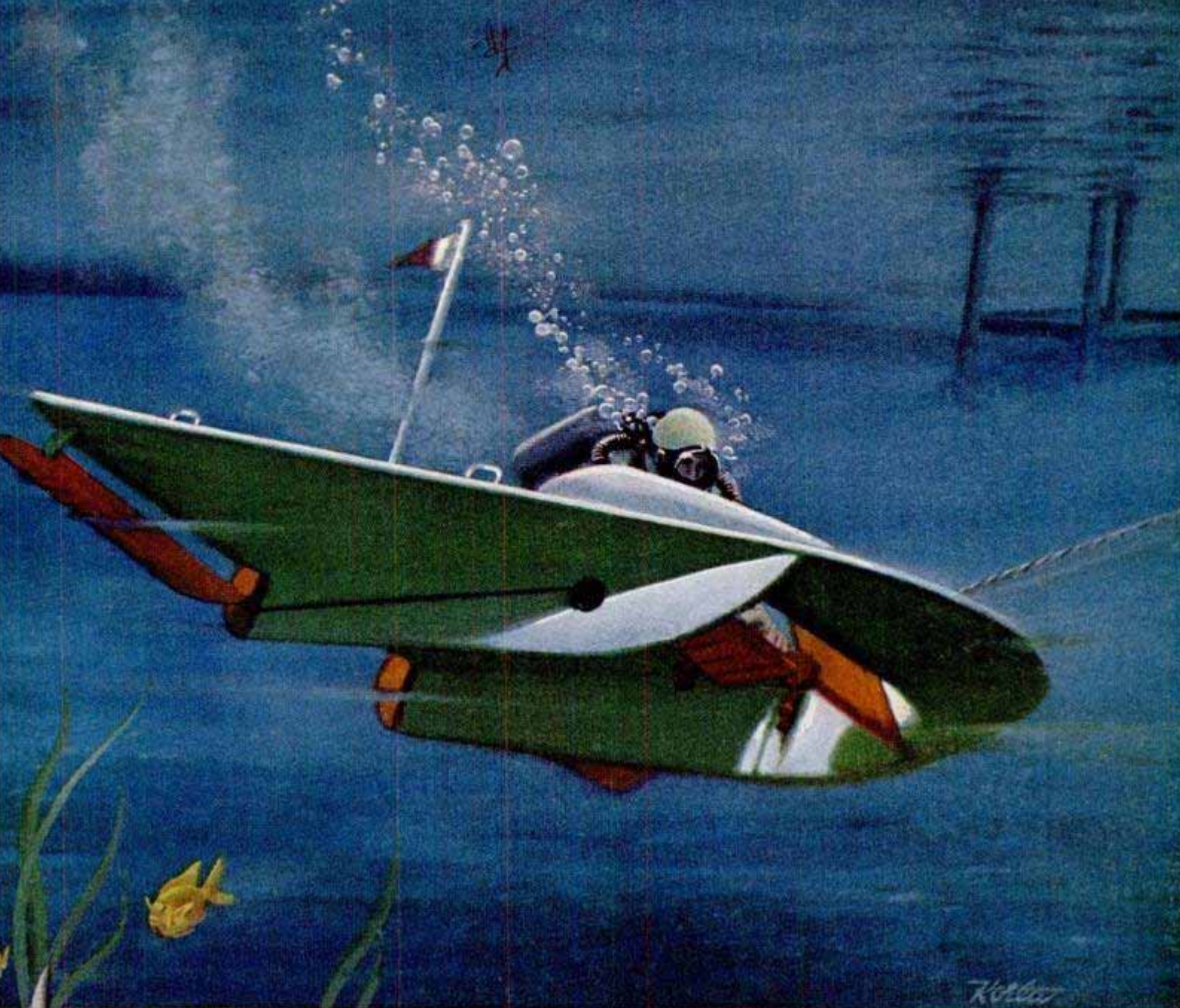


## Plastic Fender Cover

Fenders are protected from accidental damage during repair work by a cushioned plastic cover that is impervious to acid, oil and anti-freeze. Cemented to the back of the cover is a sponge-rubber sheet that allows the mechanic to place tools, instruments or heavy parts on the fender without damage to the finish. The sponge rubber also prevents the cover from slipping. A quick wipe with a moist cloth cleans the cover.



Used during preflight tests, a new instrument checks 200 airplane electrical circuits in less than 10 seconds.



# UNDER the SEA on a GLIDER

By Richard F. Dempewolff

LIKE A MONSTROUS white Manta ray skimming along beneath the swell of the southern seas, one of the strangest-looking craft ever devised has been going through its paces off the French Riviera this year. Out of the depths it comes, towed by a powerful speedboat. The delta-shaped wing, stretching some 14 feet from the tip of its rakish, pointed prow to its flared, seven-foot-wide tail, is a submarine version of a glider. A pair of rudders juts from its stern, like tail surfaces of a "Flying Wing" in miniature.

Sprawled on the back of this strange

wing, the pilot rides, held in place by rubber loops at his elbows and by steel braces over his thighs. Rubber flippers encase his feet. A sleek, skintight rubber suit covers him from neck to ankles and keeps him snug against seas as cold as 40 degrees. Goggles, a tight rubber cap and air mask cover his head.

Observers have to look fast to see him, because in a moment he'll be gone again. With a tug of his hands, he pulls at aileron controls and the skimming craft dips beneath the waves without a splash or a bubble. A few seconds later he may be 100

*P. Van Horn  
Class alpin  
81 Rue P. Antilles  
Cannes, France  
Horn*

*See Man 53 92*



Goggled and helmeted, the prone pilot grips the controls that operate ailerons to make the wing dive or bank. One red aileron is seen at left

Compressed-air bottle is strapped to pilot's back. Each bottle provides 30 minutes' air supply and the pilot can wear three of them if he wishes



feet below the surface, gliding over the ocean bottom at 10 miles an hour. He banks and turns like an airplane as he skirts the reefs and rocks on a thrilling ride. According to enthusiasts, it surpasses anything the barnstorming pilots ever tried in the way of "buzzing" or hedgehopping with an airplane.

The wing, called "Manta" after the deep-sea monster it resembles, is the brainchild of a French aviator-sportsman named Pierre Vanlaer. As a member of the Under Sea Alpinist Club at Cannes, the inventor was dedicated to exploring and spear fishing among the reefs that stud the ocean floor along the Riviera.

Despite the fact that with air mask, goggles, webbed feet and rubber suit he could browse at a depth of about 200 feet for 20 minutes, Vanlaer wasn't quite satisfied. He wanted to get around the bottom faster, cover lots more territory, waste fewer precious minutes getting down there, and to be at Davey Jones' door without having used up all the energy it takes to swim down that far.

There's nothing really new about diving boards. For untold centuries natives on the Niger River in Africa have been tying themselves to flat boards with downward-sloping prows. When tugged against the current by men on the shore, the board would submerge, fisherman and all, and the man on deck could leisurely spear any fish that happened by, without exerting himself.

Based on the same hydrographic principles as those primitive boards, Vanlaer's great submarine wing, weighing 550 pounds under ballast, is one big hydrofoil, scientifically



Ready for an underwater "flight," the wing weighs 550 pounds. Over 100 pounds of that weight is ballast

contoured in wood and cork. The outer surface is sheathed in a plastic skin, coated with several layers of paint. Beneath the wing, two keels project to prevent the craft from whipping and rolling while cruising beneath the sea. At the end of each keel is the vertical vane of a rudder. Along the Manta's trailing edge are the ailerons, providing an up-and-down or "bank" control, and a collapsible signal mast rises from her stern. It swings down when the wing is deep underwater, can be pulled vertical to signal the towboat when the wing is ready to surface.

The pilot lies prone on top of the wing. In front of him is a shield of heavy transparent plastic that acts in the water as a windshield would on dry land. Without the protection of this shield, the tremendous force of the water pushing against him would tear the diver's helmet from his head.

The pilot guides his craft under the sea

in much the same way an airplane pilot maneuvers an aircraft. His feet are hard against the rudder bars which activate both rudders simultaneously. His hands rest on a pair of bars that move back and forth independently, and tilt either aileron to any desired degree. To execute a left turn underwater, the pilot pulls his left aileron up, his right one down and kicks the right rudder bar. The undersea wing banks over like an airplane and around she goes in a long, swooping turn. She climbs when the ailerons are tilted up and noses over in a dive when they're tipped downward.

"On a towrope 300 feet long," says Vanlaer, "and hauled at a speed of one to eight knots by a speedboat, she'll dive 125 feet in a 22-degree descent. The longer the rope, of course, the deeper she'll go. She'll dive as deeply as any man's physical condition will stand. Instead of one air bottle—good for a full 30 minutes since the diver doesn't



Sliding into the blue Mediterranean at the end of a 300-foot line, the wing and pilot prepare for a dive

need to exert himself—the Manta carries three, giving her passengers a one-and-a-half-hour ride. What if the rope breaks? As soon as she loses speed, she bobs to the surface like a cork.”

Because of its buoyancy and sensitive

controls, an undersea-wing pilot has to watch himself on the turns or he's liable to slew into a barrel roll, catch the force of the water under the wing and flip up out of the ocean.

Vanlaer tells how embarrassed he was

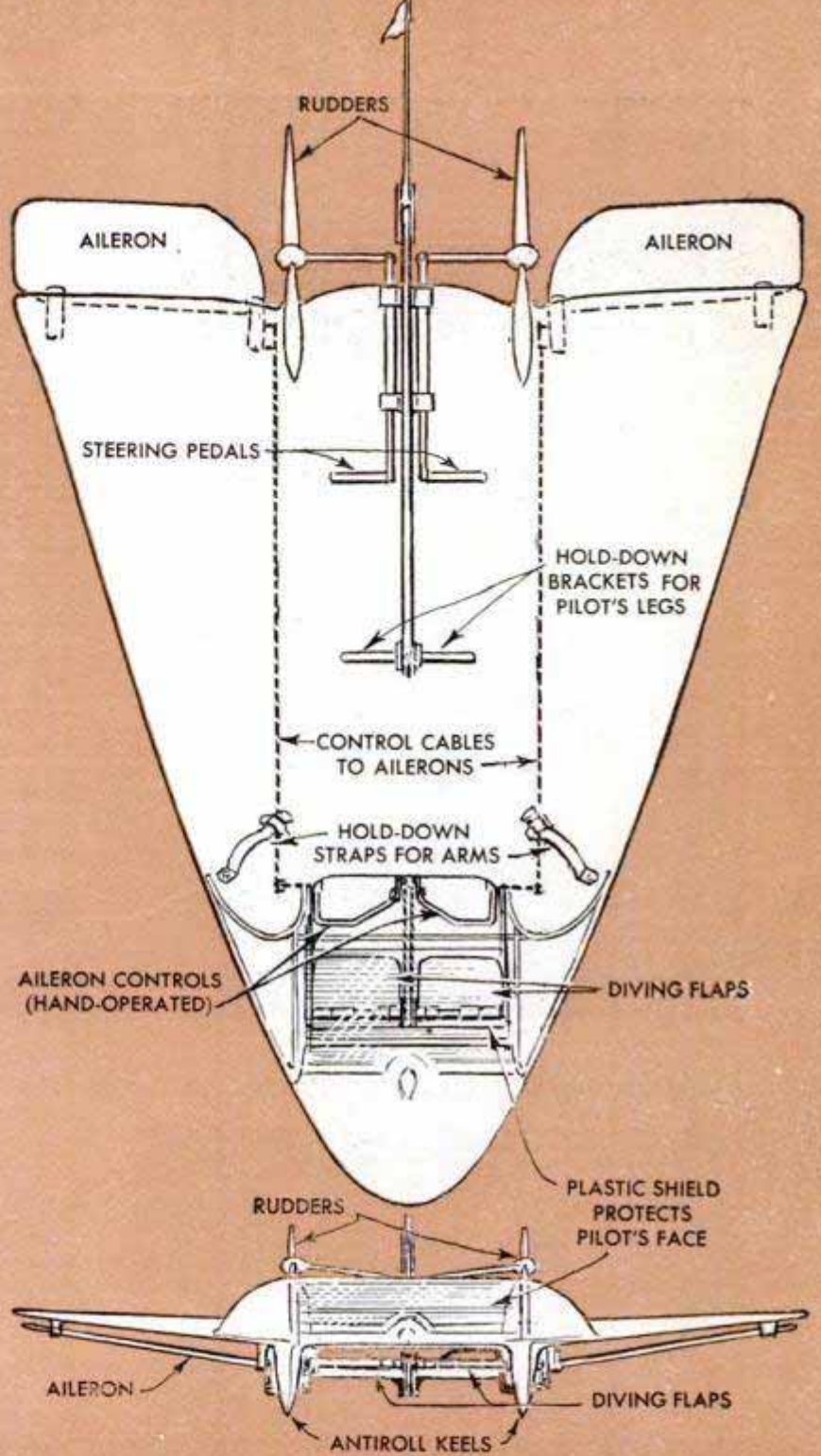
Below left, red objects are rudders controlled by foot pedals. Right, pilot displays a souvenir of a flight



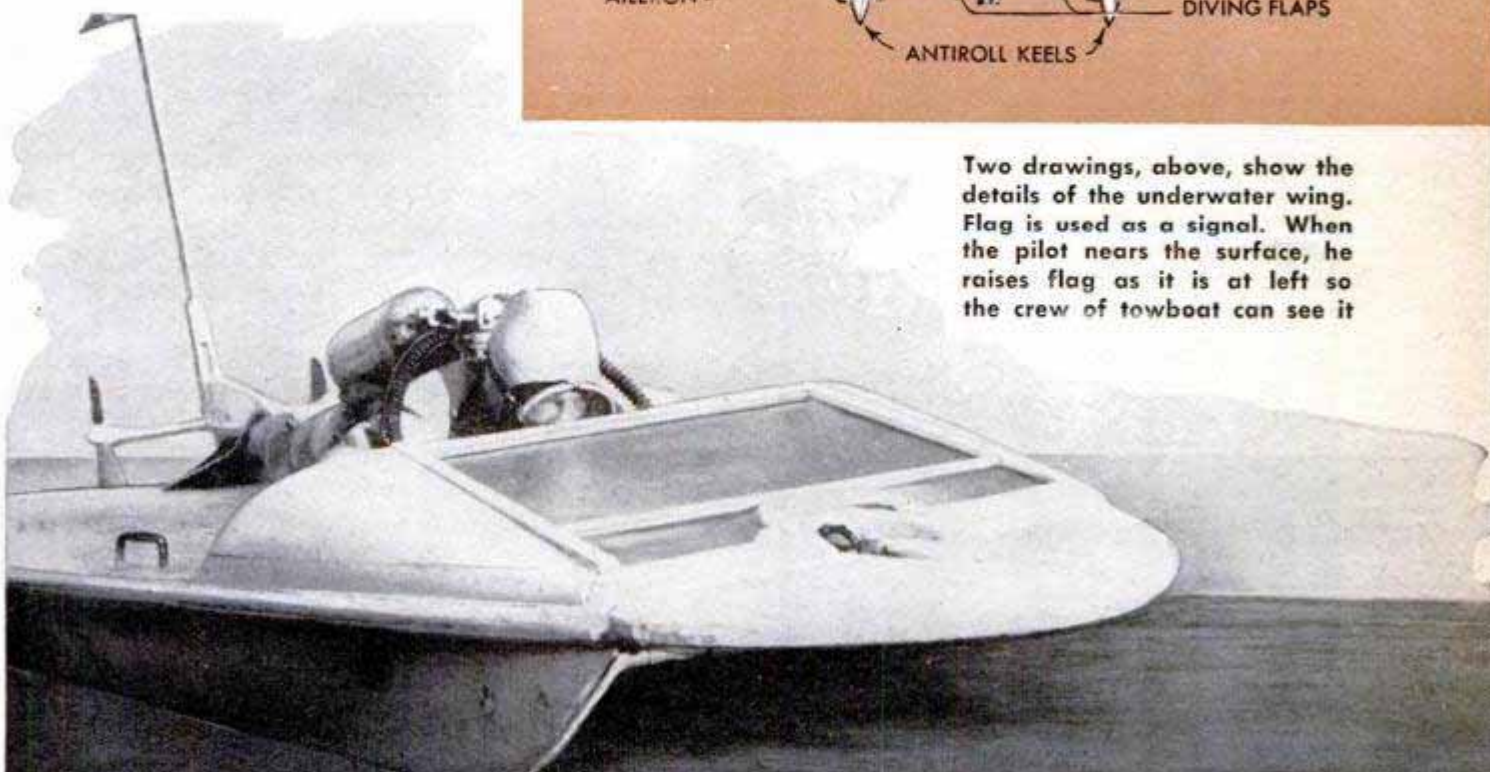
when on the wing's first sea trial, the Manta flipped from the water, broke her towline and headed for shore at a lively clip, landing high and dry.

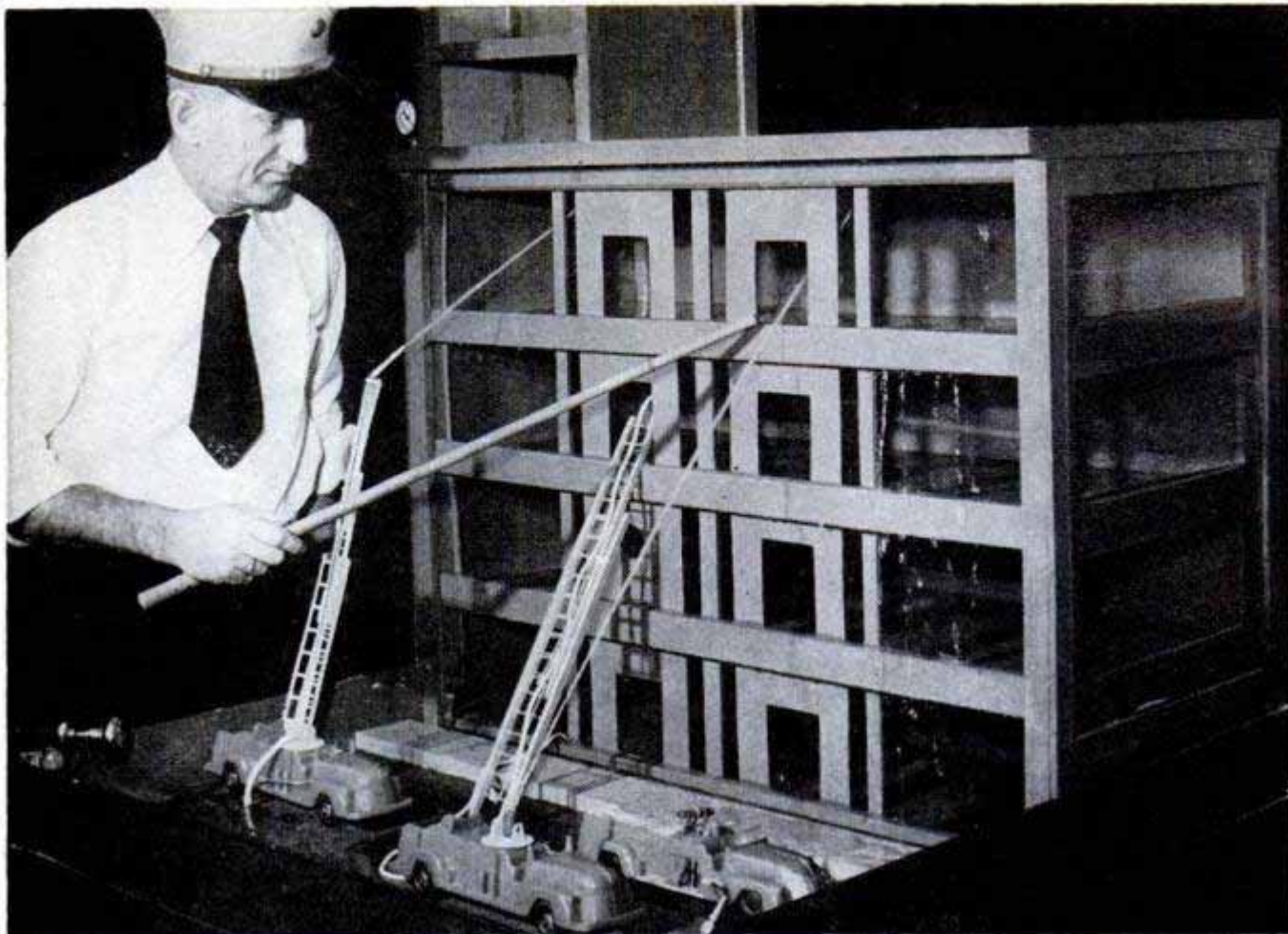
A second run that afternoon was more successful, and the Manta has been going strong ever since. Vanlaer is rigging an electric signal system to connect the Manta with the towboat by a two-way circuit that will be entwined in the towrope. A battery on the boat will provide power to ring a bell activated by a button control on the wing. Thus a Manta pilot, by a system of code signals, will be able to order course and speed changes while soaring beneath the sea. Vanlaer is also designing an engine which he hopes will provide the Manta with its own propulsion system and make it completely free to wander around the ocean floor unhampered by the limitations of a towrope. "A good pilot," he points out, "can easily perform all kinds of maneuvers as it is—barrel rolls, ups and downs, climbing and diving turns."

As it stands, Vanlaer considers the Manta a perfect vehicle for scientific study of undersea flora and fauna over wide areas. A Manta rider uses half the air a regular diver consumes in his underwater excursions. ★ ★ ★

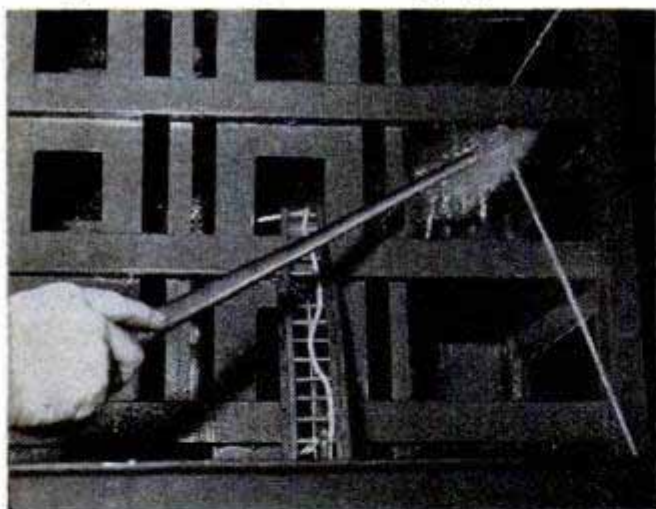


Two drawings, above, show the details of the underwater wing. Flag is used as a signal. When the pilot nears the surface, he raises flag as it is at left so the crew of towboat can see it



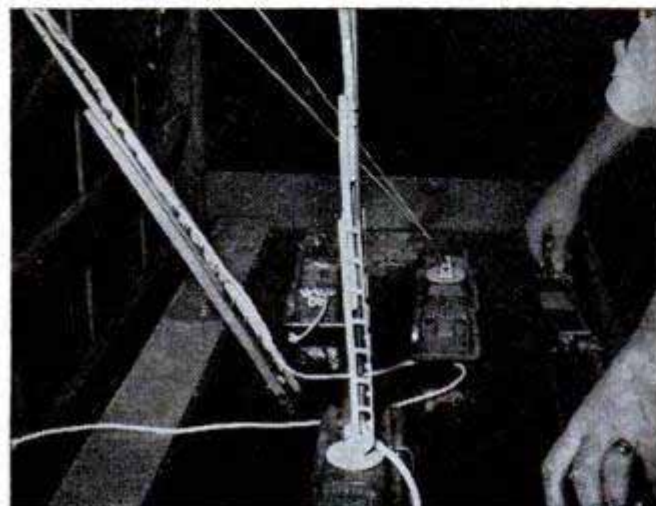


## Tiny Building and Equipment Illustrate Fire-Fighting Lessons



AN EIGHT-STORY miniature building and plastic toy fire trucks, revamped into actual working models, are helping in the training of West Hartford, Conn., firemen. The realistic set was designed and built by deputy chief John O'Laughlin to aid in demonstrating the latest methods of fire control. Though only four feet high, the building has a simulated height of 98 feet and a pressure-fed sprinkler system which draws its supply from a water tank on the roof of the structure. Odds and ends found around the fire department's repair shop went into the conversion of the toy trucks and pieces of brass were lathe-turned into scale-sized nozzles.

During classroom sessions, the deputy chief builds small fires on the various floors and then, by means of the sprinkler system, extinguishes the blaze or brings the trucks and hose equipment into action. The tiny trucks have hose equipment consisting of a ground gun, a deck gun and an aerial gun which throw streams of water into the stories at the proper angles. Individual pet-cock valves control the water supply to each truck and a drain carries off excess water flowing from the building.



Water deflected off the ceiling, top left, can be used as sprinkler to quench flames. Left, pet cocks control force of water directed into the miniature building





# Detroit Listening Post

*By Siler Freeman*

**T**HE AUTO PLANTS will turn on the steam this month to make up for production losses during the 53-day steel strike. This will be the last big month for output of 1952 models. The new models will follow closely the last of the 1952s, but inevitably there has been a delay in introductions.

Not that the plants will not be making this year's models in November and some in December. Schedules are being run out but there is a much better chance of getting a 1952 model quickly than a 1953 model. Steel shipments in this quarter, while better, are still fluctuating enough to make uncertain how fast the dealers will be stocked with 1953 models so that they can count on deliveries to customers. There will be a push, however, by the manufacturers to get the new models into production and iron out the inevitable "bugs" in the assembly lines.

Hopes for an early start on the new Chevrolet appear dim right now. Chevrolet dealers had hoped to get the jump on their arch rivals with an early showing of the new, restyled models. Now it appears they will not have them in their showrooms until the first week in January, perhaps the second.

Buyers will be intrigued next year by air-conditioning units offered by General Motors and Chrysler. The GM unit will be available on the Cadillac and Oldsmobile and is a product of GM's Frigidaire division. It marks the successful result of many years' striving for a small, compact unit that will permit installation in the back of a car and work efficiently. The Chrysler unit is the product of a research program dating back to 1939 and has been on test cars for years.

Another attention-getter this coming year will be a rash of American sports cars, which have been discussed in this column before. Chrysler's C-200 will be built in limited numbers, probably about 300 being scheduled for the initial test. Buick's Skylark will be put into production and both Cadillac and Oldsmobile will test reaction by showing their versions of the American sports car in the GM show, due for the Waldorf-Astoria the middle of January. Packard has made no move as yet.

Naturally, both of these attention-getting moves will affect only a small segment of the car-buying public because of price. The tag on the air-conditioning units is still being debated but it will be in the neighborhood of \$500. The sports cars will be priced at least \$1000 over what the regular convertible is now tagged.

But both are long-range possibilities as yet. Air conditioning for all cars is an engineer's dream. Only high-volume output could put it, like power steering, within the reach of the lower-priced car buyers. After all, automatic transmissions at first were believed too luxurious an item to be offered the general public.

Larger volume would gradually bring the cost of sports cars into a more attractive price class. Most of the manufacturers who are planning this type of offering are using as much of their regular tooling as possible.

Buick, for instance, adapts the Roadmaster chassis to the Skylark. It may even go in for Kirksite dies for the body changes to hold the cost figures down. Chrysler will use the New Yorker chassis for its C-200. Cadillac and Olds, too, will utilize much of their basic designs.

All the sports cars will have one thing in common, wire wheels. It is the spin of the style turntable that brings these back into the American field. Wire wheels once were common, now there isn't a single wire-wheel manufacturer on this side of the ocean. But there will be soon, if the trend continues.

A former high-priced item promises to reach down into the mass market in the coming year. This is the tubeless tire. B. F. Goodrich Co., which pioneered the tubeless tire, finally bringing it on the market after years of testing, has announced a new low-priced tire of this variety in volume production. At least one passenger-car manufacturer may use it as original equipment.

The tubeless tires now in use have proved themselves. They are lighter, build up less heat and are almost blowoutproof. They use quite a large amount of natural rubber but this is now plentiful and the price is getting much nearer synthetic.

THE POPULAR MECHANICS MOTOR SURVEY  
AS CONDUCTED BY FLOYD CLYMER

# The OWNERS

- 1- I am the owner of a 1952 Lincoln:  
2- I have owned it approximately \_\_\_\_\_  
Speedometer, now 9,471  
3- Having tried both kinds, I find the  
regular gasoline  premium (high test) gasoline   
4- My average gasoline mileage is 14 m.p.g. for city driving, and  
16 m.p.g. for country driving.  
5- I CHANGE OIL  every \_\_\_\_\_ miles (never add oil between changes).  
I change oil every 5,000 miles, but also ADD  one quart every 2,000 miles.  
6- Roadability and handling qualities are: Excellent  Good  Unsatisfactory   
7- Maneuverability in traffic seems to be: Excellent  Good  Unsatisfactory   
8- Acceleration is: Exceptional  Very Good  Average  Poor   
9- Curb and road clearance is: Satisfactory  Too High  Too Low   
10- Here are my main reasons for purchasing a Lincoln: Modernistic in appearance, good trade in, Wonderful riding and handling features.  
11- Particular features I like are:  New ball-joint type front wheel suspension  
 New body styling in general  "Overhead mounted" brake & clutch pedals  
 Combination front bumper & grille  Center location of gas-filler pipe at rear  
 Compact, unit-type instrument panel  Shorter, 123-inch wheelbase  
12- Specifically, what do you dislike about your Lincoln? The Chrome is terrible. Windows rattle too much, car that expensive should have backup lights standard.  
13- Have you ever owned a Lincoln before? Yes  No  How many? \_\_\_\_\_  
14- Would you buy another Lincoln? Yes  Possibly  No   
15- How do you rate your dealer service? Excellent  Good  Average  Poor   
16- How do you rate your Lincoln, generally? Excellent  Good  Average  Poor

### GENERAL INFORMATION

- 17- What type of engine would you prefer in your next new car? In-line  V-type   
Number of cylinders: 6  8  Valves: Side  Overhead   
18- Are you satisfied with the horsepower rating of your Lincoln (160 h.p.)? Yes  No   
Approximately what H.P. rating would you like in your next new car? 190  
19- What specific improvements would you like to see in your next car? Better and more chrome, more acceleration after it slows to 15 or 20 M.P.H.  
20- Based on your present experience, which transmission would you prefer: Conventional   
Conventional with Overdrive  Hydra-Matic Drive  Other type automatic trans

This questionnaire will be tabulated fairly, and your name will be held in strict confidence; we request that you attend to each question listed. Thank you.

Please mail promptly to:

FLOYD CLYMER,  
1268 SO. ALVARADO ST.  
LOS ANGELES 6 CALIF.

My name: \_\_\_\_\_  
Address: \_\_\_\_\_  
City & State: Charlotte, N.C.  
Occupation: Salesman

Write your personal comments here:

*Car rides, and handles exceptionally well especially at high speeds. Hugs the road and sticks to curves better than any.*

Clymer tests the Lincoln on the washboard roads that trail off from the Western highways. His personal test yielded the same results as a poll of the owners: The Lincoln is a rugged, easy-to-handle car



The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1952 cars who answered questionnaires sent by *Popular Mechanics* to 1000 Lincoln owners from coast to coast

# REPORT on the '52 LINCOLN

By Floyd Clymer

**M**OST LINCOLN OWNERS consider themselves among the elite in American motordom. They expect, according to our survey, a high degree of perfection in their cars. Some minor defects which owners of other makes haven't bothered to mention in previous surveys were brought up gravely by Lincoln owners, who seemed to think their cars should be above reproach. They expressed a demand for high-quality materials and workmanship.

Seventy-seven percent of those reporting use premium gasoline, and many of these never have bothered to try less expensive fuel. Although a number reported low gasoline mileage, the over-all average (16.2 miles per gallon for country driving and 13.3 miles per gallon for city driving) showed that the new Lincoln engine is somewhat more economical to operate than its predecessors. The average Lincoln owner seems more interested in performance.

Several owners registered complaints of excessive oil consumption and oil leakage. The new overhead-valve V-8 engine has found general favor but may still have a few "bugs." Although some owners complained of noisiness of the overhead-valve mechanism, 88 percent want this type in future cars. The present horsepower output of the engine appears satisfactory; 80 per-

cent indicated no desire for a horsepower increase in future models.

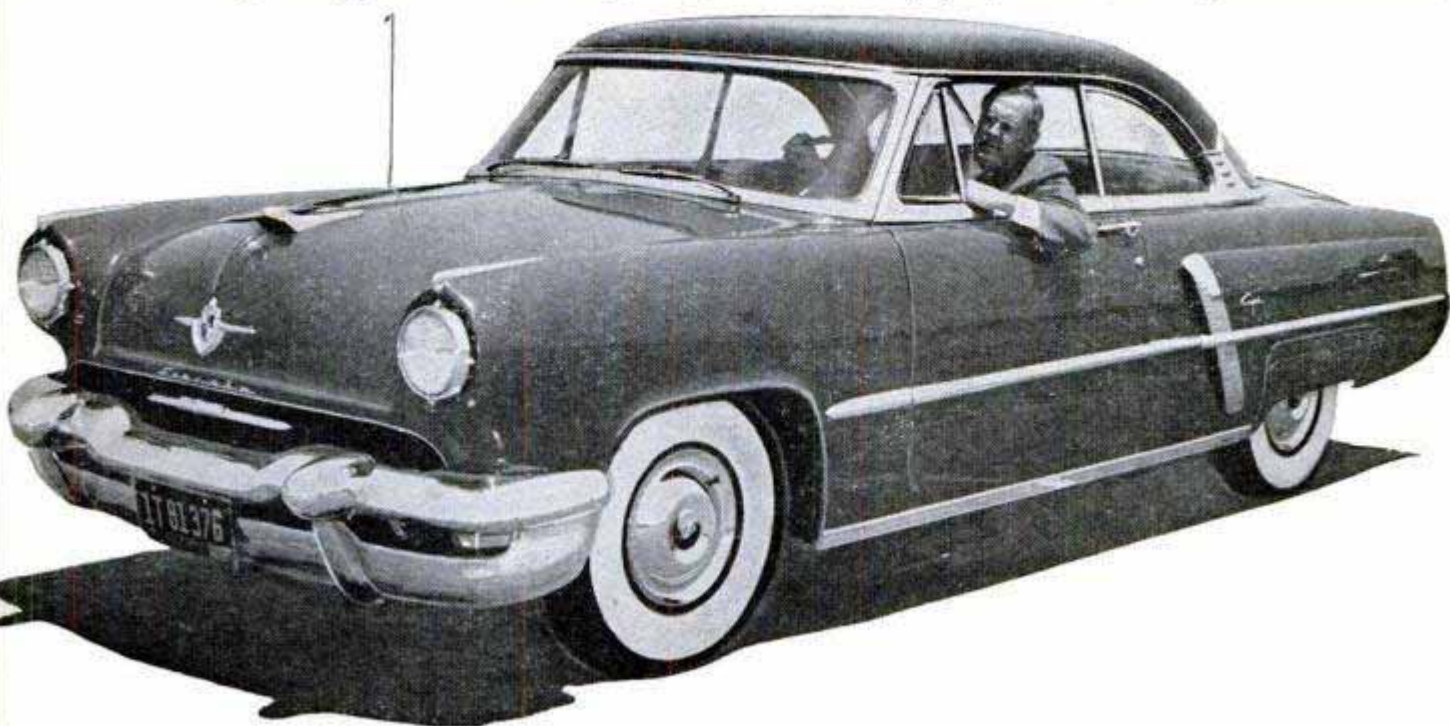
It is obvious that the owners now take automatic transmissions for granted; 94 percent want such a unit on their next car, while all have it on their present '52 Lincolns. Hydra-Matic drive was favored, although many suggested that Lincoln use Fordomatic or Merc-O-Matic next time. The conventional three-speed transmission seems to have lost all appeal—not a single owner wanted it on his next car and only six percent wanted it with overdrive.

## ACCELERATION TESTS

1952 LINCOLN CAPRI  
WITH DUAL-RANGE HYDRA-MATIC

¼ mile from zero	Drive range only .....	22.2 sec.
	Low and Drive .....	21.3 sec.
½ mile from zero	Drive range only .....	33.6 sec.
	Low and Drive .....	32.4 sec.
0 to 30 m.p.h.	Low range only .....	4.9 sec.
0 to 60 m.p.h.	Drive range only .....	15.9 sec.
	Low and Drive .....	14.8 sec.

(In tests using both Low and Drive, shift from Low to Drive was made at 30 m.p.h.)  
Top speed (by speedometer) showed over 110 m.p.h.  
Actual top speed, about 7% less (speedometer variation)



# Percentages From PM Poll

Owners of Capri models.....	53%
Owners of Cosmopolitan models.....	47%
Use premium gasoline.....	77%
Use regular gasoline.....	23%
Average gasoline mileage in country.....	16.2 m.p.g.
in city.....	13.3 m.p.g.

(All Hydra-Matic-equipped cars)

Average mileage for oil change.....	1391
Owners who add oil (also change periodically).....	24%
Average mileage for adding one quart.....	863
Roadability excellent.....	88%
good.....	11%
unsatisfactory.....	1%
Maneuverability excellent.....	82%
good.....	17%
unsatisfactory.....	1%
Acceleration exceptional.....	46%
very good.....	37%
average.....	14%
poor.....	3%

## BEST-LIKED FEATURES

New body styling.....	90%
Ball-joint front suspension.....	71%
"Overhead mounted" foot pedals.....	70%
Center location of gas-filler pipe.....	65%
Unit-type instrument panel.....	60%
123-inch wheelbase.....	58%
Combination bumper and grille.....	45%

(These percentages are based on answers to direct questions asked in questionnaire.)

## OWNERS' RATING OF CAR

Excellent.....	63%
Good.....	23%
Average.....	9%
Poor.....	5%

## GENERAL INFORMATION

Owners preferring the following on next car:	
V-type engine.....	98%
In-line engine.....	2%
Eight cylinders.....	99%
Six cylinders.....	1%
Overhead valves.....	88%
Side valves.....	12%
No increase in horsepower output.....	80%
Average horsepower output desired.....	161*
*(Lincoln horsepower figure—160—was tabulated for those owners who expressed satisfaction with present ratings.)	
Automatic transmission.....	94%

Conventional transmission with overdrive.....	6%
Conventional transmission only.....	0%
Hydra-Matic drive exclusively.....	89%*
Other type of automatic transmission.....	11%*

\*(Percentage of the 94% preferring automatic-transmission units.)

Previous Lincoln owners.....	63%
Will buy another Lincoln.....	65%
Might buy another Lincoln.....	27%
Will not buy another Lincoln.....	8%
Dealer service rated:	
excellent.....	42%
good.....	30%
average.....	15%
poor.....	13%

Chief purchase reasons (in order of popularity):

1. Styling features—interior or exterior
2. Lincoln-prestige factor
3. Previous Lincoln ownership
4. Driving ease—roadability and handling
5. Riding qualities
6. Mechanical features—engine, transmission
7. New V-type, overhead-valve engine
8. Performance impressions from demonstration

Improvements desired in next car (in order of preference):

1. Increased acceleration and power
2. Distinctive body styling (unlike other Ford products)
3. Better body fit, assembly
4. Quieter and smoother-running engine
5. Smooth-shifting automatic transmission
6. Higher quality hardware, interior fittings
7. Improved mechanical accessibility (battery and spark plugs more convenient)
8. Increased legroom
9. Easier steering at low speeds—power-assisted or otherwise
10. Higher quality chrome and paint finish.

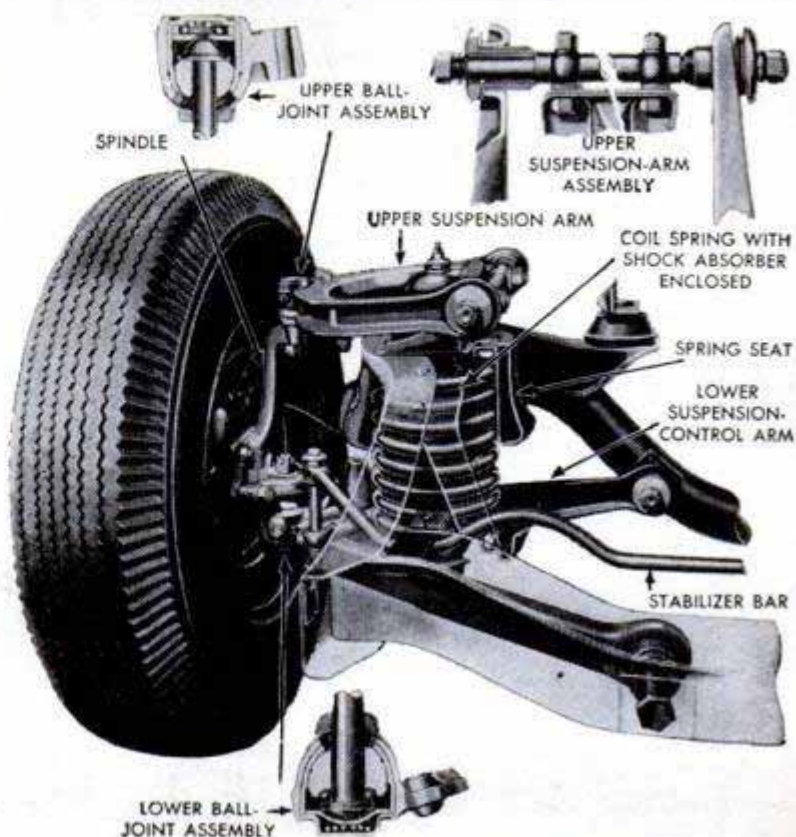
Most frequent objections:

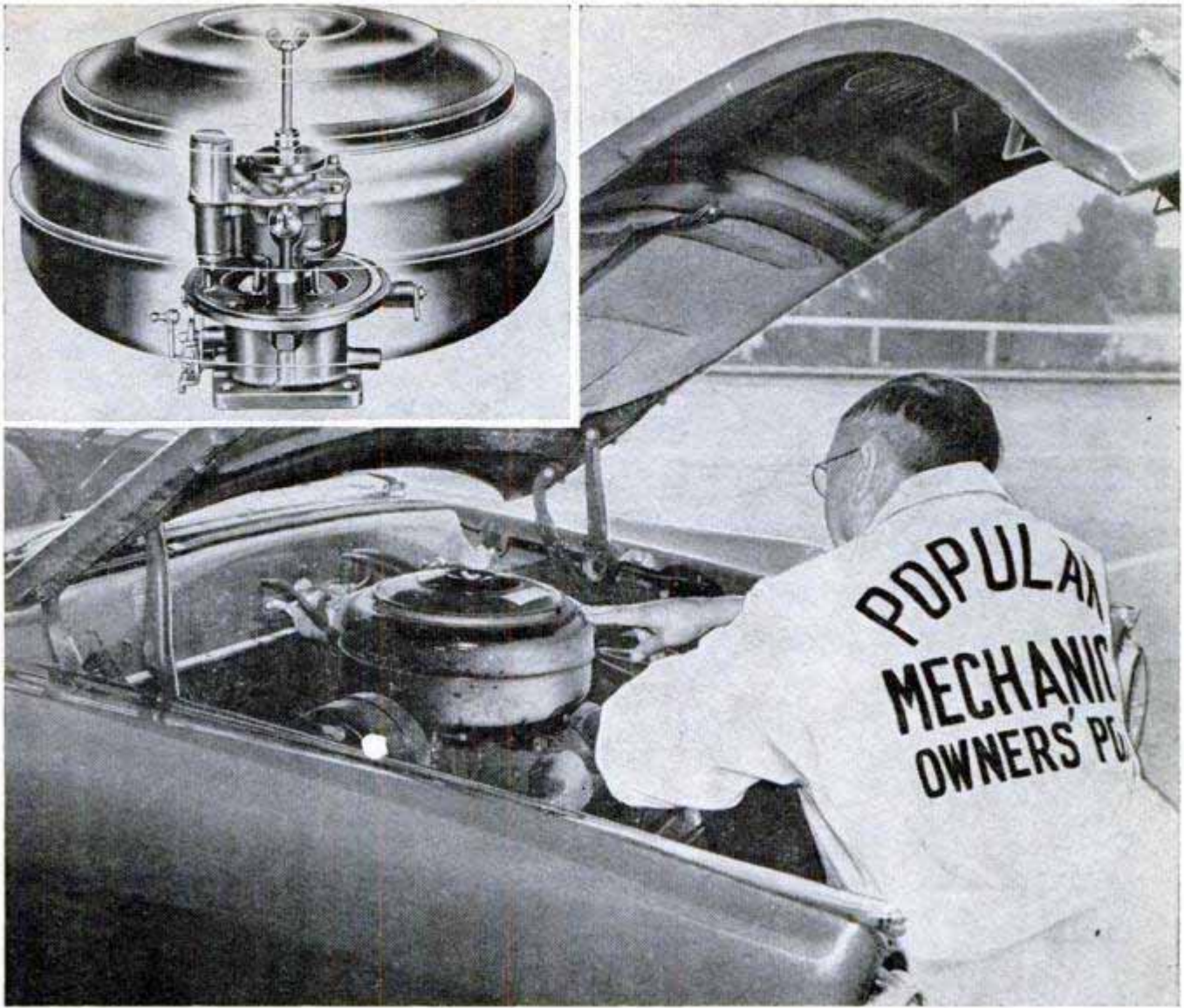
1. Body-styling features—similarity to other Ford-built cars, short wheelbase
2. Rough engine performance at lower speeds and idling
3. Lack of acceleration and power—particularly at cruising speeds
4. Noisy engine—particularly in the overhead-valve mechanism
5. Jerky shifting or noisy automatic transmission
6. Thin chromium trim and paint finish
7. Body fitting, poor assembly, etc.
8. Excessive oil consumption
9. Inadequate legroom in rear and front
10. Thin metal in window cranks and door handles

A great majority of owners approved Lincoln's new body styling, the unit-type instrument panel, the new ball-joint type front suspension, the pendulum (overhead-mounted) brake and clutch pedals and the shorter, 123-inch wheelbase. Of seven new Lincoln features we listed on the questionnaire, the combination bumper and grille was the least liked and was noted as a complaint in several cases. The centrally located gas-tank filler is liked by 65 percent of the owners, and more would like it if the license plate did not have to be held down while the tank is being filled.

More than 60 percent of the owners polled had owned Lincolns previously and 65 percent indicated

**New ball-joint front suspension system gives easy ride, stability at high speeds**





Big air cleaner surrounds carburetor instead of being mounted on top. Padding under hood deadens sounds

they intend to buy another one. Dissatisfaction with various features was expressed by eight percent, who said they definitely would not buy another Lincoln. Seventy-two percent said dealer service was excellent or good, while 28 percent said it was average or poor. As our surveys of other makes have shown, an improvement in dealer service seems to be needed.

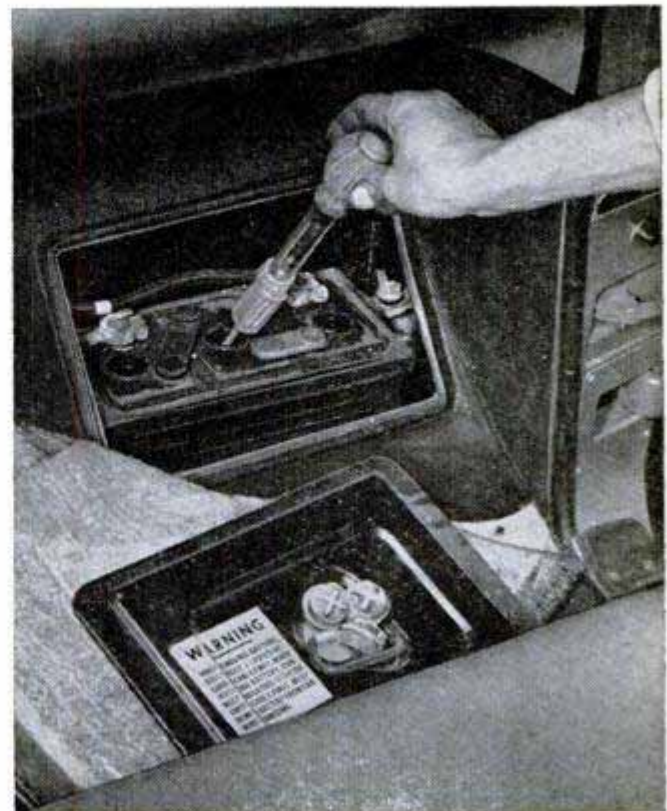
Some typical comments on the 1952 Lincoln Cosmopolitan and Capri models:

"Modernistic in appearance, good trade in, car rides and handles exceptionally well at high speeds. Three cheap features mar the finest car on the road: Thin, flimsy chrome on the front grille, cheap material in back of back seat, and cheap siding for doors."—Charlotte, N. C., salesman.

"Outside of being a little underpowered for its weight, my Lincoln Capri is a great car. Fastest I've ever owned—110 miles per hour is easy by speedometer. Roadability beats them all. My next car will again be a Lincoln and my dealer is also tops."—Chicago attorney.

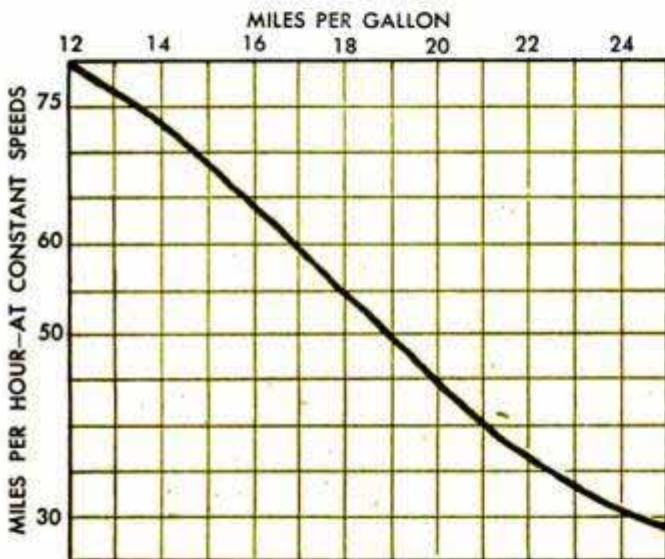
"Interior trim and appointments equal to the finest custom coachwork of today.

Battery of the Lincoln is in a controversial new position—beneath the feet of the front-seat passenger

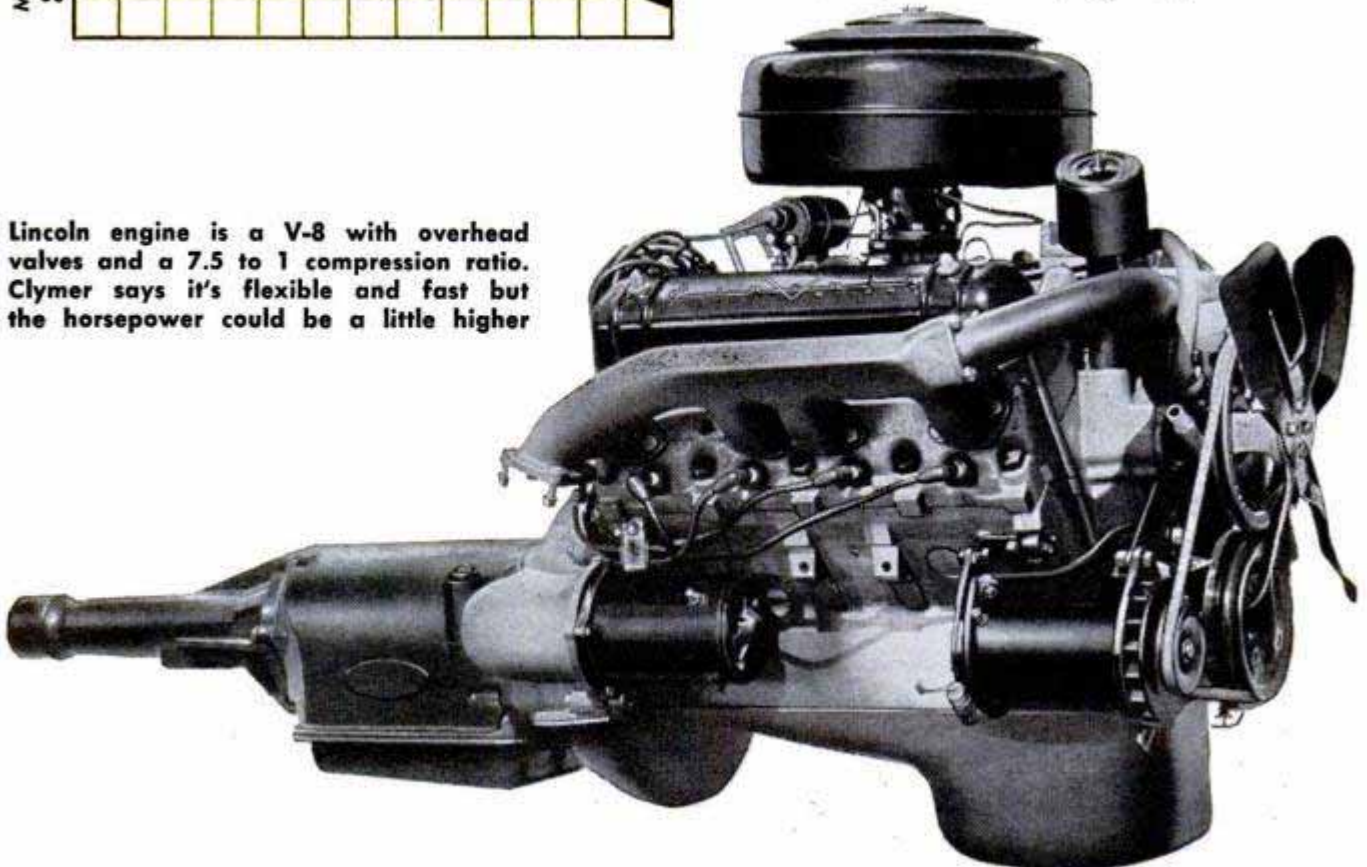




Special fastener holds visor in position. Graph below shows results of the economy test of the Lincoln



Lincoln engine is a V-8 with overhead valves and a 7.5 to 1 compression ratio. Clymer says it's flexible and fast but the horsepower could be a little higher



Mechanically, a finely engineered product. Three inches more wheelbase would allow added legroom."—Detroit plant manager.

"This is my fifth Lincoln and I have been satisfied with them all. I believe they should increase the horsepower rating. A car of this price and beauty should have more horsepower to drive it."—Morgantown, W. Va., electrician.

"I am extremely satisfied with my '52 Capri. I bought it because of good service and the faith that after '47 to '51 they were bound to come up with a good car for once. . . . This car can take corners better than any I ever have driven."—Caterville, Mass., physician.

"Roadability and maneuverability of this car is amazing. . . . It already has saved my life when I had to brake and steer to the shoulder to avoid a sight-seer in the New Mexico mountains. No other production car could have recovered its stability after this!"—Lubbock, Tex., farmer.

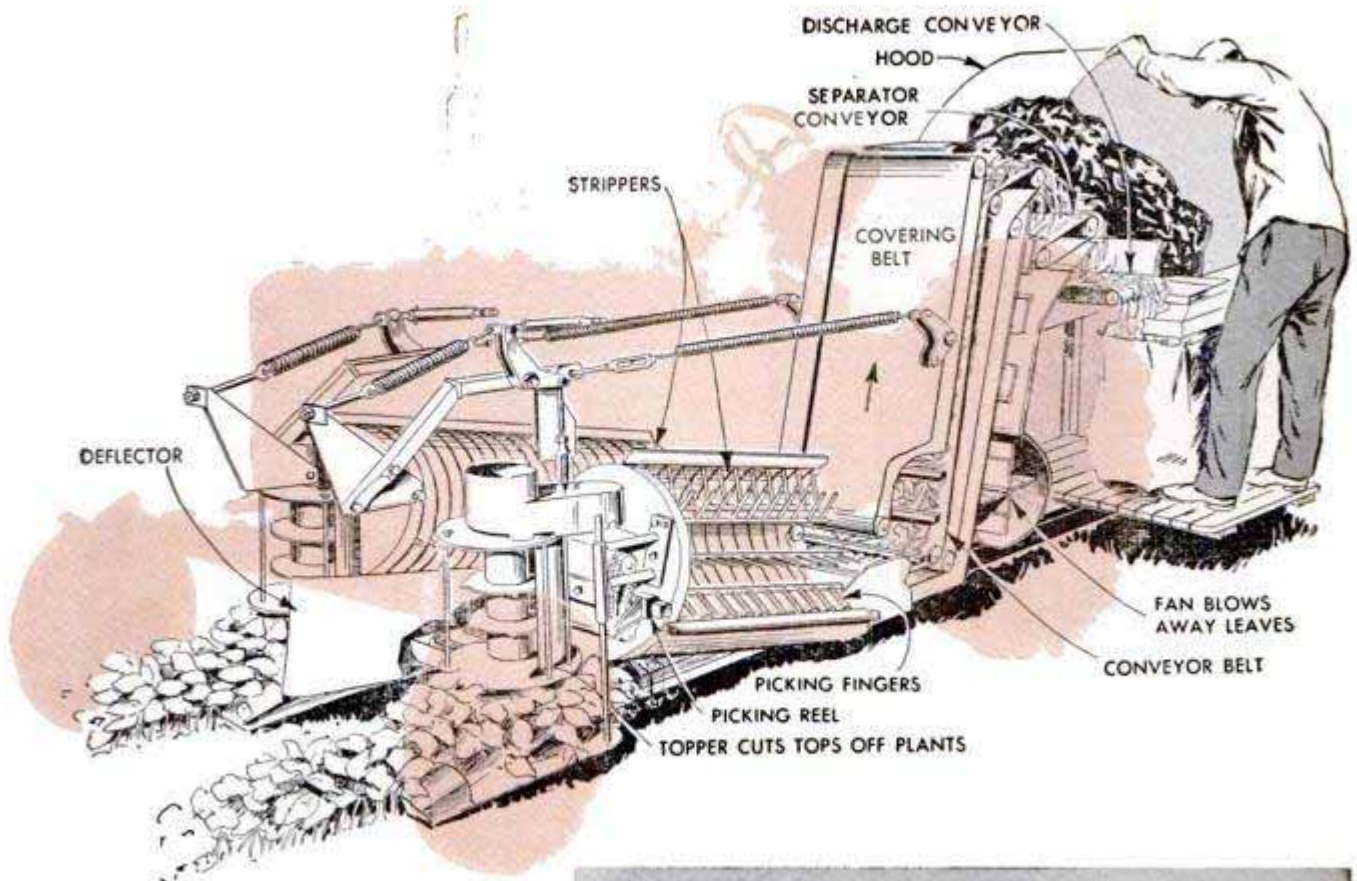
"My Lincoln is used only for business, on trips averaging 300 miles a day. It has never tired me. It has good high-speed characteristics but is sluggish at speeds below 50 miles per hour."—North Hollywood, Calif., highway contractor.

"Engine quiet at all speeds, the least road noise of any car I ever have driven."—San Rafael, Calif., executive.

"Finest car I've ever driven. If only I could get four miles more per gallon, I'd be satisfied for life."—Eau Claire, Wis., cafe owner.

"I am very impressed with the ease of

(Continued to page 252)



## Bean Picker

Snap beans are combed right off their plants by a new harvester which strips two rows at a time. The picker is mounted on a four-wheel tractor and operates from the power take-off. A cylindrical picking reel is mounted on each side of the tractor. As the tractor moves down the rows, a topper cuts off the excess top growth of the plants. When a plant moves into the reel, stainless-steel fingers comb off beans and leaves and deposit them on a conveyor. The reels are sloped down toward the rear so the picking begins at the top of the plant and works down as the tractor moves forward. The conveyor elevates the beans through air ducts which remove the leaves and soil, and the beans then move into two



discharge hoppers. The harvester can be used on certain types of beans which produce virtually the entire crop at one time, so only one picking is required. Three men, including the tractor operator, are required to run the picker.



## Telephone Night Light

Attached to any standard telephone, a lighting device serves as either a permanent night light or as a convenience light that goes on automatically to illuminate the dial when you pick up the handset. A switch controls the device. With the switch in the forward position, the light burns continuously; with the switch pushed back, the light goes on only when the handset is lifted. In addition, each time you pick up the handset, three emergency telephone numbers, written on the face of the unit, are illuminated.



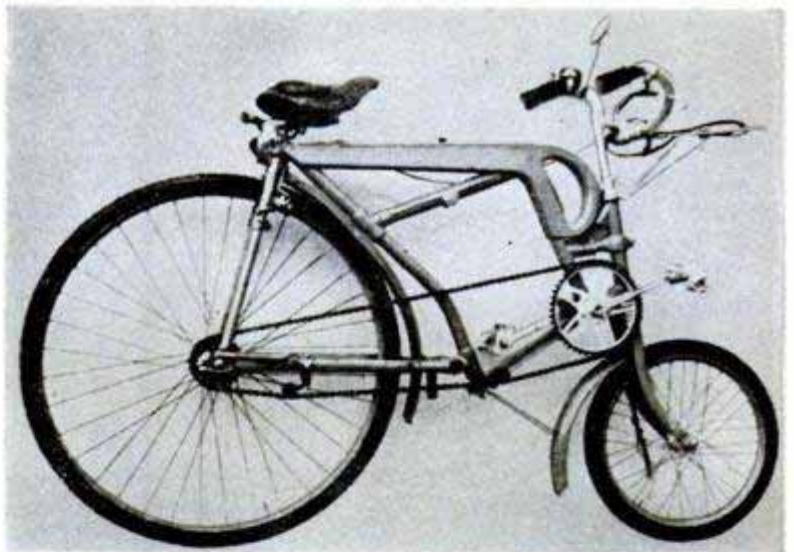
## Police Crash Car Prepared for All Emergencies

Long experienced in first-aid work, John J. Manning of Detroit, a retired police sergeant, has designed a crash car for police patrols. His invention can be adapted to any standard two-door automobile. A four-way roof light and a hood pull-over light with the word "Police" on two sides iden-

tify the car at night. Emergency equipment carried under the rear seat includes a collapsible tubular steel stretcher, fire extinguisher, shovel, sledge hammer, rope, bolt cutters, rubber gloves, dog snare, blankets and a riot gun. The right half of the front seat removes to make room for stretcher.

## French Bicycle Design Gets Greater Pedal Push

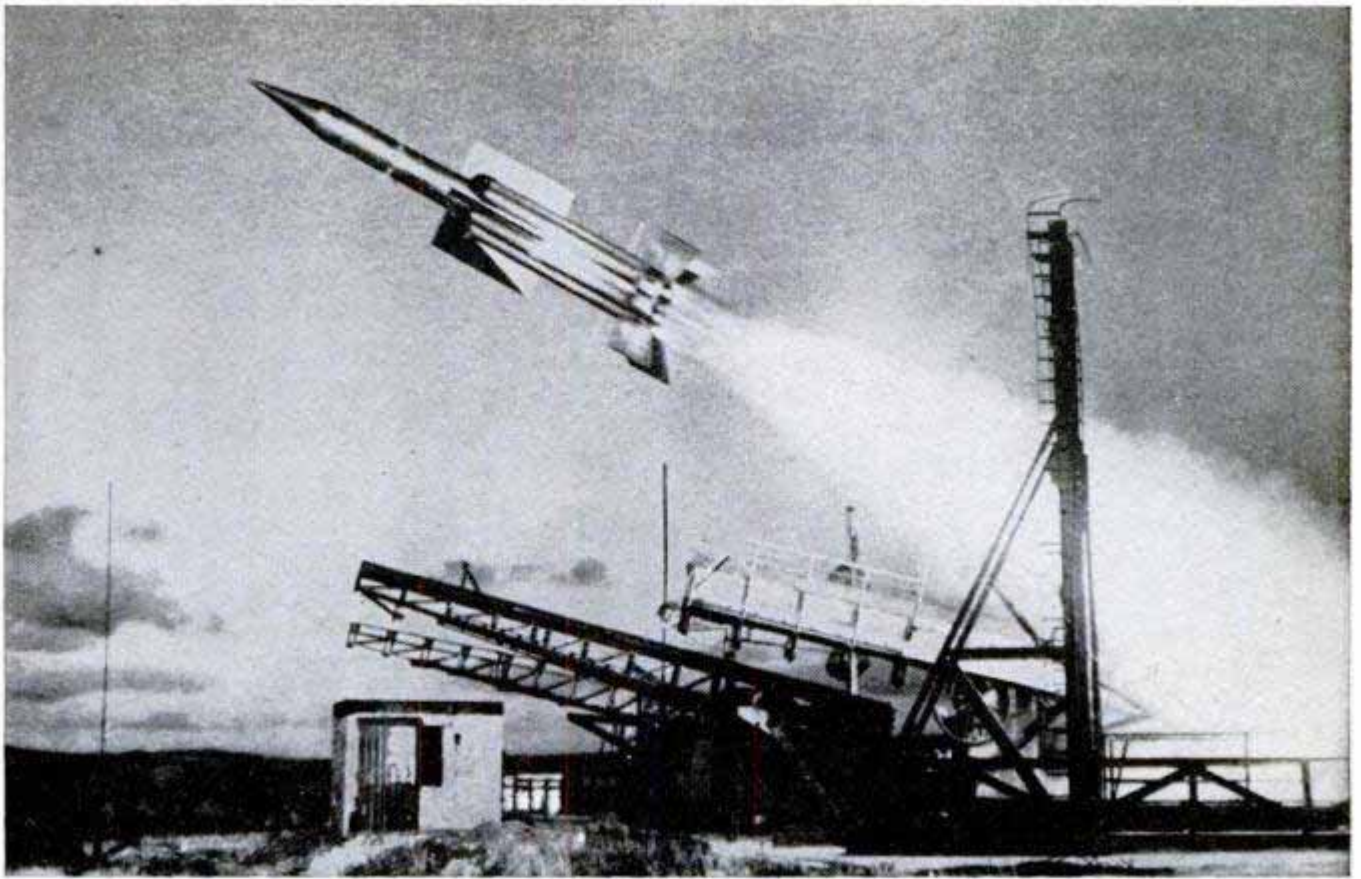
By moving the pedals forward and up so the legs pump diagonally toward the front rather than up and down, a French bicycle designer claims to have increased leg power by 30 percent. The design is based on the principle that two forces represented by the sides of a parallelogram are equal to the force represented by the diagonal. The small front wheel used in the design permits sharp turns with greater stability, the inventor claims.



## Ticket Vendor For Parking Lots

Parking lots without attendants are the result of a coin-operated ticket vendor which enables one operator to supervise several lots. Similar in operation to municipal parking meters, except that there is only one meter at each entrance, the device vends a ticket which the customer places on the seat of his locked car. Periodic checks are made throughout the day. The vendor can be set from five to fifty cents.





## British Guided Rocket Flies Over 2000 Miles Per Hour in Tests

Guided by a radar beam, an anti-aircraft rocket being tested in England travels over 2000 miles per hour and higher than any modern bomber can fly. It carries booster motors along its sides which are dropped

shortly after take-off. The missile is launched from an inclined platform. It reportedly can twist and turn with four to five times the degree of maneuverability of a pilot-manned fighter plane.

## Electronic Coffee Pot Hastens Normal Brewing Process

You'll be able to prepare coffee in a fraction of the usual time with a recently patented electronic coffee pot. Designed for use in the new short-wave-induction heat ranges, the vacuum coffeemaker is much like conventional models. The bottom sec-

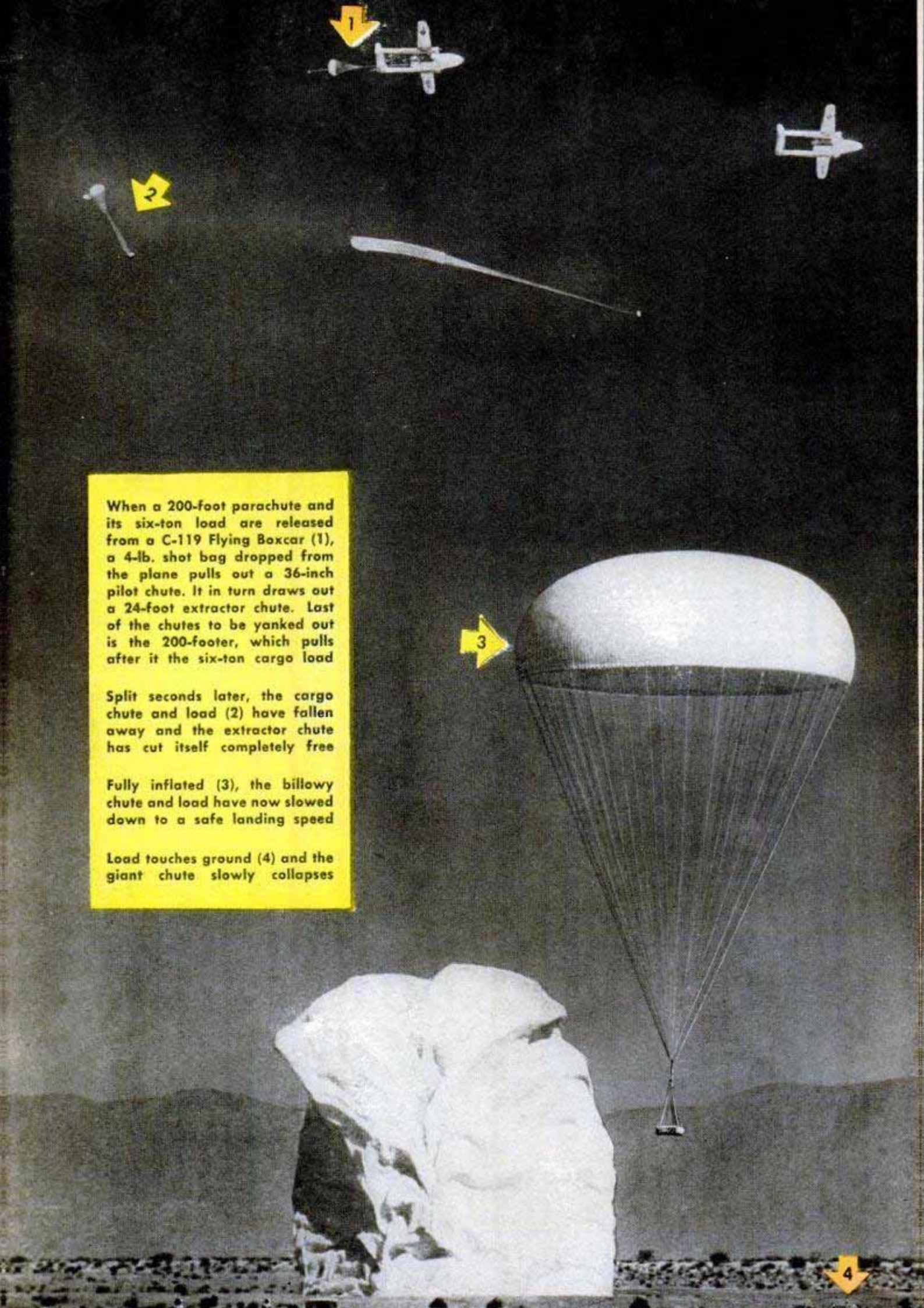
tion is of glass which allows high-frequency waves from the oven to pass through and boil the water in less than a minute. But the upper part is made of a metal which shields the ground coffee from becoming scorched during the rapid heating process.

## Versatile "Refrigerette" Keeps Refreshments Within Easy Reach

Styled like a piece of modern furniture, a miniature refrigerator stores snacks and beverages right in the room where they are to be served. Handy in recreation rooms and living rooms, the two-cubic-foot cabinet keeps refreshments within arm's reach of TV viewers and partygoers. Placed in the bedroom or nursery, the refrigerator makes midnight trips to the kitchen unnecessary. As a drug cabinet in doctors' offices or beverage cooler in businessmen's offices, the refrigerator may find extensive use. It is available in several colors.



Ⓜ Turbine and gear assembly for the aircraft carrier USS *Forrestal* will be the most powerful ever designed for ship propulsion, Westinghouse engineers report.



When a 200-foot parachute and its six-ton load are released from a C-119 Flying Boxcar (1), a 4-lb. shot bag dropped from the plane pulls out a 36-inch pilot chute. It in turn draws out a 24-foot extractor chute. Last of the chutes to be yanked out is the 200-footer, which pulls after it the six-ton cargo load

Split seconds later, the cargo chute and load (2) have fallen away and the extractor chute has cut itself completely free

Fully inflated (3), the billowy chute and load have now slowed down to a safe landing speed

Load touches ground (4) and the giant chute slowly collapses

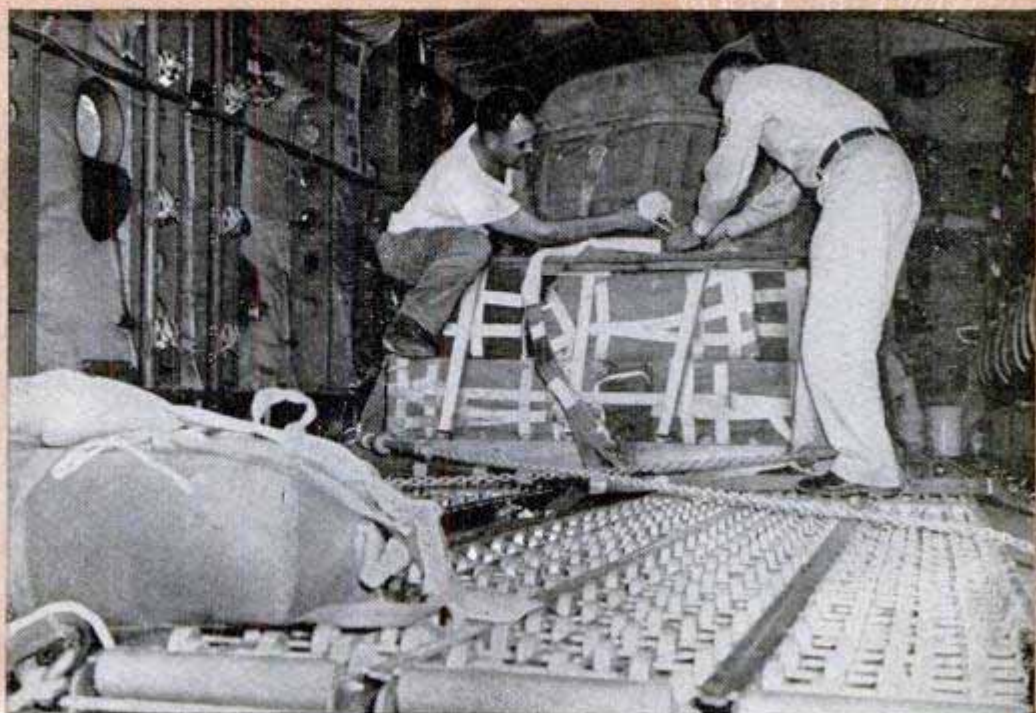
# Parachutes by the Acre

**N**OW THAT WE can drop armies of paratroopers behind enemy lines, why not equip them with big trucks, heavy artillery, and fully armored tanks, also delivered by air? Why not drop an entire convoy of armored vehicles in enemy territory, with ammunition in place and fuel tanks full, ready for immediate use?

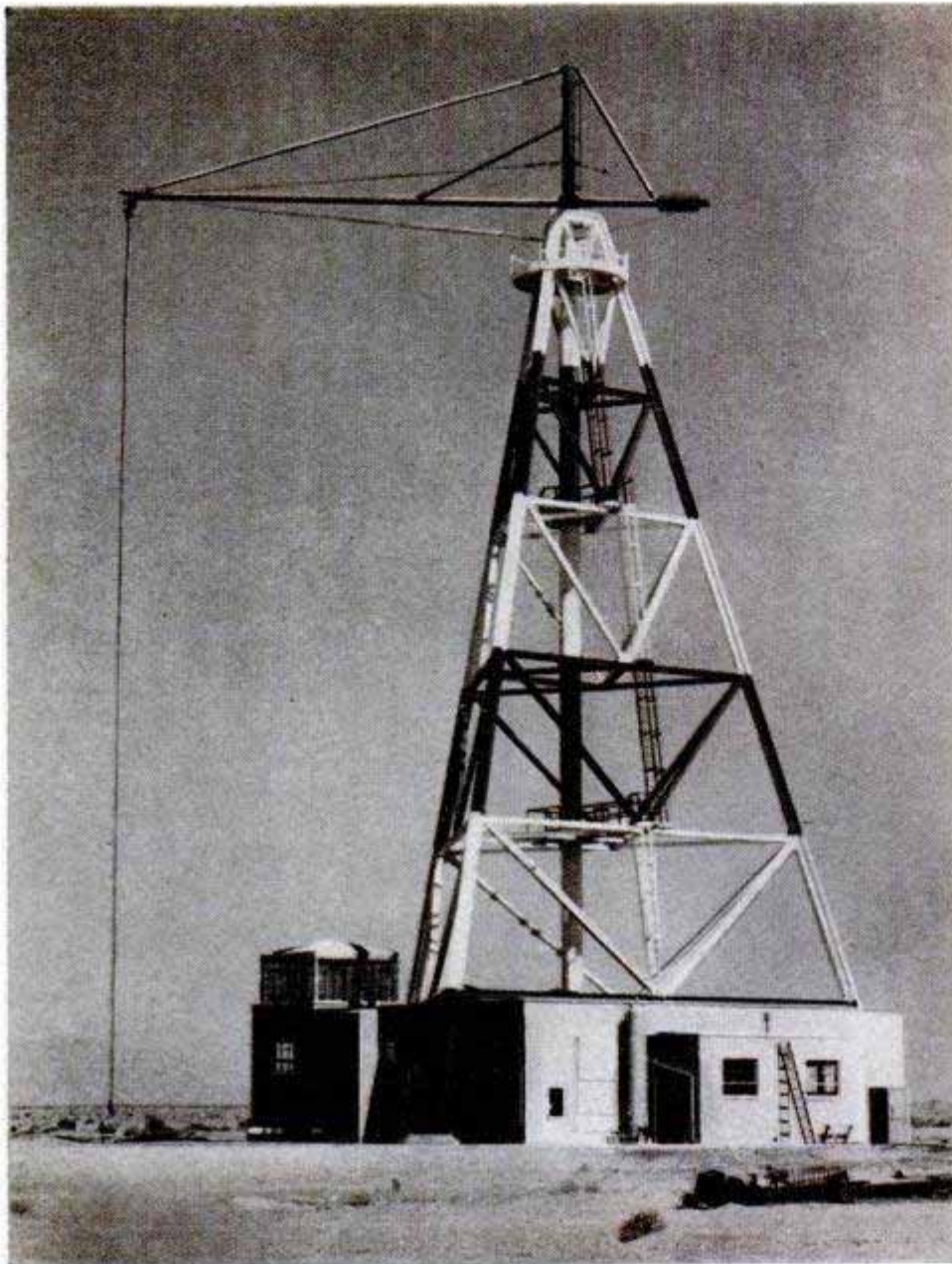
That's the reasoning behind huge new parachutes that the Department of Defense is trying out at its Joint Parachute Facility at El Centro, Calif.

Biggest of all the chutes is a giant, 200 feet in diameter, that contains about three-quarters of an acre of rip-proof nylon. This enormous white bag has lowered six-ton loads safely to the ground from 2300 feet and is

Cluster of three 100-foot chutes, above, lowering a two-ton weight. Shock of the opening ripped one

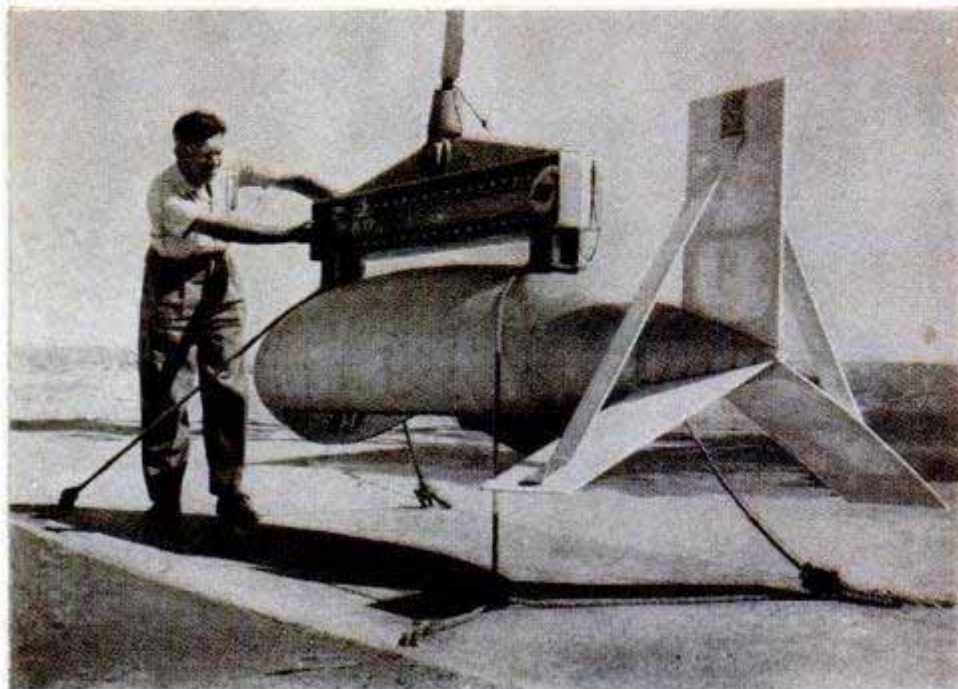


Two-ton load, with three 100-foot chutes in bags tied down on top of it, inside a Flying Boxcar



Chutes are whirled at speeds up to 500 m.p.h. on a lofty 130-foot test tower

Parachutes used in whirl-tower tests are housed in cab at the end of a long cable until release time. The cable is suspended from a rotating boom



In emergencies, test jumpers can rely on a spare chute

being further tested with loads up to eight tons. For comparative purposes, some four-ton loads are now being dropped with clusters of three or more 100-foot parachutes.

Also being tested at the parachute facility, operated jointly by Air Force and Navy personnel, are better parachutes for pilots flying at high speeds and high altitudes. Chute harnesses that are built integrally with G-suits are being tried out, and one new technique for a pilot who has to bail out at extreme altitudes is to use a three-foot parachute to steady himself while he plummets down to a comfortable altitude at

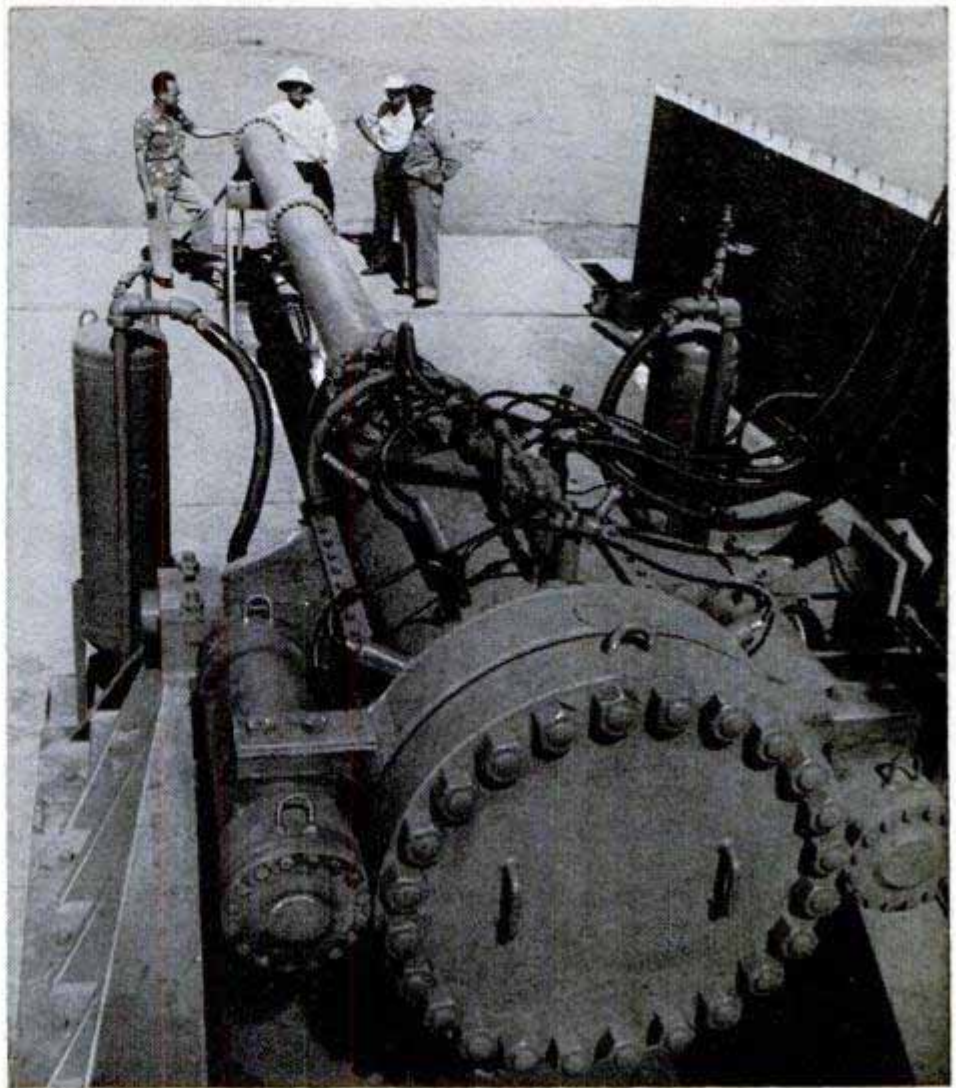
Installing data recorder in the torso of a dummy jumper



which he opens his main chute and checks his once-rapid descent to a safe speed.

New containers that are lowered by parachute and may be packed with anything from ammunition to arctic survival kits are being tested. They are used for spot delivery from the air. With practice, a pilot can land one within a 50-foot circle from an altitude as low as 50 feet, at a speed of several hundred miles per hour.

A 130-foot-tall whirl tower that will whirl experimental parachutes at speeds up to 500 miles per hour at the end of its 118-foot arm is to go into operation at El Centro, as is a new paragon that fires missiles at speeds up to Mach 2.3 (about 1750 miles per hour). Parachutes attached to the missiles will thus be tested at those speeds. ★ ★ ★



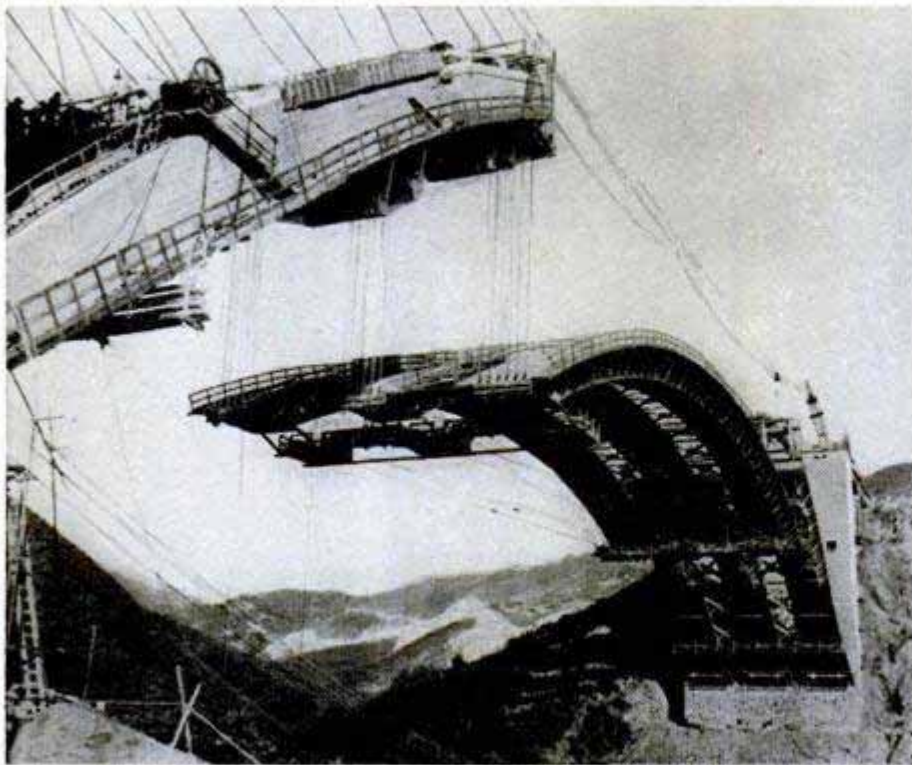
Chutes are attached to cannon-fired missiles for tests at 1750 miles per hour

Models being tested for arctic use have alternate panels of white and bright red to attract attention

Can under airplane wing, containing a complete arctic survival kit, is automatically dropped by parachute



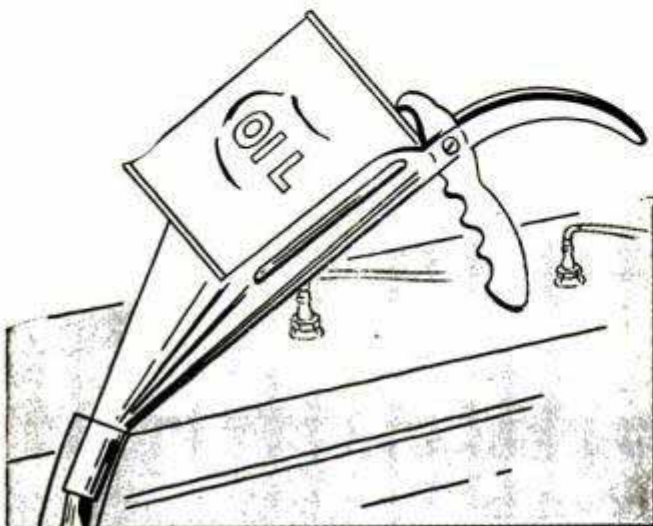
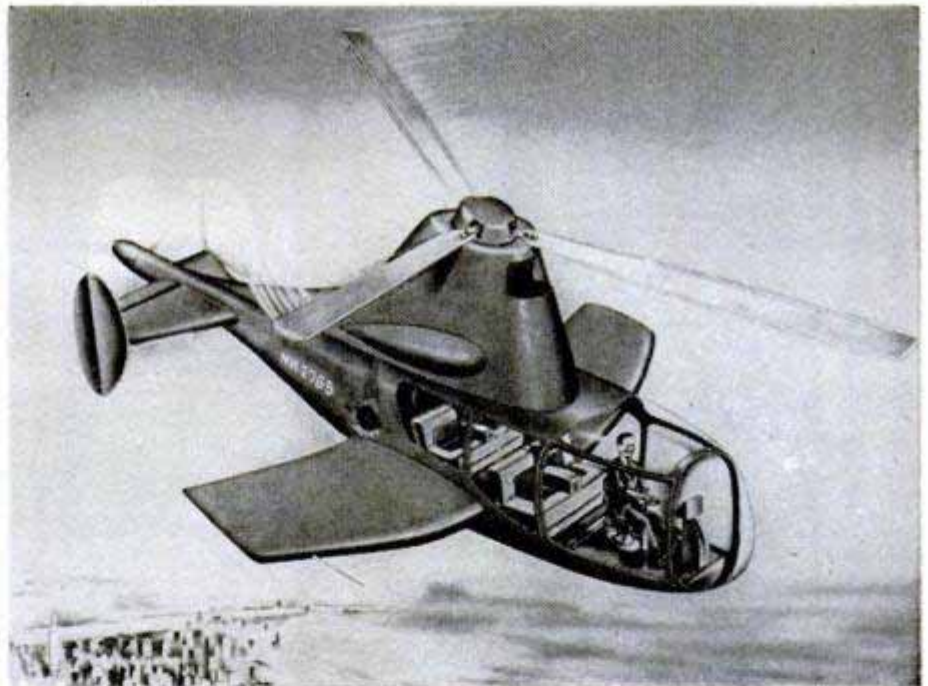
## Giant-Size Slings Ease Bridge Section Into Position



In a spectacular road-building operation in Venezuela, a complicated system of huge slings and pulleys eased a pre-stressed concrete bridge into position across a narrow but deep valley. The unique bridge is one of three along the route of the new Autopista, a 10½-mile superhighway between Caracas and La Guaira and is said to be the world's largest pre-stressed concrete span. The highway will cut the driving time between the two South American cities from one hour to 15 minutes. Costing \$6,000,000 a mile, the road is one of the most expensive ever built.

## Helicopter Taxicab

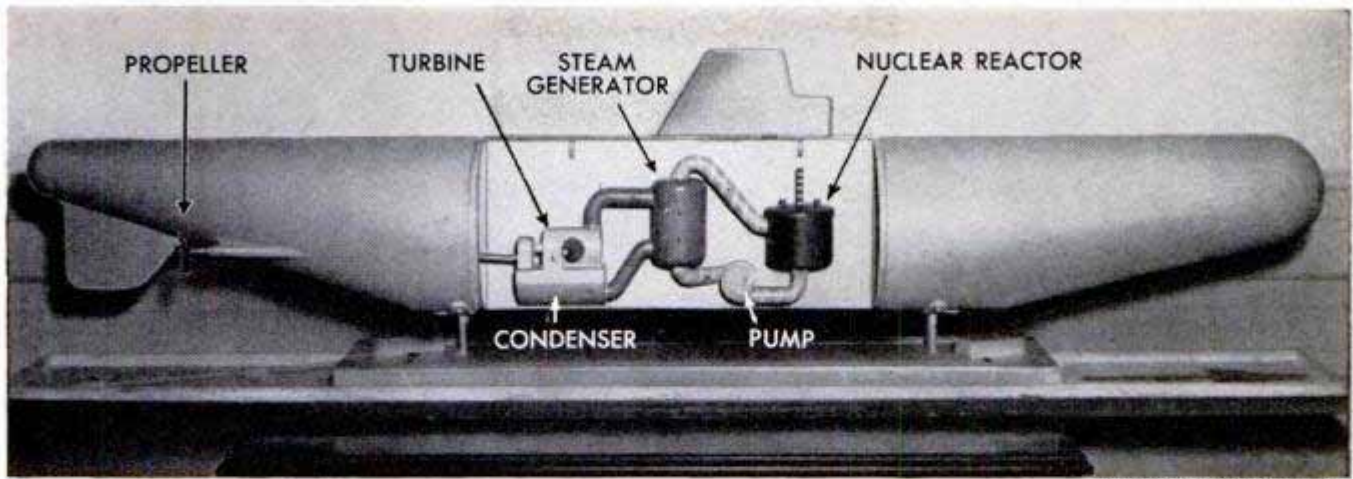
Designed as an aerial taxicab between cities and airports, prototypes of a new five-place helicopter are expected to be completed this year. Its 155-mile-per-hour cruising speed compares with about 100 miles per hour for conventional helicopters. The tubular-steel fuselage, covered with molded plastic glass fiber, will have about five times the crash strength of present designs. Stub wings will supply lift and help reduce the vibration of the rotor-blade tips.



## Motor-Oil Dispenser

Cans of motor oil are quickly pierced and their contents emptied into auto filler pipes with the aid of a cast-aluminum handle. The can simply is cradled in a trough in the handle. When the handle is squeezed, the bottom of the can is cut open by carbon-steel blades and a vent hole is cut in the top. The oil flows through a funnel built into the front of the dispenser.

☐ Air and sea rescue craft of light, bright scarlet may result from Navy researchers' findings that that color is more visible than the bright chrome yellow now in use.



Official U.S. Navy photo

## Navy Announces Its First Atomic-Powered Submarine

In the first nuclear-powered submarine, the USS *Nautilus*, one pound of uranium will develop the power of 6,200,000 pounds of coal or 360,000 gallons of gasoline. The atomic undersea ship is now under construction at Groton, Conn. Uranium fuel

generates heat at a rate controlled by three control rods at the top of a nuclear reactor. The heat is removed from the reactor by water flowing through pipes to a steam generator, or boiler, which produces steam to drive a turbine that turns the propeller.

## Electric Clothes Drier Plays Tune at End of Cycle

As a gentle reminder for the housewife, a new electric clothes drier plays *How Dry I Am* when its cycle is completed. Operated by a small electric motor, five tone chambers sound the notes and then shut off. The musical signal was especially designed by a Westinghouse engineer after makers of music boxes and door chimes were unable to meet the requirements.

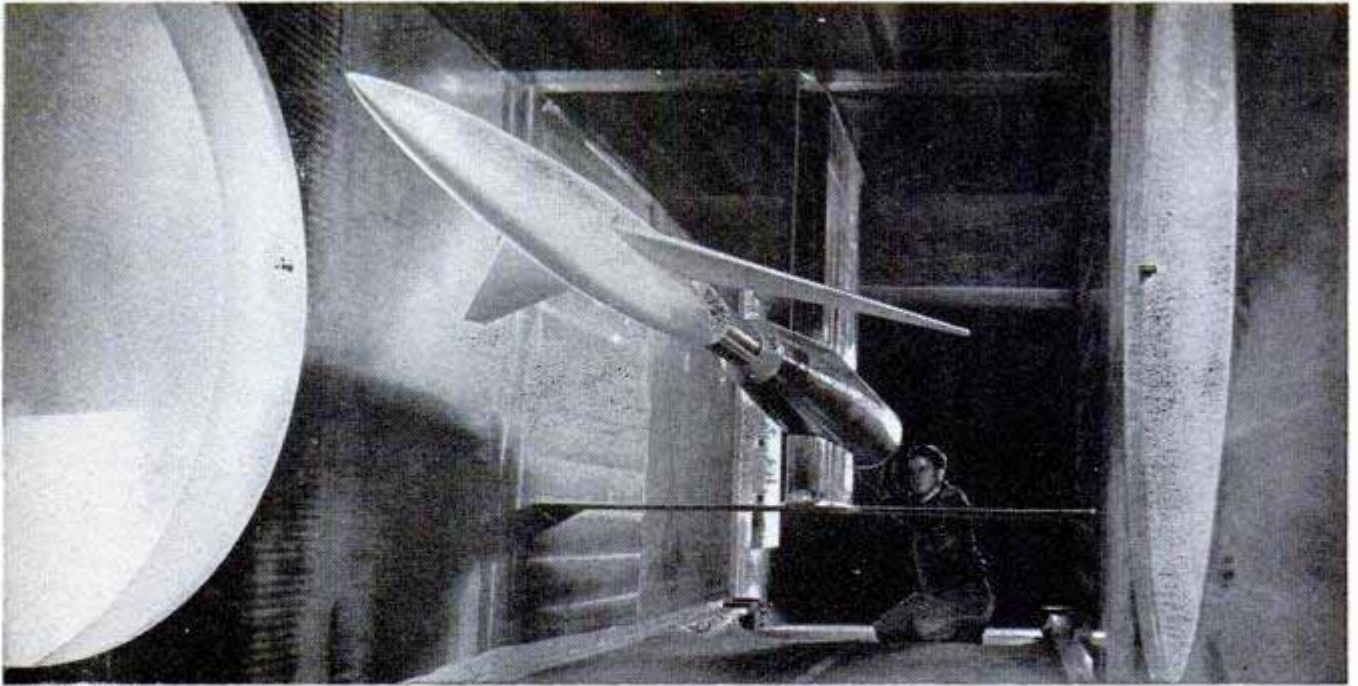
## Stop Watch Times Split Seconds

Reliable accuracy to within  $\frac{1}{25}$  second is claimed for a stop watch devised by two Canadian college students. Commercial stop watches, started and stopped by pressing a button, usually time to the nearest  $\frac{1}{5}$  second. The whole seconds on the watch are recorded by an electromagnetic counter resembling the mileage indicator on an automobile. Each second is further divided into 25 equal parts by a rotary switch, which successively illuminates 25 lights in a circle on the front panel of the instrument. Each fifth light is red and the remainder are green. When used in racing, the timer is connected to the starting gun and starts when the trigger is pressed. The first contestant to interrupt a light beam at the finish line actuates a photoelectric cell which halts the timer. The instrument also has been found useful for taking direct measurements of the speed of sound.



## TV Bug Eradicator

There's a man in Hollywood with a job that would give any ordinary mortal galloping nightmares. He's Lew Winkler, and it's his responsibility to eliminate the bugs in all the TV cameras, circuits and monitors in the city's biggest video studio. In a feature next month you'll find out how he kept a show on the air literally with his two bare hands. There'll also be another exclusive "Owners Report" and Floyd Clymer test on a new car.



Westinghouse photo

In aviation, it's engineers such as the man above working in a supersonic wind tunnel who lead the way

# ENGINEERING---the Might

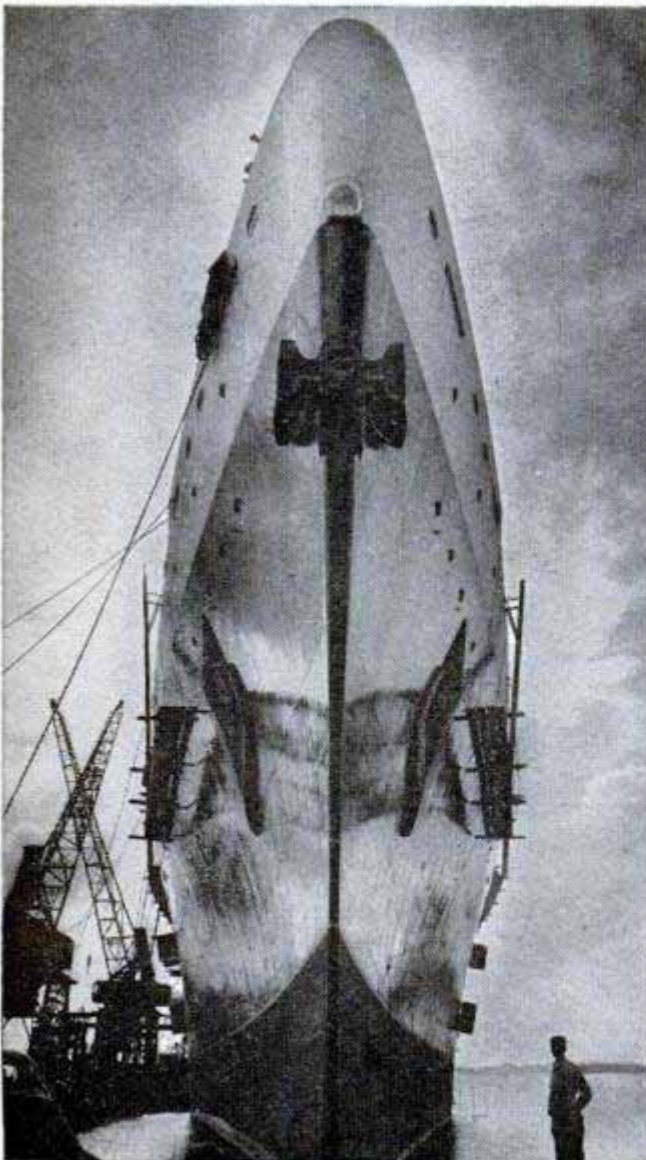
By Harland Manchester

**T**HE AMERICAN IDEA" means many things to many people, and re-evaluation of the concept will continue as long as man lives. Meanwhile most will agree that one of America's greatest contributions to welfare is its unique ability to take inventions and discoveries, test, develop and apply them, and design and produce in great quantities new and better machines and goods at prices within the reach of millions. The people who do all this are engineers.

Most engineers are unobtrusive people. They seldom advertise, pose for Man of Distinction or figure as heroes in movies. They are few. Count people on the street and every 387th will be an engineer. He looks like everyone else. Yet everything around us would collapse without him.

When you rise in the morning and turn up the thermostat, confident that warmth will follow, you are voting your faith in the American engineer. You turn the tap, sure that the water won't poison you, because the engineer has taken steps to protect you. When you snap the light switch, step on your car starter, board the 8:15, take an elevator or pick up the phone, you are reaping the fruits of uncountable engineering man-hours. Maybe you've heard of

The record-breaking queen of the seas, luxury liner *United States*, is a masterpiece of engineering. Her towering sleek hull is designed for speedy travel





only the bright luminaries—the Edisons and the Fords—but your machines serve you well because the 400,000 engineers of American industry, most of them as obscure as the coral that builds the atoll, are constantly measuring, checking, testing, designing, each playing a vital role in the great American game of doing things never done before.

If the merit system is ever used in erecting statues, some day there will rise a monument to a shirt-sleeved young man with eyeshade and sliderule—or perhaps he'll squint through a transit or wear dungarees stained with lube oil. They could carve on the plinth: The Man Who Makes Things Work—The American Engineer.

This year is the centennial of American engineering. There have been engineers since man made crude weapons, harnessed

fire and contrived the wheel, for an engineer, as Dr. Vannevar Bush puts it, "is a man who applies science in an effective manner to supply human needs and desires." But for centuries, engineering was considered a military science, and its practitioners had no formal standing in the crafts of peace. Then in 1852 the American Society of Civil Engineers was formed in New York, "civil" meaning "nonmilitary." Later the title became limited to builders of bridges, highways, harbors, dams and the like, while those who worked in chemistry, mechanics, metallurgy, agriculture, automobile design, aviation, radio, motion pictures and a score of other specialized fields branched off to form their own groups.

In a single century, American engineers have transformed a horse-and-oxen outland into a dynamic industrial complex,

Engineers below are at work on hydrogenation plant where other engineers will make products from coal

# of America

Behind the scenes of America's growth during the last 50 years are the engineers who have made possible the building of giant dams and power plants, ships and planes that have broken records on the ocean and in the sky, bridges and highways and railroads, houses and skyscrapers, factories where modern mass production was born

Union Carbide photo



A  
50<sup>th</sup> ANNIVERSARY  
FEATURE



B-47 soaring here into the skies with jet take-off was created by Boeing engineers shown at bottom of page

in which seven percent of the world's people, living on six percent of the world's land, do forty percent of the world's work. High on the long roster are the names of Edison, engineer of the light bulb; Bell, of the telephone; Tesla, father of alternating current; Steinmetz, creator of the mathematical language of electricity; John Ericsson, builder of the first ironclad naval vessel; Simon Lake, builder of the first successful submarine; Haynes, Ford, Duryea, Winton, the Stanley brothers et al., of the horseless carriage, the immortal Wright brothers, and Sikorsky, of the helicopter. Their names stand out, but behind each stood an indispensable supporting cast.

The skyscraper owes much to many men. Peter Cooper introduced structural iron beams when he built Cooper Union in 1857. Other men followed, in 1885 William LeBaron Jenney, designing the Home Insurance Building in Chicago, created the load-bearing steel skeleton and demoted outer walls to "skin," thus siring the lofty symbol of the American metropolis.

Pioneers in bridgebuilding were James Buchanan Eads, who completed the first great steel-arch bridge across the Mississippi at St. Louis in 1874, and John August Roebling, wire manufacturer and civil engineer, who in 1855 refuted skeptics by introducing the wire suspension bridge at Niagara Falls, and who later used the same technique in designing the great Brooklyn

Bridge. In subway design, the great name is William Barclay Parsons, creator of the New York system; in city water-supply systems, John R. Freeman, and in irrigation dams, John Savage, designer of the Hoover, the Grand Coulee, and of other dams in China and India.

In the last 50 years, the pace of engineering has accelerated. The science of electronics has spawned a new breed of engineers and, by creating new instruments and tools, has incredibly widened the horizon of their nonelectronic brethren. It was on New Year's Eve, 1906, that Lee de Forest, Yale Sheffield graduate who studied under the great Willard Gibbs, ran through the rain to his laboratory on New York's 14th Street with a shoe box containing two fragile tubes packed in cotton wool—the world's first triodes, in which the revolutionary third element was a platinum wire bent roughly in the shape of a kitchen grid-iron. This first amplifying tube—the result of years of pioneer engineering—lasted only 30 minutes, but it ushered in modern radio and television, long-distance telephony, facsimile, electronic welding, talking pictures, radar and giant computing machines, changing forever the life of man and making jobs for hundreds of thousands.

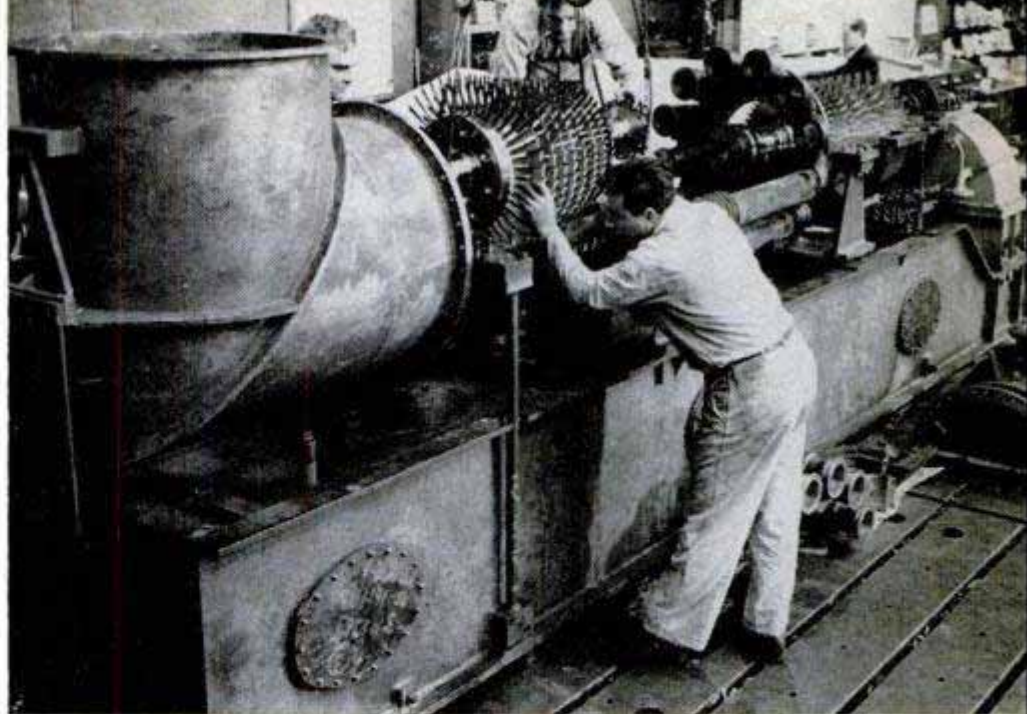
Other epochal advances in electronics were conceived by Edwin H. Armstrong when he was a student of electrical engineering at Columbia under the great Prof.



Michael Pupin. Working with the early feeble amplifying tube. Armstrong thought its output could be increased by feeding back some of its outgoing energy into the grid. The result was regeneration, one of a series of advances which made it possible to replace the "model T" radio's one-man earphone with a loudspeaker which could be heard by crowds. But when Armstrong boosted the signal, he also helped to create static, and he and Pupin went back to the laboratory in an attempt to slay the raucous monster. Years later, Armstrong brought forth frequency modulation, now enjoyed by millions of exacting listeners who like their fidelity high, and by other millions to whom mobile two-way FM systems bring prompter taxicab service.

There are many other cornice-worthy names in electronics, none of whom could have done his work without the guidance of his seniors and the help of little-known assistants. Hundreds of engineers today can point to improvements in the giant electronic structure and say "I did it."

Today's transportation system, with its intricate complex of automotive production, oil refineries, highways, railroads and airlines, was made possible by engineering developments in motors and fuels during the last three decades. The long campaign to squeeze more power out of gasoline began when Dr. Thomas Midgley, Jr., a young mechanical engineer from Cornell, set out to find an additive for fuel that would silence an engine's knock, and came up with tetraethyl lead. Then it was found that the new fuel made possible engines of high compression



Westinghouse photo

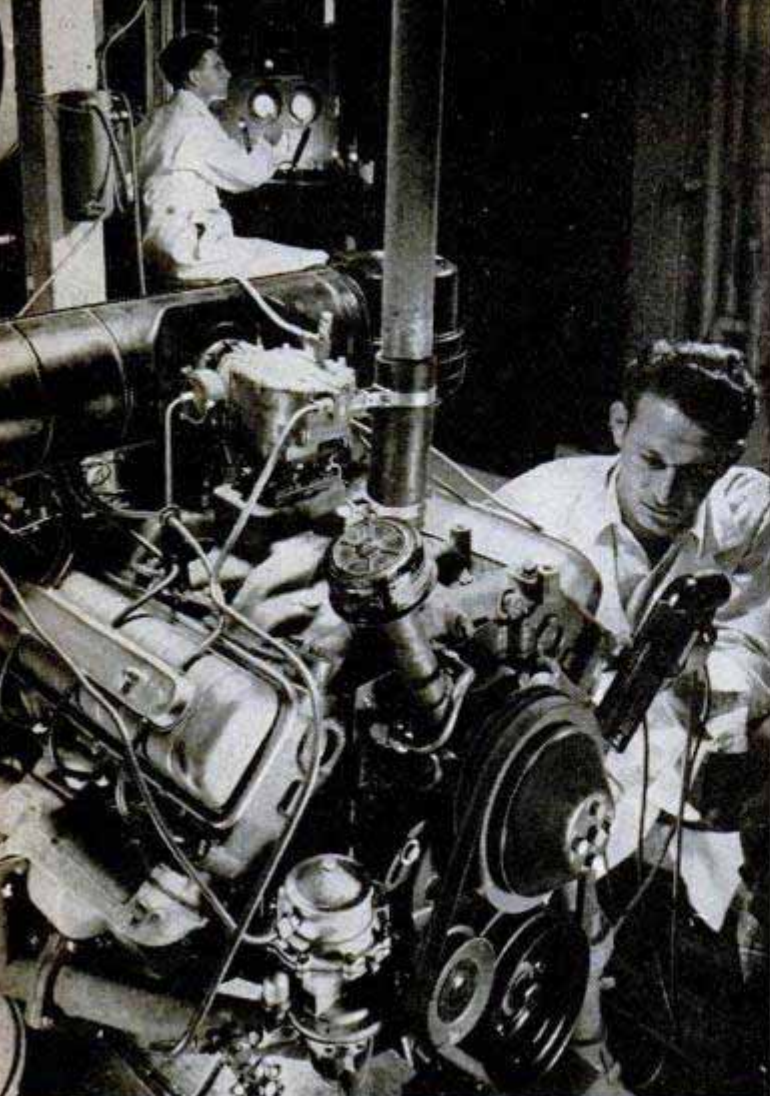
Engineers at work on 2000-horsepower gas turbine for locomotive expect it to compete economically with diesels and steam. It burns heavy oil



Los Alamos Photo Laboratory

It took engineering skill to solve the problem of handling radioactive materials in atomic laboratories. Unit above is used for weak radiation. Below, Chesapeake Bay bridge, longest span, is an engineering triumph





General Motors photo

Automotive engineers work constantly to improve engines; above, three high-compression jobs in test



Westinghouse photo

An engineer uses anechoic (no echo) chamber in big acoustics laboratory to check hum of a transformer

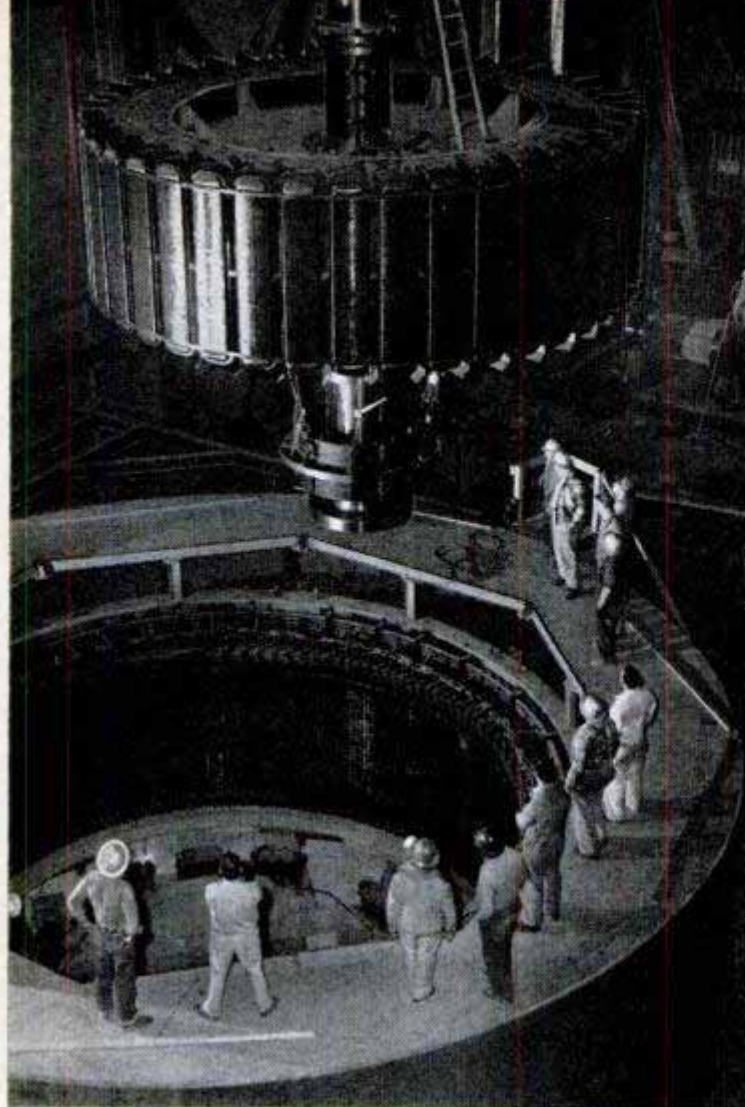
that would perform more work per gallon; the Chrysler engineering trio of the '20s, Zeder, Breer and Skelton, brought out the Red Head engine, and the race for still better fuels and engines was on. Engineer Eugene Houdry came over from France with his catalytic cracking plan for building high octanes without the use of lead; other "cat" cracking systems followed, and soon 100-plus-octane fuel was ready to increase airplane speeds and cut flying time to all parts of the planet.

Other engineers, notably self-taught Clesie Cummins of Columbus, Ind., and a staff under the direction of Charles F. Kettering of General Motors, took the cumbersome diesel, sweated it down to drive trucks, busses and streamlined trains, and paved the way for its possible widespread use in passenger cars. The gas turbine owes much to Sanford Moss who, as an engineering student at the University of California in 1896, "invented" it without knowing that others had proposed it. Many years later he built it in the form of the turbosupercharger of World War II, which used power from hot exhaust gases to pack in air to push bombers to high altitudes, and contributed greatly to jet-plane engineering. In 1919 Robert H. Goddard of Clark University,

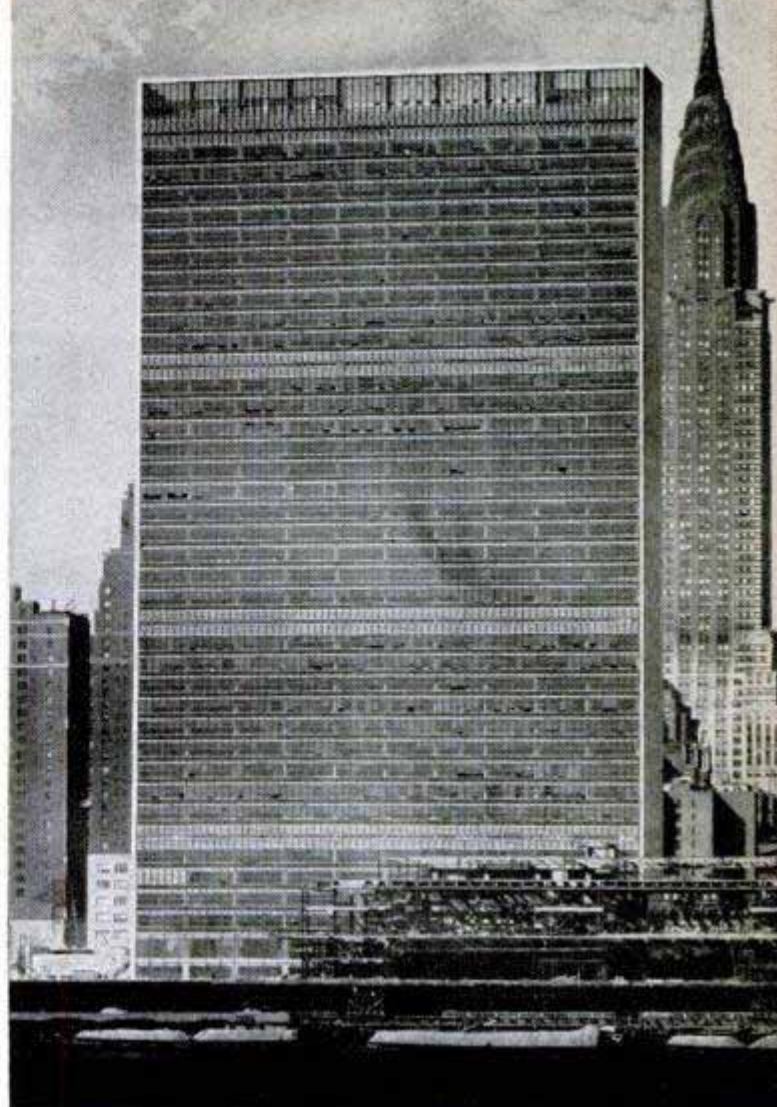
popularly regarded as a fanatic who wanted to fly to the moon, wrote a paper about his rocket experiments which was avidly read in Germany by men who later built the V-2. Because of his pioneer work, experimental rocket ships will soon fly at 100,000 feet; later they may penetrate outer space.

All these developments are mere beginnings. We are on the threshold of a technological boom that will make the work of recent decades look like the primitive gropings of a caveman, for the overlapping nature of various advances has drastically slashed the time lag between discovery and utilization. For instance, engineers are working on a possible relation between the atomic bomb and food spoilage. The AEC is now burying radioactive waste fission products in the ground. Foods can be sterilized by radiation. Can we put two and two together and get a four that means indefinite open-shelf storage of foods now highly perishable? Or consider the economic effect of de-salting sea water on southern California, and the coastal areas of Peru, Chile and Australia.

Dr. James B. Conant, gazing into his "plastic ball," has hinted that economic utilization of solar energy may come in before we get cheap power from atomic



Engineers look on while a million-pound generator rotor is moved slowly into position for lowering into the generator stator at Hungry Horse Dam, Mont.



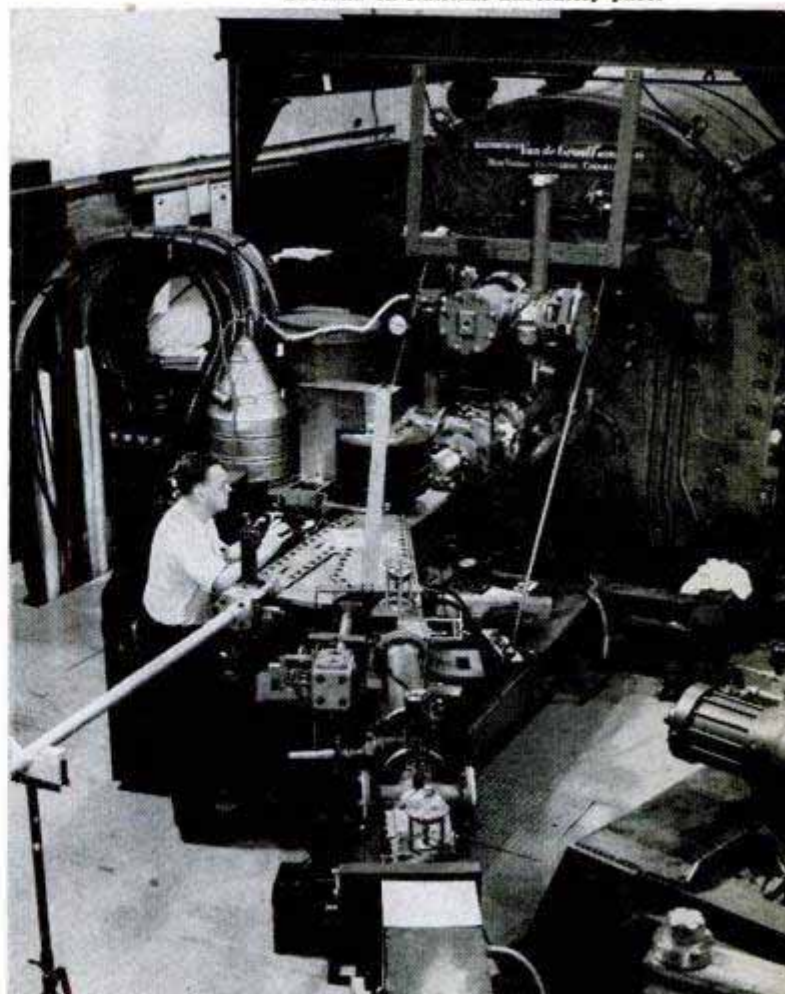
Every big city in the U.S. contains skyscraper monuments to engineering skill, such as the United Nations building. Below, cosmotron in atom laboratory

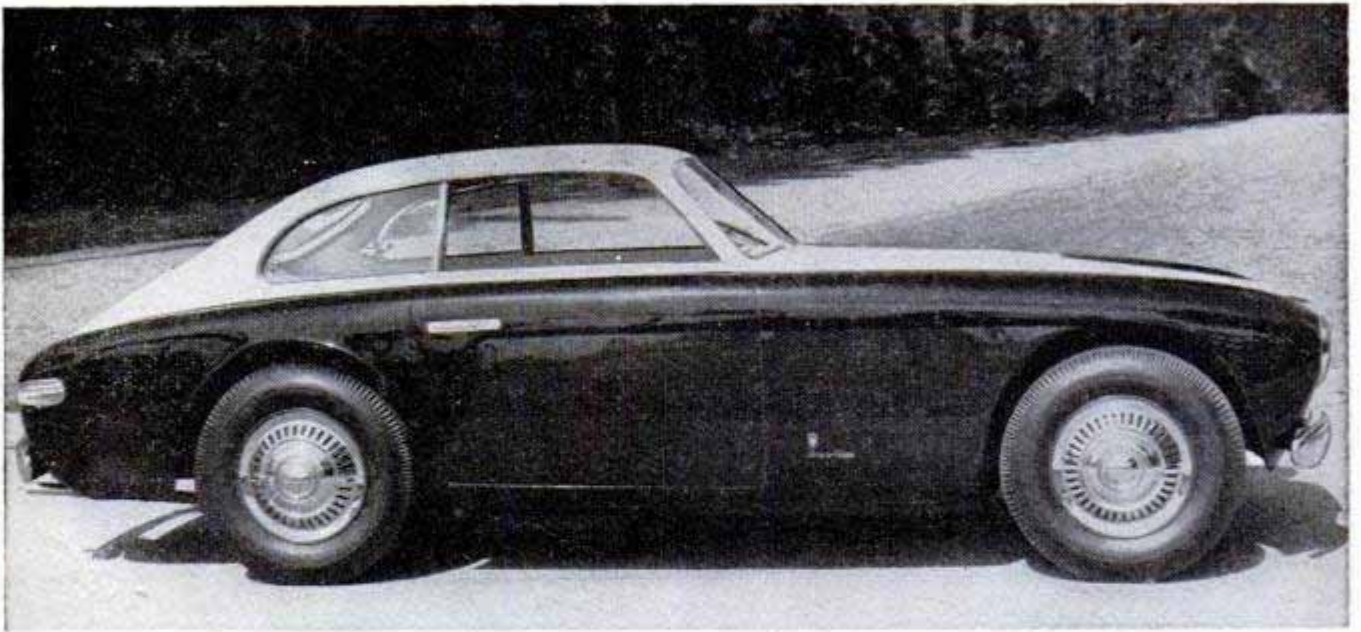
Brookhaven National Laboratory photo

plants. Engineers are working on it. And hundreds of other engineers are working on the more efficient utilization of oil, coal and gas. Some, like E. M. Barber of the Texas Company, are building "mechanical octanes" into automotive engines to enable high-compression motors to run on kerosene; others are pushing the use of high-octane "bottled gas" as a motor fuel, and still others are exploring the cheap underground gasification of coal to save labor and add to the world's fuel supply. Many a boy now in high school may help to achieve these goals.

There is a challenge to chemical engineers in the new fluorocarbon resins, which promise harder and more durable plastics and new lubricants and coolants. Thousands of possible synthetic-rubber polymers await combination; some of them may bring us synthetic truck tires that won't overheat, further reducing our dependence on the rubber tree, and others may reach that millennial goal—the tire that lasts as long as the car. Future engineers may find a bonanza in the now-wasted lignin released from wood in pulp plants, and others will undoubtedly discover newer and better

(Continued to page 258)





## Cunningham Hardtop Has Italian Body

Combining the race-bred American C-3 chassis with the Continental styling of Vignale in Italy, the new Cunningham hardtop model gives performance plus beauty. Functional streamlining has almost completely eliminated wind noise at high speeds, according to the manufacturer. The lightweight but strong chassis is powered

by a Chrysler V-8 engine equipped with four carburetors. It combines race-car performance with limousine comfort. Powerful brakes, which stop the car in a fraction of normal braking distance, and careful weight distribution make the fast car extremely safe to operate. Delivered at the factory, it will sell for \$9000 plus taxes.



## Rotary Tiller With Rotary-Mower Attachment

With a new rotary tiller, the homeowner can mow his lawn as well as cultivate his garden. The machine prepares a level, aerated seedbed and fills depressions in the ground. It cultivates within an inch of growing plants and tills a 12-inch swath up to 7 inches deep. The rotary mower is

attached to the machine with four bolts. It cuts a 16-inch strip.

☐ Cherrapunji, India, holds the world's record for the greatest amount of rainfall over a period of two years—1605.05 inches, about the height of a 12-story building.



Lined up on the Bonneville Salt Flats ready for their trials, are super hot rods with "push" cars in between

# Hot Rods Burn Up the Desert

By Thomas E. Stimson, Jr.

**A**MATEUR SPEED enthusiasts who set more than a score of new automotive records at Bonneville late in August are laying plans to capture for the United States the world's unlimited speed record for the flying mile.

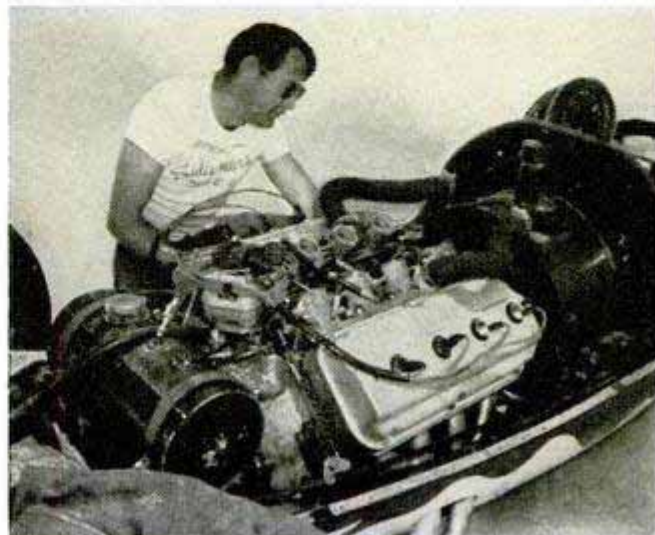
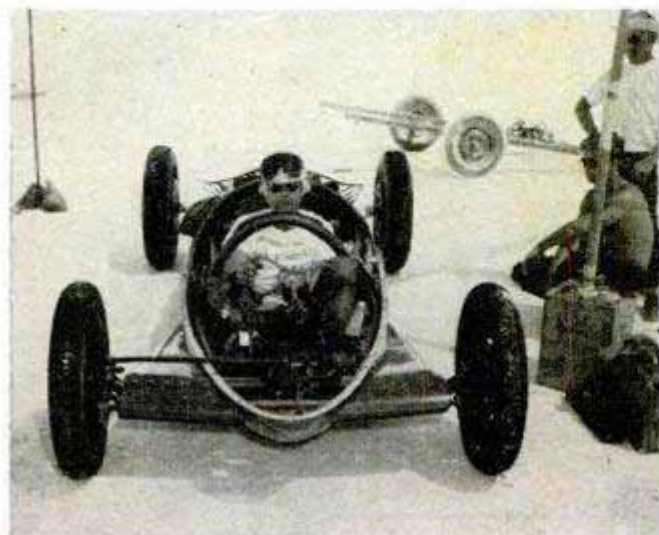
They won't do it this year and probably not in 1953, for John Cobb's two-way average of 394 miles per hour (403 one way) is far beyond the capability of any amateur

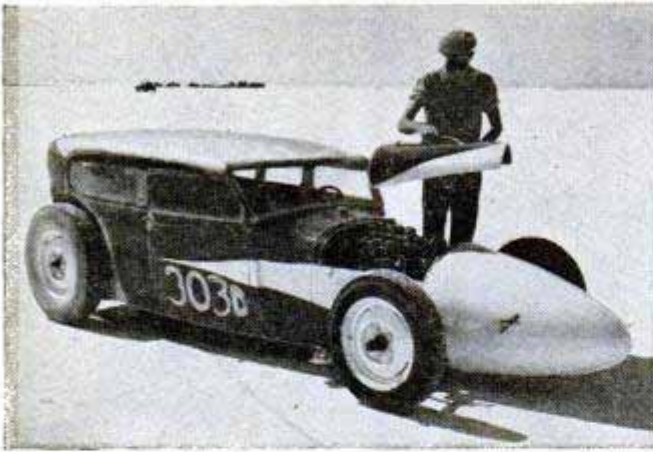
car built to date. Yet, year by year, the hot-rod drivers are getting closer to Cobb's record.

Four years ago at the Bonneville national speed trials the fastest car was timed at 189 miles per hour; in 1950 the best speed was 210, and last year a twin-engined streamliner was clocked at an average of 221 miles per hour. This year the same Bill Kenz streamliner, powered by two Ford V-8s that

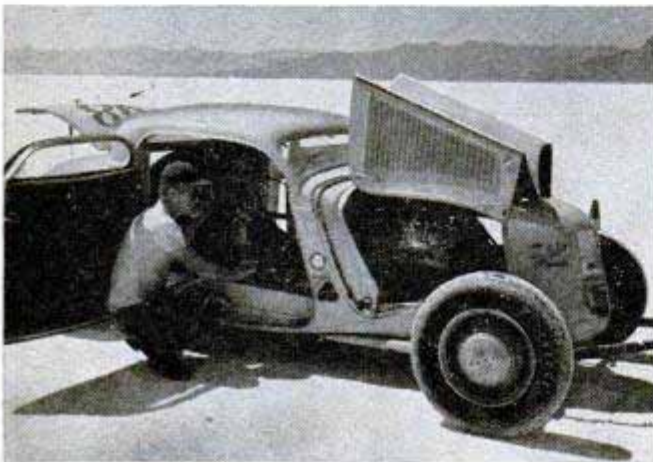
Body of "lakester" class car consists of an aircraft drop tank (top removed here showing driver in seat)

Engine of this lakester entry is a reworked Chrysler FirePower. Fuel injectors replace usual carburetor



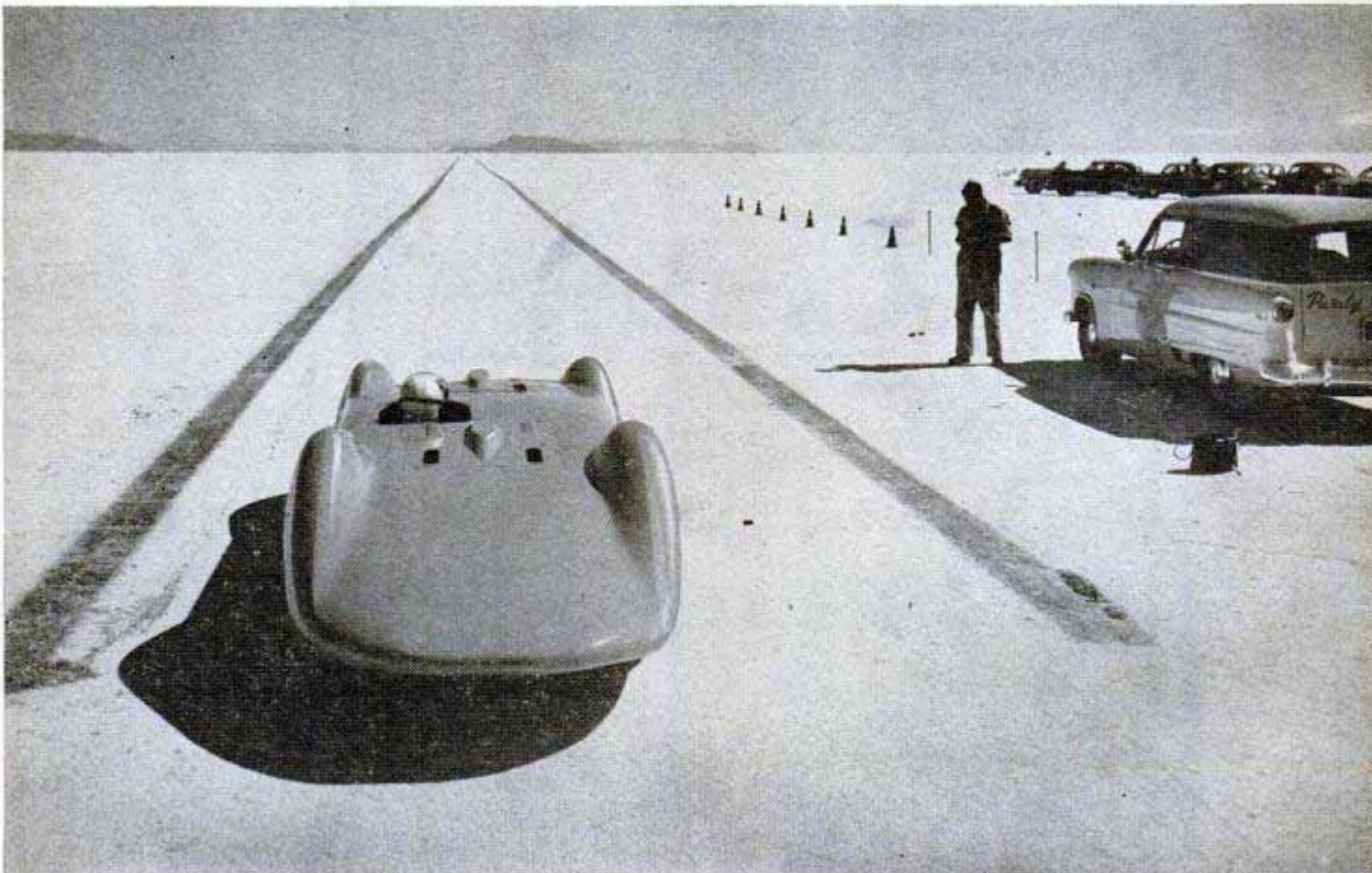


With fenders removed, a new streamlined nose and the top lowered, this entry was in the nonfender class



The top of this competition coupe was chopped down to an extreme degree to afford better streamlining

In the unlimited streamliner class, Bill Kenz of Denver set a record of 244 miles per hour with car below



develop 225 horsepower each, jumped its speed to 244 miles per hour, two ways along a measured mile. On one part of the course the car was clocked at 252 miles per hour.

With the know-how that they are acquiring at Bonneville, several different groups of amateur builder-drivers are about ready to design and build cars capable of 400 miles per hour or better. One group would use a pair of souped-up Chrysler FirePower engines in a very light chassis, another group plans to rework a pair of Allison aircraft engines to develop more than enough power. All of them are designed to hug the ground at high speed to avoid literally flying into the air.

The chief obstacle at present is the problem of tires. Cobb had special tires that were built to secret specifications and that aren't available in this country. The best tires that we have, the Indianapolis race-car type, are not good enough even for the speeds being made today by amateurs on the salt flats. The streamlined hot rods use Indianapolis tires from which most of the rubber has been deliberately buffed away to prevent the treads flying off from sheer centrifugal pull at high speeds.

Even so, portions of the tread of both front tires of the Kenz car were thrown off during his record run. Another driver blew a rear tire at 180 miles per hour, felt a slight bump, and managed to hold the car





Roadster (center) approaches one of the electric-eye timing devices at Bonneville; timer's stand at left

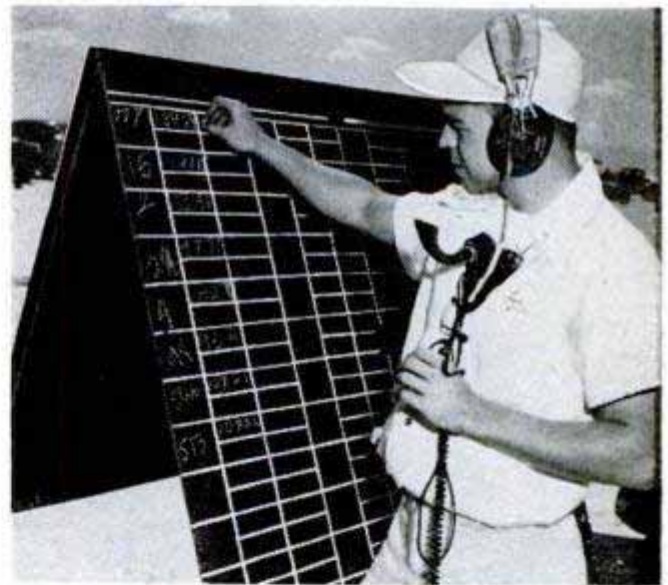
under control when it had decelerated down to 100 miles per hour. A third car blew both rear tires while traveling at 240 miles per hour.

The Bonneville national speed trials are the nation's premier amateur automobile classic, held the last week of August on the glistening white surface of an enormous salt flat in the desert 125 miles west of Salt Lake City. It's a week of speed on a wholesale basis, with an average of a car a minute howling along a six-mile-long course. Two-way runs for records are held in the mornings; one-way tune-up trial runs are held in the afternoons.

The event is sponsored by the Southern California Timing Association and is open to anyone with a fast car that can pass the stringent safety requirements. All drivers pay a \$15 fee that permits them to go through the time traps as often as they desire during the week.

This year some 225 different cars raced against time at Bonneville, with many of them changing engines after setting a record so that they could qualify to compete in a different class. Half a dozen of the cars were clocked at better than 200 miles per hour. Time is taken on a quarter-mile time trap for trial runs and over a pair of mile-long traps for official records. A Crocker electric-eye timer-printer that immediately shows the speed of a car in any of the traps is used. The cars don't race against each other, they are flagged away from the starting line one at a time.

Competition is divided into 14 different classes, including sedans with and without fenders, roadsters and modified roadsters,



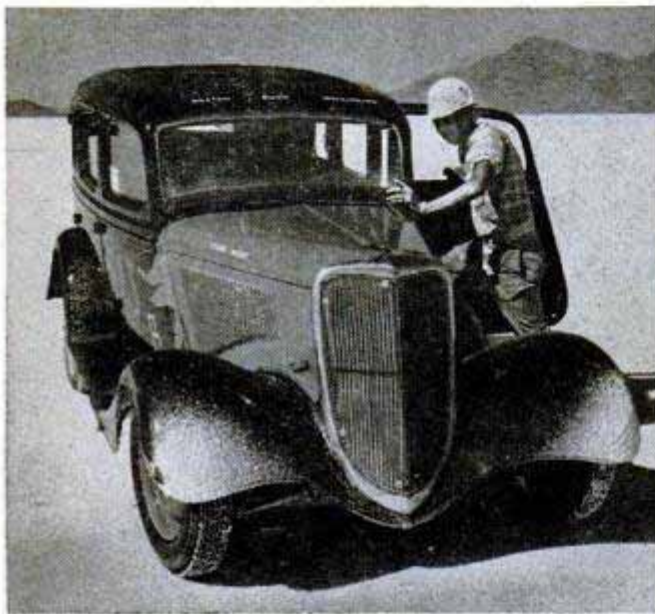
Recorder's phone is connected to timer's stand and he enters car numbers and speeds made on each run

competition coupes, "lakesters" with aircraft wing-tank bodies, and true streamliners. These classes are subdivided into five groups according to engine displacement, making a total of 70 different competition classes. The event is also open to stock cars, modified stock cars, and motorcycles.

This year new records were made in practically every class. A modified roadster powered by a V-8 60 made a two-way average of 137 miles per hour, a phenomenal speed considering its small engine. Another roadster with a reworked Mercury engine was clocked at 166 miles per hour, another record, and a similar engine in a lakester wing-tank body was timed at 198 miles per hour.



Fuel lines (above) feed three carburetors of sedan (below) which burned up desert at 135 miles an hour



Below, at start of six-mile straightaway, a drop-tank lakester gets started with aid of a push car

Competition coupes and roadsters in particular are weird-looking vehicles after they have been modified as much as the rules permit. Many of the cars have long snouts in front for better streamlining, all of them are lowered toward the ground as much as the rules will allow, and the interiors are "gutted" of all upholstery.

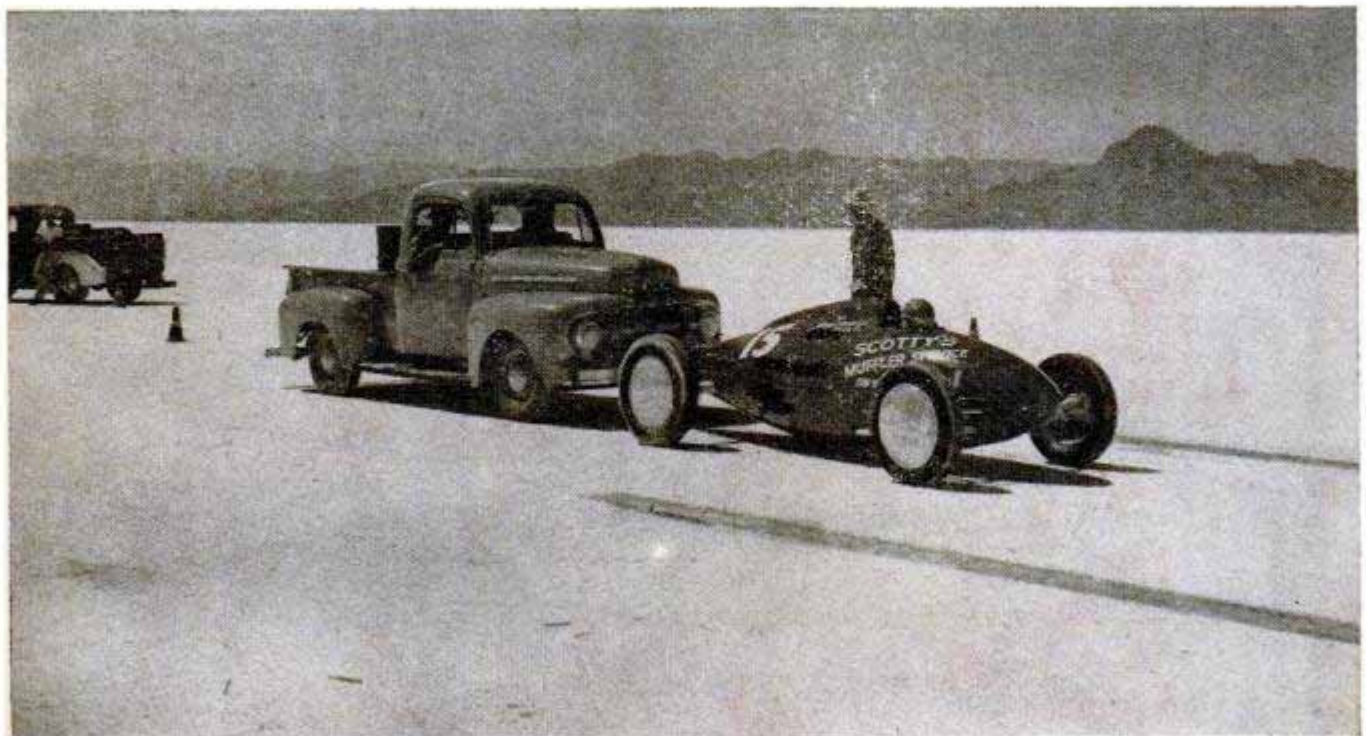
An example is a sedan built by Willie Waddill of Flint, Mich. The frame of this car consists of a thin-wall inner-drive-shaft tubing and the whole chassis weighs less than that of a Model A. The power plant is a reworked Cadillac engine equipped with two four-throat carburetors and delivers close to 300 horsepower. Over this race car is mounted the reshaped body of a Crosley sedan.

In their efforts to achieve greater speeds, most of the hot-rod designers dispense with radiators. Engines get sufficient cooling from water circulated from reservoirs. One owner fueled his roadster with racing fuel plus pure oxygen that was pumped to the carburetors from a special tank. Molded glass-fiber bodies were used by half a dozen builders.

Representative of the most advanced cars in this year's trials was the City of Burbank, a 17-foot-long streamliner that weighs 1750 pounds and whose molded glass-fiber body stands only 33 inches high. It was built as a hobby by George Hill, a heat-treater, and Bill Davis, a carpenter, both of Burbank, Calif. The car represents a cash outlay of something less than \$3000 and yet on its first try it set a new world record of 230 miles per hour for its class, breaking the German-made record.

The car is powered with a Class B type

(Continued to page 298)





## Insulated Rubber Lifeboat Keeps 15 Survivors Warm

Inflated in only 30 seconds, a 15½-foot rubber lifeboat will provide protection for 15 men in either subzero or blistering tropical weather. A temperature of about 70 degrees is maintained inside the cabin of the lifeboat by dead-air-space insulation in both the canopy and floor liner. In cold

weather, the insulation holds in body heat of the survivors to boost air temperature. In extremely hot weather, the insulated floor liner can be removed to take advantage of the cooling effect of the water against the boat bottom. The liner can be towed as an additional life raft if necessary.



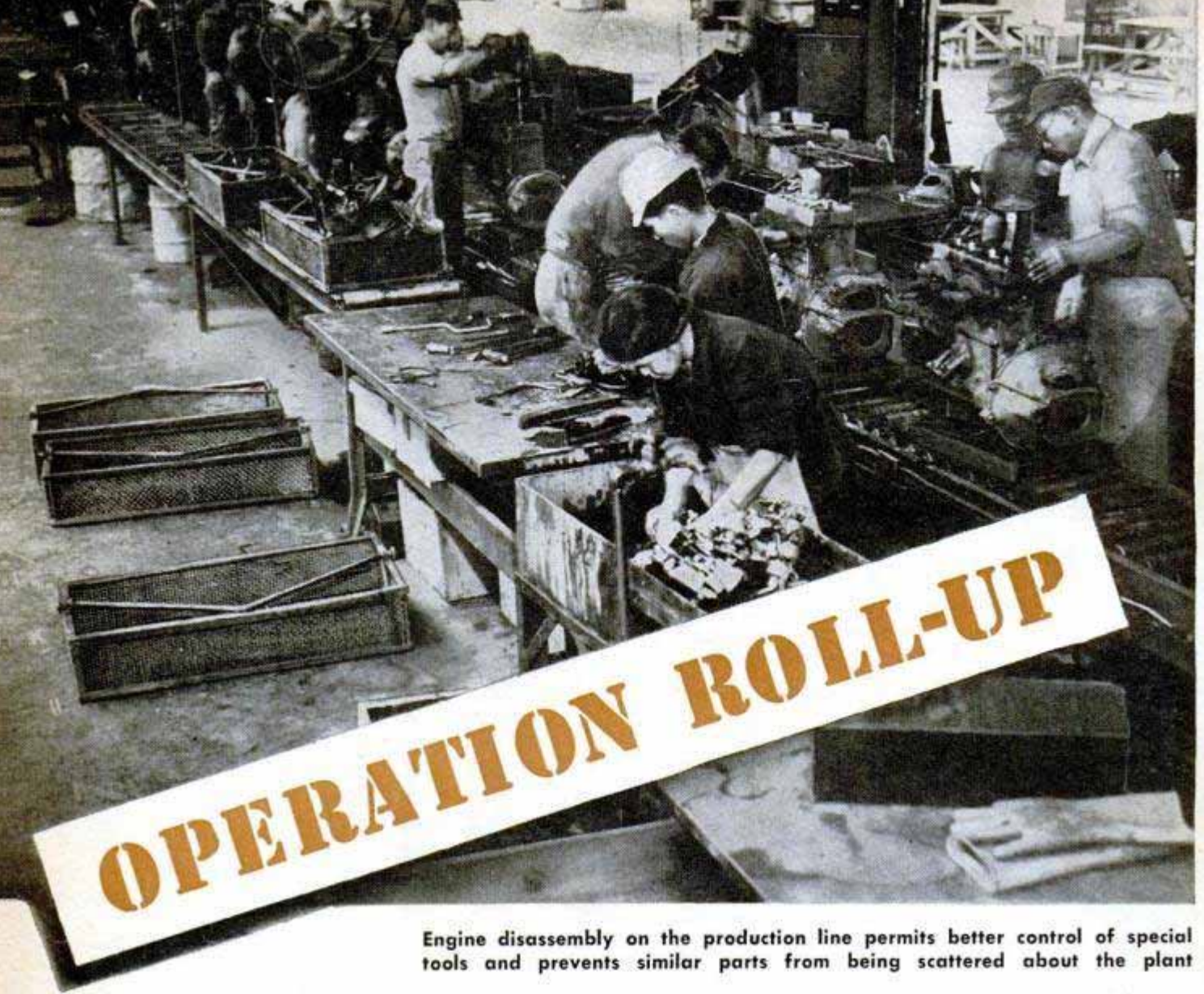
After the deflated package is thrown into the water, a release cable is pulled and carbon-dioxide gas snaps the 230-pound boat out of its carrying case. The insulated canopy takes shape as gas fills the arched rubber columns that support it. An automatically released sea anchor holds the boat steady during boarding. The boat also contains 50 pounds of canned drinking water, desalting kits for sea water, 30 pounds of rations, paddles, as well as other items of survival equipment.

## Indoor-Outdoor Electronic Golf Driver

Bad weather conditions do not interfere with practice on an electronic golf driver that can be used indoors or outdoors. It registers both the distance and the direction of each drive on a light panel. The ball is natural rubber molded onto a spring steel stem and it is never driven off the "tee." The distance of each drive is determined by counting the number of revolutions of the shaft to which the ball is attached. The shaft is mounted within two sets of gimbals which provide information as to whether the ball was hit properly, grounded, hooked or sliced. Designed for coin operation, the machine may be easily converted to continuous operation simply by pulling a plug.

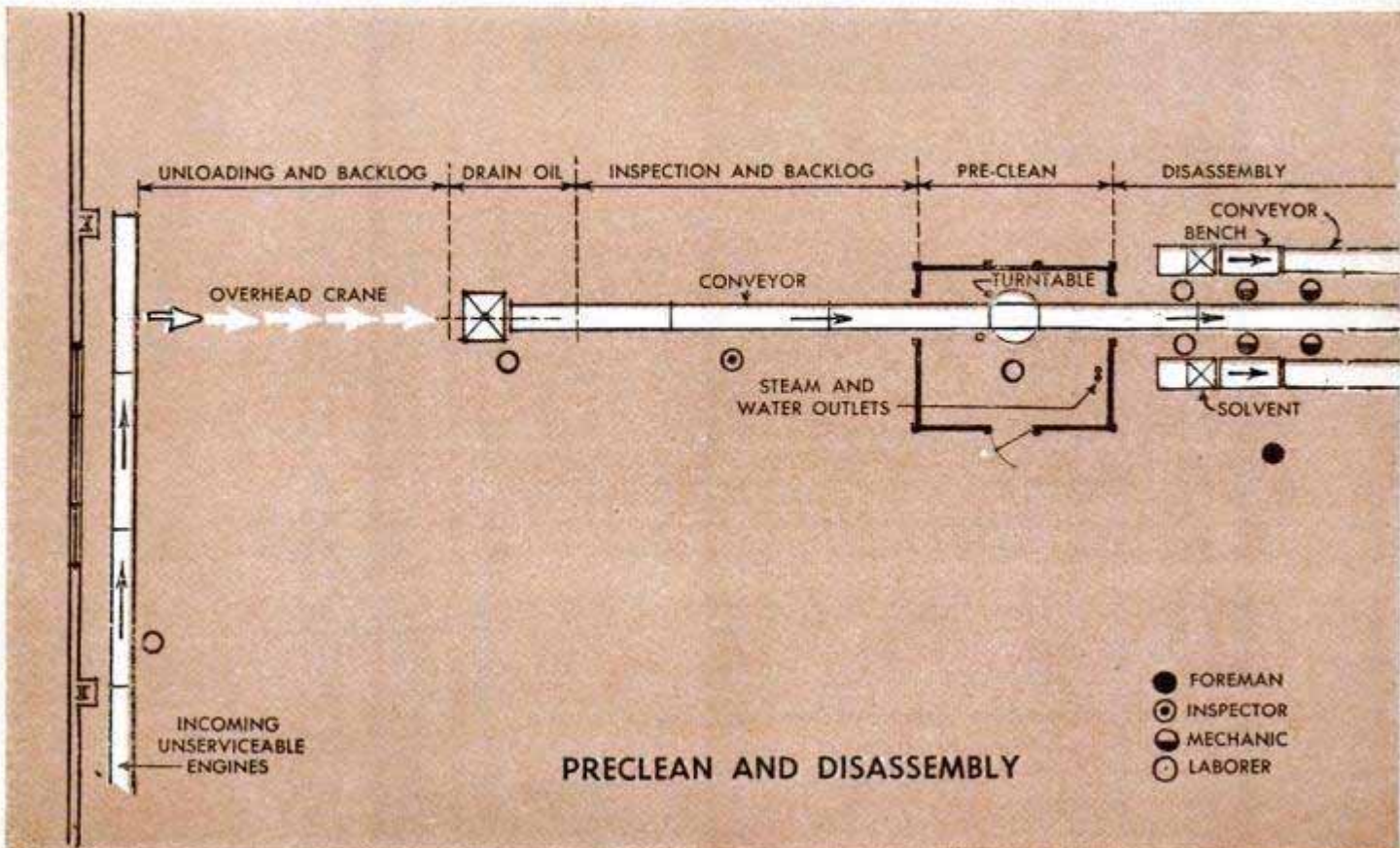
Lining up a tee shot on the electronic driving machine is Babe Zaharias, one-time women's professional champion





Engine disassembly on the production line permits better control of special tools and prevents similar parts from being scattered about the plant

From beginning to end, the engine-rebuilding "production line" is traced on this and the following two pages



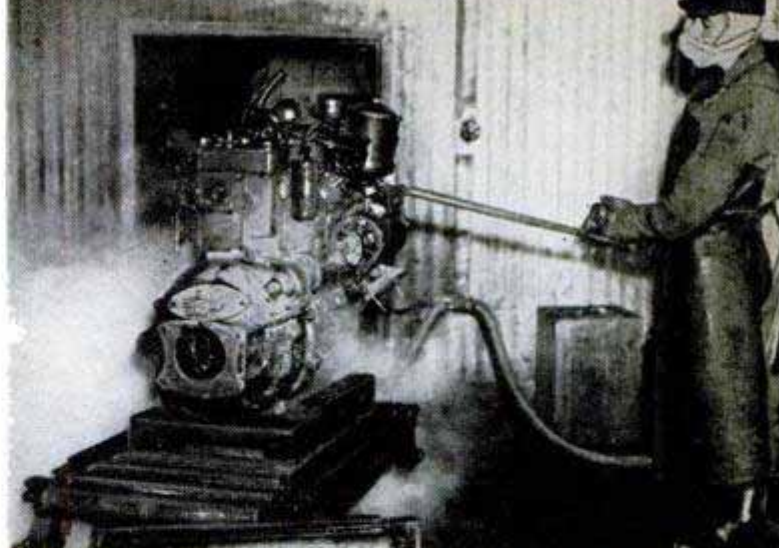
Precleaning of all unserviceable engines is done on a special turntable made from a truck rear axle

By E. L. Klein

PRIOR TO 1948 the repair of vehicles of the U. S. Army occupying Japan was accomplished by field maintenance units and Depot Ordnance shops using the "Stall Operation" method. This method is especially adaptable to vehicles requiring lesser repairs such as the grinding of valves, replacement of piston rings or adjustment of the carburetor.

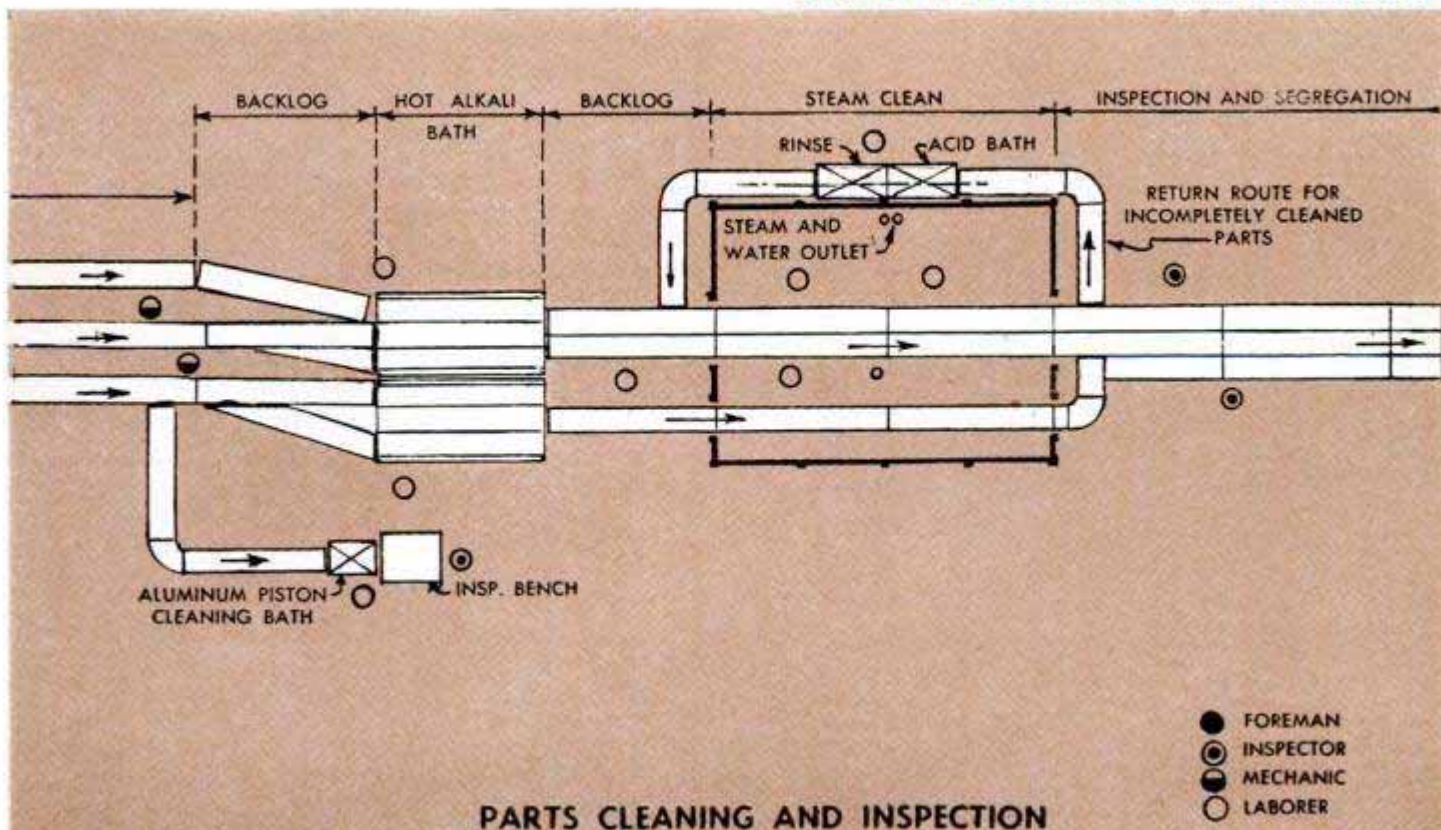
In 1948 the problem demanded a more thorough and complete method of repairing the vehicle and its major components, a method which extended to actual remanufacture. The engines had to be disassembled for their component parts, and those parts subsequently repaired and effectively reassembled as new engines. Years of open storage on the Pacific islands and the battle damage to which the vehicles were subjected necessitated this extensive procedure. The quantities of vehicles and associated equipment to be handled by ordnance in Japan after World War II, in the operation known as Roll-Up, made a production-line method more economical and practical than the Stall Operation method for reclaiming the millions of dollars' worth of precious transportation assets gathered from far-flung Pacific islands.

The Army Ordnance Corps established a Base Industrial Group known as the BIG-5 to accomplish this task. A group of engineers

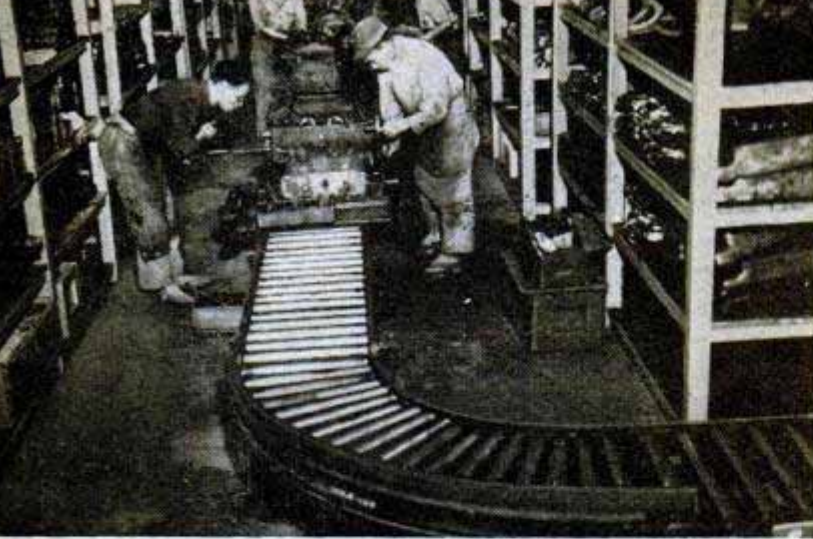


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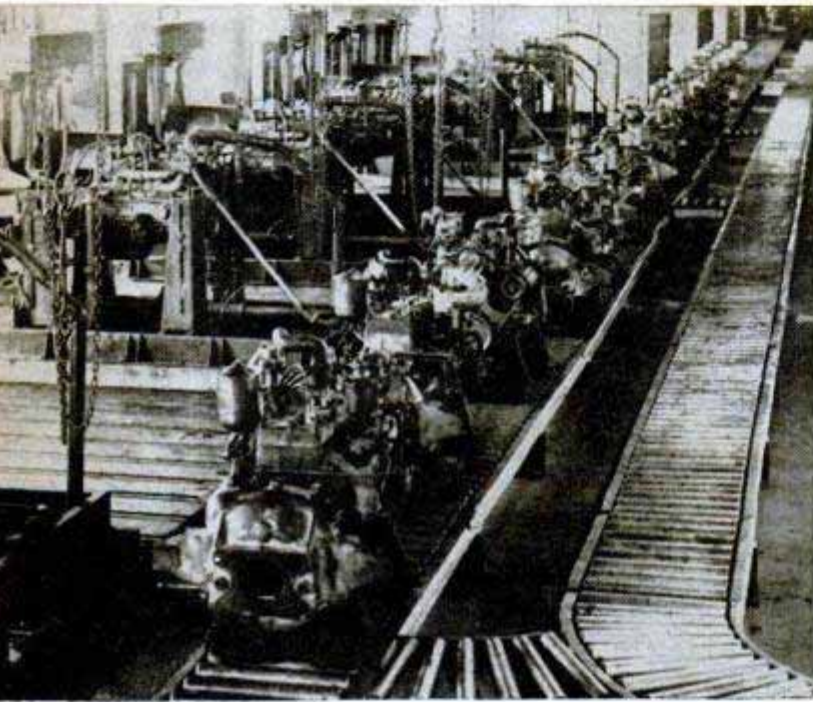
The end of World War II found the islands of the Pacific littered with tanks and trucks and weapons, abandoned to jungle rot and rust. Fortunately Army Ordnance began in 1948 a tremendous rebuilding program in Japan, eventually putting to work 30,000 Japanese and 850 Americans to restore over 60,000 trucks, Jeeps and other vehicles, 700,000 weapons and 700,000 tires and tubes. Maj. Gen. E. L. Ford, Chief of Army Ordnance, said of the project: "If it had not been for the ROLL-UP program, we would not have been able to give support to the action in Korea in the early days." This report on the vital program was written for *Popular Mechanics* by the American who was its chief engineer for four years and is now back in the U. S.



PARTS CLEANING AND INSPECTION



Parts bins alongside the line are easily accessible. Below, dynamometer testing of the completed engines

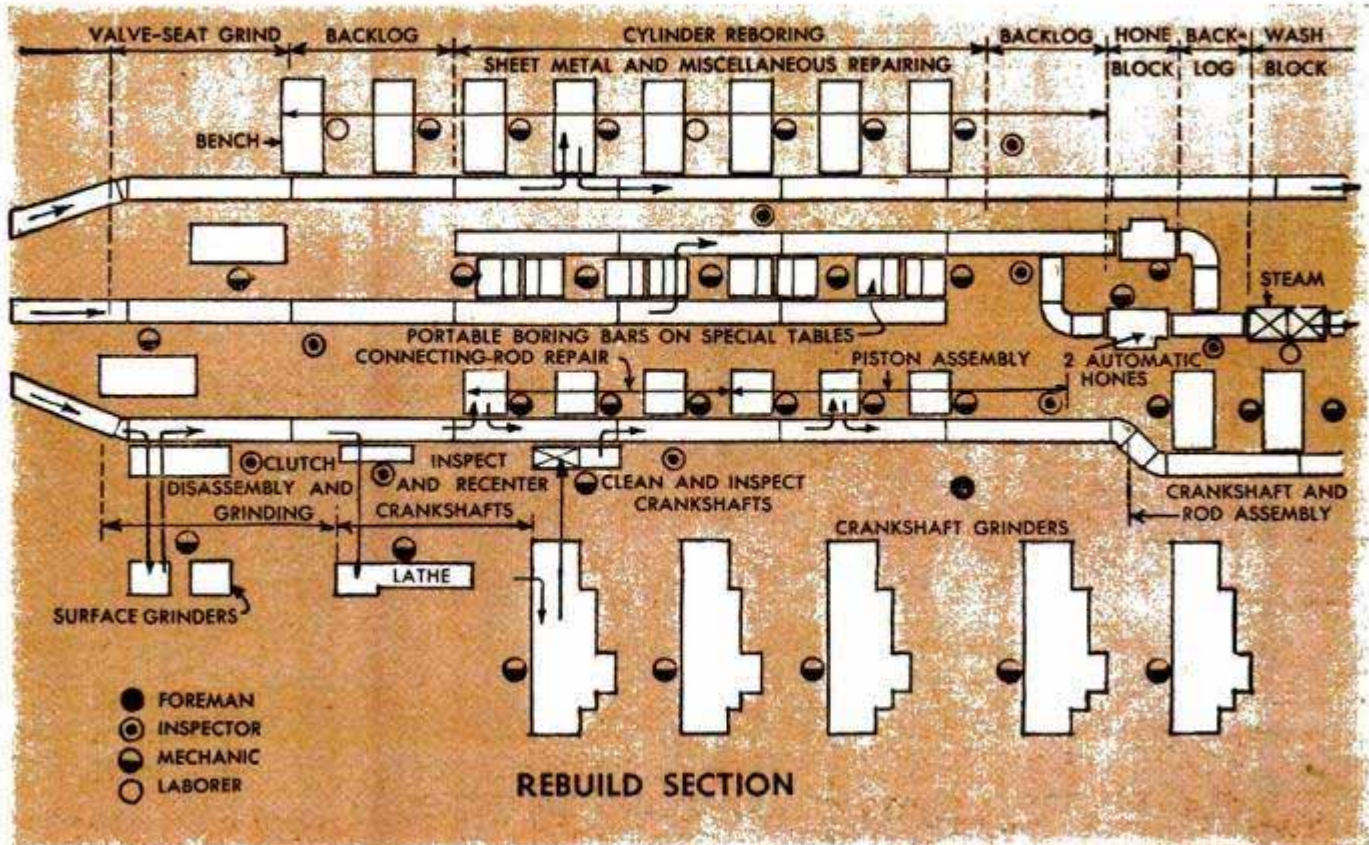


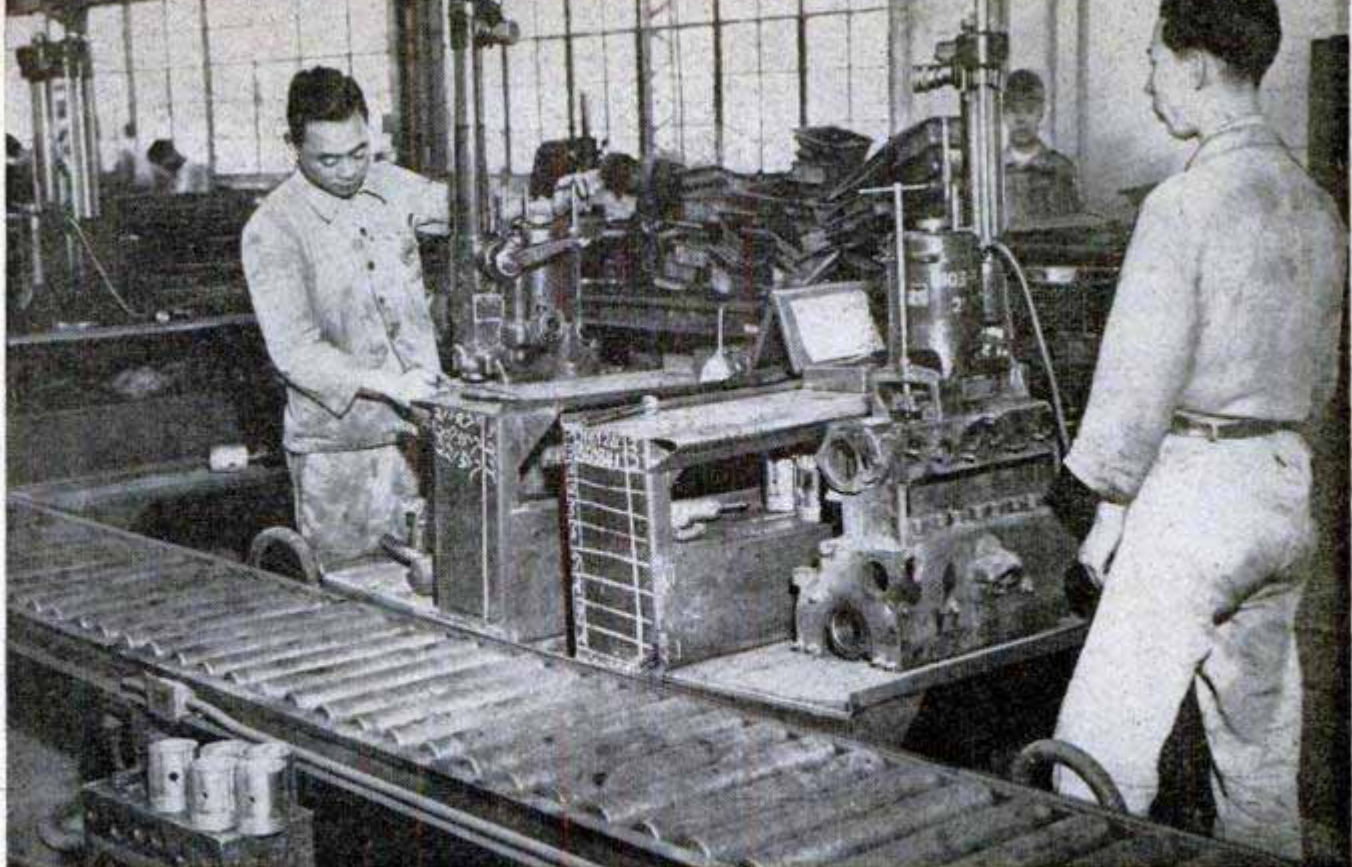
and inspectors was recruited in the U. S. to operate with the ordnance officers in the Pacific area. A nucleus of civilian industrial experts, proceeding as a team, traveled to Japan. Within five months they had designed, installed and put into operation the first mass-production line for engines.

Factories were surveyed and selected. Time studies were made. Thorough tool-engineering studies were completed to determine the best placement of machinery in the production lines. U.S.-made machine tools from the Roll-Up program, along with Japanese reparations machinery, were gathered, repaired and utilized to their fullest extent. Many specialized tools and fixtures were designed and fabricated to do specific jobs.

The training program for the Japanese mechanics and inspectors was one of the most significant phases in the development of this industrial project. Although the production lines were carefully designed so that each worker had a limited and specialized job to perform repeatedly, an extensive training program was conducted for the workers. They were instructed in the American standards of fits and tolerances of precision machine parts. They were taught scheduling and supply procedures.

Japanese supervisors and inspectors were put to work on the first production line as mechanics so that they might thoroughly understand the procedures and production-line problems. Thus they were better equipped to carry out their





Japanese workmen reboring cylinder blocks on special tables made to utilize available portable boring bars

supervisory functions later. Farmers from the rice paddies and demilitarized soldiers were taught gainful occupations in the automotive field with stress being placed upon quality control. To teach the allowable wear limits and clearances of fit in the internal working parts of the engine, classes in precision-measuring instruments were conducted. Sample parts from unserviceable engines and other bilingual visual aids were employed.

Through the training program, production began before the plants had been fully converted and tooled. All engines and assemblies were put through a two-hour run-in and dynamometer test. Those failing were disassembled so that the faults and steps to correct them could be made known to the workers and inspectors in the responsible departments.

Spare replacement parts for the production lines were obtained from requisitions on U. S. depots. Other parts came from the mountains of boxes of unidentified supplies reclaimed through the Roll-Up program and from Japanese production. The manufacture of spare automotive parts was largely responsible for the general recovery of the Japanese automotive-parts industry, greatly aiding the rise of technical standards in an extensive use of detailed manufacturing plans and specifications. Unserviceable parts and scrap, accumulated due to their uneconomical repair, were disposed of through Army channels or reissued as raw material to the Japanese contractors who furnished replacement parts requiring critical materials.

After removing the parts from their shipping containers, the first step in the remanufacture of the unserviceable engine was to drain the crankcase oil and clean all external surfaces. Supply personnel performed an important role in collecting and "staging" the engines so that a continuous backlog would be available.

The external cleaning of the engine surfaces was accomplished in a clean, well-lighted compartment by the use of a mixture of steam and soap solution. Increased efficiency was gained by the removal of grease residue and road dirt. Disassembly operations could then be performed with a minimum of disruption.

Engines were disassembled on a production line—each man performing the same operation repeatedly with a minimum of selected hand power tools. Two automatic elevators dipped baskets of engine parts in a near-boiling alkali solution for 20 minutes to remove greases. After this, they were steam-cleaned and treated with phosphoric acid to remove rust. Nonferrous parts, such as aluminum pistons, were cleaned separately to prevent deterioration by the alkali.

Valve seats in the engine block were re-faced before the cylinder walls were rebored. Cylinder-wall cracks were readily detected in this operation and those blocks having cracks set aside for specialized handling. A battery of crankshaft grinders was installed between two engine production lines to allow shifting of the work load

(Text continued to page 256)

TURN PAGE FOR MORE PHOTOGRAPHS

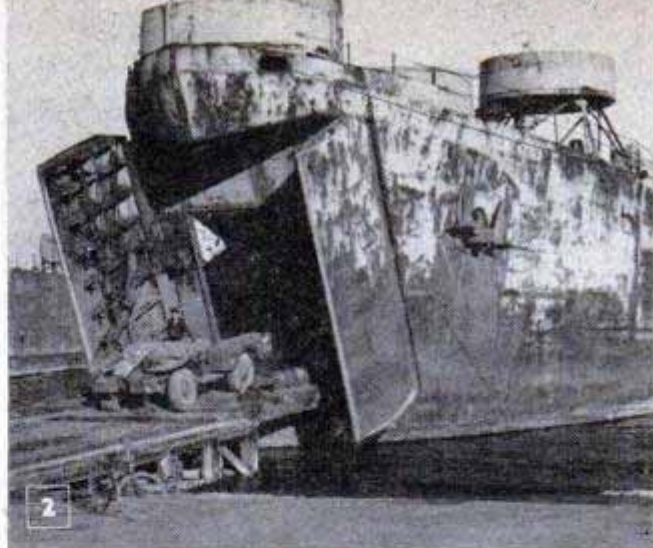


## TRUCKS FROM JUNK

1

Department of Defense photos

Tens of thousands of trucks and Jeeps are awaiting rebuilding in Japan. Some were "knocked out" in Korea



2

Reversing its job of bringing new trucks to the Pacific, this LST now carries wrecks back to Japan



4

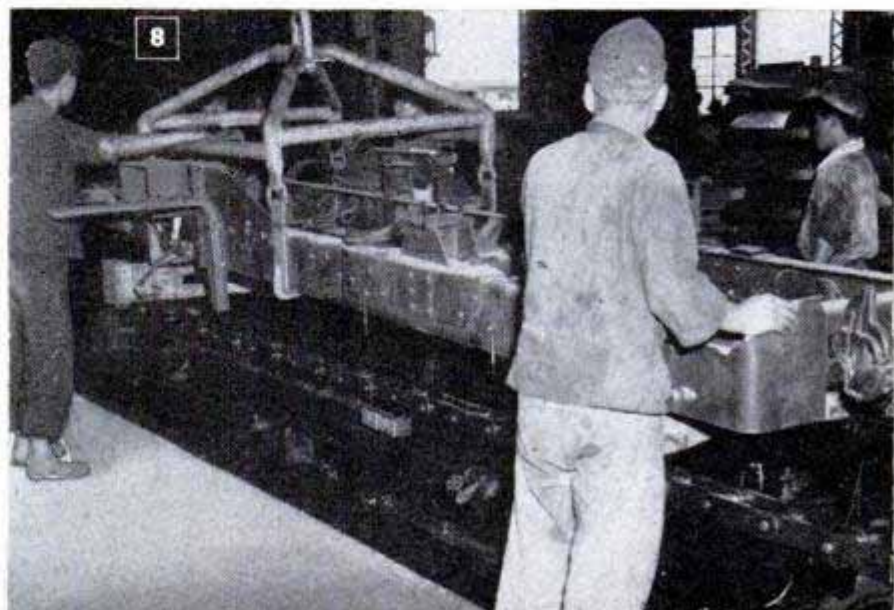
Four to six years' storage in tropical climates took a toll of acres of boxes filled with parts and supplies

Nimble fingers sort bolts, nuts, screws and washers as they pass along on a fabric conveyor belt

Reassembly of trucks gets under way when frame is placed on the main line. Specially designed jigs handle the heavier parts for greater efficiency and safety. Compressed-air outlets speed the operations



7



8

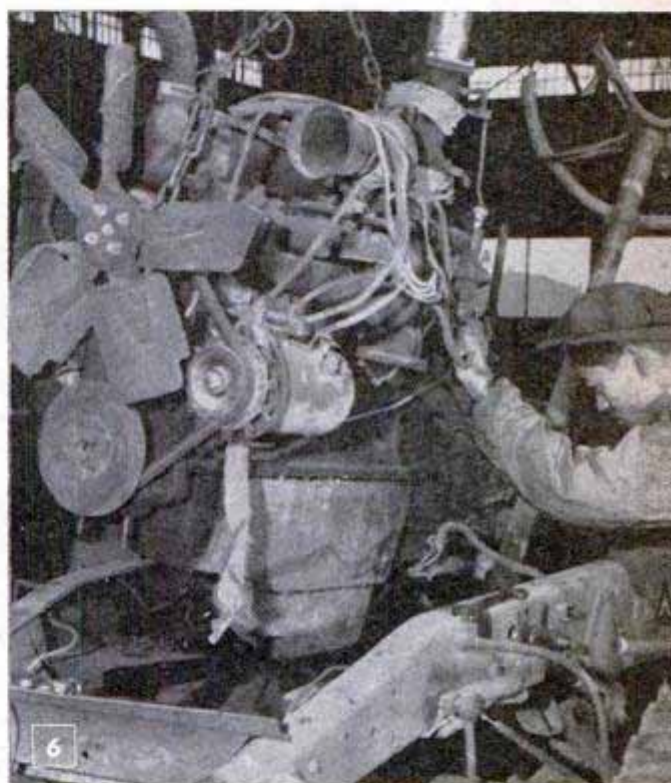




To handle the simultaneous unloading of several ships, a former Japanese seaplane ramp provided an ideal docking apron. Subsequent in-storage maintenance was an important factor in preventing further deterioration



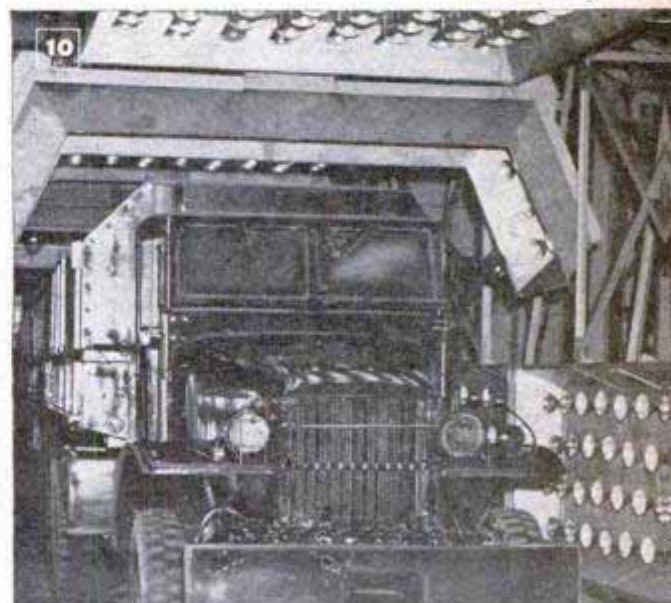
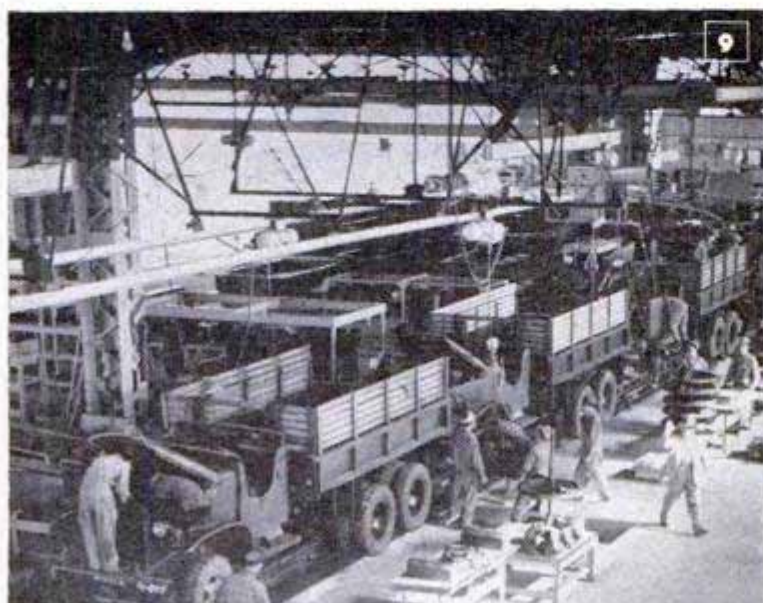
Typical of many vehicles requiring remanufacture is "junkie" above. Excessive damage ruled out the possibility of repair

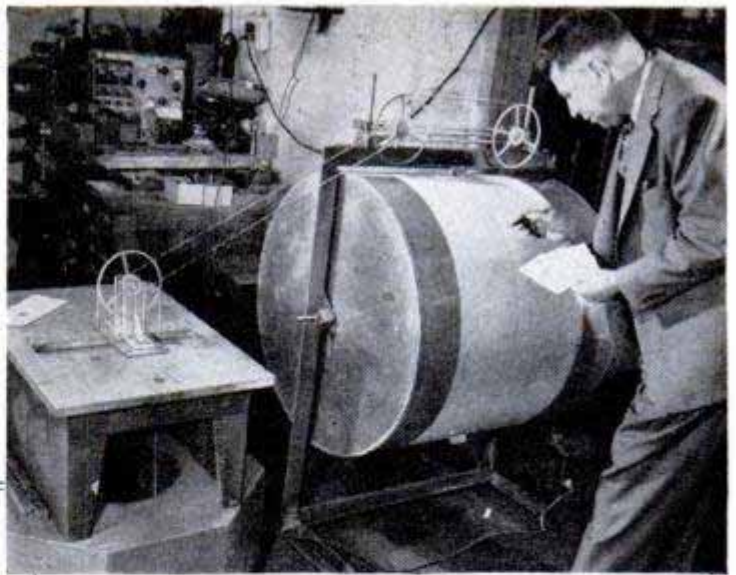
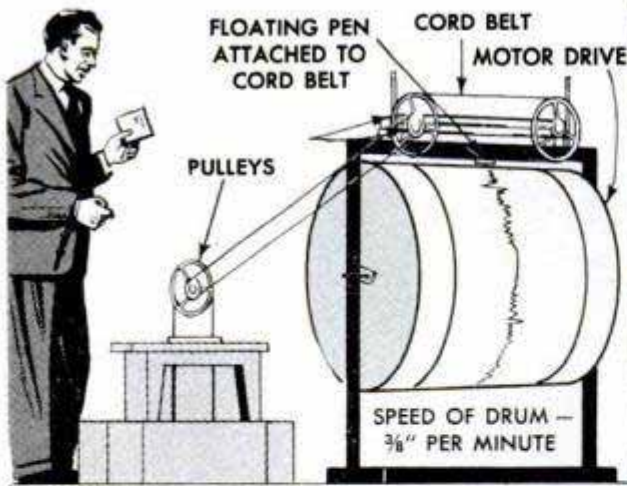


Steam and high-pressure water washing begins after all canvas and wood are removed

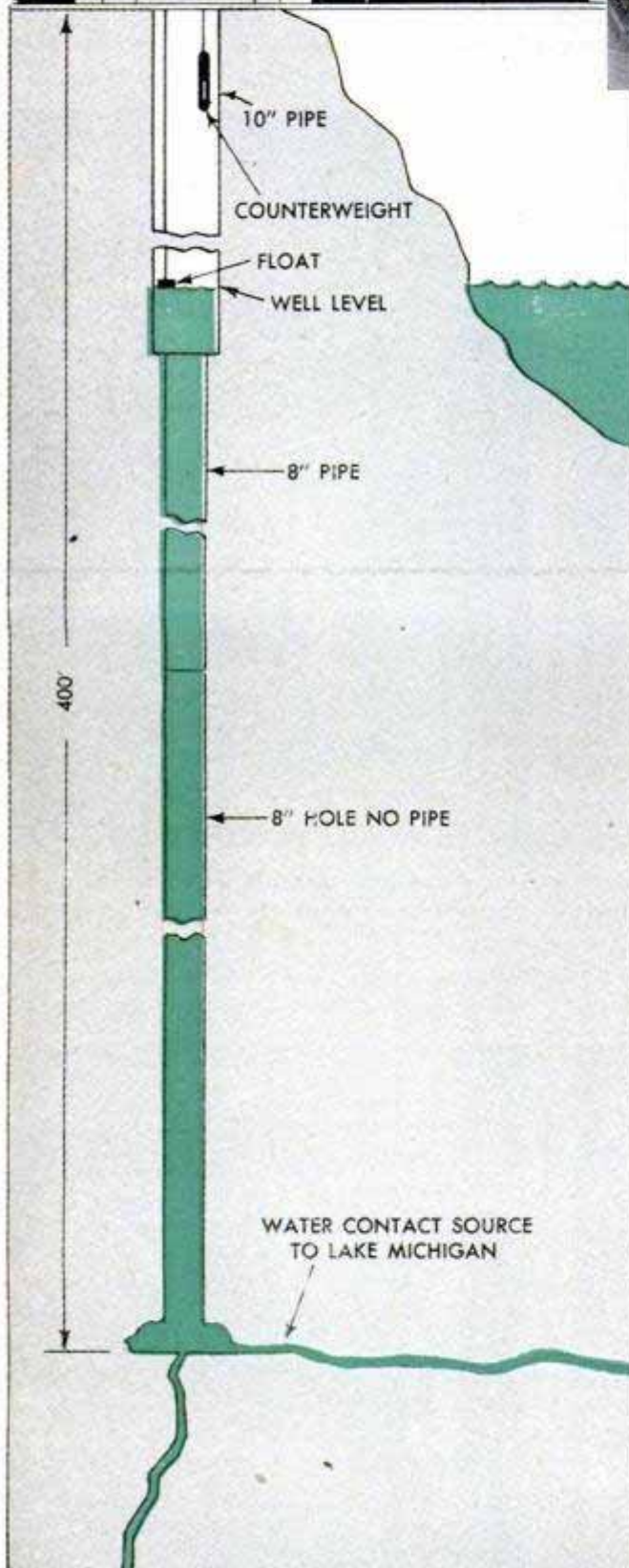
Condition of the frame determines the salvage frequency for trucks, and the body is the most important factor for Jeeps

Following their repair, all vehicles get a primer and a coat of olive-drab enamel





Left, cutaway shows details of the well seismograph. Actually, it is three miles from Lake Michigan. The vertical crack at well base is the fault believed to detect tremors. Above, Rexin reads seismograph drum



## Float in Deep Well Detects Earth Tremors

TODAY Elmer Rexin, Milwaukee plant engineer, is one of the best-informed amateur seismologists in the world because there happened to be an old artesian well under his boiler room.

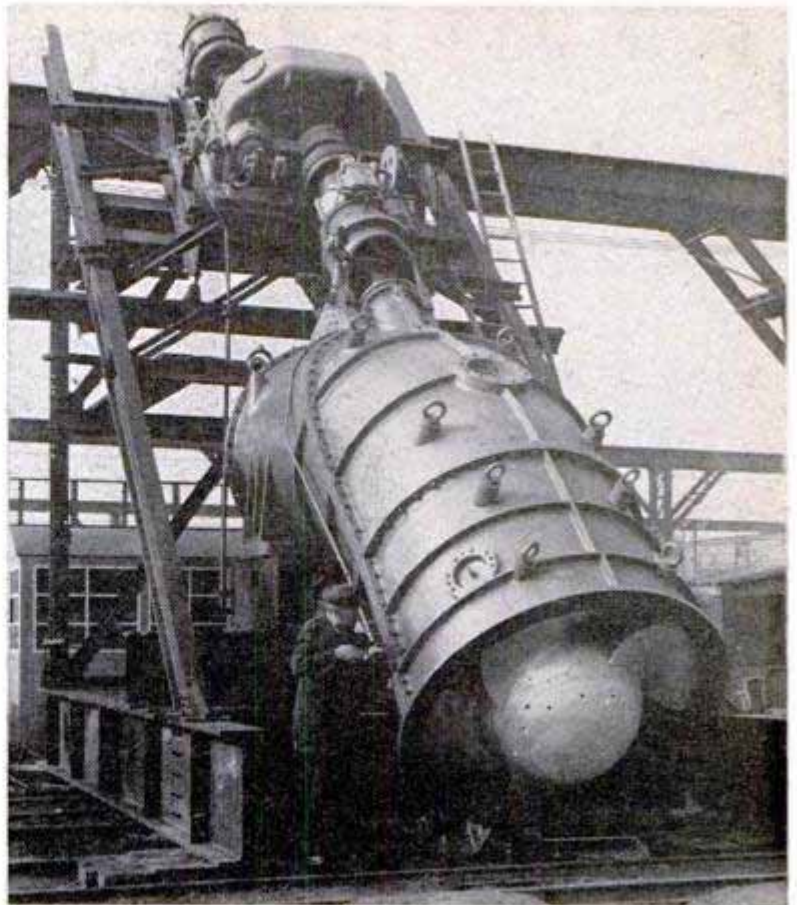
The well, 400 feet deep, detects and measures the world's earthquakes faster and more accurately than the seismographs scientists rely on, amateur Rexin claims.

An ordinary aluminum piepan floats in the well (the water was contaminated years ago by subterranean gas and is no longer fit to drink) and is connected by cables and pulleys to a stylus on a drum graph. As the water reacts to underground earth movements, the float moves and its motion scrawls a wiggly line on the graph. The theory is that directly beneath the well is a fault that extends deep into the earth. Being water-filled, the fault acts as a sensitive subterranean probe. Rexin discovered the well's capabilities by accident in 1946 when it was being used to study the declining Wisconsin water table. Biggest quake it has recorded was in August 1950, when for 12 hours the stylus bounced around describing a tremendous earth movement in Tibet. During this period, the water level in the well varied as much as 120 inches!

It is also believed that the well is connected to Lake Michigan, although this has no bearing on its function as a seismograph. Rexin's well is three miles from the lake, yet he can plot the rise and fall of the lake's level, detect tides, and measure barometric pressures over the lake by watching the water level in the well.



From hand-cranked spirals, above, that for centuries have raised water on the Nile came the idea for 445-hp. pump at right



## Nile Station Modernizes Water-Lifting Technique

Adapting an ancient method to a modern problem, a German engineer has built giant electric screw shovels to lift large volumes of water at a new pumping station on the Nile near Alexandria. Driven by 445-horsepower motors instead of the hand cranks used by ancient Egyptians, screw-shaped spirals in a set of four pipes raise the water. The pipes are set at a 45-degree angle with the sucking end always completely below

the water's surface. Sieves prevent stones from entering the intake and damaging the screw blades.

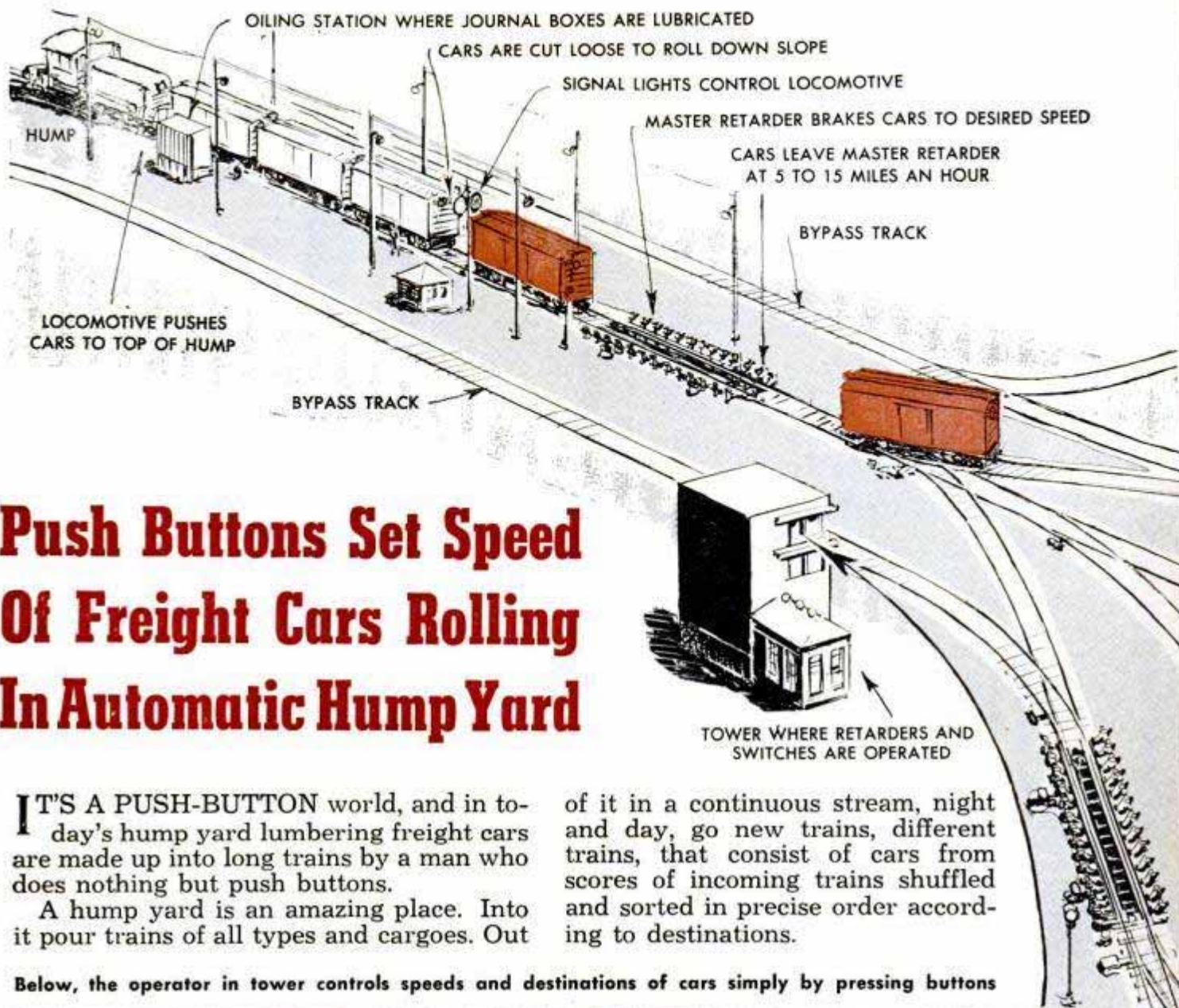


## Replacement Tail Pipe Bends to Fit Most Cars

Flexible enough to permit bending over the knee, a replacement tail or exhaust pipe for automobiles can be formed quickly to fit most cars. The bendable pipe eliminates the need for small shops to carry a wide variety of tail pipes. Six sizes of the new pipe permit duplication of 600 standard tail pipes. After the pipe is bent, it retains its new shape rigidly.

## Urge Single Runways for Airports

Future U. S. airports will have single runways or several parallel runways, if the recommendations of the President's Airport Commission are followed. Its members pointed out that cross winds have little effect on modern heavy planes during landings and that light planes can be equipped with castered cross-wind landing gears. It would mean that relatively long, narrow strips of land would be required for airports instead of the broad areas now needed. Building restrictions would be necessary only in two directions. Since heavier aircraft require longer runways, the commission urged that transcontinental and international airports have 8400-foot runways, with room to expand to 10,000 feet.



## Push Buttons Set Speed Of Freight Cars Rolling In Automatic Hump Yard

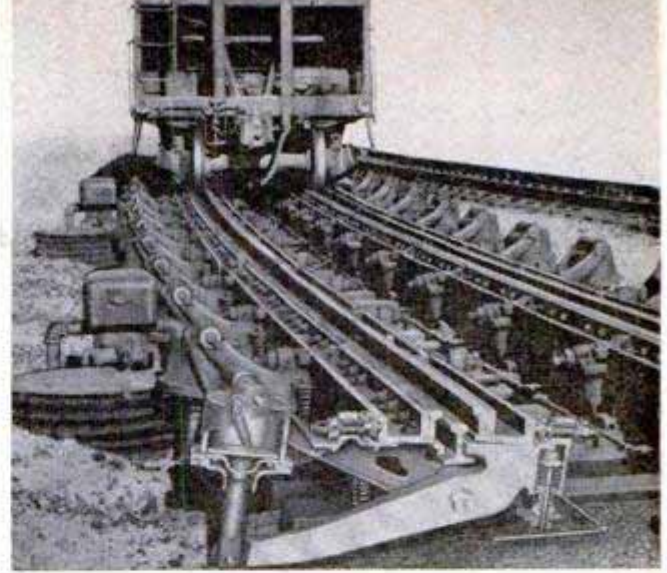
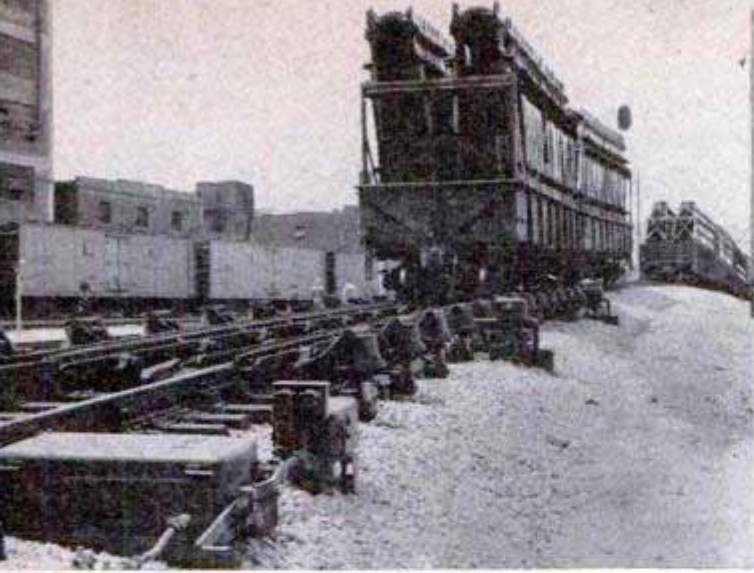
**I**T'S A PUSH-BUTTON world, and in today's hump yard lumbering freight cars are made up into long trains by a man who does nothing but push buttons.

A hump yard is an amazing place. Into it pour trains of all types and cargoes. Out

of it in a continuous stream, night and day, go new trains, different trains, that consist of cars from scores of incoming trains shuffled and sorted in precise order according to destinations.

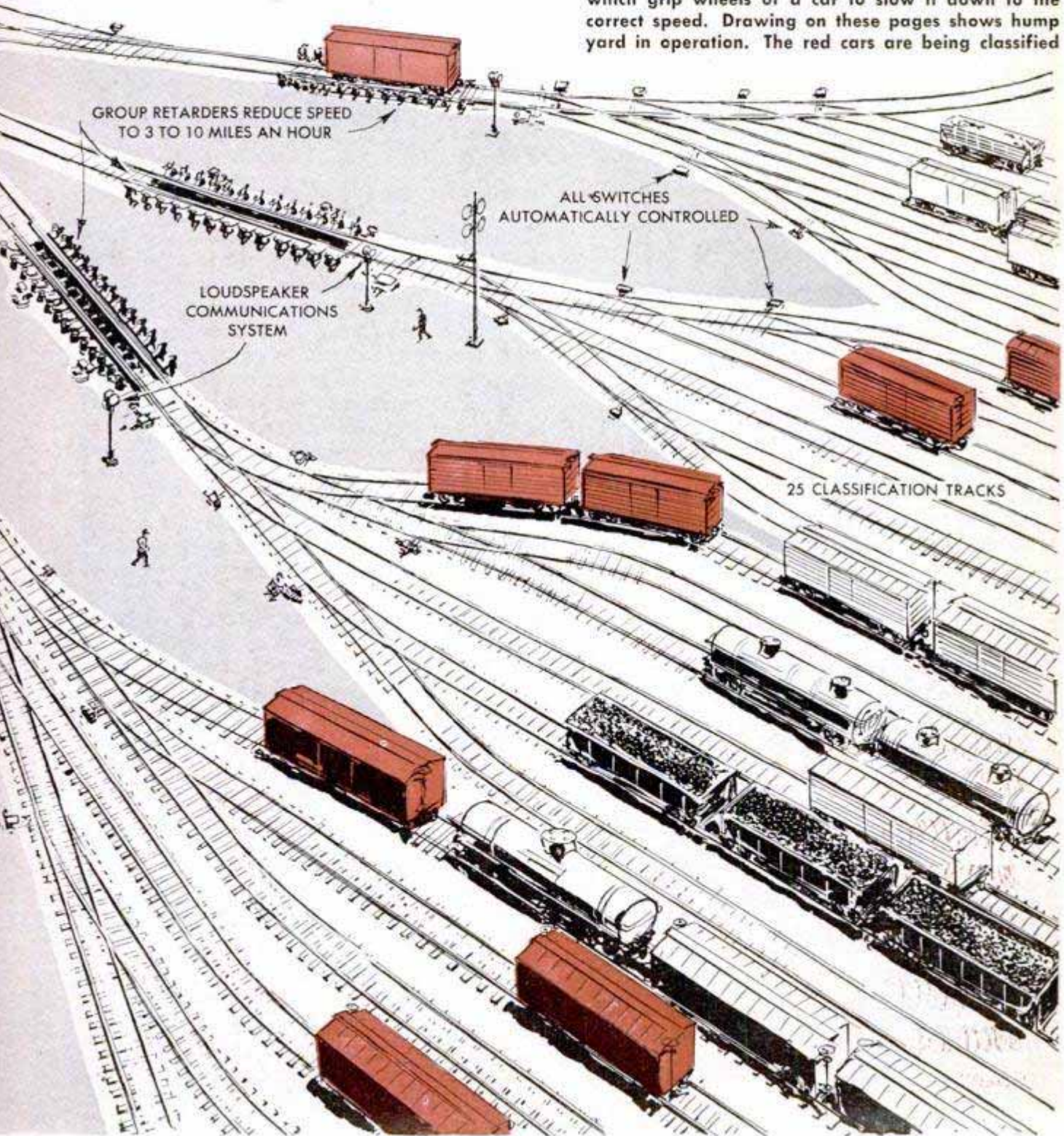
Below, the operator in tower controls speeds and destinations of cars simply by pressing buttons

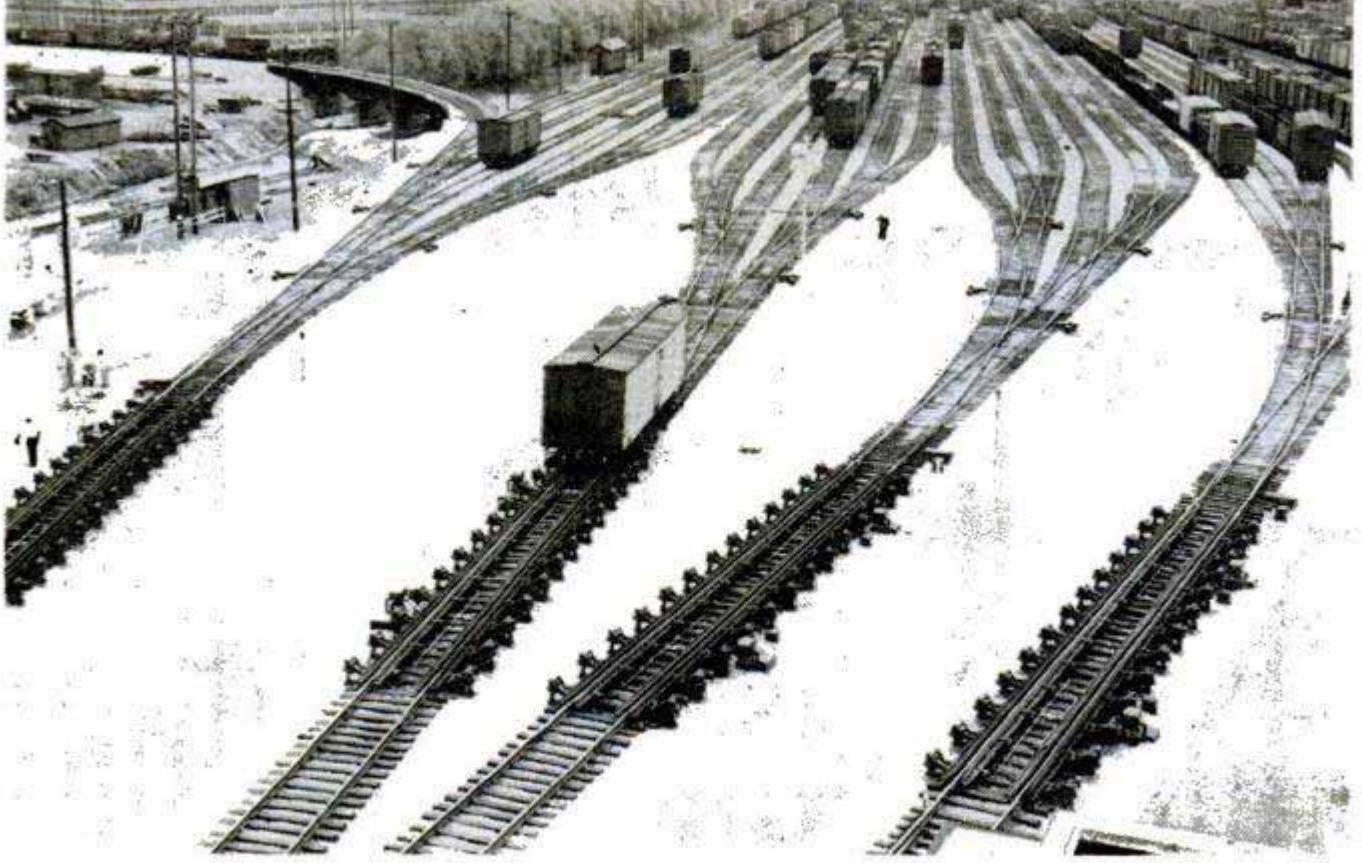




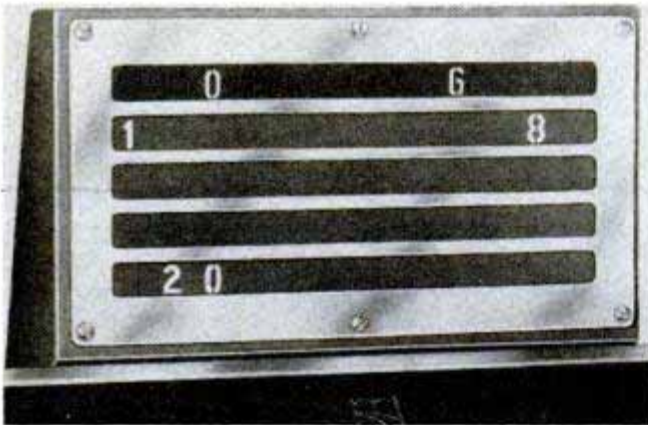
"Cut" of two cars rolls down the hump into retarder

Cutaway (foreground) shows design of the retarders which grip wheels of a car to slow it down to the correct speed. Drawing on these pages shows hump yard in operation. The red cars are being classified

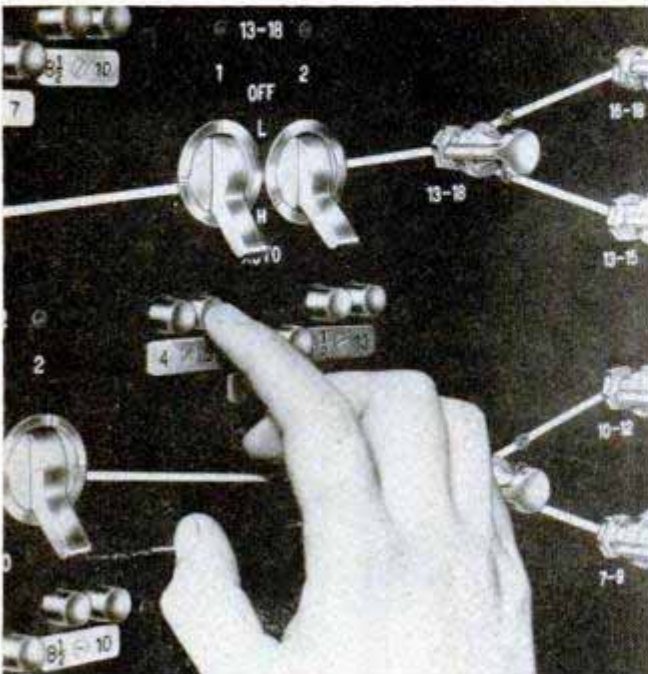




Car shown leaving a group retarder will be switched automatically into any of six tracks in front of it



Above, indicator lights show tracks that cuts now being made will occupy. Below, this button "tells" retarders to slow car down to five miles an hour



The automatic hump yard makes freight-car classification faster, gentler and more efficient. Most automatic is the Air Line Yard of the Chicago, Milwaukee, St. Paul and Pacific Railroad in Milwaukee, Wis. There the control-tower operator breaks up and makes up trains at the touch of a finger. His window-walled tower would be a paradise to a model railroader.

By pressing one button as the freight car rolls down the slope, he routes it to any of 25 tracks spread out before him. That single action guides the car through a half dozen switches to its train-in-the-making. By pressing a second button, the operator regulates the speed of the car. It's as simple as that. Free-rolling down the hump, the cars are slowed down by retarders that grip the wheels as they roll along.

He can set up in advance as many as five "cuts" (as railroaders call any car or group of cars being classified as a unit). As each cut rolls down the hump, switches in front of it are thrown automatically, taking the unit to its proper track.

Speed is controlled by retarder action. Some cars are heavy and fast-rolling, others lighter and slow-rolling. The operator estimates the speed needed to take the car to its spot on the classification track, pushes a button marked for that speed and the automatic retarders slow it down quickly and precisely. The grade of the tracks is such that after the cars leave the retarders they gradually slow down to a stop.

The new yard will handle 2400 cars in a 24-hour operating day. This is twice as fast as the system it replaced. ★ ★ ★

## Ultrastreamlined German Auto

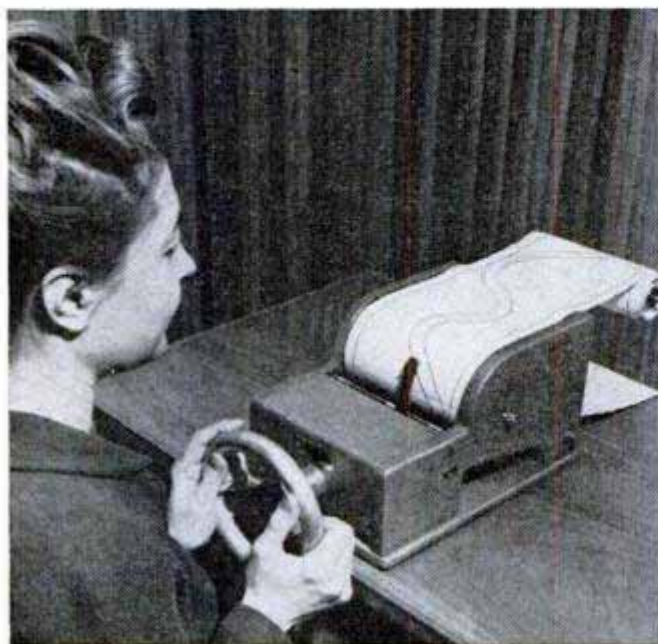
Its rear fenders providing the ultimate in the current fin styling, an ultrastreamlined German car is said to be capable of more than 125 miles an hour. Four exhaust pipes provide a rocket-ship effect in the rear. It is powered by a supercharged 40-horsepower engine and was designed by Rudolph Haller, former airplane and speedboat manufacturer in Munich.

## Build Plastic Wing

Latest of the plastic products is a delta-shaped aircraft wing now being tested in England. The makers claim it is the first step toward an all-plastic plane that could be built for half or less the cost of metal aircraft. The material consists of asbestos fiber bonded together to form large, soft, feltlike sheets. During the heat-curing process, 198 wires leading to thermocouples attached throughout the mold are connected to an automatic telephone exchange. The temperature of any area being cured can be found by dialing the number of the thermocouple on an ordinary telephone dial. After "cooking," the completed wing



is sanded and, by a technique similar to French polishing, given the hard, glossy surface needed for high-speed aircraft.



## Tester Checks Driving Skill

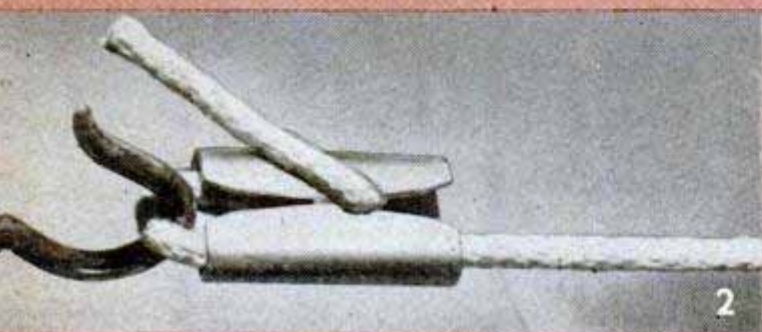
In Rome, Italy, drivers are tested for their reaction speed and aptitude by a miniature steering assembly. The machine has a paper roll which unwinds in front of the driver. Two parallel lines curve back and forth across the paper to simulate a winding road. The driver operates a miniature steering wheel, which in turn moves a pencil pointer to trace a line on the paper. A good driver keeps the pencil line between the two lines already traced.

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

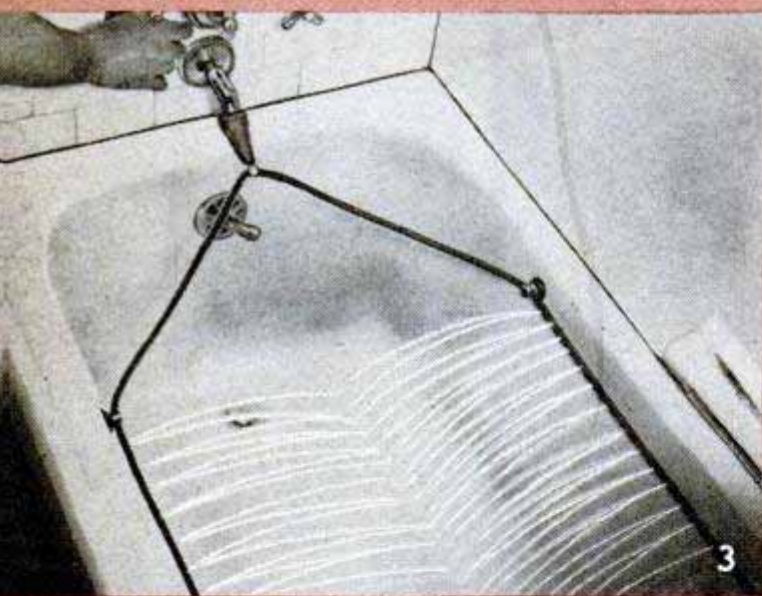
# WHAT'S NEW FOR Your Home



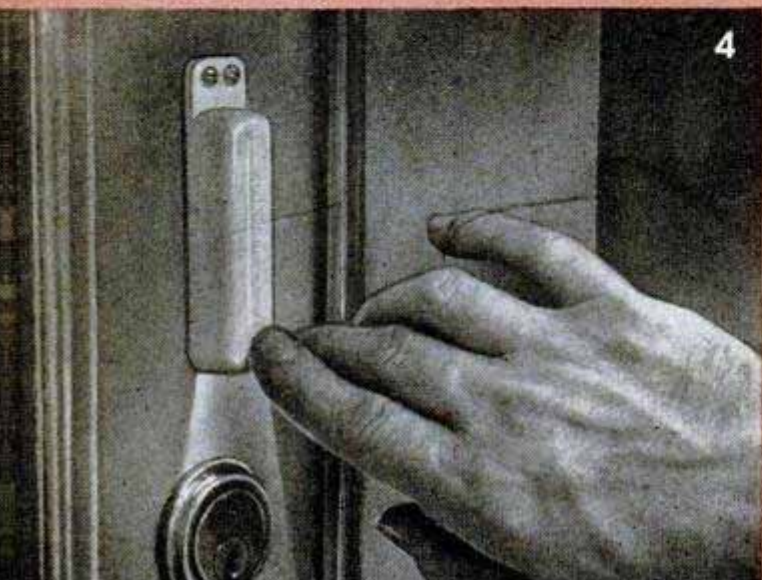
**1** SINK facilities in the center of the kitchen floor save steps for housewives. A new cabinet design is easy to get at from any of its four exposed sides. It is cubical and approximately twice the width of conventional wall-type sinks. The top has twin sink bowls and a combination tabletop and drainboard



**2** CLOTHESLINES are held taut by a metal tie that can be applied in five seconds. No knots are needed. The line is passed through the holder, pulled taut and secured in a lock slot. It is also useful to truckers or anyone using rope or cord. It is made from heavy-gauge steel, plated to prevent rusting



**3** SIT-DOWN SHOWERS are made possible by a novel rubber-tube device which may be attached easily by means of rubber suction cups to the sides of any bathtub. There is a faucet attachment at the center of 10 feet of perforated hose, with a metal T-tube dividing the flow of water between the two sides



**4** KEYHOLE LIGHT is provided by a small unit that is attached to a door or an adjacent casing. It contains a battery cell and lamp, with a lens-type bulb, and lights when touched. It is also useful in illuminating meter dials in dark locations and as an emergency panel light for boats and autos

**5** SPREADING BUTTER on ears of corn and hot rolls is done more quickly and with less waste with a new butter cylinder. On picnics it also prevents exposing the butter to insects. After the cylinder is three-quarters filled, a plunger is inserted and finger pressure forces the butter out as needed

**6** BABY-PEN transportation is simplified by a new lightweight model that can be folded and carried in one hand. It consists only of wood latticework that surrounds the child. The pen weighs six and a half pounds and packs into a small space for traveling. It is made of hardwood, with metal joints and corners



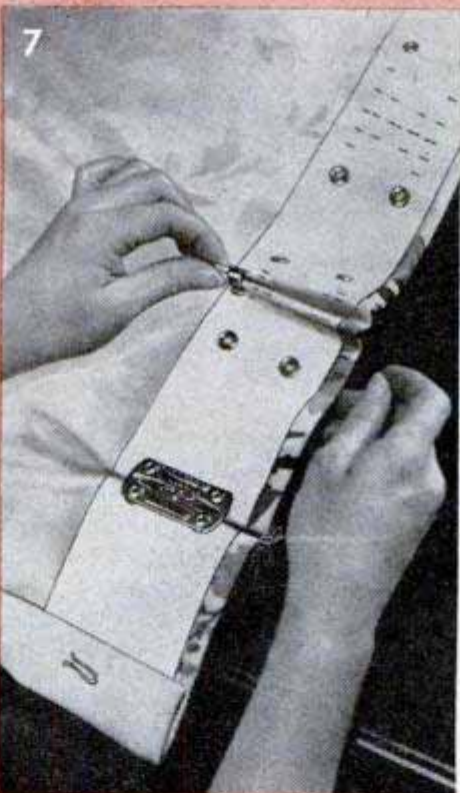
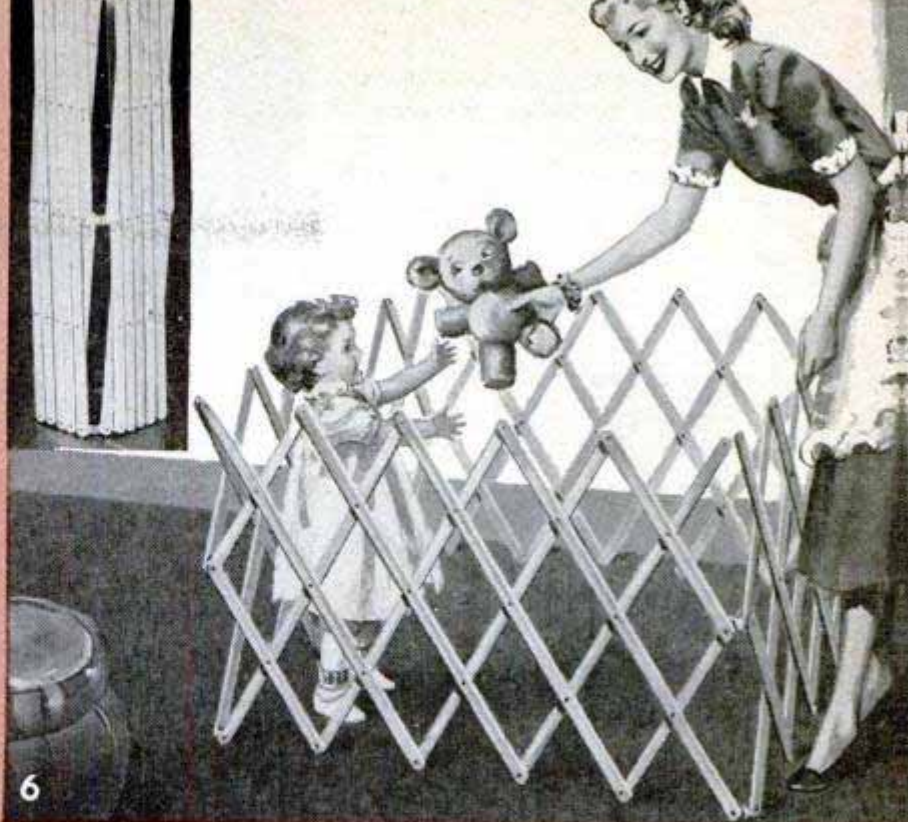


**7** DRAPERY PLEATING is done quickly and easily when a new pleating kit is used. It contains a strip of tape, cut to size for making one pair of draperies, using 48 inches of material, and a set of 10 metal pleaters that snap onto fasteners attached to the tape. The pleating areas are indicated by printed crease lines and a small clip is used to make each pinch

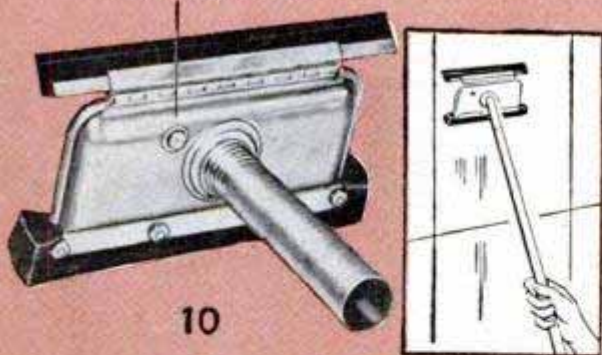
**8** ALCOHOL is used to generate steam for a new coffeemaker. It provides a brew that is served piping hot in four minutes. The steam generated by the alcohol flame passes through the finely ground coffee, extracting the full flavor, and then passes in a condensed form through the spout into the cup. Chrome-finished, the brewer comes in two and four-cup sizes

**9** DUST-CATCHING corners on stairways and in cupboards and drawers are eliminated by plastic triangles that round out the space. A small dab of special plastic glue holds them firmly in place. They come in packages of 40 in amber, ivory, mahogany, red, green and crystal clear. Once installed, they will remain in place indefinitely without additional attention

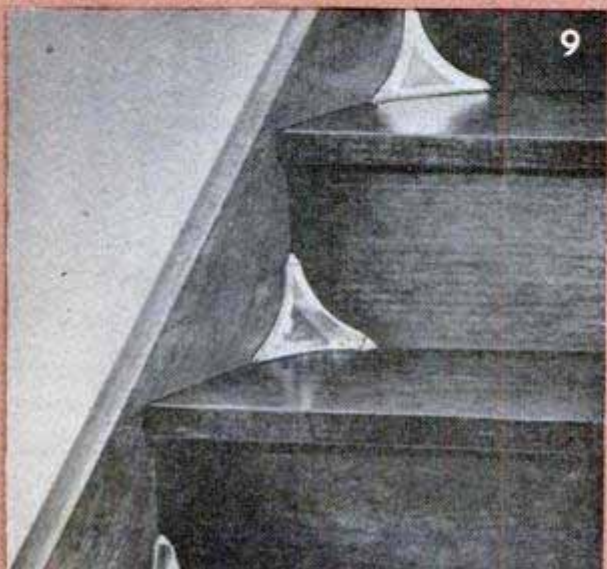
**10** WASHING WICK, water supply and wipe-dry squeegee are combined in a new aluminum window washer. A touch-type valve starts and stops the flow of water through the unit's hollow handle to the wick. The wool-felt wick's rough texture permits easy removal of even stubborn, dried bug stains. The specially cured rubber squeegee dries and polishes quickly



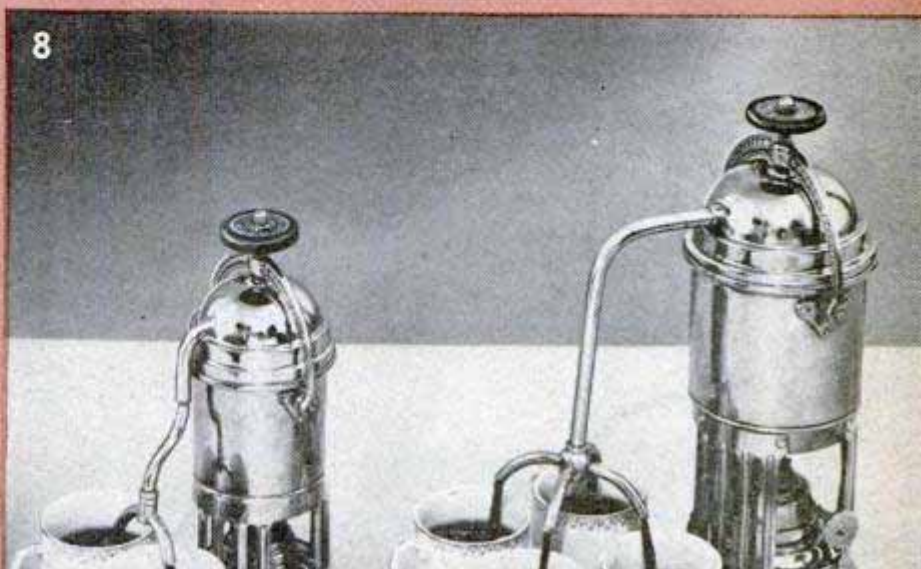
WATER-FLOW VALVE



10



9



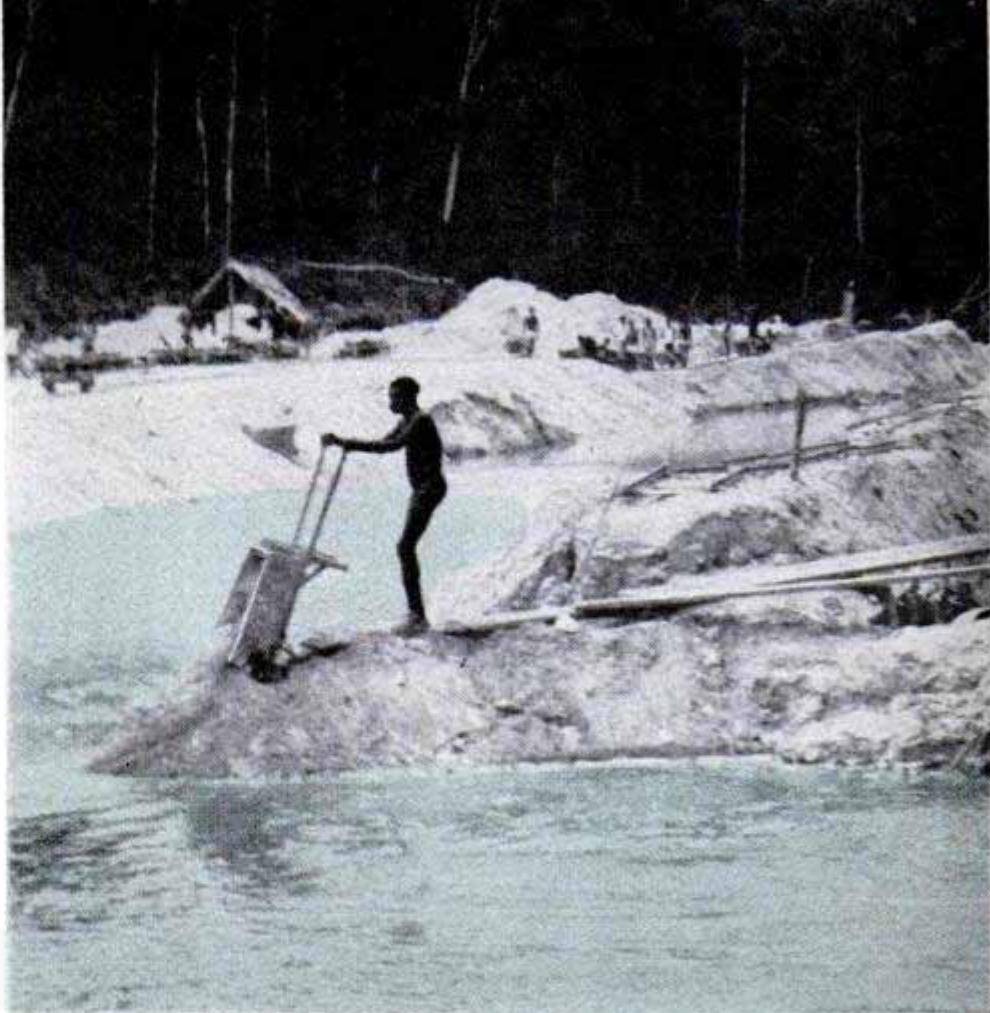
8

Native laborers patiently build diversion dams to change the course of rivers. Diamond deposits in this area are found in subsoil of river beds

**By L. Witherspoon**

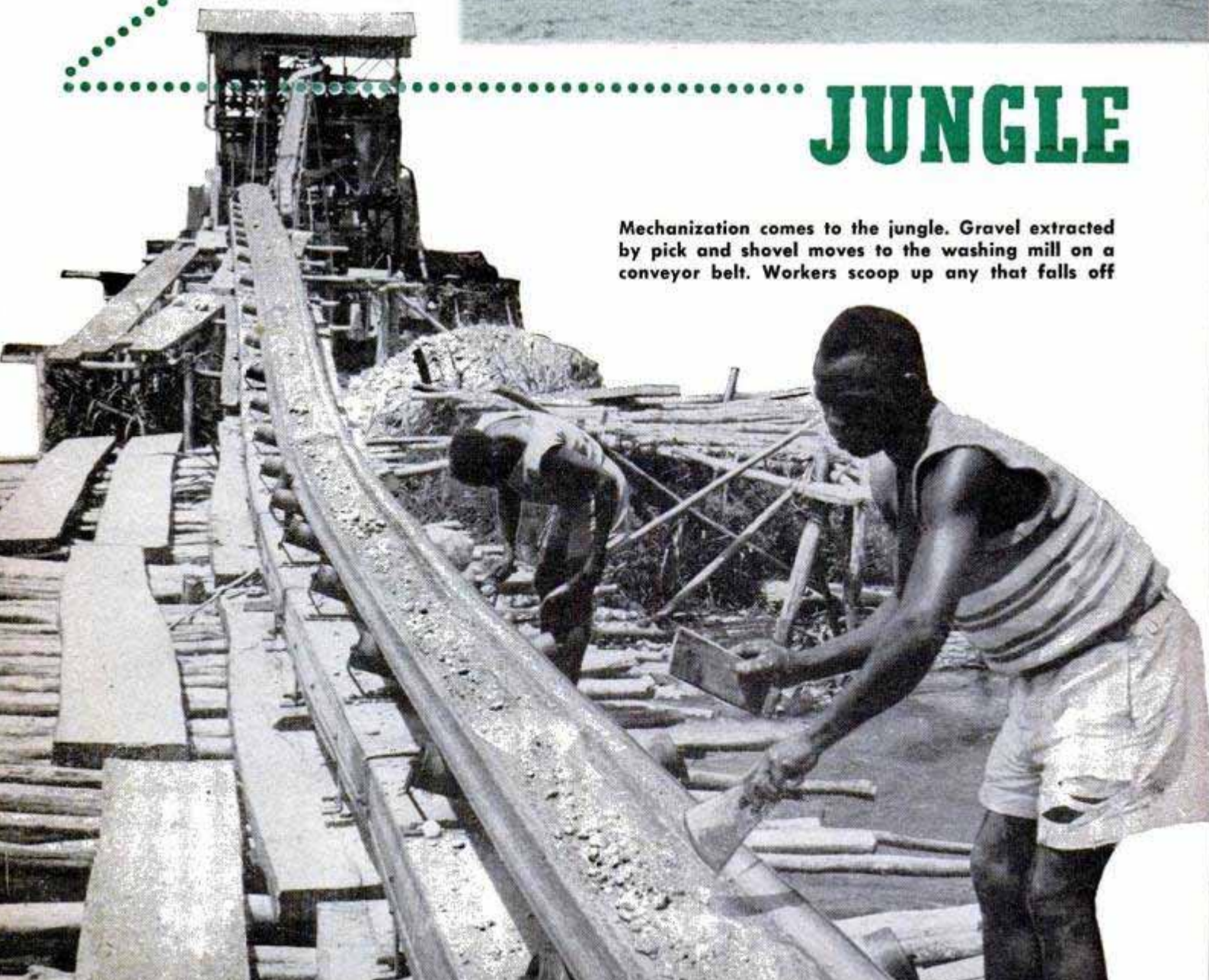
*Mutual Security Agency photos  
by George Rodger*

**Native tribesmen  
are sifting  
the river beds  
of Africa  
for hidden  
treasure**



## JUNGLE

Mechanization comes to the jungle. Gravel extracted by pick and shovel moves to the washing mill on a conveyor belt. Workers scoop up any that falls off





## DIAMONDS to Grind Our Tools

**O**NE MORNING last fall a pigmy hunter spearing game along the Lopo River in French Equatorial Africa suddenly halted in terror. Just ahead some fantastic, roaring creature was crushing trees as thick as a man's neck. A blood brother of this strange giant was biting out chunks of soil as big as a pigmy hut to make a new channel for the river. Several smaller specimens were chugging up and disgorging clanking beams of structural steel.

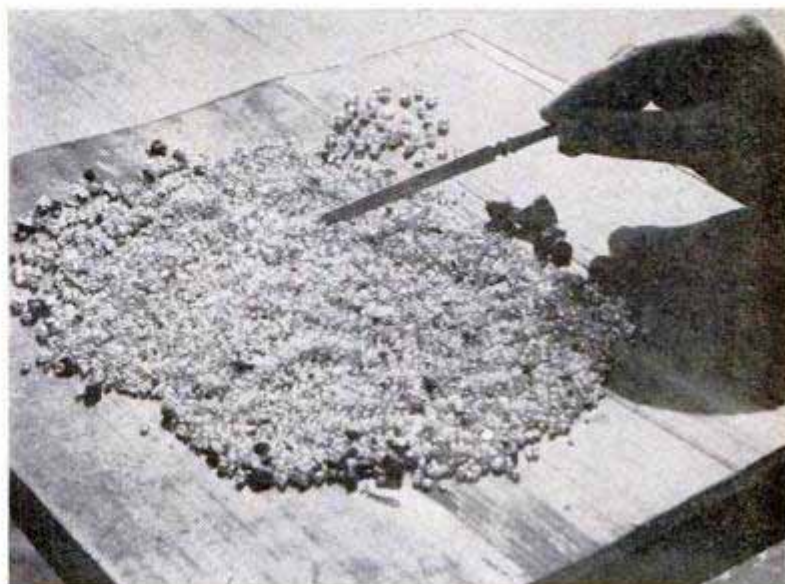
The pigmy looked on for a moment, then dropped his sack of game and ran as fast as his legs would travel. Maybe the witch doctor could explain it all.

The tree dozer, the diesel-powered shovel and the fleet of trucks which frightened the native would have seemed familiar enough to an American or European. But the purpose of all this activity might have been a trifle hard to grasp. The principal object was to find diamonds—not primarily diamonds for women to wear but in-

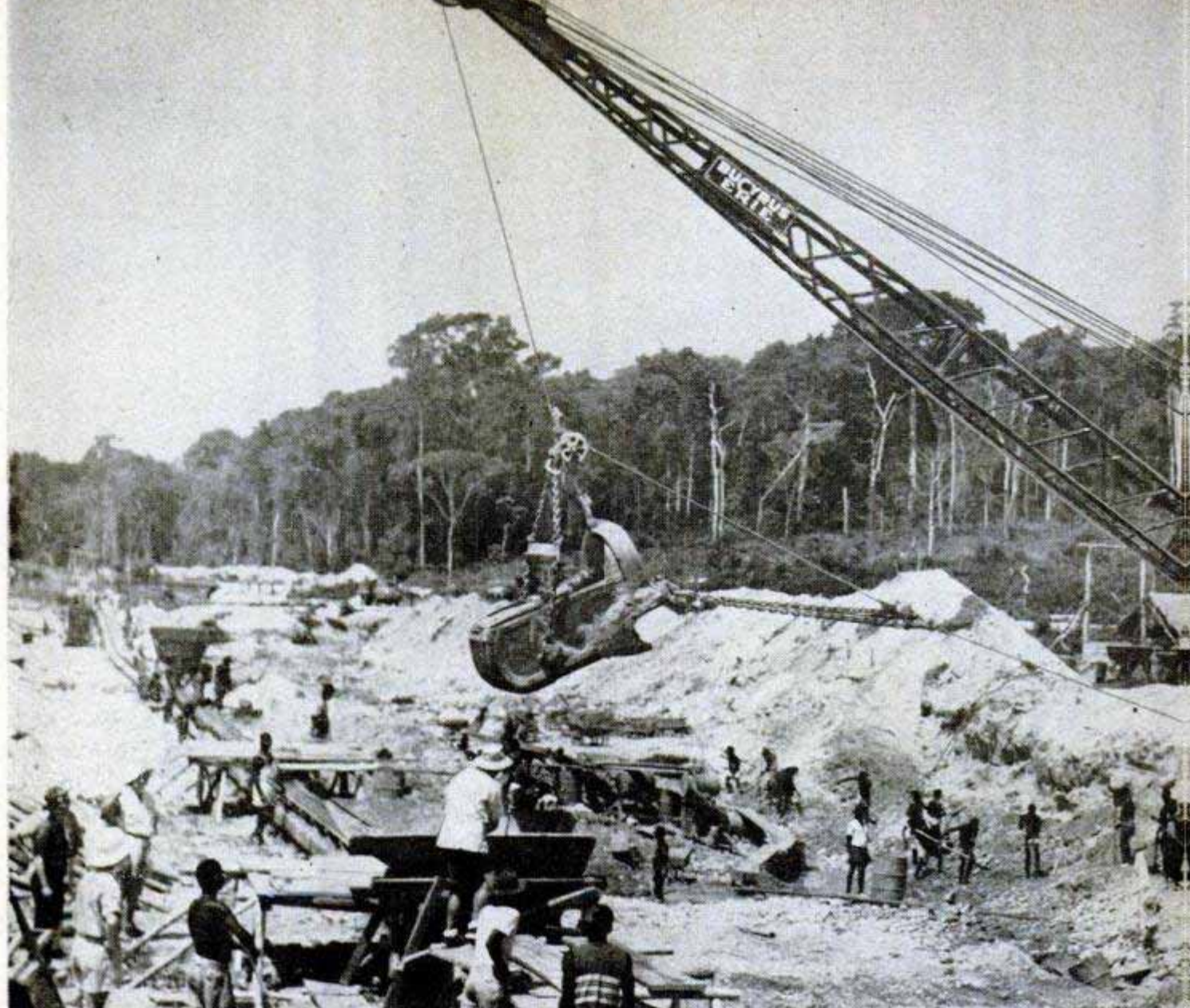
dustrial diamonds to use in American cutting and tooling machines.

If jewel diamonds were found—and the jewel and industrial types usually are found together—they would be welcome as a means of bringing down the over-all cost. But the real goal was industrial diamonds for the United States.

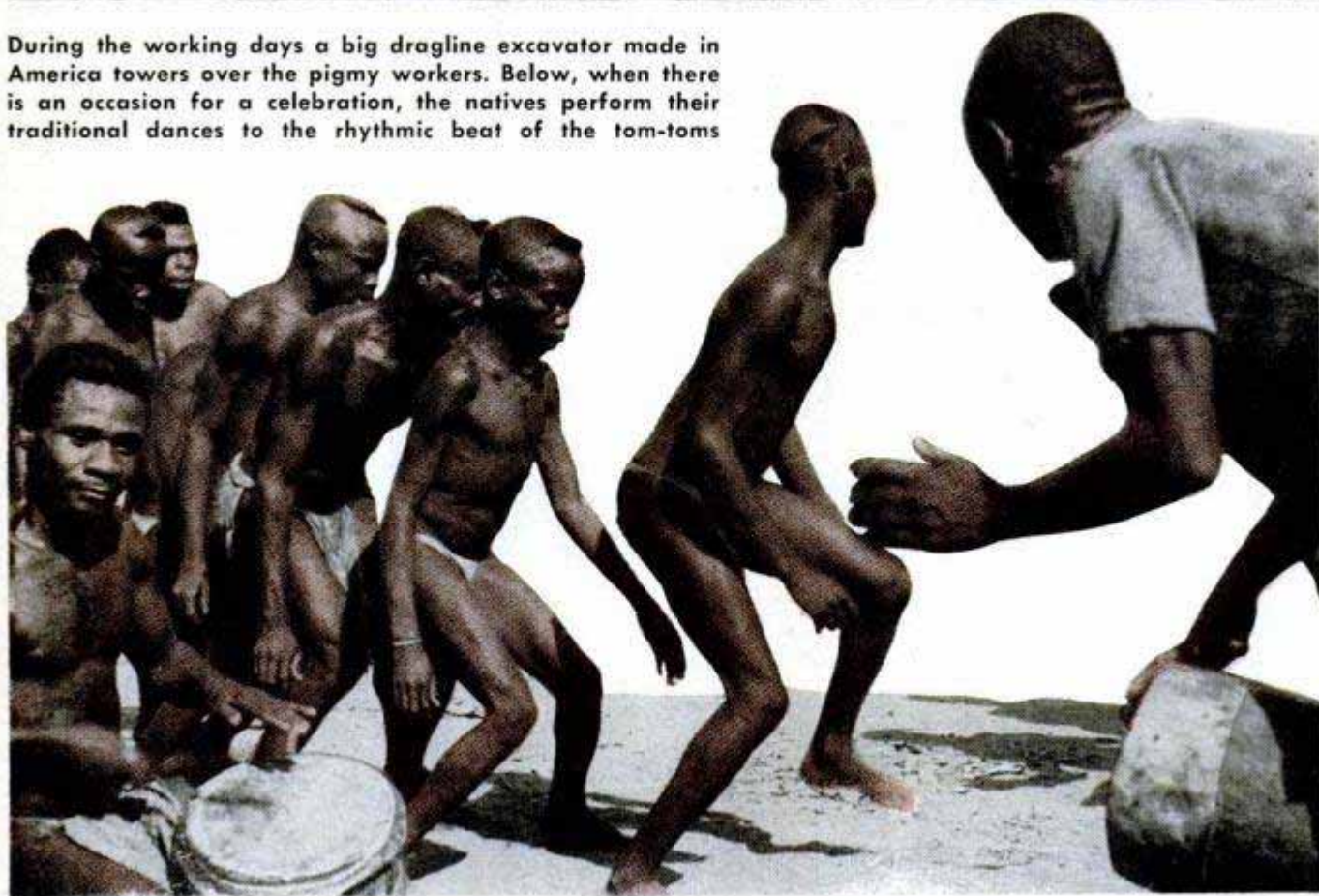
Until World War I, diamonds of all colors except yellow, white and blue-white were



Ten-day yield of diamonds from one camp, equal to 1600 carats, is worth \$20,000



During the working days a big dragline excavator made in America towers over the pigmy workers. Below, when there is an occasion for a celebration, the natives perform their traditional dances to the rhythmic beat of the tom-toms





Cans containing the diamond-bearing concentrate, sealed to prevent theft, are loaded at each camp and sent to a central plant for the final washing



After final wash, diamonds adhere to a tray covered with a special substance known as diamond grease. They'll be cleaned by boiling them in acid baths

a drug on the market. Black, brown, gray or other off-tints of diamonds were not sold at all or went at bargain-basement rates.

During the war these ugly ducklings of the diamond trade began to come into their own. A diamond is the hardest substance known and therefore provides the best cutting or grinding edge. Diamonds and diamond abrasives were required to cut and dress the bullet-resisting steels of war. For this, the off-color diamonds were every bit as good as gem diamonds.

By the outbreak of World War II, there was a whole range of metals made of tungsten, vanadium, silicon, tantalum, boron and other minerals hard to manage. Moreover, airplane and tank engines, submarine torpedo heads and a score of other armaments had to be built with components tooled to an accuracy of perhaps .0001 inch.

There were not, of course, enough industrial diamonds to do all the cutting and grinding, but enormous quantities were required simply to smooth and true the surfaces of the tools doing the grinding.

After 1945 the fine tolerances being built into peacetime machines like truck and

automobile engines kept the market for industrial diamonds from sagging too badly. The present drive for rearmament has made the demand much greater.

The world's diamond mines are now producing at the rate of 14 or 15 million carats a year, or about twice the average production before World War II. Of this total approximately 80 percent are for industrial use.

The United States regularly absorbs three fourths of the world's diamond production, jewel and industrial. As a matter of policy it is encouraging new and independent sources which will be capable of maintaining a steady supply.

Between 80 and 90 percent of all diamonds are produced or marketed under the control of De Beers Consolidated Mines Ltd., of South Africa, one of the world's tightest monopolies. The United States government has favored the development of independently controlled mines like those in French Equatorial Africa.



Though power machines have changed the jungle, some workers still load diamond-bearing gravel with shovels

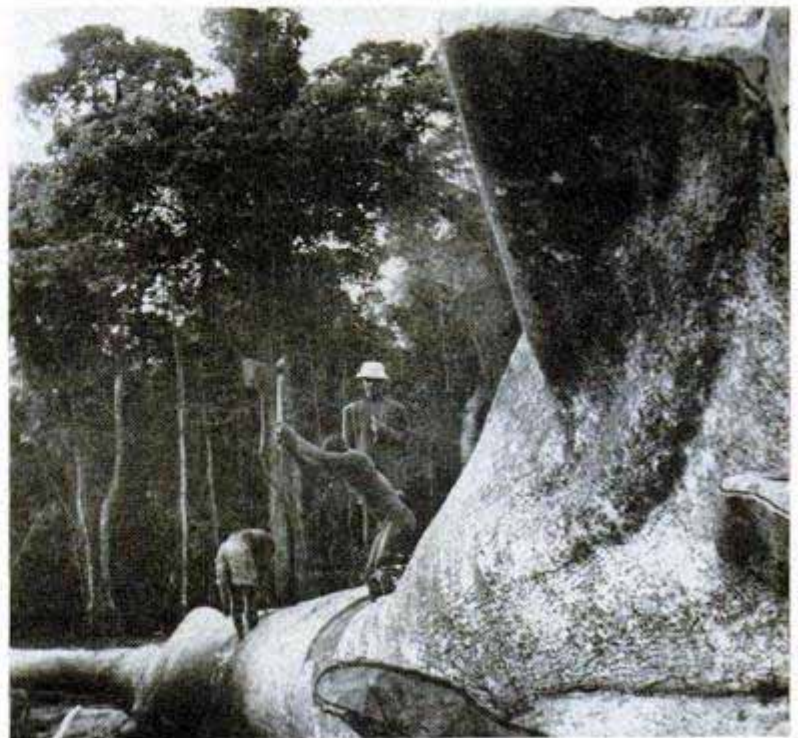
Through the Mutual Security Agency, formerly the Economic Cooperation Administration, the United States has aided two related French companies to prospect and open mines in French territories lying on each side of the equator. To search the Gabon, principally south of the equator, the Societe de Recherches et Exploitations Diamantiferes (Soredia) has received a loan of 228 million francs, equivalent to about \$650,000.

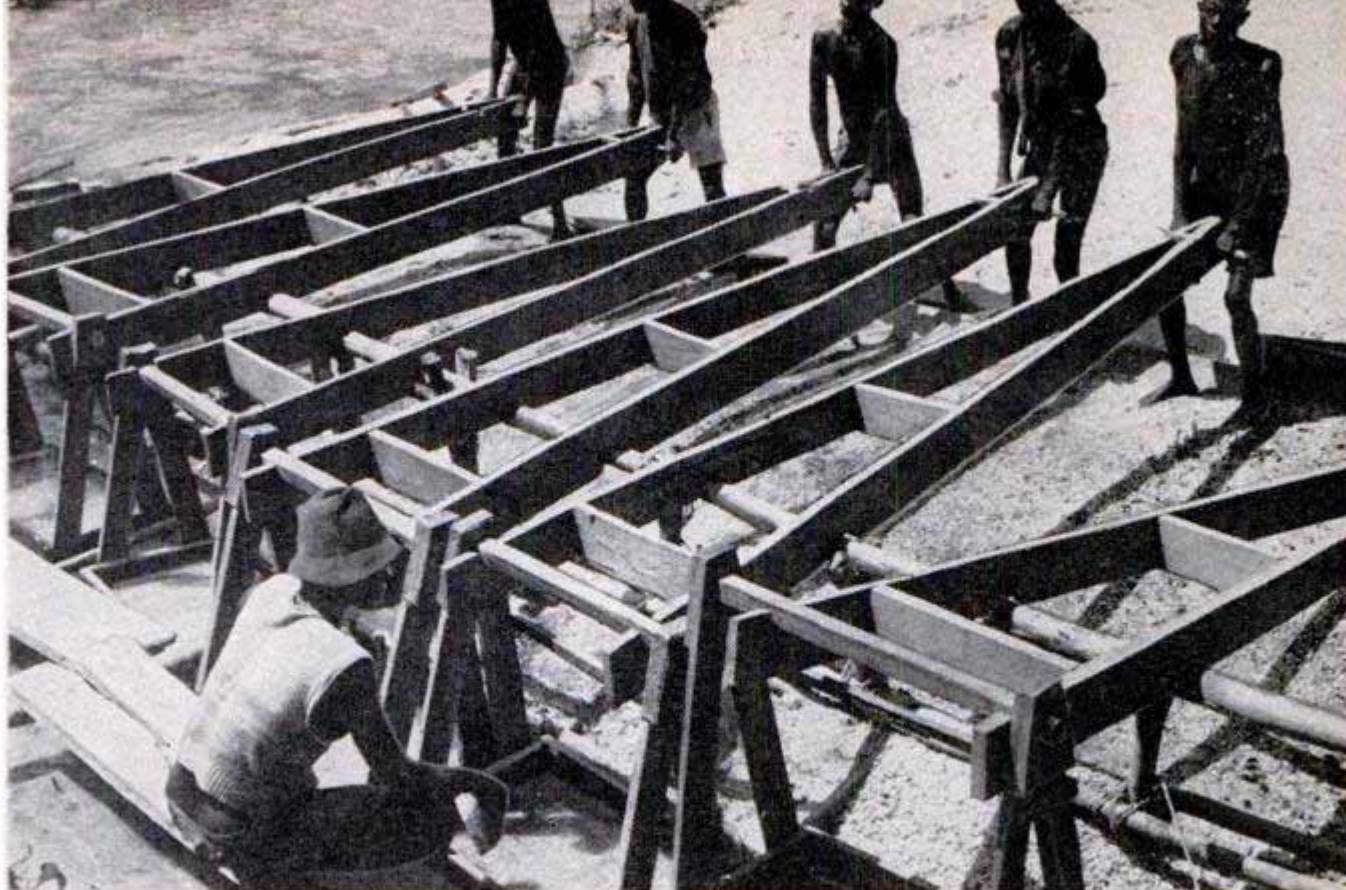
This loan came from the French "counterpart fund," a sum each MSA nation accumulates in local currency when it sells to its own citizens goods purchased abroad with MSA dollars. By law, five percent of the counterpart funds must be set aside to pay the administration expenses of MSA and to acquire materials needed for the United States' strategic stock pile. The loan to Soredia was made from the five-percent fund. Repayment is contingent upon the

Here's the amiable chief of the Bingay tribe, a family of 60 interrelated persons



When prospectors found diamonds here, natives cleared the area. Three of them worked five days to hack down giant kapok tree





discovery of diamonds in commercial quantities.

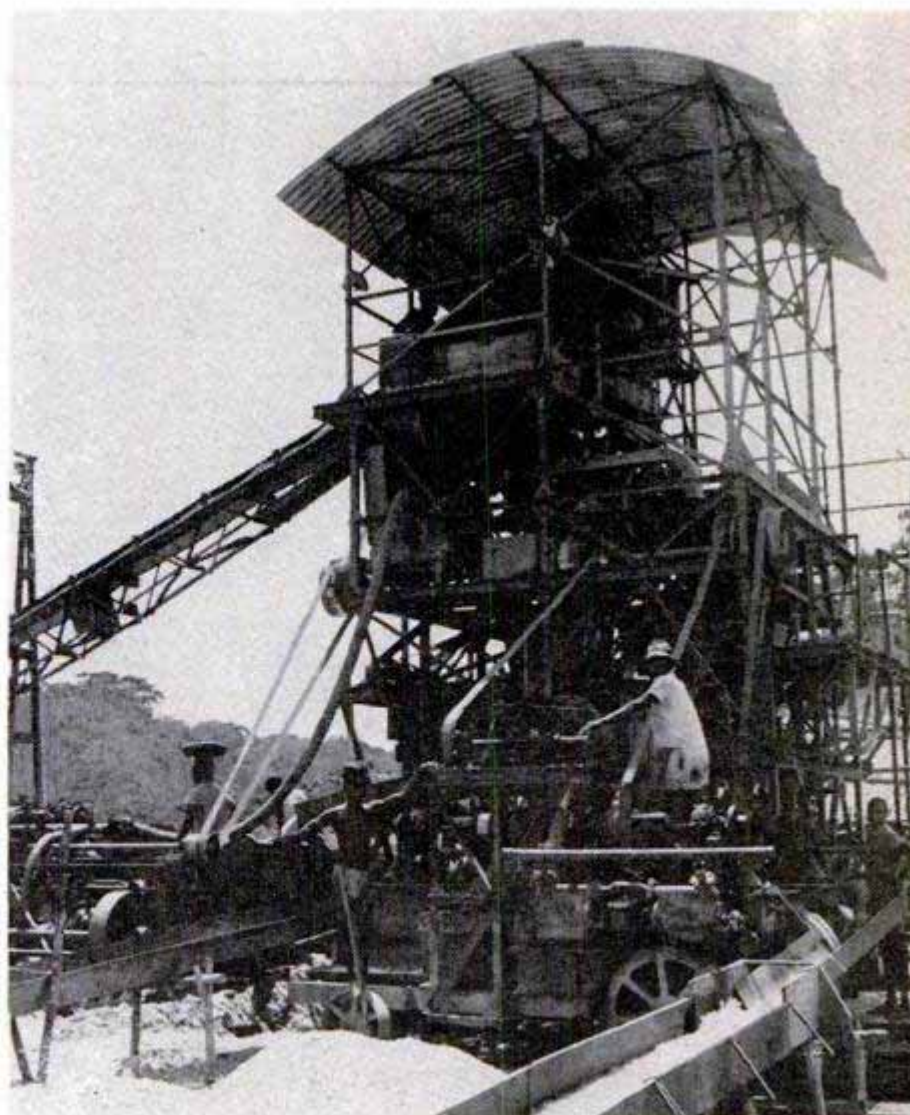
Soredia's concession covers 34,000 square miles of tropical rain forest, an area about three fourths the size of the state of New York. The engineers have marked this off into a grid of large and small squares. The large squares represent several square kilometers; the smaller ones represent only one square kilometer.

First, flying squads of prospectors and their native helpers make test drillings on the large grid. In areas where the findings are encouraging, other prospecting parties dig test holes at likely looking points in each square of the smaller grid. The gravel is concentrated and panned on portable rigs and a record is made of the results.

Prospecting squads in the Gabon — totaling 35 Europeans and 2800 natives — already have turned up several diamond deposits which will, according to company reports, repay mining.

Across the equator,  
(Continued to page 242)

In older method of separating diamond gravel, a laborer holds one end of joppling jig and shakes it rhythmically. The concentrate settles and useless material can be scraped away. Below, here's the modern method of obtaining same result. Washing mill concentrates gravel automatically





Skilled girl gives the plate a final touch-up before it is slipped into the kiln for a six-hour treatment

## BAKING "DECALS" ON CHINA

Photographer prepares camera to copy a painting. He'll print his photo on gummed paper to make the "decal"





**By Joseph Adams**

**I**N A STUDIO barn at Setucket, Long Island, skilled workers are transferring famous Audubon and Currier & Ives paintings to china and tile through a unique "decal" method. They even embed cartoons deep in the chinaware.

The method was developed by Richard Delano, formerly an architect of New York, who began decorating china as a hobby several years ago. The pieces he turned out for relatives were received so well that he decided to give more serious attention to his hobby. He bought some property at Setucket and soon converted an old red barn on the premises into a workable laboratory. Here he set about reproducing original paintings permanently on fine china.

The system he worked out combines decals with hand painting. An original painting or a fine print is copied on film with a camera. The resulting negative is used to print the piece of art work on gummed paper. This print is made in one color, magenta, on the gummed side of the paper. Lacquer is then applied to the print, producing a "sandwich" with a layer of paper on one side, a layer of lacquer on the other and the print between. When the paper is dampened, the design can be slipped off in its binding of lacquer and applied to the plate, just as conventional decals are applied.

Skilled girls — there are about two dozen of them in the studio — now go to work with fine brushes and pigments, applying colors to the decal to duplicate every tint.

Delano worked for years to perfect a system for baking the china or tile so the colors actually become a part of the plate or ash tray without bubbling or sizzling out. In his system the plates with their decals are placed in a kiln and baked for about six hours at a temperature of 1400 to 1500 degrees F. During this long period of intense heat, the china becomes soft enough so the colors seep down into it, while the lacquer goes up the flue. This leaves the design embedded in the china without a trace of the lacquer on the finished plate.

In the past year about a million pieces of dinnerware and tile have been decorated. ★ ★ ★

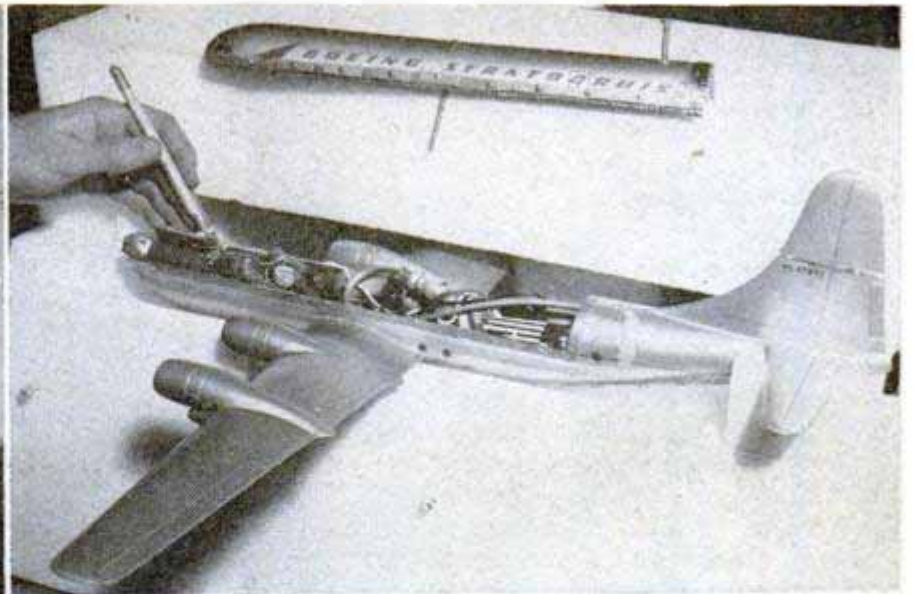
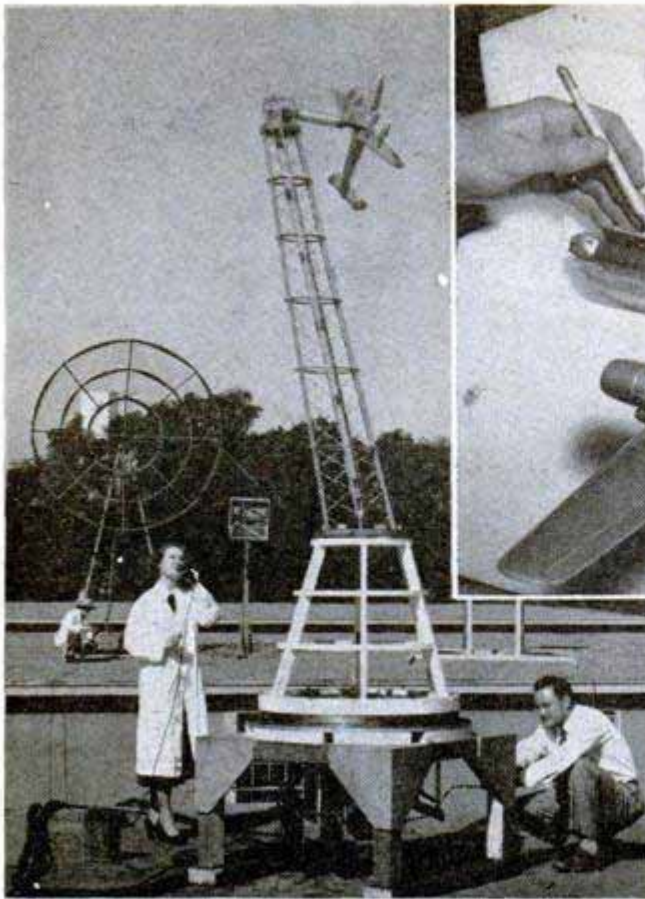


Inventor of the unique system started decorating china years ago as a hobby. Here he mixes pigments in further experiments



When gummed paper is dampened, design can be slipped off in its protecting film of lacquer and applied to the plate. Below, when plates are baked, colors seep down into the china





Airplane models are rotated on stand, left, to test antenna radiation patterns. Miniature transmitter, above, in a 1/70-scale model of a Stratocruiser

## MULTIPURPOSE ANTENNAS

Automatic tuning to a single antenna for the many items of electronic gear needed in today's airplanes is accomplished by a matching unit developed at the Stanford Research Institute. It adjusts the antenna to the operating frequency of the transmitter or receiver being used and compensates for changes caused by factors such as ice formation. Stanford's engineers, at Air Force request, are experimenting with an-

tennas built flush with the skin of the aircraft. Tests reveal that the external antennas needed for the nine or ten radio units normally carried in transports cause drag equivalent to 90 horsepower at 300 miles an hour. At expected future speeds of about 600 miles an hour, over 700 horsepower would be needed to overcome present antennas' air resistance. Miniatures ranging from  $\frac{1}{565}$ -scale models to 10-foot skeleton mockups are used in the research.



### Mechanics in a "Refrigerator"

Air Force mechanics are volunteer guinea pigs in experiments aimed at discovering how to maintain aircraft at bases where temperatures drop to 50 below zero. These tests, conducted at the aeromedical school, Randolph Field, Tex., may lead to improved clothing and also to a method of selecting personnel best suited for work in extreme cold. By running large numbers of mechanics through a standardized test, researchers hope to learn what personal characteristics, temperament and background make the best mechanic in frigid climates. The standardized test procedure involves removing a propeller part from a sealed box, disassembling it, putting it back together in the shortest possible time and then sealing it in the box again.

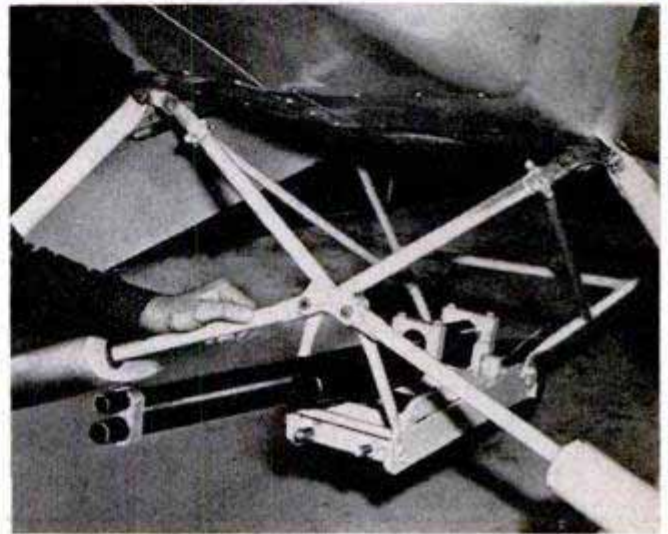
☛ An electric "tongue" which "tastes" the saltiness of foods by means of electrodes inserted in solids or liquids has been developed by Norwegian scientists.



Loudspeakers located at wing struts enable rancher to relay instructions to cowboys during roundup operations. Automatically fired shotgun mounted on landing-gear V, right, is aimed by pointing plane

## Ranch Plane Mounts Loudspeakers, Shotgun

Techniques borrowed from modern warfare are being used on a Texas ranch to speed operations and hunt down coyotes and birds of prey. Strafing and observation operations are combined by Bob Masterson of Paducah in a Piper Super Cub which mounts a public-address system to direct cowboys on the ground and an automatic, 12-round shotgun which fires below the propeller disk. With the sound system, Masterson can call down instructions to his men, greatly facilitating roundup operations and the location of strays. The shotgun, located on the landing-gear V, is especially effective in shooting eagles, which

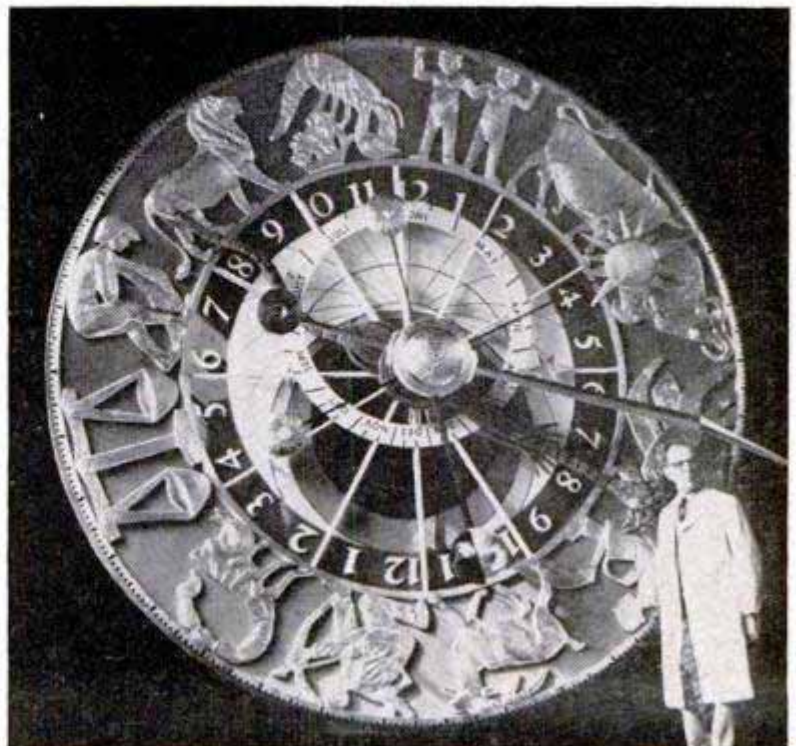


prey on small animals, and is much more accurate under this arrangement than when fired from the wide window of the plane. Installation of speakers at wing struts provides the most broadcast quality in all directions.

## Sundial Clock for Oslo

Designed to top the town hall of Oslo, a giant sundial clock has been completed by the House of Ungerer, famed French clockmakers. Circled by the 12 signs of the zodiac, it shows Oslo local time, astronomical time, time of sunrise and sunset, sun and moon positions in relation with the constellations of the zodiac, moon phases, and sun and moon eclipses. The adjustments of the astrolabe are made by electrically driven clockwork.

Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from the Bureau of Information, *Popular Mechanics*, 200 E. Ontario Street, Chicago 11





Fold-up home is comfortable emergency housing which can be dismantled, moved and rebuilt in half a day

# PACK UP YOUR HOUSE

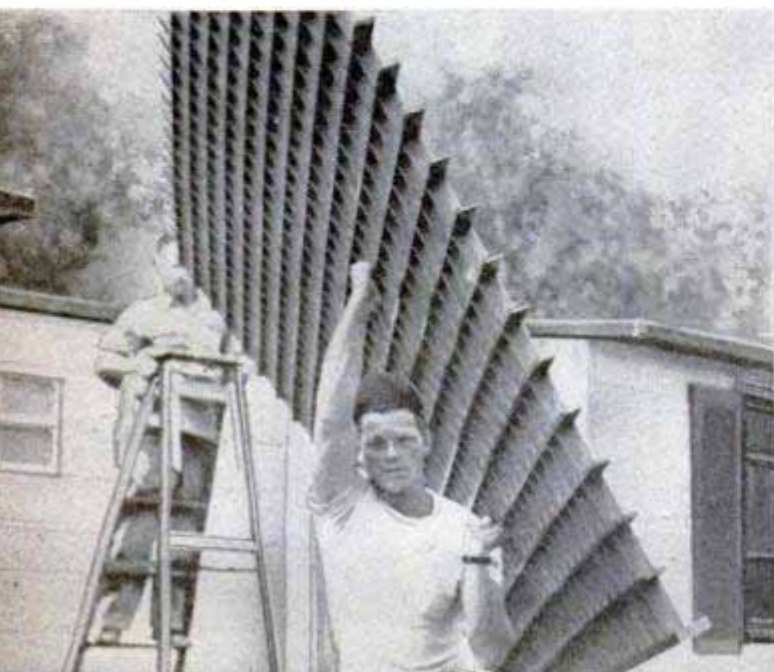


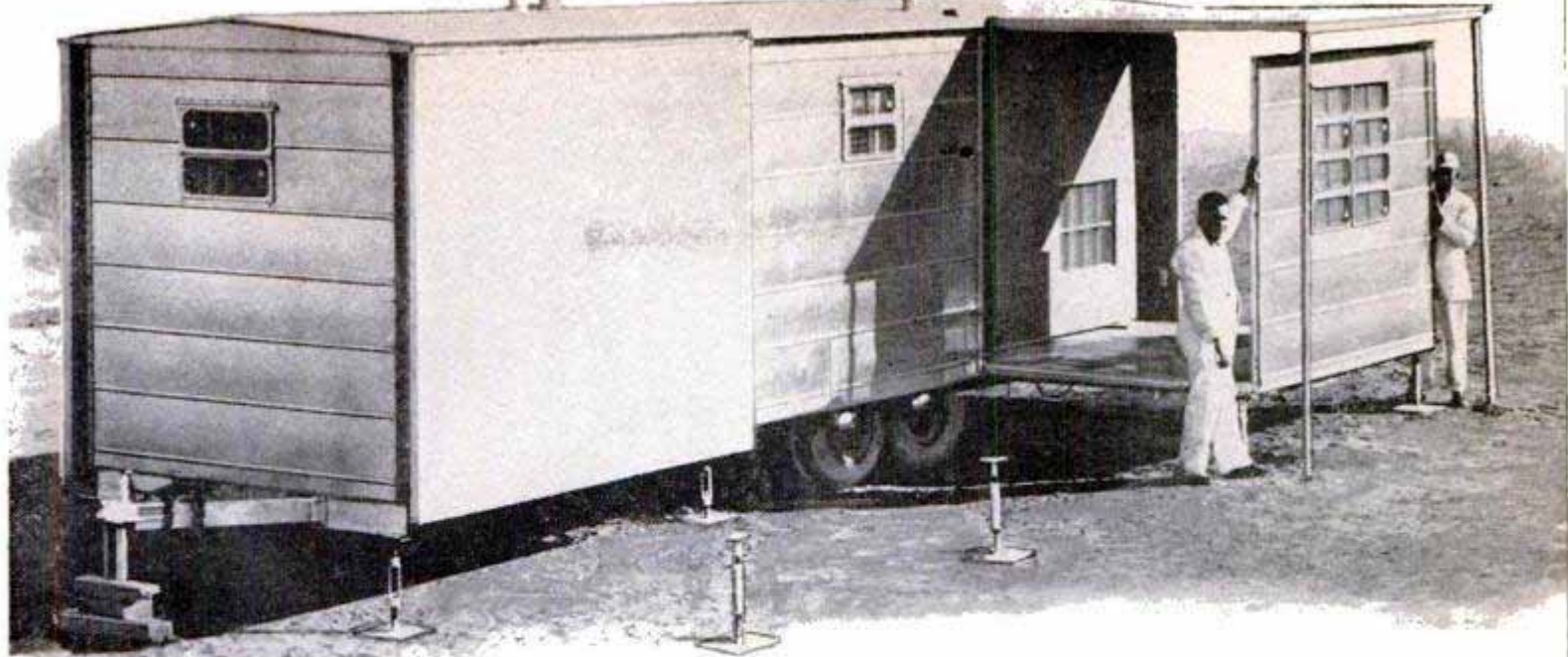
Home has a 20-foot living room, two bedrooms separated by a modern bath, a kitchen with stove and refrigerator, three closets and a shaded patio. Below, down comes lattice over patio to start moving job

**YOU CAN HAVE** lunch in a new two-bedroom house, then pack it up and move it at 50 miles an hour through traffic to a new homesite, where you can unpack and rebuild your house in time for dinner. The house, in addition to the two bedrooms, has a 20-foot living-dining room, a cabinet kitchen furnished with a refrigerator and stove, three closets, and a shaded patio. An inexperienced crew of four men can dismantle the house and fold it into a shipping package measuring 8 by 10 by 30 feet in about 1½ hours. The home can be rebuilt in even less time.

Since 1949 the Federal Housing Administration has been seeking a full-size, com-

With a socket wrench a workman removes the fasteners which are used to join the attractive walls





Home has been moved like a house trailer on a special chassis and now is ready to be "unfolded" on new site

# and MOVE!

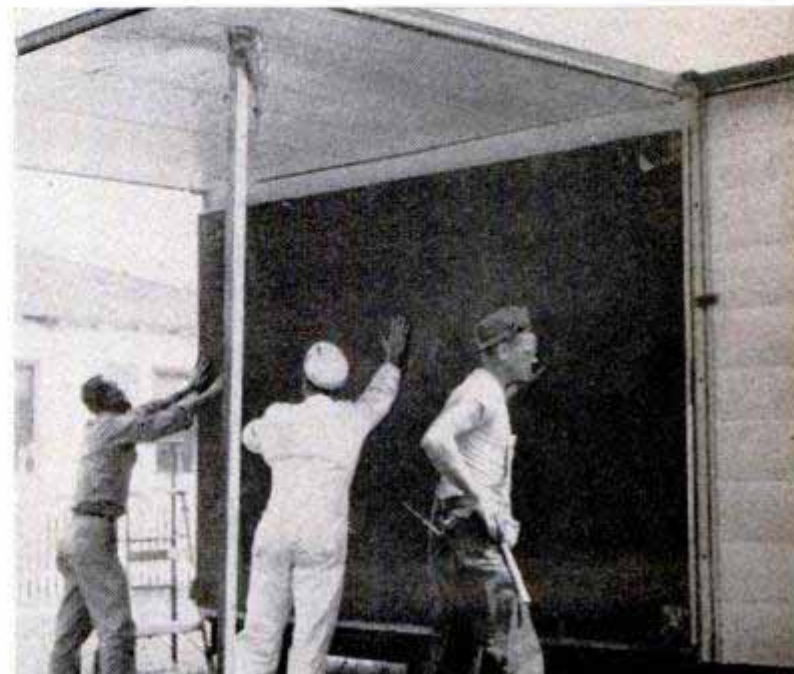
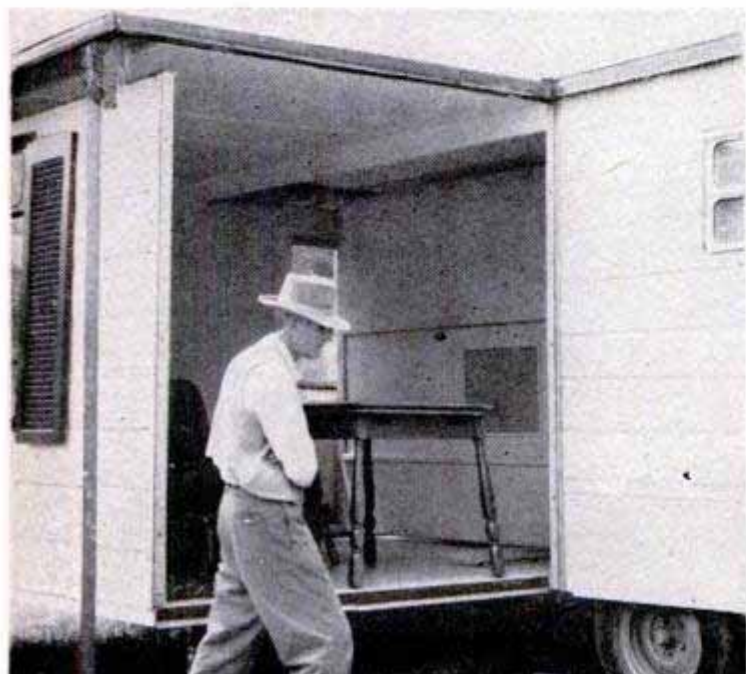
By Paul W. Travis

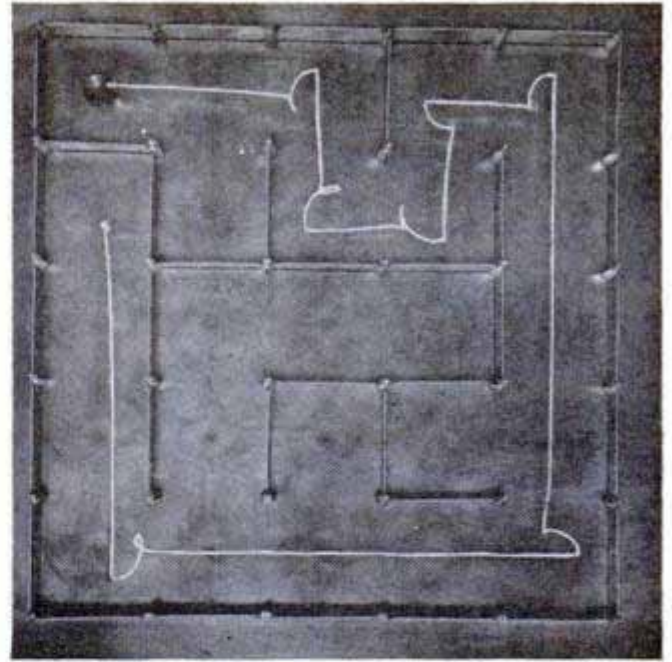
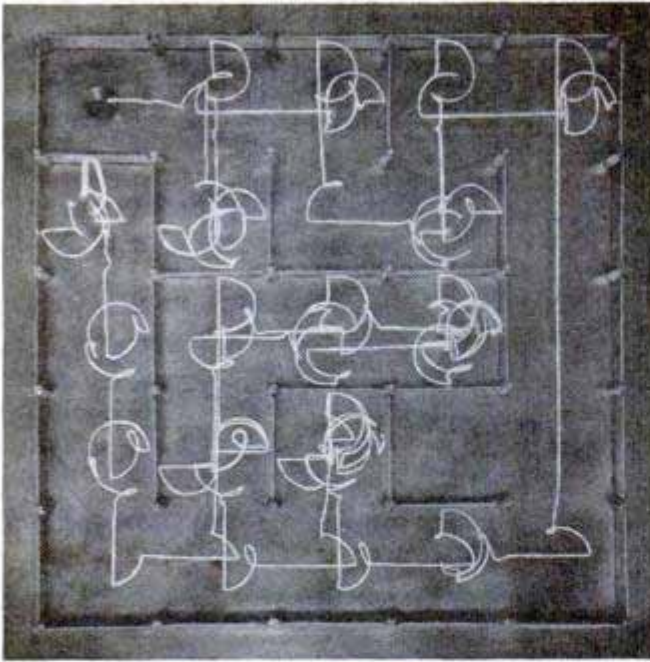
portable house that could be moved after a housing emergency was over. The fold-up home was designed as an answer to that problem. H-shaped, it has 800 square feet of floor area, weighs 10,000 pounds and sells for about \$8000. Two oil burners heat the building. It is moved on a special dolly and chassis, which are removed after the house has been installed on a wooden foundation at the new site. Thus an entire settlement could be moved with only dolly and chassis. On moving day the house is collapsed by removing the lateral walls and setting them upright in cradles built into the living room. Outer walls fold and the roof drops to form the exterior sides of the package. ★ ★ ★

Midway in the packing, one of the lateral walls can be seen installed in special cradle in living room



Panel wall with its doorway is tipped sideways and slipped into place. This is secret of home's mobility. Below, propped-up ceiling will become side of package





Time exposures show mouse's route through maze first time, and direct route once it had solved the problem

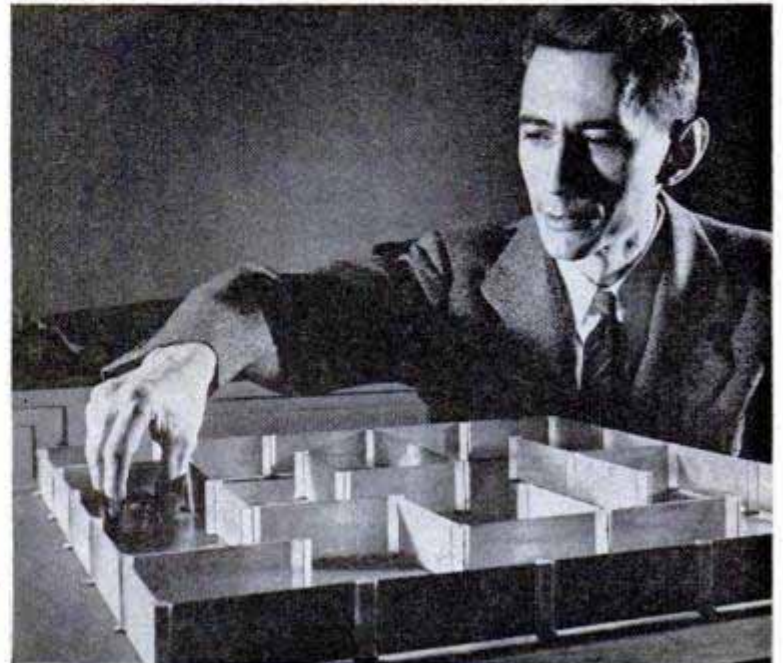
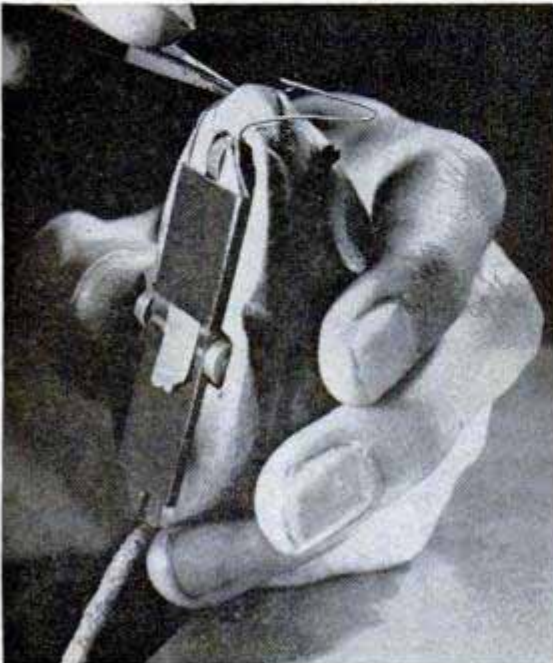
## *Manmade Mouse With a "Memory"*

There's a manmade mouse in New York City that goes scuttling down corridors, bumping into walls, backing up and exploring until finally it finds its "piece of cheese"—an electric terminal. The mouse is the work of Dr. Claude E. Shannon, a Bell Telephone Laboratories mathematician. Strangely enough, it is supplying basic knowledge of the type of switching relays used in telephone systems. The mouse is a bar magnet. On a metal plate Doctor Shannon builds a maze with sections of aluminum fence. There are a million possible variations to the maze. The scientist places the mouse at an arbitrary point in

the maze and the "cheese" at another point. Then the mouse goes scampering off to find the cheese. When it bumps into a wall, it turns around until it finds its way out. Minutes may pass before it finds the cheese, but once it has solved the problem, it can be placed anywhere on its previous route and go directly to the bait. The mechanism for the mouse is under the table; a motor-driven electromagnet seizes the mouse in a magnetic grasp and feels its way around the barriers. A circuit containing 59 relays serves as the mouse's "memory" to guide the mechanical creature back to the bait.

**Mouse actually is a bar magnet operated by magnetic force of an electromagnet installed under the table**

**Inventor builds random maze, then places mouse anywhere in it. The mouse scurries off to find its "cheese"**



## Jet Transport

Under construction in France is a twin-jet transport for feeder service in Europe and North Africa. Carrying 60 passengers, it is designed for 300 to 1200-mile distances, less than the British Comet's best range. The principal turbojets will be supplemented by small auxiliary jet engines. Flexibility and stability are chief features.



## Funnel-Type Tester for Emergency Showers

Safety engineers at General Electric can test emergency showers installed at strategic points in the workrooms without getting so much as a drop on them. A large funnel directs the flow from the shower into a can from which the water is piped to a near-by sink. These showers release large volumes of water and are designed for dousing a scientist or laboratory worker in case his clothes catch fire or are sprayed by acid.

## British Army Doctors Test Aluminum Foil Dressings

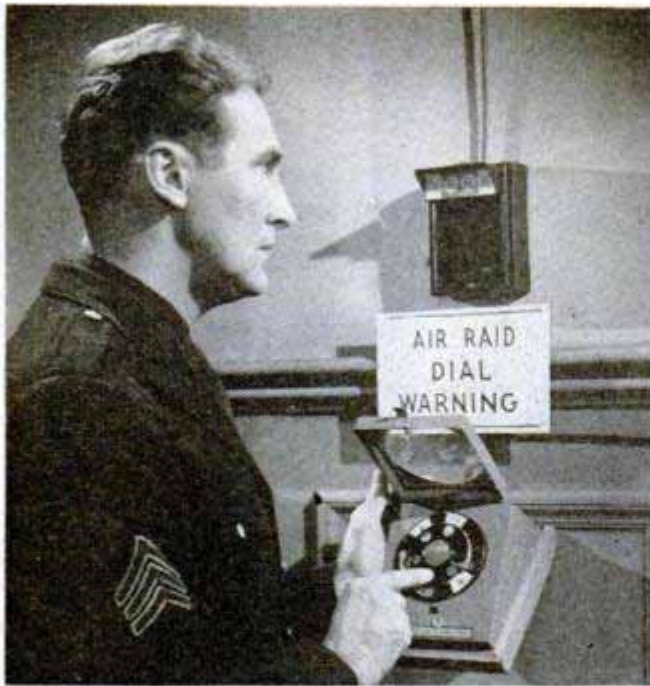
British Army doctors report that aluminum foil has been used successfully as a covering or dressing for operation wounds. More than 100 cases, ranging from large abdominal incisions to small cuts on the arms, have responded favorably to aluminum dressings. The doctors state that the foil doesn't adhere to the wound, is easily removed and is more comfortable.

## Psychological "Gun"

Mounted atop an Army tank, a high-powered loudspeaker conveys information and announcements to enemy forces. The 300-watt amplifier is designed to broadcast surrender invitations and accurate news counteracting enemy propaganda. It may also be used for emergency battle communications within friendly lines.

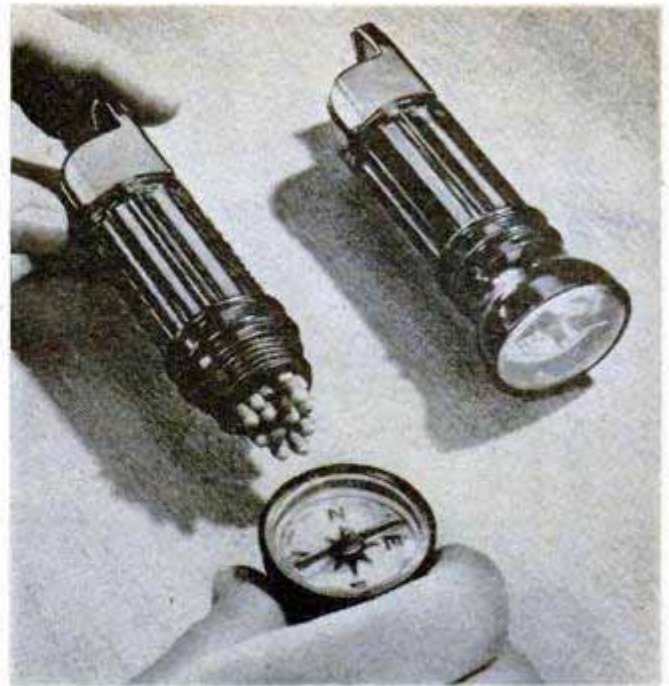
☐ To help them glide through 600-mile-per-hour air, a special compound is used to coat the rivetless exterior of Boeing-Stratojet fuel tanks.





### Dial Air-Raid Warning

Dialed like a telephone at a central point, a signaling system uses a private one-way circuit to warn of air raids. The warning signal can be received at many points simultaneously. The system is designed for use in factories, schools, public buildings and other places where many persons may be at work in different rooms. In the central office, the operator simply dials the code color corresponding to the degree of alert. At the receiving end, a bell rings in code and a colored light flashes continually. Four alert signals—yellow, red, white and blue—can be transmitted. If desired, the receiving system can be wired so the confidential yellow alert is received only at authorized points. The operator ends the warning by dialing "stop," or dials another color signal.

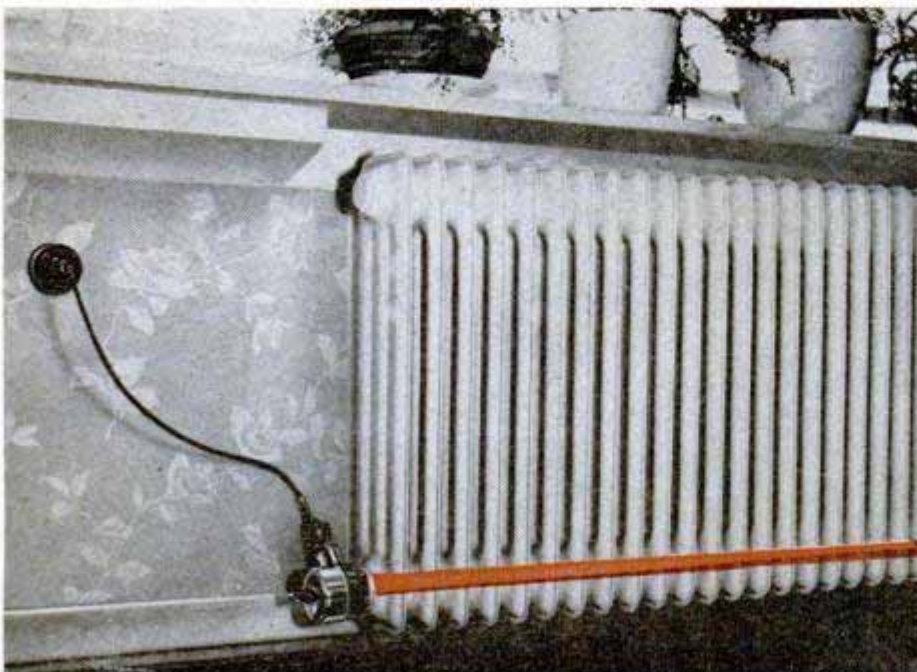


### Sportsman's Kit

Designed for use in field, woods and mountains, a three-in-one kit holds a luminous compass, waterproof match case and signaling whistle. Room for a small candle or map is also provided. Light enough to be carried in a pocket or from a sling around the neck, the closed kit will float in water.

### Crane Cargo Weigher

Suspended from the end of a loading crane, a gargantuan scale weighs cargo as it is being transferred from or to ships' holds. Built in England, the scale shows accurate weight on its clock-dial face in half-ton units up to a maximum of 120 British tons (134 U. S. tons). Of cast iron, it is eight feet long, two and a half feet wide, and has a weight of 3000 pounds.

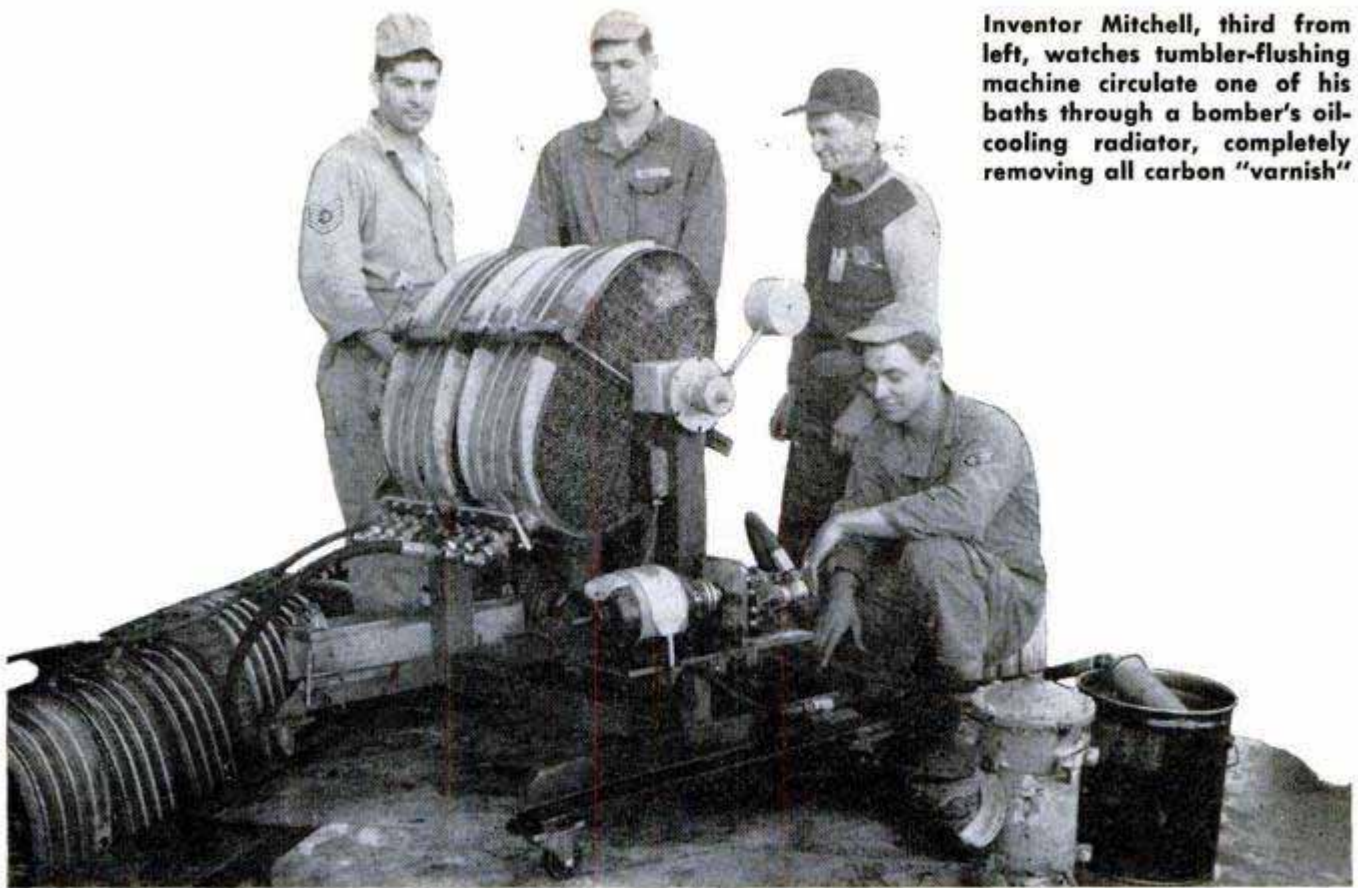


### Electric Stick Heats Radiator

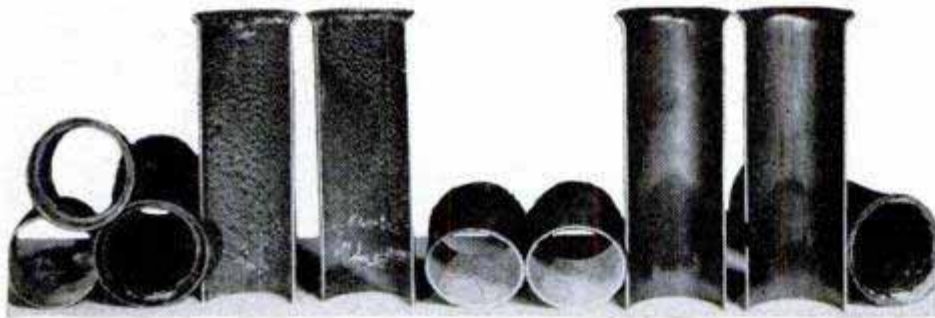
Steam radiators can be made hot enough to take the chill off a room on a cool day with an electric heating stick developed in Germany. The stick is screwed into the bottom of the radiator in place of the standard plug. Connected to an electric outlet, the stick gets hot and warms the entire radiator.

⌚ Lightning struck the Empire State Building in New York City 226 times during the last 10 years.





Inventor Mitchell, third from left, watches tumbler-flushing machine circulate one of his baths through a bomber's oil-cooling radiator, completely removing all carbon "varnish"



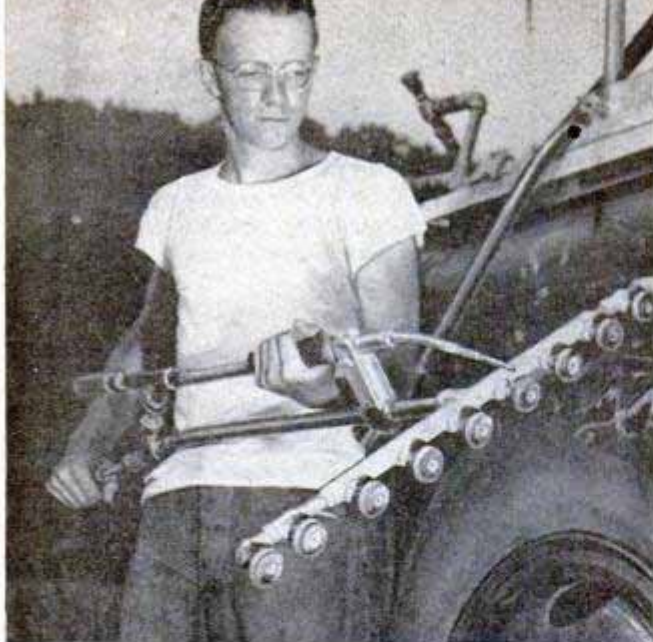
In less than eight minutes, a chemical bath changes carbon-coated B-24 exhaust stacks at left to the bright, sparkling surfaces displayed at right

Water and steam being used on a B-29's engine cowling remove dirt and grease prior to paint-removal process that restores brightness to metal

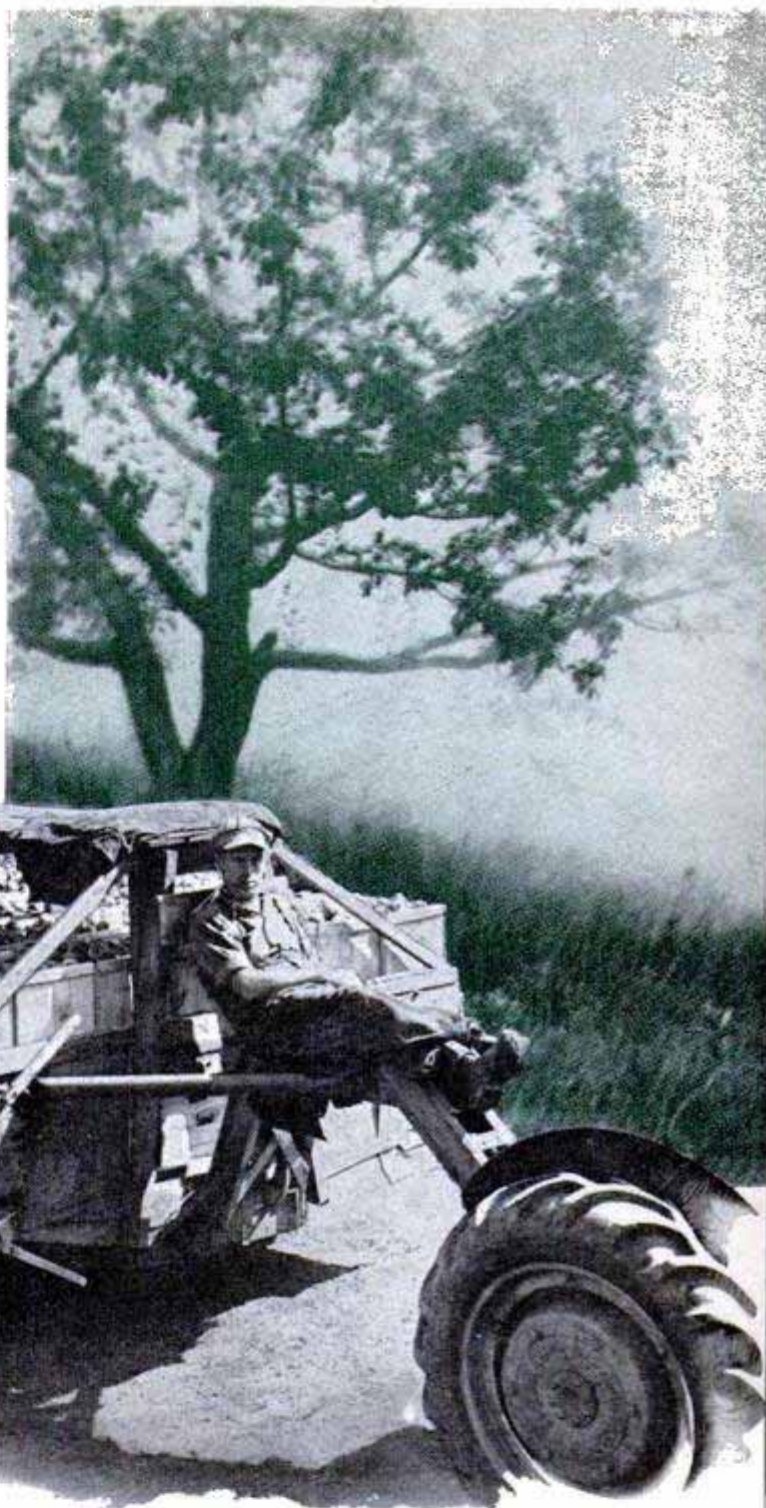
## "DECARBONIZING" FACTORY

AN IDEA Robert Mitchell first tried out in his wife's bread pans became a "decarbonizing" factory that has saved the government almost \$500,000. Mitchell, a foreman in the welding shop at March Air Force Base in California, used the pans to test some chemical baths he hoped would remove carbon from the exhaust stacks of aircraft engines. Sandblasting it away, an expensive process, also cuts through the hard surface of the stacks. Mitchell's formulas worked. They now do a half dozen different kinds of cleaning and restoration jobs at the base. They remove carbon from collector rings and the stacks of reciprocating engines and from some portions of jet engines, carbon "varnish" and other deposits from oil-cooling radiators of bombers, and old paint from miscellaneous aircraft parts. His cost-cutting ideas have brought him four awards from the suggestion committee at the base, three of which were top \$250 awards.





Lower line of this double-barreled spray gun has 10 nozzles for "shotgun" work and an upper, single line for "sharpshooting." Below, homemade unit that carries 100 boxes, each on tracks with roller-skate wheels



### By William Gilman

**R**EMEMBER that apple tree you used to raid when you were a boy? It's been mechanized into big business by the gadgets of modern science and gimmicks of native ingenuity.

Today's apple crop is grown mainly by specialists. They're allergic to doing by hand what machinery will do faster and better. Just one big riddle still baffles them—the automatic apple picker. A fortune awaits the inventor who dreams up such a harvester—every apple in the 200 million bushels that America picks and packs annually is still snapped off twigs by hand.

The rest has been transformed by plant

breeding, engineering and chemistry. For example, today's spraying isn't aimed at orchard pests alone. There are also the hormone sprays dropped by plane or helicopter that chemically thin out the growing apples so those remaining will ripen bigger and better, and the "sticker" sprays that make finished fruit hang on till the pickers can come.

Applegrowers can't meet expenses from windfalls and inferior apples sold for cider and applesauce. Facing mounting competition from citrus fruits, they'll try anything that produces apples with "eye appeal" and keeps them that way.

Handling apples from orchard to packing shed can easily bruise them. One solution



With automatic nozzles at the sides and "sharpshooter's" tower, this sprayer does complete job on one pass

# **Johnny Appleseed Hires a Mechanic**

has been hauling them in small trailers lined with foam rubber. Newest is the car-ferry system used by F. Cabot Holbrook, an M.I.T.-trained engineer who turned applegrower.

He built a double-decker trailer, so no apple box would sit on top of other fruit. Instead, each box rests on tracks equipped with roller-skate wheels.

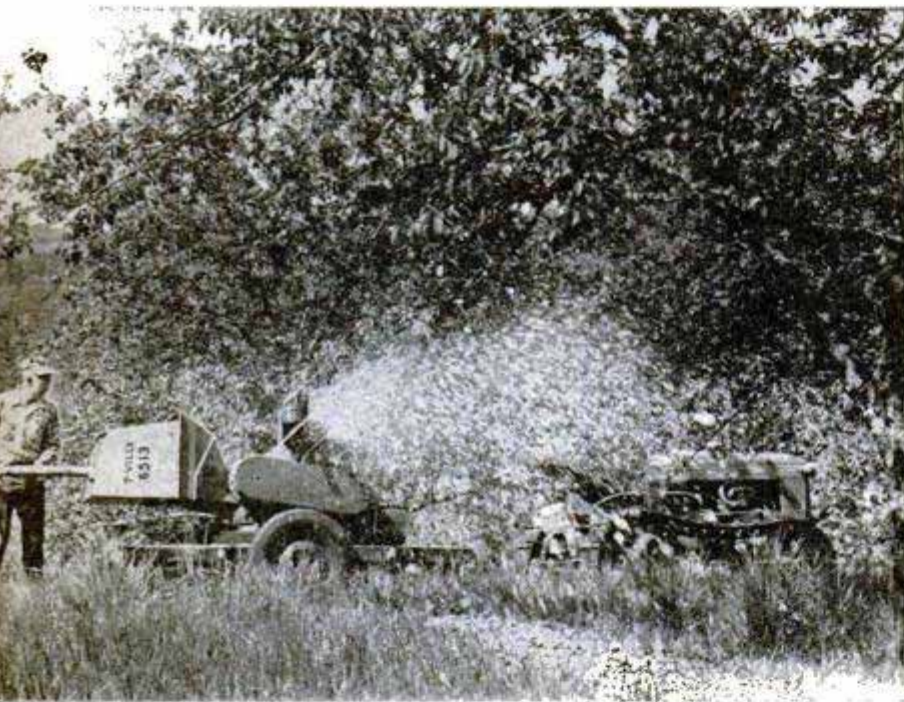
At the packing shed, the receiving dock has similar tracks to match. The tractor-hauled trailer pulls up alongside. The dock is adjusted by chain hoist so that its tracks line up with those of the trailer, then boxes are rolled off without banging and bruising. When the trailer leaves, tilting the dock with the chain hoist sends boxes gently

Sound fruit riding rubber belt is automatically graded into six sizes, with packer at each station filling boxes provided on overhead track. Revolving rubber wheels trap all the apples large enough to make contact and whirl the fruit into packing trays

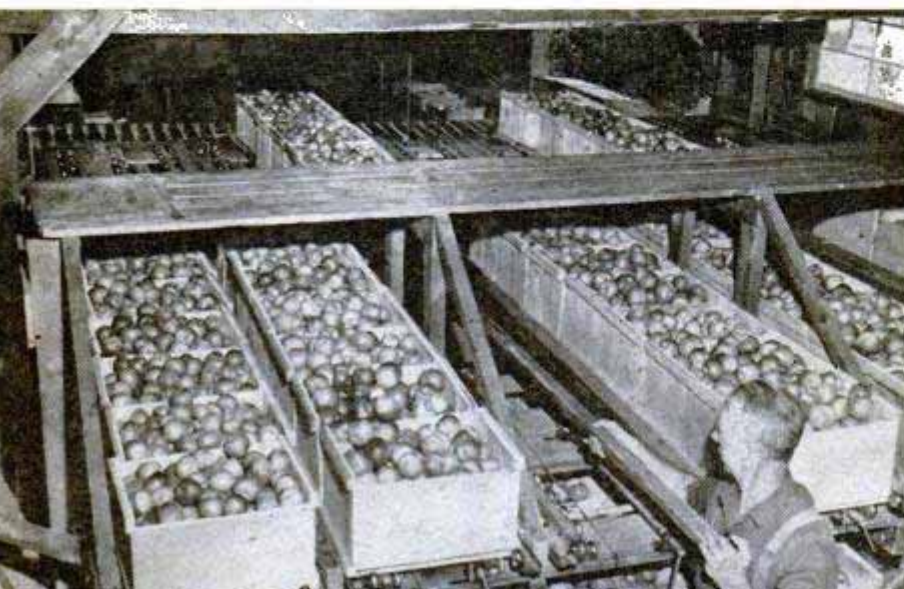




**Cross-braced to the tractor, an old hayrake is put to work gathering brush after orchard pruning. The rake's 10-foot reach gathers brush under tree limbs as the driver circles and a second tractor scoops it up and carries it to bonfire**



**Branches up to six inches in diameter are fed into a chipping machine and then blown back under trees as mulching material. Below, there's no bumping or hand labor that might bruise the apples as they move on track rollers into the packing shed**



sliding down to the track that feeds them to the automatic grader.

There's a wide choice of such machines that sort the fruit by sizes. In the latest type, as apples ride a rubber belt they are given a rotating motion every few feet when they pass under a sponge-rubber paddle. At each of six stations, a revolving, rubber-tired wheel overhead catches those apples large enough to make contact and rolls them off into a free-wheeling tray attended by a woman who packs them in boxes for storage or shipment. The sorting wheels are set at different heights. Largest apples come off first, smallest ones run the gauntlet to the last station.

A temperature just above freezing helps keep apples fresh over winter. But newest methods go beyond mere cold storage. They also seal the apples inside a "gas chamber" where the air steadily receives chemical scrubbing. Blowing it through canisters of activated carbon removes ethylene, a ripening gas that hastens spoilage. And circulating air through tanks of caustic soda keeps oxygen low without allowing carbon dioxide to build up.

This is equivalent to suffocating the apples—slowing down their "breathing" makes them last twice as long and they leave storage in May practically as juicy and firm as they were when hanging on trees in October.

Winter months, when his trees are dormant, find the orchardist busy as ever. In bad weather he sticks to his workshop, overhauling spray equipment, building wood boxes for next season's fruit, converting old jalopies into orchard trailers.

During mild spells trees receive the "manicuring" that produces healthier and finer fruit. The orchard worker now uses a pneumatic pruner that's faster and easier than the old-fashioned saw—up to a half dozen such "guns" can be run by compressed-air lines from a tractor's power take-off.

But the power pruner can't touch hard-to-reach limbs so orchardists carry the mechanized method a step further with homemade elevator platforms erected on trailers or mounted over the tractor itself.

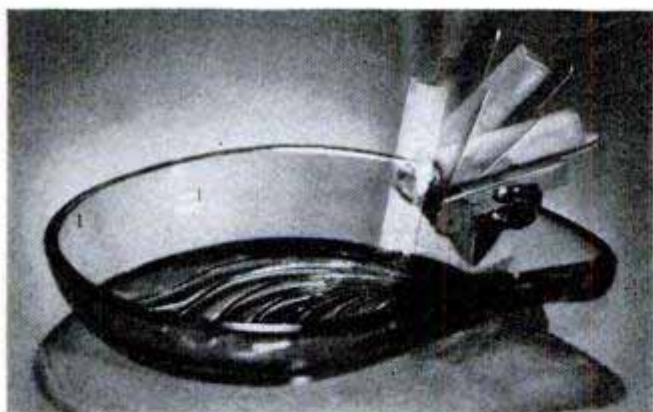
(Continued to page 248)



## Log Grapple

Mounted on a standard truck, a log loader picks up  $\frac{1}{4}$  cord of logs at a time and pivots 180 degrees to lower them onto a

truck's bed. Designed for use in off-road areas of pulp forests, the loader is hydraulically operated. It can lift 3000 pounds of logs to a height of 14 feet. The loading cycle takes only 20 seconds.



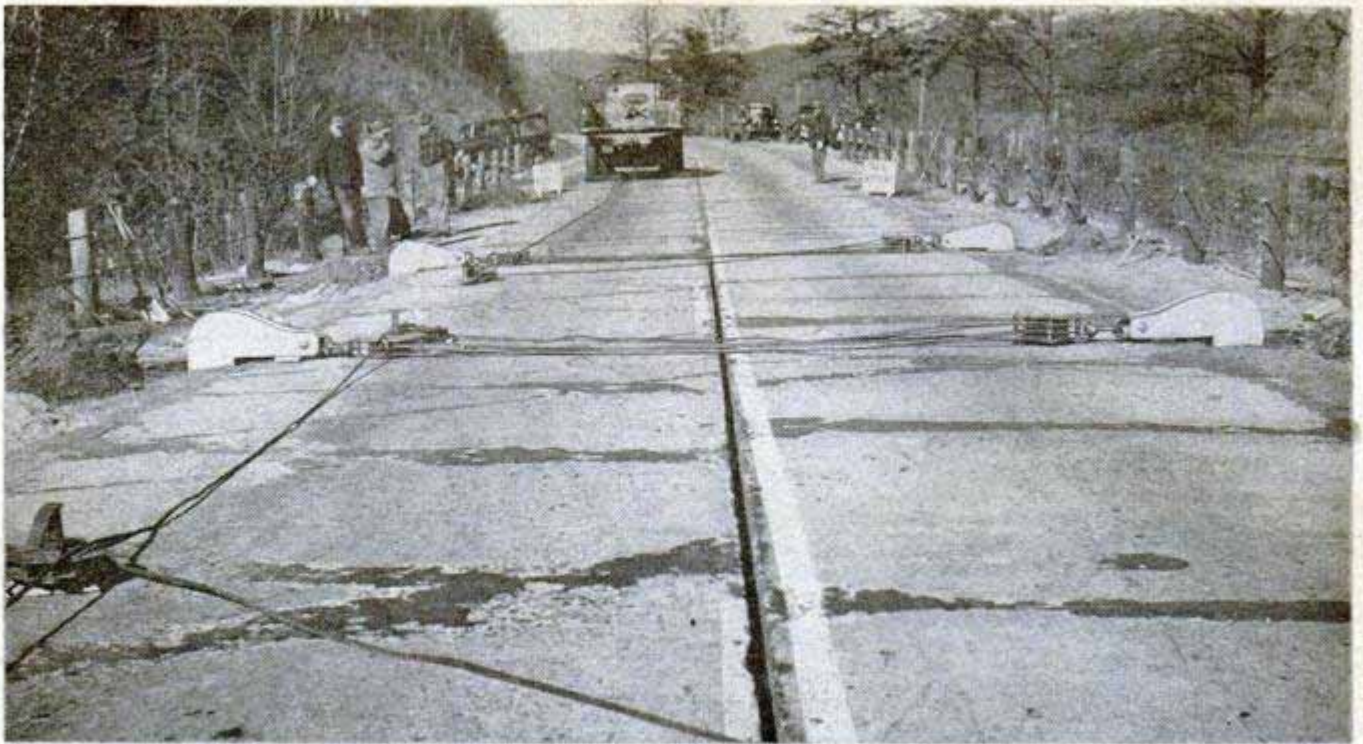
## Cigarette Watchman

If you leave a burning cigarette on the shelf of an automatic ash tray, you don't have to worry. The shelf will dump the cigarette into the tray when it has burned down to the danger point. A thermostatic spring does the trick. When the butt has burned down and the end is opposite the spring, the metal expands and flips the shelf up and over, dropping the burning cigarette into the commodious ash tray where it can do no harm.

## Train Brakes For Trucks

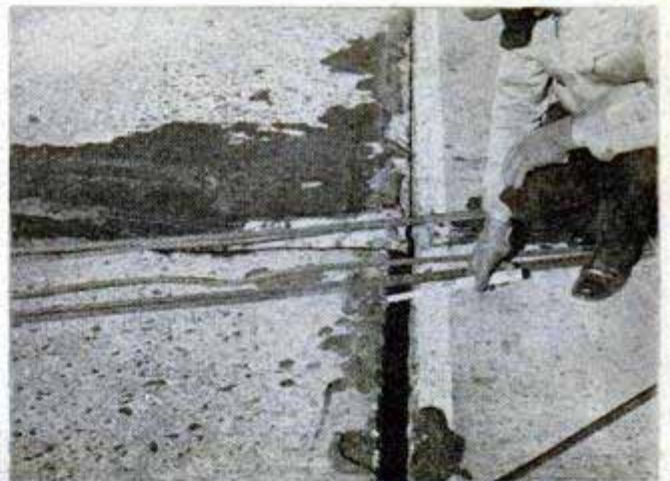
Brakes similar to those used on railroad cars have been developed for trucks by a German inventor. A brake shoe is installed behind and in front of each rear wheel. The shoes will stop a heavy truck traveling about 25 miles per hour in less than 17 feet, according to the inventor. They also stop backward skidding on icy slopes.





## Out-of-Place Highway Squeezed Back Into Position

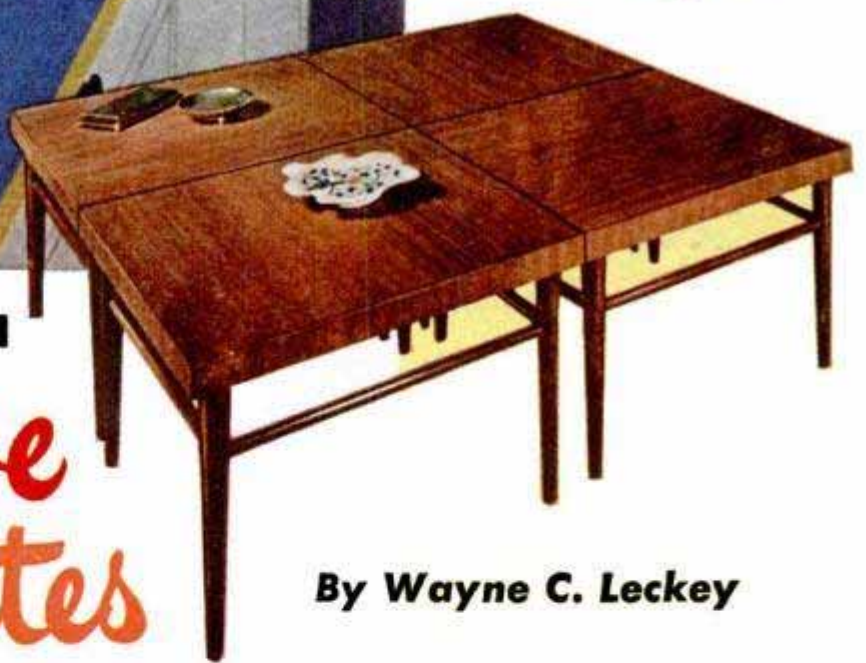
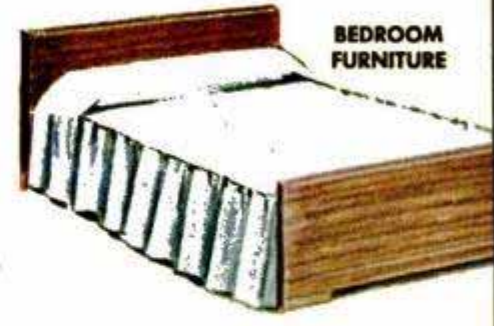
Huge slabs of highway concrete which have slipped out of position can be moved back into place through a unique system devised by the Connecticut State Highway Department. The eight-inch slabs, measuring 60 feet long and 11 feet wide, weigh an average of 60 tons. In the town of Haddam, Conn., the slabs had slipped apart as much as 2½ inches. Using mud jacks, the crew propped up the pavement. Then the men installed heavy hooks on opposite sides of the pavement and connected the hooks with block and tackle. When a winch truck pulled on the cable, the blocks moved slowly back into position.



## Straight-Line Shotgun Fires in Two Opposite Directions



Police and Army ordnance officers in Chicago have been puzzled by a strange little weapon — a double-barreled shotgun which fires in opposite directions. The barrels, which thread together, are each about four inches long. When they are unscrewed, 20-gauge shotgun shells can be slipped into the chambers. One lever fires both barrels. The owner told members of the Chicago Police Department that he picked up the unique firepiece while serving with American occupational forces in Germany.



Photos courtesy United States Plywood Corp.

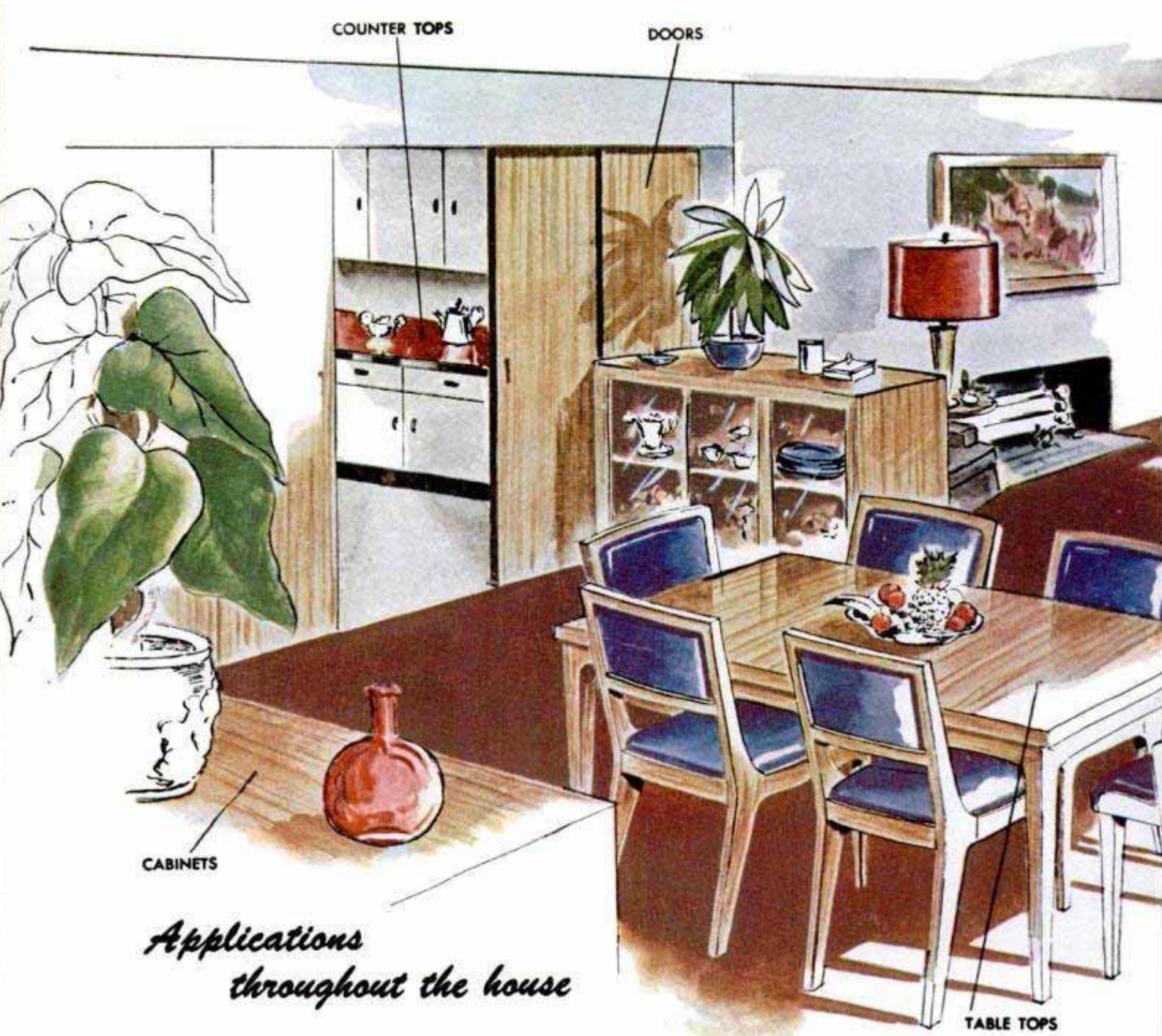
**WHAT YOU CAN DO WITH**  
**Decorative Laminates**

**By Wayne C. Leckey**

**M**OST EVERYONE knows what usually happens when a frosty drink is placed on a highly polished table or a burning cigarette accidentally falls from an ash tray—the table top is ruined and a costly refinishing job is in order. Homeowners who have experienced this will be eager to learn of a comparatively new plastic material that literally defies marring. Called decorative laminate, this amazing plastic material will withstand most acids, will resist heat and cold and endure chemical action. It is virtually unstainable. It won't chip, scratch, craze when wet, or corrode when soft drinks, food or liquor is spilled on it. It requires no refinishing or polishing — just a quick wipe with a damp



**WINDOW SILL**



*Applications  
throughout the house*

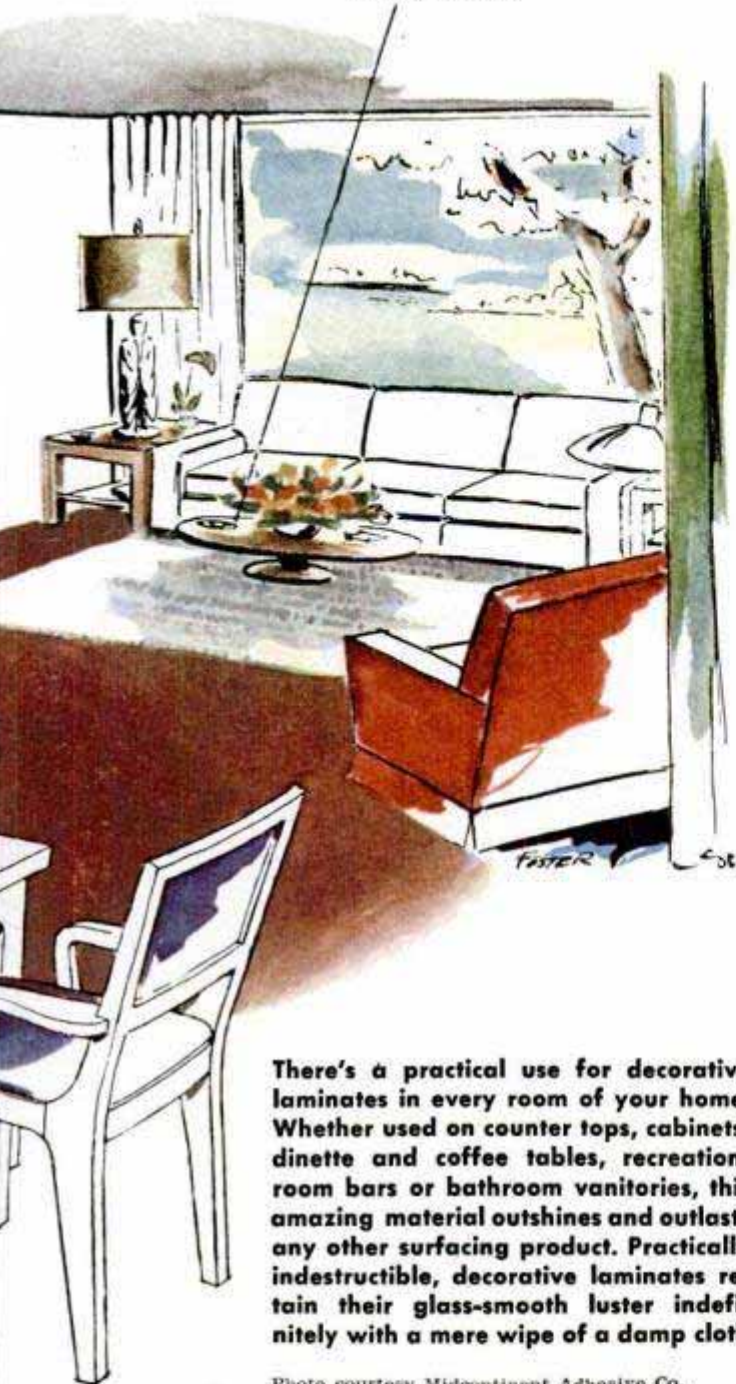
cloth will bring back its original bright luster, year after year.

Familiar to many who first remember seeing it on restaurant tables and counter tops, decorative laminate, as its name implies, is a durable high-pressure plastic laminate with a decorative surface. It is made up of many layers of resin-soaked kraft paper and veneer which are fused together under intense heat and pressure. The laminations actually merge to form a new substance which is coated with a super-tough skin of clear plastic that locks in the color and pattern for life. Marketed under several different trade names, decorative laminate can be had in roll or sheet form and in a score of patterns and colors, including beautiful reproductions of rich mahogany, oak, prima vera and walnut wood grains. Available in various lengths and widths, decorative laminate also may be

purchased at lumberyards, ready bonded to  $\frac{3}{4}$ -in. plywood. Most linoleum stores carry laminates and the cement that's needed to apply them.

Decorative laminates are at home in every room of the house. On kitchen counters, cabinets and other work surfaces where cleanliness is a must, this miracle material provides a most practical covering. Liquids, grease and food particles leave no residue on its impervious glass-smooth surface. On furniture in the living room and bedroom, laminate fills the double function of fashion and lasting utility. A more practical top for a cocktail table could not be found. In the bathroom it does triple duty in repelling water, medicines and cosmetics. On a refreshment bar in the recreation room it comes through without a scratch or stain. Dated panel doors can be converted to beautiful flush doors by





There's a practical use for decorative laminates in every room of your home. Whether used on counter tops, cabinets, dinette and coffee tables, recreation-room bars or bathroom vanities, this amazing material outshines and outlasts any other surfacing product. Practically indestructible, decorative laminates retain their glass-smooth luster indefinitely with a mere wipe of a damp cloth

Photo courtesy Midcontinent Adhesive Co.

covering them with any of the true wood-grain reproductions to be had. Window sills will stay permanently protected from the hot sun when surfaced with laminate. A section of a wall can be paneled in wood grain to give contrast to a papered or painted wall.

While decorative laminates have an exceptionally durable surface, it is not so hard that it cannot be damaged under certain conditions, and while it can stand constant abuse, one should avoid giving it unnecessary punishment. It is neither recommended nor necessary to clean the surface with gritty scouring powders—only a damp cloth is needed to clean it. Also, avoid placing a hot pressing iron directly on the laminate, or using it as a cutting surface. Always place a pad under a toaster, waffle iron, percolator or other hot appliance.

Heretofore, the application of decorative laminate has been limited to the furniture manufacturer having facilities for gluing and clamping the material securely to the surface. Now, thanks to the development of special "no clamp" adhesives, the application of decorative laminate can be done right at home with a few common hand tools. Of the several adhesives available, Roltite and Tapon were successfully tried by the author in bonding several different decorative laminates.

While laminates can be had in both roll and sheet form, the roll type is  $\frac{1}{32}$  in. thick and the sheet type is  $\frac{1}{16}$  in. thick. The thinner material is cut by merely scoring the top surface with an awl and then bending it upward to snap it off, whereas the heavier  $\frac{1}{16}$ -in. material must be cut with a fine-tooth (metal-cutting) keyhole saw, using downward strokes to avoid chipping. It is always best to cut the material about 1 in.

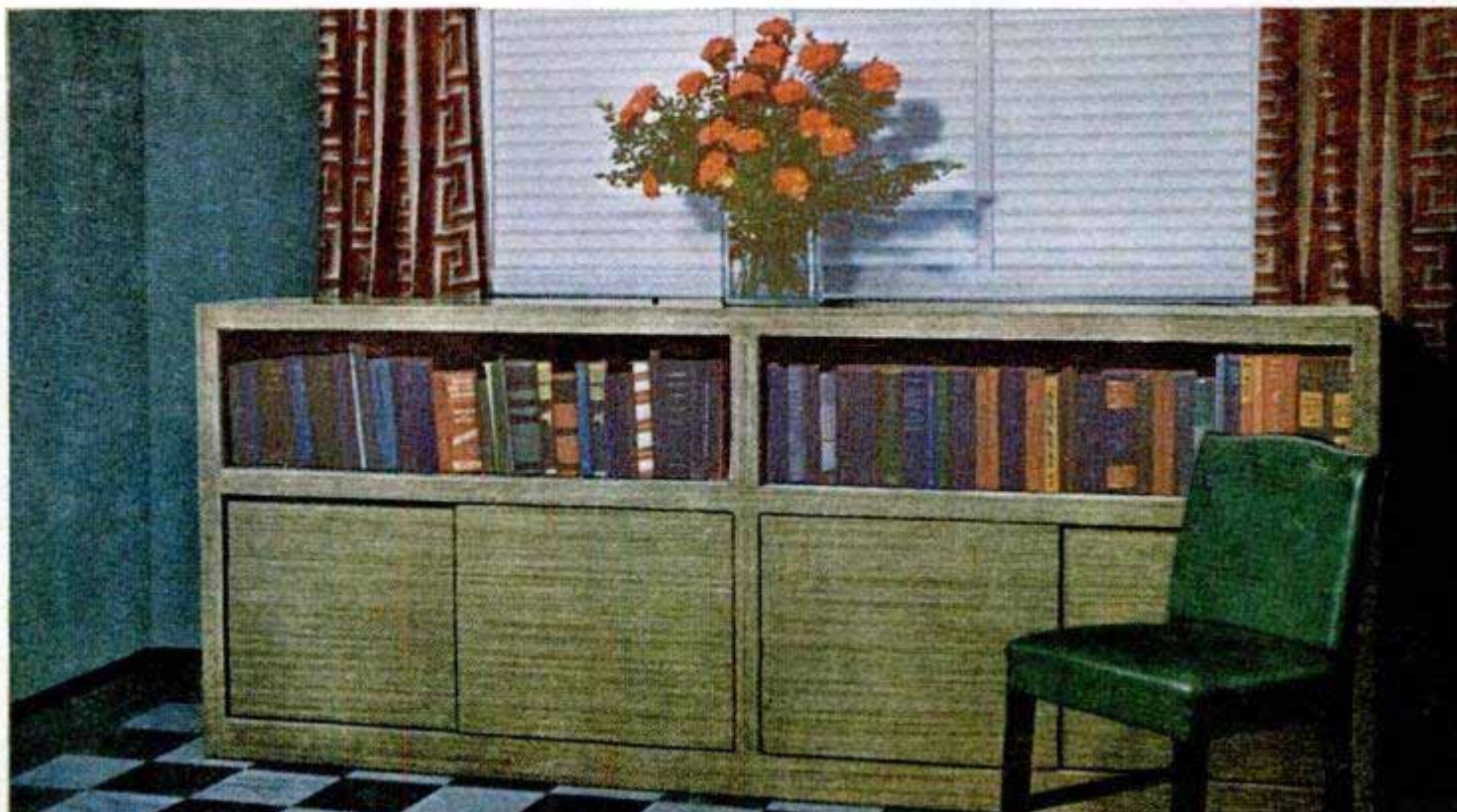




Photo courtesy General Electric Co.

While not a sheet laminate but of the same durable quality, molded counter is available in 6-ft. lengths



Photo courtesy Midcontinent Adhesive Co.

Above, laminate makes excellent durable covering for traveling case, and a most practical surface material for a vanity in a powder room as pictured below

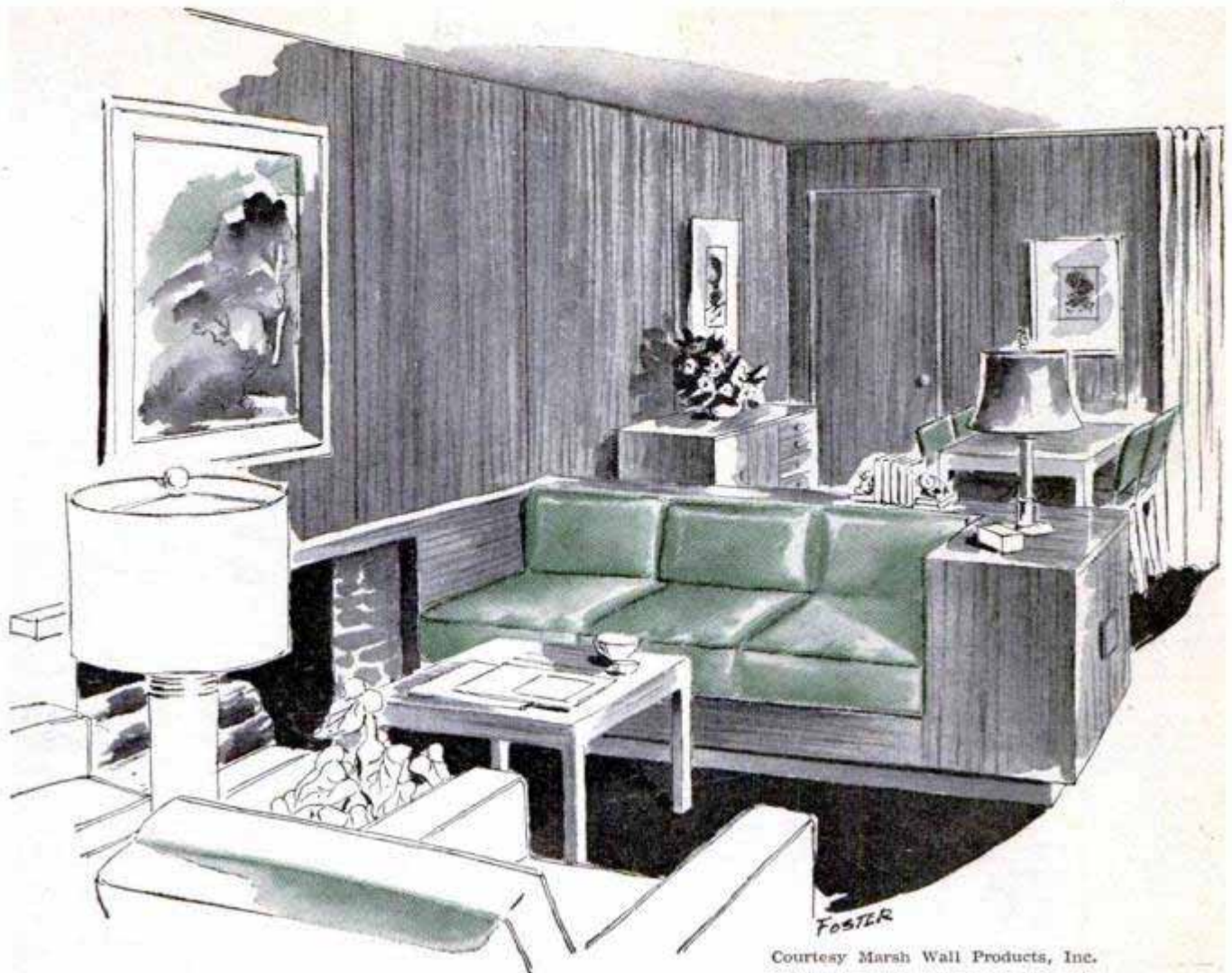
Photo courtesy The Formica Co.



oversize to be on the safe side if chipping should occur and also to have enough waste to later trim carefully to line. When it comes to actual application, the work should be done in a room temperature of at least 70 deg. F., and it is important, too, that the laminate be of room temperature. The cement must be applied warm, heating it beforehand in a pan of hot water until it is warm to the touch. All wood surfaces to be covered must be flat, clean and dry. If the surface has been painted or varnished, better results are had if the finish is removed. If the edges as well as the top surface are to be covered, the laminate is always applied to the edges first, using a cement of thicker consistency which is made specifically for edge work. Assuming that only the top and not the edge of a work counter is to be covered, first brush a coat of cement on the wood with a clean paintbrush and allow to dry at least 30 min. Then apply a second coat. While this is drying, brush a coat on the back of the laminate and allow all coats to dry not less than 30 min. There's no need to hurry, the cement can be left to dry up to two hours and still be workable. To determine when the cement is dry enough to bond the laminate, test it with a piece of wrapping paper. If, after pressing it on the cement, it has a tendency to pull the cement away from the surface, the cement is not dry enough. If for any reason it is necessary to allow the cement to dry for a longer period than specified, it can be reactivated by applying another coat on top of the first one. Strive to brush an even coating over the entire area; dull spots upon drying indicate that the application was too thin.

These decorative laminate samples show four popular patterns which are available in variety of pastel shades and wood grains to suit any interior treatment





Courtesy Marsh Wall Products, Inc.

Because bonding is immediate and permanent when both cemented surfaces come in contact, wrapping paper is used as a separator to permit the laminate to be positioned and aligned properly. The paper is placed lightly over the cemented surface and the laminate placed on top of it. When in proper position, the laminate is raised slightly and the paper is withdrawn two or three inches. This allows a portion of the laminate to make contact with the coated surface, after which the paper is pulled out all the way. All that remains to be done is to roll the laminate firmly to assure over-all contact, and the bonding is completed. Trimming the edges back to line is done

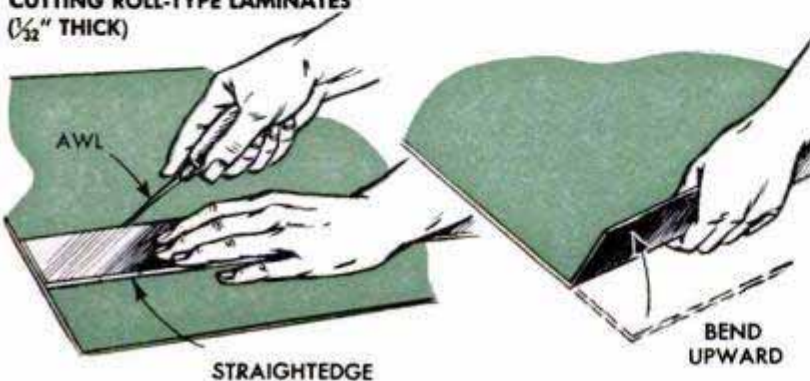
Beautiful walls which require only a wipe of a cloth to clean are had by paneling a living room or den with rich wood grains of mahogany, walnut or oak

with the square edge of a single-cut file, working carefully and slowly to avoid chipping. If the laminate is to be covered with a metal or wooden edging, carefulness is not too important. If the edge of the laminate is not to be covered, the laminate is finally filed at a slight bevel, just enough to break the sharp corner. This is done with the flat side of the file as pictured. Don't worry about any excess cement on the surface, it is easily rubbed off with the fingers.

Remember that if the edge of the work is

Here are pictured the two methods recommended for cutting roll and sheet-type laminate. Roll type is scored with pointed tool like an awl or ice pick and bent upward to snap off. Sheet laminate is cut with a fine-tooth saw

CUTTING ROLL-TYPE LAMINATES  
( $\frac{1}{32}$ " THICK)



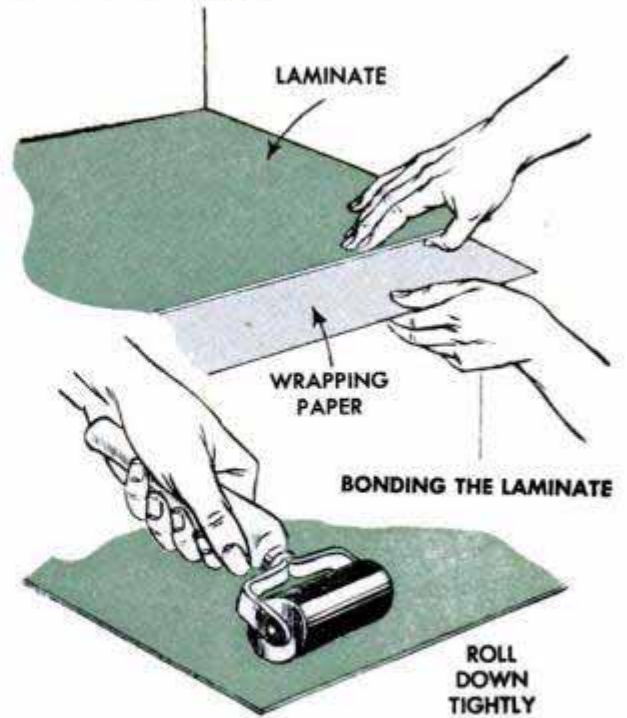
CUTTING SHEET-TYPE LAMINATES  
( $\frac{1}{16}$ " THICK)





The cement is applied warm with a clean paintbrush and left to dry at least 30 min. Two coats are applied to the wooden surface and one to the laminate

#### POSITIONING THE LAMINATE



Wrapping-paper separator permits laminate to be positioned on cemented surface prior to final bonding. Rolling with firm pressure assures positive contact

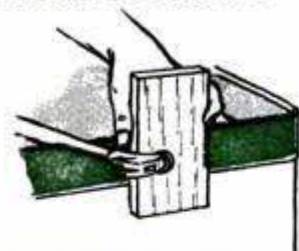
#### FINISHING



CUTTING LAMINATE FLUSH

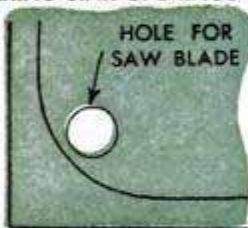
DRESSING EDGE

#### APPLYING EDGE FACING



PROJECTS 1/4"

#### MAKING SINK OPENINGS



PRICK MARKS  
FILE TO LINE WITH  
FINE RASP

#### REPAIRING POOR BOND



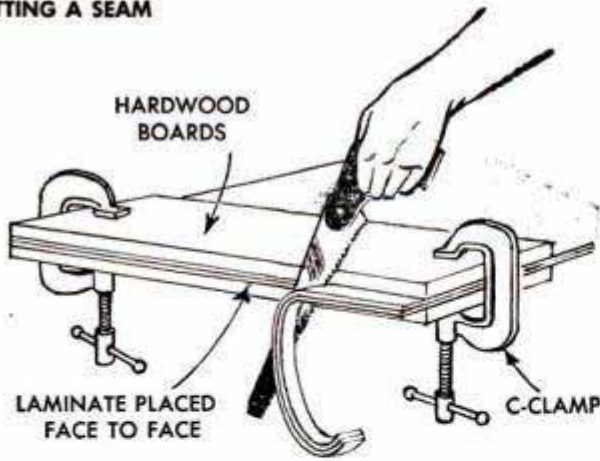
HEAT LAMP

to be covered, the edge is done first and then the top surface. Cut the laminate so that it will be flush with the bottom of the edge and wide enough to extend about 1/4 in. above the top surface. Apply the cement as before, using a special and thicker cement (Tapon), and let dry. Then apply by aligning the laminate in position and tapping it in place with a hammer and a block of wood. Finally, the waste is filed off as before, flush with the top surface. Laminate covering the surface should always be laid to extend over the edge of the facing strip. If it is necessary to bend the facing strip around a corner, heat it at the bend with a heat lamp (never an open flame) to prevent surface cracking. Do not attempt to bend it around a sharp corner.

Where a seam must be used, abutting edges of the laminate are first placed face to face and both cut at one time. This is done by clamping the material between two hardwood boards having perfectly straight edges, allowing the laminate to extend about 1/4 in. Saw as close to the hardwood as you can without cutting into it and then dress down both edges of the laminate with a file before removing the clamps. Where the abutting ends of the laminate have a tendency to curl, place a piece of wrapping paper over the seam and press the laminate with an electric pressing iron set at 200 deg. F., or "silk" on indicator dial. Move the iron back and forth with pressure until the laminate becomes hot and has relaxed into positive contact at the seam.

If for any reason you obtain a poor bond

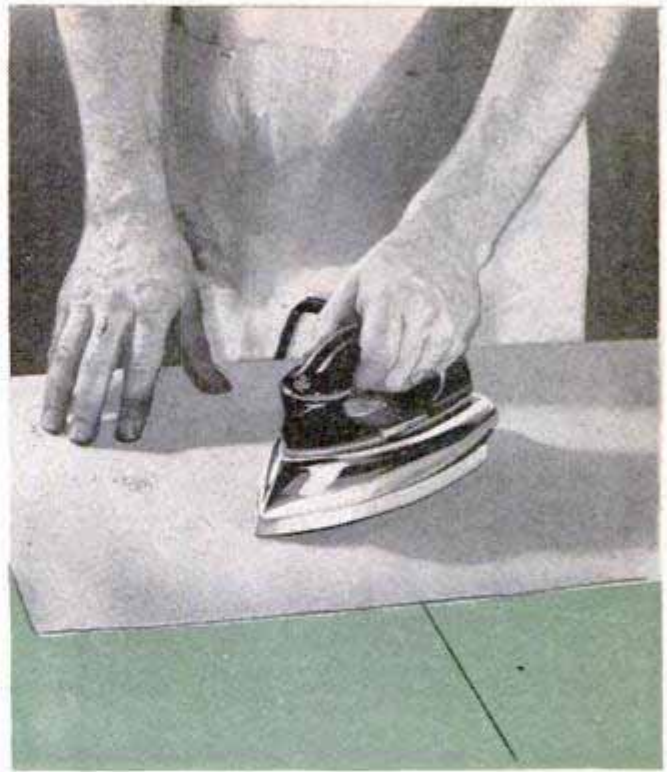
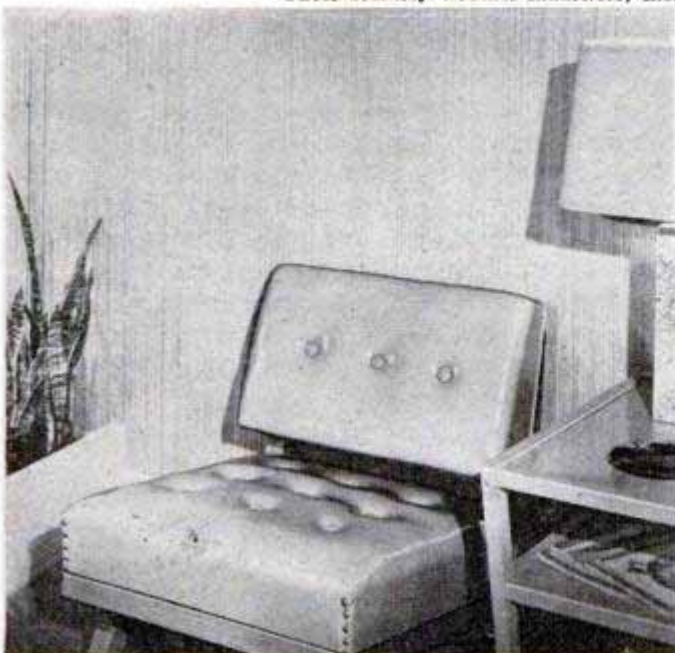
## CUTTING A SEAM



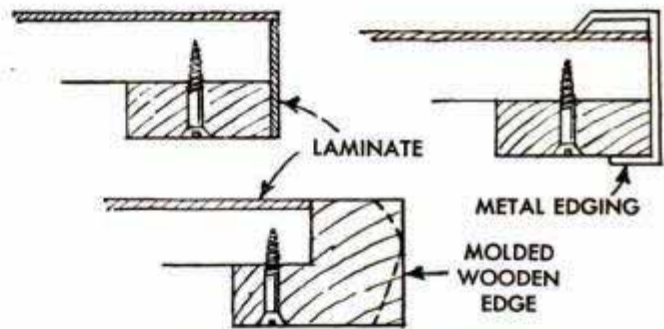
or if a blister should develop under the laminate, the defective area generally can be repaired by heating it until hot (130 deg. F.). This relaxes the laminate and reactivates the cement film, after which mere pressure usually will rebond the spot. If not, a C-clamp and block of wood will do the trick where it is possible to clamp the work. In the case of a blister, heat and press the surface as described and then quickly chill the surface with ice. If it is necessary to remove the laminate completely, cement solvent applied with an oil can to the cement will soften it to the point where the laminate can be peeled carefully from the surface. In the case of some cements, it is recommended that repairs must be made within a few days of the original application, as the cement tends to vulcanize with age and prevents any repairs being made.

Where walls are perfectly straight and flat, the laminate can be applied directly. Otherwise, it is best to provide a smooth base of hardboard. If desired, hardboard panels can be purchased prebonded with laminate and ready for direct application. The left-hand photo below shows a wall covered with prebonded laminate. ★ ★ ★

Photo courtesy Woodall Industries, Inc.



Abutting edges of a seam which have a tendency to curl, are heated with an iron to make pliable and pressed in contact with the cement-coated surface



BUILT-UP EDGES AND EDGE TREATMENT

If you do not wish to face the edge of the work with laminate, the edge can be attractively concealed with either a metal or wooden molding. Note that laminate applied to the surface extends over facing strip

Photo courtesy The Formica Co.



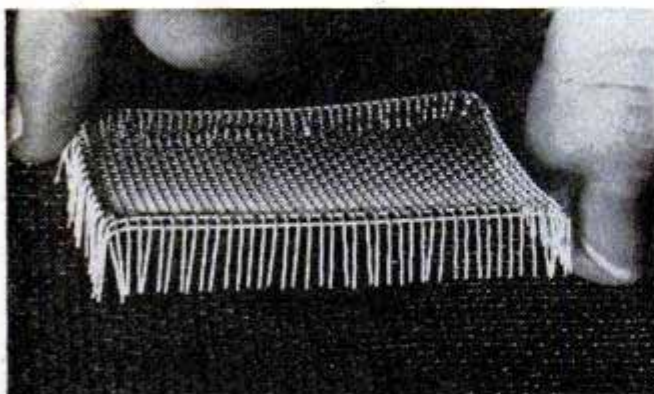
## Gourd Made Into Jack-O-Lantern



Traditional jack-o-lanterns made from hollowed pumpkins lack the durability and portability so much desired by Halloween pranksters. A good substitute that fills all the practical requirements can be made from a large gourd of the necked variety. The gourd selected should be properly dried and coated with shellac or orange-colored enamel. Cut eyes, nose and mouth in the appropriate design, then cut off the neck of the gourd at a point just below the bulbous end. Fit the lens of a large flashlight into the opening, trimming or padding the opening as required to obtain a snug fit. The flashlight is held securely in place with several turns of cellulose tape.

G. E. Hendrickson, Argyle, Wis.

## Method for Securing Patches Simplifies Screen Repair



No thread or string is needed to put a neat patch on a screen door or window. The job can be done by using only a piece of screen. Cut the patch about 1 in. larger all around than the hole to be patched. Un-

ravel four or five of the wires running parallel with the edges of the patch and bend the remaining ends at right angles to the patch, as shown in the photograph. Then, place the patch over the hole in the screen, pushing the wire "teeth" of the patch through the openings in the screen and clinching them toward the center of the patch on the other side of the screen.

R. F. Donovan, Guttenberg, N. J.

## Clothes Rack From Tree Branch Suits Decor of Rustic Cabin

Fastened to a wall of a cabin or summer home, this rustic clothes rack will furnish additional "hooks" upon which jackets, raincoats and other outer garments may be hung. A rack of this kind may also be used to support a number of fishing poles if desired, making it unnecessary to store them in corners in an unsightly manner. After obtaining a straight branch having a suitable number of smaller branches to serve as hooks, strip the bark from it and allow it to dry for several days. This done, stain or varnish the branch to match or complement the color of the wall.

R. F. Bertrand, Dearborn, Mich.

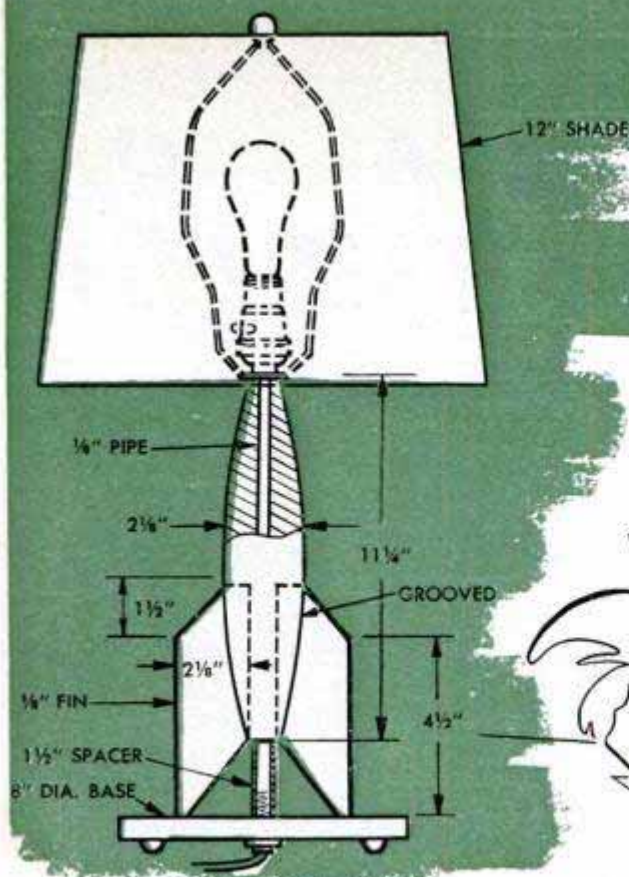


## Preserving Labels on Sprayer Tank

If not protected, the paper labels on a garden-sprayer tank, which contain important instructions as well as the model number, soon become illegible. To preserve the labels, cover them with one or two coats of spar varnish or clear lacquer. Be sure that the protective coating extends beyond the edges on all sides of the labels in order to prevent water and chemicals from working under the edges of the paper.

N. R. Bangert, Sacramento, Calif.

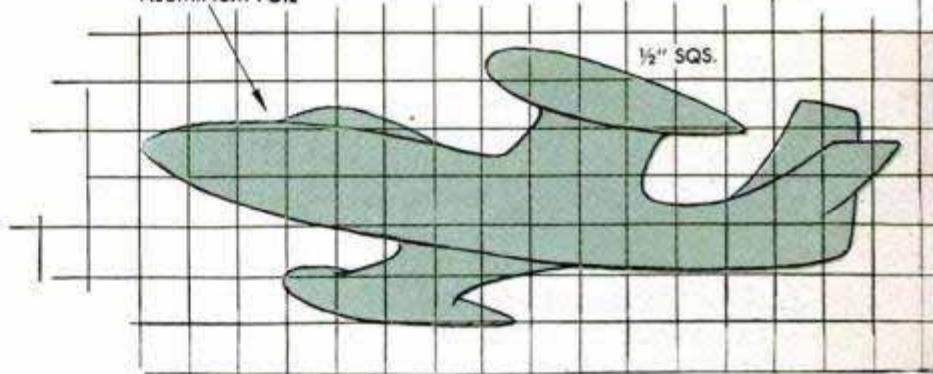
☛ To fill cracks between floor boards shrunk by too close proximity to the heating plant of a home, use a paste mixture of fine sawdust and shellac with whiting and color added.



# ROCKET LAMP

By Marvin Reid Hartley

ALUMINUM FOIL

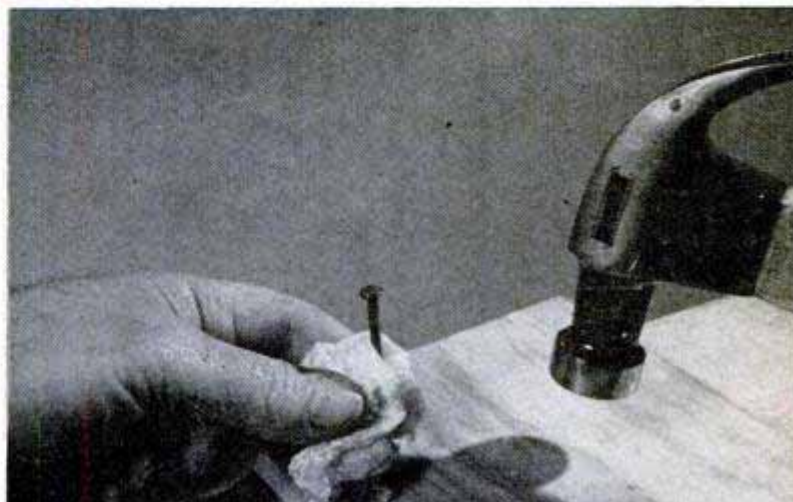


THIS ROCKET desk lamp will have the space-minded youngster beaming with enthusiasm. The rocket-shaped standard is a split hardwood turning, each of the two parts first being grooved lengthwise to take a 1/8-in. fixture pipe. After grooving, the parts are glued together, the ends plugged temporarily and turned to the contours of a rocket hull, following the dimensions given. After turning, the lower end of the rocket is slotted to receive four tail fins of

1/8-in. stock. The fixture pipe inserted through the hull anchors the rocket to a wooden base 8 in. in diameter. Note that a spacer of red plastic or fiber is slipped over the exposed end of the pipe before fastening it to the base. The top end of the pipe is fitted with a standard lamp socket and harp, and a suitable lamp shade is decorated with a jet-plane silhouette cut from aluminum foil. Dark blue is suggested for the base, with light blue for the rocket.

## Wax Paper Lubricates Nails

One craftsman finds that nails are easier to drive if they are wrapped with a wad of wax paper and held for starting as shown in the photo. The paper automatically coats the shank of the nail with a thin film of paraffin as the nail is being driven, lubricating the nail without affecting its holding power. This will prove especially helpful when driving thin coated nails in certain hardwoods where there is a strong tendency for the nails to bend under the hammer blows.—Ken Murray, Colon, Mich.





# Once a Tin Can

By Bertram Brownold

## PART I

**C**RAFTSMEN who like to work with metals but find that copper, aluminum and other favorite materials not only are expensive but difficult to get, can discover an unlimited source of metal by using the common tin can. The cost is nothing and the material, which actually is tin-plated steel, works into an unexpectedly handsome project. When the tin plate has been hammered and burnished with steel wool it takes on an attractive silvery gleam that remains bright indoors without lacquer or other protective coatings.

To store the tin plate for further use, remove the ends of the cans with a rotary-type opener. Then cut one side of the can parallel to the seam and as close to it as possible. Flatten the cylinder to form a rectangular sheet of metal which, from the largest household-size can in general use, will be about  $7\frac{1}{2} \times 19$  in. However, should you decide on a project which requires a larger sheet of metal, you usually will be

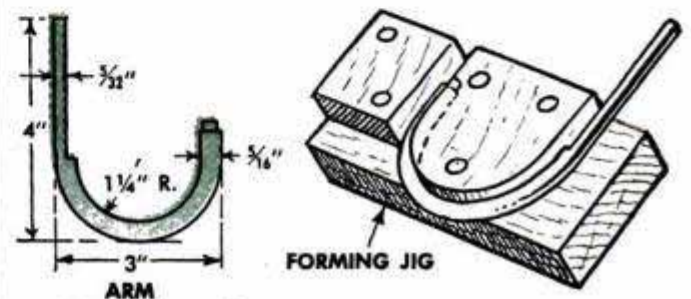
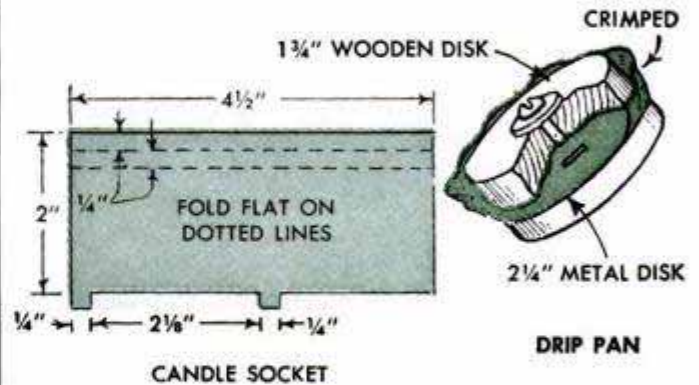
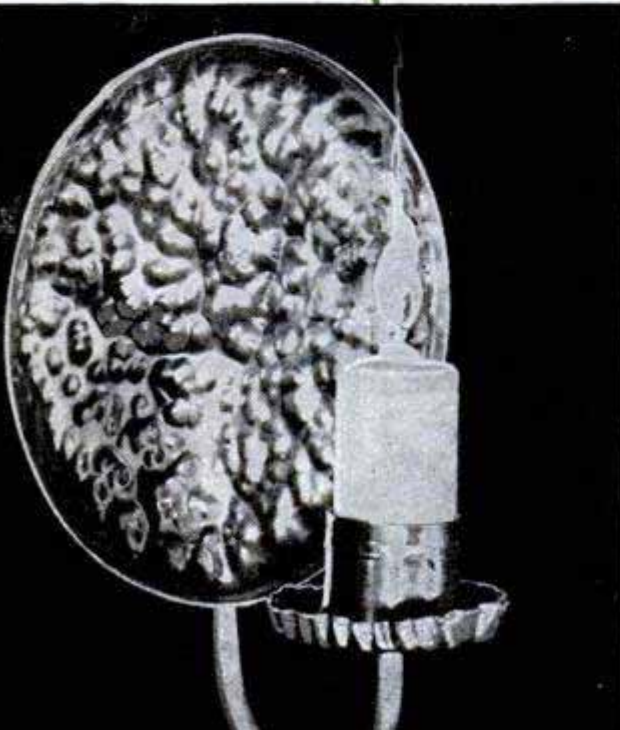
able to obtain cans of sufficient size from local restaurants or soda fountains.

When marking the metal for cutting, use a scribe or awl, but if it is difficult to see the scribed lines coat the work with India ink before scribing. The ink dries rapidly and is easy to wash off when finished.

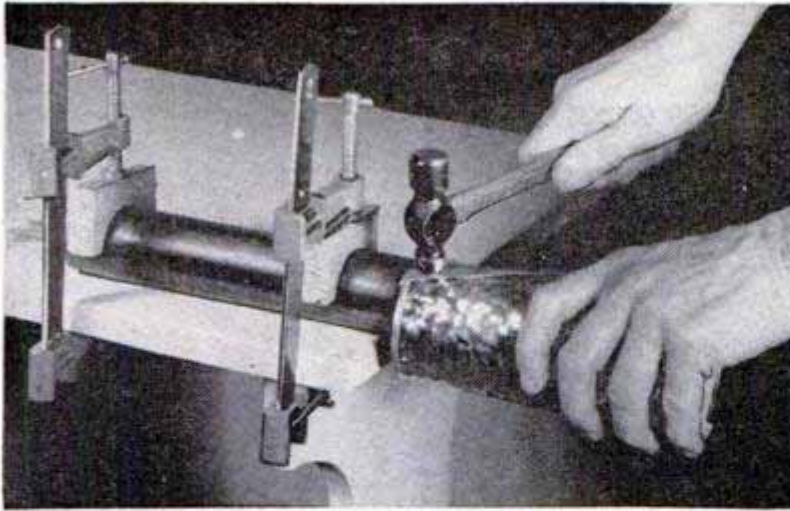
Cut straight lines and large-radius curves with tin snips, using a pair of old scissors to cut curves having a small radius. Use a jigsaw with a fine-toothed blade for inside cuts, and sandwich the work between two pieces of thin, soft wood for cutting. Lay out the pattern on the upper piece of wood.

You probably will want a hammered surface for most of the projects, and this is attained quickly by indenting the metal with a ball-peen hammer. The work is placed on a block of wood for hammering, the effect being varied by the softness or hardness of the block, the size of the hammer, force of the blows and thickness of the metal. With a little experimenting, just the right effect can be attained. You will notice that hammering the metal causes the sheet to buckle, or become dished. This can be corrected by placing the metal between two boards after hammering and

**Decorative wall sconce features reflector made from coffee-can top. Tabs anchor socket to slotted drip pan which is riveted to tenon on front end of arm. Rear arm section is filed flat for riveting reflector**



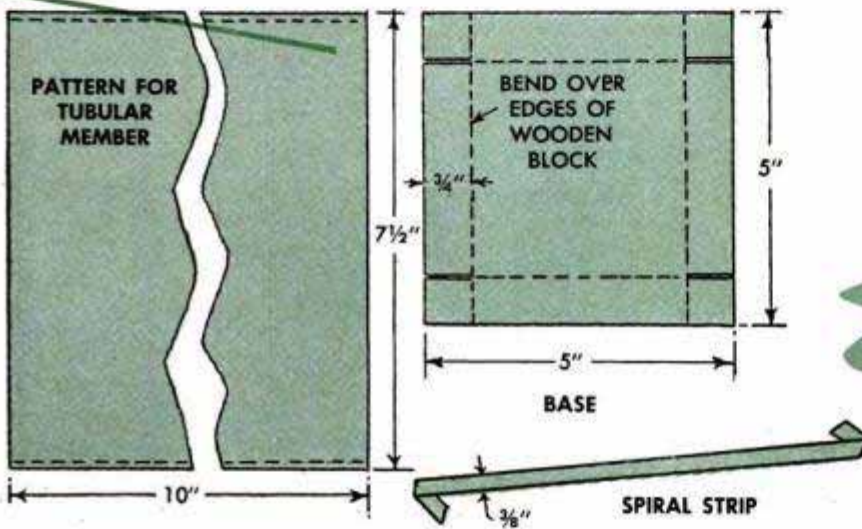




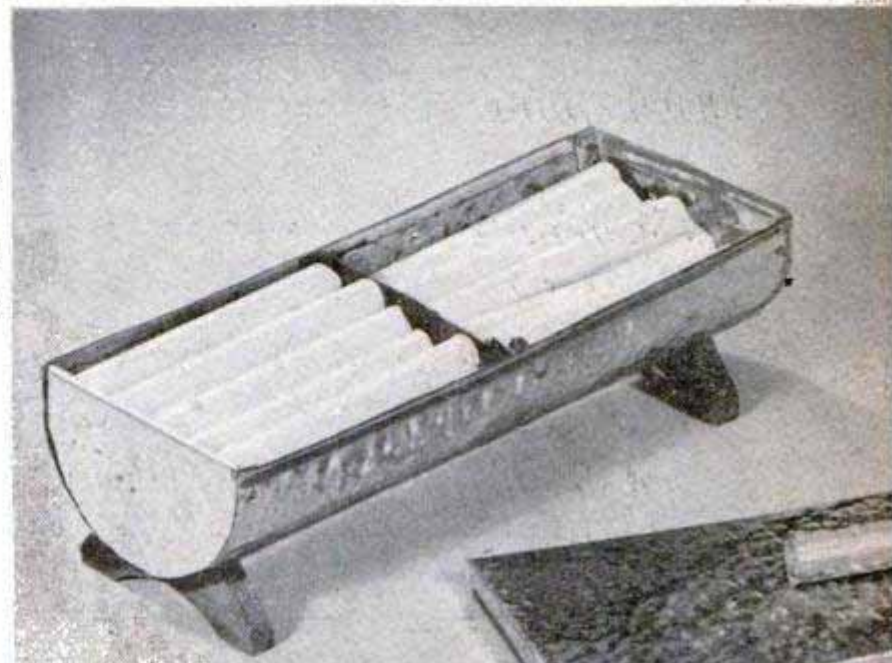
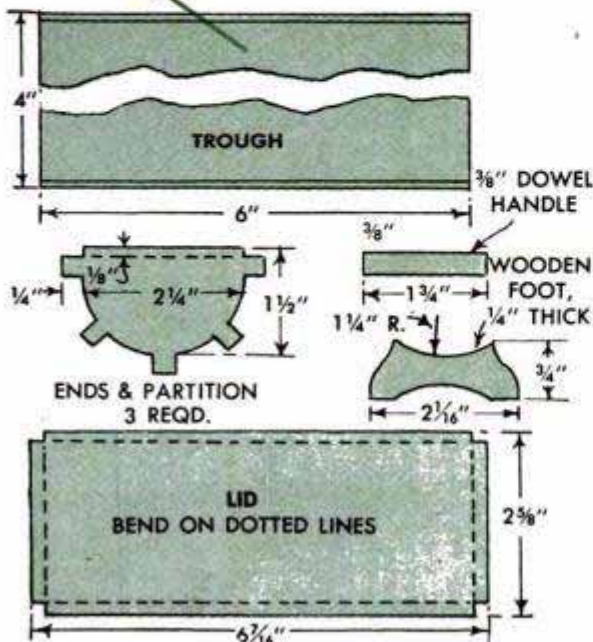
Attractive flower vase is made by bending hammered metal around pipe and riveting spiral overlays to cylinder. Angle irons riveted to sides of vase permit fastening to the base

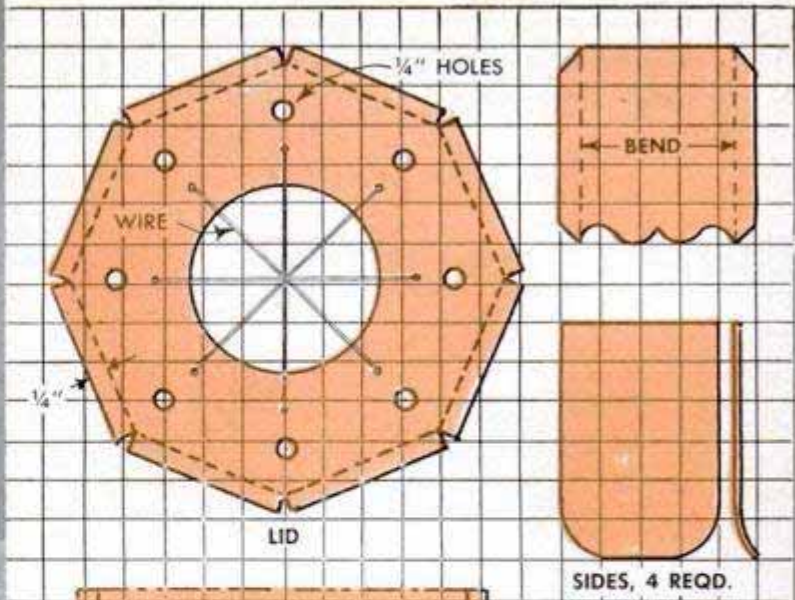


*Flower Vase*

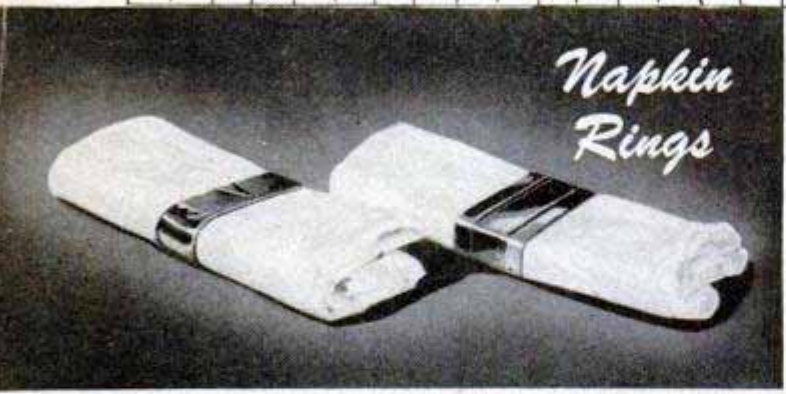
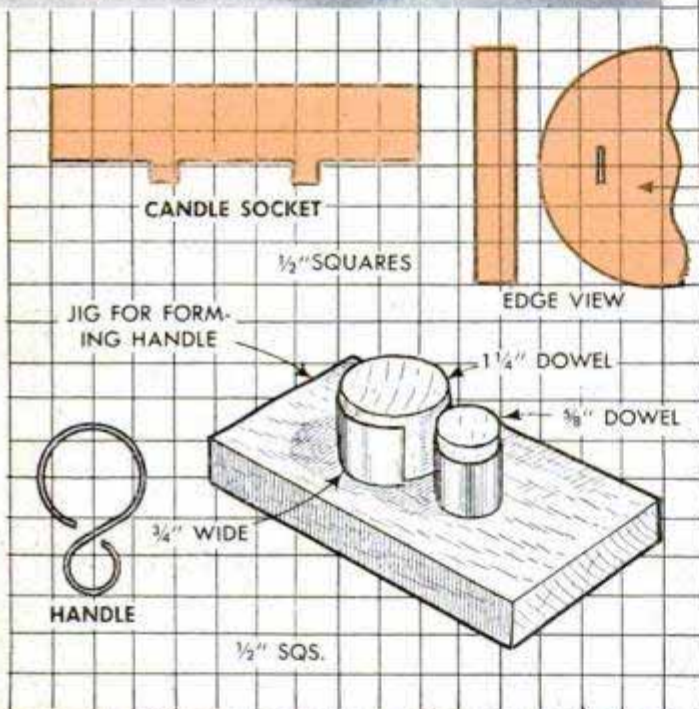


To make hammered cigarette trough, below, can is flattened, peened and then bent to form the trough at right angles to its original bend. In this way, the ends of the can sides provide ready-made beaded edges for the trough. Tabbed endpieces and center divider are riveted to the trough, while the wooden feet and lid handle are fastened with small round-headed screws. The trough is lined by cementing clear cellophane to the tin plate. An unusual coffee warmer and two neat napkin rings are detailed on the following page. Sides of the coffee warmer consist of eight separate pieces riveted together, four each of patterns shown in upper detail

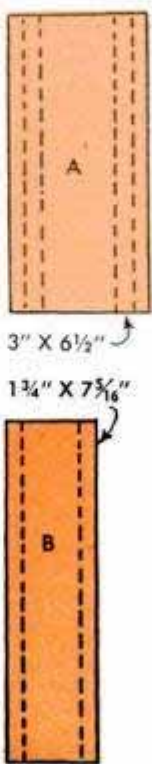




*Coffee Warmer*

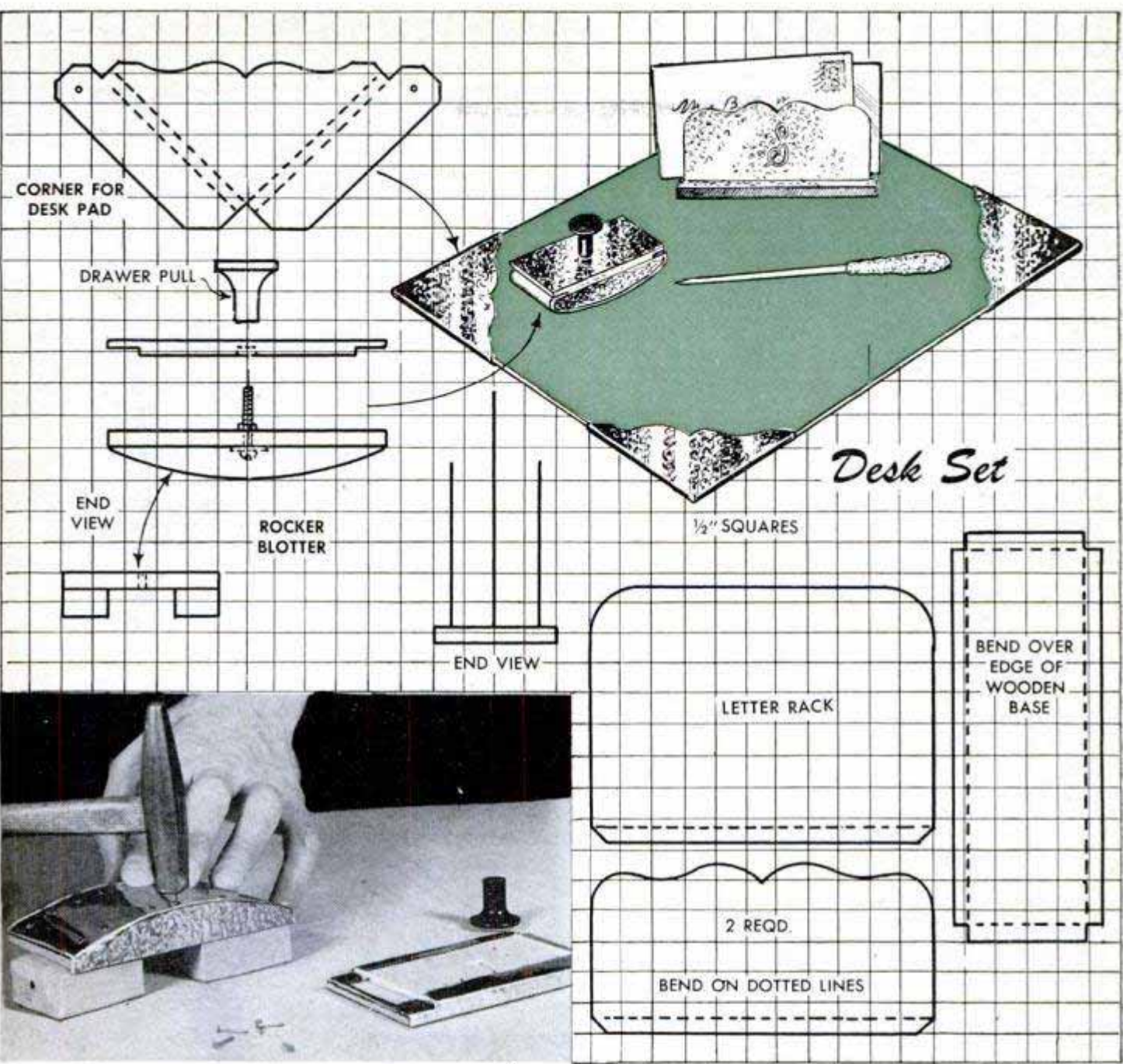


*Napkin Rings*



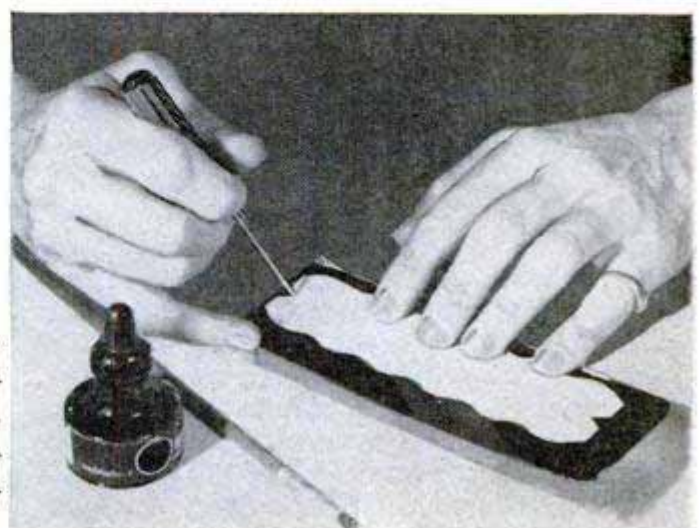
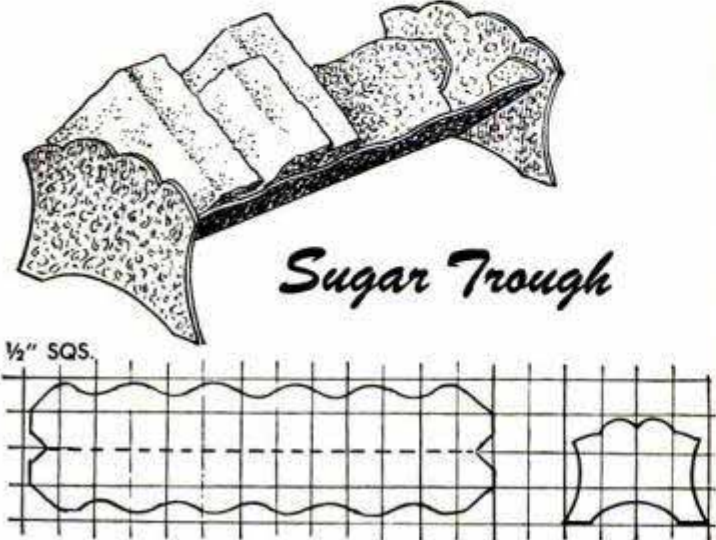
then striking the wooden surface with several sharp blows of a hammer.

Small nails (about the size used in cigar boxes) provide excellent rivets for sheet-metal work. Clip the nails so only a short length of shank remains, and back up the nailhead with an iron surface for riveting. As punching holes for the rivets upsets the metal around the holes, making a tight riveting job difficult, drill all the rivet holes. If the chuck of your drill press or hand drill will not take the small-diameter drills necessary, chuck the bit in a pin vise and then chuck the vise in the drill. A nail set also can be used for punching the holes in sheet metal. ★ ★ ★



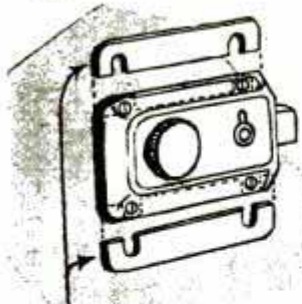
In matching desk set, above, tin plate corners are riveted to linoleum base to make desk pad. Rocker blotter is metal-covered wooden form. Uprights of letter rack are tacked to wooden base, and tin plate is riveted to the handle of purchased letter opener

The old-fashioned sugar trough, below, can be assembled with either metal or wooden ends. Note in the photo how a cardboard template is used when scribing the ink-coated metal. As ordinary ball-peen hammer makes too large an indentation for this work, peen by hammering with ball head of small hinge pin



# MODERN CEDAR CHEST

## Loose-Fitting Night Lock on Door Tightened With Cardboard Shims

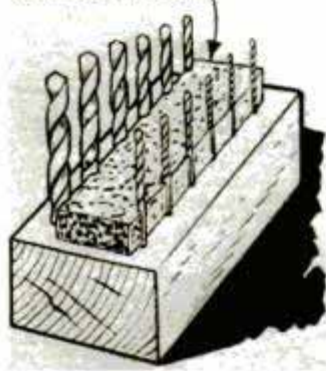


CARDBOARD STRIPS

Doors having night locks that have worked loose frequently produce rattling noises when exposed to strong winds. One way to make the lock fit snugly again, without having to recut the woodwork in order to move the latch plate, is by using cardboard shims between the lock and the door. Simply loosen the screws that hold the lock in place and slip the shims, which are notched for the screws, under the lock.

## Preventing Damage to Drills

SPONGE RUBBER



Whether carried in a toolbox or kept on a workbench, a set of drills stored in a drill holder has less chance of falling out and being damaged if wedged in place by a piece of sponge rubber as shown. Cut the rubber wide enough so that the edges are forced against the drills and can "grip" them securely.

Frank M. Butrick, Alma, Mich.

## "Reverse Polarity" Plug For Trickle Charger



Reversing the polarity of a trickle charger for use on cars having a positive or negative ground is easily done by installing a special two-piece plug, or connector, in the line connecting the charger to the cigar-lighter outlet. The line from the charger to the outlet is cut at the halfway point and male and female plugs are attached to the ends, care being taken to preserve the identity of the wires through the plugs. Then letter the word "negative" across the two plugs as indicated. To use the charger on a car having a negative ground, connect the plugs as above. To use on a positive ground, simply turn one plug over to reverse the polarity.

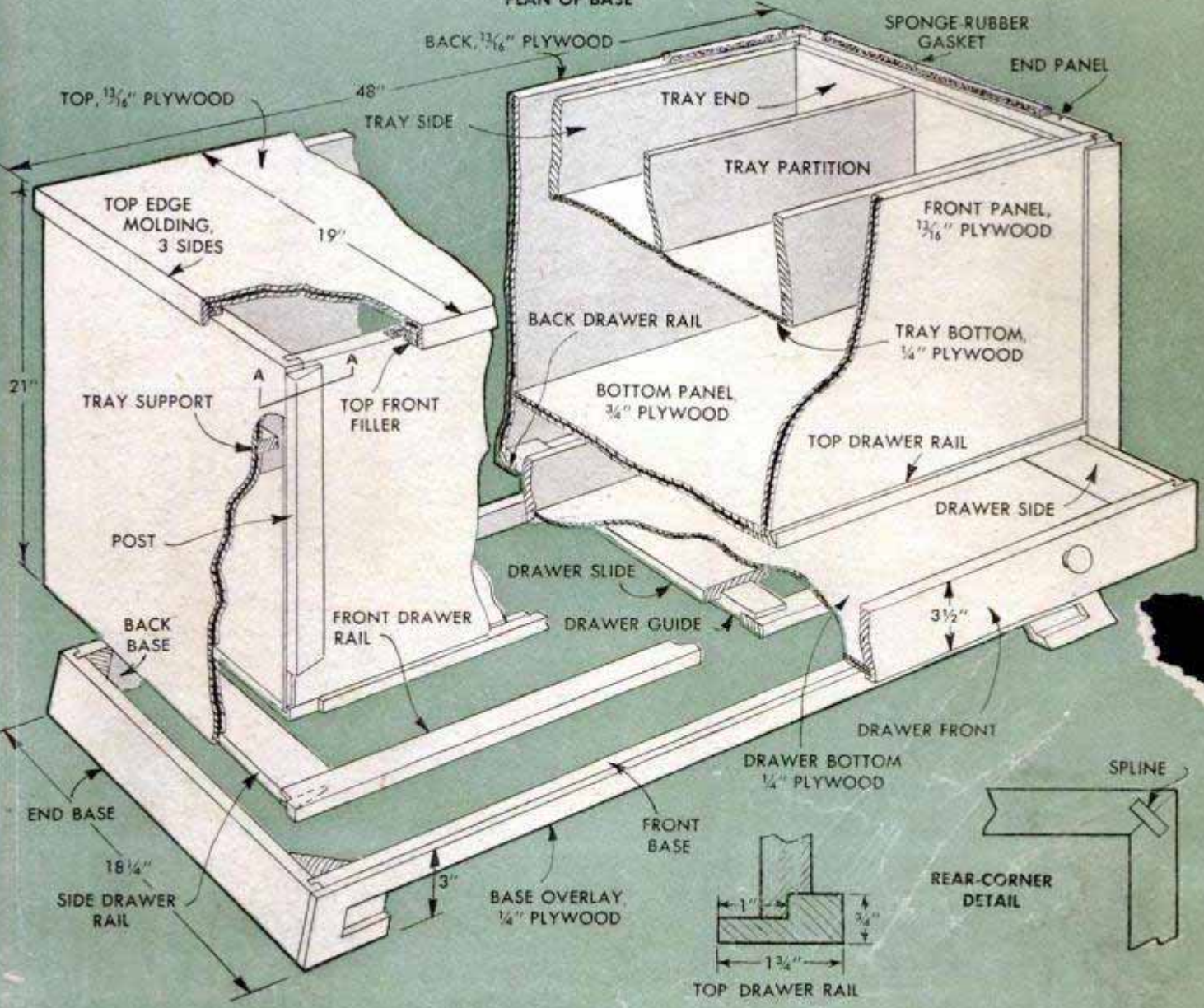
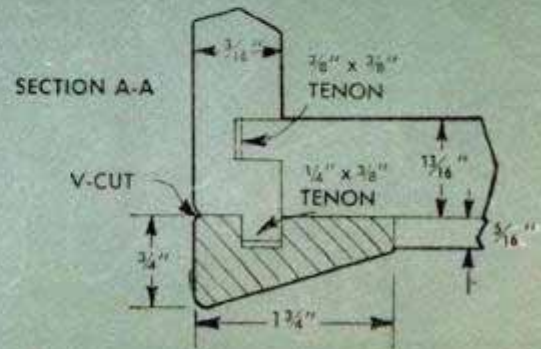
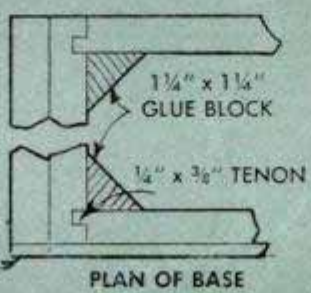
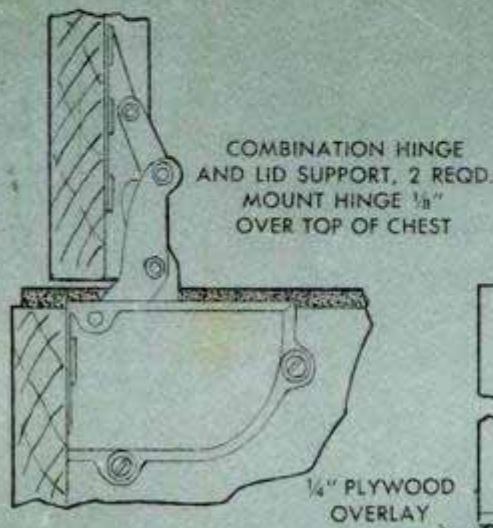
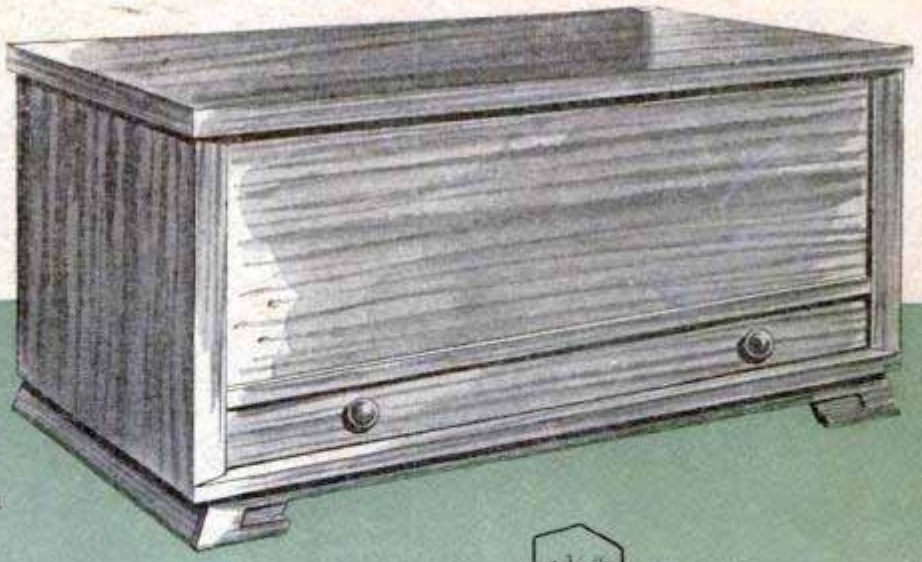
Ed Packer, Chicago.

CLEAN, UP-TO-DATE lines and an extra storage drawer distinguish this roomy cedar chest. The unit is built primarily of cedar-faced plywood or solid cedar plus your choice of cabinet wood, the end grain of the plywood at the front corners of the chest being hidden by two beveled posts. The top, which is of 1<sup>3</sup>/<sub>16</sub>-in. plywood, is given a heavier appearance by a 1<sup>1</sup>/<sub>4</sub>-in. molding applied to the front and both ends. The molding is laid in a mitered rabbet for an invisible joint and is also mitered at the corners. A 1/4 x 1/2-in. sponge-rubber gasket is cemented along the top edges of the side panels to form an airtight seal when the top is closed. When fitting the tray, be sure that sufficient clearance is allowed between the tray ends and the end panels of the chest to permit mounting combination hinges and lid supports on the inside of the panels. Note in section A-A that the front edges of the end panels are tenoned to fit the corner posts and that the panels are grooved to take tenons on the ends of the front panel. The rear edge of each end panel is mitered and joined to the rear panel with a spline as in the lower right-hand detail. Both back and end panels are grooved 4<sup>1</sup>/<sub>4</sub> in. from the lower edge to support the bottom panel.

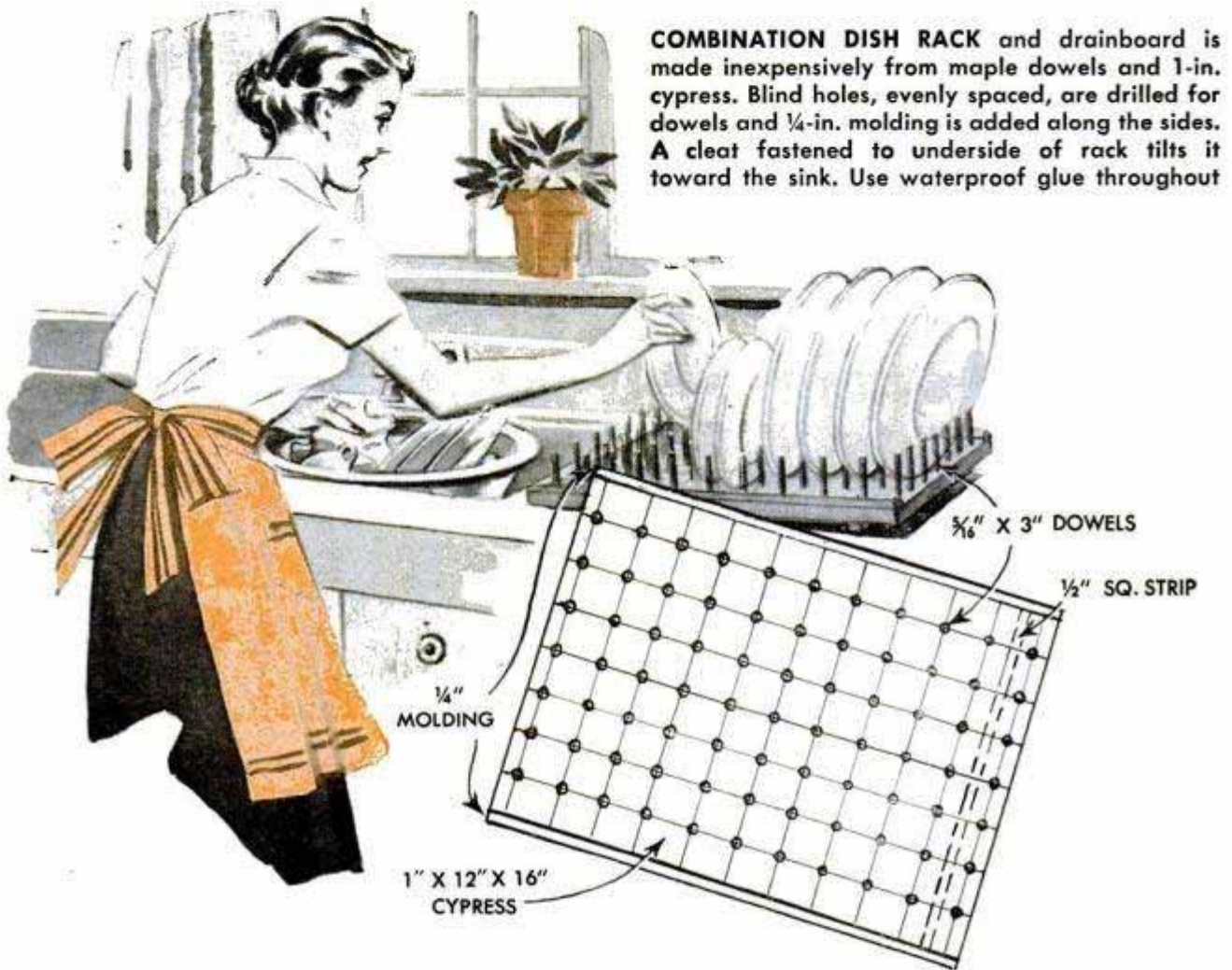
### MATERIAL YOU WILL NEED

- Cedar-faced plywood**
  - 1 pc.—13/16" x 19" x 48"—Top
  - 2 pcs.—13/16" x 18 1/8" x 19-15/16"—Ends
  - 1 pc.—13/16" x 19-15/16" x 48"—Back
  - 1 pc.—13/16" x 15-5/16" x 46 3/8"—Front
  - 1 pc.—3/4" x 16 5/8" x 46 3/8"—Bottom
- Solid cedar**
  - 2 pcs.—3/4" x 5" x 15 1/4"—Tray ends
  - 2 pcs.—3/4" x 5" x 44 3/8"—Tray sides
  - 1 pc.—1/2" x 4 3/4" x 43 3/8"—Tray partition
  - 2 pcs.—1" x 1 1/4" x 16 1/4"—Tray supports
- Plywood**
  - 1 pc.—1/4" x 15" x 43 3/8"—Tray bottom
  - 1 pc.—1/4" x 3" x 47 1/4"—Front-base overlay
  - 1 pc.—1/4" x 16 1/8" x 42 3/8"—Drawer bottom
- Cabinet wood**
  - 2 pcs.—5/16" x 1 1/4" x 19"—Top end molding
  - 1 pc.—5/16" x 1 1/4" x 48"—Top front molding
  - 1 pc.—7/16" x 3/4" x 47 3/8"—Top front filler
  - 2 pcs.—3/4" x 1 3/4" x 19"—Posts
  - 1 pc.—3/4" x 1 3/4" x 46 1/2"—Top drawer rail
  - 1 pc.—3/4" x 1 3/4" x 47 1/4"—Front drawer rail
  - 2 pcs.—3/4" x 3 1/4" x 18"—End base
  - 1 pc.—3/4" x 3" x 46 1/2"—Front base
  - 1 pc.—3/4" x 3 1/2" x 43 3/4"—Drawer front
- Lumber**
  - 2 pcs.—1/2" x 3 1/2" x 16 3/4"—Drawer sides
  - 1 pc.—1/2" x 3 1/4" x 42 3/8"—Drawer back
  - 1 pc.—3/4" x 1 3/4" x 46 1/2"—Back drawer rail
  - 2 pcs.—3/4" x 3" x 16 3/8"—Side drawer rail
  - 1 pc.—3/4" x 3" x 46 1/2"—Back base
  - 1 pc.—3/4" x 1 1/2" x 16 1/2"—Drawer guide
  - 1 pc.—9/16" x 3" x 16 1/8"—Drawer slide
- Miscellaneous**
  - 2—combination hinges and lid supports
  - 2—2" dia. brass drawer knobs
  - 1—chest-lid lock
  - 1—drawer lock
  - 4—3/8" dia. furniture glides
  - 7'—1/4" x 1/2" sponge-rubber gasket

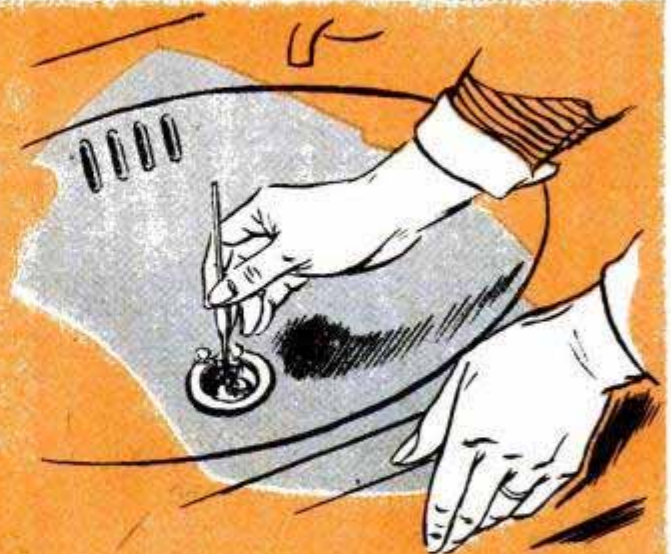
By John Bergen



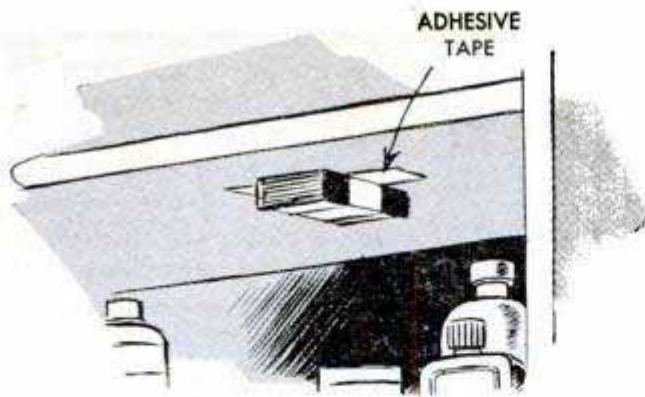
# Solving HOME PROBLEMS



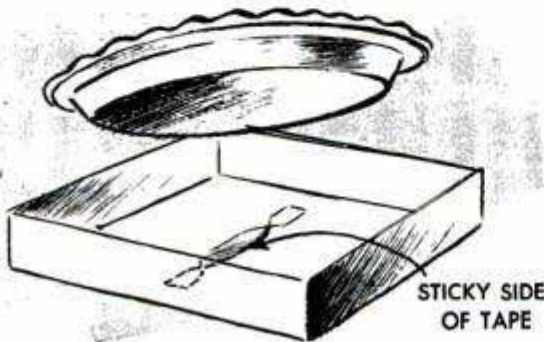
**WHEN REMOVING DECALS** from walls or wood-work prior to painting, first soften them with denatured alcohol. The alcohol will loosen the decals to the point where they can be scraped off easily. Then sand the surface smooth before painting



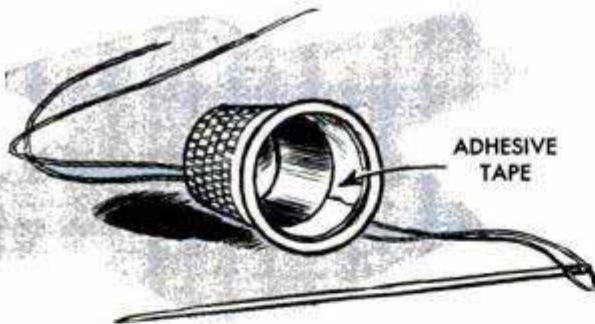
**IF HAIR HAS CLOGGED** the drain in the bathroom lavatory or bathtub, you will find that an ordinary crochet hook can be used to clean out the drain. Hair that has wrapped around the parts of the drain may be removed with a small tweezers



**TO KEEP RAZOR BLADES** out of reach of children, open the package at one end and tape the package to the underside of upper medicine-cabinet shelf

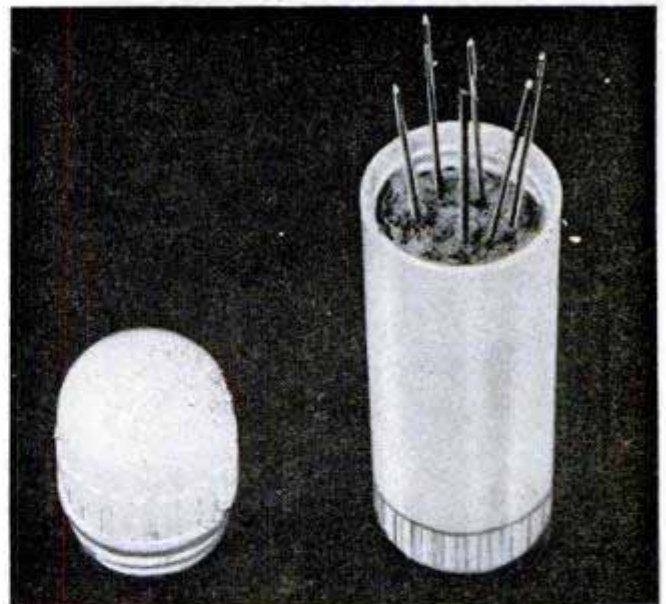
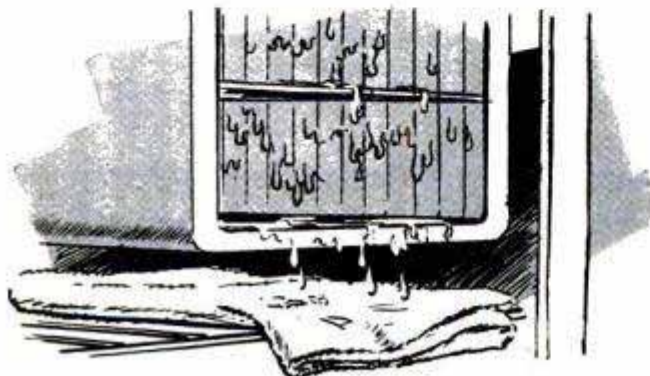


**PIE OR CAKE** carried on picnic is not likely to shift inside box and be crushed if strip of cellulose tape is twisted and stuck to bottom of the box as above

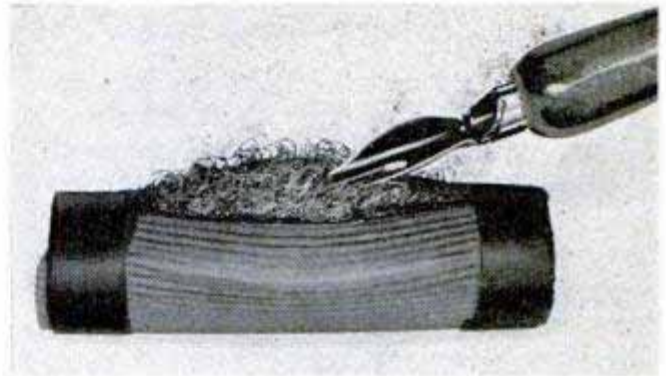


**A THIMBLE THAT** is too large for your finger can be made to fit snugly in a few seconds by placing a narrow strip of adhesive tape inside thimble rim

**DEFROSTING REFRIGERATOR** is less trouble if folded bath towel is placed under coils to catch ice and drops of water that otherwise would fall to the floor

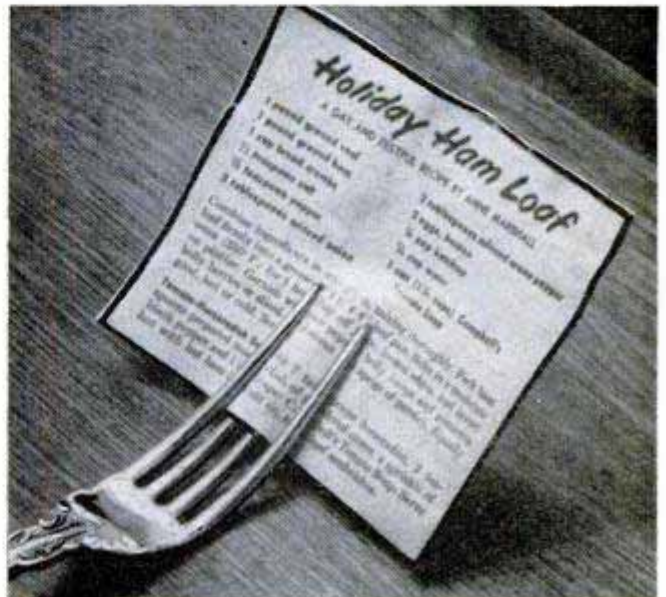


**HANDY NEEDLE CASE** is improvised from plastic container used to hold inhaler-type medication. Insert is removed and piece of cellulose sponge pressed in base. Screw-on cap covers tops of the needles

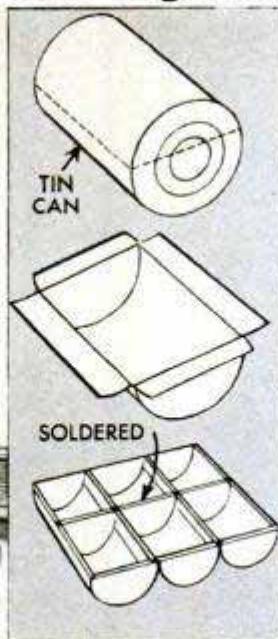


**STEEL WOOL** quickly cleans dried ink from pen points. The wool is inserted in section of rubber tubing which is split lengthwise and taped at ends. Pen point is brightened by pressing into steel wool

**HANDLING OF RECIPE** clippings while cooking or baking is avoided by inserting recipe between tines of a fork. This not only saves time but also protects favorite recipes from becoming worn and stained



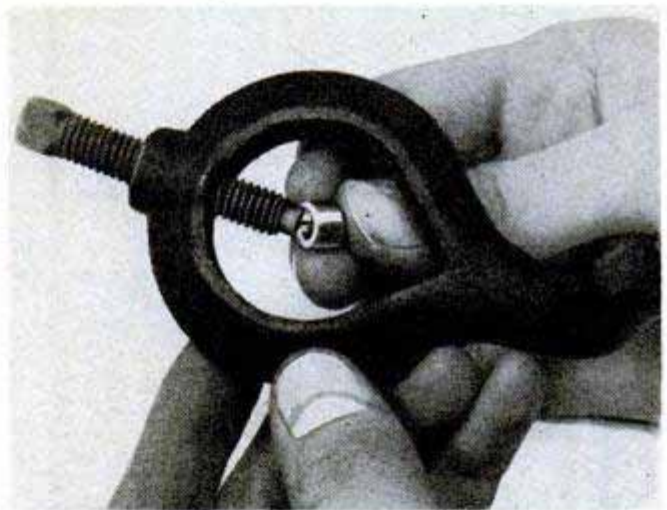
## Small Parts Stored in Handy Tray Made by Soldering Tin Cans Together



A number of discarded tin cans of uniform size, preferably of the type in which condensed milk is sold, can be made into a useful sectional tray for storing various small parts. First, cut the cans in the manner indicated in the detail, allowing tabs to remain on the ends and sides so that the cans may be crimped together. After arranging the cans in the particular order desired, crimp and solder them together. The outside tabs then should be bent over and flattened in order to eliminate any sharp edges.—Huge Lineback, Stillwater, Okla.

## Brass Pad on Lathe-Dog Screw Prevents Marring of Work

The clamping screw of a lathe dog often mars the work, especially if the turning is of soft metal. Makeshift pads generally used to prevent marring usually fall out of place or are difficult to find when needed. However, cups turned from brass and bored to press-fit over the tip of the clamping screw provide excellent nonmarring pads which are always at hand. Pads are made by chucking a piece of brass rod in the lathe and boring with the drill held in the tailstock chuck. A slight chamfer is turned on the face of each pad to relieve a sharp edge. A set of different-size dogs can be "padded" in this manner.



## Buffer Fitted With Extra Handle For Easier Manipulation

When waxing a car, it often is difficult to hold a small motor-driven buffer steady, especially when the cleaning disk is caked with wax. To overcome this, one car owner removed the handle and bracket from an old coffeemaker and attached them to the buffer as shown, thus enabling him to steady the tool with both hands. If a percolator handle is used, a bracket can be made from a strip of sheet metal.

Grover Brinkman, Okawville, Ill.

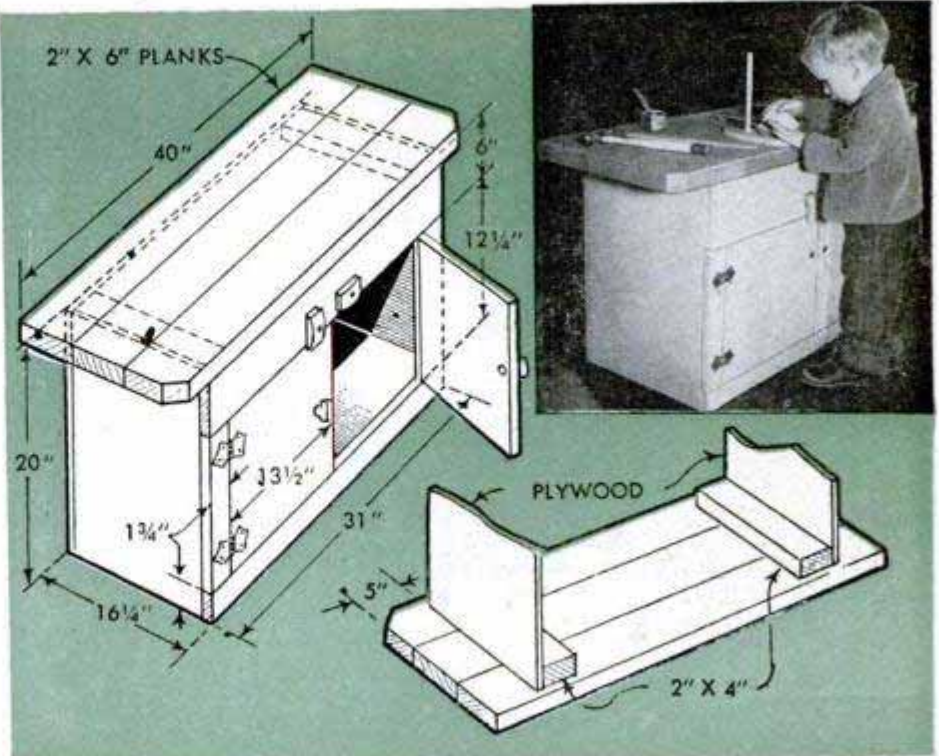
## Pencil Erasers Polish Small Parts

Pencil stubs having the erasers still intact serve as handy polishing heads for brightening small metal parts when making jewelry or models. Simply chuck the stub in the drill press and lock the spindle.

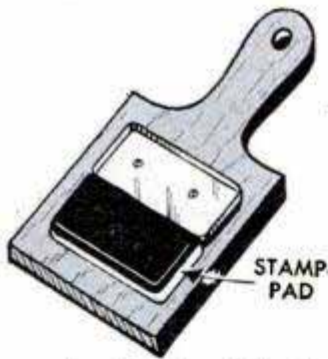


# Workbench Encourages Small-Fry Craftsman

Designed especially for a young "carpenter," aged two, this tiny workbench proved just the thing for encouraging craftsmanship in one small fry. It also helped curtail further practicing of his handiwork on walls and woodwork of his home. Constructed with simple tools, the bench top consists of 2 x 6s cleated together with 2 x 4s. Back and side panels, as well as doors and front trim, are of plywood. The bench is assembled with glue, screws and nails, then sanded. The top is stained and the cabinet enameled. — Jerome Parker, Sonoma, Calif.

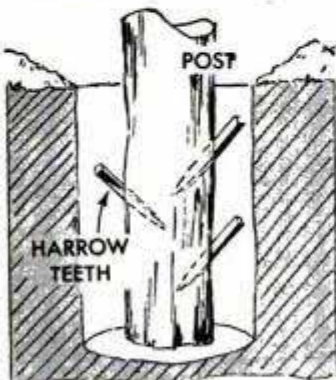


## Stamp Pad Located Easily When Tacked to Paddle



Finding that his small rubber-stamp pad always seemed to be hidden under papers on his desk whenever he needed it, one shipping clerk adapted it for hanging on the wall within easy reach. To do this, he tacked the cover of the pad to a wooden paddle which in itself makes the pad easier to locate on occasions when it becomes misplaced.

## Discarded Harrow Teeth Anchor Fence Posts



Fence posts set in wide ditches or other low spots in fields often are loosened by frost action and contraction of the wires causing the fence line to go slack when the ground thaws. After making several unsuccessful attempts to solve this problem, one farmer salvaged the worn teeth from an old drag harrow and drove several of these into each post

before setting. Note in the detail that the harrow teeth are driven into the post at an angle. The projecting ends of the teeth engage tamped soil around the post and prevent it from being lifted.

## Razor Blades Stored Safely In Slitted Rubber Tubing

Used safety razor blades can be stored quite safely in a workbench drawer or a tool box, provided the blades are first pressed into a short length of rubber tubing as shown in the illustration. Several blades may be stored in each slit if desired.

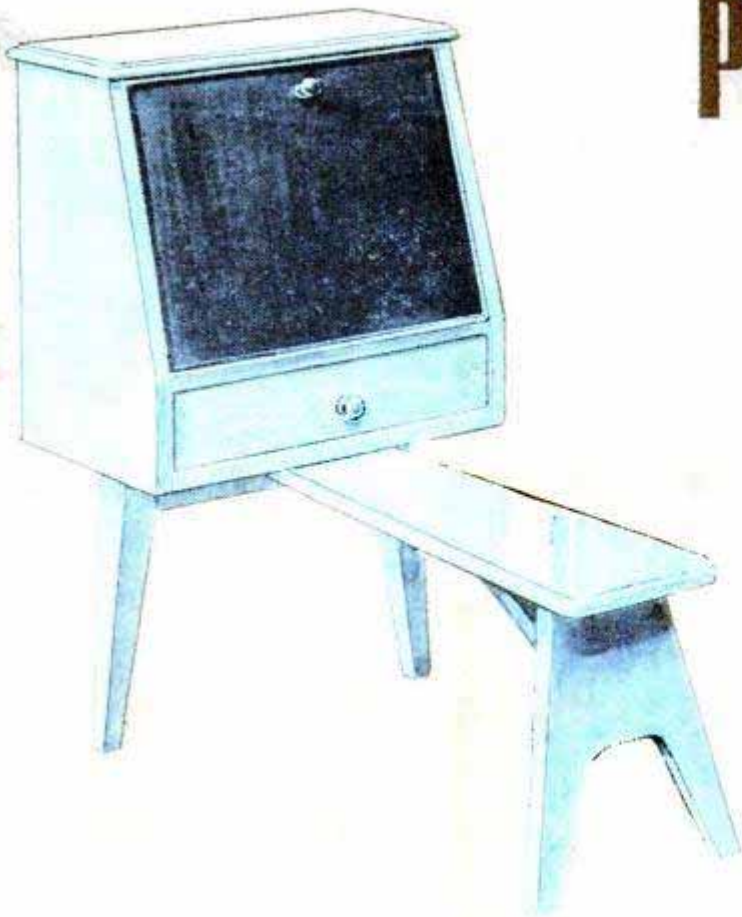


## Wall Surrounding Light Switch Shellacked for Easy Cleaning

To simplify the removal of finger marks giving a soiled appearance to the wall around a light switch, first clean the wall and then apply one or two coats of fresh, white shellac. This will enable you to clean the wall quickly and as often as necessary with a damp cloth.

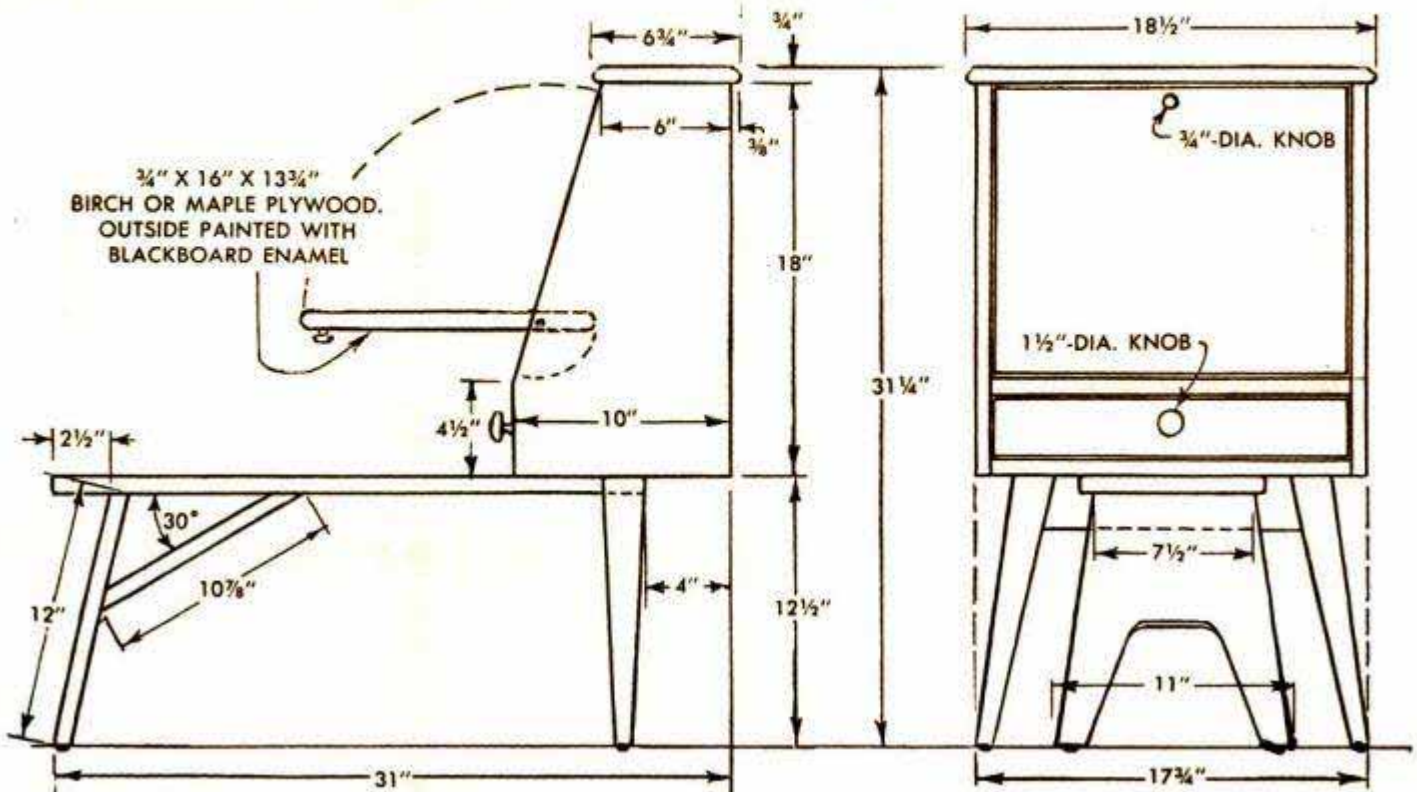
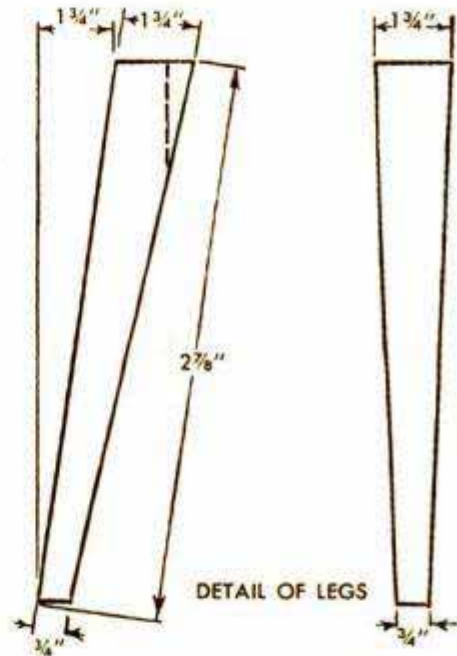
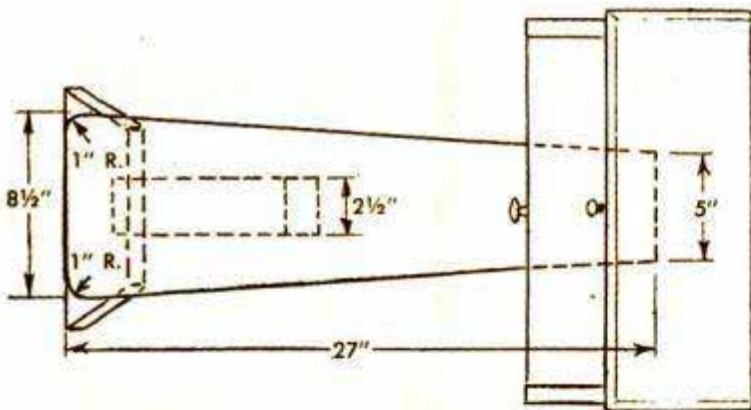
☛To prevent a new penpoint from scratching as it writes, hold the point over the flame of a lighted match for a few seconds to eliminate any irregularities in the metal.

# PLAN of the MONTH...



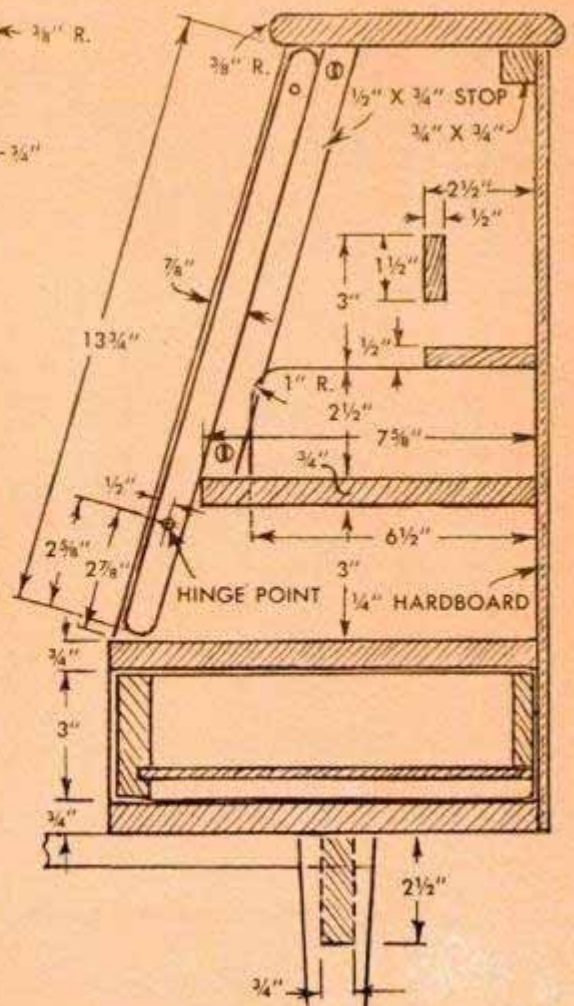
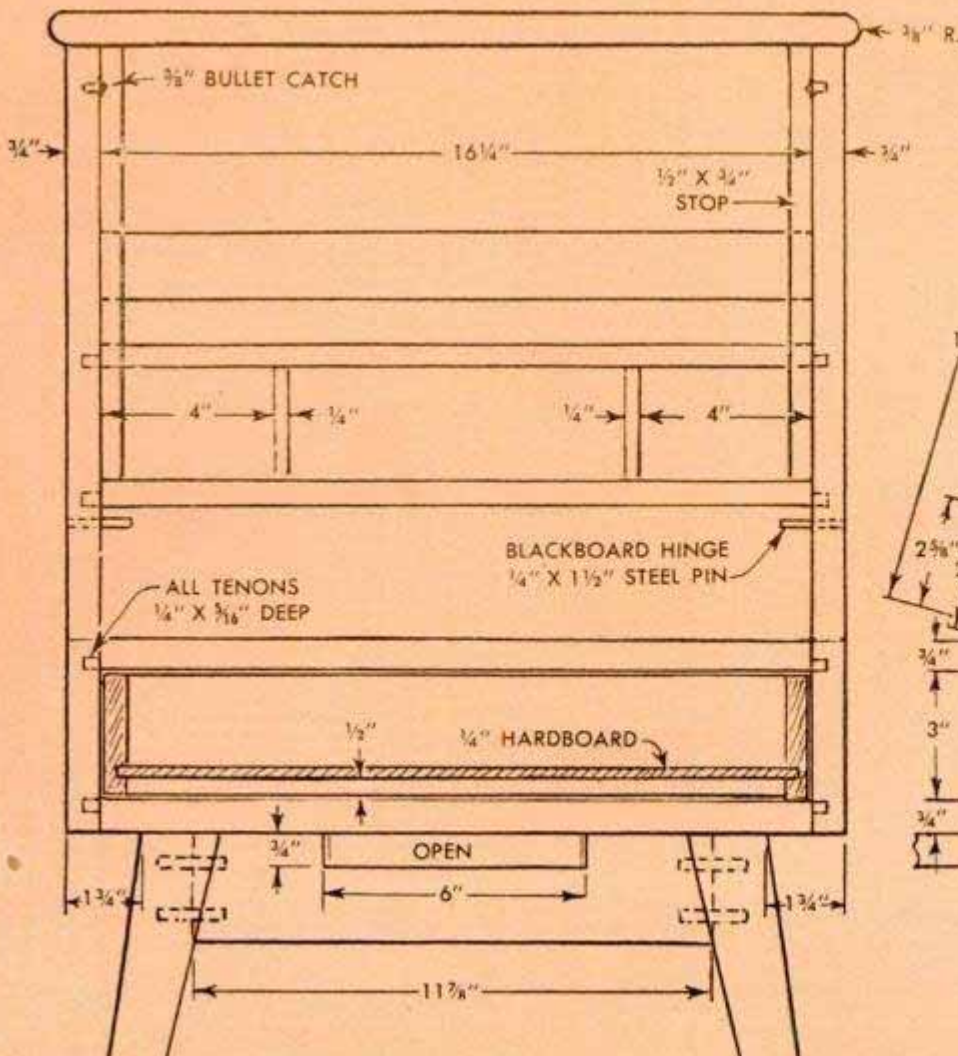
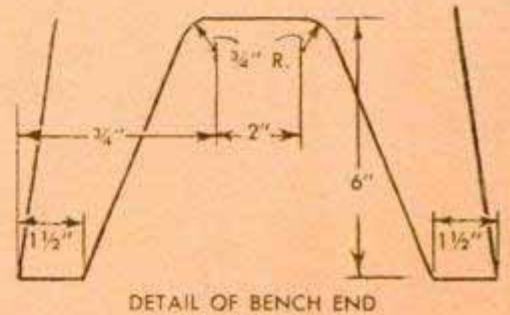
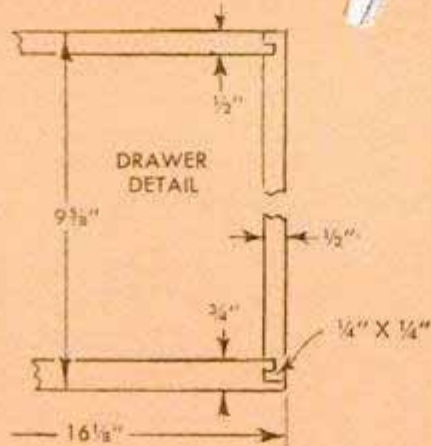
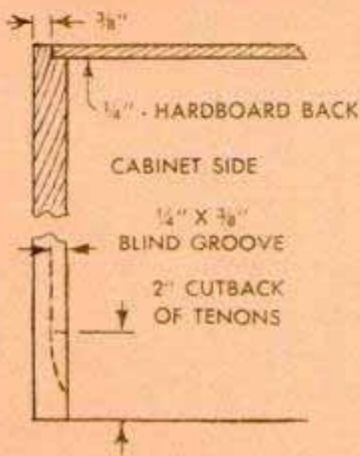
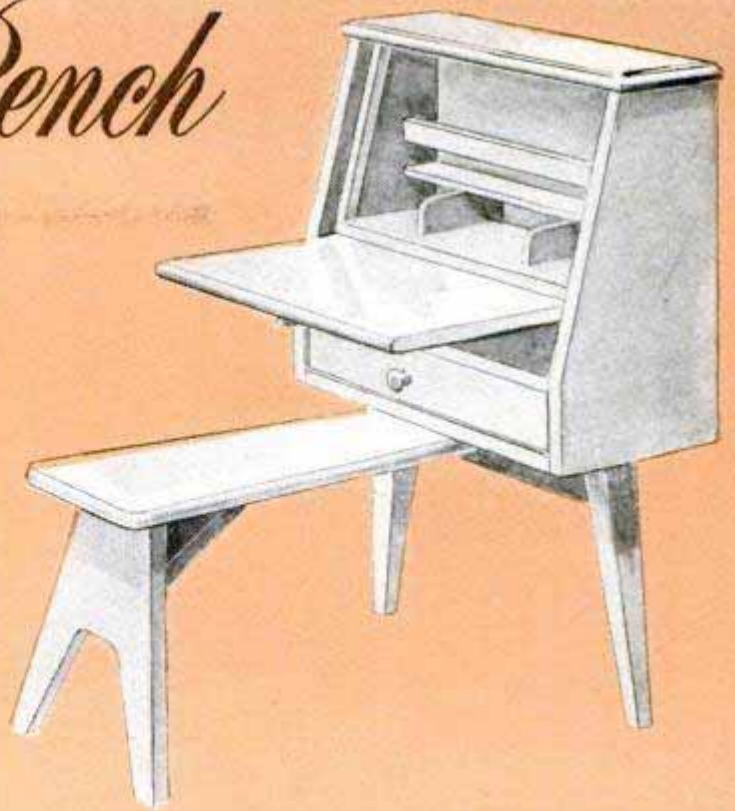
## MATERIAL LIST

Clear Lumber			
1 pc.	$\frac{3}{4}$ "	x 6 $\frac{3}{4}$ "	x 18 $\frac{1}{2}$ " — Top
2 pcs.	$\frac{3}{4}$ "	x 10"	x 18" — Sides
1 pc.	$\frac{3}{4}$ "	x 8 $\frac{1}{2}$ "	x 25" — Bench seat
1 pc.	$\frac{3}{4}$ "	x 11"	x 12" — Bench end
1 pc.	$\frac{3}{4}$ "	x 2 $\frac{1}{2}$ "	x 10 $\frac{7}{8}$ " — Brace
2 pcs.	1 $\frac{3}{4}$ "	x 1 $\frac{3}{4}$ "	x 12 $\frac{7}{8}$ " — Legs
1 pc.	$\frac{3}{4}$ "	x 2 $\frac{1}{2}$ "	x 11 $\frac{7}{8}$ " — Leg cross brace
1 pc.	$\frac{3}{4}$ "	x 7 $\frac{3}{8}$ "	x 16 $\frac{7}{8}$ " — Shelf
2 pcs.	$\frac{3}{4}$ "	x 9 $\frac{3}{4}$ "	x 16 $\frac{7}{8}$ " — Shelves
1 pc.	1 $\frac{1}{2}$ "	x 2 $\frac{1}{2}$ "	x 16 $\frac{7}{8}$ " — Shelf
1 pc.	1 $\frac{1}{2}$ "	x 1 $\frac{1}{2}$ "	x 16 $\frac{1}{4}$ " — Rail
2 pcs.	$\frac{1}{2}$ "	x 3 $\frac{1}{4}$ "	x 10" — Side stops
1 pc.	$\frac{3}{4}$ "	x 2 $\frac{7}{8}$ "	x 16 $\frac{1}{8}$ " — Drawer front
2 pcs.	$\frac{1}{2}$ "	x 2 $\frac{7}{8}$ "	x 9 $\frac{3}{8}$ " — Drawer sides
1 pc.	$\frac{1}{2}$ "	x 2 $\frac{1}{8}$ "	x 15 $\frac{5}{8}$ " — Drawer back
1 pc.	$\frac{3}{4}$ "	x 3 $\frac{1}{4}$ "	x 16 $\frac{1}{4}$ " — Cleat
Hardboard			
1 pc.	$\frac{1}{4}$ "	x 9 $\frac{1}{8}$ "	x 15 $\frac{5}{8}$ " — Drawer bottom
1 pc.	$\frac{1}{4}$ "	x 17"	x 15 $\frac{5}{8}$ " — Back
Birch Plywood			
2 pcs.	$\frac{1}{4}$ "	x 2 $\frac{1}{2}$ "	x 6 $\frac{1}{2}$ " — Dividers
1 pc.	$\frac{3}{4}$ "	x 16"	x 13 $\frac{3}{4}$ " — Blackboard

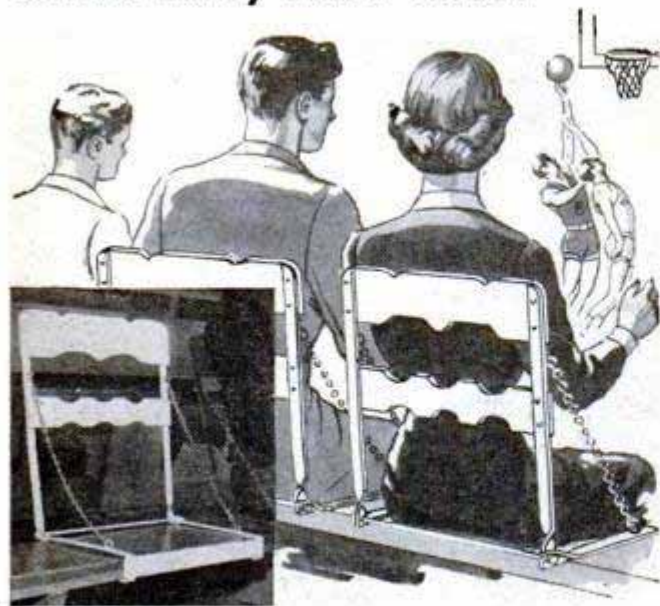


# ... Drawing Bench

The child who likes to play with chalk, crayons and water colors will spend many happy hours at this "sawhorse" drawing bench. The hinged desk front is coated with blackboard enamel to provide a large drawing surface when closed. When opened, the front forms a desk top and discloses a handy storage rack for paper and coloring books as well as three compartments for drawing materials. A drawer for odds and ends is installed directly beneath the desk top. Note that the cross brace which is fitted between the splayed legs of the desk unit is notched to take the end of the bench seat. The latter is inserted in the notch and fastened with glue and screws to the underside of the desk after the bench endpiece and brace have been assembled



## Backrest Used on Plank Seats Carried Easily When Folded



The discomforts of sitting on plank seats at sporting events led one enthusiast to design and construct a lightweight, folding backrest. Consisting of seat and back sections having flat-steel frames joined together by a plywood seat brace and two back panels, the backrest is folded where the two sections pivot on a steel rod which also serves as an additional brace. The seat frame is bent over the seat brace and turned back at the ends sufficiently to hook over the front edge of a plank. The back is supported by lengths of chain attached to the seat section which, in use, is anchored under the legs of the occupant.

Fulton H. Travis, Yakima, Wash.

## Comfortable Milk Stool Made From Scrap Parts



Needing another milk stool, one farmer hit upon the idea of constructing one from an old bucket and a discarded implement seat to provide additional comfort. After the bail was removed, the seat was bolted to the bottom of the bucket in the manner shown.

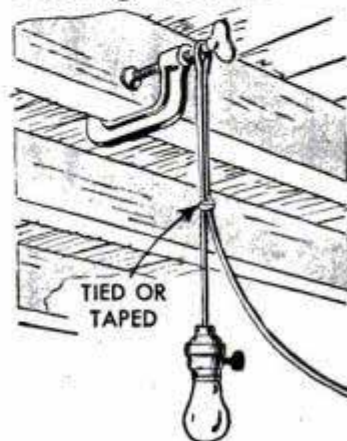
## Doorstop Braces Refrigerator To Reduce Vibration

In instances where a refrigerator tends to vibrate excessively whenever the door is closed sharply, the annoying vibration

may be reduced to a great extent by fastening a rubber-tipped doorstop to the wall in back of the refrigerator. The doorstop screw is driven into a stud at a height just below the top of the refrigerator cabinet. Then the refrigerator is pushed back until there is just a slight pressure against the stop.—W. H. McCloy, Pasadena, Calif.

## C-Clamp Converts Extension Cord Into Temporary Ceiling Fixture

When it is necessary to use a lamp and an extension cord as a temporary ceiling fixture in a building where there are exposed joists or rafters, a C-clamp will enable you to support the lamp in almost any location desired. Simply fasten the clamp to a joist or any other convenient projection, loop the cord over it as shown, and tie or tape it in place.



## Loose Joint in Furniture Is Glued With Aid of Medicine Dropper

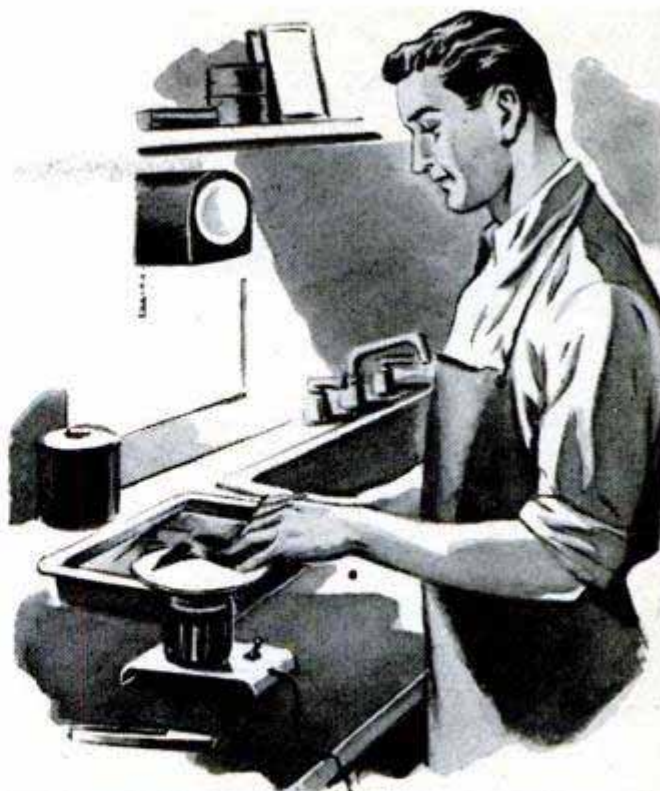
To avoid taking a piece of furniture apart in order to glue a loose joint, drill a small hole at an angle in the tenon through which glue may be injected with a medicine dropper. The dropper will supply sufficient pressure to cause the glue to reach all parts of the joint. After wiping off any glue that has seeped out, press the parts together and use clamps or rope to hold them until the glue has dried.



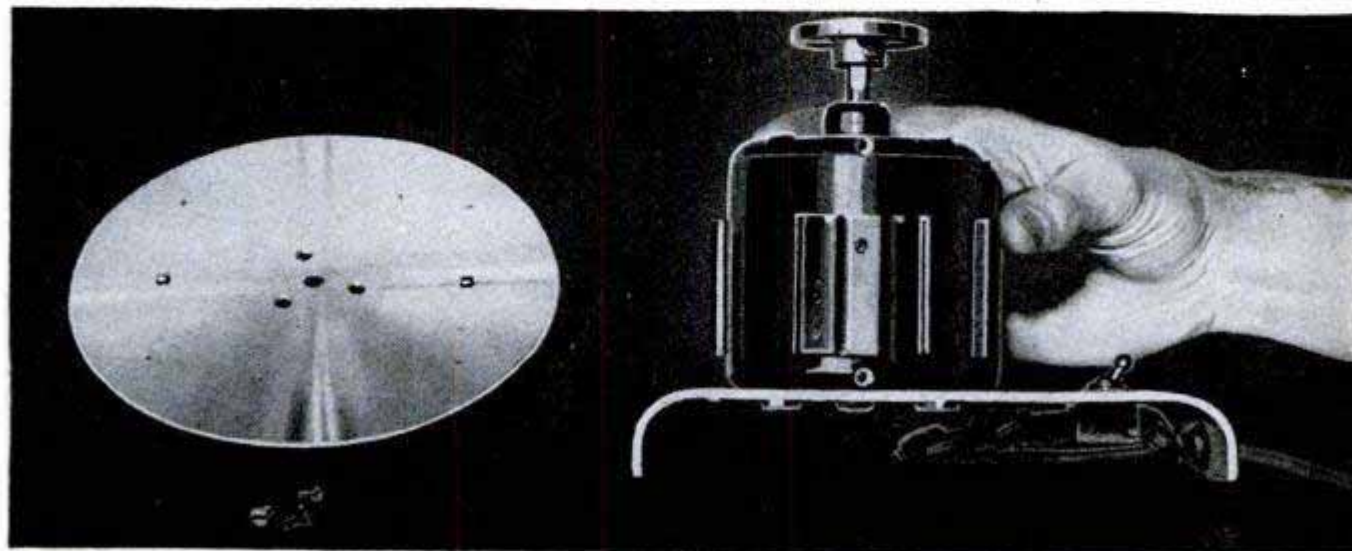
# Centrifugal FILM DRIER

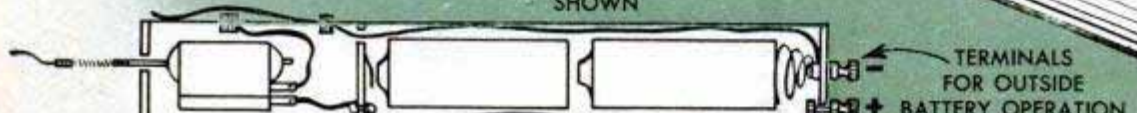
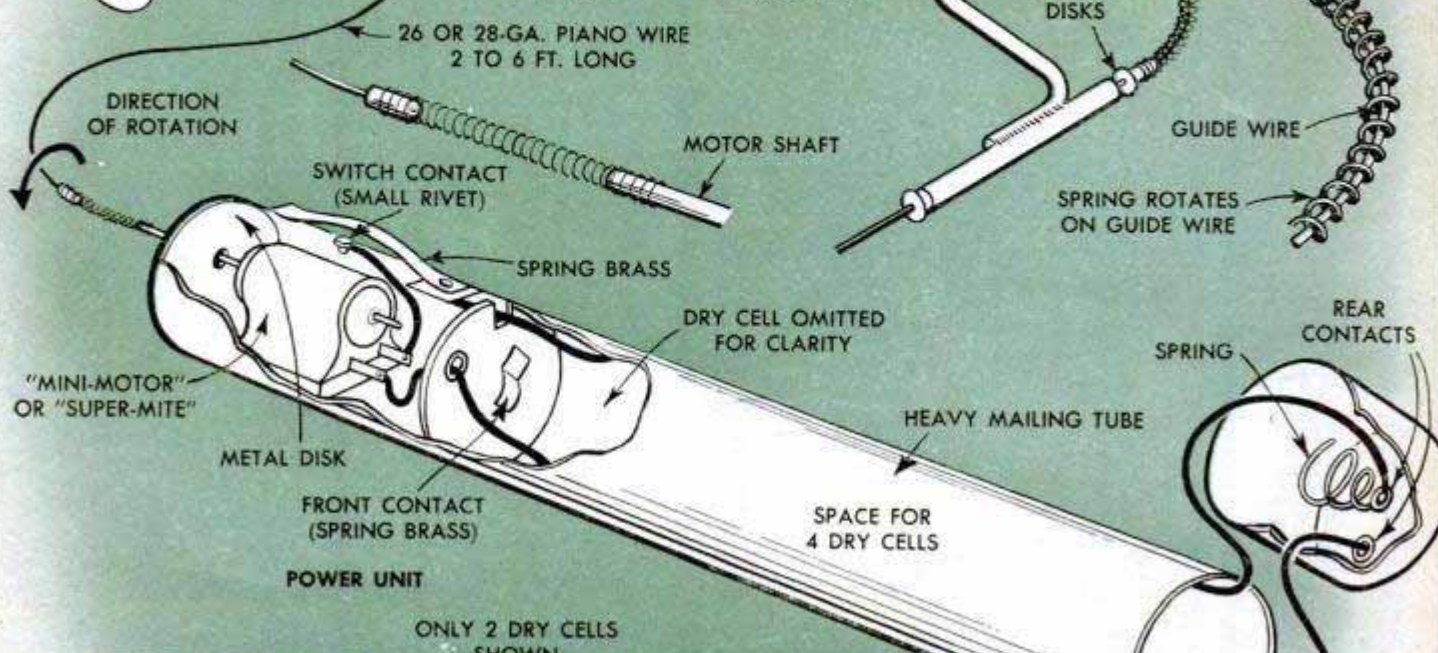
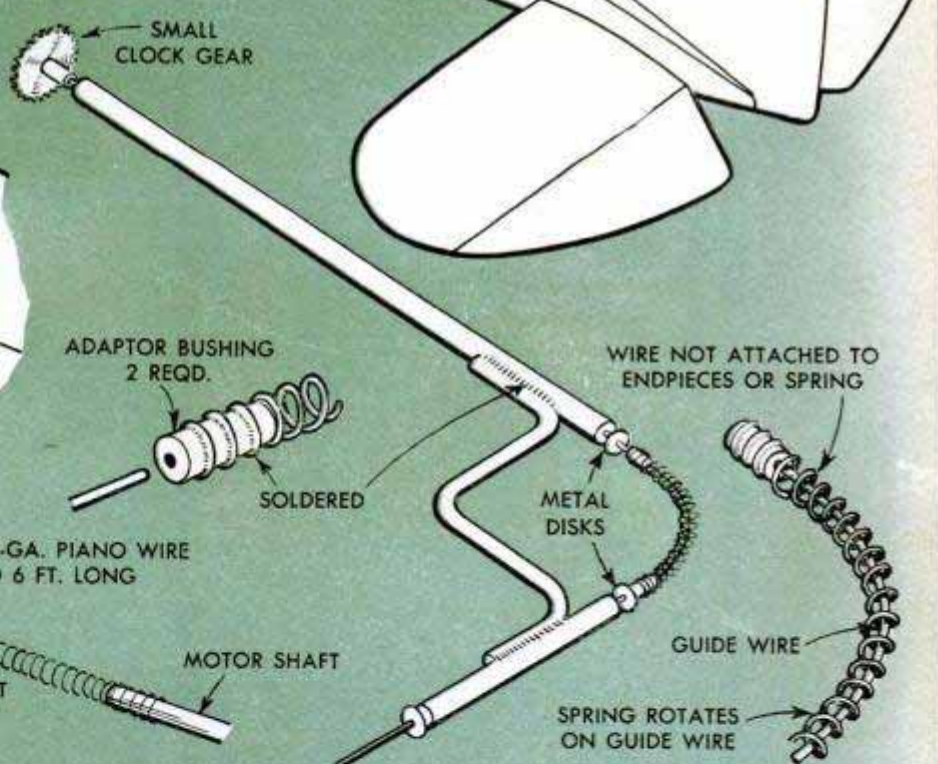
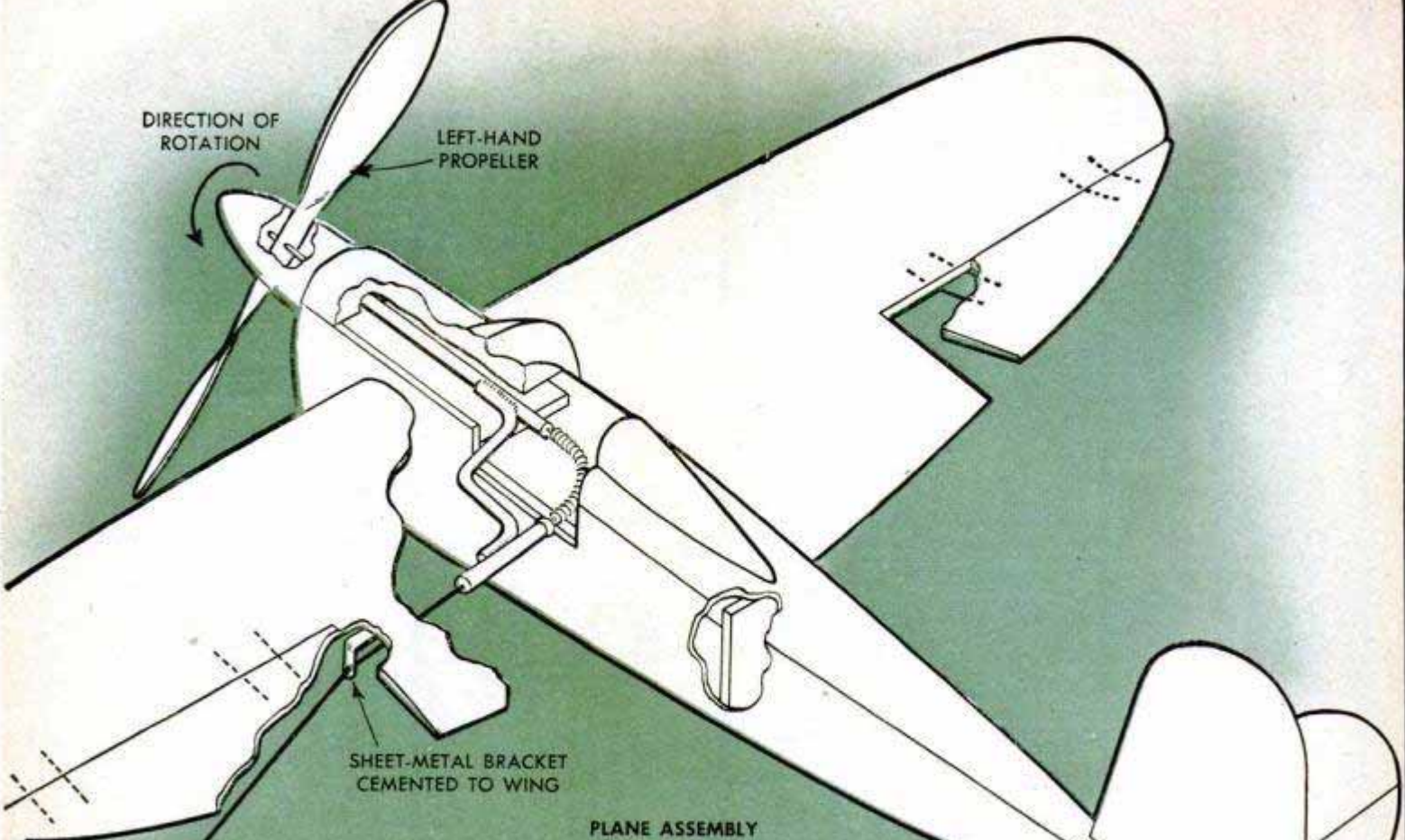
By Hugh Smiley, Jr.

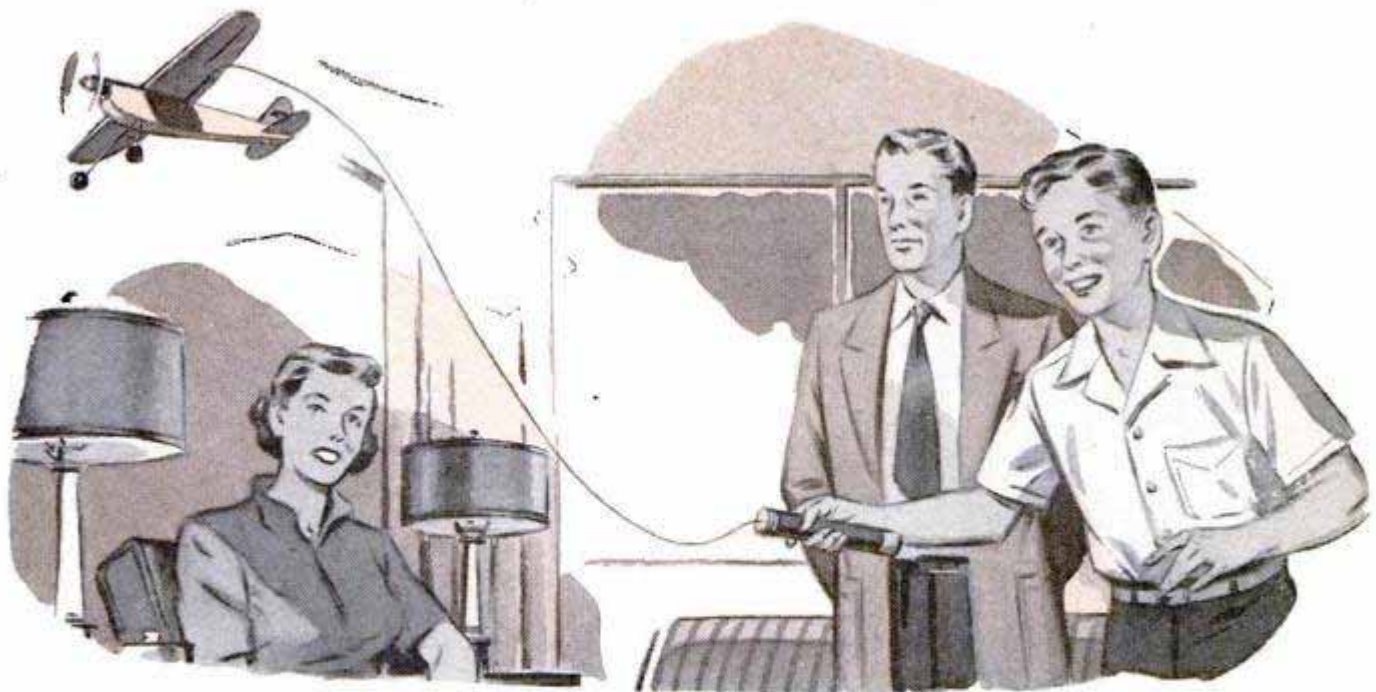
THIS CENTRIFUGAL cut-film drier whirls away surface water in a few seconds, leaving your negatives free of dust, stains and abrasion marks to assure sparkling prints. The drier, which handles film up to 4 x 5 in., consists of a brass disk fastened to the shaft of a small, 1750-r.p.m. motor. The latter is mounted vertically on a base made of  $\frac{1}{8}$ -in. sheet aluminum, one end of the base being drilled for the motor cord and fitted with a rubber grommet. The 7-in. drying disk is cut from 18-ga. brass and center drilled for fitting to a faceplate fastened to the motor shaft. The faceplate can be made from a small brass gear blank or by cutting the rim from a die-cast pulley. After the disk and faceplate are aligned on a dummy shaft, three equally spaced holes are drilled around the center hole as shown below. These are countersunk and tapped for 8-32 screws which join the two parts. The negative is held on the disk by engaging opposite ends of the film under the heads of two brass machine screws. These are turned into tapped holes in the disk and held with locknuts so that a  $\frac{1}{32}$ -in. gap is left between the screwheads and the top of the disk. The screws are located so the center of the film bows about  $\frac{3}{4}$  in. when placed between them, and two or three pair may be used to take different sizes of film. The negative, of course, must be centered over the motor shaft, and to speed centering, index marks are punched where the corners of the film contact the disk. If necessary, balance the disk by applying solder to the underside. Film-pack negatives can be semidried by centering them flat on the disk and turning them over after drying one side.



Negative is mounted on drying disk by inserting edges under heads of small machine screws. When drier is spinning, centrifugal force holds film against both screwheads in addition to throwing off water







# U-CONTROL MODEL PLANE

By Kai M. Klemm

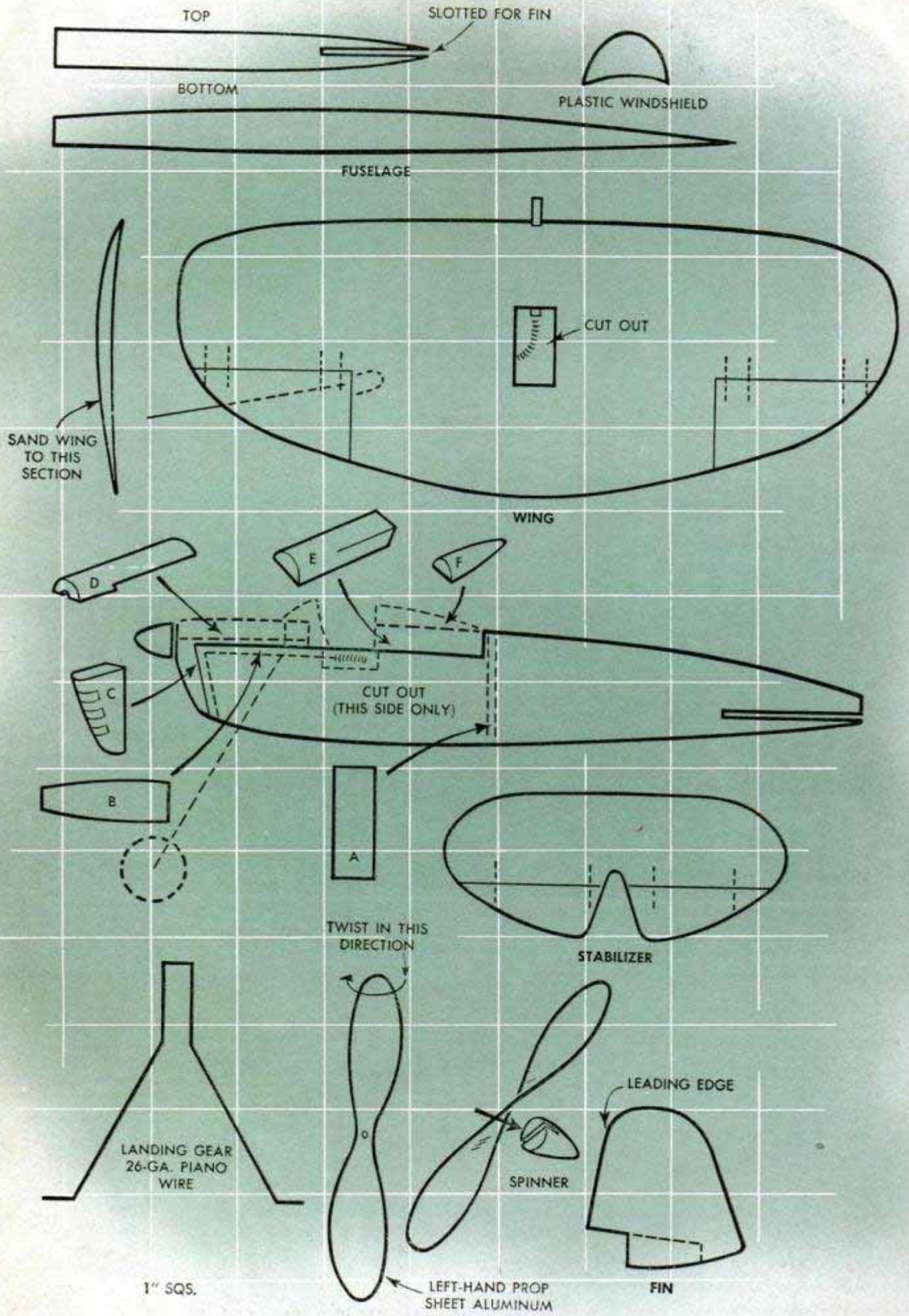
**P**OWERED by a novel electrically driven remote-control unit, this tiny plane will fly level, zoom and loop on a circular course in a small living room. The control unit, which also supplies power, is housed in a mailing tube about the size of an ordinary flashlight, except that it is slightly longer to accommodate four flashlight dry cells and a tiny electric motor. The motor drives the propeller through a "flexible shaft" of fine piano wire, the length of the wire depending on the radius of the flight space available. Because of the constant speed of the left-hand prop and the connection of the flexible shaft to the fuselage at its center of gravity, the plane maintains level flight without any tendency to nose down due to torque.

All parts of the plane are made of balsa-wood, except, of course, the angle drive and the landing gear. Sheet balsa,  $\frac{1}{16}$  in. thick, is used for all parts except D, E and F in the details on the following page. The sides of the fuselage are made first, then the bulkhead, A, is glued in place. Next, both the sides are glued together at the tail and cowl block, C, is glued in place. The landing-gear frame is bent to fit inside the fuselage and must be cemented in place before the bottom is put on. The inclination of the frame is shown by dotted lines on the details. After gluing on the bottom, the fuselage is sanded to contour and sides are slotted for the stabilizer. Now make the wing, stabilizer and fin, but do not attach the wing until the angle drive is in place.

The details on the opposite page show the

assembly of the angle drive and how it is placed in the plane. The drive housing consists of two pieces of  $\frac{1}{16}$ -in. o.d. brass tubing held at right angles by a brace of brass wire to which the housings, or sleeves, are soldered. The piano-wire shaft from the motor is passed through the short sleeve so that the end projects. A thin metal disk about  $\frac{3}{16}$  in. in dia. is soldered to the end of the wire. Then a length of the piano wire is inserted in the long sleeve, cut to required length, and a  $\frac{3}{16}$ -in. metal disk is soldered to the end. The flexible connector between the two shafts is made as in the right-hand center detail on the opposite page. The drive is made through a fine coil spring of the type and weight found in camera-shutter releases. The ends of the spring are soldered to short bushings cut from  $\frac{1}{16}$ -in. o.d. brass tubing and the outer ends of the bushings are soldered to the metal disks at the ends of the flexible shafting. Before soldering the bushings to the metal disks, pass a length of spring-brass wire through the bushings and the coil spring and bend to a uniform curve, cutting to length as required. When the assembly is made and all parts have been soldered in place, the spring and bushings turn on the curved-wire guide. In this manner power from the flexible shaft is transmitted at right angles without buckling the spring. Care must be taken in assembling to assure that the curved wire is free at the ends and that the metal disks do not bind against the ends of the short and long sleeves. Adjust the unit by bending the wire brace until it turns freely.

The angle-drive unit is assembled in the





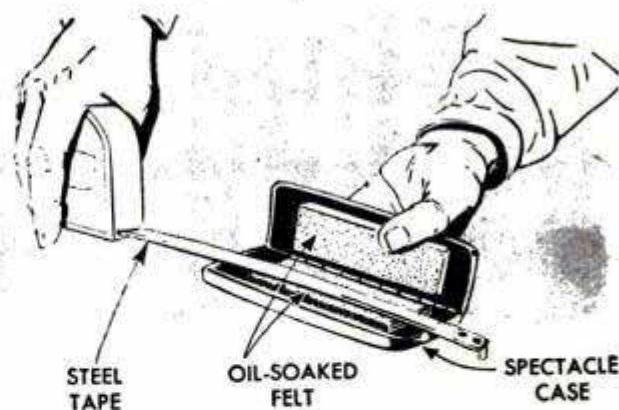
fuselage as in the upper detail on the opposite page. First glue part B in place, then cement the long sleeve, or propeller shaft bearing, to it. Note that a part of the brace and the short sleeve project from the opening in the side of the fuselage. Next, sand the wing to the airfoil indicated in the detail and cut out and hinge the ailerons with lengths of fine copper wire. Cement the wing in place on the fuselage with a 3-deg. angle of incidence. Then add the rear cowling, E, the windshield and headrest fairing. As the final step in this assembly, bend a bracket bearing from sheet brass and drill a hole for the piano-wire shaft near the end of one arm. Then slip the bracket over the wire and cement it to the underside of the wing as shown.

The power unit, shown in the lower details on page 188 consists of a mailing tube divided into two compartments, the smaller housing the motor, with its shaft projecting through an oversize hole in the cardboard disk which is cemented or taped to the end of the tube. A coil spring about 1 in. long and of the same general characteristics as that used in the angle drive is used to form a flexible connection, or universal joint, between the motor shaft and the piano-wire shaft. In order to make the connection it will be necessary to solder a suitable bushing to the end of the piano-wire shaft as shown in the detail. Then the spring is slipped over the bushing and soldered. It is not soldered to the motor shaft, as a tight fit is sufficient to transmit the full power of the motor.

The battery compartment of the tube is closed at the lower end with a friction cap made of sheet brass. Two terminals and a compression spring are fitted in the cap and the positive terminal is insulated from the metal. After wiring and installing a switch and dry cells, test the assembly for smooth operation without the prop. If there is any tendency toward vibration, the cause must be found and corrected before the assembly will operate satisfactorily. Cut the prop to the size indicated from thin sheet aluminum, give it a left-hand twist and mount on the prop shaft with a small disk of sheet metal to which a short length of  $\frac{1}{16}$ -in. brass tubing has been soldered to form a hub. If available, a small gear wheel from a clock is just the thing. Fit the prop with a balsawood spinner as in the details.

Flying the plane is quite simple. Once in the air it is controlled by arm movements. Successful maneuvers depend on the application of power at the proper time and also in the guidance of the hand and arm. Experimentation with elevator and aileron settings will be necessary. ★ ★ ★

## Steel Tapeline Oiled in Device Made From Old Spectacle Case

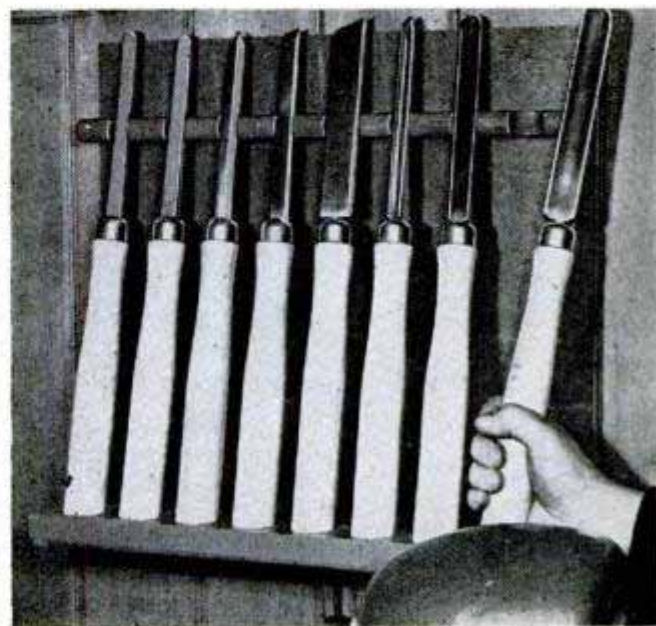


An old spectacle case containing two pieces of felt will provide a handy oiler for a tapeline. The pads are cemented or otherwise attached inside to the bottom and the top of the case, after which they are soaked with oil. In use, the tapeline is pulled between the pads to apply a light film of oil. Clean the pads and replenish the oil supply from time to time.

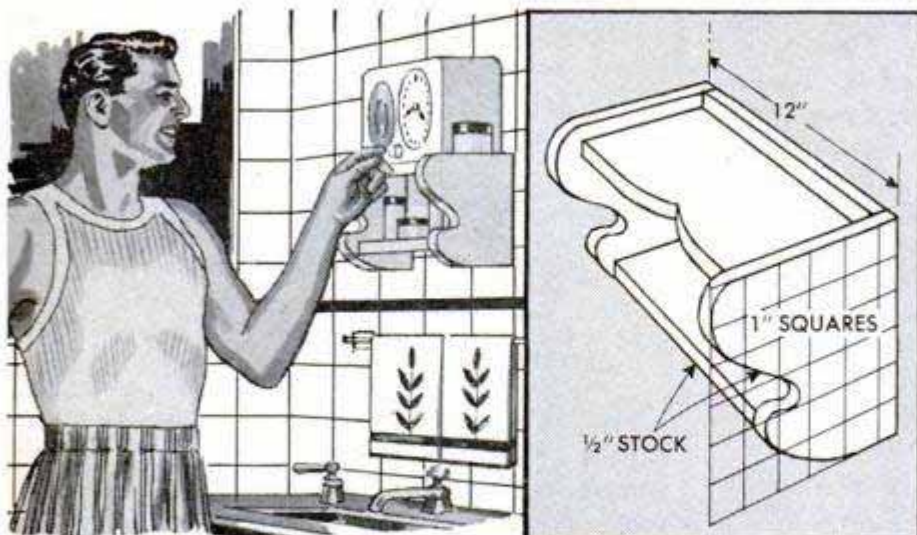
## Rack for Wood-Turning Chisels Permits Easy Removal

I find this open rack for wood-turning chisels much more satisfactory than clip hangers, slotted boards or other devices. A tool can be removed or replaced in an instant without getting caught on anything. The base is a  $\frac{3}{4}$  x 5 x 17-in. board supported on shelf brackets. The tool handles rest in large holes bored part way through the wood, these holes being continued through the wood with a smaller drill to permit easy removal of the shavings. The tool blades fit in open cuts in a  $1\frac{1}{2}$ -in. strip nailed to a backboard. The tools are tilted back sufficiently to prevent them from falling out.

Robert Hertzberg, Jackson Heights, N. Y.



## Attractive Shelf Fastened to Bathroom Wall For Holding Small Radio and Toilet Articles



Designed primarily to provide extra storage space for toilet articles in a bathroom, this easy-to-make shelf also will accommodate a small radio. Using a template, outline the sides on  $\frac{1}{2}$ -in. stock or plywood. After cutting the pieces, assemble them with glue and screws and sand smooth before finishing. Fasten the shelf to the wall with screws. **Caution:** To prevent possible electric shock, the radio should be located out of reach of any person using the tub or shower. A. E. Fenn, Chicago.

## Whiting Coated on Storm Windows Simplifies Cleaning After Storage

If you want to avoid having to wash storm windows on a cool fall day, wash them after removing them in the spring and coat the panes with whiting or a cleaning compound such as Bon Ami before storing them. Mix the whiting and water to a creamlike consistency and apply with a

sponge. Once dry, the whiting seals the glass from dust and when wiped off, after the windows are taken out of storage, will provide sufficient abrasive action to clean and polish the glass. Under ordinary circumstances the windows will be found clean enough to forego washing them again.

## Rubber Tape Covering Fishhooks Prevents Possible Injury

To prevent fishhooks from snagging on clothing and equipment as well as possibly injuring the fingers, cut small pieces of rubber tape and fold them over the point and barb of each hook. The tape not only can be removed easily but also may be used several times if necessary.

Martin D. Koehler, River Grove, Ill.

## Salvaging Worn Whisk Broom

Instead of discarding a whisk broom that has become worn badly, try trimming and shaping the edges to a point at the center. The broom is ideal for cleaning corners in cupboards, closets and drawers.—Marguerite McLees, Moose Jaw, Sask., Can.



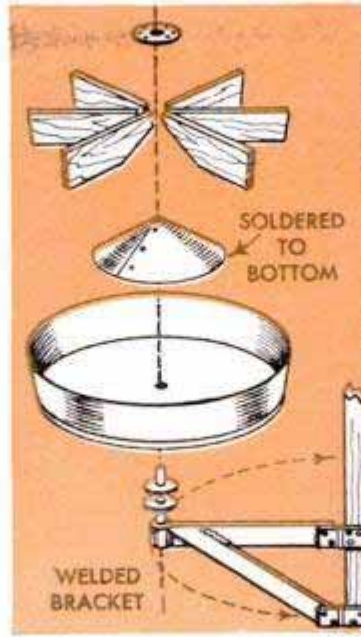
## Tube Held Over Spray-Gun Nozzle Directs Thinner Into Container

When spraying thinner to clean a paint-sprayer gun, you can reduce the danger of fire, as well as the loss of thinner, by slipping a piece of tubing over the nozzle to direct the spray into an empty container. The tubing will cause most of the mist to condense. Although impure after one spraying, the thinner still can be used to reduce paint and lacquer, or used as a thinner in a priming coat.

Clyde Allison, Cadillac, Mich.

# Small-Parts Tray Swings Under Workbench

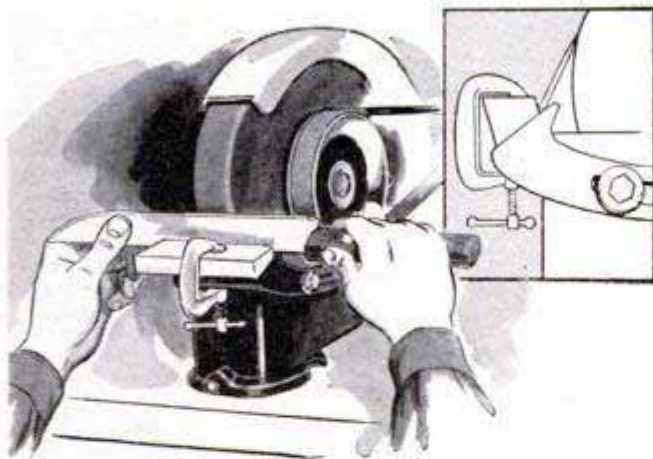
One advantage of this tray for small parts is that it can be mounted within easy reach on a leg of a workbench and simply swung out of the way when not in use. Constructed almost entirely of scrap parts, the tray itself is cut from one end of an oil or gasoline drum, while the conical-shaped center section of the tray is formed from a round piece of metal cut from the other end. The cone is made by cutting a narrow segment from the metal, overlapping the newly cut edges and riveting them together. The cone is then soldered to the bottom inside surface of the tray. Partitions may be made from either  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. stock, and are beveled on one end so that they fit snugly where they converge at the center of the tray. Two lengths of flat steel are welded together as shown to provide a supporting bracket, while hinges welded to the ends of the steel are screwed to a work-



bench leg to anchor the bracket to the bench. The tray itself rotates on a steel rod fitted vertically in an eye formed on the outer end of the bracket and welded in place. Two or three washers are used to assure sufficient clearance between the bracket and the bottom of the tray.

T. O. Honiball, Detroit, Mich.

## Wooden Guide on Grinding-Wheel Rest Aids in Knife Sharpening

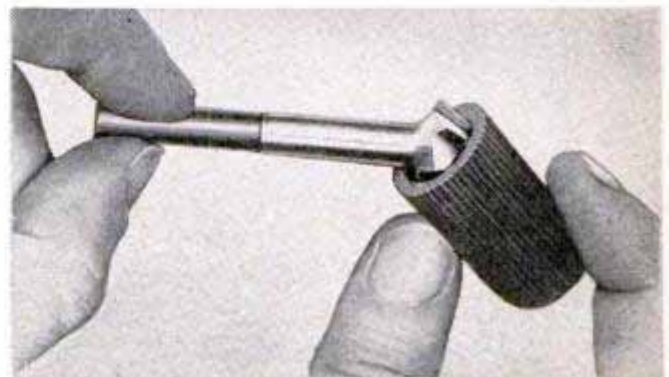


With a wood-block guide similar to the one illustrated clamped to the rest on a grinder, it's easy to obtain a perfect hollow-ground edge on a knife blade no matter how many times it is lifted from the grinding wheel during the operation. The guide should be at least two or three times greater in length than the thickness of the wheel, so that the entire blade may be fed across the wheel at the same angle. Because of the difference in grinder rests, the guide will have to be beveled to fit the crosspiece and also to provide a flat surface for the clamp to grip.—J. B. King, Orange, Tex.

## Rubber Sheath for Countersink Made From Rubber Tubing

To protect the cutting edges of a countersink to be stored in a toolbox or a drawer, slip a piece of rubber tubing over it as indicated. If the latter is not available, try one of the fingers from an old rubber glove, or a plastic tube corked at both ends.

John J. Rea, Urbana, Ill.



When gluing a small piece that cannot be clamped, such as a chip from a piece of furniture, use a short strip of cellulose tape to hold it.

# It's New and Better! "PERIMETER"

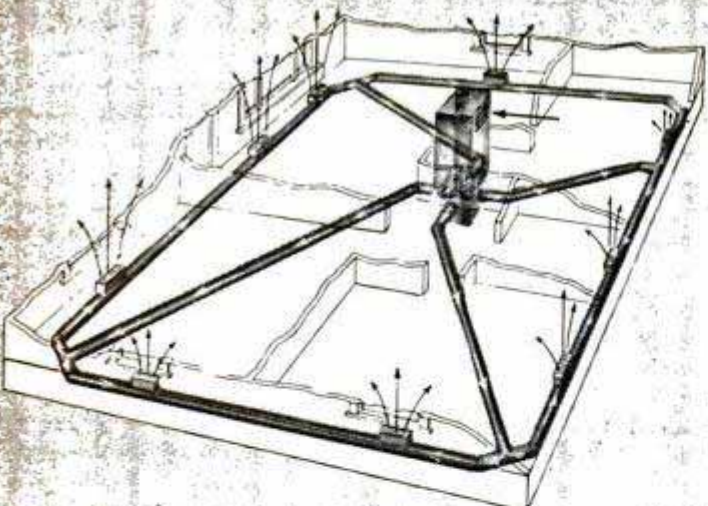
These forced-air systems mean warm floors and more comfort for one-story basementless homes built over concrete slabs or crawl spaces

By E. R. Haan

**W**ARM-AIR perimeter heating not only improves living comfort in basementless homes but also has the advantages of simplicity and comparably low cost. Perimeter heating differs from ordinary forced warm-air heating in three ways: (1) Warm-air ducts are installed in or under the floor, keeping it warm and providing radiant heat for the rooms above. (2) Warm-air outlets with diffusing-type registers are located along outside walls at floor level and preferably under windows. This placement of the registers provides a curtain, or blanket, of warm air where it is needed most, thus eliminating the usual temperature differential in rooms. (3) Return air is taken back to the furnace through high grilles in partitions instead of through grilles located at floor level.

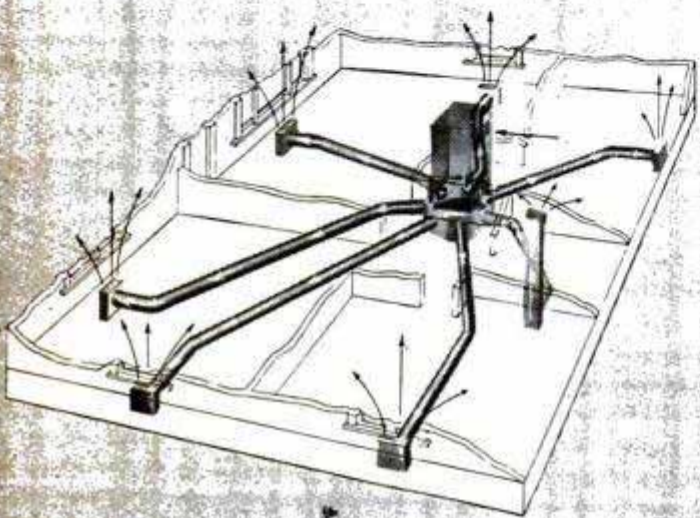
**Four common arrangements:** Perimeter-heating systems are applied in different ways. The loop system, Fig. 1, is used in basementless homes having slab-type floors of concrete. The warm-air ducts, which are embedded in the concrete, extend from the furnace to, and entirely along, the perimeter of the slab. The radial system, Fig. 2, can be used in homes built over either slabs or crawl spaces. This system does not assure an entirely warm border in slab floors, and usually is not used where the floor area exceeds 1000 sq. ft. The radial system is better suited to homes built over crawl

Certain photos and data courtesy of National Warm Air Heating and Air Conditioning Association



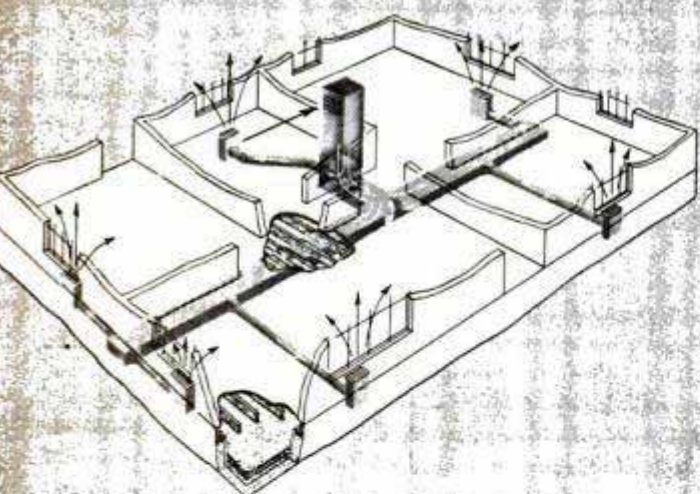
LOOP SYSTEM

1



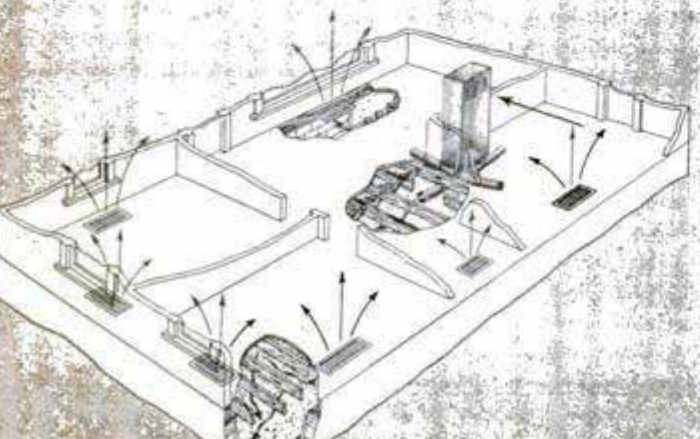
RADIAL SYSTEM

2

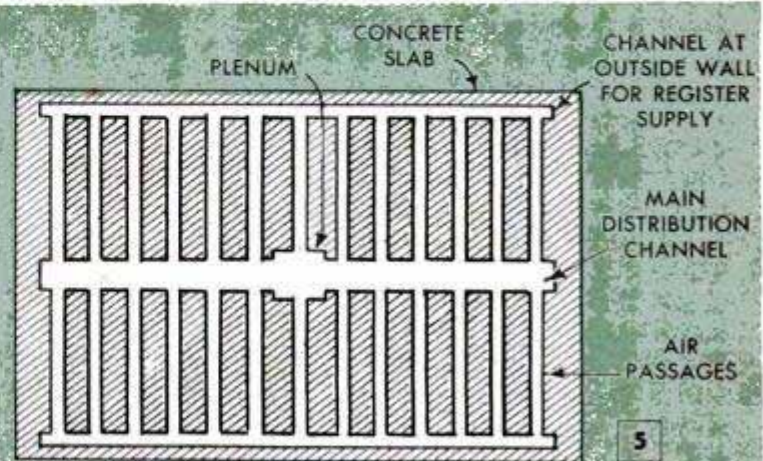


EXTENDED-PLENUM SYSTEM

3



LATERAL SYSTEM



5

# HEATING

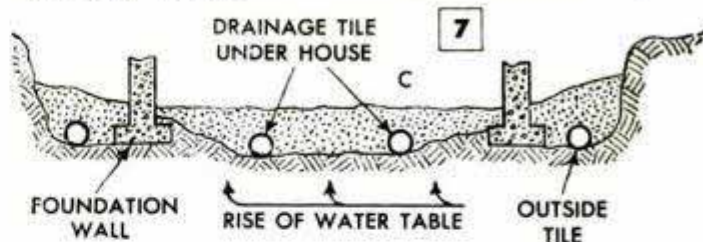
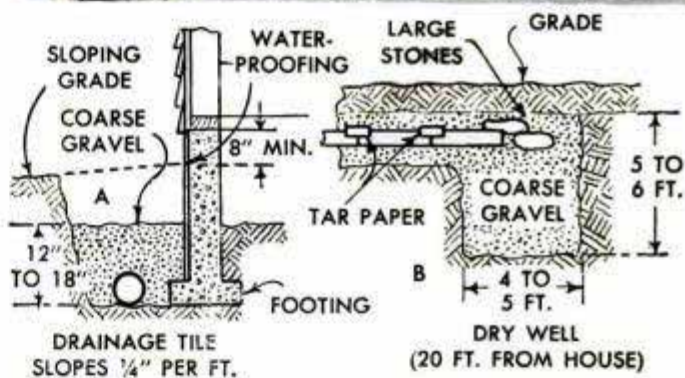
*with forced warm air*

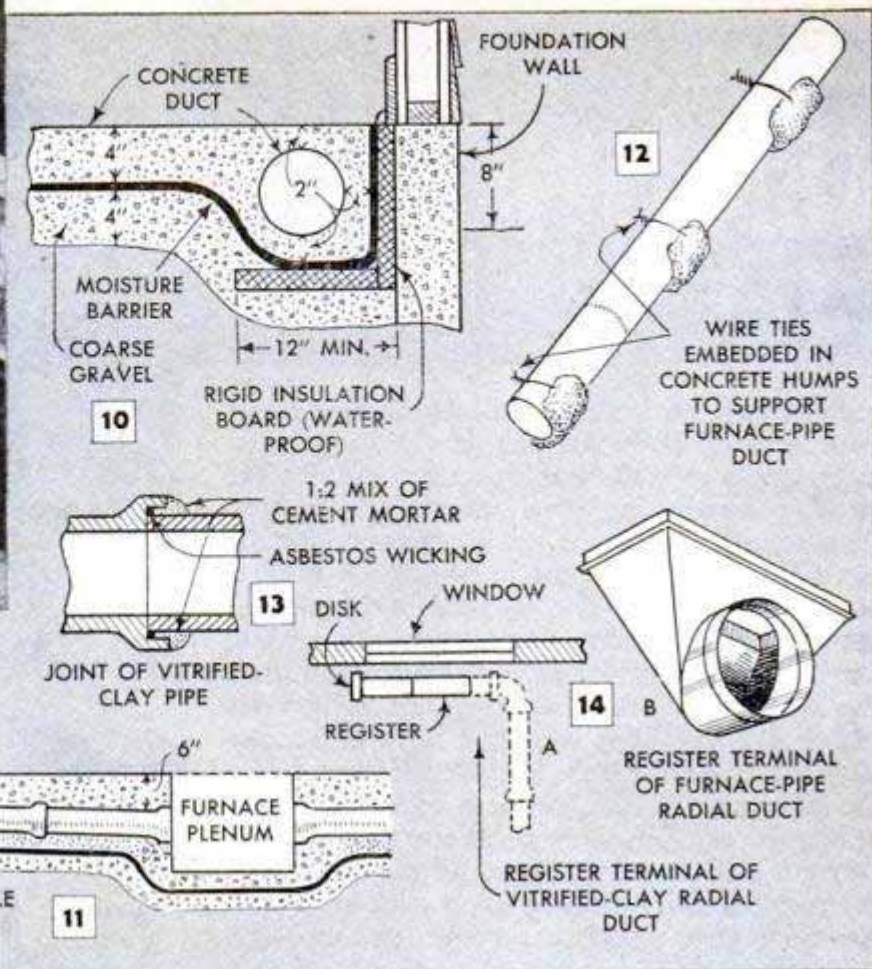
spaces, and in such installations the floor area may be over 1000 sq. ft. In long, narrow homes or where the furnace cannot be located centrally, the extended-plenum system, adaptable for crawl spaces, Fig. 3, has definite advantages in obtaining better heat distribution. The plenum is the chamber in or adjacent to a furnace from which warm air enters the distribution ducts. Fig. 4 shows a crawl-space-plenum system which is adaptable to small homes. It has stub ducts about 6 ft. long extending from the plenum. A fifth system, called the lateral system, Fig. 5, is used for large slab-floored buildings. It must be designed especially for the building to provide uniform space heating and to avoid excessively warm floors.

**Dry location essential:** Standing water and damp earth under a heated crawl space or a concrete slab are the cause of more unsatisfactory heating installations in basementless homes than any other single factor except possibly inadequate insulation. *Where such conditions cannot be corrected a heating system that introduces heat under or into the floor should not be used.*

You can minimize the collection of surface water under a slab or crawl space simply by installing drainage tile around the footings as in Fig. 7, A. The tile lines should have a slope of  $\frac{1}{4}$  in. per ft. They should connect to a combination sewer or a storm sewer, or to some other point of disposal such as a dry well, Fig. 7, B. The outside of the foundation walls also should be covered with a  $\frac{1}{2}$ -in. layer of portland-cement plaster. After this has cured, apply a coat of damp-proofing compound or hot tar. Diversion of surface water is particularly necessary on the side of a house facing a rise of ground. In locations where the water table is apt to rise during spring months or after prolonged rainfall, it may be advisable to provide drainage lines under the house as in Fig. 7, C. The tile is covered with a substantial layer of coarse gravel or crushed stone. A moisture barrier over the gravel, Fig. 8, also is required.

**Under-slab fill:** Never use cinders as fill under a slab floor. Only coarse gravel with the fines removed is suitable. The layer should be at least 4 in. thick and must be





thoroughly tamped. Before placing the fill, trenches are dug at the locations of the ducts so that the gravel layer under them will be of equal thickness, Fig. 10. Trenches near the furnace plenum should be 6 in. deeper than those for perimeter ducts. Connecting ducts are sloped between the two levels as in Fig. 10. Edge insulation is installed as in Fig. 9 after leveling and tamping the gravel. This extends along the entire length of the foundation wall, between it and the slab, Fig. 10. It should be of the rigid, waterproof type, preferably 2 in. thick. The horizontal pieces should extend inward not less than 12 in.

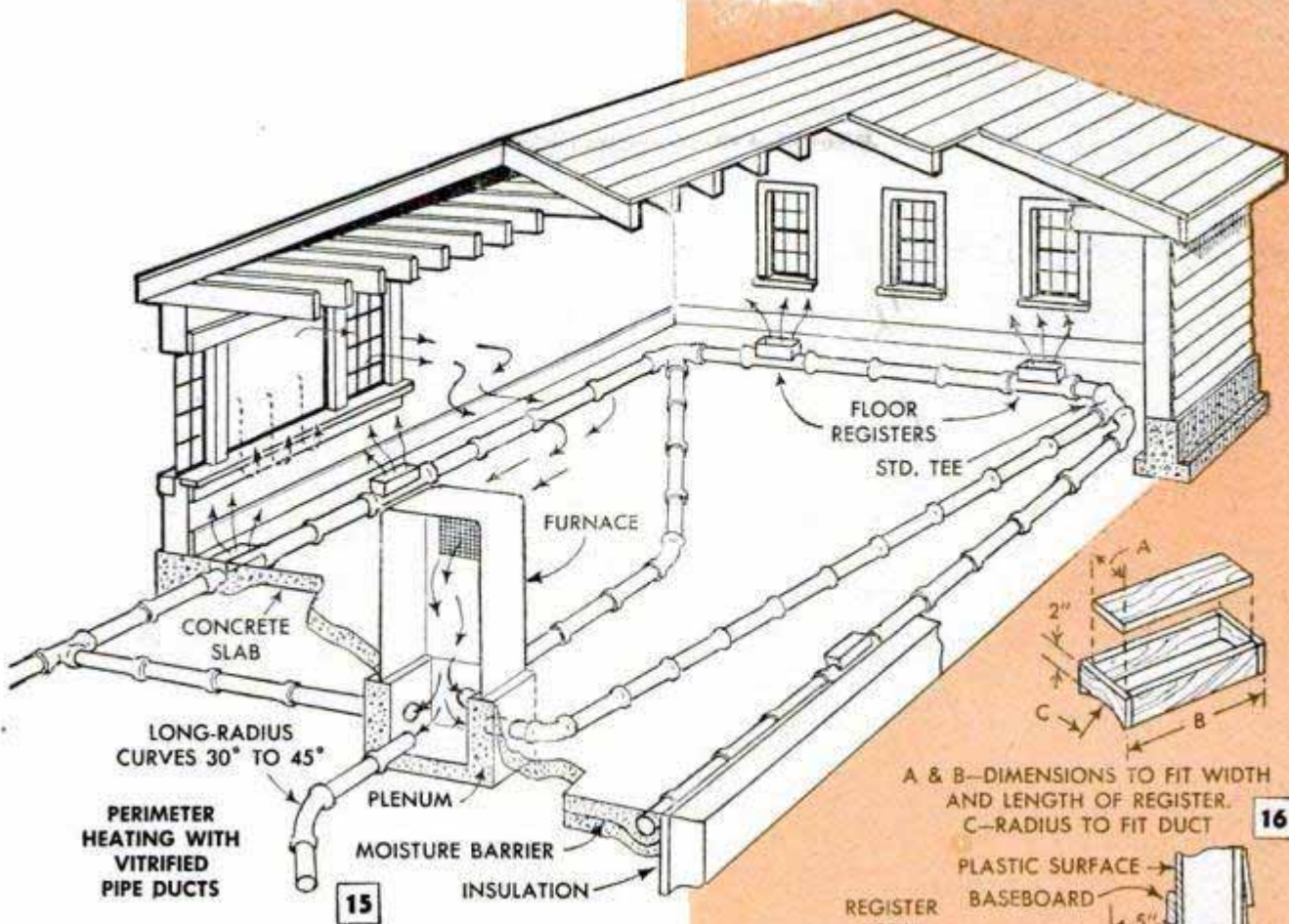
**Moisture barrier under slab:** Before the slab floor is poured, the gravel fill is covered with a layer of 55-lb. asphalt roll roofing, Figs. 8, 10 and 11, which forms a moisture barrier. The edges are overlapped from 4 to 6 in. and sealed with roofing cement. The barrier should extend up along the foundation walls to the floor surface. Wherever it must be cut to fit around pipes, it should be sealed as in Fig. 19.

**Placing ducts in trenches:** Trenches should be deep enough to permit a 2-in. layer of concrete to be poured entirely around all the ducts as in Figs. 10 and 11. The concrete covering over ducts at the plenum should be about 6 in. thick, Fig. 11. The reason for this is to obtain uniform heat penetration through the floor—the air entering the ducts at the plenum being

so much hotter than it is at the perimeter.

**Installing sheet-metal ducts in slab:** Furnace pipe of 28 ga. may be used for ducts. For small homes the 6, 7 or 8-in. sizes are sufficient. The size selected should be used throughout the system. Round ducts are recommended. Perimeter ducts are located so that the center of the registers will be from 7 to 9 in. inside the finished wall line to clear drapes and curtains, Figs. 16, B, and 25, B. Sheet-metal ducts must be held in place securely when the slab is being poured. This can be done by embedding wire in humps of concrete placed under the ducts to hold them at the correct height. Tie the wires around the ducts after the concrete humps have hardened, Fig. 12. Sheet-metal brackets, Fig. 6, often are used to support the pipe. Register fittings of sheet metal can be used at the ends of radial ducts as in Fig. 14, B, or rectangular forms as shown in Fig. 6 can be used.

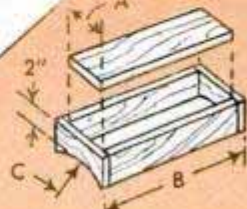
**Vitrified-clay ducts:** Vitrified-clay pipe also may be used for ducts, Fig. 15. It is supported by gravel or sand, preferably fine gravel. The joints are calked with asbestos wicking, about one third their depth, then filled with a 1:2 mix of portland-cement mortar, Fig. 13. Both short and long-radius fittings are used for changes of direction. The open ends of pipe at register locations of a radial system are closed with vitrified-clay disks, Fig. 14, A, which are held in place while pouring the slab.



15

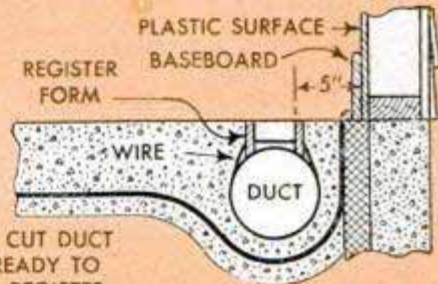
**Register openings in slab floors:** To form register openings in concrete over ducts, removable wooden forms fitted with covers as in Fig. 16, can be wired to the pipe or sheet-metal forms used, Fig. 6. However, the pipe is not cut until the registers are to be installed. If desired, the wooden forms can be left in place to provide a base to which registers may be fastened. Sometimes wall registers are installed just above floor level. In this case only the type designed for perimeter heating is used. Slotted baseboards may be used instead of registers, an installation particularly adaptable for crawl-space-plenum systems. Fig. 17 shows how a duct and register are placed under a kitchen cabinet that occupies the entire wall space. A wall-type register is used in bathrooms.

**Concrete plenum cast with slab:** In slab floors the plenum can be cast integral with the slab, using an inside form which is suitably braced. See Figs. 11 and 18, A. Sheet-metal ducts are allowed to extend through the wall of the plenum and are cut off flush with the wall of the plenum after the forms are removed. Vitrified-clay pipe is butted against the forms as shown in Fig. 18, B. The floor, laid after the forms are removed, should be not less than 2 in. thick, and should come from 1½ to 2 in. below the bottom of the ducts. If a metal plenum is used, it should be entirely enclosed in concrete. The plenum may be provided with

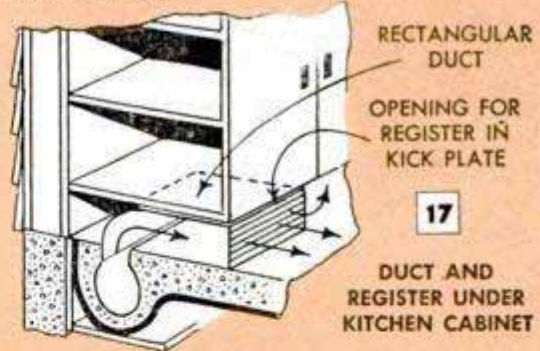


A & B—DIMENSIONS TO FIT WIDTH AND LENGTH OF REGISTER. C—RADIUS TO FIT DUCT

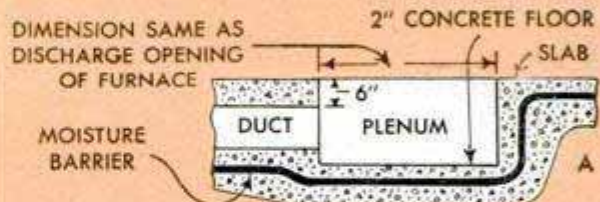
16



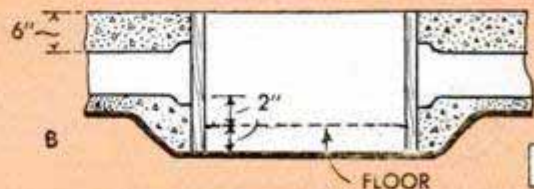
DO NOT CUT DUCT UNTIL READY TO INSTALL REGISTER



17

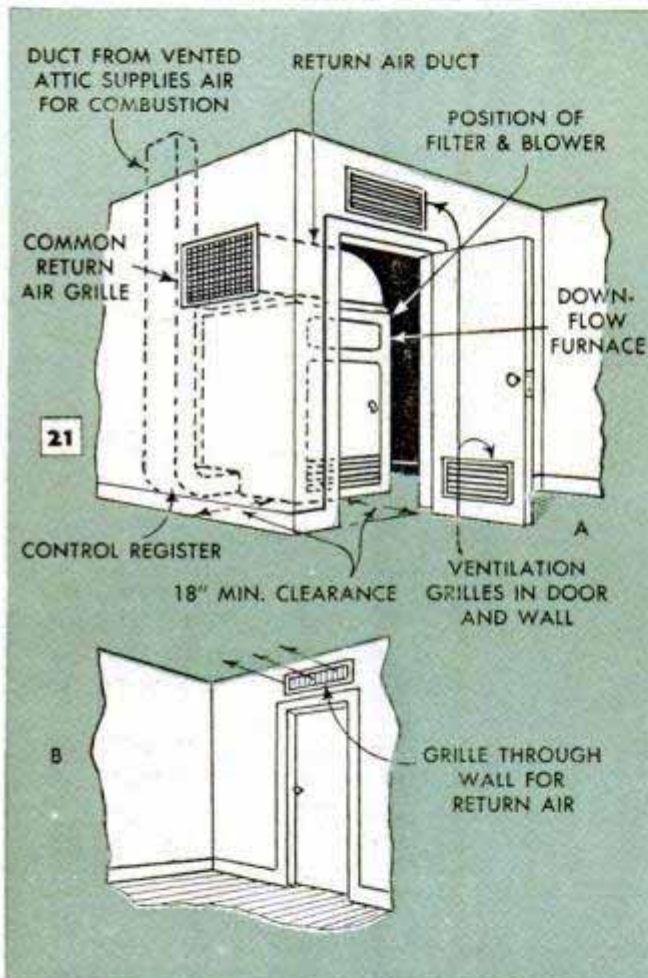
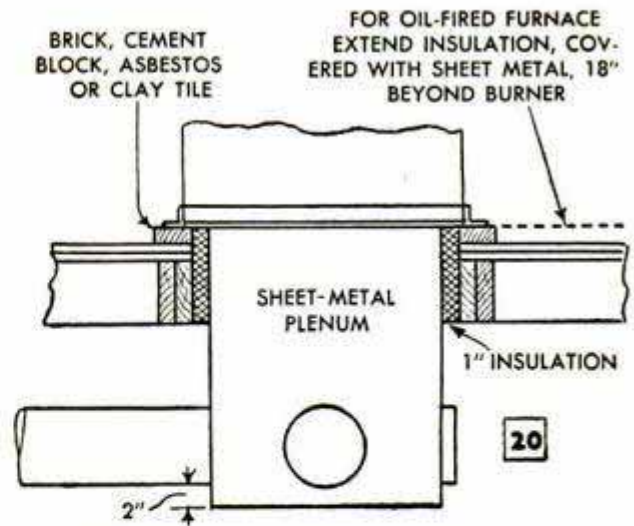
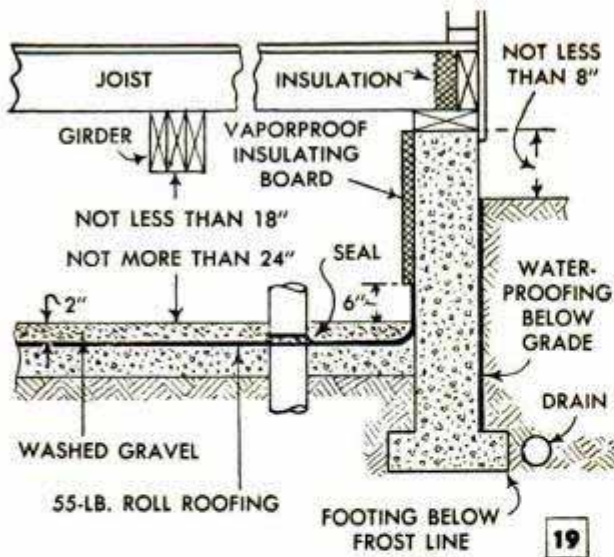


CONCRETE PLENUM CAST INTEGRAL WITH SLAB



18

HUB END OF VITRIFIED-CLAY DUCTS BUTT AGAINST FORM



a floor drain over a small dry well as a precaution against the possibility of water collecting in the plenum due to an overflowing bathtub or water closet.

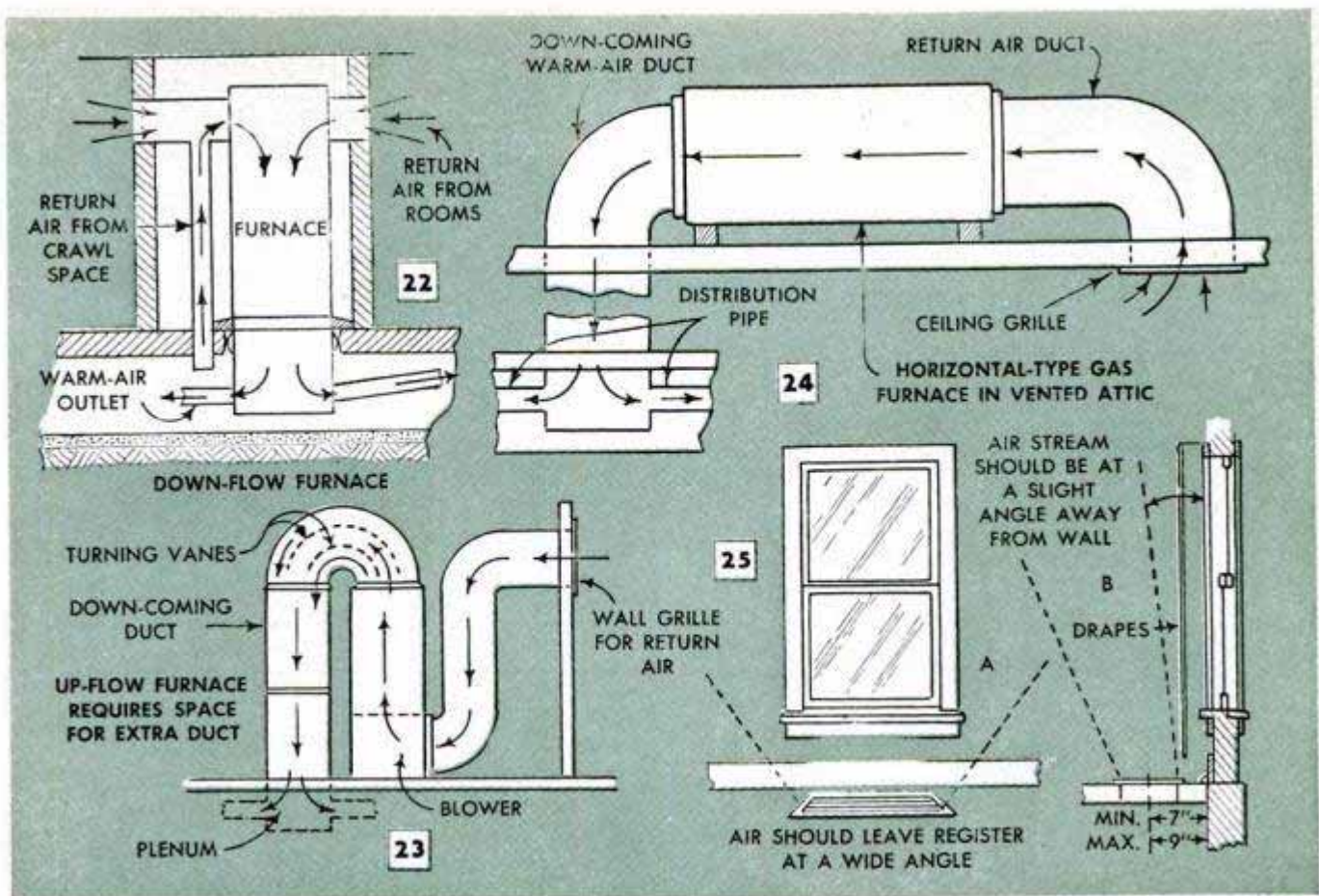
**Crawl-space requirements:** As shown in Fig. 19, a crawl space used for perimeter heating must be completely sealed against the entrance of moisture, and it also must be insulated and sealed at the walls to prevent infiltration of cold air. High humidity in a crawl space should be prevented as it causes rapid deterioration of the wooden structural parts of a house and also causes rusting of ducts. The earth floor of a crawl space is covered first with a layer of coarse gravel at least 4 in. thick. Over this is laid

a continuous moisture barrier, the same as in slab floors. The moisture barrier is covered with a 2-in. protective layer of concrete or washed gravel. The space between the floor and the house girders should not be less than 18 in. nor more than 24 in. Foundation walls should extend below frost level and should be waterproofed on the outside. Drainage tile are provided where necessary. Cracks in the wall and those between it and the sill are caulked. Rigid waterproof insulating board, 2 in. thick, is cemented to the inside of the walls with roofing cement. It should overlap the upturned moisture barrier of the floor.

Escape of air from a crawl space to an attic should be prevented by sealing all stud spaces in outside walls and partitions with insulating batts having vapor-barrier coverings. Vent openings as well as the entrance to a crawl space should be tightly sealed during the heating season. The floor of the house is not insulated, as heat transmission through it is one of the requirements of perimeter heating. Neither are the warm-air ducts insulated. The ducts may be either round or rectangular in shape and are suspended from joists, observing regulations as to clearance from combustible materials. Besides the warm-air outlets to the house, there should be one or more warm-air ducts opening into the crawl space; also a return-air duct, Fig. 22. The crawl space should never be used for storage.

**Plenum for crawl spaces:** The plenum for a crawl space is a square or rectangular sheet-metal chamber having the same size opening as the discharge opening of the furnace. A round plenum should not be used unless approved by the furnace manufacturer. The framed opening in the floor should be about 1 in. larger than the plenum, Fig. 20, and the space between the two should be packed with fireproof insulation. When connected to a down-flow furnace, both plenum and furnace should be supported on a base of noncombustible





material such as brick, cement block, asbestos or clay tile. The joint between plenum and furnace must be tightly sealed with furnace cement or a suitable calking compound. The bottom of the plenum should be at least 1½ to 2 in. below the distribution pipes.

**Return-air grilles:** One or two return-air grilles in partitions next to the furnace, Fig. 21, A, generally are adequate for small homes. The grille, or grilles, should be of proper size and centrally located where air can flow to them unobstructed. A common return-air grille to the furnace should never be located in a kitchen, bathroom or bedroom. Fig. 21, B, shows how grilles are located over doors that are left closed most of the time. Those placed over bedroom doors should be the type that can be closed manually. When a furnace is installed in a confined space, the return-air grille in the wall of the enclosure should connect to a duct that is sealed to the furnace.

**Furnace selection:** Practically any automatic oil or gas-burning furnace designed for forced-air heating can be used. Although a down-flow furnace usually is the most adaptable type for perimeter heating, Fig. 22, the conventional up-flow furnace may be used if it is provided with two ducts as in Fig. 23. A horizontal gas-burning furnace can be placed in a vented attic as in Fig. 24.

If the building is so tightly constructed that a sufficient amount of air for combustion is not supplied by natural infiltration,

a duct to provide combustion air can be run up to a vented attic as shown in Fig. 21, A. Clearance between the furnace and the closed door of the enclosure should not be less than 18 in. Similar clearance all around the furnace gives easy access for keeping the space clean and for servicing the furnace. A door providing access should have a grille at its bottom and another grille should be fitted in the partition above the door to provide for normal ventilation of the enclosure.

**Automatic temperature controls:** Automatic controls are furnished with the furnace. The room thermostat, which operates the burner, should be located at the recommended height on a partition well away from warm air coming from the registers, and also where temperatures are least likely to fluctuate from opening doors or using a fireplace. For perimeter heating, slow, continuous forced-air circulation is preferred, with the burner operating at frequent intervals, the room thermostat being adjusted to a differential of 1½ deg. In down-flow furnaces, failure of the blower to function will cause the filter motor and blower to become overheated. To prevent damage an additional limit-control switch is installed to turn off the burner when such trouble occurs. Registers should be of the type designed to discharge warm air in a fan-shaped spread and away from the walls as in Fig. 25, A and B. Registers should be fitted with adjustable dampers, or valves.

★ ★ ★

## Camp Water Supply Toted in Jugs Suspended From Dowel Handles



Instead of carrying water in one large, cumbersome container to our campsite, I used four 1-gal. jugs, carrying two in each hand to better balance the load. Carrying handles were made from dowels and slipped through the jug handles, using cotter pins as shown to keep them in place. Hardwood sticks cut to the proper size could be used in place of the dowels, while wooden pins or wrappings of wire could be substituted for the cotter pins.

Edmund D. Sherman, Johnston, R. I.

## Protective Coating on Bristles Extends Useful Life of Broom



To get maximum service from an ordinary corn broom, coat the ends of the bristles with thinned shellac. In some cases, this treatment will double the life of the broom. Pour shellac, 1 part, and alcohol, 1 part, in a shallow pan and dip the end of the

## Heating Comfort

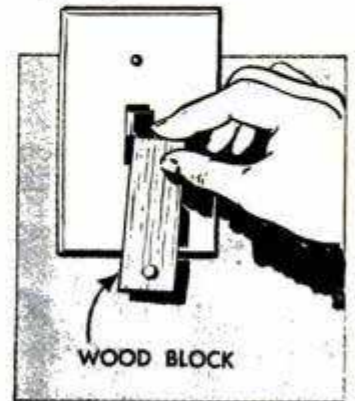
is assured without fluctuating room temperatures if your forced-air furnace is converted to continuous air circulation. This prevents air stratification, and intervals of hot and cold temperatures will no longer cause discomfort. A story next month tells how any homeowner can make this change in his furnace at practically no cost.

broom in the solution. The coating, which should be applied whenever the broom begins to show signs of wear, hardens the bristles to a certain extent but does not reduce the efficiency of the broom.

Don Nielsen, Aurora, Neb.

## Wood Block "Locks" Light Switch As Reminder to Employees

As a reminder to hired help that the lamp serving as a night light in a building is to be left on after work each day, a farmer installed a small block of wood below the switch. The block, mounted in the manner illustrated, pre-



vents the lamp from being turned off so long as it remains in an upright position. Pivoted to the wall on a nail, the block must be moved to one side before the switch can be snapped to the "off" position. The requirements of the operation, however, serve sufficiently to remind the user that the light is to be left on.

Charles Stratton, Hollis, N. H.

## Shoe-Polish Bottle Used for Glue Provides Cap Applicator

A discarded liquid-shoe-polish bottle, once it has been washed thoroughly in strong soapsuds, makes an ideal container for glue. The dauber, which also should be washed, makes an excellent glue applicator. It's a good idea, too, to dip the wooden stopper that forms the handle of the applicator in hot paraffin, which will make it less difficult to remove whenever the glue is to be used.



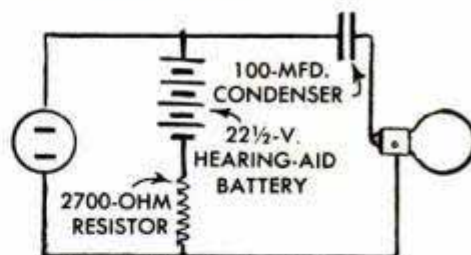
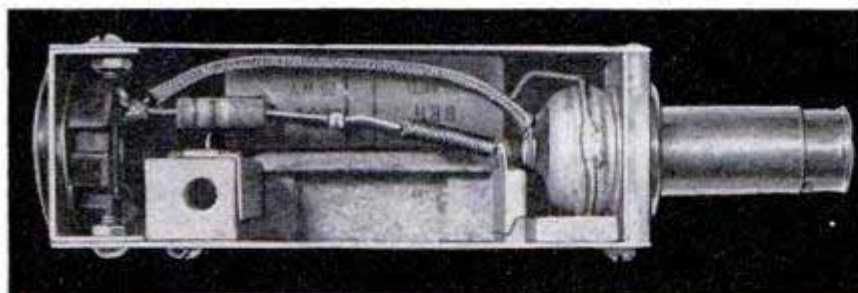
# CONDENSER FLASH UNIT

WHILE THREE to six volts usually are required to fire photoflash bulbs, it has been found that they can be fired with far less current if a condenser is used to provide a higher voltage. This makes for a more compact flash unit, as a small hearing-aid battery is adequate to fire No. 5 flash bulbs. Current from the battery builds up in the condenser after each bulb is fired, and a resistor allows the condenser to charge but impedes the flow of current so as not to fire the bulb prematurely. When the shutter contacts close, the battery and resistor are shorted out, which causes the condenser to discharge and fire the bulb. The resistor serves to protect the battery during this period of a dead short, so the battery does not burn out. As the strength of the battery weakens, a slightly longer interval is required each time to charge the condenser, but as the current that flows from the battery is used only to fire the bulb, the current consumed each time is very little. Hence, extra-long life can be had from the battery. In addition, a more positive synchronization results from minimized resistance due to the low current and high voltage. While the unit will not operate a solenoid-type synchronizer, it is

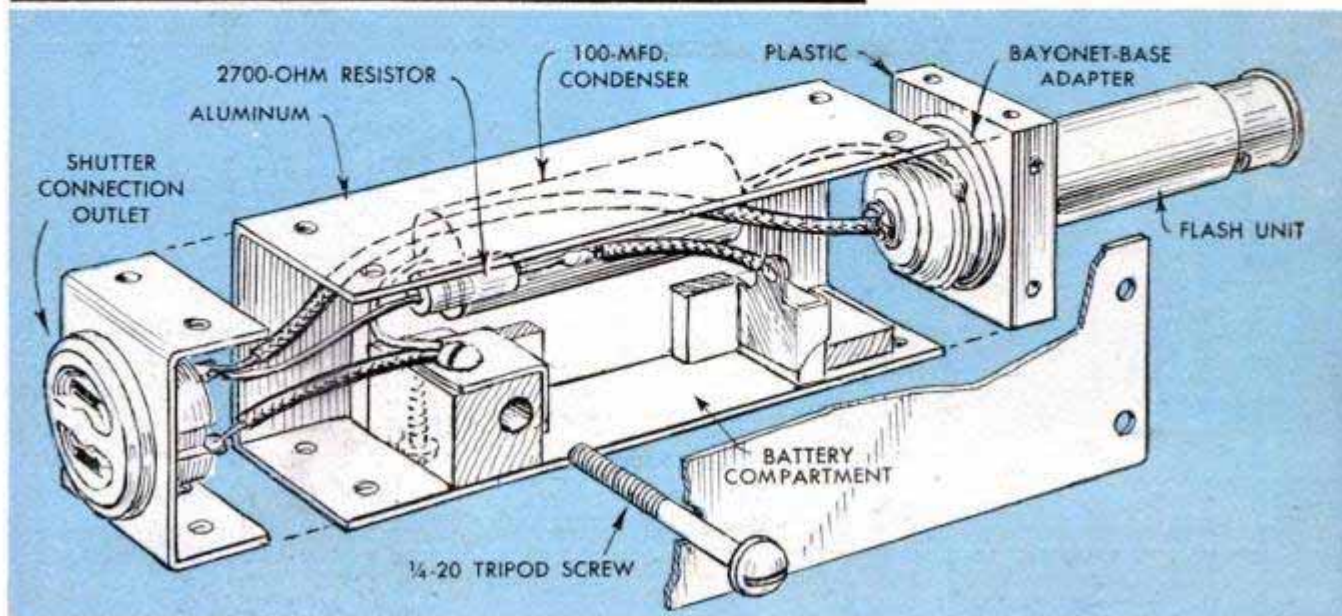


made to order for the many cameras having mechanical-type synchronizers or built-in synchro-shutters.

Housed in a sheet-metal case formed as shown and provided with a cover, the unit is attached to the camera with a bolt which engages the tripod-screw hole. Only five parts are needed: a 22½-volt hearing-aid battery, a 100-mfd. condenser, a 2700-ohm resistor, a bayonet-base flash-bulb adapter and a receptacle for plugging in the shutter cord. Wooden blocks fitted with brass contacts provide a compartment for the battery.—John M. Avery, Dexter, N. Y.



WIRING DIAGRAM



# Know Your Car's NERVOUS SYSTEM

By W. K. Mitchell and  
Howard B. Birt



## EMERGENCY MEASURES

### *Important Maintenance Steps*



Frequently check water level in battery and add distilled water to maintain correct acid level



Keep battery and cable terminals tight, clean and free from corrosion. Inspect the parts periodically



Always make sure that the generator, starter and distributor are properly lubricated at all times



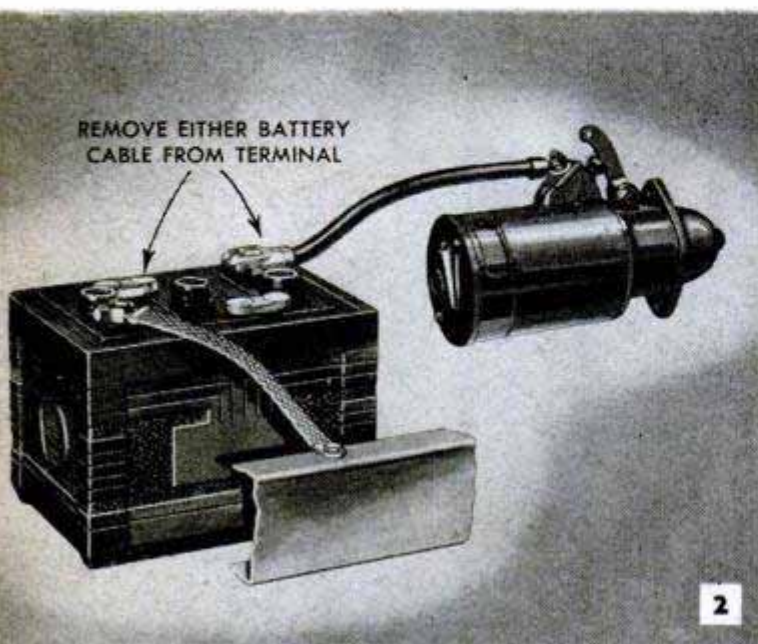
Keep distributor contact points and spark-plug electrodes clean and properly set to correct gap

THROUGH THE YEARS one of the most marked advances in the automotive industry has occurred in the dependability of the car's electrical system. Today, a motorist driving a modern passenger car and giving it reasonable attention, can expect to encounter only a bare minimum of electrical-system trouble. In addition, there are more repair garages, tow-in services and mechanics available than ever before. Nevertheless, even with these advantages, it is still possible for a modern car to develop electrical trouble when in an isolated spot where immediate assistance is not available.

For this reason, it is a wise policy for every driver to know how to use a few simple emergency measures that are calculated to help him "limp in" to a mechanic if the necessity should arise. A number of these measures, pertaining to the electrical system of the car, can be employed almost anywhere without special tools, equipment, or skills.

**Defective battery:** There is a great difference between an internally defective battery and a run-down, or discharged, battery. The latter, which is experienced by most motorists at one time or another, simply requires that the car be pushed while in gear and with the ignition turned on. This will start the engine and the generator will supply current to operate the car as long as the engine is running.

A battery with an internal defect, such as a short circuit between cells, is a more serious matter. In cases of this type, the defective battery usually will drop the generator voltage so low that the engine



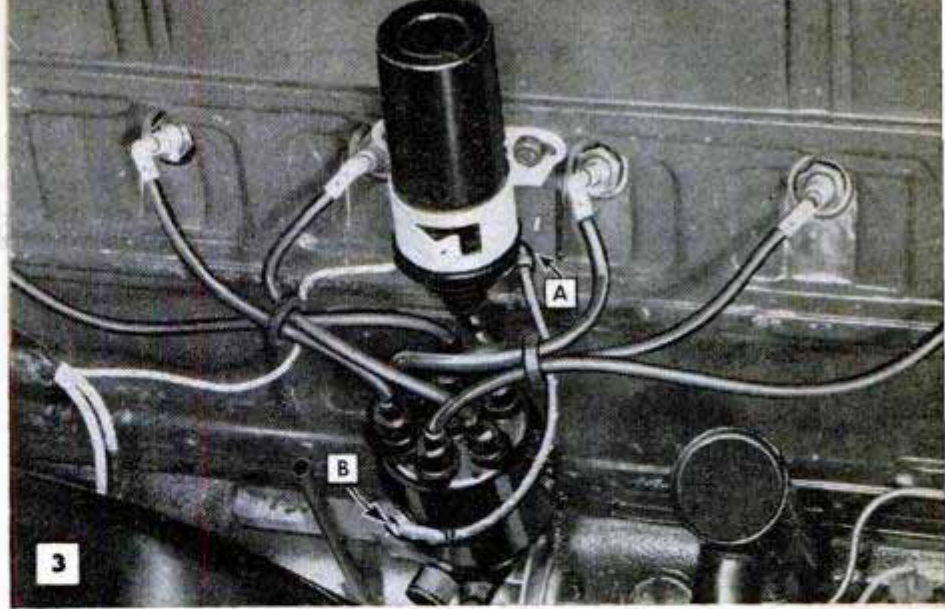
REMOVE EITHER BATTERY  
CABLE FROM TERMINAL

cannot be started even though the car is pushed. In this type of emergency, either of the battery cables can be removed, Fig. 2, to take the battery completely out of the charging circuit, and the engine then can be started by pushing the car, in gear, with the ignition turned on. When driving with the battery disconnected, the parking lights or some other electrical load should be kept on to prevent development of a damaging high voltage.

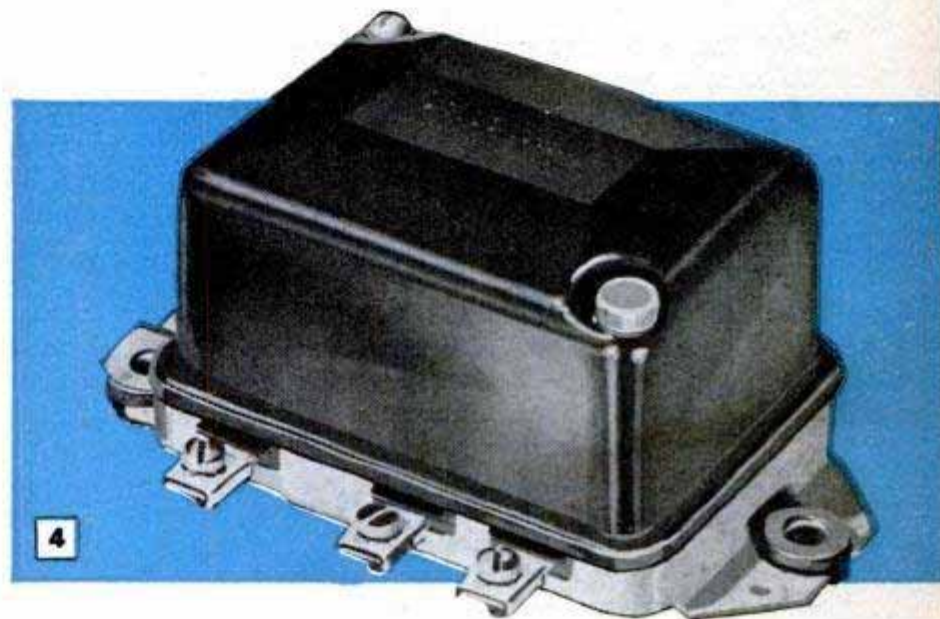
Should the car battery run dry, exposing the tops of the plates above the water line in one or more cells, and distilled water cannot be obtained, it is safer to add any water rather than drive the car with a dry battery.

**Solenoid trouble:** If the solenoid or the magnetic switch on the starter fails to close, the starter will not be actuated. Then the first thing to do is to check the battery charge by switching on the lights or blowing the horns. If the battery seems to be in good condition, run a wire from the battery terminal on the switch, Fig. 1, A, to the coil terminal, B. This will close the circuit and, if the trouble is somewhere in the starter-solenoid control circuit, cause the starter to crank. If the starter does not crank, the trouble is inside the solenoid and the latter should be checked thoroughly.

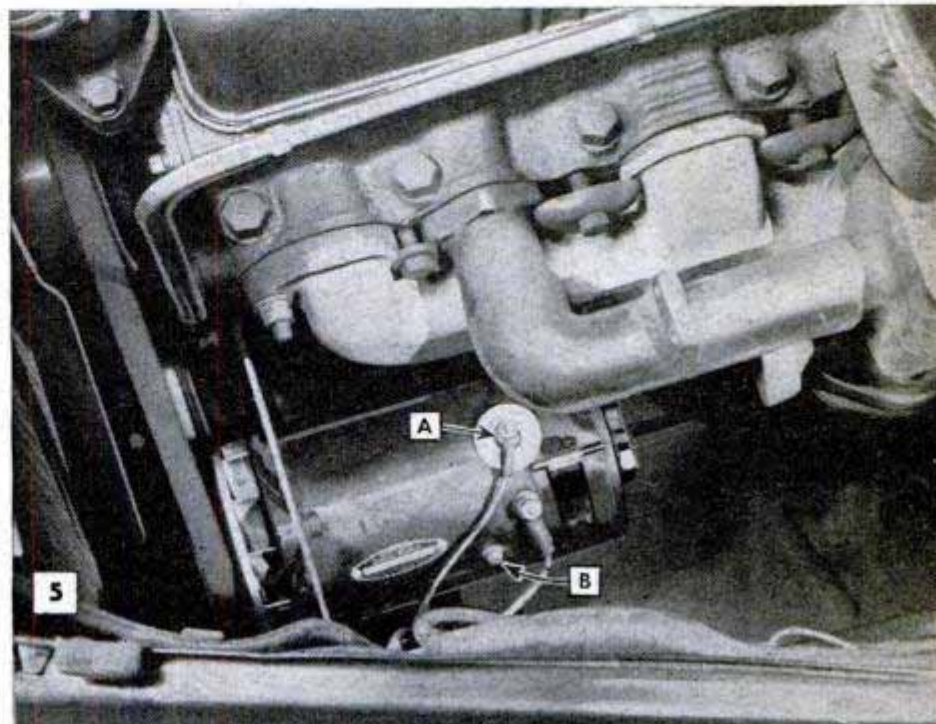
It also is possible for the solenoid switch to stick in the closed position after the starter has cranked the engine. Should this happen, the solenoid will not release, the shift lever cannot return properly and the engine will spin the starter. In such an emergency, quickly remove the small wire from the solenoid terminal. This ordinarily will cause the solenoid to release, thus indicating that the trouble is somewhere other than in the solenoid switch and that it will have to be systematically found and corrected. If removing the wire does not release the solenoid, chances are that a coil is shorted inside the solenoid. In this case, remove the battery lead from the solenoid to cause it to release. If this step must be taken it will be necessary to hold or wire together the various leads which terminate on the battery terminal



When ignition switch cannot be used to stop engine, remove the primary-coil lead either from the coil, A, or the distributor, B



To drive with defective regulator, disconnect it from circuit by removing lead from field terminal and grounding it to base of regulator, above. Below, when generator won't charge, ground field terminal, A, to generator frame, B, with a length of wire



## Condition of Battery

## Ammeter Reading

## Indication

FULLY CHARGED

+



=

NORMAL

FULLY CHARGED

+

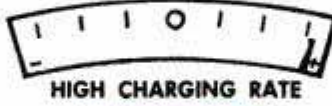


=

OVERCHARGING

DISCHARGED

+

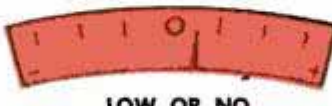


=

NORMAL

DISCHARGED

+



=

UNDERCHARGING

6

of the solenoid in order to keep the engine running.

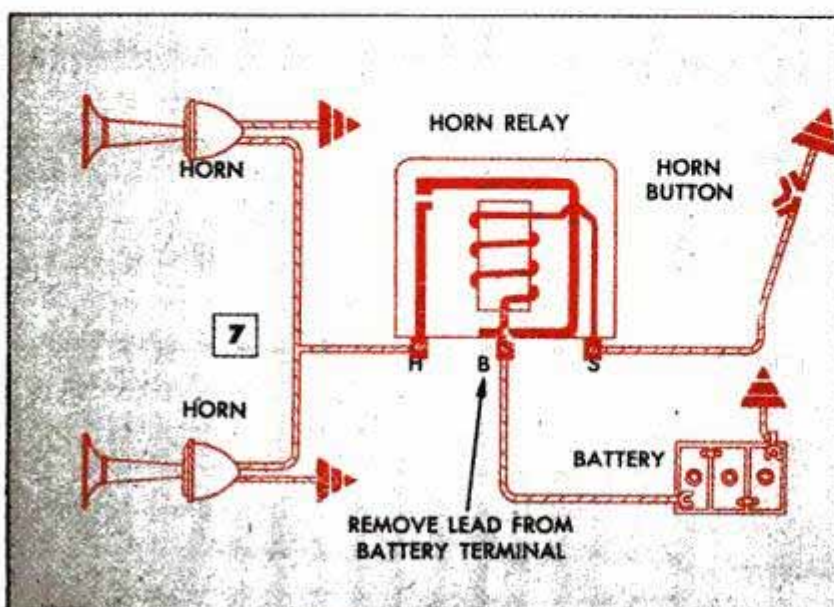
**Defective ignition switch:** Should the ignition switch become inoperative due to a key being broken in the switch lock, or for any other reason while the engine is running, the engine will continue to run. To stop the engine and also prevent discharging of the battery through the ignition circuit, remove the primary lead either from the distributor or the coil, Fig. 3, point A or B.

**Generator trouble:** Should the generator commutator become coated with oil or gum to a point where the generator cannot charge, and sandpaper or a brush-seating stone is not available, the commutator can be cleaned temporarily with an ordinary pencil eraser. To do this, remove the generator-cover band, idle the engine, and move the eraser back and forth across the rotating commutator. After the oily film

has been removed, move a dry rag back and forth across the revolving commutator to complete the cleaning. This procedure often will enable the generator to resume charging until a more thorough cleaning job can be performed.

A break anywhere in the field lead connecting the regulator and the generator will prevent the generator from charging. If this happens, ground the generator field terminal to the generator frame with a short piece of wire, Fig. 5. This will permit the generator to charge and the car can be driven. However, the car must be driven less than 25 m.p.h. in high gear, and at slow engine speeds in lower gear, while the generator field terminal is grounded. Otherwise the generator will charge uncontrolled and could damage itself or other parts of the car's electrical equipment.

**Defective regulator:** An internal defect in the regulator can shut off the supply of field current to the generator and stop it from charging. If this should happen, the car can be driven a short distance on battery current alone. However, if it is necessary to drive for a length of time that might run down the battery, especially at night when the lights must be used, the regulator can be disconnected from the circuit so that the generator will charge. To do this, remove the lead from the field terminal of the regulator, pictured in Fig. 4, and ground it to the regulator base. Again, it is necessary to drive at low speeds to pre-



Photos and information courtesy Delco-Remy Division, General Motors Corp.

vent the uncontrolled generator from damaging the system.

**Stuck horn:** Occasionally a short circuit develops somewhere in the horn wiring which causes the horn to blow continuously. This can happen even when the car is unoccupied, causing considerable disturbance, particularly in a busy area, and quickly discharging the car's battery.

The fastest and easiest way to stop a "stuck" horn is to remove the battery lead from the center terminal on the horn relay, Fig. 7, B. This disconnects the horn from the battery and silences it until the trouble can be located and repaired. The bare end of the battery lead should be fastened back so that it cannot short-circuit against any metal part.

Probably the most simple and effective manner in which a motorist can know when to expect possible trouble in the electrical system is to maintain a regular watch over the ammeter on the instrument panel. Note in Fig. 6 how the ammeter reading indicates either a normal condition or the possibility of something wrong. Also note the condition of the battery that is indicated in the chart, as slight variations will change the interpretation.

If the ammeter shows a high charging rate over an abnormally long period, the battery could be low or running too hot, there may be a defective unit in the regulator, a ground could exist in the generator field circuit (in either the generator, the regulator or the wiring) or the regulator could be set too high.

If the ammeter shows a very low, or "no" charging rate over a like period of time, look for loose connections, frayed or damaged wiring, internal defects in the battery, high resistance in the charging circuit, too low a regulator setting, oxidized regulator contact points, or a defective generator.

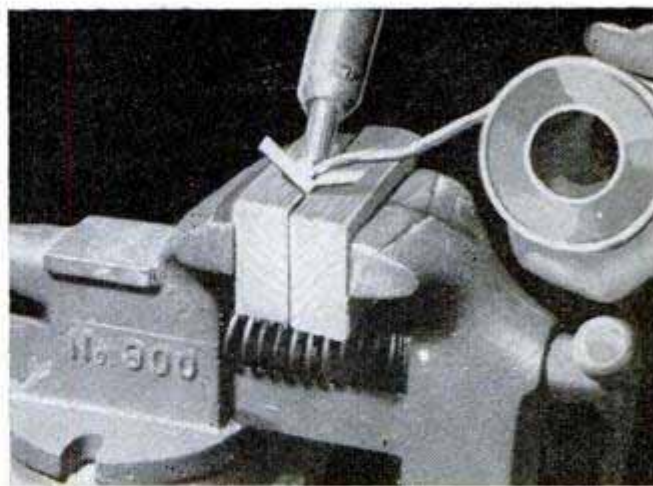
Regular maintenance is, of course, the best possible way of avoiding trouble, prolonging the life of the car's electrical system and insuring better engine performance. Thorough maintenance procedures covering each of the electrical units have been discussed in previous installments of "Know Your Car's Nervous System."

\*\*\*

### Editor's Note

This is the concluding installment in the series of articles in which we have attempted to explain the function, maintenance and repair of the electrical system of a car so that the owner could better understand it. If you have enjoyed reading the articles, or have benefited by them, and would like to see other parts of the car described in a similar manner, drop a line to James R. Ward, the Craftsman Editor.

## Soldering Aid for Work Held in Vise



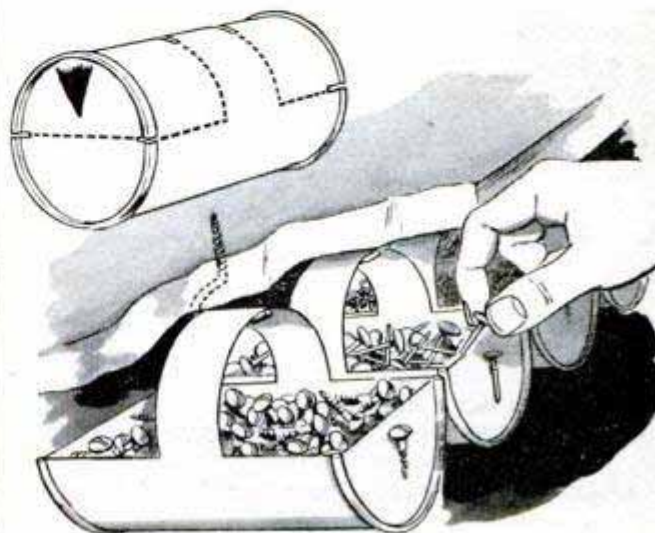
When small work must be held in a vise for soldering, the job can be speeded up considerably if the work is gripped between two pieces of wood as shown in the illustration. Soldering is done more quickly inasmuch as the wooden blocks prevent heat loss to the jaws of the vise.

J. W. Rocke, Atkinson, Neb.

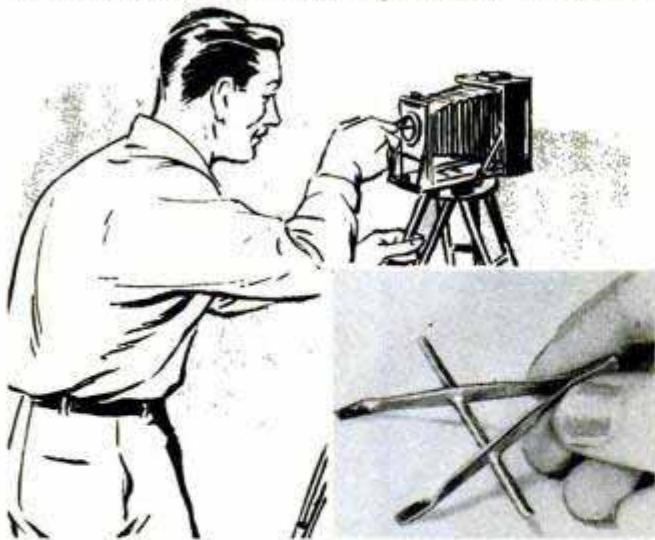
## Small-Parts Trays From Cans

Supported along the underside of a shelf above a workbench, trays cut from small tin cans will provide containers in which screws, nails and other small parts can be stored close at hand. First, obtain cans of uniform size, preferably beverage or juice cans in which only one hole has been punched for removal of the contents. Now, using tin snips or sheet-metal shears, cut one side of the can as indicated in the detail, leaving the center section to serve as a handle. Quick identification of the contents can be made possible simply by soldering one item to each tray end. The trays may be hung on hooks or other suitable supports attached to shelves.

George Kapitan, New York City.



## Tweezers Used as Spanner Wrench for Removing Camera Lens

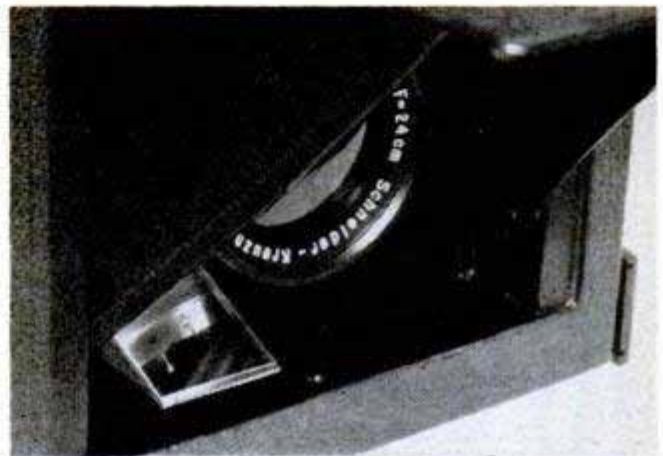


Owners of cameras having removable lenses will find that a lens can be removed or replaced safely with the aid of a spanner wrench made from a pair of tweezers and a short length of stiff wire. First, the points are cut off the tweezers and the ends filed square. Then aligning holes are drilled through the legs of the tweezers to take the short length of wire. Next, the legs are spread to correspond with the size of the lens retaining ring and held with a wooden block while the wire is soldered in place. Finally, each leg of the tweezers is placed in a vise and twisted 90 deg. with pliers to form blades to engage the slots in the retaining ring.

## Small Mirror Mounted at Angle Simplifies Reading of Lens Settings

When using a lens other than the original one on a Graflex camera, you will find that the "f"-stops, located on the side of the lens, are rather difficult to read. However, by mounting a small mirror just below the lens in the manner shown, the settings may be read with little difficulty. Cut the small mirror from a larger one and attach it with rubber cement to a wedge-shaped piece of wood, which has been shaped so that, when screwed to the camera, it will hold the mirror at an angle of about 40 deg. to the lens.

Roy J. Wexler, Stamford, Conn.



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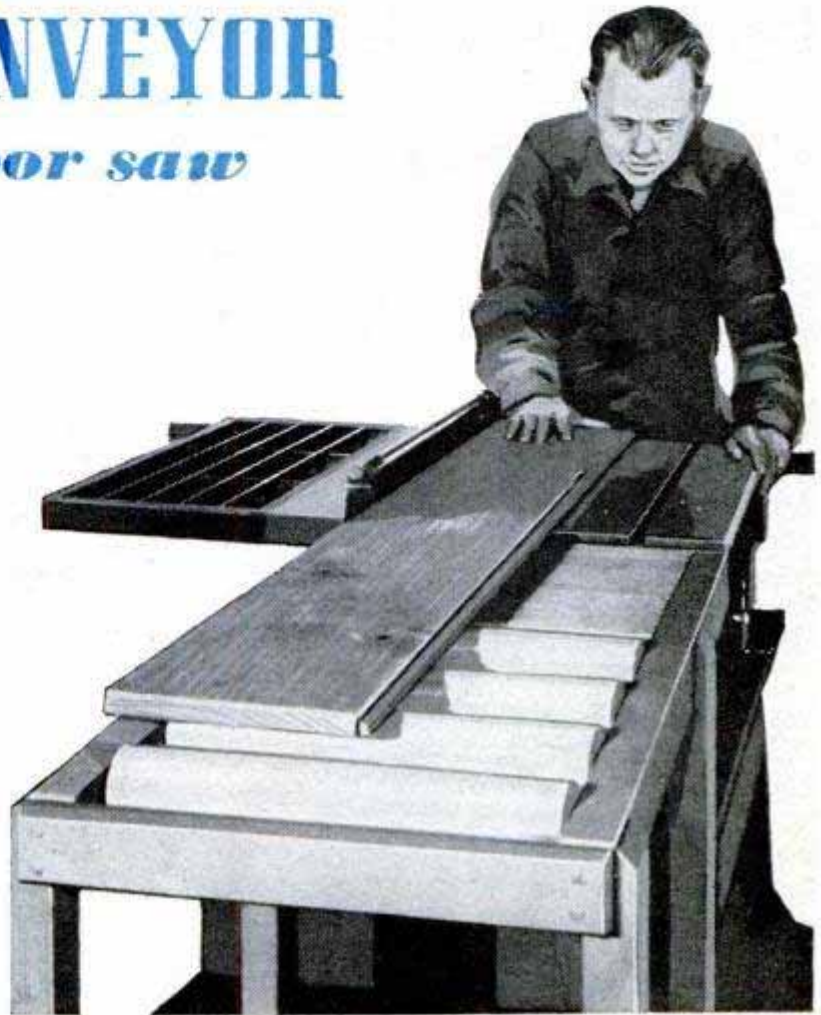
# SHOP NOTES

## ROLLER CONVEYOR

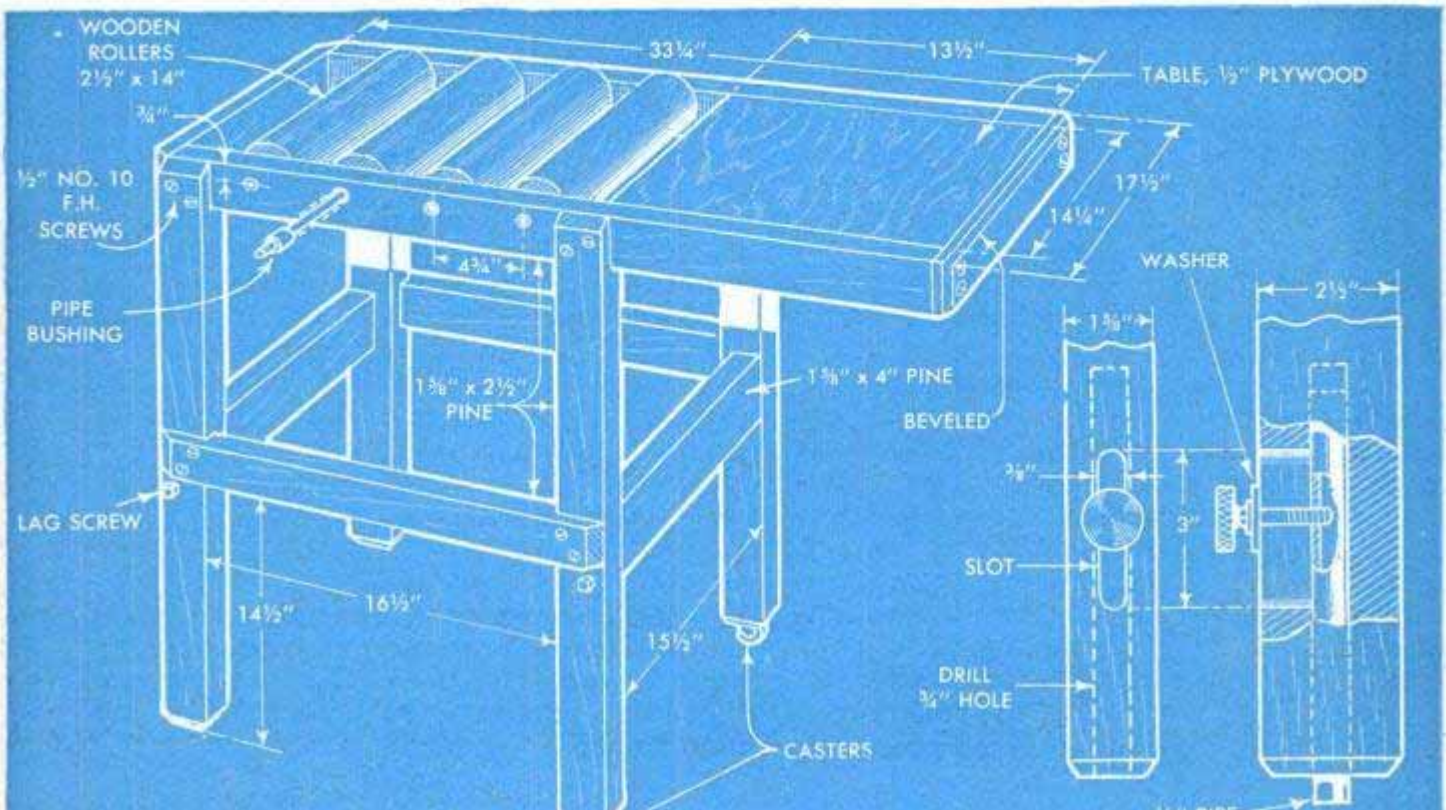
*for tilting-arbor saw*

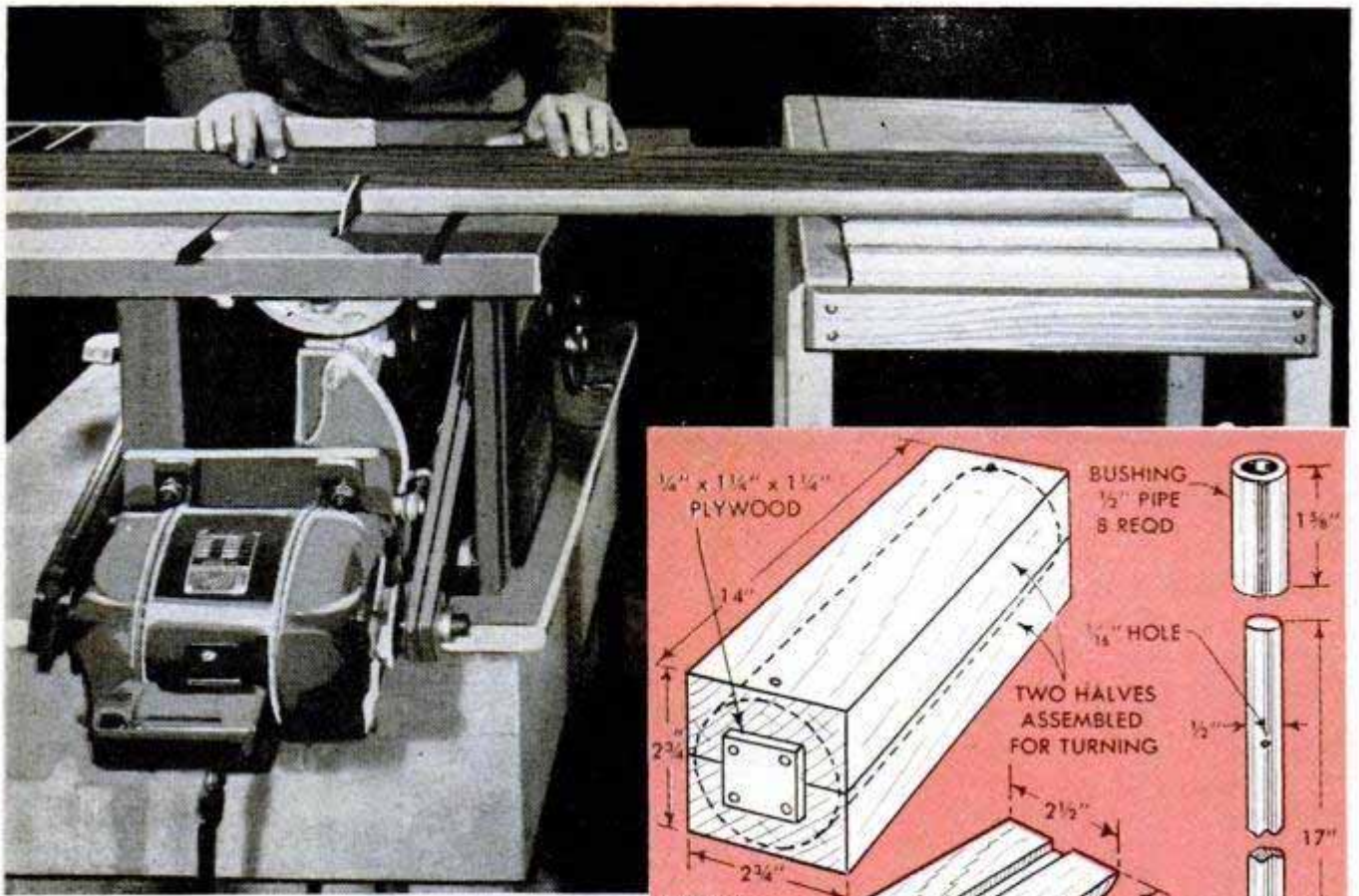
By Dick Hutchinson

**H**ANDLING long stock safely on a small saw table single-handed requires use of a roller-type conveyor. This unit supports the unwieldy overhang of the stock either at the back or side of the table when ripping or cross-cutting. Unless the overhanging portion of the stock is supported in a level position it is difficult to do accurate work when ripping or molding on the long edge of the material and equally difficult to cut, groove or mold across the grain. The conveyor detailed below has been designed especially for use with a small floor-type circular saw having a tilting arbor and a motor mounted at the rear of the floor stand. It will serve equally well when used with a bench-type saw. A shelf, or table leaf, is placed in the overhanging section of the top



Conveyor can be used at the side or rear of the saw table to support long stock when ripping or crosscutting. A plywood-covered extension at the forward end of conveyor protects motor

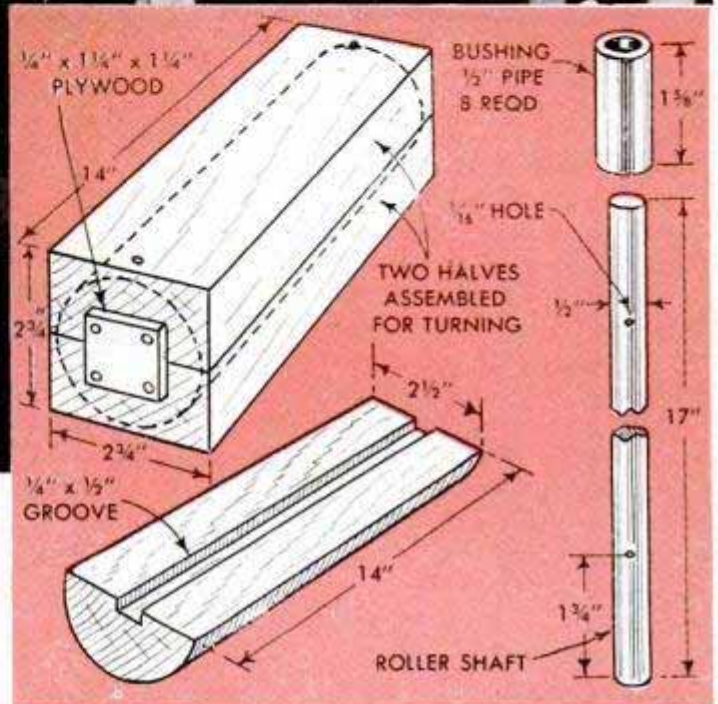




frame to shield the motor from sawdust and small pieces trimmed from the stock. Four hardwood rollers are mounted in the top frame at the rear of the table extension. Details on the preceding page show how these can be made by first grooving two pieces of hardwood, then nailing them together for turning in the wood lathe. After turning, the halves are separated, the shaft inserted and the parts glued together permanently.

Another method that saves considerable time is to make the rollers from ordinary household rolling pins which are readily available and are turned from selected hardwoods. Simply cut off the handles on each roller, center a hole in each end and drive in a stub shaft.

Check the dimensions of your saw table before cutting stock for the frame of the conveyor. Probably some dimensions will have to be altered from those given in the detail. Before assembling, check the length of the legs to make sure that correct allowance has been made for the casters, and that the leg extension works freely. The extension built into one leg provides a handy means of leveling the conveyor on an uneven floor. Construction of the top frame and the legs is quite simple, the upper ends of the legs being notched over the horizontal frame members and attached with flat-headed screws. In assembling, it's a good idea to use glue in all joints. After assembly, make sure that all the rollers turn freely. Photos above and on the preceding



page show the conveyor in use at the side and rear of the saw table for crosscutting and ripping operations. The casters on two of the legs make it easy to move the unit to either position. ★ ★ ★

## Repairing Damaged Chimney

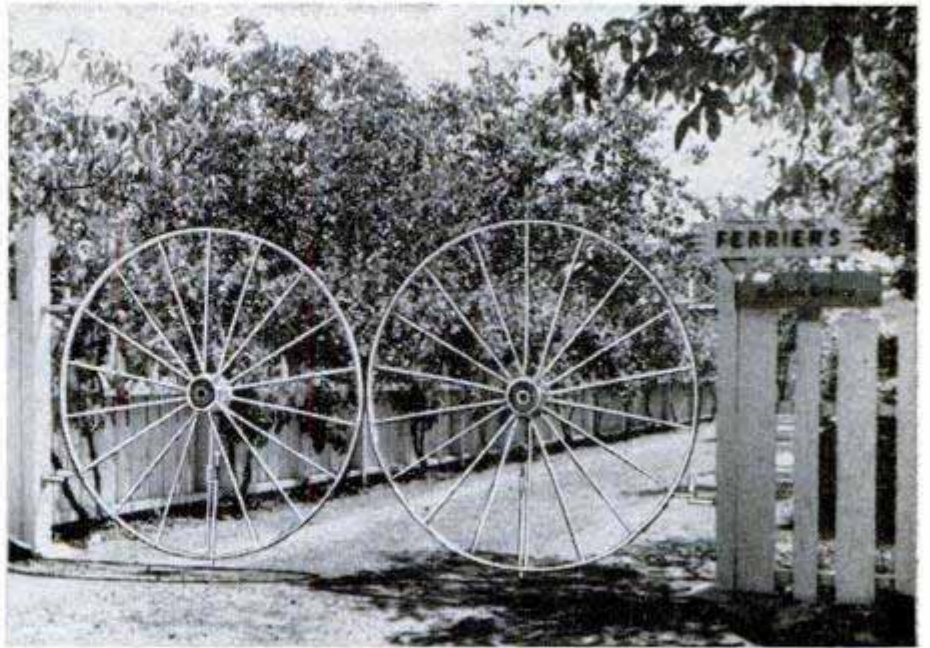
When the bricks near the base of a chimney have begun to crumble due to an accumulation of moisture, repairs can be made easily by replacing two or three bricks at a time. Use a hammer and cold chisel to chip away the defective bricks and mortar and, after replacing the bricks, allow the mortar to set for a day or two before removing more bricks. Repeat this operation until all the damaged bricks have been replaced. Use a mortar of quick-setting cement and sand, adding very little lime. If the chimney does not have a cleanout door, leave out a couple of bricks and fit the opening with a metal cover.

Arthur N. Nelson, Kansas City, Mo.

☛ When using an electric mangle during the winter, leave it in a warm room at least one hour before it is used. This will assure that lubricants have been softened so the mangle will be easier to operate.

Working in his spare time only, one homeowner utilized the wheels from an old horse-drawn hay-rake to provide a unique but inexpensive driveway gate. Pieces of 1-in. flat iron were drilled with holes in order to fit over and pivot on large, screw-type hinge pins fastened to the gateposts, after which they were welded to the rims. Iron rods, which work up and down in brackets that are attached to vertical spokes below the hubs as shown, serve as stops for the gates when lowered into short lengths of pipe set in the ground.—A. M. Morgan, Lafayette, Calif.

## Novel Driveway Gate Made Inexpensively By Using Large Farm Implement Wheels



## "Blackboard" Sales Card Permits Price Change

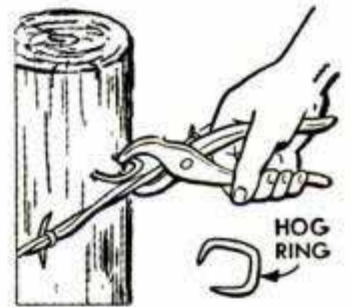


To avoid making new sales cards each time a price change is required, one merchant paints a black square on each card where the price of the item normally is lettered in crayon.

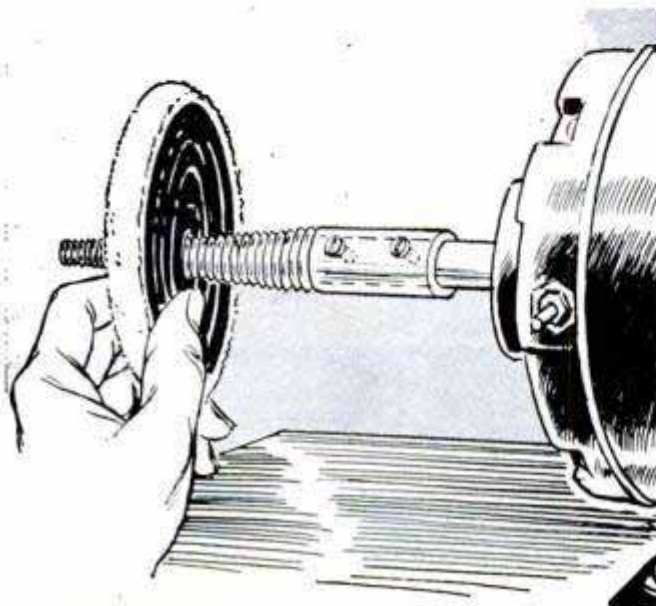
He uses a regular blackboard paint which dries with a dull finish having a slight "tooth" that makes prices lettered in white or colored chalk clearly legible, yet easy to erase.

## Attaching Temporary Fence Wire

Whenever it is necessary to set up a short temporary fence, one farmer uses hog rings to fasten the wire to staples driven in the fence posts. The easily opened rings permit the fence wire to be removed from the posts quickly without prying loose the staples, and the latter may be left in the posts ready for use when they are again needed. Note in the accompanying detail that the rings are clamped around the wire as the staple is engaged.



## Tapered Arbor on Motor Shaft Speeds Changing Buffers



Where several buffing wheels were being used repeatedly during a particular polishing operation, one small-shop owner found that his workmen were spending much of their time in changing buffing wheels. This led to the use of tapered arbors instead of the regular straight type so that the wheels could be quickly threaded on or off without having to tighten or loosen a nut. Buffing wheels used on an arbor of this type usually have lead or wooden bushings. Due to the tapered spindle and the fact that the thread is either a right or left-handed one, the wheels actually tighten themselves on the arbor when in use. Arbors are available in several diameters from dealers in jewelers' supplies.

William Lane, St. John's, Newf., Can.

# TIP YOUR TOOLS WITH

## Part II

**A**FTER READING in Part I of the phenomenal production performance that can be expected from tools tipped with carbide, the small-shop machinist, as well as the home craftsman, will be eager to learn how comparatively simple it is to tip his own cutting tools with this hardest of metals made by man.

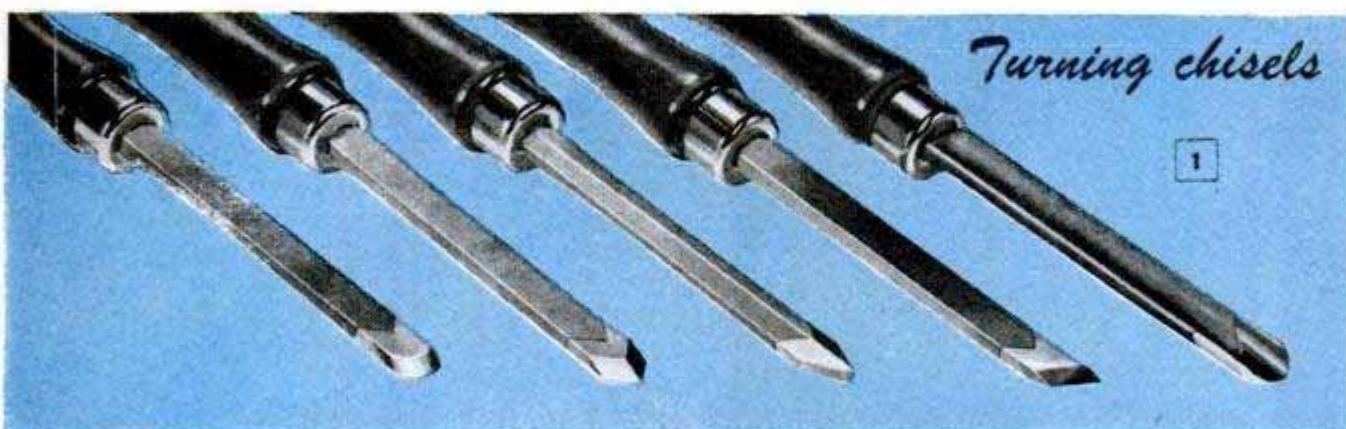
Of the two wonder metals, cast alloy and cemented carbide, that so outperform the cutting ability of even super-high-speed steel, cemented carbide is the harder. Like the diamond, it will scratch glass, cut the hardest file and stand up in taking the "skin" cut from cast iron. But like all very hard materials, the tool grades of cemented carbide tend to be brittle and consequently cannot stand excessive shock loads. However, being extremely hard, carbide turns all materials at speeds higher than are possible with other cutting tools. As previously described in Part I, tools tipped with cast alloy (Tantung) are used for turning all materials except hardened steel, ceramics or other very hard substances.

Carbide blanks for tipping your tools are available in a variety of shapes and sizes and at very little cost. They can be purchased separately or in kit form which includes the flux, silver solder and even a torch for brazing the tips in place, as well as a suitable silicon-carbide grinding wheel.

In addition to such standard shapes as those used to tip common lathe tool bits, there are special blanks to be had for tipping your present set of wood-turning chisels, Fig. 1, conical blanks to tip your lathe centers, etc. All come in blank form which means that they must be ground and sharpened after being brazed to the tool. Once properly ground and sharpened, the tips will stay sharp longer than any other cutting tool. Only an occasional light grinding and honing are required to maintain their diamond-hard, razor-sharp cutting edges.

Whether tipping a lathe tool bit, chisel, plane iron, masonry drill or saw blade, the steps are essentially the same. The steps in tipping a lathe tool bit, for example, consist of (1) shaping the tool shank; (2) cutting the recess to receive the carbide blank; (3) brazing the blank to the shank, and (4) grinding the carbide tip. Fig. 4 pictures four types of rabbeted recesses generally used in forming a seat for the carbide blank. Type A is recommended primarily where the tool is to be used for grooving and cutting-off operations. Type B is used when support for the blank against side thrust is necessary. The most widely used recess is type C, which provides support for the carbide blank against both side and end thrust. Recess type D is used for both

Converting your present set of wood-turning chisels is done easily by grinding the ends to a point and tipping them with a standard set of Tantung blanks. Note that blanks have V-notches to give maximum brazing union



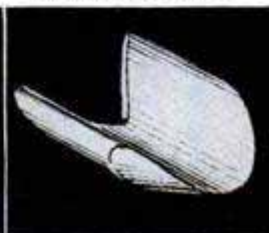
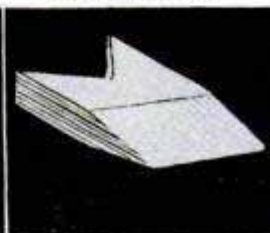
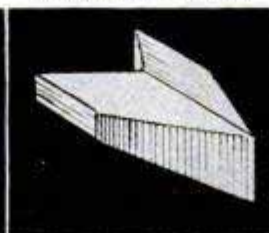
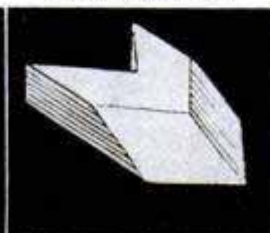
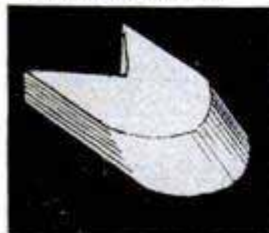
ROUND-NOSE TIP

SPEAR-POINT TIP

PARTING-TOOL TIP

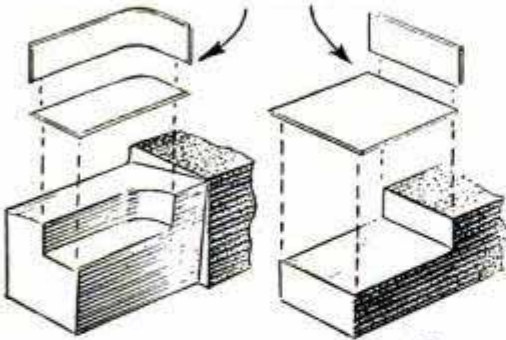
SKEW-TOOL TIP

GOUGE-TOOL TIP



# CARBIDE

1st— CUT BRAZING-ALLOY STRIPS

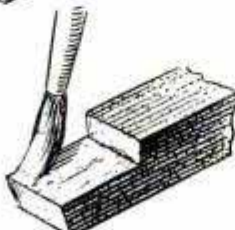


2

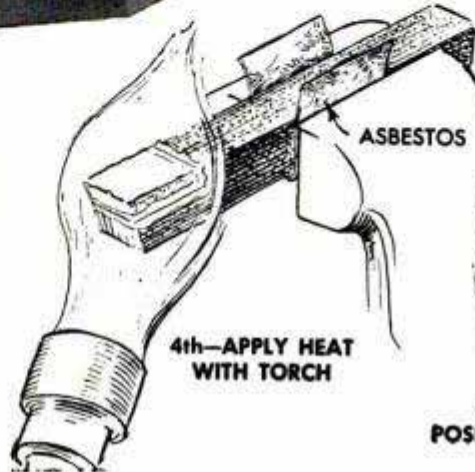
2nd— CLEAN RECESS WITH CARBON TETRACHLORIDE



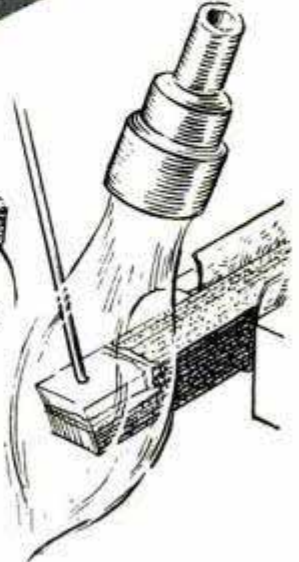
3rd— COAT WITH FLUX



4th— APPLY HEAT WITH TORCH

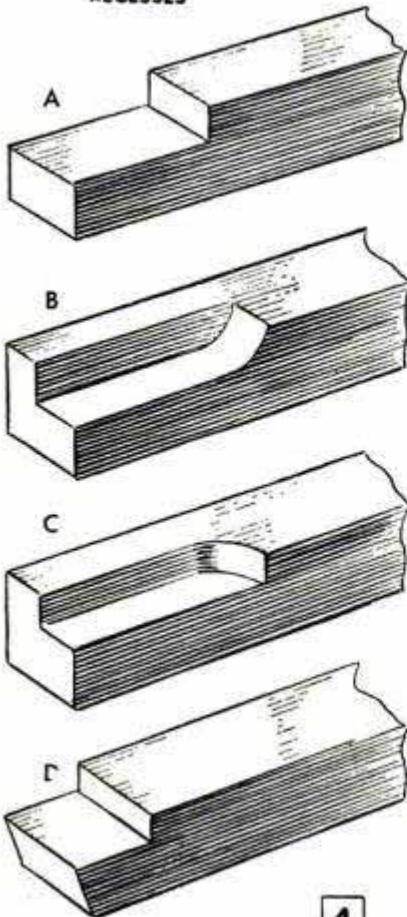


5th— HOLD TIP IN POSITION AND LET COOL

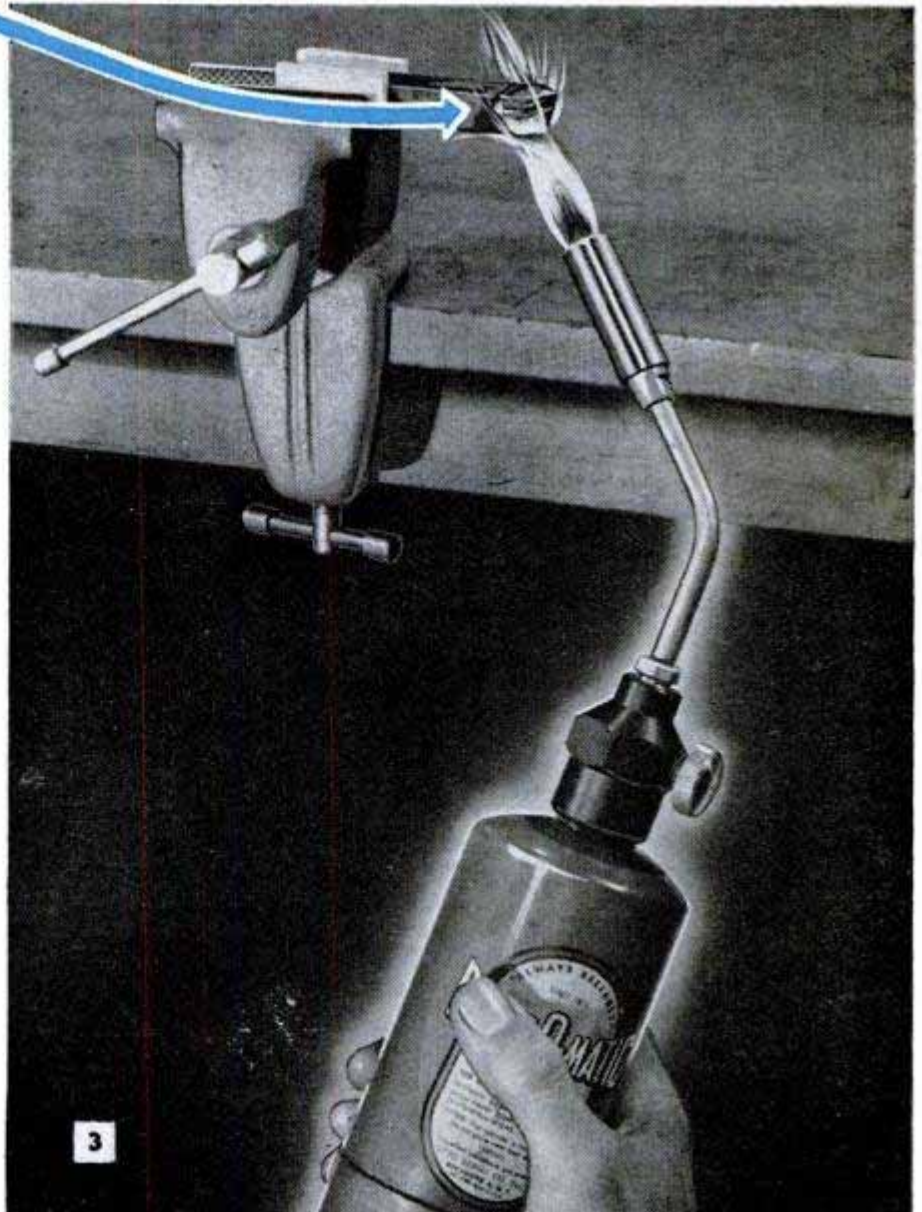


*Steps in tipping a lathe tool bit*

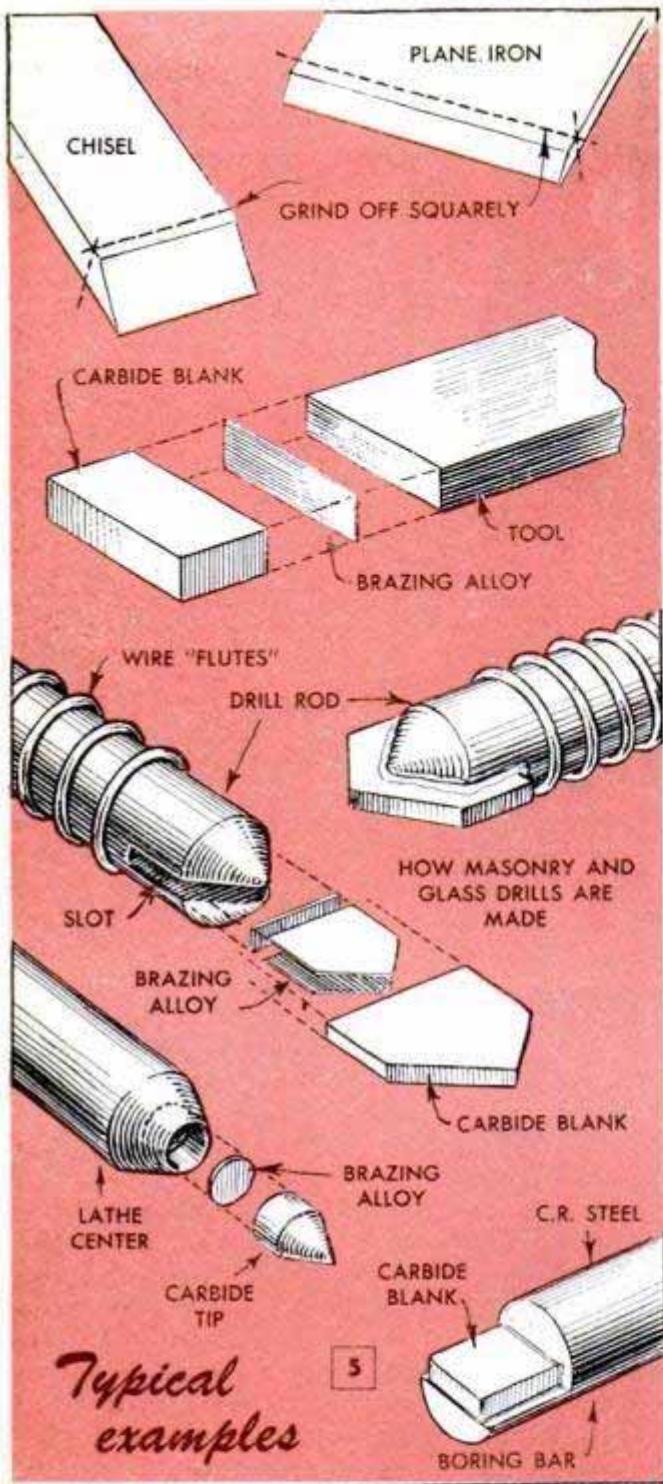
TYPES OF TIP RECESSES



4

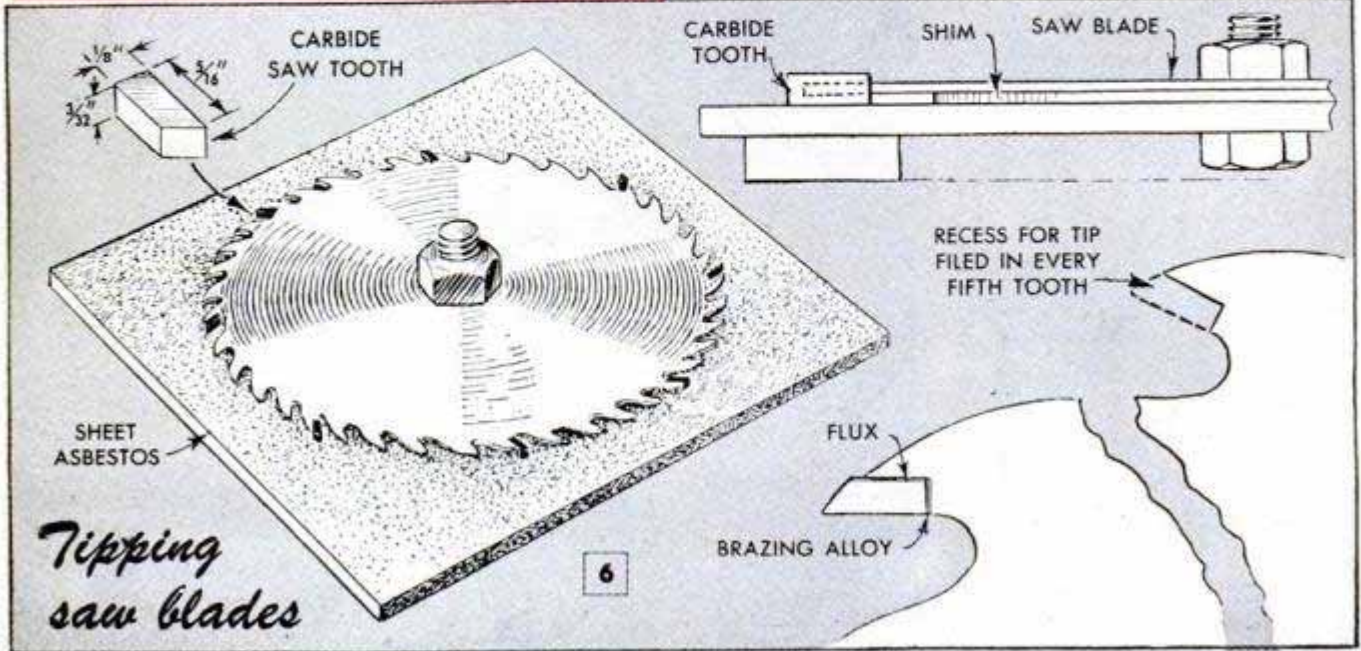


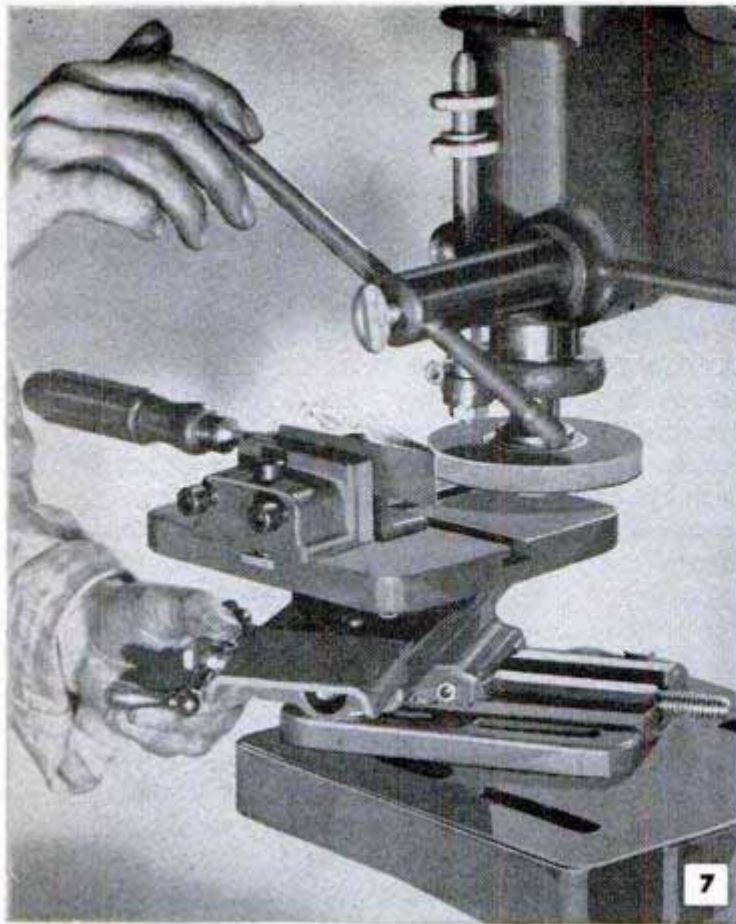
3



right and left-hand turning tools. In some cases, depending upon the particular machining operation, the carbide blank can be brazed directly to the top surface of the shank, thus eliminating the recess. Front and side relief angles are machined usually before the recess is cut. These, as a rule, are milled from two to four deg. greater than the specified primary relief on the tool so that after brazing it is only the carbide tip that needs to be ground. In forming the recess of the particular type required, it is important that it be perfectly flat. Any unevenness in the recess may cause the carbide tip to crack in use.

Originally, most tipped tools were brazed in a furnace. In recent years tool manufacturers have adopted high-frequency induction heating which is quicker and gives the operator complete supervision over the tool during brazing. Induction brazing causes less softening of the tool shank since only that part of the steel in the vicinity of the carbide tip is heated. However, a very satisfactory brazing job can be done with an oxyacetylene welding torch, and if such a torch is not available, both the small-machine-shop worker and the home craftsman can do an excellent job of brazing with one of the inexpensive compressed-gas torches now on the market, Fig. 3. The five steps in brazing a tip to a lathe tool bit are pictured in Fig. 2. First, pieces of brazing alloy (sheet silver solder) are cut slightly larger than the recess. Next, all surfaces to be joined are cleaned with carbon tetrachloride. This is important to assure a good bond. Now, with the tool shank clamped in a vise and insulated from it with small pieces of asbestos, thin paste flux is applied to the recess and the silver solder placed in position. Finally, a second application of flux is applied and the carbide tip is set in place in the recess.





Either straight or cup-type wheels can be used. Typical grinding setup in photo above shows how universal milling table can be used in conjunction with drill press. Lathe tool-post grinder provides another setup

**TOOL ANGLES RECOMMENDED FOR MACHINING VARIOUS MATERIALS**

Material to be cut	Back rake (Degs.)	Side rake (Degs.)	Front relief (Degs.)	Side relief (Degs.)
Aluminum alloys	10-20	10-20	8-12	6-10
Aluminum castings	10-20	10-20	6	6
Brass, yellow	0-5	2-6	4-8	4-8
Bronze and its alloys	0-5	0-10	4-6	4-6
Cast iron:				
soft	0-4	4-6	4-6	3-6
hard	0	3-6	3-5	3-4
chilled	0	3-6	3-5	3-5
malleable	0-4	4-8	3-5	3-5
Copper	0-10	8-15	6-8	6-8
Fiber	0-10	6-12	5-10	6-10
Plastics	0-10	6-12	5-10	6-10
Rubber:				
hard	5-15	8-15	6-10	6-10
soft	10-20	8-20	8-15	8-15
Steel:				
up to 200 Brinell	0-10	4-15	6-8	6-8
200-275 Brinell	0-8	4-10	5-8	5-8
275-350 Brinell	0-5	4-8	5-8	5-8
350-425 Brinell	0-3	0-6	4-6	4-6
425-up Brinell	0	0	4-6	4-6
Zinc-base die castings	0-10	8-12	6-10	6-10

In brazing the tip, the tool shank should be heated first, playing the flame of the torch to the underside of the shank and holding it a short distance from the tip. Heating should be done gradually. If heated too rapidly, the carbide tip may crack. Move the flame around to both sides of the tool so that no part becomes overheated. When the proper brazing temperature has been reached, which is when the silver solder melts and the end of the shank and carbide tip become a dull cherry red, the carbide blank is held in position with a pointed rod or the tang of a file. When the silver solder has melted completely, the flame is removed and the blank is pressed firmly into the recess and held until the brazing solder solidifies. Pressing down on the blank will force out excess solder and assure a tight brazing union. Only a thin film of solder is needed to make a sound weld. Scale, flux and excess brazing material are cleaned off with a wire brush and the tool is ready for sharpening.

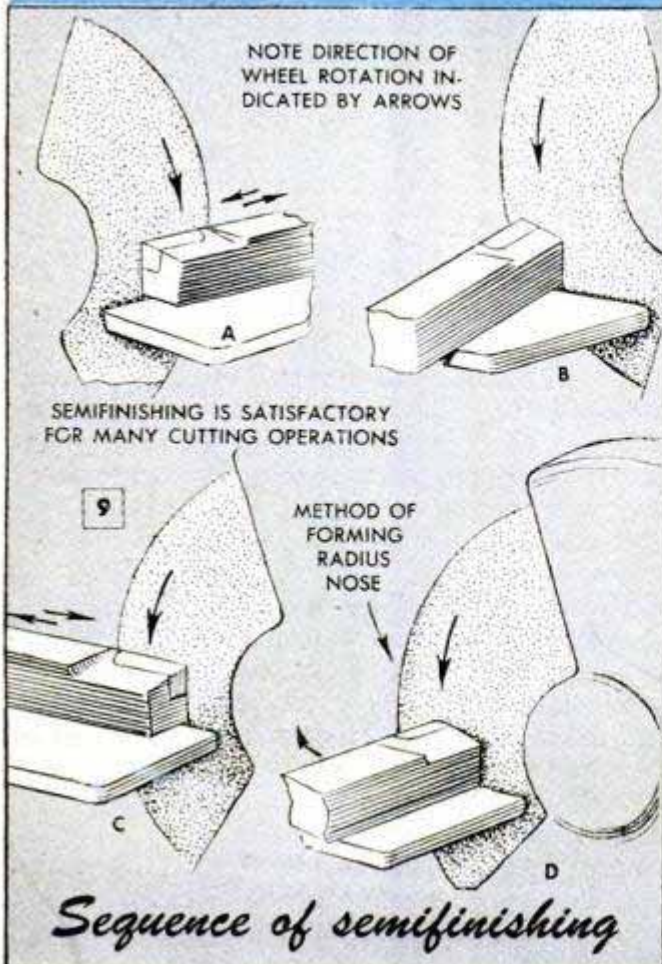
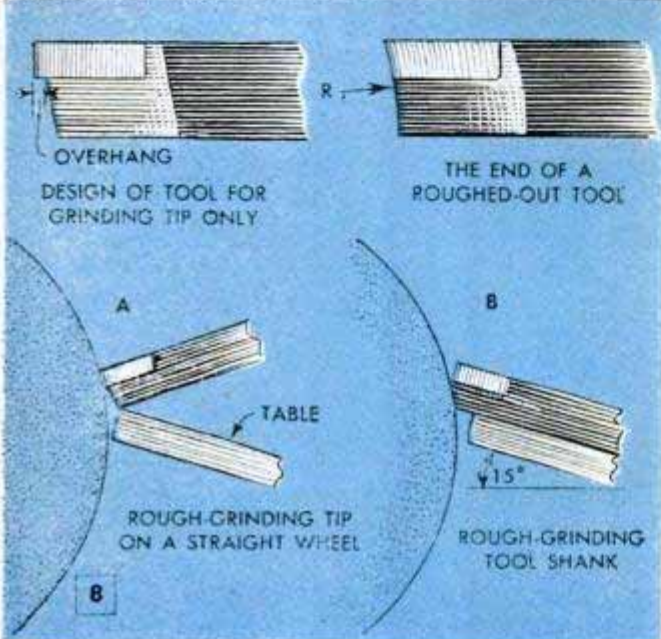
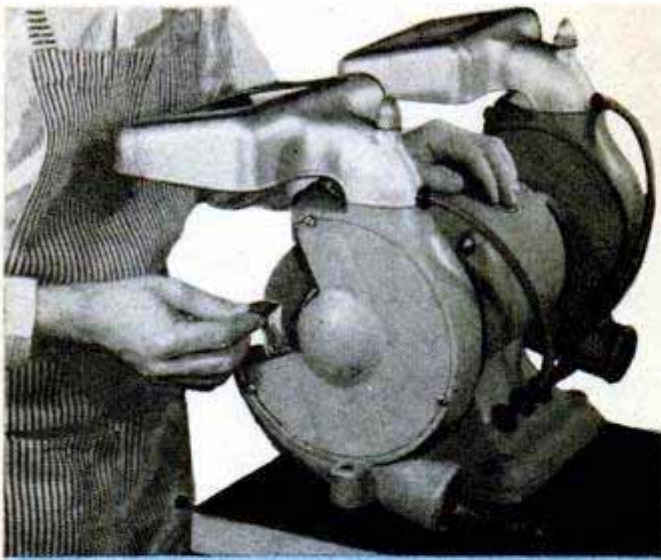
Brazing the tip of a wood chisel or plane iron with cast alloy is done in a very similar manner. In both cases, a recess for the tip is not required, the present beveled edge of the tool being merely ground off square and the blank butted and brazed to the square end. Excellent masonry drills of various sizes can be made inexpensively by slotting the end of drill rod to take regular carbide masonry tips. The slot is made wide enough to allow room for the pieces of brazing solder. Converting your present circular saw blade to a carbide-tipped blade is not too difficult. Pockets for the tiny carbide teeth are filed in every fifth tooth or so and then the tips are brazed in the pockets, bolting the saw blade to a piece of thick asbestos and shimming it to center

**WHEELS RECOMMENDED FOR GRINDING CARBIDES**

Type of operation	Abrasive used	Grain size	Grade	Porosity	Bond
Offhand					
Roughing	SiC	60	H, I, J	6	Vitrified Resinoid
Finishing	Diamond	100	J		
	SiC	100	H, I, J	5	Vitrified Resinoid
	Diamond	100	J		
Machine Grinding					
Roughing	SiC	60	G, H, I	5-6	Vitrified
Finishing	SiC	80-100	H, I, J	5-6	Vitrified
SURFACE GRINDING					
Roughing, dry	SiC	60	G, H, I	6	Vitrified
Finishing, dry	SiC	100	G, H	5	Vitrified
Roughing, wet	Diamond	100	J		Resinoid
Finishing, wet	Diamond	220	J		Resinoid
Form grinding, wet	SiC	100-120	J, K	5	Vitrified
Lapping					
Average lap	Diamond	220-320	H, I		Resinoid
Fine lap	Diamond	400-500	H, I		Resinoid
Extra-fine					
	Nickel-chromium cast-iron disk charged with #4 diamond dust				

**R.P.M. AND PERIPHERAL SPEED IN F.P.M. FOR GRINDING WHEELS OF VARIOUS DIAMETERS**

WHEEL Diameter (inches)	Peripheral speed in F. P. M.							
	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,500
1	15,279	17,189	19,098	21,008	22,118	24,828	26,737	28,647
2	7,639	8,594	9,549	10,504	11,459	12,414	13,368	14,322
3	5,093	5,729	6,366	7,003	7,639	8,276	8,913	9,549
4	3,820	4,297	4,775	5,252	5,729	6,207	6,685	7,162
5	3,056	3,438	3,820	4,202	4,584	4,966	5,348	5,730
6	2,546	2,865	3,183	3,501	3,820	4,138	4,456	4,775
7	2,183	2,455	2,728	3,001	3,274	3,547	3,820	4,092
8	1,910	2,148	2,387	2,626	2,865	3,103	3,342	3,580
10	1,528	1,719	1,910	2,101	2,292	2,483	2,674	2,865



the carbide tips on the edge of the blade, Fig. 6. Tipping your lathe tailstock center is easily done by center-drilling the end to receive a disk of solder and a standard carbide tip. Boring bars, scribes and other tools may be tipped.

Now to grind the tips: Silicon-carbide wheels (Si C) are commonly used for rough as well as finish grinding of sintered carbide tools. For ordinary offhand (free-hand) and machine grinding, a wheel of open porous structure is needed. A wheel which is too hard may result in localized heating and cause the tool tip to check and crack. While a soft-type wheel will prevent heating, avoid using a wheel which is so soft it will wear rapidly. Because of their lower cost, silicon-carbide wheels of the proper grit are frequently preferred to the diamond wheel. Wheels most commonly used for grinding single-edge tools are the straight and cup types. The straight wheel has an advantage over the cup wheel in that it provides a somewhat cooler cutting action due to minimum surface contact. Carbide-tipped tools are usually designed so that grinding of the shank is not necessary. The carbide tip overhangs the end of the shank approximately  $\frac{1}{64}$  in. as shown in the upper left-hand detail, Fig. 8. In cases where a tool becomes badly chipped, the grinding sequence pictured in details A and B, Fig. 8, is used. The ends of the tip and the tool shank are rough-ground with a straight wheel. The concavity produced is later removed in the semigrinding operation. In all carbide sharpening, the grinding wheel should rotate so that the cutting is done from the cutting edge toward the body of the carbide. This important rule is indicated by the direction-of-rotation arrows in Fig. 9. If this rule is not followed, the edge of the carbide is apt to chip.

Here is the grinding procedure to follow in rough-grinding a lathe tool bit using a 60-grit silicon-carbide wheel: First, the face of the tool is ground. Next, the front relief is ground about 4 deg. more than the finished relief angle, leaving a land approximately  $\frac{1}{32}$  in. for finishing. The side relief angle is next rough-ground to about 10 deg., a  $\frac{1}{32}$ -in. land being left on the side for final grinding. After rough-grinding comes semifinishing in which the tool edge is further ground, this time using a 100 to 200-grit silicon-carbide wheel. First, the table is set to the desired rake angle and the top of the tool is finished. Following this, the front relief is ground. The table is then set for the side relief angle and the tool ground accordingly, making certain that the wheel rotation is against the cutting edge. If the tool is to be used in the semifinished condition, the nose radius is ground by swing-



ing the tool shank in an arc on the table as in step D, Fig. 9. When it is necessary to have the cutting edge ground to a high degree of finish, the edge is finish-ground, or lapped, with a 220-grit diamond wheel or 180-grit silicon-carbide wheel. Under no circumstance should the ground tools be dipped or quenched in water during or after grinding. This drastic cooling is very apt to crack the carbide tip.

In a concluding article next month, actual and unusual tool setups will be pictured and described, citing instances where small shops have licked stubborn production problems by tooling-up with carbide. ★ ★ ★

Information courtesy Vascoloy-Ramet Corp. and American Technical Society of Chicago

### Cream Soap Is Handy For Driving Screws

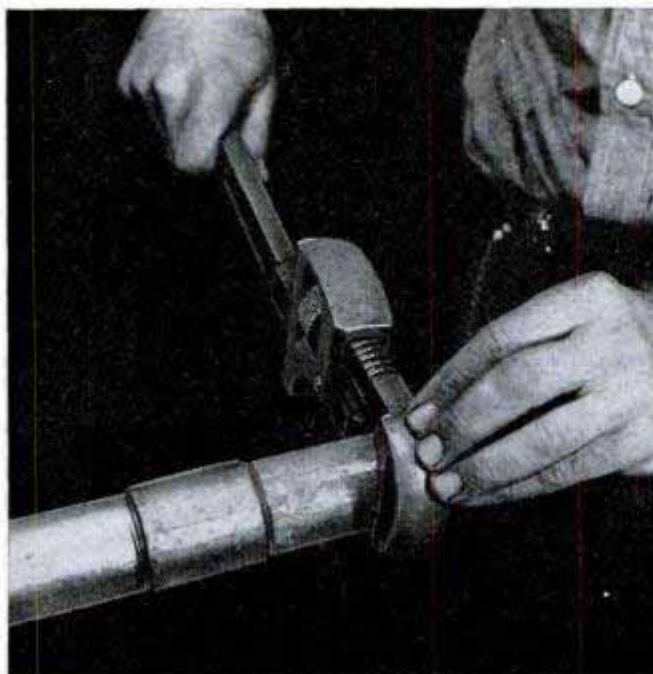
Instead of using a piece of hard soap for coating wood screws to make them drive easier, I keep a tube of cream shampoo in my toolbox. I find that this is much handier than hard soap and works just as well. Before starting a screw just squeeze a drop on it and spread with your finger. Liquid shampoo that comes in plastic containers will work just as well, in most cases.

Norm Jacky, Fond Du Lac, Wis.

### Improved Pipe Nipple

When a short pipe nipple is not available, one can be made by cutting off the threaded end of a longer pipe to the desired length and then threading the severed end. To grip the short piece of pipe in a vise without damaging the end already threaded, screw it into a coupling which has been placed on a longer piece and then mount the assembly in the vise.

Michael Ligocki, Gary, Ind.



### Axhead Fitted to Pneumatic Drill Cuts Through Tree Roots Easily



To provide a quick means for cutting through such obstructions as thick tree roots or timbers buried in the ground and, in some cases, submerged in water, one contractor welded an axhead to the shaft of a pneumatic drill. Before welding, the axhead was cut off just below the eye, or handle opening, and slotted in the manner indicated. Before the new arrangement is put to use, however, the rotating pawl in the drill must be disconnected in order to keep the axhead from rotating.

John Krill, North Lima, Ohio.

### Stool From Disk-Harrow Blades

When the nature of the work necessitates stooping or kneeling for long periods of time, this light shop stool makes the job less tiresome. It's made from two discarded disk-harrow blades assembled with a long threaded rod and a pipe spacer. The



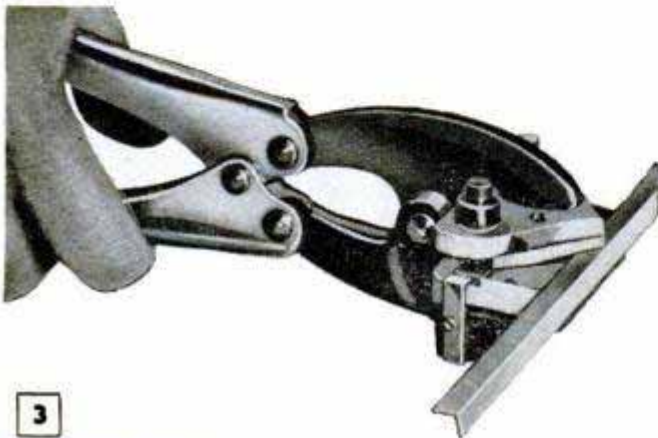
upper blade should be 16 in. in dia., but the lower one forming the base can be 18 or 20 in. in dia. For added comfort, use a farm-implement seat cushion.

A. M. Wettach, Mt. Pleasant, Iowa.

# SHOPPING FOR TOOLS



1



3



4



5



2

1. **SPRING TWEEZERS** equipped with an adjustable magnifying glass are designed to aid in sorting and assembly of small parts. Glass is mounted on a two-piece arm pivoted at three points to give a universal adjustment of magnifying lens. Latter can be locked securely at any desired position after adjustment

2. **ALL-PURPOSE OIL** for household use is now available in a pressurized container especially adapted for application of the oil in a thin film to all bright and polished metal surfaces subject to corrosion. Affords positive protection for hand and power tools in damp basements. Protects chrome-plated car parts

3. **HAND-OPERATED MITERING TOOL** works like a pair of pliers and cuts miters, notches and slots in mild steel up to 1/32-in. thickness and nonferrous metals up to 1/16 in. Interchangeable dies make it easy to change from one operation to another. Unit is especially effective for mitering cuts in light-metal angles



6



**4. PAINT-ROLLER SCRAPER** makes short work of difficult and tedious job of cleaning paint rollers. Scraper has a curved edge which removes paint without damaging wool covering. After roller has been rinsed in solvent, scraper is used to remove solvent from fabric. Handle has blade for opening paint cans

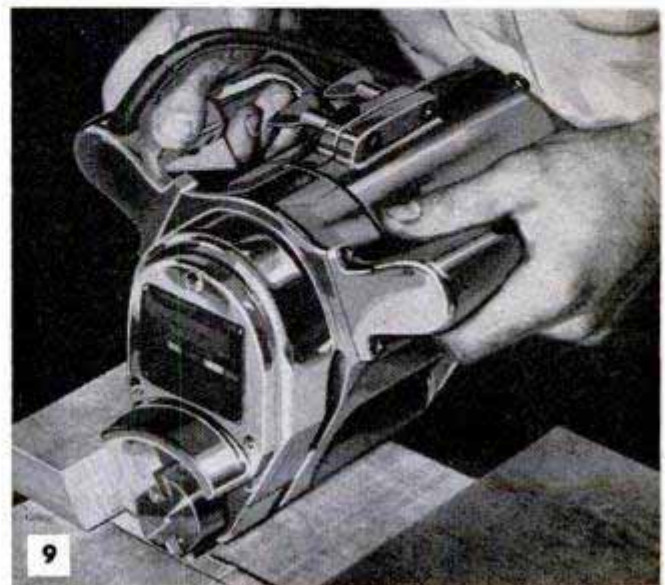
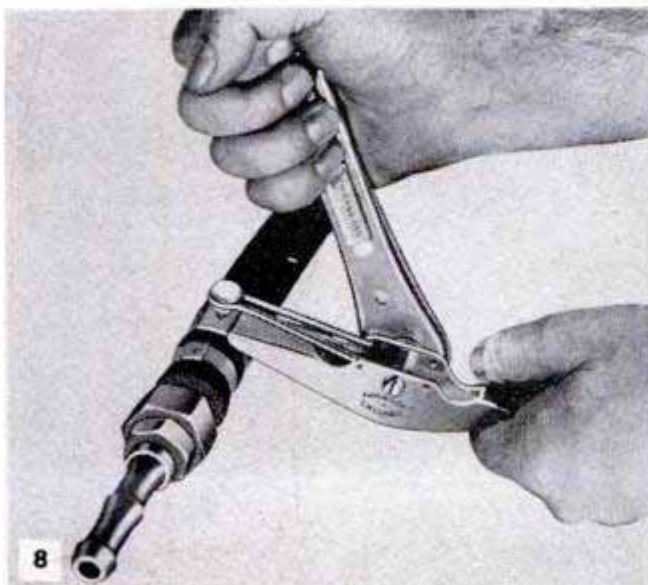
**5. SCREW STARTER** holds small screws for starting in the most difficult-to-reach places. Dual bits placed side by side rotate in screw slot when a slight pressure is applied to the handle. When the screw has been gripped tightly mechanism locks automatically. After screw has been started, the tool is easily disengaged

**6. NONCLOGGING SANDING CLOTH** is new development in abrasives consisting of individual abrasive grains embedded in a tough, open-mesh fabric. Works on either wood or metal and may be used wet or dry, flat or folded, just like ordinary sandpaper. Both sides of open-mesh cloth may be used before discarding

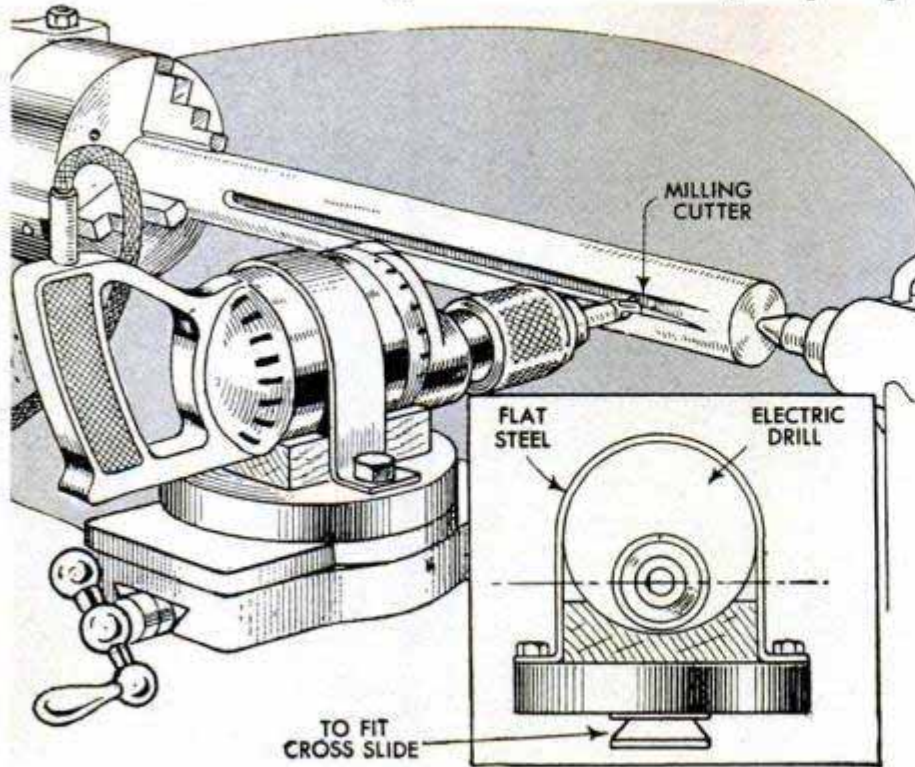
**7. ONE-MAN CHAIN SAW** is driven by hydraulic mechanism from tractor power take-off. Hydraulic pump is attached to power-take-off mounting pad on tractor, and is connected to saw motor by hose lines. By-pass in pump protects operator and saw unit should saw clog or pinch in cut. Saw unit weighs only 30 lb.

**8. PUNCH-LOCK CLAMP** gives a uniform clamping action on circular, square or rectangular work such as hose, ducts, rope and thin-walled tubing. Applied with a ratchet-type tool, the clamp is locked under tension by indenting the clamp bands with a special punch built into the tool. A single hammer blow locks clamp

**9. PORTABLE SHAPER** works on wood, hardboards and nonferrous metals. Unit is hand-held and can be operated in any position on concave and convex surfaces in either vertical or horizontal positions. Useful in pattern work, aircraft fabrication, furniture construction and boatbuilding. Motor 1 hp., 18,000 r.p.m.



## Electric Drill Mounted on Lathe Cross Slide Drives Milling Cutter for Cutting Keyways



Keyways can be cut in a lathe by chucking a milling cutter in an electric hand drill and mounting the drill on the cross slide. First, a steel disk is made up with a tapered lug on the bottom to engage the dovetail slot in the cross slide. The drill then is placed upside down on a wooden block after which both drill and bed are clamped to the disk with a piece of flat steel. Shape the bed so the center line of the drill chuck aligns with the lathe center. With the work held between centers, tighten the tailstock center, lock the headstock and turn on the power. Now feed the milling cutter along the side of the work.

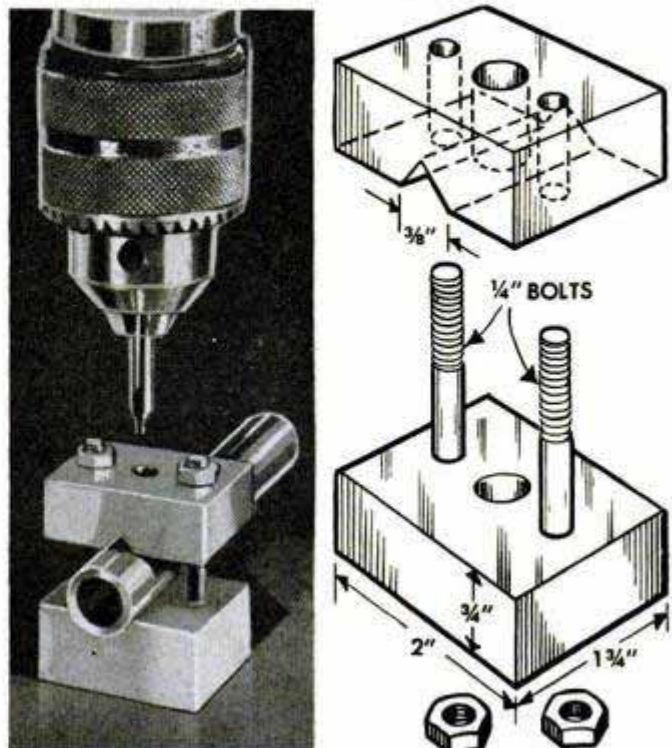
## Scaffold Supported by Stepladders Secured With Hook-Bolts

When using a plank scaffold supported by stepladders, many painters and decorators find that the plank frequently will tip dangerously when they tread near the edges. To overcome this, one painter cut slots, centered on the plank and located a short distance from each end, to take a hook-bolt. The slots are cut long enough to permit easy adjustment of the bolts to

the steps without the need for moving the ladders. The bolts are inserted in the slots so that they hook under the steps and thus, when tightened, hold the plank firmly in place. A washer is placed under each nut to support the bolt in the slot. In many cases, this arrangement will permit the ladders and plank to be moved about as a single unit.

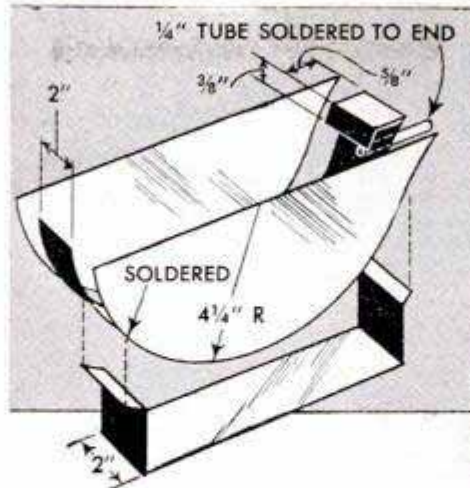
## Jig Clamped to Round Work Provides Guide When Drilling Holes

The usually difficult job of drilling holes in round work is greatly simplified by the use of this jig and a center drill. The center drill is used to start the hole, after which a regular twist drill of the correct size is used to complete the hole. As you can see in the detail, the jig consists of two metal blocks, one of which serves as a base and the other a cap. Both pieces are drilled centrally for the guide hole which takes the drill. The base is drilled and tapped on each side of this hole to take two stud bolts, which project to hold the cap in place. The latter is drilled to slide over the two studs and has a V-groove cut in the underside to aid in gripping round stock. After the work has been put in place, two nuts are turned down on the studs to hold the cap against it. The jig can be made any size desired, and if you have a variety of work to do it's a good idea to make up more than one of them. Each one can be made to hold work of different sizes within a given range.



Since neglect of the air-filter screen on an automobile will eventually affect the engine's performance, care should be taken to assure periodic cleaning of the unit. According to most car manuals, this should take place about every 1000 miles. The job of cleaning the screen may be simplified to a great extent by washing it in a container, similar to the one shown, which has been partly filled with kerosene. Sides of the container are semi-circular in shape and, together with a center strip, are cut from large tin cans to form the container itself. Another strip is bent to form a base and is soldered in place. One end of the container is flared slightly and fitted with a 1/4-in.

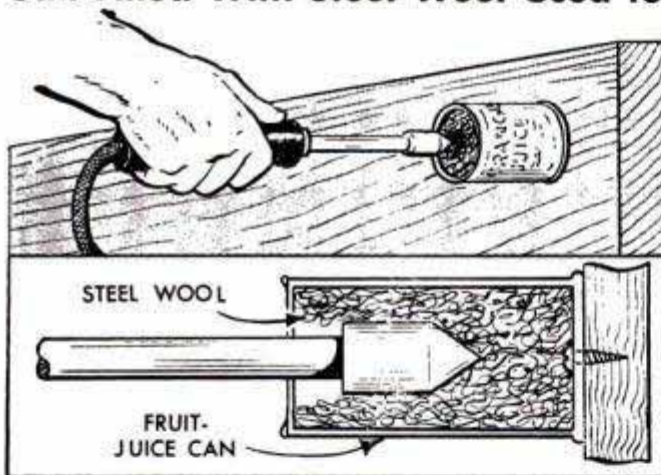
## Air-Filter Screen of Car Washed Easily In Container Assembled From Sheet Tin



tube to facilitate emptying when finished. After the screen has been washed thoroughly, it should be drained and oiled before installing it again.

R. Hanscom, Elmhurst, Ill.

## Can Filled With Steel Wool Used to Clean Soldering Iron



To keep the tip of a soldering iron clean and bright, insert it from time to time in a can containing steel wool, working it back and forth and twisting it around. Use a can of the type in which baby foods or frozen fruit juices are sold and screw it to a wall or part of a workbench. After filling the can with steel wool, bend part of the edge over to keep the wool from being pulled out whenever the iron is withdrawn. It's also a good idea to drive several metal screws into the side of the can to prevent the wool from turning with the iron as it is twisted around inside the can.

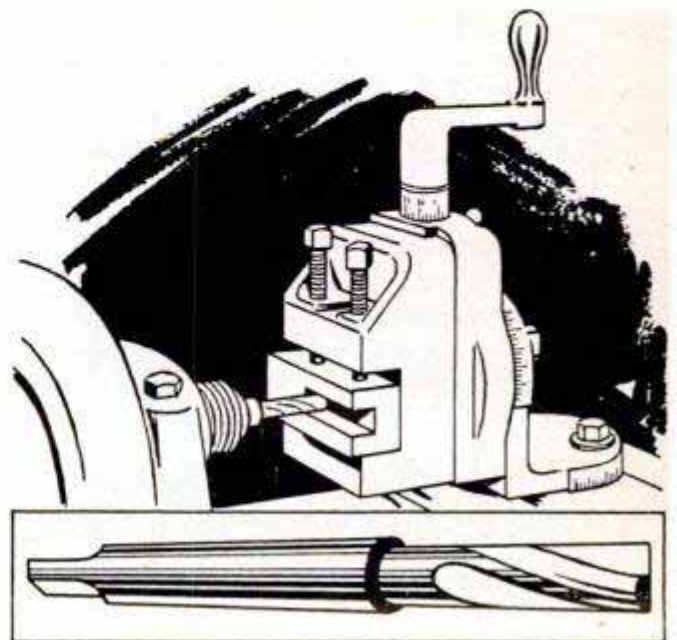
## Broken and Worn Twist Drills Converted Into Taper-Shank End Mills

Broken or worn drills can be salvaged by converting them into end mills for cutting keyways, grooves and recesses. To do this, first square the ends of the drills and then grind each cutting lip to a 3-deg. bevel. To avoid spring or possible breakage, drills of small diameters should be kept quite short or well supported by chucking them close to the cutting end.

## Roadside Repair for Fuel Pump

Stranded by a pin-point leak in a fuel pump, I wet a soft cloth and wrapped it tightly around the body of the pump, holding it in place with a short length of cord. This simple repair enabled me to drive several miles to a service station where the defective pump could be replaced.

Wilbert W. Thomas, Thayer, Mo.



# Bending

# SHEET METAL with a BRAKE

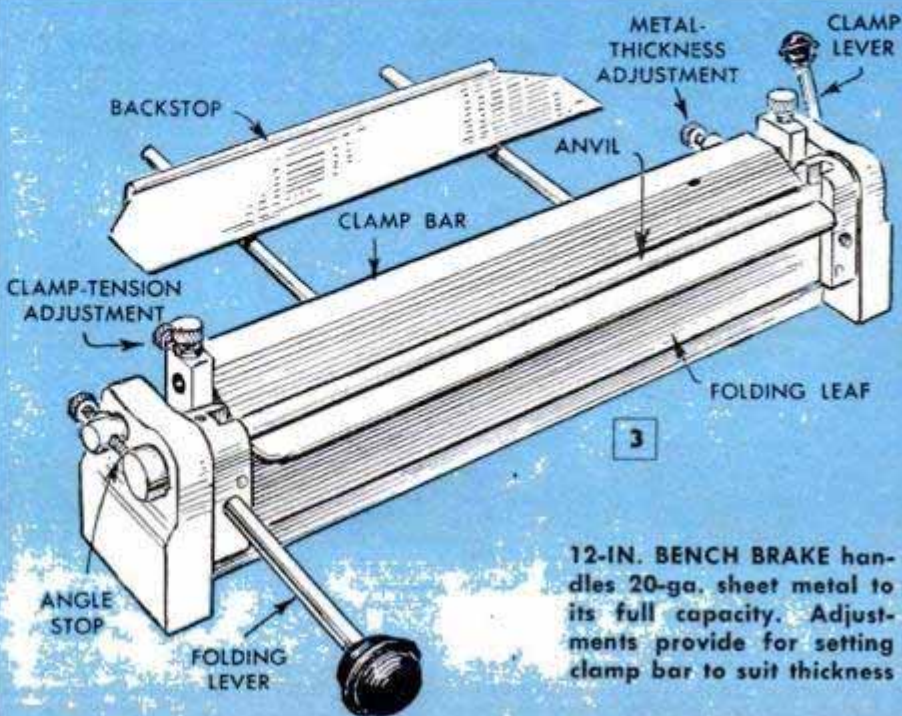
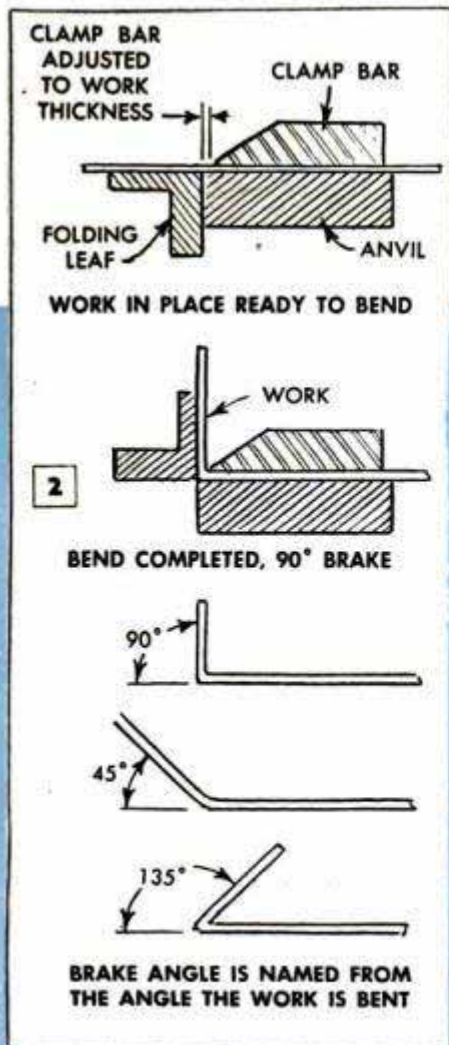


1 POLISHED STAINLESS STEEL bent in a zigzag pattern makes this attractive modern lamp base. Top cap and base are of hardwood

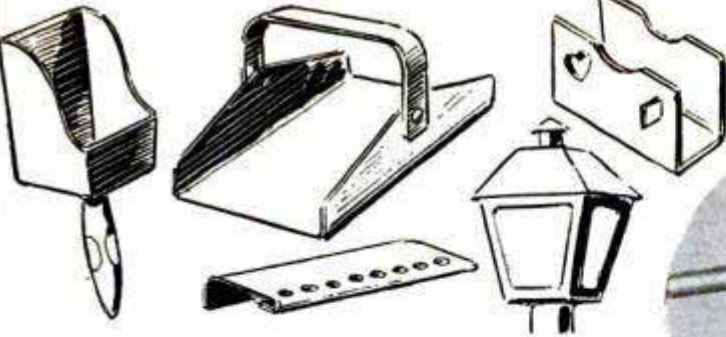
ONE OF THE main characteristics of sheet metal and the one that appeals most to the craftsman is that it can be bent to a wide variety of shapes. In small shops the tool that does this job is a simple hand-operated device, commonly called a brake, or bar former. Fig. 3 shows a typical bench-type brake suitable for craftwork and light professional jobs in metals up to 20-ga. steel. A brake of this type has three main parts — anvil, folding leaf and clamp bar. The work is supported on the anvil, held by the clamp bar and bent by rotating the folding leaf, Fig. 2. Although brake work requires no skill so far as any individual bend is concerned, it takes a considerable amount of actual experience to make the operator familiar with various sheet-metal shapes.

**Reverse bends:** This is one of the few multiple bends which the brake can make without complications. The work is alternately turned face up and face down to make as many bends as desired, Fig. 5. As each bend hooks over the folding leaf, the minimum step which can be made with the

By  
Sam  
Brown

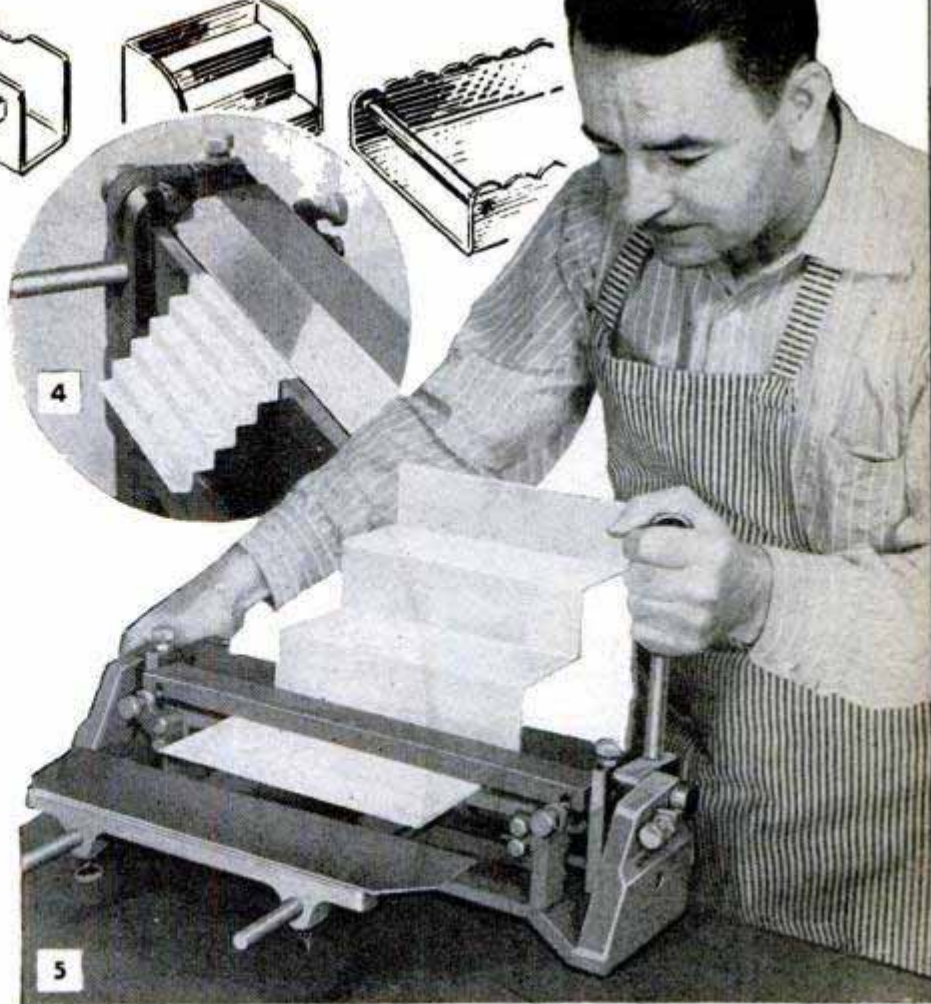


12-IN. BENCH BRAKE handles 20-ga. sheet metal to its full capacity. Adjustments provide for setting clamp bar to suit thickness

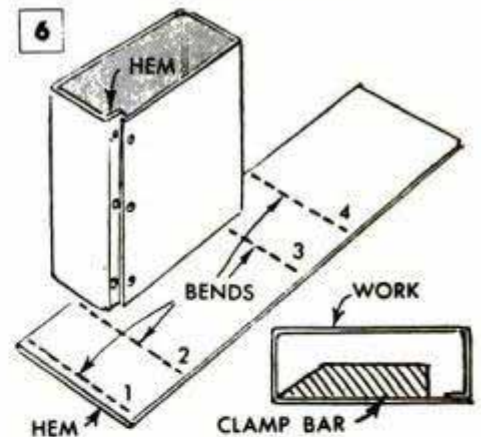


brake shown in Fig. 3 is 1 in., the width of the folding leaf. If the front portion of the folding leaf is removed, reverse bends with  $\frac{3}{8}$ -in. steps can be made, Fig. 4. Steps over 1 in. may be made as desired. In this case, alternate bending lines must be marked on opposite sides of the work so that they are visible when the work is turned over. Many interesting projects can be made with reverse bends, such as the lamp pictured in Fig. 1 and detailed on page 223. Bends also may be made on a diagonal, and pleated flower pots or fan shapes can be worked by making the bends wider at one end than the other. Reverse bends usually are made with a 90-deg. brake. When many bends are to be made it is worth-while to set the angle stop, Fig. 3, to assure the same angle of bend throughout.

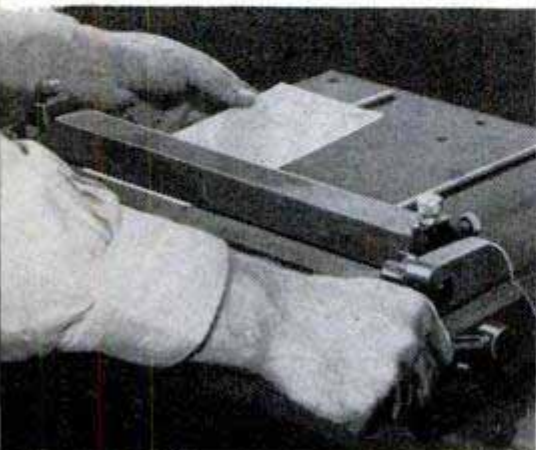
**Closed forms:** A closed form is usually a tube shape, Fig. 6, and it can have any number of sides. A hem  $\frac{1}{4}$  in. wide, or wider, ordinarily is provided to fasten the ends of the form together. A closed form offers no complications provided it can be fitted over the clamp bar, Fig. 6. The sequence of operations in making a typical closed form is shown in Figs. 7, 8 and 9. The hem usually is made first. Also, when the tube approximates the shape and size of the clamp bar, the hem should be made on the short side, as in Fig. 6. Starting with the short side, you naturally finish with a long side, Fig. 8, which matches the shape of the clamp bar. Any good bench brake has an instantly detachable clamp bar to permit ready removal of closed work, Fig. 9.



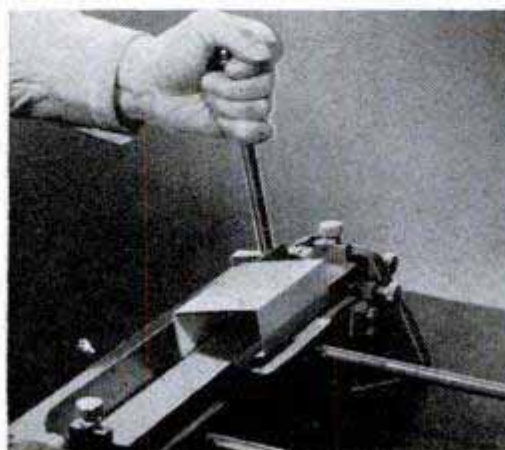
**REVERSE BENDS** can be continued indefinitely by turning the work over to make the successive bends. Steps as small as  $\frac{3}{8}$  in. in width can be made simply by removing the front portion of the folding leaf in the manner pictured in the inset above, Fig. 4



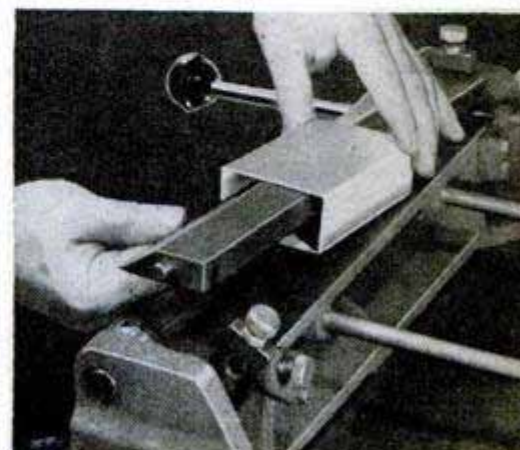
**CLOSED FORMS** are readily made when shape is slightly larger than clamp bar. Photos show how it's done



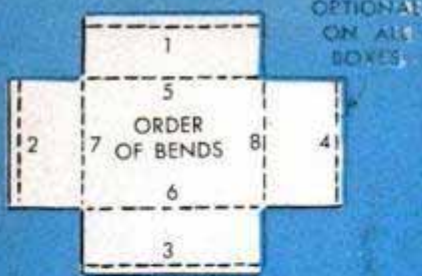
**7** SETTING WORK FOR FIRST BEND



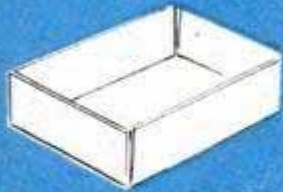
**8** MAKING THE LAST BEND



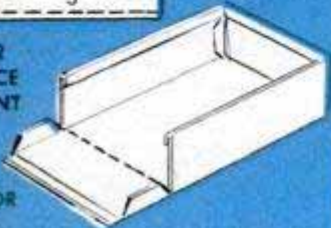
**9** BAR RELEASED TO REMOVE WORK



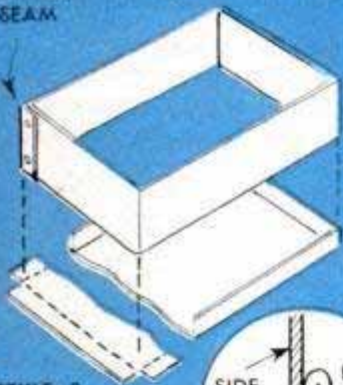
STYLE 1  
ONE-PIECE  
BUTT JOINT



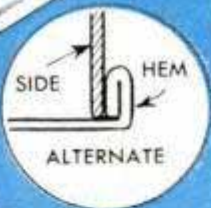
STYLE 2  
ONE-PIECE  
TAB JOINT



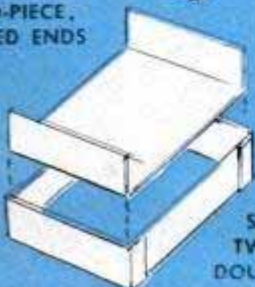
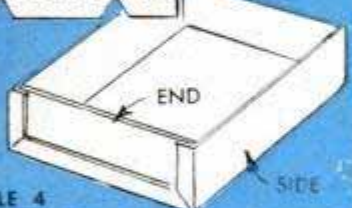
CENTER, OR  
CORNER,  
SEAM



STYLE 3  
TWO-PIECE,  
FLANGE  
BOTTOM

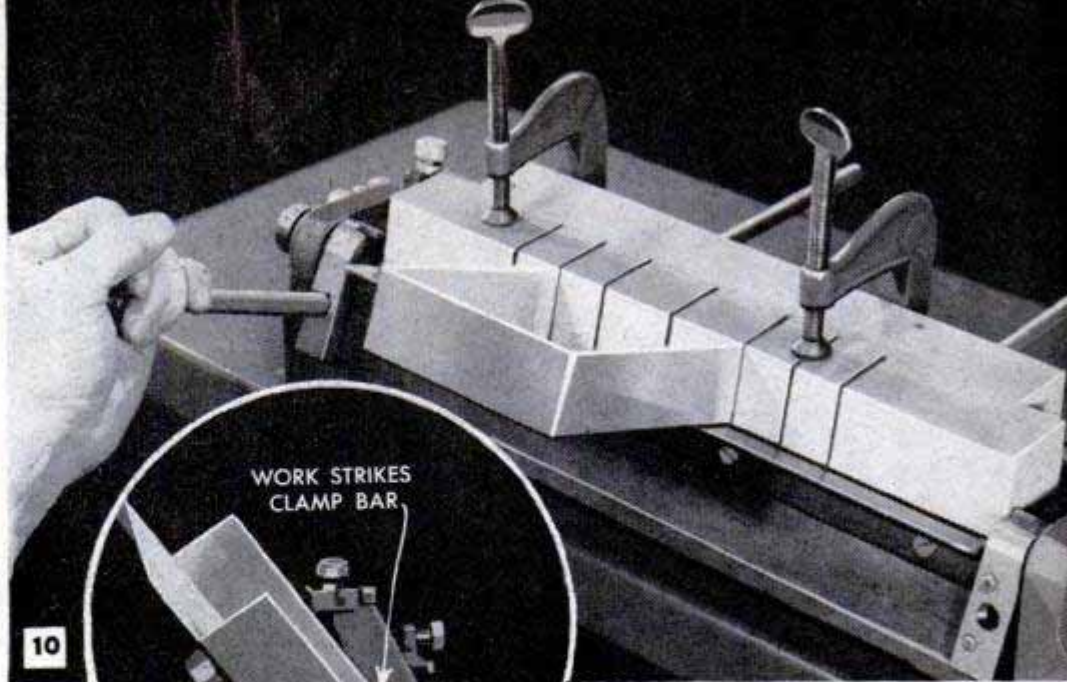


STYLE 4  
TWO-PIECE,  
MITERED ENDS



STYLE 5  
TWO-PIECE,  
DOUBLE ENDS

13

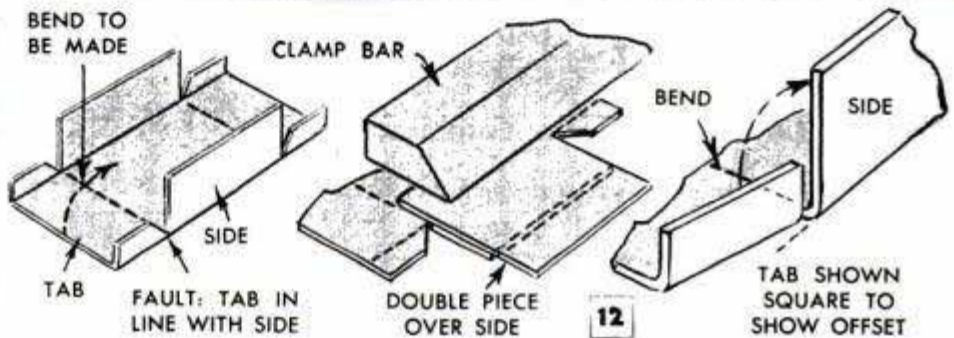


10

11

WORK STRIKES  
CLAMP BAR

BOX BENDS require a special clamp bar which can be made of hardwood. Note how the slots in bar take sides of box when making closing bend



12

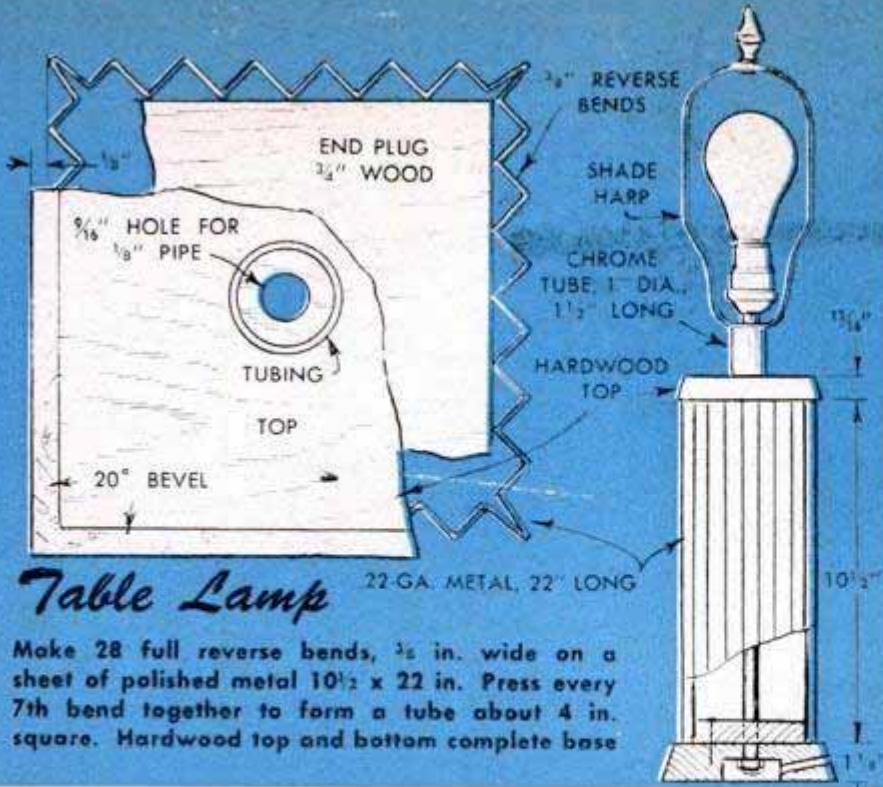
OFFSETTING TABS with the use of a doubling piece of metal permits easier and neater bending of those bends that close the box form in final assembly

When a closed form is smaller than the clamp bar, the work will run into the bar on the final bend. Most work of this kind is simply forced on the last bend, permitting the work to distort and then reshaping by hand hammering or hand pressure alone. It is sometimes worth-while to make up special thin clamping bars, Figs. 23 and 24, to suit small openings.

**Box bends:** There are many different ways to make sheet-metal boxes, five of the more popular styles being shown in Fig. 13. The simplest is one-piece construction with butted joints, style 1. Although the joints usually are soldered, open joints are practical for certain jobs. The standard clamp bar of the brake cannot be used for most box bends. What happens is shown in Fig. 11. When a style-1 box is made, it is no trick at all to bend two opposite sides of the box, but when you try bending the two remaining sides you find the first bends striking the clamp bar, Fig. 11. Special clamp bars can be purchased or made to solve this problem. One style is the slotted bar, Fig. 10, which is satisfactory if made of hardwood. It should have a front-edge bevel of about 15 deg. and the back edge should be notched to take advantage of the screw adjustment to set it square with the folding leaf. A wooden bar is not strong enough to take pivot pins to work with the regular folding lever. This makes it necessary to clamp the bar for each end as in Fig. 10.

Perhaps the most common box construction is style 2 with

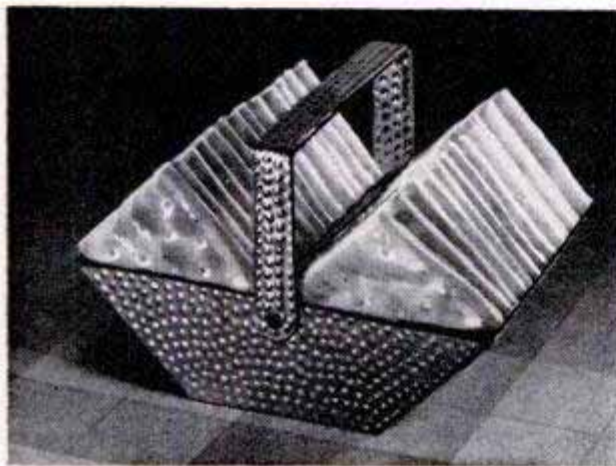




## Table Lamp

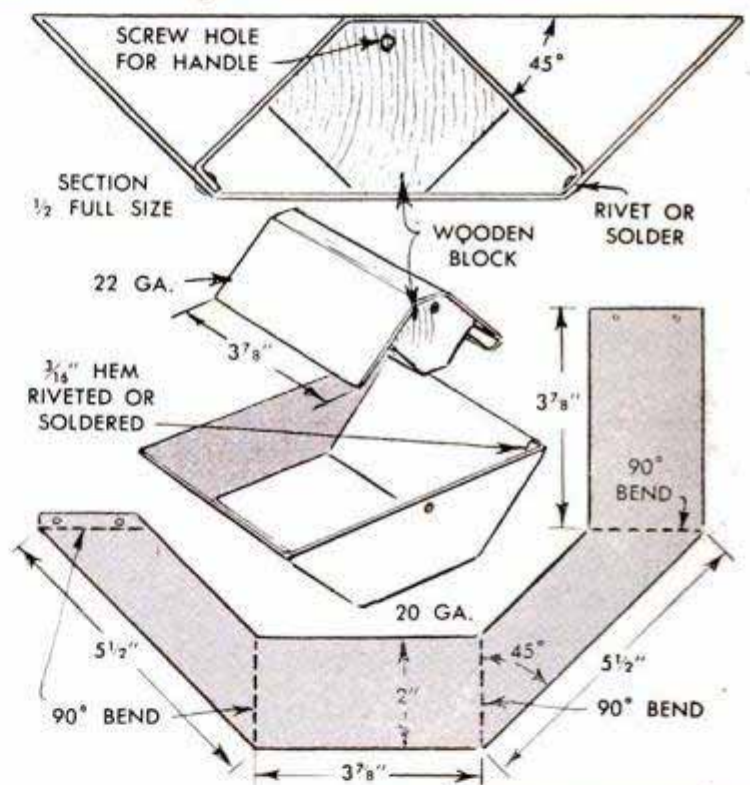
22-GA. METAL, 22" LONG

Make 28 full reverse bends,  $\frac{1}{2}$  in. wide on a sheet of polished metal  $10\frac{1}{2} \times 22$  in. Press every 7th bend together to form a tube about 4 in. square. Hardwood top and bottom complete base



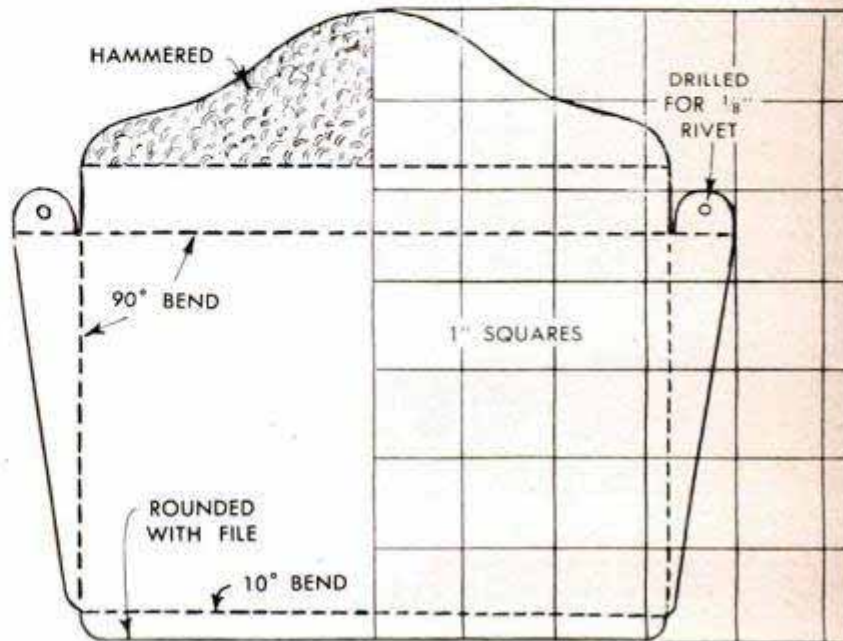
## Cracker Server

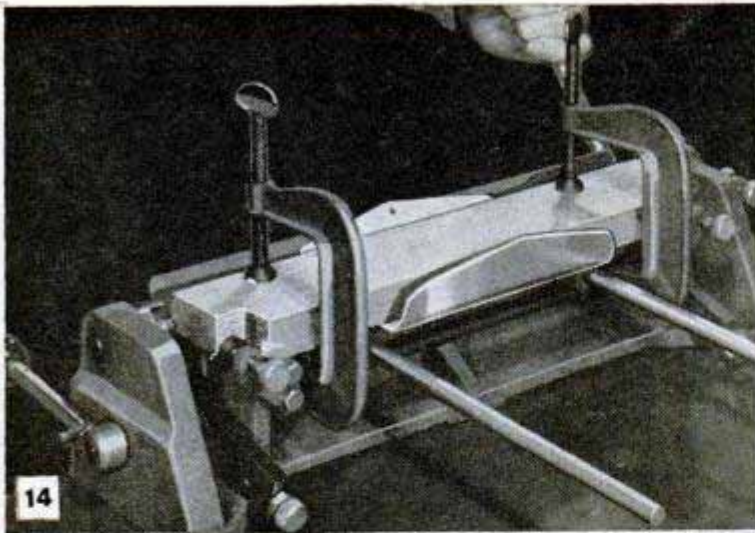
Form the outer part first, then bend the inner part to fit. The handle is bent from a  $\frac{3}{8} \times 9$ -in. strip. Using plain metal, the outer part can be 20-ga., the inner part 22-ga. and the handle 18-ga. metal. Server in the photo is made from 24-ga. chrome-plated stock with a hob-nail finish which was made by tapping with a rounded punch. Note the unusual surface texture



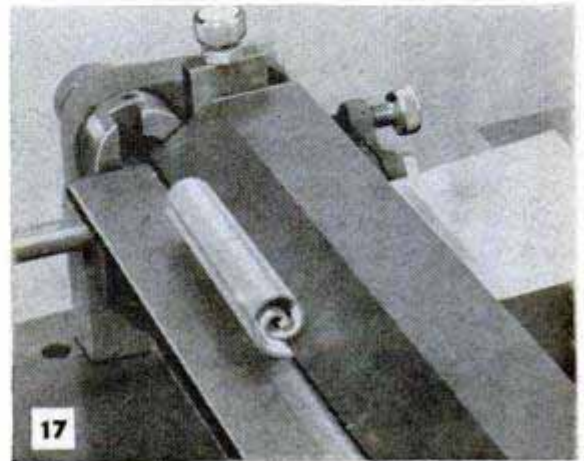
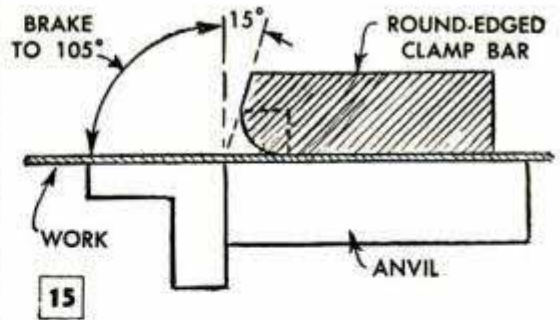
## Crumb Tray

This is a simple brake job. Handle sections are hammer-finished before bending. Tray is made from stainless steel, red brass or cold-rolled copper

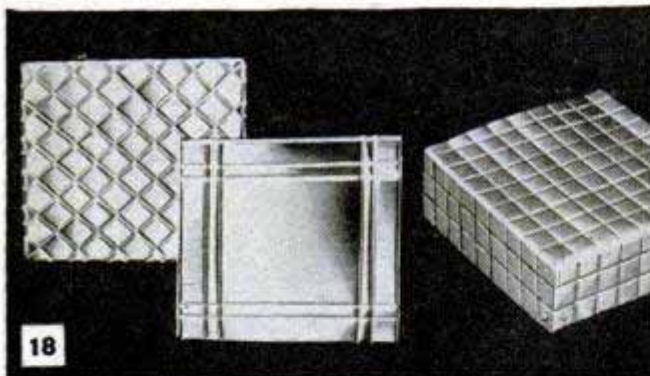
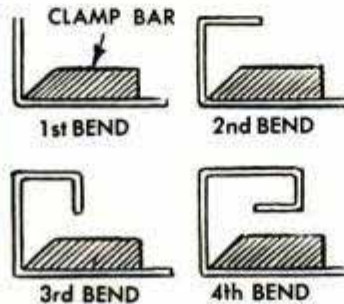
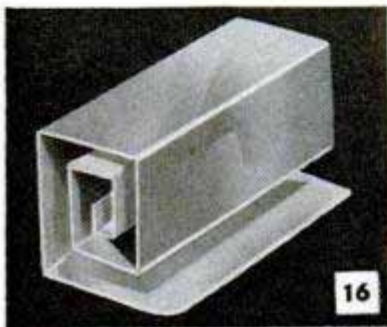




**ROUND CORNERS** are bent with aid of a clamp having radius worked on one edge. An angle of 105 deg. corrects springback



**SPIRALS** are easily worked out with short successive bends. The angular type, which is commonly used as decoration, is formed as detailed in the sketches at the left. Note the clamp bar



**CREASING** is useful for special forms of ornamentation. Lines are deepened by using pad under metal

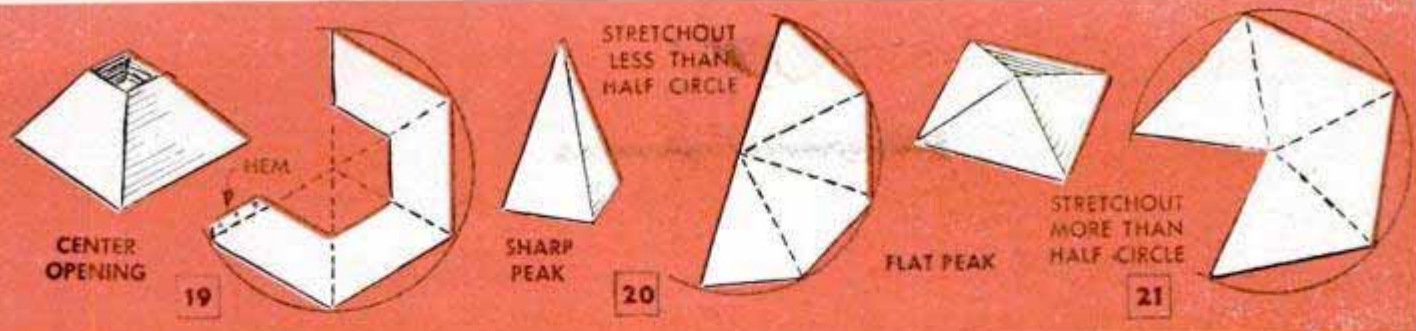
tab joints. One trick in making a box of this kind is the offsetting of the tabs, which allows a much neater fit than when the tabs are simply formed in line with the side bend. Fig. 12 shows how to offset. When ordinarily bent, the tabs are directly in line with the sides and do not bend in or out readily when the final bend is made. Now, if you use a doubling piece of metal over the side of the box when the bend is made, Fig. 12, the tabs will be offset slightly to the inside, as shown in the right-hand detail, permitting a neat corner closure. Where the tabs are to form on the outside of the box, the tabs would take the doubling pieces instead of the side.

Style-3 box is a useful pattern. The sides are bent easily, being simply a closed form. The bottom is like the style-1 box with the

flanges inside or outside as desired. Style 4 is a neat form of construction requiring no offsetting. Style 5 often is useful since it can be made without difficulty by using the standard clamp bar.

**Pyramids:** This figure can have any number of sides, four being the most common. When you have a big center opening—big enough to fit over the clamp bar—the bending of the pyramid is easy, being essentially the same as a simple closed form, Figs. 19 and 22. A pyramid with a small center opening will always strike the clamp bar but usually can be forced, or, it can be worked over a special clamp bar made small enough to pass through the work, as shown in Figs. 23 and 24. Pyramids which run to a peak, Fig. 20, form readily if the stretchout of the figure is contained in a half circle or less. When this is the case, you usually can bend all but the last fold without interference. Peaked pyramids having a stretchout greater than a half circle should be designed with diametrical bends as in the right-hand detail, Fig. 20. A peak figure like this cannot be formed fully on the brake since the work eventually fouls at the bends. Hand reforming is necessary.

Fig. 21 is the one type of pyramid which cannot be formed on the average brake. You can make the center bend, but that's all. If you try to make the other bends, you will get a crease across the work where it is not wanted. One common solution to a



**PYRAMIDS** can have any number of sides but figures with center openings are the easiest to bend to shape

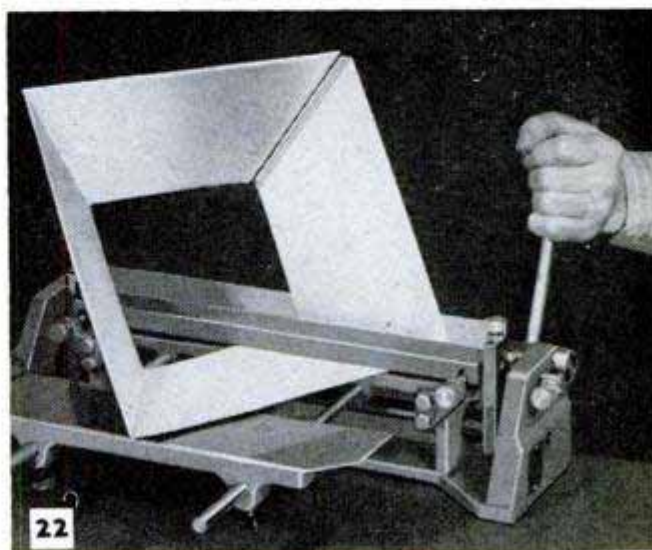
job of this kind is to make the work in two parts and solder together. Otherwise, the center bend can be made on the brake and the other two bends made by hand hammering over a steel bar.

**Round corners:** With round-corner wooden clamp bars which you can make easily, a brake will form round corners of any radius, Fig. 14. After the round is formed on the wooden bar with a suitable shaper cutter, the remainder of the edge should be sawed at a 15-deg. bevel, as in Fig. 15. When the bar is fitted in place, it should be set back slightly to allow a brake angle of about 105 deg., which is necessary to overcome springback. Since the standard clamp bar opens to about  $\frac{1}{4}$  in. above the anvil, rounds of  $\frac{1}{4}$ -in. radius or less also can be worked by slipping a piece of hardwood with a rounded edge under the regular clamp bar. Half-round bends are formed by first making a single quarter-round bend and then shifting the work slightly for a second bend.

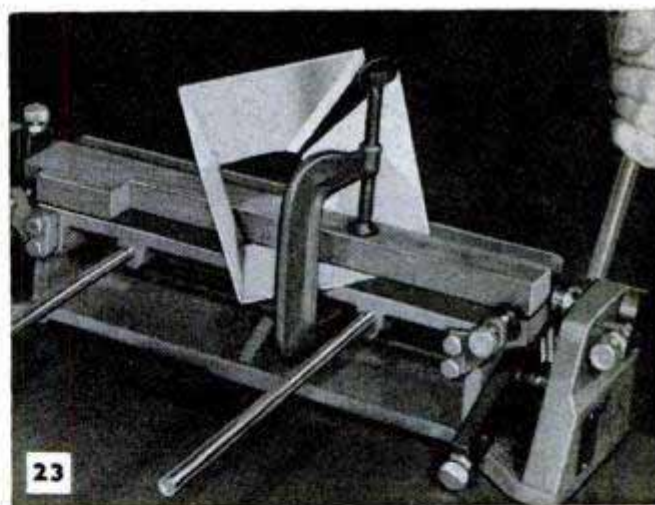
**Spirals:** Both angular and round spirals may be made with the brake. The round spiral can be worked with the regular clamp bar, making successive short bends about  $\frac{1}{16}$  in. apart to curve the work, Fig. 17. The same technique with a  $\frac{1}{8}$ -in. round-nose bar is faster and somewhat smoother. The angular spiral is a plain job of bending, as shown in Fig. 16, starting with the short bend and continuing with as many additional bends as required.

**Creasing:** Creasing is a handy brake operation having utility value in the formation of complicated figures, that is, you can crease and flatten almost any figure and then reform it by hand. Opening of the crease by hand causes more or less rounding of the standing part of the metal and this can be used to advantage in making flutes or beads. Creasing also is used for ornamentation, Fig. 18, and is especially effective on thin metals backed with rubber or other soft material to make the crease more pronounced. The top side of the work shows crease the best and if a soft backing is used it should be placed under the work.

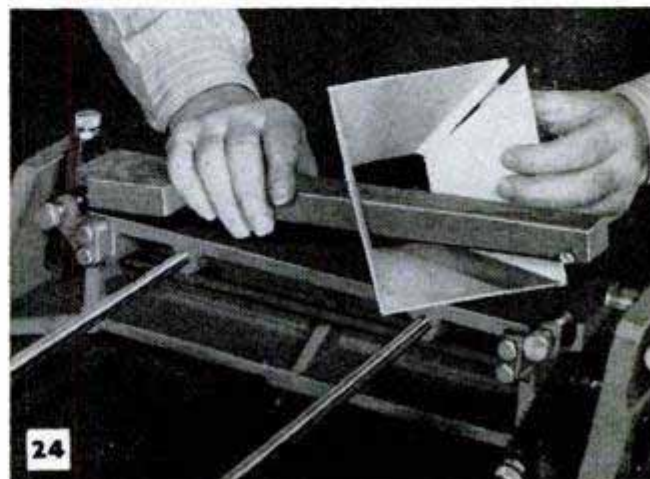
★ ★ ★



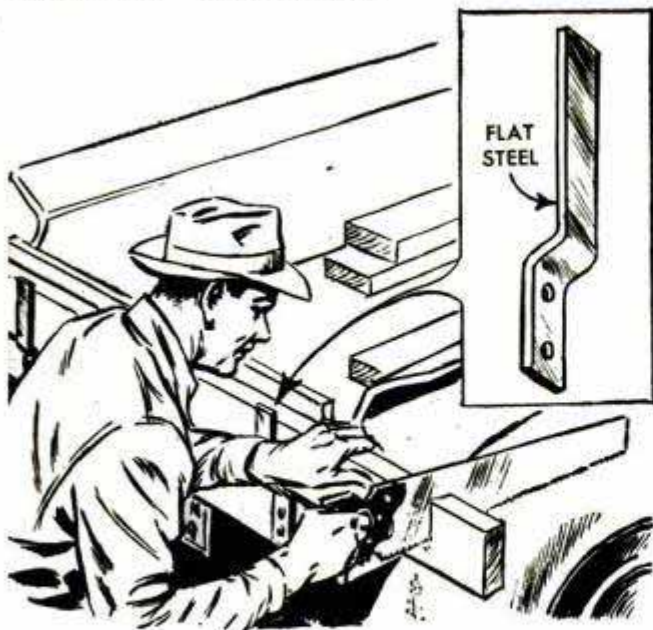
**BIG CENTER OPENING** assures simple bending because clamp bar is always clear. Hem is braked first



**SPECIAL CLAMP BAR**, above, is made of hardwood to form pyramid with small opening. Below, wood screw in bar is used to set position of adjusting screw

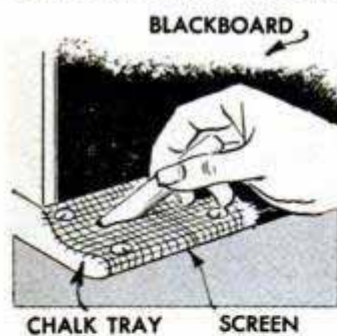


## Brackets on Truck Endgate Serve as "Sawhorse"



Contractors and others whose work requires occasional rough sawing of boards, will find that a couple of steel brackets bolted to the endgate of a truck serve ideally as a substitute for a sawhorse. The brackets are shaped from  $\frac{1}{4}$ -in. steel. Their length and the amount they are offset will be determined by the width and the thickness of the work usually handled.

## Screen Wire Used to Point Chalk



Attached to one end of the chalk rail of a blackboard, a small piece of screen wire will provide an ideal surface on which to point pieces of chalk. The screen, which is tacked in place, permits the chalk shavings to sift through onto the rail where they may be collected and disposed of easily.

## Fence Posts Treated Effectively With Small Supply of Creosote

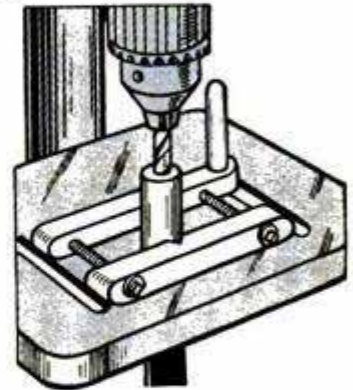
If pressurized-creosoted fence posts are not available, you can give posts the protective coating necessary for added life by soaking the ends to be placed in the ground in an oil drum containing creosote. However, if a sufficient amount of creosote for covering the posts to the depth desired is lacking, soak them for several days, or a week, in all of the creosote on hand. This done, lower a garden hose to the bottom of the drum and run in water to raise the creosote, which will float, higher on the

posts. Again let them soak for a few days, repeating the operation until the posts are creosoted to the desired height.

Otto E. Kirchner, New York City.

## End-Drilling Long Work

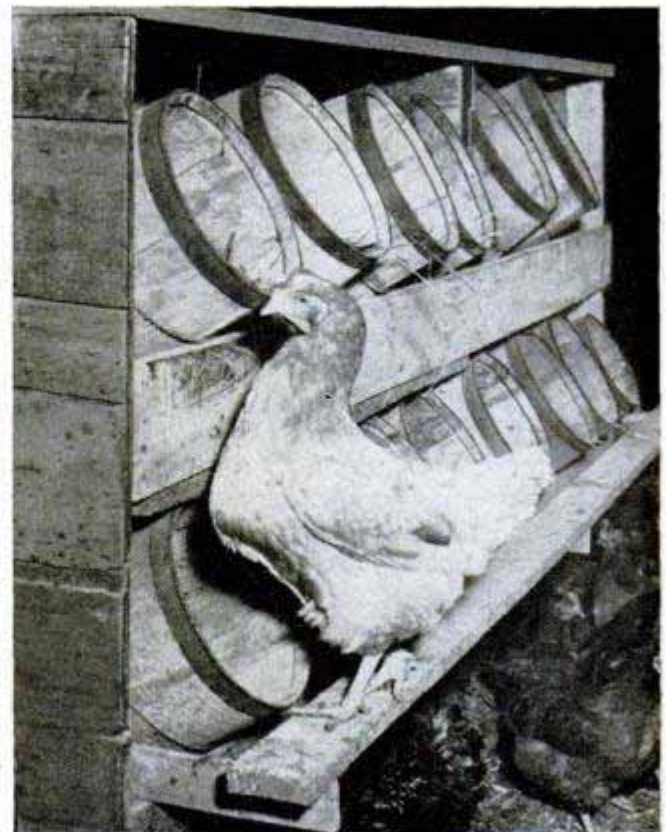
The ends of shafting or other long work can be drilled with little difficulty in a drill press by allowing the work to project through the center hole of the drill-press table and holding it in place with a clamp-type lathe dog. A tool-maker's parallel clamp also may be used if available. By swinging the work table to the right, or to the left, holes can be drilled either in the center, off-center or around the edges of the work.



By swinging the work table to the right, or to the left, holes can be drilled either in the center, off-center or around the edges of the work.

## Nail Kegs Placed in Racks Form Laying-Nest Units

To reduce the number of broken eggs in multiple-nest units, one poultryman replaced his regular equipment with units made by racking ordinary nail kegs in rows one above the other as pictured. Note that the wooden racks are constructed so that the kegs are inclined uniformly at an angle of about 30 deg. The individual kegs are easily removed for cleaning.



## HINTS FOR TV-SET OWNERS

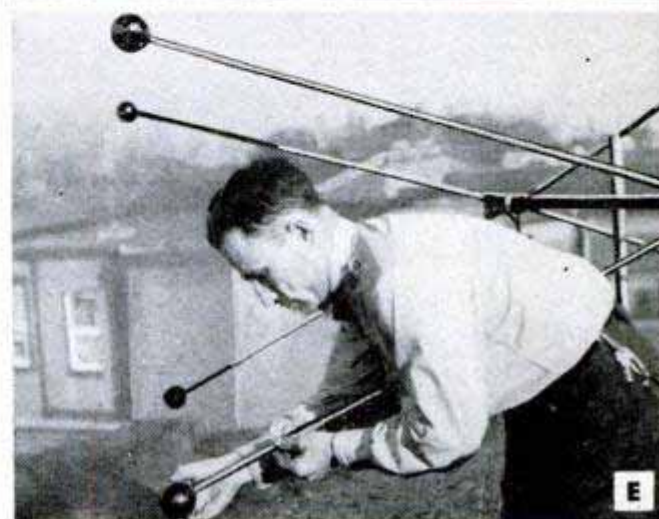
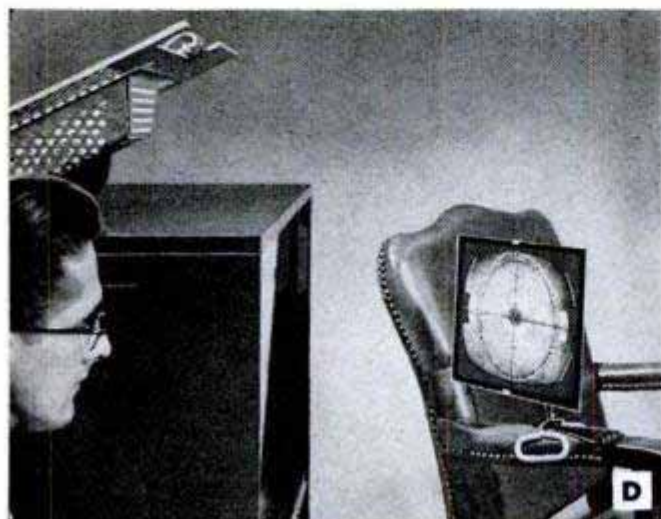
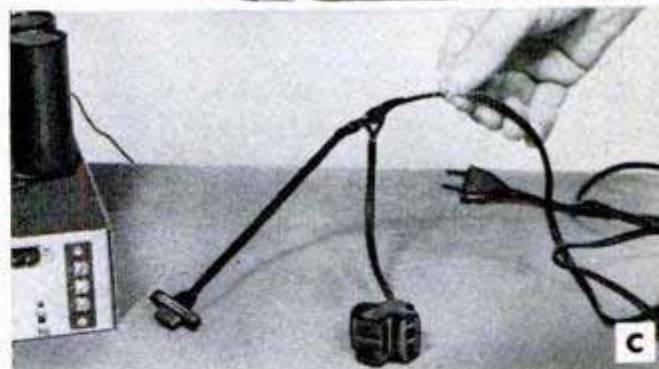
**A**—Using a reading glass for ultrafine focusing on a camera ground glass is an old photographer's trick that can be employed for fine tuning on the television screen. When the scanning lines are magnified it is easy to adjust the control for ultrasharp focus which provides an improved picture for viewing

**B**—Nonpowered isolation box for use with a TV-antenna-distribution system in apartment houses, hotels and stores. It contains a matching network of resistors providing an isolation factor between receivers of at least 30 db, with a minimum signal drop across the outlet. Terminals are for 300-ohm twin-lead

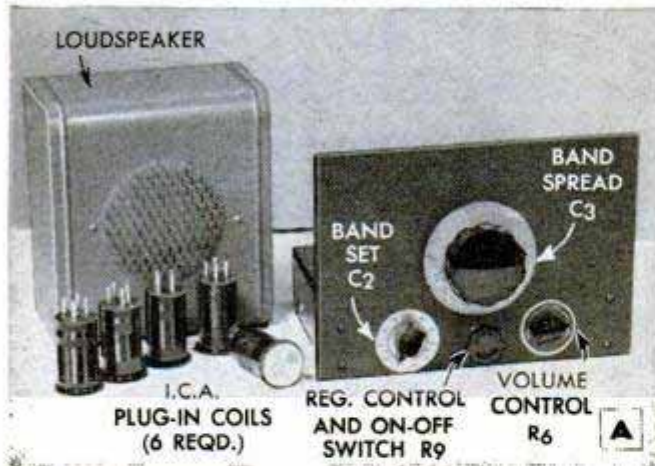
**C**—Three-way cube tap spliced to the TV interlock line cord, commonly used for testing in place of the regular cord, increases its usefulness. It may be employed to connect a soldering iron, test lamp or other equipment without hunting for a wall outlet. Many TV servicemen find this a useful timesaver

**D**—TV-picture aligning is simplified by the use of a target sight printed on the surface of a mirror. Designed by Du Mont engineers as an aid to servicemen, this unit attaches to a chair in front of the television receiver with a spring clamp. The mirror is adjustable to give the proper viewing angle

**E**—One TV-set owner had a simple solution for his problem of intermittent noise caused by antenna vibrations being transmitted down the mast, through the roof and along partitions. He placed toy sponge-rubber balls on the ends of each antenna element which corrected the troublesome vibration period



# BEGINNER'S TWO-TUBE A.C.-D.C.

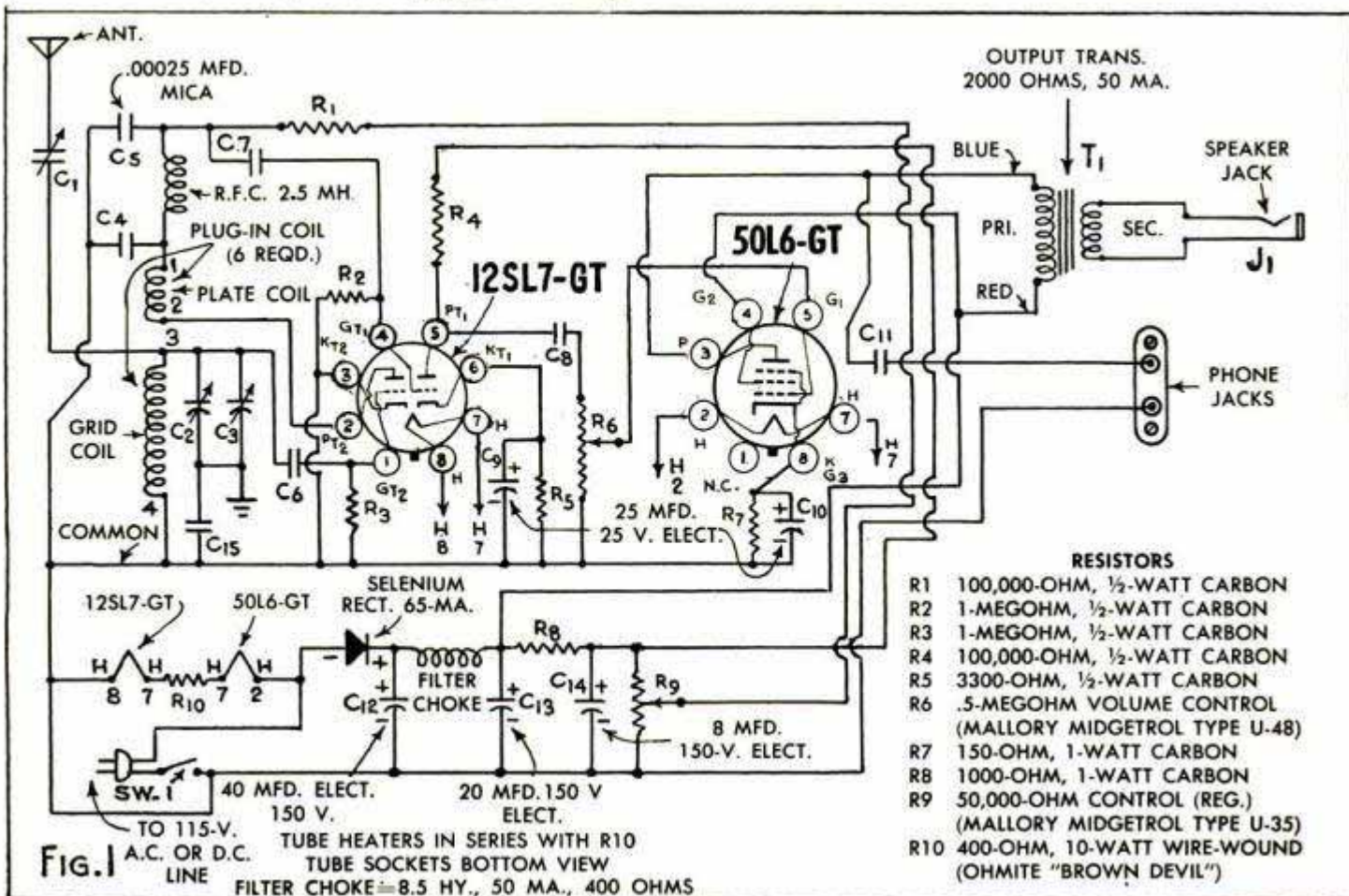


ALTHOUGH simple in appearance, this little student-type radio receiver can literally hop the oceans and bring in stations from many foreign countries. This, of course, means if a suitable antenna is used, and if local receiving conditions are normal.

If you intend to become an amateur radio operator, or if you are interested in listening in on amateur or short-wave stations as well as standard broadcast programs, this simple 2-tube receiver represents a worth-while project. It has been especially designed for the beginner and, though you have had no previous experience with radio, you should have little difficulty in building the receiver and obtaining satisfactory results. Although only two vacuum tubes are used, the performance is similar to that of a 4-tube radio because one of the tubes actually consists of two separate tubes in one envelope, and a selenium rectifier eliminates the need for a separate rectifier tube. There are no coils to wind as the six I.C.A. coils are available from any of the large radio-parts houses.

The circuit is that of a regenerative receiver followed by an audio voltage amplifier and a power-output tube. To change from one band to another it is necessary merely to plug in the coil designated.

A complete schematic circuit diagram is



# SEVEN SEAS SCOUT

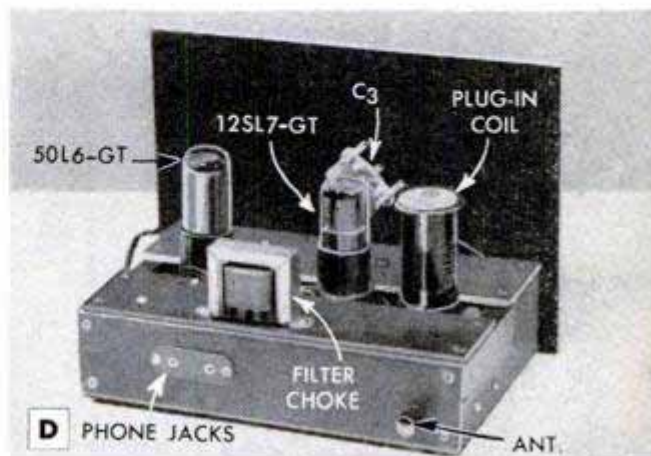
given in Fig. 1 and a pictorial wiring diagram appears in Fig. 2. The chassis-base construction in Fig. 2 does away with socket mounting holes. The selenium rectifier is mounted with a 2-in. machine screw. Check photos A, B, D and E for locations.

To mount C1, the 3-30-mmfd. antenna trimmer condenser, two fiber spacers are used so that there will be sufficient space between the condenser and the side of the chassis to permit opening and closing of this variable capacitor by means of a wooden "screwdriver." The common-negative bus bar (a piece of No. 12 bare copper wire) is supported by a soldering lug on the 12SL7-GT tube-socket mounting screw. Do not substitute metal for the hardboard chassis-top strips and rear panel; the front panel must be metal. All small resistors and capacitors are mounted by their leads and these leads are covered with spaghetti tubing. Keep all leads short and use rosin-core

(Continued to page 236)



C



D

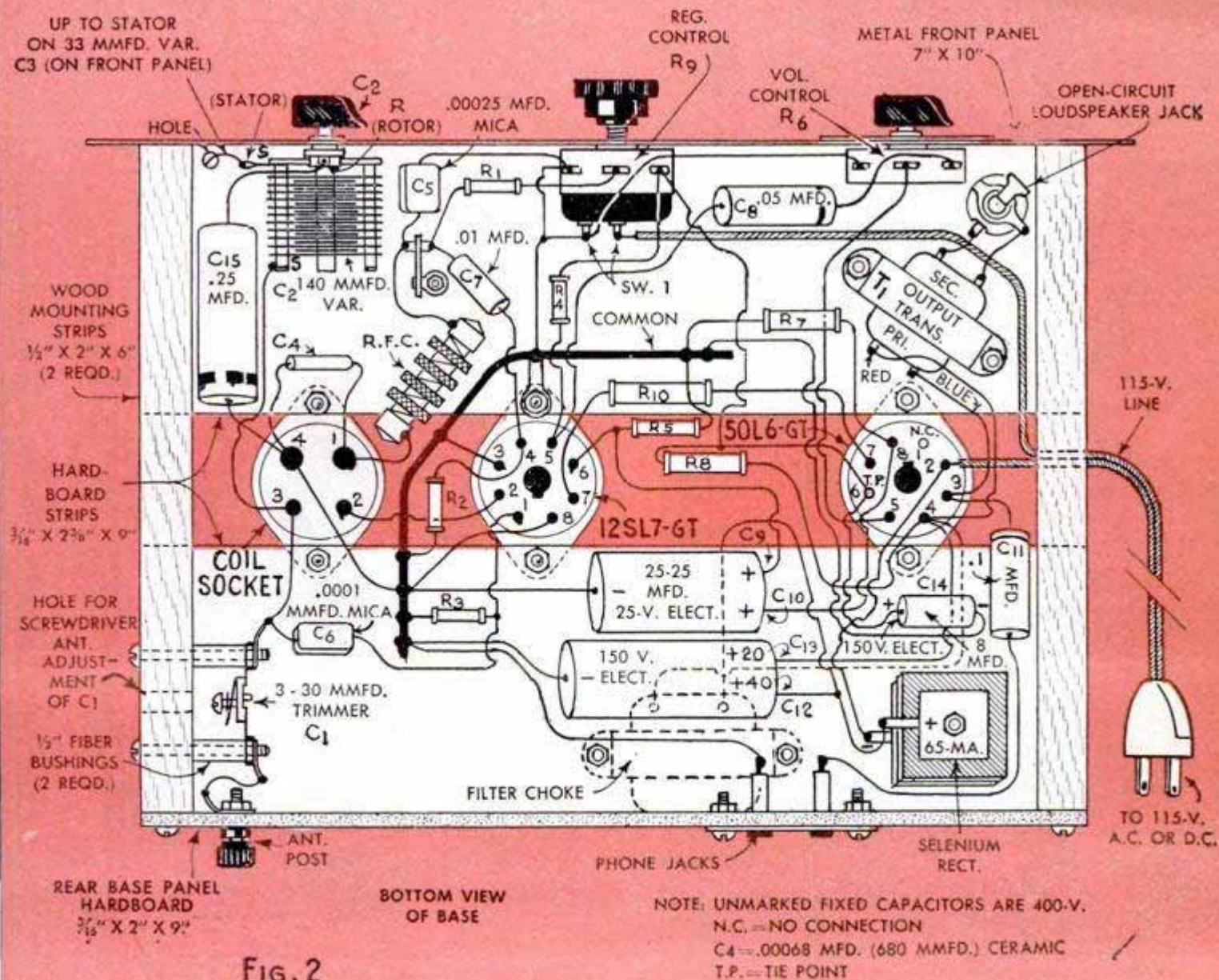
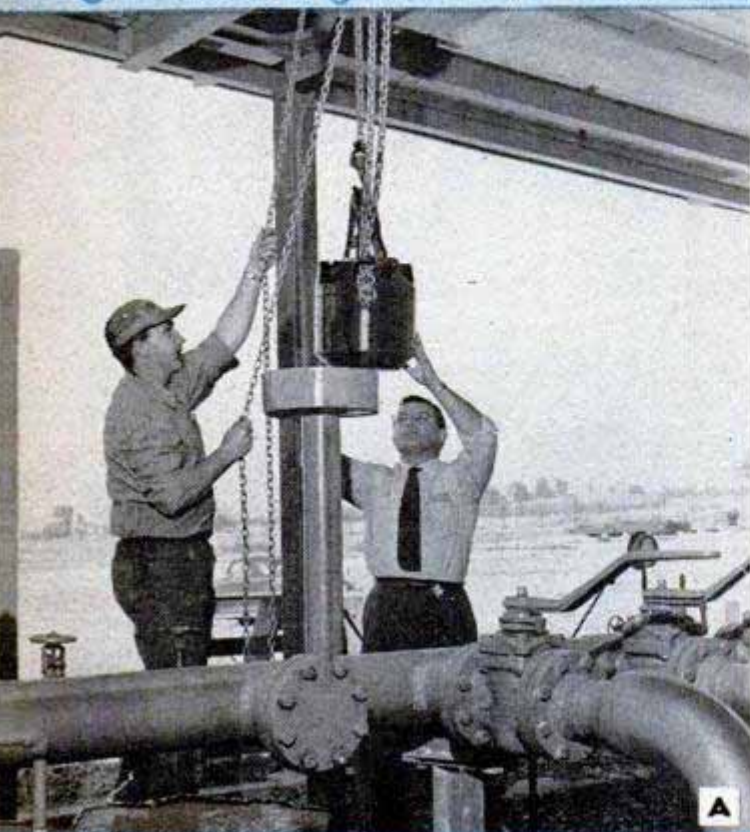


FIG. 2

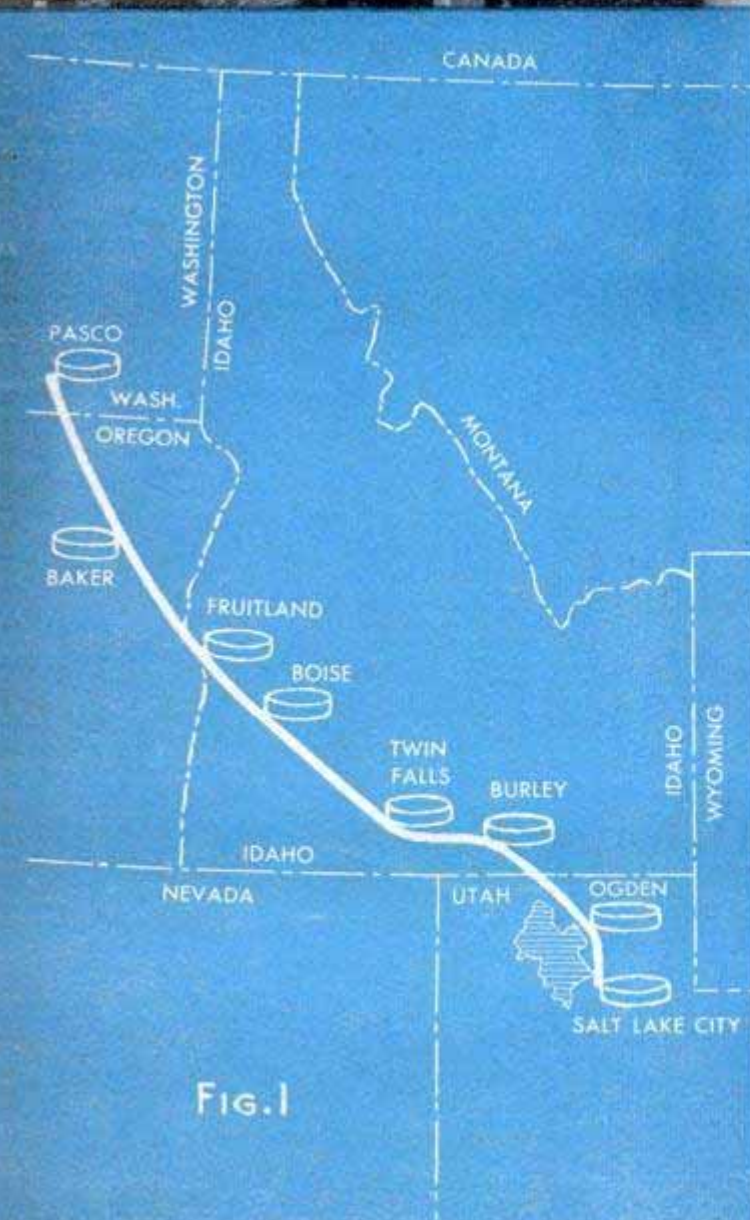
# PIPE-LINE SHIPMENTS



**C**OMMON-CARRIER pipe lines transporting successively such varied items as gasoline, diesel oil and heating oils, must indicate at the terminals when one fluid ends and the other begins. The Salt Lake Pipeline Company, a subsidiary of the Standard Oil Company of California, has developed a new method for doing this which does away with the wasteful process of constant sampling. It also saves valve attendants many hours of watchful waiting.

The new method consists of introduction at the starting point of a minute amount of radioactive antimony at the boundary between two products. Geiger tubes attached to the pipe at destination indicate immediately to the operator the arrival of a new product so that he can change valves and direct the arriving product into a different storage tank. A short pipe line with one starting point and one destination could measure the number of gallons pumped and thus approximate the division point between the two products. But this pipe-line company was faced with the problem of seven intermediate take-off points where a portion of a product might be delivered, involving many small individual shipments over 566 miles of pipe line extending from Salt Lake City, Utah, to Pasco, Wash.; see map, Fig. 1.

The Atomic Energy Commission, aware of the possible value to American industry of the "know how" developed within the atomic-energy program, is cooperating. In this case the radioactive antimony used is ordinary antimony prepared in the Rich-



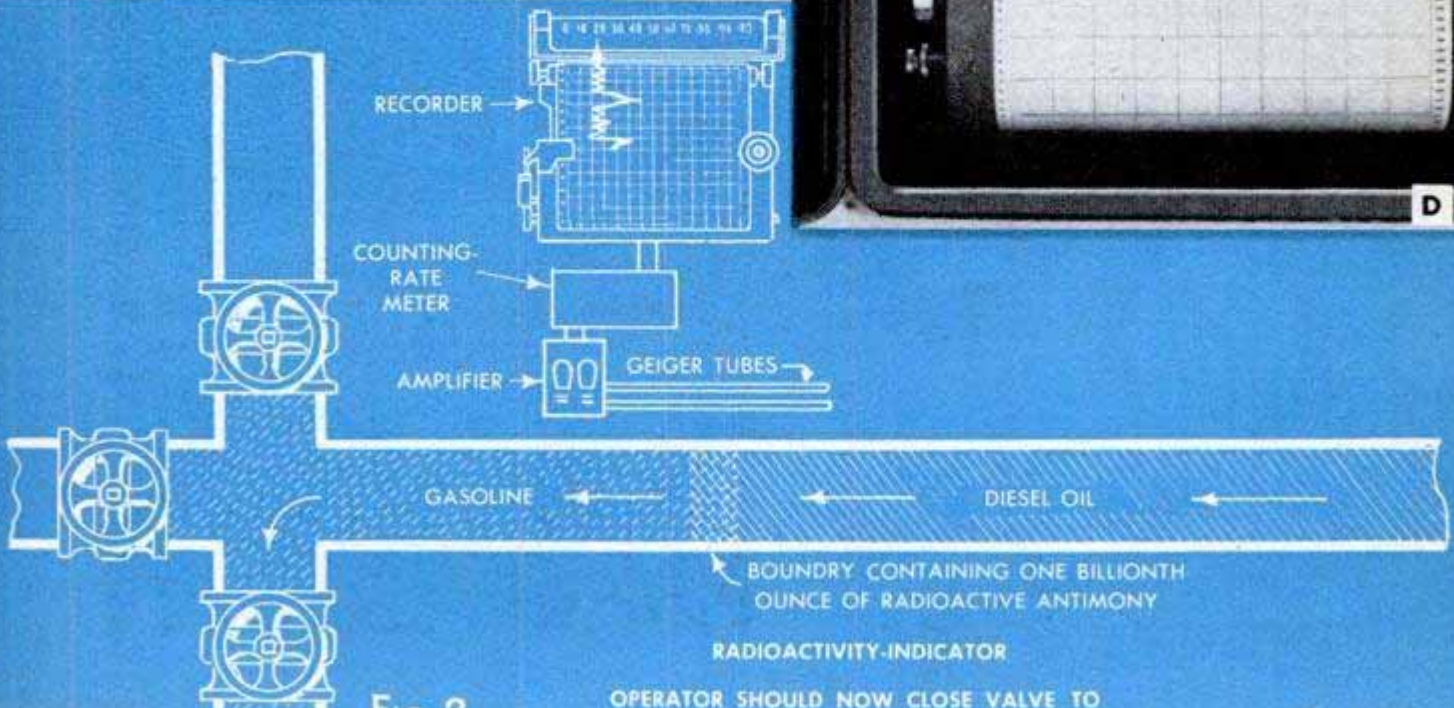
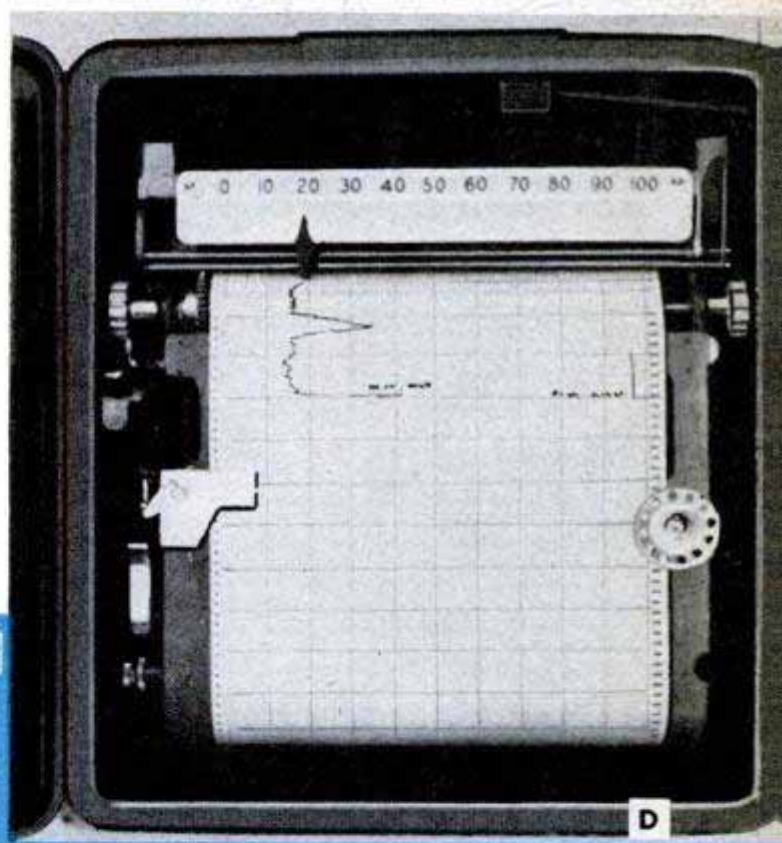
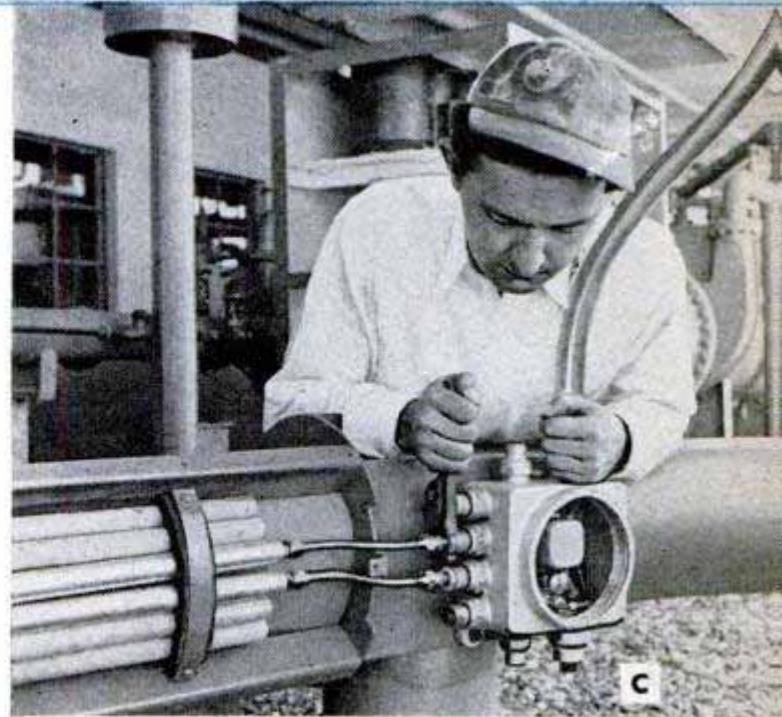


# SEPARATED BY RADIOACTIVE TRACERS

mond Laboratories of the California Research Corporation. It is shipped to the U. S. Atomic Energy Commission at Oak Ridge, Tenn., and placed in an atomic pile where it is subjected to a neutron bombardment which converts a portion of the antimony to the radioactive form. This "hot" material is returned in a lead container to the oil-company laboratories where it is further processed and diluted with a light oil to become this tracer fluid.

Only at the point where the tracer solution is introduced into the pipe line is the quantity of radiation sufficient that special precautions must be taken by lead shielding, remote-control valves and mirror observations. At the introduction point, photo A, the shielded shipping container is shown being hoisted onto a safety stand at the Salt Lake pumping station. This radioactive tracer fluid is then removed from the container and placed in the injection apparatus connected with the pipe line, photo B. The operator in photo B is measuring the tracer fluid being injected into the pipe line by means of a remote-control handle.

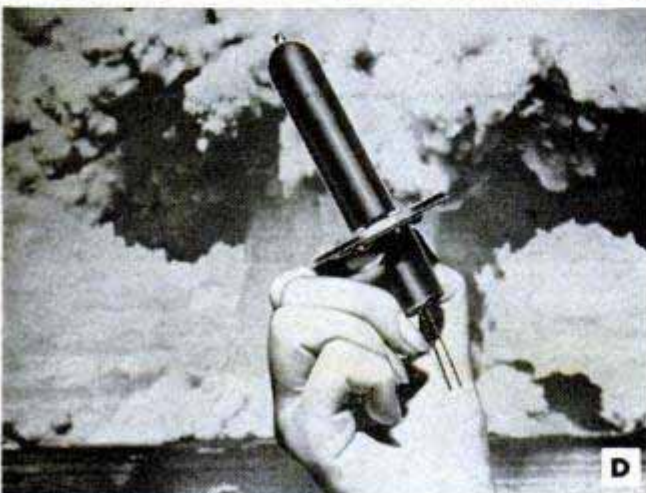
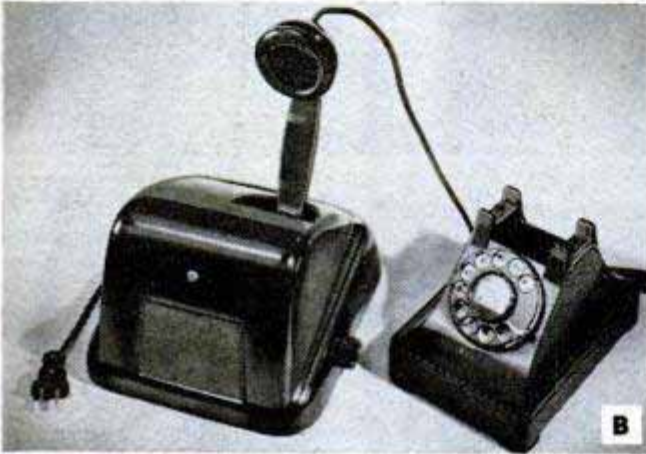
The Geiger tubes, connected to a preamplifier, are mounted in position on the pipe line at the destination point, photo C. As the boundary between the two shipments moves along the pipe line, the radioactive tracer moves with it as indicated in Fig. 2. At each take-off point the signal from the Geiger tubes is fed through the amplifier into a counting-rate meter connected with the Radioactivity Recorder, photo D. As the boundary arrives, a sharp break in the line being traced signals the arrival of a new product. ★ ★ ★



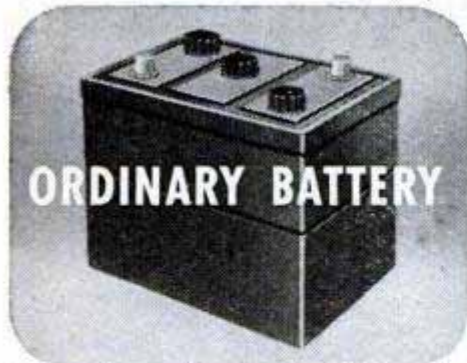
## Ultrasonics and Electronics Today

ULTRASONICS — the sound frequencies which human ears cannot hear—are now being used by one of the large radio-tube manufacturers to conserve materials vital to the nation's defense program. The device illustrated in photo A vibrates at a frequency more than three times that of the highest audible pitch. It is employed to shake off glass beads from valuable tungsten-alloy rods salvaged from faulty discarded vacuum tubes.

The telephone-amplifier unit, shown in photo B, is a useful electronic device that leaves the hands free for writing or other work while the person listens and replies to incoming calls. It operates from any electrical outlet; no connections to the phone line. A special 27-piece tool kit designed for radio, TV and electronic servicemen appears in photo C. It contains practically every hand tool necessary for this work, plus extra pockets for other favorite tools. Putting the finger on deadly atomic rays in planes flying over A-bomb blast sites is the grim job of the electronic instrument shown in photo D. It is known as an ion chamber and is claimed to be much smaller than other gamma-ray detectors of the same sensitivity. It looks like, and is called, "the Finger." The amplified megaphone demonstrated in photo E employs tiny germanium crystals called transistors. It amplifies the normal speaking voice to a volume comprable to a cheerleader's yell. Small batteries are enclosed within the amplifier unit near the mouthpiece.

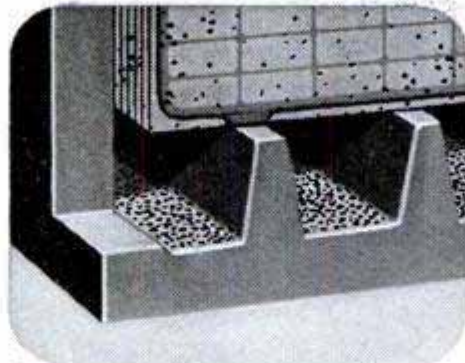


# Which battery do you want in your car?

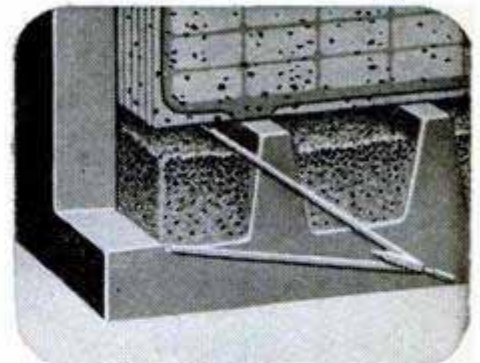


**ORDINARY BATTERY**

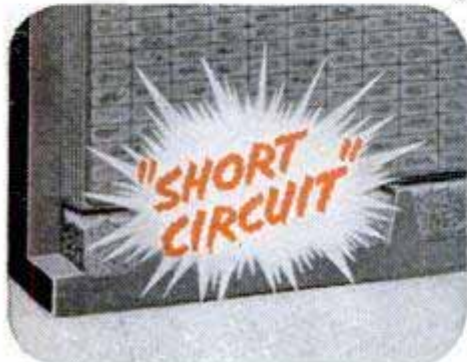
1. In ordinary batteries, small particles keep flaking off positive plates . . .



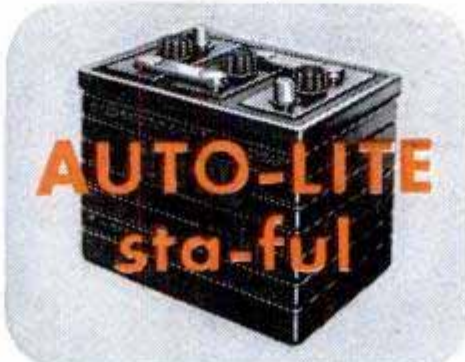
2. so ordinary design batteries must have large sediment wells at bottom of case to hold these particles.



3. Even these sediment wells in ordinary batteries aren't big enough to hold flaking particles from positive plates . . .



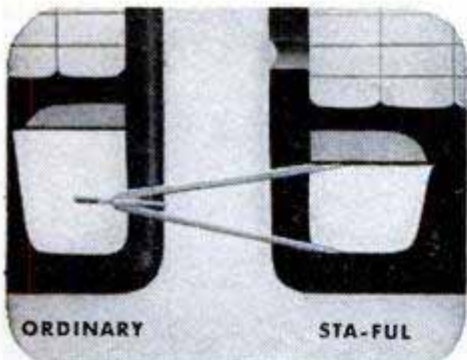
4. so particles pile up and short circuit plates, causing failure.



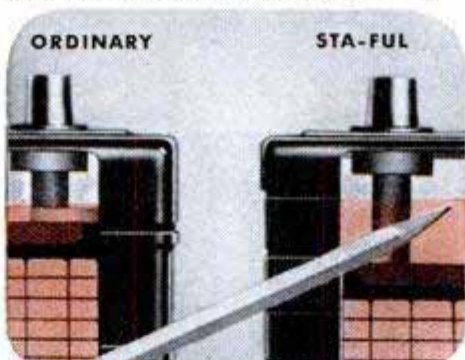
5. But in the Auto-Lite "Sta-ful" Battery, every positive plate has a Fibre-glass retaining mat protecting it . . .



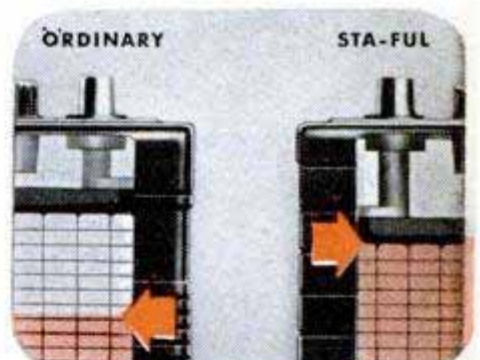
6. to hold the active materials in place to reduce shedding and flaking.



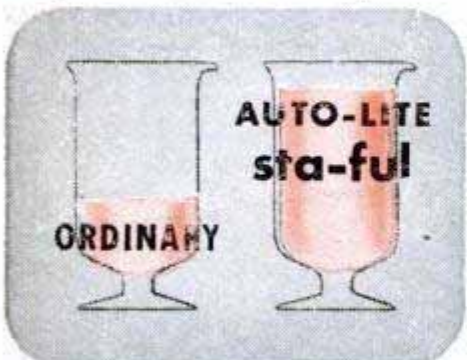
7. Side-by-side view shows that the Auto-Lite "Sta-ful" Battery doesn't need the extra space at bottom that ordinary design batteries do. So extra space . . .



8. in "Sta-ful" Battery is moved to top where it holds more electrolyte, giving room for over 3 times the liquid reserve in the "Sta-ful" as in ordinary batteries.



9. Here's proof of performance! Equal water evaporation shows how the Auto-Lite "Sta-ful" extra reserve keeps plates covered and active.



10. That's why "Sta-ful" needs water only 3 times a year in normal car use. Auto-Lite "Sta-ful" Batteries give longer life, too, in tests conducted according to minimum life cycle standards.

**AUTO-LITE BATTERY CORPORATION**  
Toledo 1 Ohio

**AUTO-LITE**  
**sta-ful**  
*...needs water*  
*only 3 times a year*  
IN NORMAL CAR USE

# Developing, Printing, Enlarging ... a fascinating hobby

**So easy to begin, too—and inexpensive**

**D**ID YOU KNOW that Kodak offers a complete printing kit for only \$4.95 (see opposite page)—that for this small amount you can have the thrill of making prints from your own negatives? Taking the picture is really only half the fun. Developing and printing can double your enjoyment from photography. And for less than \$50 you can acquire a fine enlarger that will let you select the ideal portion of your picture ... eliminate unwanted areas ... make the final print even more than what you hoped for when you clicked your camera shutter.

On these pages you see just a few examples of a wide choice of equipment now on display at your Kodak dealer's. He will be glad to start you off right and help to keep you within your budget.

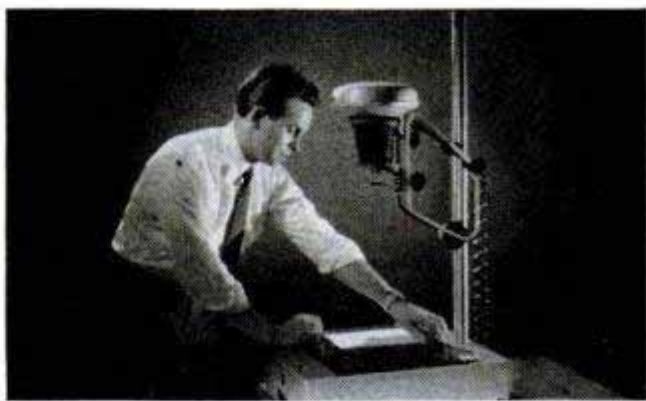


Easy to set up—Simple design gets the "Hobbyist" into action fast.

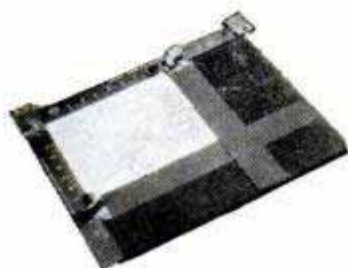


Rotary negative carrier—Open-frame, open-hinge type. Loads quickly.

**Complete enlarger — less than \$50.** The Kodak Hobbyist Enlarger uses cold-light illumination—perfect protection for negatives. Only reflected light reaches negatives. Integrating-sphere lamphouse, together with specially created interior reflective coating, results in even light distribution. Newly designed negative carrier loads easily. Knobs are provided for locking both elevation and focus. Enlarges up to 7 times. Kodak Enlarging Ektanon Lens, 89mm.,  $f/6.3$ , helps produce crisp, sharp enlargements. For negatives through  $2\frac{1}{4}'' \times 3\frac{1}{4}''$ . \$44.



**Fine, versatile enlarger—the Kodak "Flurolite"**—\$99.50 (without lens). Advanced design ... integrating-sphere light source for even illumination ... easy-loading rotary negative carrier. Focusing and elevating knobs may be used at the same time. With accessories, the  $2\frac{1}{4}'' \times 3\frac{1}{4}''$  "Flurolite" quickly converts for copying and many other uses.



**Eliminate unwanted areas in enlargements—**Select ideal portions with the help of Kodak Masking Easel,  $11 \times 14$ . For use with any vertical enlarger. Can be adjusted for  $\frac{1}{4}''$ - to  $\frac{3}{4}''$ -inch margins. \$9.60.



**Everything you need for printing—Kodacraft Printing Kit** contains rocker-type trays, printing frame, paper, graduate, Kodak Tri-Chem Pack, thermometer, stirring rod. \$4.95.



**For developing and printing—Kodacraft Photo-Lab Outfit** includes printing frame with masks for popular negative sizes, Kodacraft Roll-Film Tank, other essentials. \$8.75.



**Includes metal printer—Kodacraft Advanced Photo-Lab** offers complete developing and printing equipment. Everything can be packed in printer for handy storage. \$14.10.



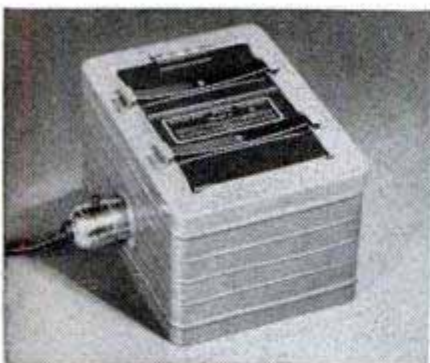
**Converts ordinary tray into effective washer—Kodak Automatic Tray Siphon.** Washes prints and films automatically. Hypo-laden water is siphoned out as fresh water enters. \$4.50.



**Kodacraft Roll-Film Tank (left)** is easy to load, pour; holds 16 oz. of solution. After loading, it can be used in lighted room. Includes aprons for 620-120, 616-116, and 127 films. \$2.53. **Kodacraft Miniature Roll-Film Tank (right)** permits simultaneous development of two rolls of 35 mm. film or Bantam-size film (828). \$2.53.



**A Safelight that adjusts quickly—Kodak Adjustable Safelight Lamp (left)** has double-swiveled shank and bracket. \$7.40. **The new Kodak 2-Way Safelight (right)** provides either direct or indirect illumination—or both. For light in two directions, simply take out removable metal panel in back and replace with a safelight filter. \$4.50.



**Kodacraft Metal Printer, Model A—** accepts negatives from 35mm. up to 4 x 6 inches. Metal construction with hinged platen. An easy-to-follow folder of instructions is supplied. \$6.95.



**For timing contact and projection printing—Kodak Electric Time Control.** The printer or enlarger plugs into the control. Automatic timing 1 to 57 seconds. Repeat timing possible. \$13.50.



**Spring-wound Kodak Timer—** covers all intervals up to 60 minutes, has both minute and split-second hands. Tilting base permits adjustment to any angle. \$7.20.

Your Kodak dealer will be glad to demonstrate this equipment for you. Make his store your headquarters for all your photo needs.

*Prices subject to change without notice*

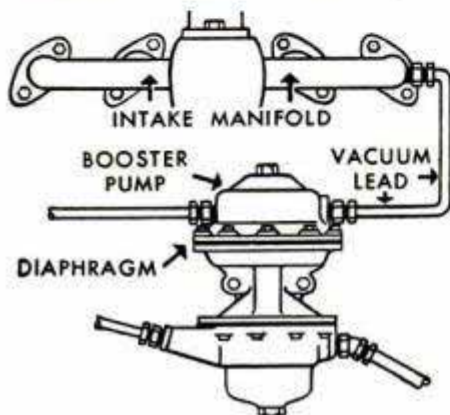


# Care and Feeding of Engines

BY S. P. CORP

## THE CASE OF THE SLOW WINDSHIELD WIPER

Most cars have a windshield wiper booster pump mounted on the fuel pump. Any time your wiper operates at less than 80 strokes per minute, check this booster pump for trouble—because such trouble can affect engine operation.



ness in the valves of the end cylinder, eventually burning the valve seats.

Remove vacuum line at intake manifold. Plug the hole in the manifold and run the engine. If engine idles smoothly (when it missed before) the trouble is in booster pump or vacuum line. If there is any trace of oil in the line, your booster pump needs a new diaphragm—because a cracked or damaged diaphragm has been causing oil waste. The oil you see has been sucked up from the crankcase and delivered to the intake manifold, to be burned with fuel.

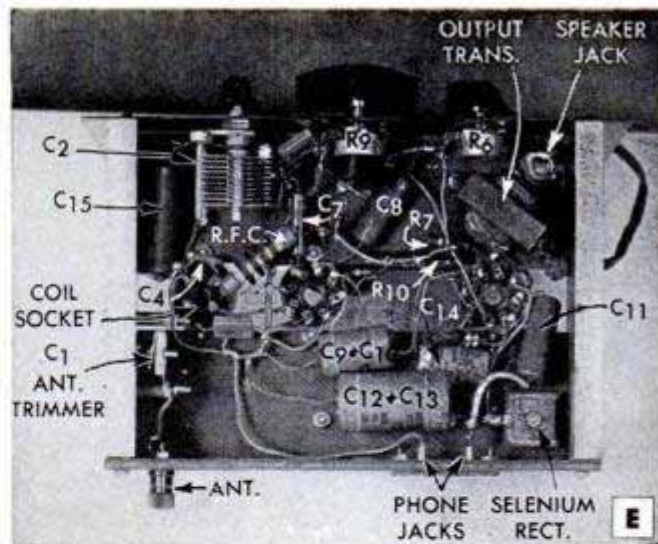
If your windshield wiper seems slow, at any engine speed, check the booster pump!

## TEST SHOCK ABSORBERS

Shock absorber trouble can cause hard steering, pitching on turns, and hard riding. Check each corner by trying to bounce the car, holding the end of a bumper. If it bounces several times before coming to rest, the shock absorbers need attention. To remove, take off upper and lower holding nuts from rubber bushing on studs. Lock lower end of absorber in a vise, and pump up and down full length of travel. If it sticks at any point, or is hard to pull, it should be replaced. If there is no resistance, valves are leaky and it should be replaced. Normally, there should be more resistance in extending than in compressing.

## NEW FREE BOOK ON CAR CARE

Send for your free copy of the new illustrated booklet, "MORE POWER, Less Oil, Less Gas" which tells you how to keep your car running better. It also tells you all about Sealed Power KromeX Ring Sets, engineered especially to fight heat, friction, abrasion, and corrosion in late-model cars and trucks. Sealed Power Corporation, Dept. G-10, Muskegon, Michigan.



## Beginner's Two-Tube A.C.-D.C. Seven Seas Scout

(Continued from page 229)

wire solder to assure good connections.

Two sets of plug-in coils are employed: one short-wave set of I.C.A. type 1471 consists of four 4-prong coils which cover 9.5 to 217 meters; and two broadcast-band coils, I.C.A. set type 1473, cover from 190 to 550 meters. The six coils cost less than \$5.00.

For best results on both short-wave and broadcast bands use an outdoor antenna approximately 75 to 100 ft. long, especially for distant stations. However, a 20 to 40-ft. wire stretched around the room is sufficient for bringing in locals. Tuning the short-wave bands is somewhat critical and it takes patience and practice. The initial test should be made with one of the broadcast-band coils and a pair of headphones. The volume control should be set about  $\frac{1}{2}$  on, then advance the regeneration control, R9, until a thud or hiss is heard as the band-set condenser, C2, is rotated. This is the critical point of oscillation. Adjust the antenna trimmer condenser, C1, for maximum capacity (widest opening) possible while maintaining the critical oscillating point over the entire band. After this adjustment, turn R9 down to the point where the whistles and oscillations stop. This is the point of maximum sensitivity and clarity for music and speech. Short-wave and amateur stations occupy a small space on the band-set dial. After the band is located, use the band-spread condenser, C3, as it spreads these short-wave stations out for easier tuning. Turn C3 very slowly; a vernier tuning knob can be added to this dial if desired. Any small PM speaker can be plugged into the open-circuit speaker jack. Detailed student material list R-413 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

# Don't put in a drop of Anti-freeze

... until you've cleaned out rust with



## DU PONT Cooling System CLEANSER

**It's a safe, easy way to prevent  
clogged radiators that waste anti-freeze,  
cause trouble and expense**

Now, before freezing weather sets in . . . before you put in anti-freeze . . . it's time to clean out your cooling system. **Du Pont Cleanser** makes the job safe, simple and thorough. You can even let the cleanser work while you're driving. And neutralizer is included in the can for a complete job. Du Pont Cleanser removes all rust—*without reverse flushing*, without fuss. Get an economical can at your service station or auto supply store today.



Insure against leaks that waste anti-freeze with  
**DU PONT COOLING SYSTEM SEALER**

Don't let radiator leaks rob you of anti-freeze. Seal it in with **Du Pont Cooling System Sealer**. Even when the cooling system is apparently watertight, many permanent anti-freezes will "creep" and be lost by seepage through tiny pinholes. Such leaks are stopped immediately by Du Pont Sealer. It's simple to use, flows with the water and can't clog, or harm hose or metal parts.



**BETTER THINGS FOR BETTER LIVING  
... THROUGH CHEMISTRY**

# Here's how for home painters



**Wire handles cut your hands?** Slit a piece of garden hose, slip it on the handle. Result: a comfortable hand grip. Another neat trick when repainting your house: use Devoe's new Wonder-1-Coat House Paint and get 2-coat protection and beauty in just one coat.

**Protect "almost-dry" surfaces.** Use wax paper on newly painted floors or stairs that may be tacky after initial drying. The wax film is harmless to the paint. When painting your floors, use Devoe's Floor and Deck Enamel. It dries quickly to a tough finish.



**Stored for quick identification.** If the paint in a can isn't all used, make a paint mark on the outside of the can to show level of what's left, and what the dry color looks like. With the Devoe Library of Color system you can always find the exact color you want.

**Avoid spattering and dribbling.** When pouring from a gallon container of turpentine, hold the can with the spout at the top! Then the air enters freely above the liquid and the stream is steady and easy to control. Not many people know this trick.



You can get all the painting accessories that you need—and many more helpful tips at the sign of the Devoe Diamond. Why not stop in and see your Devoe Dealer very soon? You'll find his name listed in the Classified section of your Phone Book.



## 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.



### Installing Outlet Box

**Q**—I wish to install an electrical outlet in a wall just above the baseboard. I believe the plaster has been applied over wooden lath as the house is quite old. How does one locate studs and determine beforehand if there are obstructions in the wall? How is the box fastened in place after the opening is cut?

G. M., Calif.

**A**—The studs are located easily by tapping the wall lightly with a hammer. Spaces between studs will give forth a hollow sound when the plaster is tapped, but when a light blow is struck directly over a stud the sound will be more sharp and metallic. After locating the studs, determine the desired location of the outlet box and mark its position on the wall. Cut through the plaster with a cold chisel on the pencil lines outlining the box. Then remove the plaster and expose the lath. Cut through the lath with a keyhole saw, being careful to keep the cuts within the outline. In some cases it is possible to cut the lath so that the box can be attached directly to them but a better way is to use special metal box supports made for the purpose. Insert these through the opening and bend the tabs down so that the supports do not drop inside the wall. Connect armored cable to the box and position it in the opening, adjusting the mounting brackets to bring the box flush with wall surface. Then pull the supports tightly against the inside wall surface and bend the tabs of both supports tightly over the edges of the box. Homeowners who make installations of this type should be sure that they are thoroughly familiar with the requirements of local electrical codes.

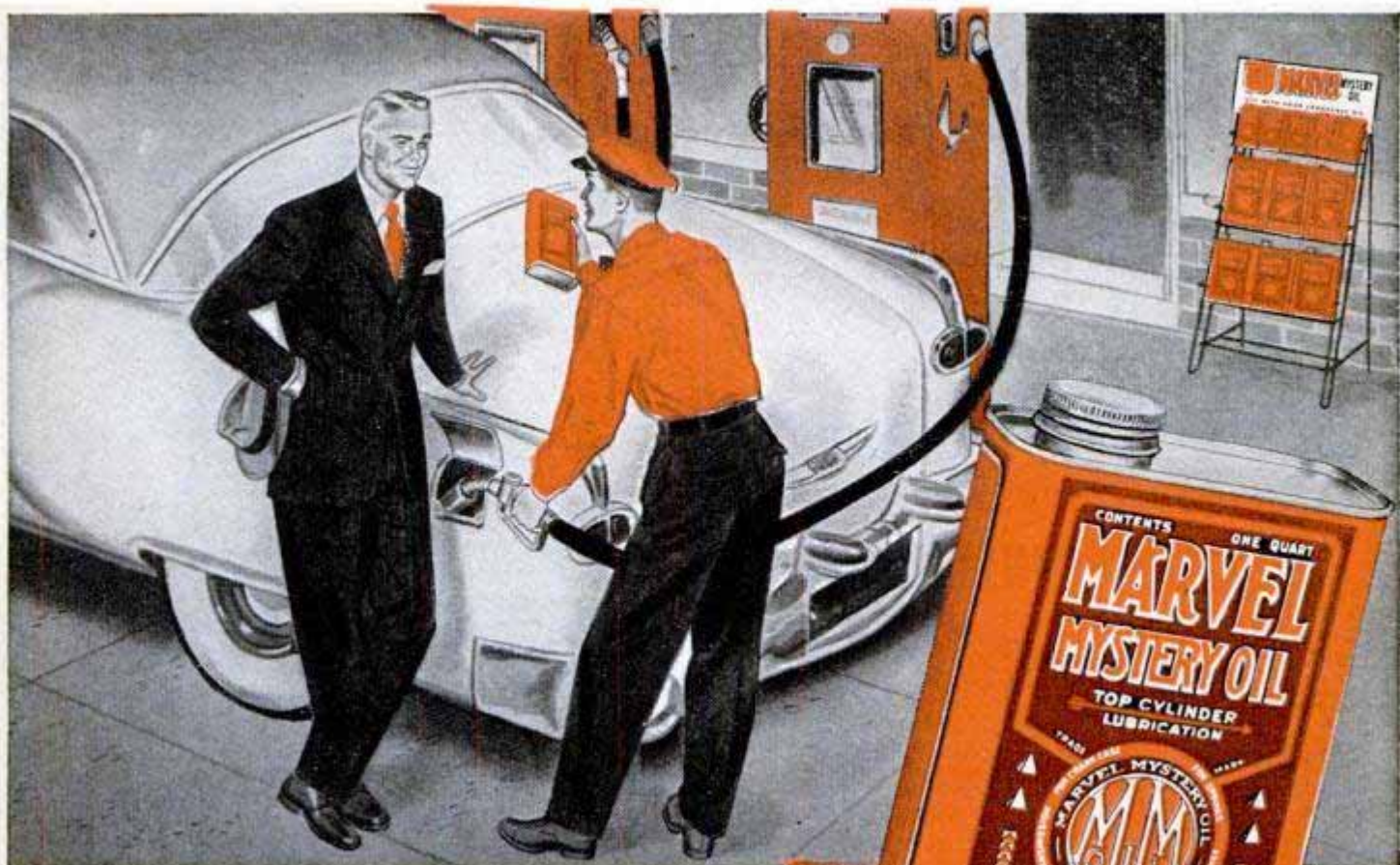
### Concrete Drain Keeps Garage Dry

**Q**—My garage is built into a slope, the rear of the floor being about 6 in. below grade. Frequently water seeps through the wall and spreads over the floor. What should I do to prevent this?—P. T., Ill.

**A**—It would seem that the simplest thing to do would be to dig a shallow channel or trench at the rear wall along its entire length, sloping the trench in each direction from the center. Pour about 3 in. of concrete into the trench and trowel smooth to a concave surface to form a drain channel. This will carry away any surface water that drains from the slope. In some cases it is possible to form a grassed waterway by first removing the sod in squares. Then dig a trench to a depth of 3 to

(Continued to page 240)





## Make Friends with Marvel!

**Y**OU PULL UP to a gas pump, face glum. Gas again! This bus sure isn't delivering miles per gallon. You ask the station attendant what's wrong, thinking, "Here it comes. The big service repair bite . . ." The man surprises you. He takes a can of Marvel from the rack. "Chances are", he says, "there's *nothing* wrong with your car Marvel won't clean up in a jiffy."

This you've got to see! You let him pour a can of Marvel into the crankcase and gas tank. You slip behind the wheel, turn the ignition, step on the gas . . .

**ZOOM!** New power . . . new pleasure . . . new smoothness . . .

Marvel is a specially developed lubricant for today's high compression engines. It goes to work immediately, sending a strong, tough, heat-resistant film of oil to all moving parts. Eliminates hydraulic valve clatter . . . provides ring seal . . . cleans, cools, and protects bearings and vital upper cylinder areas. Marvel puts "guts" in your engine. You get a faster pick-up . . . more engine hours per dollar . . . many more miles of smoother, more efficient driving.

Try a can of Marvel in your engine today See if your car doesn't run better, longer . . . right from the start.



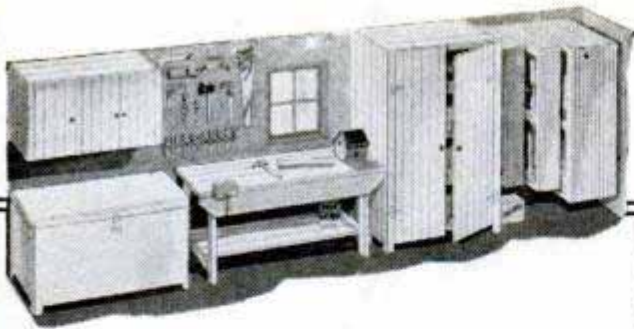
Install a Marvel Inverse Oiler for direct lubrication to the heart of your engine. Feeds in direct proportion to horsepower curve through inverse ratio to manifold vacuum. No other oiler works on this principle! Fully adjustable. Easy to install. Fully guaranteed.



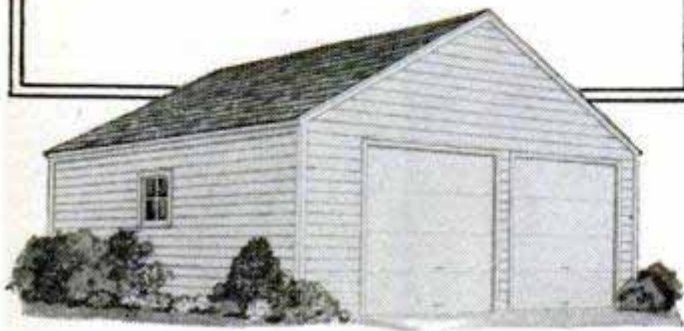
MARVEL MYSTERY OIL...THE MECHANIC'S CHOICE FOR THIRTY YEARS

**EMEROL Mfg. Co., Inc.**

Dept. 122, 242 W. 69th Street, New York 23, N.Y.



## One of 6 New Garage Designs with Extra Storage Space



"Garage-plus-storage" is the new trend in garage design. Now it's easy to erect the garage you need to include extra space for extra storage room.

Weyerhaeuser offers 6 basic plans for single and double garages which can be expanded to include a variety of arrangements for extra storage space and cabinets.

With complete blueprints and material lists covering the structural and storage features, these garages can be erected quickly with Weyerhaeuser 4-Square Lumber. Write for folder illustrating and describing all 6 garages and storage features, or see your local lumber dealer.

### Weyerhaeuser Sales Company

2001 First National Bank Bldg., St. Paul 1, Minnesota

● Please send details on your "garage-plus-storage" plans.

Name \_\_\_\_\_

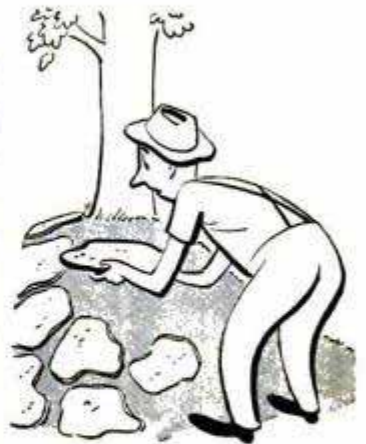
Address \_\_\_\_\_

Town \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

5 in., sloping it each way from the center as before. Then replace the sod, pressing the squares into close contact with the soil underneath. Water the resodded area periodically at intervals of several days.

### Moving Shade Tree

Q—We have an elm tree growing at one corner of the lot on which we recently built our new home. The tree is between 7 and 8 in. in dia. through the trunk. Apparently it has grown out of the center of a mound of earth about 3 ft. high and we are fearful that as the tree grows older it will die. Should we cut it down or move it to another location? — W.E., Mo.



A—Leave the tree where it is, at least for a time. Any shade tree, especially the hardy elm, adds to the value of the homesite. The tree in question is not likely to be affected by a lack of moisture in the mound or the surrounding topsoil, as its roots will seek moisture deep in the subsoil. In this case they will likely go even deeper than normal because of its location. We suggest that you slope the sides of the mound more or less uniformly and cover the soil with flat stones laid in a hit-and-miss pattern with 2 to 3-in. spacings between the stones. There are a number of perennial rock plants which will thrive in such a location. These can be planted in the spaces. Try to arrange the stones so that they will act as terraces to prevent the soil from washing away before the plants strike root. Small pieces of burlap also can be used to prevent soil from washing.



### "Transparent" Painting

Q—I have an old-style dresser, which is made of oak and, although it now is fairly dark-colored, I believe it was originally finished in the natural color of the wood. I'd like to refinish it in blond color, but I don't know how to apply finishes of the type I see on new furniture built of oak and other woods. How is it done?—T.D., N.Y.

A—The degree of success you have in applying the so-called blond finish will depend to some extent on the type of finishing materials used on the piece originally. If you are sure that the wood is oak (some old pieces of this type were made of chestnut or ash) and it has been finished in the natural color, then it should be comparatively easy to remove the old finish with a varnish remover and sand the wood preparatory to applying the new finish. Be sure that you remove all the old finish, also the remover, unless the latter is the type which does not affect new finishing materials. One simple method of attaining an attractive blond finish is to apply a thin coat of ordinary oil-base paint or a semigloss enamel in a rich cream color. Before the paint sets rub off the excess with a soft cloth until the grain of the wood shows through the coating. Allow the remaining paint to dry thoroughly, then sand lightly, dust and apply a coat of flat varnish. As a rule it is not necessary to fill wood that has been previously finished as most of the filler will remain in the wood grain. When refinishing by the method described above, the paint pigment also acts as a filler. It should be understood, of course, that this is only one method of producing the finish you desire, but we recommend it as being one of the simplest.

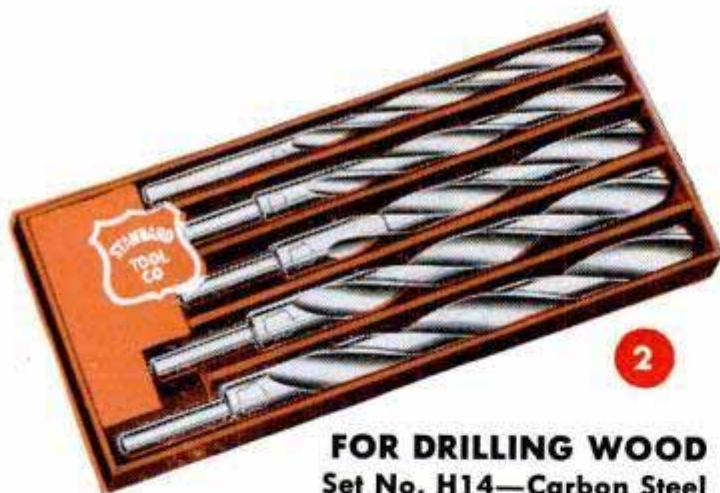
# Wow! What a bite!



1 The quick-starting, fast-penetrating point of the new Standard Metal Drill.

## FOR DRILLING METAL Set No. H45—High Speed Steel

A New Metal Drill with quick-starting point. 5 Drills to set, one each  $\frac{1}{4}$ " ,  $\frac{5}{16}$ " ,  $\frac{3}{8}$ " ,  $\frac{7}{16}$ " and  $\frac{1}{2}$ ". All have  $\frac{1}{4}$ " shank to fit electric hand drill or drill press. Plastic box with clear lid.



## FOR DRILLING WOOD Set No. H14—Carbon Steel

Five Drills in set, one each  $\frac{1}{4}$ " ,  $\frac{5}{16}$ " ,  $\frac{3}{8}$ " ,  $\frac{7}{16}$ " and  $\frac{1}{2}$ ". All Drills have  $\frac{1}{4}$ " shank to fit electric hand drill and drill press. Strong tray with divider protects drills. Clear plastic cover.

Quick-penetrating action from new type points makes "Standard" the best Drill to use.

Standard Drills for Metal and Wood Boring do better, faster work because of special construction.

1 The point of this drill is new in design. It starts quicker than any drill you've ever used and penetrates rapidly. A great time-saver in drilling sheet metal; equally effective in heavy stock. Drills are made of finest grade High Speed Steel—heat treated for greatest durability.

2 These new drills are designed with wide, smooth flutes to remove the chips and drill a clean hole. Tempered to avoid damage if metal is encountered in drilling.

**Buy Them at Your Hardware Store**  
Standard Shield Brand Drill Sets are now sold by Hardware Stores. Identify them by the Shield Brand—it is a guarantee of quality and satisfaction. If your dealer does not have them, send us his name. We will supply you direct on receipt of money order or check. Use the coupon below.

The best drilling equipment is no better than the drills you use in it. For best results, use Standard Shield Brand Drills.

### USE THIS COUPON

Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio

Please send me postpaid Standard Drill Sets:

No. H45 Standard High Speed Sheet Metal Drill Set @ \$8.00 ( ) ; No. H14 Standard Carbon Steel Wood Boring Drill Set @ \$3.98 ( )

Literature on other Standard Drill Sets ( )

I enclose check or money order for \$.....

Name \_\_\_\_\_ (Please Print)

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City and State \_\_\_\_\_

I usually buy tools at (Name of Store) \_\_\_\_\_

Address \_\_\_\_\_

This offer good in U. S. only

# STANDARD TOOL CO.

3950 Chester Avenue • Cleveland 14, Ohio



Since 1881, makers of production cutting tools for industry. Special Drill Sets for the home craftsman and shop owner.



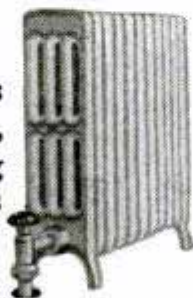
*Handy Hank says:*

"Try these slick tricks with **PLASTIC WOOD**"

**HANDLES LIKE PUTTY  
HARDENS INTO WOOD!**

**Fill Holes Around Pipes!**

Handy Plastic Wood seals cavities to prevent dust, drafts, bugs, mice from coming through. Has dozens of uses all through the house.

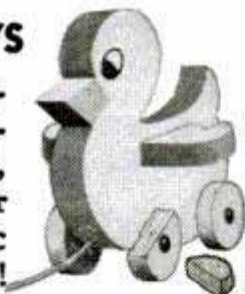


**RESET LOOSE SCREWS**

Clean and fill old screw holes with Plastic Wood. Let dry and drive screws back into place. Plastic Wood holds firmly, lastingly. Won't crack or pull away. And it's so easy! *Handles like putty... hardens into wood!*

**MEND BROKEN TOYS**

Plastic Wood sticks firmly to most common surfaces... wood, metal, plastic, fabric, plaster and composition. Plastic Wood is a real toy saver!



Plastic Wood makes dozens of home repairs *easy!* Can be sawed, sanded, carved or drilled. Will not chip, crack or peel. You'll want Plastic Wood Solvent, too, for controlling the consistency of the Plastic Wood, and for cleaning hands and tools.



**Jungle Diamonds to Grind Our Tools**

(Continued from page 149)

northeast of the Gabon lies the Ubangi-Shari, where Soredia's mother corporation, Compagnie Miniere de l'Oubanghi Oriental (CMOO), has been mining diamonds since 1932. This is the area from which American circuses used to import strange native women with spadelike lips, and necks elongated by wearing a succession of brass rings.

The diamonds in the Ubangi and the Gabon are found not in the craters of extinct volcanoes, where most South African diamonds are found, but in the alluvial subsoil of river beds where they were deposited in some long-past geological age. They are recovered by removing an overburden of 5 to 15 feet of mud, sand and fine rock that hides the diamond-bearing gravel.

This gravel is passed through a separator which washes it and shakes off the lighter material. The "diamond concentrate" which remains is then shipped in large metal containers to a central plant.

There the diamonds are extracted by a washing process based on the affinity of diamonds for grease. The diamonds are held by the grease while the water floats away everything else. Finally the diamonds are cleaned in a bath of sulphuric and hydrochloric acid and are ready to be classed and graded.

Camp Lopo, on a tributary of the Mambere River, is one of the Ubangi mines which is being mechanized under the MSA assistance project. The diamond-bearing gravel, found 15 feet under the bottom of the Lopo River, gives a good yield of diamonds, a relatively large share of which is of gem quality. Practically all, gem and industrial, are of good size.

Camp Lopo is fortunate also in having a large supply of modern mining machinery. The other camps are less fortunate. MSA aid to CMOO, as the Ubangi enterprise is called, began about the same time as the war in Korea. With no priorities, deliveries of machinery have been slow.

The population of Camp Lopo consists of three white men, 200 native laborers and about 350 native women and children. The

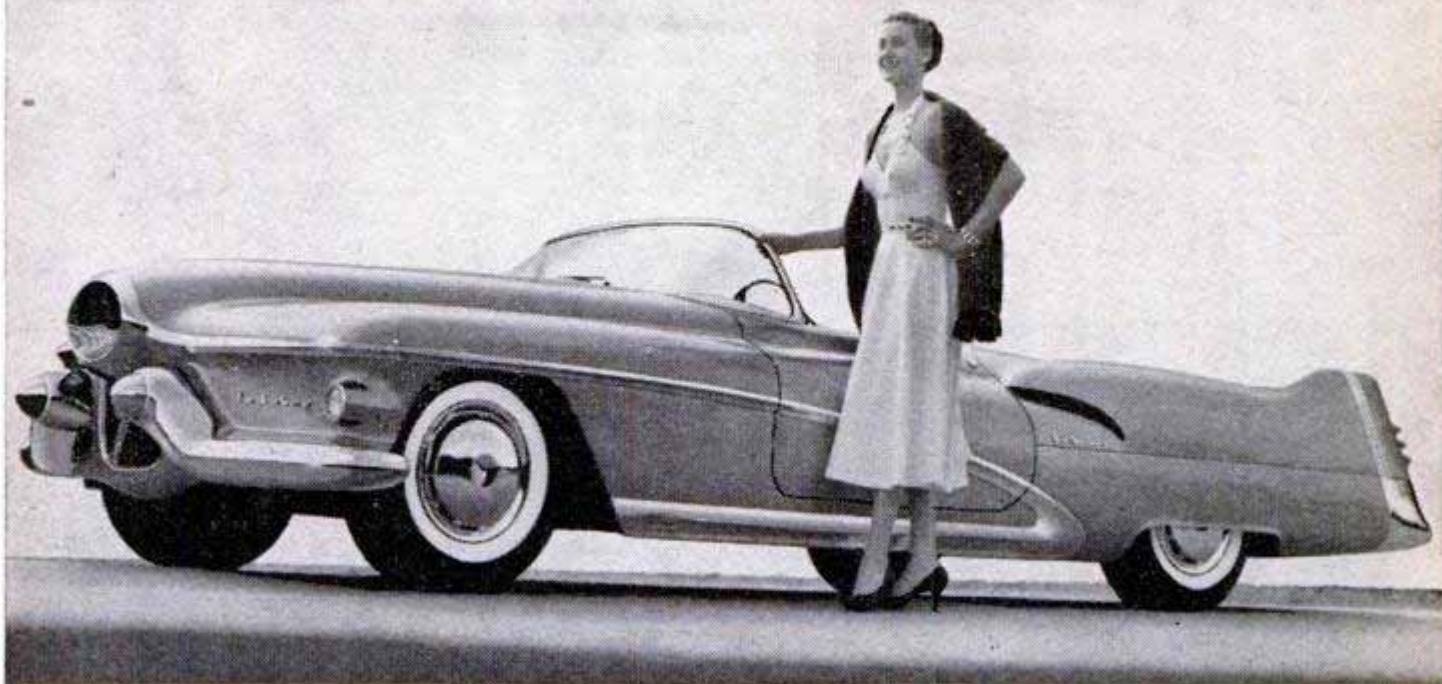
(Continued to page 244)

**You Name It!**

Here are the correct answers to the "You Name It!" photo quiz on pages 88 and 89:

1. Burned match; 2. Condensation on windowpane; 3. Face of golf club; 4. Base of pine cone; 5. Design on man's shoe; 6. Tennis-racquet gut; 7. Bottom of tablespoon; 8. Slice of cabbage.

# Fashioned for the Future...



STYLED FOR THE FUTURE



FEATURES OF THE FUTURE



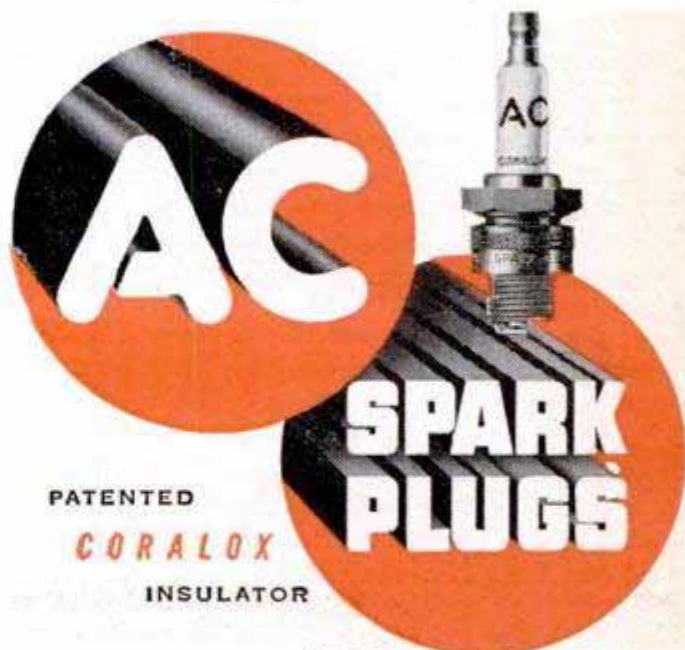
POWERED FOR THE FUTURE

What will tomorrow's motor car be like?

Motorists can find many indications of a very wonderful tomorrow in the spectacular General Motors experimental car—*Le Sabre*.

To spark the Le Sabre 335 horsepower engine, its designers selected AC Spark Plugs. Exhaustive tests proved that AC's patented *CORALOX* Insulator best withstood the extreme temperature and high compression developed in this high-powered engine.

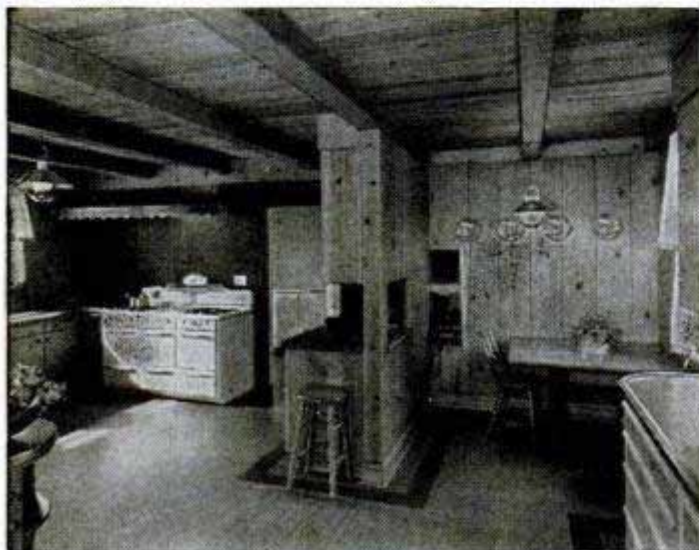
What all this adds up to—for today's motoring and tomorrow's—is better spark plug performance. Insist upon ACs for your car.



AC SPARK PLUG DIVISION  GENERAL MOTORS CORPORATION

panel a dining room...

do over a kitchen



## with easy-to-work **WESTERN PINES\***

LET these lovely-to-look-at, easy-to-work and handle woods of the Western Pines\* add their own lasting beauty to your remodeling jobs or workshop projects!

Doorways, halls, walls, playrooms, kitchens, built-ins, bunk bedrooms—whatever you build or remodel, these fine-grained, soft-textured woods make your work easier, give lasting satisfaction. They can be painted, enameled, stained—or left natural; they adapt themselves to any architectural design or decoration theme.

Send today for your **FREE** copy of **NEW** colorful, idea-packed booklet, "Enchanting Homes of Western Pines." 68 pictures, many in gorgeous color, with details and suggestions for "doing it yourself" with the woods of the Western Pines\*. Write to **WESTERN PINE ASSOCIATION**, Dept. 538-N, Yeon Bldg., Portland 4, Oregon.

These are the Western Pines

- IDAHO WHITE PINE
- PONDEROSA PINE
- SUGAR PINE

natives live in traditional thatched huts. The European men live in clay-brick cottages but cannot have their wives and children with them. This is permitted in only a few central towns.

Europeans have to learn to live with the jungle itself as well as with its natives. They must become accustomed to the sweltering equatorial heat; two months of relentless rain and floods in July and August; the threat of mite-borne diseases; the war against the malarial mosquito and the tsetse fly, the bearer of sleeping sickness. The seasoned jungle hand is careful to sleep under a mosquito net. He learns that most jungle animals are harmless if left alone, but that he must be on the alert against dangerous exceptions such as the panther and the crocodile.

In the Gabon and the Ubangi, the python, which kills by constriction, is the most dangerous snake. Python skins, however, bring a good price from fancy-shoe manufacturers. It is not unusual to see python skins drying on the wall of a French engineer's cottage. The python has other uses, according to one French commissioner.

"You see," he said, explaining a slithering noise, "I have a python living between the ceiling and the roof. He's been up there two months. I used to think I'd go up and clean him out. But now we're on cozy terms. I sleep better because he keeps away the chirping bats and the singing lizards."

Some ticklish problems arise with the natives who make up the mine-labor force. In the first place, labor is scarce. Until less than a hundred years ago, the population was cut frequently and drastically by slave hunters. Native diseases, abetted by new scourges brought by the white men, now take their toll. Forty is regarded as a ripe old age.

France is sponsoring a road-building program in the area and plantations of cotton, coffee and palms increase competition for the insufficient labor supply.

CMOO has found that the best labor-recruiting officers are the native women. In the native economy, the women do the work. They plant, cultivate and harvest the crops. The men confine themselves to occasional hunting. In the mining camps this order is reversed. The men work regularly, food better than the native diet is supplied as part of the wages and it is the woman's turn to take life easily.

Each measure to improve the health or living conditions of the natives has to be introduced with care. One morning the chief foreman of one camp woke up to find every hut in the native quarters deserted. A new health measure had offended a

(Continued to page 246)



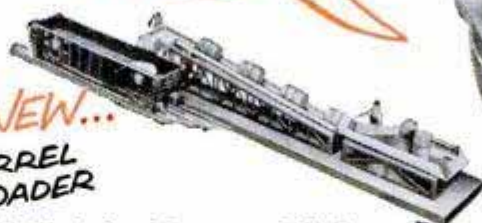
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AC SPARK PLUG DIVISION  GENERAL MOTORS CORPORATION

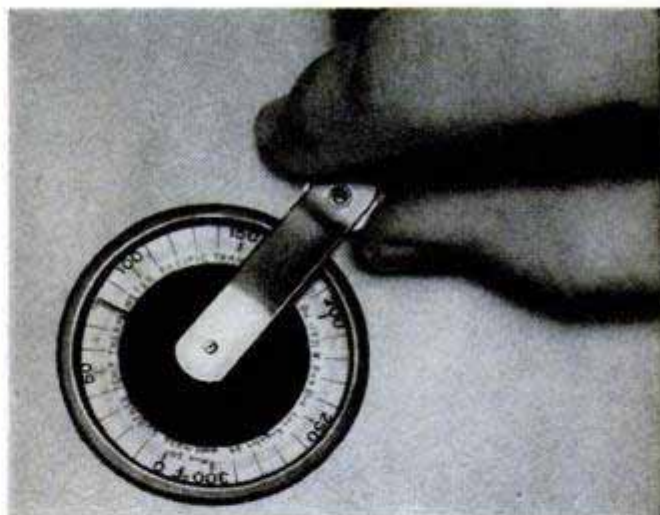
native taboo and the workers had decided to revert to the old life in the jungle. They never came back.

In the Ubangi-Shari, labor conciliation is based on a local institution called the "palabre," or "palaver." If the workers feel they are not getting their due, their spokesman goes to the chief foreman and demands a palabre. The palabre may last one or two days or more, depending on the time that is needed to agree on the issue and restore good feeling.

The palabre serves not only as a labor-relations instrument but also as a court of domestic relations. If a wife runs away with another man, the husband may demand that the company executives bring her back.

Women cause more friction than anything else. The natives do not win their wives by love, looks or prowess, but buy them from the fathers. The price, which the husband pays annually for life, booms in the mining camps. The single men resent this and show their dissatisfaction now and then with a sit-down strike. The CMOO naturally tries to persuade the men to return to work as soon as possible.

The MSA thinks its program to obtain strategic materials in Africa makes good sense—and at the same time it gives thousands of natives their first practical contact with Western civilization. ★ ★ ★



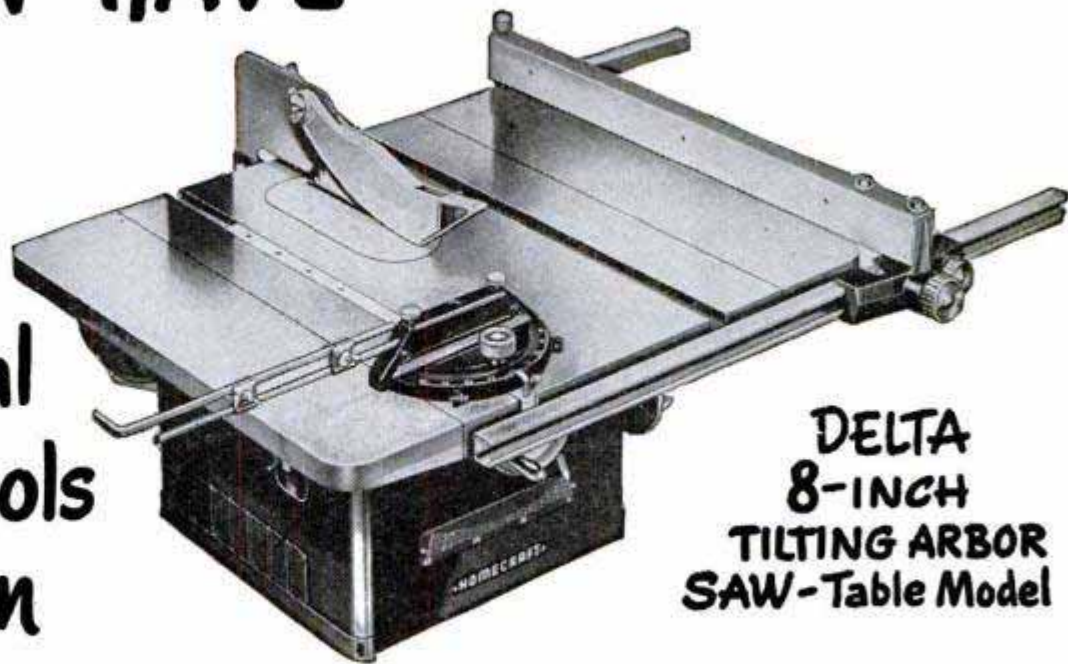
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## Johnny Applesseed Hires a Mechanic

(Continued from page 162)

Here's where the sky is the limit on ideas. One grower made his pneumatic lift out of war-surplus retractable-landing-gear cylinders. Another sends his men and their pruning guns up and down on a platform built over the hydraulic hoist from a filling station's outdoor greasing rack.

After pruning comes cleanup, formerly a tedious hand job. Here, too, hydraulic methods have stepped in. An old-fashioned dump hayrake is attached with braces to the side of a tractor which circles the rake around under each tree. Its hydraulic lift deposits the branches in a windrow between the tree rows. It's followed by a second tractor with a hydraulic-run buckrake mounted in front. The long, flat teeth sweep up the windrows and bring the brush to a safe spot chosen for a jumbo bonfire.

Apples can't stand big winds, which can kill trees in winter, uproot them or throw an apple crop to the ground. Latest solution is the "installment plan" windbreak used at Arthur B. Burrell's orchard in Peru, N. Y. He set out double rows of protectors—Lombardy poplars and red pines side by side. The speedy poplar grew 60 feet tall in 15 years. They aren't a long-lived species but when they're gone, the slower, more permanent pines will be ready for sentinel duty against wind.

With spring starts the spraying and the dusting; 12 to 15 times each fruit tree is fully covered against leaf-eating insects, fruit-ruining worms and fungus diseases.

Another of Holbrook's workshop products is the double-barreled spray gun he adapted from standard equipment. Its lower line has 10 nozzles for "shotgun" spraying. Turning a handle switches to the upper, single-jet line for spotting work.

When Holbrook's spray machine moves through the orchard, there aren't any missed branches. The rig itself carries four automatic nozzles on each side. For limbs higher and farther away, an aluminum tower was welded on and it carries two "sharpshooting" men, each with a double-barreled gun. For good measure, the tractor driver himself mans a swivelling spray gun used low on trees and around corners.

Even the apple itself has changed in recent years, and plant breeders already list over 7000 varieties. Old favorites have been pushed out by newer varieties like Baldwin. But its trees weren't hardy enough in winter, and McIntosh came down out of Canada to become the most common apple of today—with new rivals popping up every year to promise something even better.

★ ★ ★

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It's *wood* that gives warmth and livability to your home. And wood windows, doors, porches and flooring—all last longer and stay better looking treated with protective PENTA solutions.

PENTA safeguards against rot, decay and termites. Available in water repellent solutions, it helps your woodwork resist swelling and warping, providing an excellent surface for painting.

When you build or make repairs **BE SURE**—buy PENTA protected lumber. You can buy and apply PENTA solutions yourself . . . also available in handy one and five gallon cans from your lumber dealer. Protect the value, protect the appearance of your home—protect with PENTA!

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against termites  
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PENTA protects framing lumber against termites and decay, protects the very foundations of your house—rafters and roofing, joists and plates, sills and subflooring. Water-repellent PENTA solutions also minimize warping and swelling—prime causes of plaster cracks and sticking windows and doors. Exterior use for windows, doors, trim and porches helps them resist decay for better appearance and easier upkeep.



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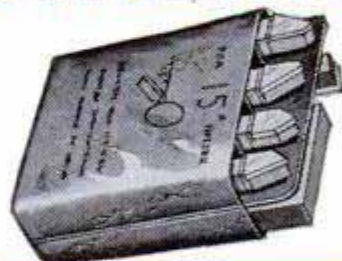
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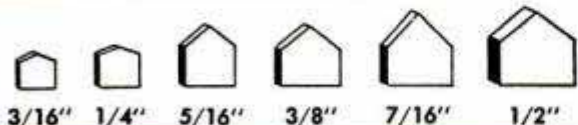
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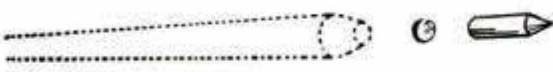
**MAKE-YOUR-OWN SMALL TOOL KIT.** One Tungsten Carbide rod approximately 1"x1/8" and one 2" by 1/8" diameter with which to make a host of wonder-working small tools. Easy-to-obtain rod makes unexcelled tools for marking, engraving, or Etching on hardest steels, porcelain, enamels or glass. Tip old prick punches. Make small turning and boring tools, guides, rollers, etc. Complete with instructions, Brazing alloy and Flux. **ONLY \$1.95**

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**STANDARD PRODUCTION TOOLS — TUNGSTEN CARBIDE**  
Choice of five different styles—four different sizes. When ordering give sizes and style wanted—state whether for steel or other materials.

STYLES	SIZES	PRICE
THREADING #8A	5/16"	\$1.95
ROUND NOSE #8B	3/8"	\$2.50
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LEFT FACING #8D	1/2"	\$3.50
GENERAL PURPOSE #8E		

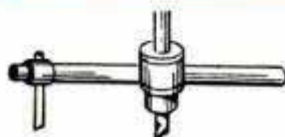
**KIT  
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**WORLD'S FASTEST BORING MASONRY DRILLS**  
Ejects all dust from even the deepest hole. Never before such speeds for drilling concrete, brick, marble, tile, stone.

WHEN ORDERING	No. 9A 3/16"	\$1.80	No. 9D 3/8"	\$2.15
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AND SIZE	No. 9C 5/16"	\$1.95	No. 9F 1/2"	\$2.70

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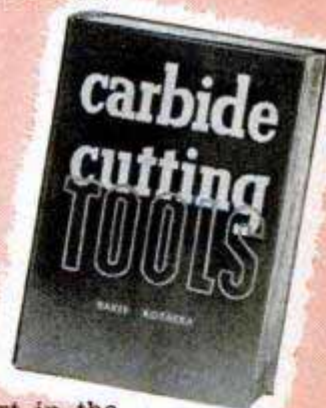
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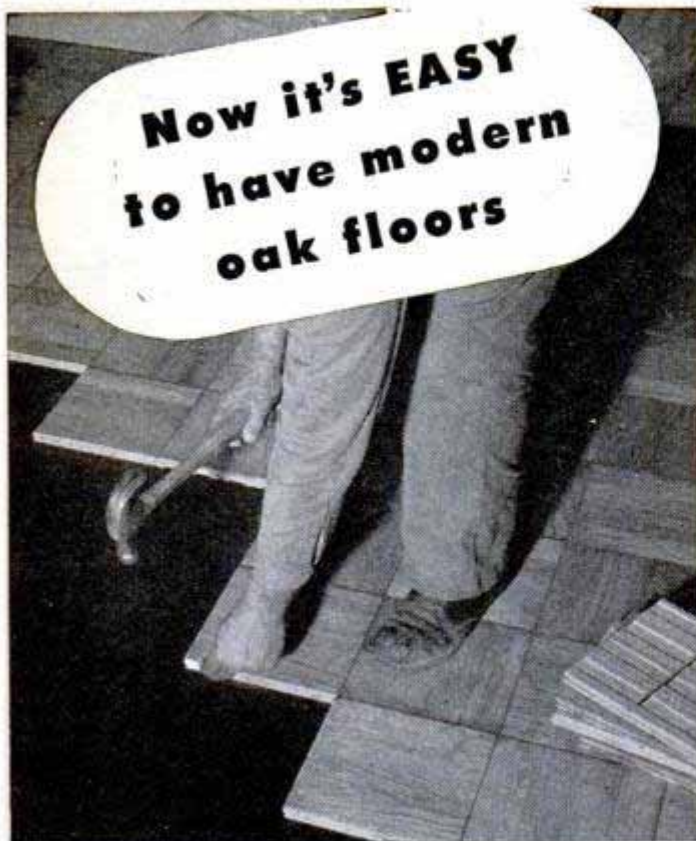
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*Your choice of block or strip design*

## Just lay prefinished Bruce oak flooring right over your old floors... no sanding or finishing

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**Bruce Hardwood Floors**

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## The Owners Report on the '52 Lincoln

*(Continued from page 108)*

handling in the Lincoln compared to other big cars."—Wortendyke, N. J., realtor.

"The Lincoln has what the others say they have."—Milwaukee, Wis., sheet-metal worker.

"No road 'wander' or wind noise in car at high speeds. Very fast, yet I get 20 to 22 miles per gallon in the country. Comfortable driving position. Needs about 20 horsepower more for mountain driving."—Denver, Colo., cattleman.

### 1952 LINCOLN SPECIFICATIONS

**Cosmopolitan and Capri Models**

#### ENGINE

Type ..... 90° V, 8 cyl., OHV  
Bore and stroke ..... 3.8 in. x 3.5 in.  
Piston displacement ..... 317.5 cu. in.  
Brake horsepower ..... 160  
Compression ratio ..... 7.5:1  
Transmission ..... Dual-Range Hydra-Matic drive (4-speed) standard equipment on all models

#### GENERAL

Steering ratio ..... 20.4:1  
Steering wheel, lock to lock... 5¼ turns  
Turning radius ..... 22 ft. 8 in.  
Brakes ..... Conventional with riveted linings  
Tire size ..... 8.00 x 15  
Recommended tire pressure... 26 lb. front; 22 lb. rear  
Weight (4-dr. sedan, unladen)... 4170 lb.  
Wheelbase ..... 123 in.  
Tread, front ..... 58.5 in.  
Tread, rear ..... 58.5 in.  
Height over-all (unladen)... 62.7 in.  
Width over-all ..... 77.5 in.  
Length over-all ..... 214.1 in.  
Road clearance ..... 8.2 in.

#### CAPACITIES

Oil ..... 5 qt.  
Water ..... 24.5 qt. (with heater)  
Gasoline ..... 20 gal.

#### INTERIOR DIMENSIONS

Front-seat width ... 62.6 in. Headroom, rear ... 34.7 in.  
Rear-seat width ... 62.1 in. Legroom, front ... 43.1 in.  
Headroom, front ... 36.1 in. Legroom, rear ... 41.6 in.

The questionnaires always ask what the owners dislike about their cars, and here is a cross-section of the answers:

Quite a few agreed with a San Francisco physician that the Lincoln needs more legroom in the back seat.

An East Haven, Conn., salesman expressed the sentiments of several owners: "When you buy a car in the \$4000 class, it is annoying to have people ask you how you like your new Mercury—or Ford. Lincoln should make a car to look like a Lincoln." Concurring in this complaint were others including an Indianapolis grocer, who remarked, "General Motors certainly did not make a Cadillac to look like a Chevrolet."

Some agreed with a Birmingham, Ala., manufacturer who didn't like the position of the battery beneath the floor board,

*(Continued to page 254)*

For preparing  
new  
surfaces



smoothing seams  
and  
joints



removing old paint



refinishing furniture

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FEATURES



**KING-SIZE BOTTOM PLATE**  
extends beyond body of tool  
for sanding in very close  
quarters.



**MODERN SWITCH HANDLE**  
is located close to housing for  
better control, less operator  
fatigue.



**AUXILIARY KNOB HANDLE**  
gives choice of three positions  
for ease in sanding close to  
obstructions.



**UNIQUE PAPER HOLDER**  
stays open when attaching or  
detaching paper, frees both  
hands for job.



**NEW**  
**Black & Decker**  
**Utility**  
**No. 44 SANDER**  
**only \$46.95**

- "Satin-Smooth" Finish, every time, in any direction, because tool produces small  $\frac{3}{16}$ " orbit 4250 times per minute!
- Ten Times Faster than hand sanding on wood, metal, plastics, compositions!
- Light Weight, only 5½ lbs., easy to use . . . helps even beginner do professional jobs!

**Black & Decker**  
**ELECTRIC UTILITY TOOLS**  
**PORTABLE ELECTRIC TOOLS**



**Bob Davis says:**

"Take it from a guy who cut his eyeteeth on tools, this new B&D Utility No. 44 Sander is a top buy! It's smooth-running, gives a finish like satin and it's priced below tools of comparable quality! Just attach a 3½" x 9" sheet of abrasive paper; plug it in any electric outlet (A.C. or D.C.); and you're ready for the finest finish sanding — no final hand sanding needed! When you want a real tool, not a mere toy, pick the brand the experts choose . . . BLACK & DECKER!"



**WRITE FOR FREE BOOK!**  
Packed with helpful, money-saving hints on home jobs!  
Send to: Home Service Dept.  
H10M, THE BLACK & DECKER  
MFG. Co., Towson 4, Md.

Name.....

Address.....

City & State.....

# Pointers for Home Painters Floors:

Remove wax and polish by washing floor with turpentine. Wipe dry. Unless this is done, finish coats may not dry or stick properly.



Paint in areas about four feet square. Start in far corner and work toward door. For best results use wide nylon-bristled brush—one designed for the job.



On open-grained floors, brush wood filler into pores. Rub across grain with burlap to remove excess. Let dry. Sand lightly with grain. Clean with cloth moistened with turpentine.



To store brushes for long periods, clean thoroughly and wrap securely in manner shown here. Brushes stay in better condition when they're kept in good shape.

**JOB AFTER JOB**, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name **NYLON** on the handle. Be sure to pick the size brush designed for the job . . . and demand Du Pont nylon bristles.

*150th Anniversary*



Better Things for Better Living  
... through Chemistry

The best brushes have  
**DU PONT NYLON  
BRISTLES**



There's lots of luggage space in the rear compartment, which has a counterbalanced, self-locking lid

while others went along with a Beloit, Wis., banker who complained that the ash tray is too far from the driver.

Other miscellaneous grievances:

"Noisy valve lifters and smoke coming out of the exhaust for a couple of minutes after starting. They can't fix it."—West Newton, Mass., textile sales manager.

"Two oil leaks within 5800 miles."—Teaneck, N. J., publisher.

"Find parts hard to locate. . . Dealers state they are slow in coming from factory. Very inconvenient at present. Maybe better later."—Birmingham, Ala., salesman.

"Plugs foul up at low speeds."—Bloomfield, N. J., sales manager.

"Workmanship is not comparable with that of former models. A lot of little things could be remedied. It's too good a car to be built carelessly."—Jacksonville, Fla., restaurant owner.

Several owners, such as a Perth Amboy, N. J., salesman, indicated they were satisfied with the car but suggested Lincoln change its body lines for more distinction.

A frequent observation was that Lincoln provides an unusually easy ride at high speed. "I travel an awful lot," wrote a Corpus Christi, Tex., sailor, "and this is the only car I have found that doesn't beat me and my wife at high speeds."

"The feeling that we have something solid and dependable under us at all times makes motoring a pleasure," said a Columbia City, Ind., machine-repair man.

"The 1952 Lincoln is a big improvement in the line."—Catonsville, Md., attorney.

"We have six Lincolns in my office and they all have proved satisfactory."—Indianapolis insurance agent.

A few gratuitous suggestions were received from some owners:

(Continued to page 264)

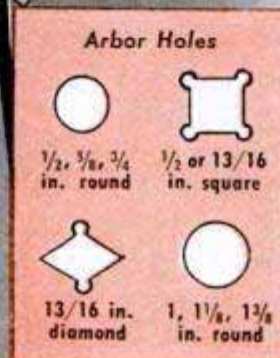


Tungsten carbide tips on all 8 teeth

# SEARS CUT PRICES Up to \$5.00 on Carbide-Tipped Saws!



8-inch blade  
Only  
**\$7.95**  
Each



## CRAFTSMAN Carbide-tipped 8-tooth Saw Blades . . . Buy now! Regular low prices cut even lower until October 31st!

Already priced lower than other carbide-tipped blades . . . now **SALE** priced until **October 31st!** Out-performs similar blades selling for much higher prices! One of these saws—a 10-inch blade in actual service—sawed more than 27 miles of  $\frac{3}{8}$ -inch laminated Masonite without resharpening, until damaged by a steel object.

Safer 8-tooth design . . . teeth project only .020 inch above non-cutting edge. Saw can't grab—protects you from kick-back injuries! Special steel saw blade is heat treated: **tungsten carbide tipped.** Cuts faster . . . easier . . . uses less power than ordinary circular saw blades . . . generates less heat . . . needs less resharpening.

Rips, cross-cuts, miters. Cuts woods, plastics, Formica, Masonite, Transite, laminates, roofing, aluminum, etc. (Not for masonry, steel, iron, or other ferrous metals.) All sizes reduced until Oct. 31, 1952, at your nearest Sears Retail Store!

Diam.	Arbor Hole	Fits These Saws	Price
5 $\frac{7}{8}$ in.	13/16 in. diamond	6-in. Skil-saw elec. hand saw.	\$ 6.95
6 in.	$\frac{1}{2}$ in. square . . .	Mall; DUNLAP elec. hand saw	6.95
6 in.	$\frac{9}{8}$ to $\frac{1}{2}$ in. round bushed arbor . . .	Porter-Cable electric hand saw; bench saws . . . . .	6.95
6 $\frac{1}{8}$ in.	1 $\frac{1}{8}$ in. round . . .	6-in. Black and Decker . . . . .	6.95
6 $\frac{1}{2}$ in.	$\frac{1}{2}$ in. round . . . . .	CRAFTSMAN 6 $\frac{1}{2}$ -in. electric hand saw; bench saws . . . . .	6.95
7 in.	$\frac{5}{8}$ to $\frac{1}{2}$ in. round bushed arbor . . .	Bench saws . . . . .	7.95
7 in.	13/16 in. diamond	Skil-saw, and Sears former 02186 electric hand saw . . .	7.95
7 in.	$\frac{1}{2}$ in. square . . . . .	Mall electric hand saw . . . . .	7.95
8 in.	$\frac{5}{8}$ to $\frac{1}{2}$ in. round bushed arbor . . .	CRAFTSMAN 8-in. electric hand saw; bench saws . . . . .	7.95
8 in.	13/16 in. square . . .	Mall electric hand saw . . . . .	7.95
8 in.	13/16 in. diamond	Skil-saw electric hand saw . . .	7.95
8 in.	1 $\frac{3}{8}$ in. round . . . . .	Black & Decker elec. hand saw	7.95
10 in.	1 to $\frac{3}{4}$ - $\frac{5}{8}$ in. round bushed . . . . .	Bench, builders', radial, and swing saws . . . . .	10.50
12 in.	1 to $\frac{3}{4}$ in. round bushed arbor . . . . .	Radial saws, swing saws, and bench saws . . . . .	16.50

**CRAFTSMAN** and **DUNLAP** Tools by **SEARS, ROEBUCK and CO.**  
Famous for fine quality . . . precision performance . . . low price!



with 40 most  
useful accessories  
in see-thru case

**\$2995**



**GRINDS • DRILLS • POLISHES • CARVES • CUTS • SANDS  
SAWS • ENGRAVES • ROUTS on WOOD • METAL • PLAS-  
TIC • GLASS • LEATHER • BONE AND OTHER MATERIALS**

**Only Loyd Scruggs Gives You All These Features**

- 110 V., A.C.-D.C.; U. L. approved.
- 25,000 r.p.m.—all the power you'll need.
- Compact (6" long, 1 5/8" diam.), balanced for easy handling.
- Efficient fan, aluminum housing for cool operation.
- Positive switch tested for 100,000 operations.
- 7-bar commutator (not 3) increases performance.
- Ball bearing construction, sealed-in lubrication.

**TRY IT** at your Hardware Store, Department  
Store or Hobby Shop

Not until you use this palm-size powerhouse — and see for yourself the sweet way it performs countless jobs — will you know why the new **LOYD SCRUGGS PRECISION POWER TOOL IS YOUR MOST PRACTICAL BUY!** For the name of your nearest dealer and interesting free folder, write The Loyd Scruggs Co., 1022 N. Sixth St., Dept. PM-1052, St. Louis 1, Mo.

*Loyd Scruggs*  
**PRECISION POWER TOOL**

## Operation Roll-Up

(Continued from page 133)

between them with a minimum of handling and a saving in operational time.

Three grinders were integrally mounted on a three-foot-thick concrete foundation. This was insulated from the floor of the building so as to prevent vibrations from being transmitted to the machines. The honing of the cylinder walls was accomplished by single-spindle automatic honing machines. The cylinder diameter was made to fit the piston, and working clearance was established by the use of a shim-and-pull gauge.

The first step in the reassembling of the engine was to fit the connecting-rod bearings to the crankshaft. The connecting rods were straightened and rebored where necessary. In the meantime, the cylinder block was washed thoroughly to remove any possible grinding residue. The final assembly of engines was likewise accomplished in the sequential manner on a production line. The open-backed stock bins were filled from the outside so that the workers might have free access in their working position. A ready supply of bolts, nuts and washers was carried in the trays attached to the sides of a roller conveyor line.

Electrical subassemblies and accessories were gathered in the carburetion and electrical section. Here carburetors, fuel pumps, generators, starters and distributors were disassembled, repaired, reassembled and tested on individual production lines. Spark plugs also were cleaned, adjusted, tested and sorted for reuse.

After being dynamometer tested, the engines were given two coats of paint and dried between banks of infrared lights. These were installed on either side of the conveyor line and were adjustable to accommodate different-sized engines. Two painting booths with waterfall backing kept the air free of stray paint and fumes. The volatile gases were removed from the paint-drying line by ducts and fans. In the processing section the engines were sprayed internally with a rust-inhibiting oil. The electrical accessories were sealed and sprayed with an ignition-sealing compound. Following this operation, the engines were boxed in reusable containers and delivered to the supply channels.

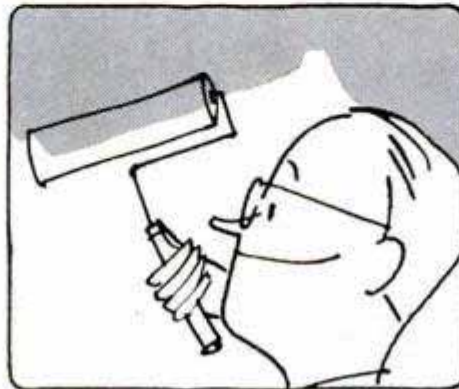
Unique in Japan, and outstanding by comparison with engine-remanufacturing facilities in the U. S., these production lines have performed a most important function in extending the taxpayers' dollars. At the same time they provide the indispensable replacement assemblies which support the United Nations in Korea today. ★ ★ ★

# YOU CAN'T DO A BAD PAINT JOB

## with New Gold Bond Velvet!



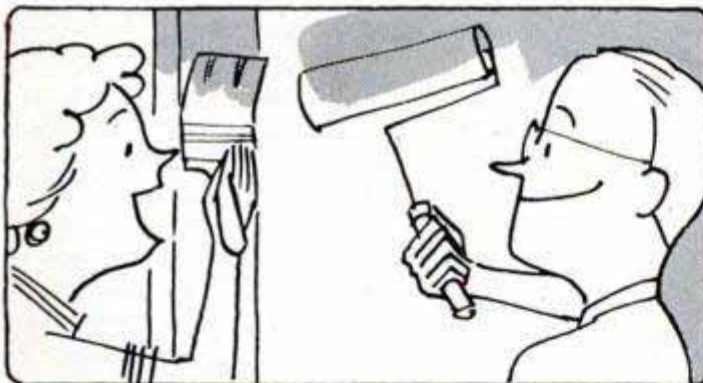
**GOLD BOND VELVET** is the easiest-going wall paint you ever used! Ready-to-use. No primer needed. Dries in minutes to a velvet smooth surface that won't crack, chip or peel.



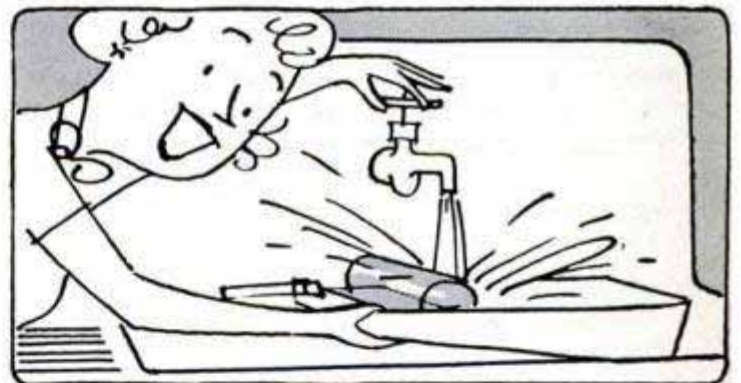
**FLOWS ON!** Just dip your roller or brush in odor-free Gold Bond Velvet and see how it goes on almost by itself! It eliminates what professional painters call "drag," which is so tiring.



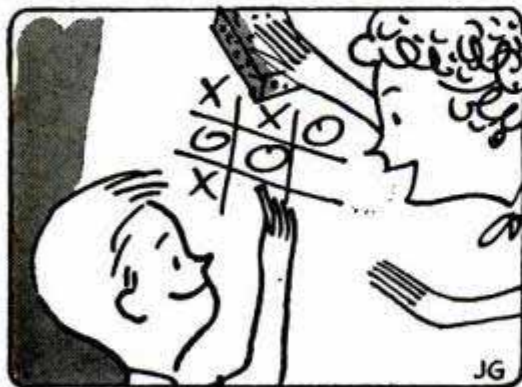
**WITH ORDINARY PAINT** you have to guard against lap or brush marks, touch-up spots. No worry with Gold Bond Velvet! This latex-base paint blends perfectly... you can't do a bad job!



**COVERS WALLS AND WOODWORK, TOO!** Use Gold Bond Velvet over paint, plaster, wallboard and even over most wallpaper... without an undercoater.

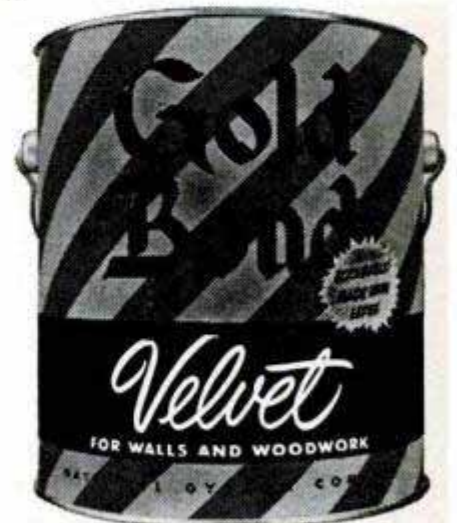


**EASY TO CLEAN UP!** Brush or roller cleans off with plain water. Spatter or splash marks clean up with a damp cloth. No turpentine needed.



**SCRUBABLE!** Durable Velvet can be scrubbed year after year without harm. Pencil, crayon, finger marks and food smears wipe right off!

Ask your local Gold Bond paint dealer or lumber and building material dealer to show you the 12 new Velvet colors. The orange and tan label is your assurance of another top quality National Gypsum Company product.



NATIONAL GYPSUM COMPANY • BUFFALO 2, NEW YORK



\* What Termites are to a house, Wearmites are to your engine! These minute bits of grit, dirt and tarry sludge that contaminate motor oil, cause engine wear and destruction. Car, truck and tractor engines that grow old before their time can usually point to these unseen mechanical vermin as the cause!



**Exterminate Grit, Dirt, and Sludge WEARMITES with-**

**wix**  
TRADE MARK REG.

**ENGINEERED FILTRATION**

A WIX HEVI-DUTY Oil Filter Cartridge rids motor oil of more destructive contamination and continues its job of cleaning oil for far longer periods of time! By using WIX Cartridges you save three ways! You get better service from your motor oil . . . you save on less frequent filter changes . . . you save unnecessary engine wear! Ask your Serviceman about WIX today.



**wix**  
TRADE MARK REG.



**OIL FILTERS CARTRIDGES**  
**WIX ACCESSORIES CORP., GASTONIA, N. C.**  
**IN CANADA: WIX ACCESSORIES CORP. LTD., TORONTO**

## Engineering—the Might of America

(Continued from page 123)

formulas for weed killers and insecticides.

We are notorious for neglecting our rivers. Sanitary engineers must clean them up, and hydraulic engineers must catch up with Europe in learning from the operation of hydraulic models how to prevent disastrous floods. Air safety, solution of today's intolerable traffic problems, modern city planning and cheap, durable houses are other challenges. We are just beginning to use prestressed concrete to build light, graceful bridges and buildings and save scarce steel. We need more engineers who understand it.

One would think that in a nation of mechanically minded, adventurous youth there would be a stampede into a profession that offers such opportunities and satisfaction. Unfortunately, such is not the case. Industry is wailing about the shortage of engineers, and has been signing up whole graduating classes, sight unseen. T. A. Marshall, Jr., head of the Engineering Manpower Commission of the Engineers Joint Council, reports that civilian industry alone needs 30,000 engineering graduates a year. Last June the colleges turned out about 28,000. Enrollments show that only 19,000 will be available in 1953, and less than 17,000 the following year.

The blame for this appalling situation is variously distributed. The U. S. was the only big belligerent engaged in World War II which had a policy of drafting engineers and engineering students for general military service—a great waste of skilled manpower. The decline in fledglings is partly due to the delayed effect of the low birth rate during the mid '30's, partly to a false report or a glut of engineers widely published two years ago.

Today the engineering student is getting more attention than a triple-threat back. Executives tour the campuses armed with attractive contracts. Albert Meyer, head of the Engineering Societies' Personnel Service, reports that the average graduate with a B.S. or an M.E. degree can command starting pay of \$325 to \$350 a month, that the boy with the Master's degree can get \$375, while the Ph.D. can start life at \$450 to \$500. This scale applies to *average* graduates; the exceptional man can get more, and can often choose among half a dozen firm offers. This means, among other things, that the engineering graduate can marry at once if he wishes—a privilege few professional men enjoy.

Reports indicate that the tightest pinch is in electrical engineers, with mechanical

(Continued to page 260)

# REMODEL IT YOURSELF... USE THE BEST



**save**  
**1/3**  
**or even more!**

PUT YOUR FOOT DOWN...  
INSIST ON **GOLD SEAL®**  
**LINOLEUM TILE!**



Put down **Gold Seal Linoleum Tile** and know that you've got the *right* tile over your wood floor. For this is *genuine* inlaid linoleum... *flexible*... designed to take the up-and-down movement of the average wood floor without a strain. It *can't* snap, chip, or shatter!

**And Gold Seal Linoleum Tile practically installs itself!** These tiles are precision-cut into *true, right-angled 9" x 9" squares*. They slice into odd shapes with just a knife... without heating, scoring, or hacksawing.

**It's greaseproof to household fats and oils.** Even splatters from a hot frying pan won't pit, soften, discolor, or disintegrate it.

**What a floor you get!** A smooth, warmly colorful floor, with all the quiet, restful resilience of the very finest custom installations... *at just a fraction of the cost!* Satisfaction guaranteed or your money back!

ABOVE ALL, USE **GOLD SEAL**  
**CONGOWALL®** IT'S UP FOR  
GOOD IN OVER 5,000,000 HOMES!



**There's only one Gold Seal Congowall**... the baked-enamel wall covering that looks, feels, and cleans like expensive ceramic tile... *never* needs refinishing, repairing or repainting.

**Only one genuine Congowall** that's so tough and sturdy... yet so flexible and *downright simple* to put up. Just paste it to the wall... that's all! Congowall's special, patented backing *locks* it to your wall... *keeps it there*, smooth and tight for good!

**Only Gold Seal Congowall** gives you a choice of 16 true tile colors, plus the new Ivy and Vine patterns. Cost? Only about 15¢ a square foot... including the Gold Seal *guarantee* of complete satisfaction or your money back!

**FREE!** Special do-it-yourself decorating booklet... 16 pages of full-color pictures, ideas, suggestions... easy-does-it hints for all rooms. Instruction booklet, too!

-----MAIL COUPON TODAY-----

Congoleum-Nairn Inc.  
Kearny 15, N. J.

Please send me **FREE** Decorating  
Booklet and Instructions.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



**CONGOLEUM-NAIRN INC.**

© KEARNY, N. J.

MAKERS OF GOLD SEAL GUARANTEED FLOOR AND WALL COVERINGS

*Money-Making Jobs...*

**ALL AROUND YOU!**

APARTMENTS

CHURCHES

NEW HOMES

STORES

SCHOOLS

OLD HOMES

SHOPS

**BE YOUR OWN BOSS!** *Big Money* waiting for you today in floor surfacing! Hundreds of prospects near you! The floor next door may be your first job—and business mushrooms as folks tell others. Earn as high as \$50 and more a day sanding floors with an easy-to-run American Machine. Pleasant indoor work—steady the year round. A sound opportunity to get in something for yourself and be *your own boss!* No schooling—no experience needed. Only small investment in sander gets you started to success! Send coupon for “money-making booklet” entitled “Opportunities in Floor Surfacing”—enclose 25c in coin or stamps to cover handling.



## AMERICAN FLOOR MACHINES

**SEND!**

The American Floor Surfacing Machine Co.  
535 So. St. Clair St.  
Toledo 3, Ohio

Enclosed find 25c in stamps or coin for booklet “Opportunities in Floor Surfacing”, telling me how I can start my own floor sanding business.

Name.....

Street.....

City..... State.....

and chemical engineers next in scarcity, but any kind of an engineer is snapped up. West Coast aircraft firms say, “If he’s an engineer, we take him and retrain him if necessary.”

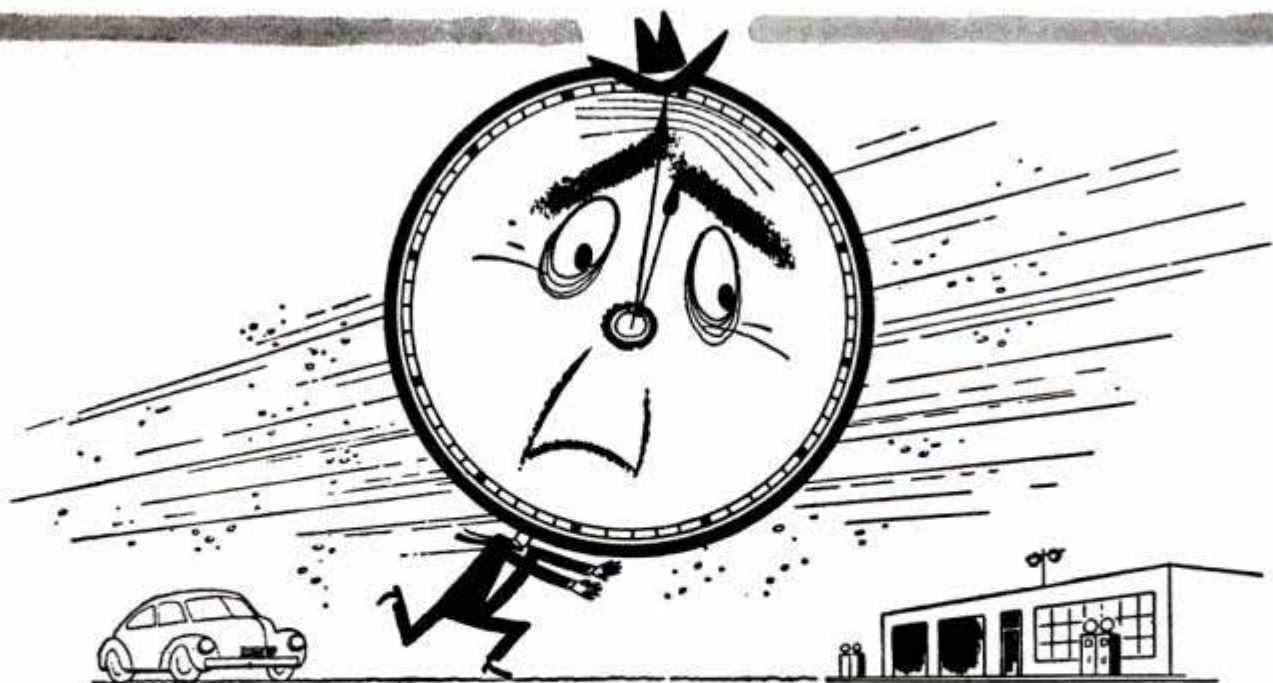
Once, the boy who aspired to corporation leadership went to law school; now engineering is the royal road to management. Leading engineering societies report that more than 30 percent of their members are in administrative or management posts.

All these prospects should appeal, not only to the boy choosing a vocation, but to the relatives who pay the bills. Yet it would be a serious mistake to suggest engineering to “fast buck” careerists. Most engineers are able to live comfortably by any reasonable standard, but few become rich. Only those who are fascinated, even excited, by the opportunities of the work itself, who wish to become a part of the highly skilled corps which is shaping tomorrow’s world in the service of mankind, should enter a calling which demands honesty and objectivity as first essentials. For such men, the engineering profession offers rewards found in few other occupations.

### “Doughnut” Glider



Sporting a round hole in the center, a new type of glider has been designed by members of the Aachen University Aero-club in Germany. A full-size glider is being constructed from the model, shown in above illustration, which is six feet in diameter. In actual flight, the pilot will sit in the forward section of the craft.



# Don't be a last minute man!

## PROTECT YOUR CAR NOW WITH PEAK® ANTI-FREEZE

Why run the risk of an unexpected cold wave that may freeze up your car's radiator or engine? Drive in early and let your serviceman clean the cooling system and put it in tip-top shape. Then, get Peak... the all-winter, all-weather anti-freeze. One filling is all you need for complete winter protection. Peak saves you the fuss and bother of check-ups after

every warm spell...it won't evaporate or boil away even on the warmest day. What's more, Peak's *exclusive* anti-rust combination keeps the cooling system clean all winter...prevents corrosion and rust clogged radiators. Beat the last minute rush - drive in and ask for Peak today. PEAK ANTI-FREEZE is a product of Commercial Solvents Corporation.

LOOK FOR THE BLUE AND SILVER CAN...

...\$3<sup>75</sup>  
GALLON



Freeze? FORGET IT!



Boil-away? NOT A CHANCE!



Rust? NEVER! NEVER!



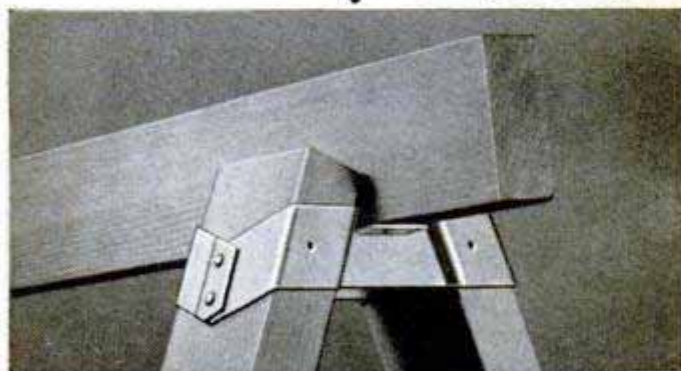
ONE FILLING  
IS ALL  
YOU NEED

PEAK...THE ALL-WINTER...ALL-WEATHER ANTI-FREEZE

# HOW TO...

## SET UP or KNOCK DOWN

# SAWHORSES FAST!



Use Strong, Lightweight

## NU-WAY SAWHORSE BRACKETS

Set up or knock down sawhorses in jig time! Carry them in your car . . . or store them easily . . . the modern way—the NU-WAY!

Practical, simple, time-saving NU-WAY Brackets are inexpensive . . .

**ONLY \$1.50** (one pair makes up one Sawhorse).  
**PAIR**

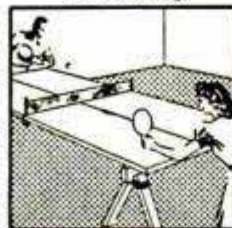
See your Hardware, Paint or Lumber Dealer NOW! If he does not carry Nu-Way Brackets, send check or money order for \$1.50 per pair (postpaid) to:



Work Benches



Scaffolding



Hobby Tables



Temporary Tables

THOMAS PRODUCTS CO., 8490 Lyndon, Detroit 21, Mich.

SEND me \_\_\_\_\_ pairs NU-WAY Sawhorse Brackets.

I enclose \$\_\_\_\_\_ in check or money order.

My name \_\_\_\_\_

Address \_\_\_\_\_

City and State \_\_\_\_\_

My favorite Dealer is:

Store Name \_\_\_\_\_

Address \_\_\_\_\_

City, State \_\_\_\_\_

## I Ride the Sno-Cat

(Continued from page 85)

That evening Phil Norton gives Wogy some valuable information on wildlife conditions in the upper valley.

On our trip back down the valley the next day, we stop at the Wyoming Game and Fish Commission's elk trap. On Wogy's next trip up here he'll be trapping elk. Each one will be labeled with a numbered metal eartag so its movements can be traced if later bagged by a hunter or captured.

Now, however, we will have to ready the elk trap. "An elk'll fall out of sight in those giant snow drifts!" Wogy exclaims. "Val, see if you can pack 'em down with the cat. Later, we'll scatter some hay around to lure in the elk."

As we race on down the valley at the alarming speed of 12 miles an hour, the deep powder sinks unevenly under our pontoons. And as the pontoons rock, the cab pendulums back and forth considerably. We gallop onward and the feeling of being seasick also races onward. At any moment I expect to look out the window and see porpoises playing in the white waves. Wow! Open the window for air, Mc-Hugh, you've been riding in this land-locked ship too long!

A night at the Goosewing Ranger Station and we're ready to shove off on the final jaunt of our 90-mile trip. The same trip by ski or snowshoe would have taken many more days of tedious travel. The Sno-Cat is the only vehicle that could take us and our equipment over this mountain terrain.

As we chug back into town, some natives gather to look over our odd vehicle. While Val steers the cat onto its trailer, one of the local men speaks to Wogy, "Sure musta been easy goin' in that contraption!"

Wogy looks at the man and smiles. He doesn't say a word. ★ ★ ★

## Oil Wrapped in Foil

Oil and grease drums are now being made of layers of aluminum foil laminated to linerboard. They were tested for a year under the same rugged handling given conventional steel drums, including ship and truck movement, and rough usage by logging, construction and mining crews. Made in 5 and 15-gallon sizes, sheet-steel tops and bottoms are attached to the shells by a special process. The new containers are eventually expected to replace the 30 and 35-gallon steel drums, which because of their original cost have to be reused many times and thus add bookkeeping and re-conditioning costs during the transfers.



# FOR EASIER SCRATCH-FREE SANDING . . . . . USE DREMEL STRAIGHT-LINE ACTION SANDERS

**FOR ALL HOUSEHOLD AND WORKSHOP SANDING**  
 You'll find Dremel Electric Sanders indispensable around the house and workshop. Thousands of satisfied users have proved only Dremel straight-line action sanding can produce professional-like, scratch-free surfaces. Both models sand with-the-grain, are durably built to give years of service. Avoid slow, tiresome hand sanding. See "where to buy" instructions at the bottom of this page.

## MODEL 2000

A high speed, fast-cutting production sander for home and shop use. Its straight-line with-the-grain action is ideal for redecorating jobs, furniture and cabinet making, boat building or refinishing, etc. Recommended by painters and carpenters for sanding woodwork, doors, stairways, dry wall joints, etc. Weighing less than 5 lbs., it is perfect for difficult vertical and overhead sanding jobs. Has 21 sq. in. (3 1/2" x 7") sanding pad. **\$24.50**

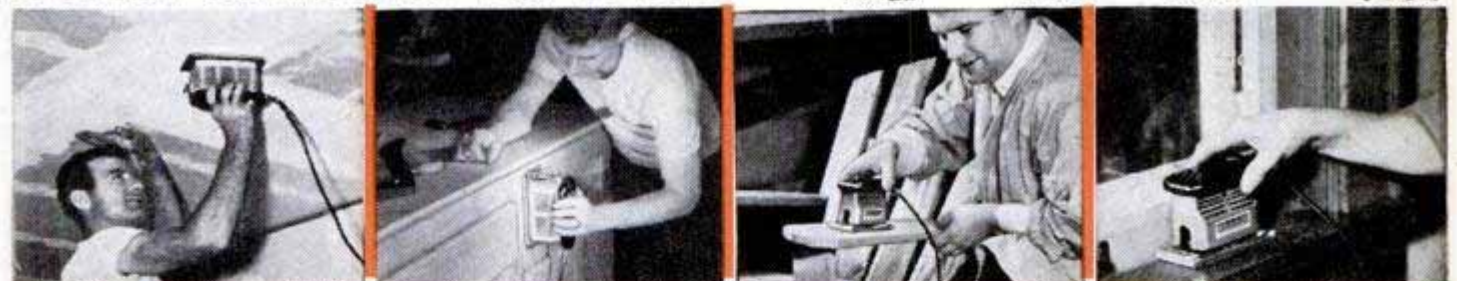
Price includes this sturdy steel storage case (shown below) with handy carrying handle; 25 assorted abrasives; 1 sheepskin pad.



### FREE SANDING GUIDE

A handy "How-To-Do-It" booklet containing helpful hints on sanding and refinishing procedures is packed free with each Dremel Sander. Extra copies available for 8.25.

## A DREMEL SANDER IS SO EASY TO USE



A "must" for sanding dry-wall joints. Fast—cuts refinishing time in half. Prepares furniture for repainting. Sands right into tight corners.

## GRINDS • CARVES • DRILLS • ROUTS • ENGRAVES • SHARPENS DREMEL Electric MOTO-TOOL



**KIT NO. 2** Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hard-wood case. **\$23.50**

### FASTEST, MOST POWERFUL TOOL IN ITS CLASS —APPROX. 27,000 R.P.M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a must. And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge.

**Check These Important Features:** Oilless sealed bearing • Dynamically balanced armature • Shockproof, Bakelite housing • Dust-filtered air cooling system • Sturdy 110-120 V., A.C.-D.C. motor • Wt. only 13 oz. • A precision tool widely used in industry for many years.

**KIT NO. 1** Includes Model 1 Moto-Tool and 34 Accessories (Steel Cutters, Grinding Wheels, Polishers, etc.). Packed in attractive lacquer-finished wood case. **\$17.50**

**MOTO-TOOL NO. 2** Offers more convenience and long life features for the money than any other hand grinder. Thousands of satisfied users. Moto-Tool No. 2 (With 1 emery wheel point) **\$16.50**



## MODEL "A"

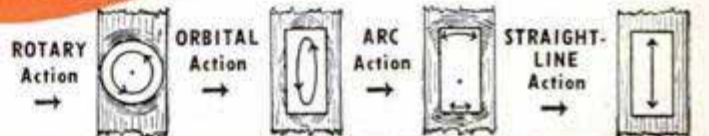
The lighter capacity Model "A" Sander is an excellent all-purpose household sander for home maintenance, furniture polishing, hobby projects, etc. Wonderful wax polisher. Perfect for massage use. Weighs only 2 1/2 lbs.; has 12 sq. in. (2 3/4" x 5 3/8") sanding pad. **\$14.85**

Price includes: 6 sandpapers, 1 sheepskin, 1 felt pad.

**BOTH MODELS FEATURE:** Only 2 moving parts; easy one-hand operation; 10-second paper change; 14,400 strokes per minute; 110-120 V., 60 cycle, A.C.

To produce flawless work of professional quality, all sanding must be done with the grain of the wood. Therefore, when selecting a Sander, it is important to remember that only Straight-Line, with-the-grain action is suitable for finish sanding operations. For the finest finishes, insist on a Dremel.

Note How Dremel With-The-Grain Action Eliminates Cross-Grain Scratches



SEE YOUR LOCAL DEALER Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship post-paid. Or, send only \$2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MANUFACTURING CO.

Dept. 112-K

RACINE, WISCONSIN

"Would like to see leather upholstery available in sedans as standard equipment."  
—Glen Ellyn, Ill., printer.

"Women with high-heeled shoes need a comfortable footrest."—Winchester, Mass., manufacturer.

"Power brakes and power steering, plus a little more horsepower, would do wonders on this car."—Los Angeles, Calif., sales manager.

"New cars should be serviced and checked free of charge through 5000 miles, thus catching everything which may not be right."—Porterville, Calif., grower.

Lincoln apparently gives a strong feeling of security. "I have had occasion to drive several other cars of top quality," wrote a Park Ridge, Ill., lawyer, "and I can truthfully say the Lincoln is a magnificent road car. It holds the road under the most adverse conditions and conveys a feeling of complete safety to driver and occupants."

As could be expected, the average gas mileage reported by Lincoln owners was somewhat lower than that recorded for smaller, lighter cars. The survey showed that Lincoln owners average 13.3 miles per gallon in city driving, 16.2 miles per gallon in the country. In this connection, a St. Louis, Mo., manufacturer's agent could well be the envy of many drivers today. He wrote: "I don't worry too much about gas-

oline mileage and haven't kept any real check on what I am getting. I feel that the difference between 15 miles to the gallon and 19 miles amounts to only a few dollars by the end of the year, so I don't worry about it!" (This is exactly the feeling of many owners of high-priced cars, according to our surveys.)

No conclusion can be reached in this survey on the matter of chrome trim. As many owners said they wanted more chrome and some said they wanted less, the argument remains unresolved. (Many owners of nearly every make think the chrome is not good enough.)

A few owners complained that many garage mechanics seem at a loss in going about repairs. A Charlotte, N. C., owner wrote: "My Capri spends at least one full day a week in the shop, and the mechanics don't even like to work on the motor because of its poor response to their efforts." This was echoed by a Toledo, Ohio, engineering executive who said: "On a trip, I drove into a Lincoln-Mercury service shop in a town of more than 100,000. I waited 2½ hours, but they didn't know what to do with the car. They said they hadn't received instructions as to what service should be rendered. I had trouble and put in all new plugs after 3000 miles. That's good?"

(Continued to page 266)

Only the new Millers Falls

No. 966 Sander-Polisher

*Does Them  
All*



**\$37<sup>50</sup>** with 6" rubber pad, 6" lamb's wool bonnet, and three 6" sanding discs.

Additional accessories and attachments are available to save you time and money on hundreds of jobs.

- Buffing ✓
- Disc Sanding ✓
- Orbital Sanding ✓
- Drilling ✓
- Grinding ✓
- Polishing ✓
- Waxing ✓
- Mixing Paint ✓
- Wire Brushing ✓

Compare its uses . . . compare its price . . . compare its quality. You'll find no other power tool offers so much for so little. See it at your hardware dealer's or write for full details.  
Millers Falls Co., • Greenfield, Mass.



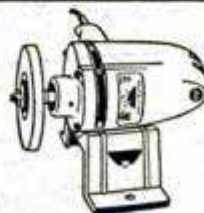
*The Mark of Superiority*



It's a 6" Disc Sander and Polisher



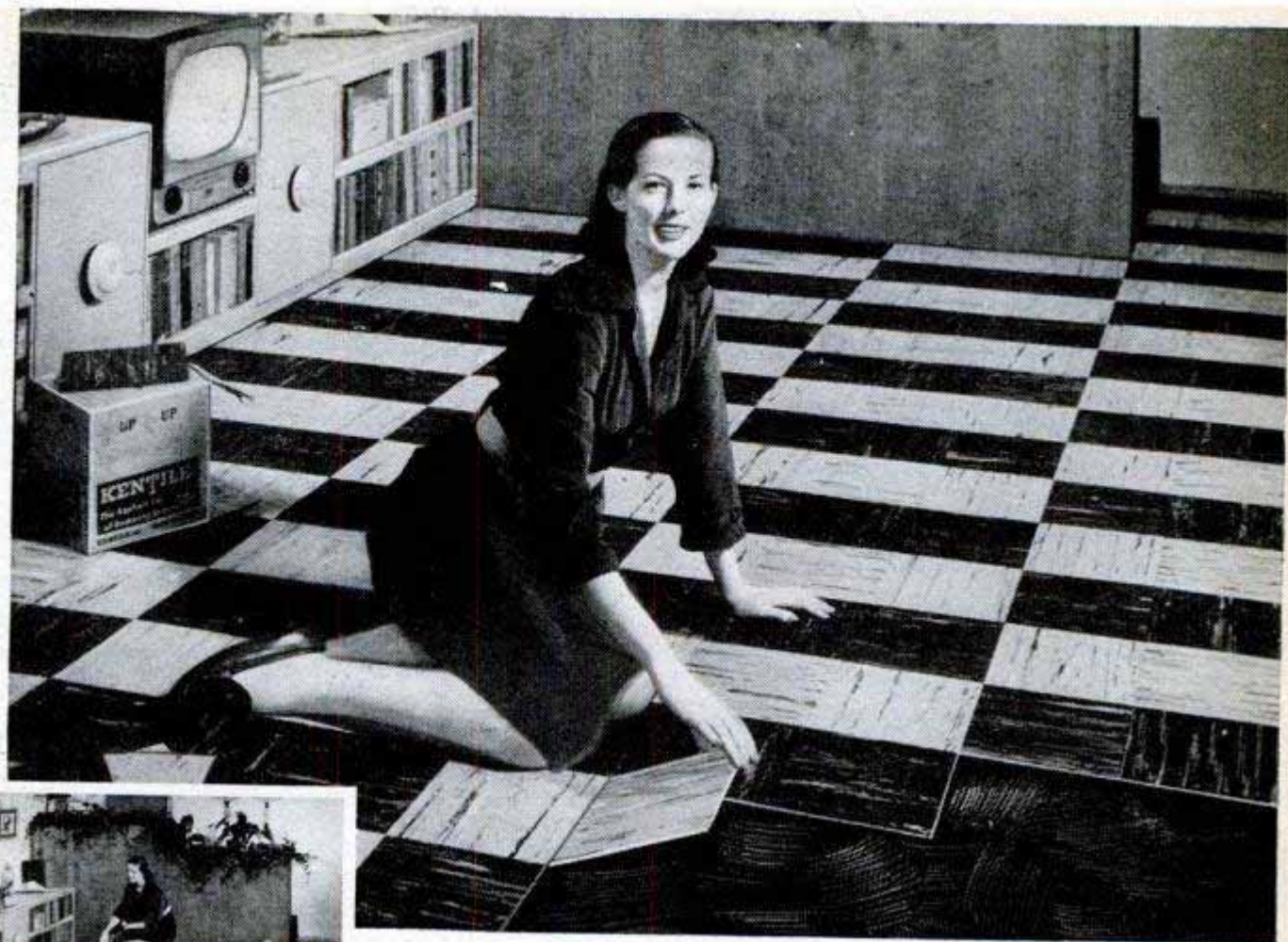
It's a Fine Finish Sander with the No. 980 Orbital Attachment



It's a Bench Unit with the No. 9668 Stand



It's a ¼" Drill with No. 9665 Jacobs Key Chuck



**STEP 1...** Mrs. Lansing follows the simple instructions. Here she's beginning to spread adhesive over half the play room.



**STEP 2...** She puts tiles down in place, one at a time. When half the floor is covered, the adhesive is spread over the remaining half.



**STEP 3...** After adhesive is ready, Mrs. Lansing continues installing tiles... and the other half of the room is finished... and all ready to walk on.

## Mrs. Richard Lansing shows how to install a **KENTILE FLOOR** like this for only **\$22<sup>25</sup>\*** FOR 9'x16'6" FLOOR

Think of the money you'll save! 26 glorious colors to choose from give you colorful beauty for kitchen, bedroom, living room...anywhere in your house. Cleaning is easy with Kentile...it sheds dirt and stains...gleams like new with occasional no-rub waxings...stays bright and fresh even with the hardest kind of service.

So why buy floor-coverings with just a colored surface that wears off with use? For so little more you can now get wear-resistant Kentile with colors extending right through each tile—and with quality assured by this guarantee.

KENTILE, INC., 58 2nd Ave., Dept. G-9, B'klyn 15, N. Y.

Only Kentile dealers  
offer you these  
low-priced Guaranteed  
Kentile Floors

\*Price quoted is for a 9'x16'6" Kentile floor (less stair area) installed by you. Your Kentile Floor may cost less or slightly more, depending on size of room, colors and freight rates. See your local Kentile dealer. He's listed in the classified phone directory under FLOORS. In Canada, T. Eaton Co., Ltd.



# KENTILE®

The Asphalt Tile of  
Enduring Beauty



### KENTILE

### GUARANTEE

#### FOR SELF-INSTALLED KENTILE

Kentile, Inc. will provide new tile without charge for any Kentile that wears out... and on which colors wear off... during your own occupancy of your home when you have installed Kentile. This guarantee does not apply to damage caused by improper handling, or failure to follow the instructions for installation and maintenance available at your Kentile dealer's.



## make your **HANDS** **MORE CREATIVE** with **X-acto Knives and Tools**

Creative hands can be your greatest asset... X-acto knives and tools help the intelligent coordination of active minds and agile fingers... they can develop skill and dexterity in any art or handicraft you select.



Whether it's boat whittling, model airplanes, wood-carving, leathercraft, model railroads or any other handicraft, you can make your hands more creative with "designed-for-the-job" precision-engineered X-acto knives, tools and handicraft kits.



X-acto offers the complete line of handicraft knives, interchangeable blades, tools and attractive kits



From 25¢ to \$30.—at dealers everywhere.



No. 82  
X-ACTO KNIFE CHEST  
\$4.20



Send 15c to cover postage  
for our new illustrated  
28-page Catalog.



**X-acto Crescent Products Co., Inc.**  
440 Fourth Avenue, New York 16, New York

A wide variety of responses was received to the question, "How do you rate your dealer service?" Of the owners replying, 42 percent said excellent; 30 percent good, 15 percent average and 13 percent poor. In all our surveys to date, this item has been one of the most important factors in the owner's decision as to whether he would buy the same make of car again.

A Mansfield, Ohio, housewife, voiced what must be the unanimous sentiment of automobile owners everywhere in her response to our question, "What specific improvement would you like to see in your next car?"

She replied: "Same car at a lower price."

**And now for my own test** of the Lincoln Capri. We drove the test car from the factory in Detroit to Los Angeles via Indianapolis, Denver, Grand Junction and Las Vegas—a distance of 2750 miles—which included considerable off-road testing in the mountains and deserts. We made several detours over rough and muddy roads.

Lincoln has gone overboard in its styling, and engineering improvements have made the new Lincoln a really worth-while automobile in appearance, performance, roadability and economy. Over all kinds of highways, including tests in the Rocky Mountains of Colorado and the Nevada and California deserts, I found the Lincoln to be responsive and superior to most cars in its class in roadability and cornering.

The new 160-horsepower engine of overhead-valve design has 317.5 cubic-inch displacement and a 7.5 to 1 compression ratio. It is fast, flexible and has little vibration. The engine weighs 100 pounds less than the engine used in the 1951 Lincoln. The 1952 four-door sedan is 242 pounds lighter than the 1951 four-door model.

The new ball-joint front suspension system enables one to corner at high speeds with a feeling of safety and with little steering effort. The car steers almost as easily while in motion as if it were equipped with power steering, and easier at all speeds than most cars of comparable weight. The controlled-action shock absorbers give a very comfortable ride. Only twice at high speeds did the front or rear end "bottom" when we hit sharp bumps.

Another feature I like is the dual mufflers (one for each bank of four cylinders). This eliminates some back pressure and should help some in cooling. The dual system also should increase top speed and power a trifle.

The car has excellent top speed. On long open stretches the speedometer needle well above 110 miles per hour, the last figure on the dial. (Like most speedometers

(Continued to page 268)

# How Creative Designing Gives You This Easier Working, Precision Bench Saw:

## WIZARD 8 INCH TILT-ARBOR SAW

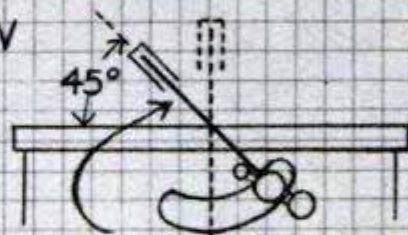
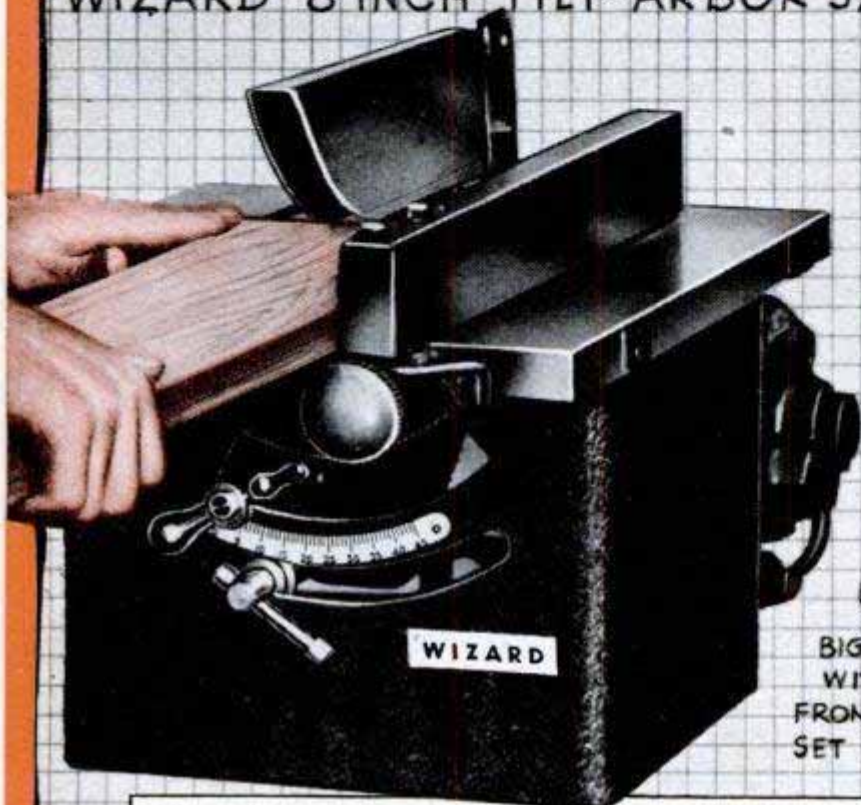
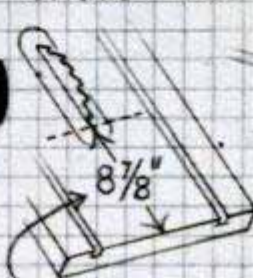
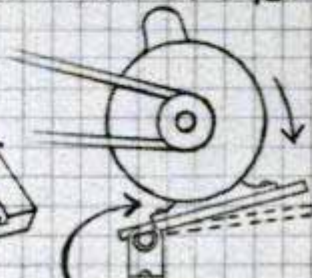


TABLE AND WORK STAY LEVEL WHILE BLADE TILTS TO 45°... BEVEL CUTS A 2"X4" MAXIMUM STRAIGHT CUT DEPTH OF 2<sup>5</sup>/<sub>8</sub>".



BIG 17"X14" TABLE WITH FULL 8<sup>7</sup>/<sub>8</sub>" FRONT WHEN BLADE SET FOR 1" CUT.

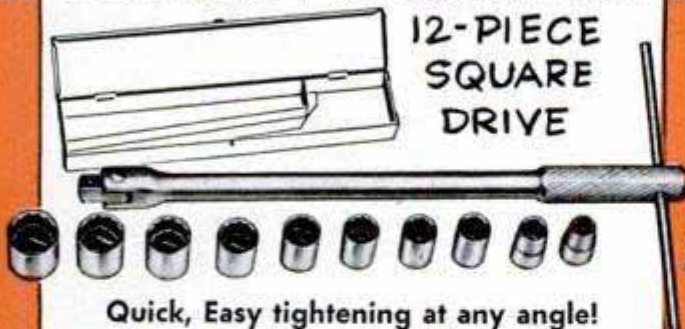


FLOATING MOTOR RAIL CONTROLS BELT TENSION FOR EFFICIENT OPERATION.

Fix-up jobs and woodworking are fun with this rugged saw. Save hours of tiresome hand sawing . . . your work's done with greater accuracy *in minutes!* 8" combination blade zips through piece after piece . . . rips, crosscuts, rabbets, bevels! Dado capacity: 1<sup>5</sup>/<sub>8</sub>" deep, 11/16" wide. 1/2" ball-bearing arbor never needs oiling. Complete with blade, guard, splitter, V-belt, pulley, motor rail, miter gauge, fence. (2H1006) **\$53.95**

## WESTCRAFT 1/2" SOCKET SET

12-PIECE SQUARE DRIVE



Quick, Easy tightening at any angle! 10 most-used alloy steel 12-pt. sockets with hot broached, uniform tapered walls. Chrome plated. Tee Flex handle & crossbar: Metal box. (HR2950) **\$9.45**



## WIZARD ELECTRIC 1/4" DRILL

Whirls through wood, metal, plastic in a flash! Motor gives perfect speed-power balance. Alloy steel-cut gears. Trigger switch. Precision "hand-tite" chuck. (2H1379) **\$12.48**

CHOOSE FROM OVER 1,100

**Wizard-Westcraft Tools** SOLD ONLY BY **Western Auto**

STORES AND ASSOCIATE STORES

NOTE: WESTERN AUTO ASSOCIATE DEALERS OWN THEIR OWN STORES AND SET THEIR OWN PRICES. TERMS AND CONDITIONS. PRICES MAY VARY DUE TO DIFFERENCES IN LOCAL CONDITIONS. IF YOU DO NOT KNOW THE LOCATION OF YOUR NEAREST WESTERN AUTO STORE, WRITE: WESTERN AUTO SUPPLY CO., 2107 GRAND, KANSAS CITY, MISSOURI. (PM102)

# LOOK what you can MAKE

with  
**DURON\***  
THE HARDBOARD  
OF 1,001 USES!



CABINETS



TABLES



ROOM DECORATIONS



TOYS



GAMES



NOVELTIES

Make an end-table, make a chair—and make it out of DURON Hardboard! Versatile DURON is wonderful material for craftsmen: hand-bend it easily for curved-front effects, saw it without later sanding, nail it without splintering. Yes, work it just like wood—but get neater results for less cost. Marble-smooth on both sides, you don't even paint DURON unless you want a different color. For your next project, try this strong, wood-fiber base plastic material. DURON... the hardboard with 1,001 uses in your shop!

\*T. M. Reg. U. S. Pat. Off.

See your lumber dealer. Or send for these two folders—free. Packed with useful shop information. Write: United States Gypsum Co., Dept. 143-O, 300 W. Adams St., Chicago 6, Ill.



**UNITED STATES GYPSUM**

The Greatest Name in Building

I found it approximately 7 percent fast at top speed.) The acceleration is not quite as fast as I had expected up to about 60 miles per hour, but the flow of power is smooth and there is little vibration at any speed. Above 60 miles per hour, acceleration is excellent. The car could stand a few more "horses." Regular gasoline was used during the entire test run with practically no evidence of pinging or heating. Even in the mountains, over muddy roads, and in the desert I was unable to make the engine heat.

On a short cut through Zion National Park, Utah, we encountered several hours of heavy rain. Much of the road was unpaved and we drove in mud for many miles. The body was tight and there were no water leaks. Two squeaks developed but later disappeared. There were no rattles and I noticed that even at high speed there was little body rumble or wind noise.

The hood lifts easily and locks from the outside. I'd prefer an inside hood lock, which affords some protection for underhood units.

Visibility in the new Lincoln is outstanding, although the front end is about as wide as that of any car I ever have driven. The windshield is curved and one-piece. It has a slight uniform tint throughout—just enough to break or filter the rays of the sun, but not enough to give a noticeable effect at twilight. The wrap-around rear window on the Capri model gives excellent rear vision. As in most other cars, there is considerable reflection day and night on the curved windshield from the top of the instrument panel.

The brakes are exceptionally good, and the foot brake is operated by a wide pedal with slight pressure. The pedal is of the pendulum type hanging from above, and thus eliminates any hole in the floor board where dirt, water or air can enter. The suspended pedal and linkage to the master cylinder allows quite a bit of travel and leverage before pedal pressure actuates the brakes, so the application may be severe. After I learned the "feel" it was easy to apply the brakes gradually. The hand brake is at the right side and requires quite a lot of pressure to apply. As soon as the ignition is turned on, a red warning indicator starts flashing and continues until the hand brake is released.

The instrument panel is beautiful and the instruments are grouped directly in front of the driver. The speedometer face deserves mention, as it has a separate trip-mileage indicator. The odometer, or mileage, figures are under the needle and thus are not hidden at any time. The speedometer needle is thin and gives a fairly accurate indication

(Continued to page 270)

# SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD



## NEW HIGH SPEED SMALL DRILLS

Sizes available—letter size C, fraction size 3/16", number sizes 2, 5, 10, 12, 13, 18, 40 & 50. 12 of any one size, doz. \$2.15  
12, any mixture of your selection of above sizes . . . . . \$2.35  
NOTE: Min. order, 1 doz. Large quan. available at further discounts.

**SET 12** different size H. S. straight shank Drills, 1/4" to 1/2", lengths up to 7". Only . . . . . **\$3.98**

## HIGH SPEED DRILLS

1/4" to 17/32" WITH 1/4" SHANKS!  
**SET 6** different size H. S. Drills, 1/4" to 17/32" all with 1/4" shanks. PPD. . . . . **\$2.98**

**SET 10** of above, **36F** PPD. . . . . **\$4.95**  
Sets 35F and 36F will fit any 1/4" drill.

## HIGH SPEED DRILLS

1/2" to 1-3/16" WITH 1/2" SHANKS!  
5 Drills for less than the price of one new Drill!

**SET 5** different size H. S. Drills **32F** 1/2" to 1-3/16" . . . . . **\$7.95**

**SET 10** different size H. S. **33F** Drills 1/2" to 1-3/16" . . . . . **\$14.50**  
These new and used H. S. precision Drills with 1/2" shanks can be used in a 1/2" elec. drill or a 1/2" capacity lathe or drill press.

## HIGH SPEED MORSE TAPER SHANK DRILLS

**SET 15** Different Size High Speed Morse Taper Shank Drills up to 9/16" with No. 1 and 2 tapers. New and used. \$50 value. Priced at only . . . . . **\$6.49**

**SET 20** Different Size High Speed Morse Taper Shank Drills from 1/4" to 1" New and used. \$70 value. Priced at only . . . . . **\$12.95**

**SET 10** Different Size High Speed Morse Taper Shank Drills from 1/2" to 1 1/4". **15F** New and used. \$50 value. Priced at only . . . . . **\$9.95**

**SET 8** Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. New and used. \$125 value. Priced **\$29.95** only.

## 6 SLITTING SAWS WITH MANDREL

**SET 6** different size high speed Slitting Saws, 5 pcs. 2 1/2" dia. x 1" arbor, plus 1 pc. 5" dia. x 1 1/2" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" electric drill. \$25 value. PPD. Only . . . **\$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. Ppd. **\$4.95** A bargain at . . . . .

## HIGH SPEED WOODRUFF KEY SEAT CUTTER

**SET 5** different size cutters. Can be used as mounted milling **4F** cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 3/4", dia. up to 1". New and used. Ppd. . . . . **\$3.95**

## NEW MOUNTED STONES

**SET Mixture of 12** Mounted Stones with 1/4" shanks. PPD. . . . . **\$2.49**

**New Buffing Wheels**  
Approx. 5/16" thickness.  
5 pcs. 7" dia. . . . . \$1.70  
5 pcs. 8" dia. . . . . \$1.70  
5 pcs. 9" dia. . . . . \$2.00  
5 pcs. 10" dia. . . . . \$2.50  
5 pcs. 12" dia. . . . . \$2.50  
Large quantity available at an enormous saving!

## New Rotary FILE MIX

7 different pcs., High Speed 1/4" shank. PPD. . . . . **\$4.49**  
**SET 14** different pcs., as above. PPD. . . . . **\$8.79**

## DOUBLE-END END MILLS

**SET 4** right hand H. S., 3/8" straight shank End Mills up to 3/8" dia. . . . . **\$3.98**

## LARGE SAW BLADES

These large steel, flat high speed steel, flat ground, circular blades are in excellent, usable condition. Excellent for cutting brass, copper, aluminum and other soft metals, bone, plastics, rubber, paper, etc.  
8 x 1/16 x 5/8 arbor . . . . . ea. \$2.50  
10 x 3/32 x 1 arbor . . . . . ea. 2.50  
12 x 3/32 x 1 arbor . . . . . ea. 2.50  
14 x 3/32 x 1 arbor . . . . . ea. 2.50

## H. S. TAPER SHANK CHUCKING REAMERS

**SET 15** Different Size High Speed Morse Taper Shank **25F** Chucking Reamers up to 1 1/2" with No. 1 and 2 tapers. New and used. Priced at only . . . . . **\$7.95**

**SET 8** Different Size High Speed Morse Taper Shank **13F** Chucking Reamers from 1/4" to 1". New and used. Priced at only . . . . . **\$6.95**

## HIGH SPEED HAND TAPS

**SET 8** different size H. S. Std. Thread Hand Taps up to 5/8". **1F** including 2 Std. H. S. Pipe Taps. . . . . \$2.95  
**SET 40F** 16 same as above . . . . . \$4.80

**NEW NORTON CUT-OFF WHEELS: 80-grit MSL.** Will cut stone, steels, plastics, etc.  
3 x 1/16 x 1/4 arbor 3 pcs. . . . . 25c  
3 x 1/16 x 1/4 arbor 3 pcs. . . . . 27c  
4 x 1/16 x 1/4 arbor 3 pcs. . . . . 30c  
4 x 1/16 x 1/4 arbor 3 pcs. . . . . 30c  
4 x 1/8 x 1/4 arbor . . . . . ea. 25c  
8 x 1/8 x 3/8 arbor . . . . . ea. 70c

**TAP HANDLE** . . . . . \$2.75  
No. 6 (5/32" to 3/4" Cap.)  
Only . . . . . Discounts on quantity

## BARGAIN TOOL & SHOP MIXES—PPD.

- 30 GRINDING WHEELS 1/4" arbor, 4" diameter max. . . . . **\$3.29**
- 12 FILES up to 12" length, a buy at . . . . . **\$3.49**
- 2—8" WIRE WHEELS coarse and fine, 1" thick, 3/8" bore. Pair only . . . . . **\$2.29**
- 300 SPRINGS all types and sizes . . . . . **\$1.79**
- 100 MOUNTED POINTS 1/8" and 3/32" shanks. Various shapes . . . . . **\$8.98**
- SURPRISE MIX: Over 50 pcs. for your 1/4" elec. drill including rotary files, drills, bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied. . . . . **\$2.98**
- BEARING MIX: About 40 needle, ball and roller bearings, new and used. Up to 2 1/2" dia. approx. 5 lbs. Outstanding buy at . . . . . **\$2.95**
- RIVET MIX: 5 lbs. assorted rivets; cherry, explosive, etc. Hundreds of rivets. . . . . **\$2.29**

## GENERATORS!

**P1 GENERATOR** 200-amp. 24-volt, continuous duty. Wt. 48 lbs. Special closeout price. F.O.B. Tulsa. . . . . **\$14.98**  
**ESA GENERATOR** 50-amp, 12 volt continuous duty. Wt. 21 lbs. F.O.B. Tulsa. Only . . . . . **\$9.98**  
These used, guaranteed serviceable aircraft quality generators are easily convertible for welders, power plants, boats, platers, etc.  
**2 H. P. MOTOR** 24-volt, 90-amp. double end ball-bearing shaft. Wt. 18 lbs. F.O.B. Tulsa, only . . . . . **\$7.00**

Money-Back Guarantee On RECEIPT of Merchandise. All mdse. mixture of new and reconditioned unless specified new. All orders (Except those specified F.O.B. Tulsa) are shipped Post Paid, saving you up to 25% on total delivered cost!

Write For Free Catalog Describing Thousands of Bargain Cutting Tools.

## HYDRAULIC BARGAIN DEPT.



**New Hydraulic Hose!!**  
2000-lb. Test  
• Any length • Std. Pipe Connections  
3/8" and 1/2" ID Available

Length in feet	Price 3/8" ID	Price 1/2" ID	Length in feet	Price 3/8" ID	Price 1/2" ID
1	\$1.50	\$1.65	6	\$3.60	\$3.75
2	2.25	2.40	7	3.75	3.95
3	2.75	2.95	8	3.95	4.10
4	2.95	3.10	9	4.25	4.40
5	3.40	3.60	10	4.50	4.65

11 to 50 ft. lengths available at 40c per ft. for 3/8" ID hose and 45c per ft. for 1/2" ID hose. All lengths priced complete with connections! Finest construction. Double wire internal braid.  
Note: Large quantities available at additional discounts.

## NEW VICKERS MF9, 6 H.P. HYDRAULIC MOTOR

Unit is compact, powerful. Displaces .507 cu. in. per revolution, 6 gal. per min. at 3000 RPM, 1500 PSI. Positive displacement. Angle type. Rated at 6 H. P. Rotates either direction. Unit can also be used as a pump. Here is the finest hydraulic motor available at a fraction of its new cost of over \$200. . . . . **\$29.50**  
Our price only . . . . .

**NEW VICKERS HYDRAULIC MOTOR:** Serial No. MF 1071130 B.C. F. 2. cu. in. displacement per rev. .378, 3600 R.P.M., 1000 P.S.I. Unit similar to above only with smaller displacement and H.P. Only . . . . . **\$24.50**

## NEW VICKERS HYDRAULIC VARIABLE DISPLACEMENT PUMP

Unit is used where a varying volume under continuous pressure is desired from a motor pressure generator in a hydraulic circuit, with non-pulsating flow. Pump will deliver maximum volume at any pressure setting between 600 and 900 PSI. When the volume of oil required is reduced from maximum to 0, a pressure rise up to 100 PSI above setting will occur. Any pressure setting is made by adjusting regulating screw. Unit has 1100 PSI internal relief valve. Pump housing serves as a reservoir for system and has built-in compressed air supercharger making the system independent of outside atmosphere pressure. Rotation is to the left only, continuous duty RPM 3750. .484 cu. in. per revolution displacement. PPD. . . . . **\$29.50**

## NEW MASTER HYDRAULIC CONTROL VALVE for controlling two single or double action cylinders separately or simultaneously. Valve is close center type. 1500 PSI rating, only . . . . . \$9.98

## PESCO HYDRAULIC GEAR TYPE PUMP

Rated at 3 GPM, 3750 RPM, 1500 PSI, 1/2" drive spline. Gov't cost over \$90. Yours for only . . . . . **\$9.49**

## NEW GEAR BOX TRAIN

6 to 1 gear ratio to two flex shaft outlets; one 1 1/2" flex shaft included. Unit includes 8 gears and 7 precision bearings. Many other gear ratios possible. Wt. 10 lbs. PPD! **\$6.95**

## 1/20 H. P., 110-VOLT MOTOR

60 cycle A. C. 1550 RPM. bronze bush bearing. 5/16" shaft. Wt. 4 lbs. Used, guaranteed serviceable. Only . . . . . **\$2.49**

## 24-VOLT TRANSFORMER: 110-volt A. C. to 24-volt, 3 amps. Just the thing for your small 24-volt motors. . . . . \$1.95

**T & T TOOL** 221 W. SECOND TULSA, OKLA.

of the speed. It is much more effective than needles on many other cars, in which the styling department has gone overboard by using a wide, thick needle so the driver cannot accurately determine his speed.

All instruments are included in the one panel. The starter operated by push button. Radio antenna is raised or lowered by push button which operates only when the engine is running. The radio reception is excellent and the Capri has front and rear speakers. Either can be controlled by the turn of a selector. One cigarette lighter and an ash tray are located near the center. An ash tray and lighter are located in each armrest for rear-seat passengers. There are four levers for controlling the air and temperature, the vents, the defroster and the blowers. The heating system is excellent—adequate and well-engineered to circulate heat or cool air on either side of the car. The control levers are conveniently located but are somewhat complicated and require some study for manipulation. The operation of the entire system could be simplified. The dome-light switch is in an unhandy position, low on the left-side panel behind the driver's seat.

The full-circle horn ring is the first I have noticed that does not partially obstruct the view of the speedometer or other instruments on the dashboard.

There is a neat map light under the dash, operated by a toggle switch. The clock is small but easy to read and it kept excellent time. The glove compartment is about average size.

At times, as in many other modern cars, there is a disturbing reflection of the sun off the top of the instrument panel.

Six and a half turns of the window crank are required to lower or raise the window; in my opinion, far too many. (Engineers should try the Plymouth or new Willys window-cranking ratio.) The doors open easily by a push button on the outside and a convenient lever on the inside. It takes about average pressure to close the doors.

The bumpers are massive and afford ample protection.

One of the new features this year (which also appears on Ford and Mercury cars) is the new center-fill gas tank, which permits the driver to enter a station on either side of a gasoline pump. Most service station attendants I talked with liked this feature, but several complained that the license plate which hides the center cap had to be held down while the cap is removed and the tank filled.

The test car was equipped with the new Dual-Range Hydra-Matic transmission, which is an improvement over the former

(Continued to page 272)

# POWER like this you've never

*ride Harley-Davidson's NEW '53 Twin for the thrill of*

**ADVANCED  
ENGINE  
DESIGN**



- 45 degree V-type Overhead Valve Engine — 55 horsepower
- The only motorcycle engine in the world with Hydraulic Valve Lifters
- Hemispherical Combustion Chambers for maximum performance
- Valve Rotators prevent carbon on valve seats and hot spots on valves
- Aluminum-bronze cast-in valve seat inserts reduce valve wear and assure proper valve seating

Sensationally new! Another reason why Harley-Davidson continues to lead the field with the newest, smoothest riding, best performing motorcycles in the world. The new '53 Twin sets the pace for thrills with an improved 74 OHV motor . . . a twin that's packed with features that lead the way for the entire automotive industry.

Here's flashing power for swift, fun-packed miles. Tops, too, in comfort, reliability and sleek, streamlined styling. See and ride the sensational Hydra-Glide at your dealer's today. Bring a buddy along. Or send 25 cents for illustrated literature and a copy of the Enthusiast magazine, filled with exciting action pictures and stories.

Harley-Davidson Motor Co., Dept. P, Milwaukee 1, Wis.



**HARLEY-  
DAVIDSON**  
**HYDRA-GLIDE®**

POPULAR MECHANICS





## Build This Handy SHELF-DOOR WARDROBE With Easy-To-Use Plywood

HERE's a brand new idea in built-ins—a single storage unit that combines a big, roomy wardrobe for coats and dresses . . . ample drawer space for shirts and sweaters . . . plus *extra* storage space for socks, odds and ends and jewelry inside the generously shelved doors. Easy to build. All you need are a few sheets of plywood, some framing lumber, hardware, ordinary tools and common sense. Ideal "handy man" project.

*Douglas Fir* Plywood

AMERICA'S BUSIEST BUILDING MATERIAL

**PLANS ONLY 10¢**

This ingenious shelf-door wardrobe, designed by E. W. Hanson, Stillwater, Minn., was awarded first prize in national architectural competition for plywood built-ins. Complete plans, bill of materials and finishing instructions are available for only 10c. Also available: Portfolio of over 50 top contest designs. 10c. Mail coupon today!

DOUGLAS FIR PLYWOOD ASSOCIATION (Good USA Only)  
Department 910, Tacoma 2, Washington  
Please send material checked. I enclose 10c for each.

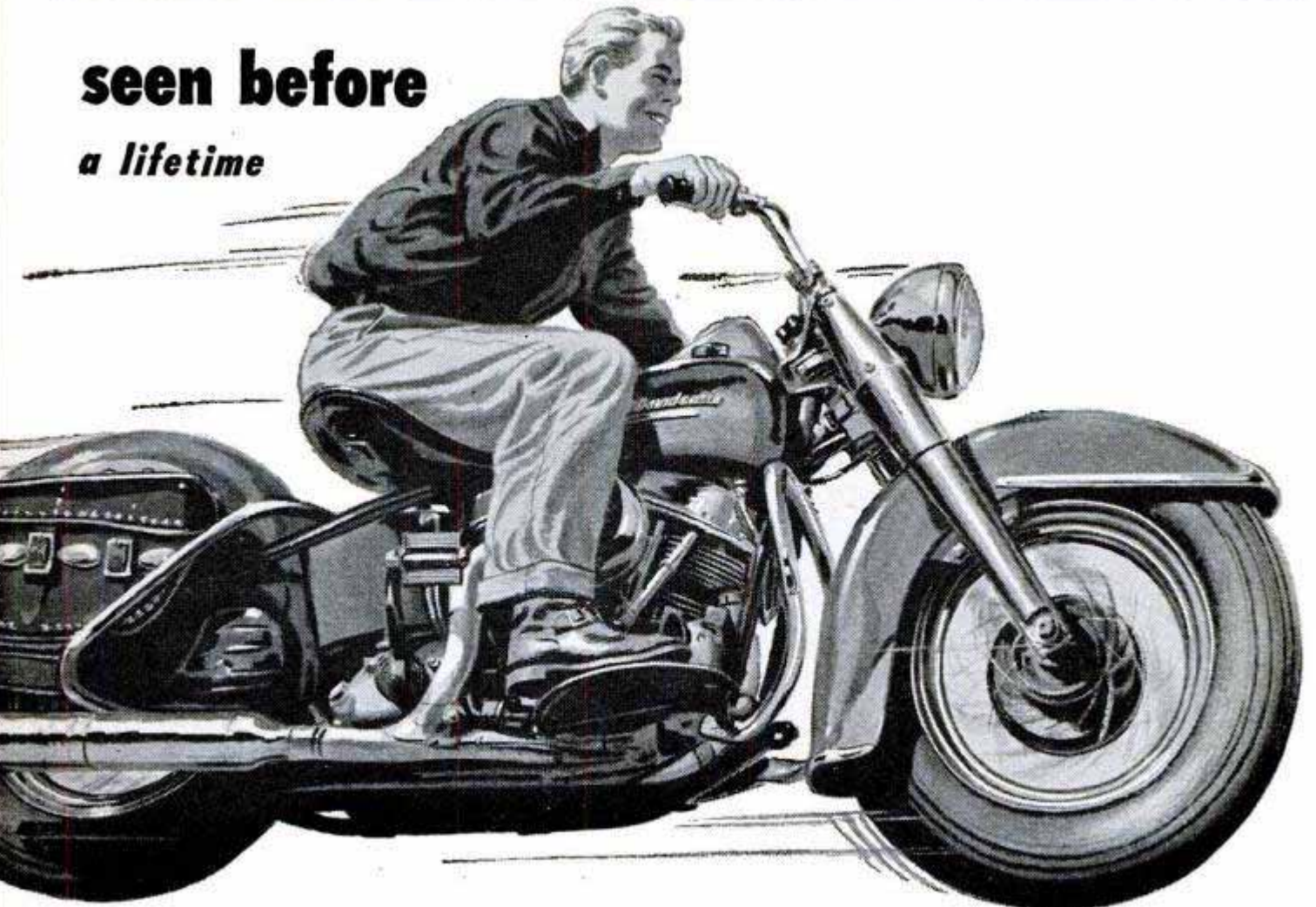
- Wardrobe Plans  
 Design Portfolio

Name .....

Address .....

City.....Zone...State.....

**seen before**  
*a lifetime*



*Magic Clips*  
**Attach Chains**  
**To Auto Wheels**  
*Instantly*



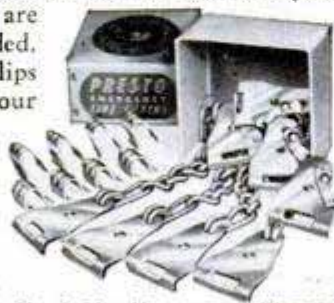
## Get Out of Trouble After Your Car is Stuck

### On Ice, In Snow, Mud or Sand

An amazing new invention . . . *PRESTO Emergency Tire Chains* are snapped on to wheels *instantly after your car is stuck* . . . not before. This assures a savings in fuel, tire wear and time . . . you drive smoothly along with complete confidence of having efficient traction to *get out of trouble* from wheels spinning next to the curb, on ice at intersections, up that sloping driveway, off wet and muddy highway shoulders, in mud or snow. Chains are used only when needed and therefore give years of service. There are no straps to tighten . . . no jacking up the car . . . no loss of time, fuel and tires because you can get your car out of trouble instantly, this easy *PRESTO* way:—

**MAGIC CLIPS** are inserted between the tire and rim (like wheel balancers) and chains are attached instantly when needed. Wheels stay in balance and the clips are unnoticed. One box of four chains (enough for one car) assure trouble-free driving.

ORDER DIRECT for two weeks trial on our money-back guarantee of your entire satisfaction. Postage prepaid if payment in full is sent with order, or write for free circular.



No. 1 Size (for one car) fit 5.25 to 7.20 tires, \$5.95. No. 2 Size (for one car) fit 7.60 to 8.20 tires, \$6.45.

Dealers, Agents Wanted

**PRESTO CHAIN CO.** 213 W. 7th St.  
 Des Moines 2, Ia.

single-range unit. The gearshift indicator is well located high on the steering column and easily read. It is conveniently marked for positions 3 or 4 in the drive range. Under normal conditions No. 4 position is used, which permits the four speeds to change automatically. If the throttle is held to the floor board, the transmission will shift into fourth speed at 70 miles per hour. No. 3 of the drive range actually gives three forward speeds that shift exactly the same as No. 4, but fourth speed is inoperative. No. 3 is convenient for quick acceleration in city driving or in descending hills. In No. 4 position, the top gear actually is similar to an overdrive unit. At speeds between 30 and 60 miles per hour, when the throttle is depressed to the floor board, the unit automatically drops into third speed.

There is, of course, the conventional low gear for use when extreme pulling power is needed; it also can be used as an extra brake in descending steep hills. Low and reverse positions are next to each other on the indicator, which is desirable for rocking the car in mud or snow.

The car is very economical for its size and weight (see my gas mileage chart). The 1952 A.A.A. Mobilgas Economy Run (Class G) was won by a Lincoln Capri with an average mileage of 22.36 miles per gallon at 40.84 miles per hour average speed from Los Angeles to Sun Valley, Idaho—a distance of 1415 miles; Lincoln also placed second in the sweepstakes, which was won by Mercury. Average mileage of all 25 competing cars was 22.057 miles per gallon; thus Lincoln mileage actually beat the average of all cars, including the light ones. (Average drivers do not drive as carefully or at speeds as slow as the contestants in this annual Economy Run, hence their mileage is lower.)

After exhaustive tests I would rate Lincoln as one of the three finest mass-produced cars built in the United States.

The new Lincoln styling and the many new features, several of which are exclusive, attracted much attention wherever we stopped. Lincoln is making new enthusiasts and converts in 1952. ★ ★ ★

## Wood-Veneer Wallpaper Simulates Paneling

Extremely thin wood veneer, bonded to a paper base, serves as a wallpaper which gives the appearance of real paneled walls. The veneer is available in birch and beech, stained in 12 colors. A roll measures 27½ inches wide by 47 feet long and is hung in the same manner as ordinary wallpaper. The veneered wall is easily cleaned with ordinary furniture polish.

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Grueling track tests on Ford test tracks prove that there are no better parts available for your Ford.

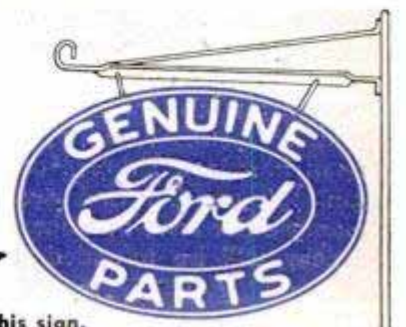
Come in...  
**"LET'S GET ACQUAINTED"**

When your Ford needs service attention take it where you see the Genuine Ford Parts Sign



Tough tests on Ford's Dearborn test track prove that Genuine Ford Parts can take it.

Save by Specifying →

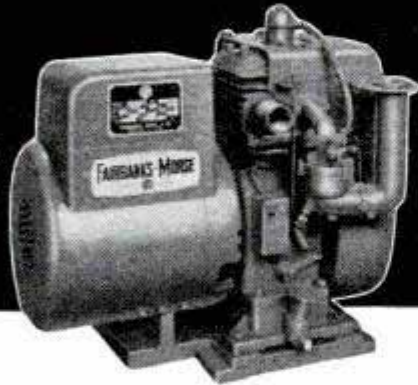


Available at all Ford Dealers' and selected independent garages which display this sign.

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## FAIRBANKS-MORSE GENERATING SETS

Fairbanks-Morse  
1800 Watt  
A.C. Generator



Even though storms, accidents or calamities cut off your power supply, you can still have plenty of power to operate lights, utilities, tools etc., if you install a Fairbanks-Morse stand-by generating set—*now!*

Fairbanks-Morse Generating Sets are available in capacities from 600 to 35,000 watts, A.C. or D.C., with manual, remote or automatic starting. There are sizes for all shops, filling stations, garages, farms, homes, stores, and other businesses. For complete details, see your local Fairbanks-Morse dealer, or write Fairbanks, Morse & Co., Chicago 5, Ill.

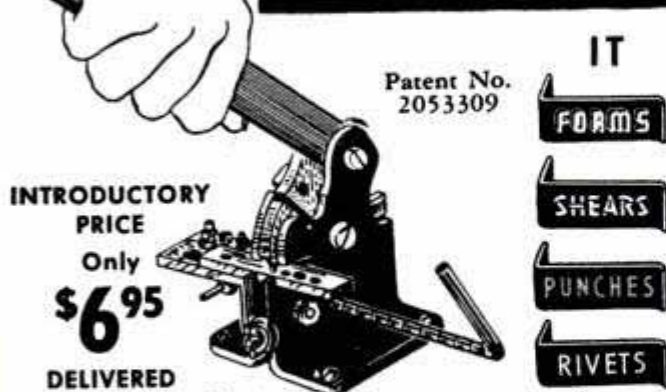


## FAIRBANKS-MORSE,

a name worth remembering

# 4 TOOLS IN 1

The Complete  
METAL WORK SHOP  
FOR HOME AND PLANT



INTRODUCTORY  
PRICE

Only  
**\$6.95**

DELIVERED

Ideal for hobbyists, craftsmen, repair shops, garages, model mfgs., experimental labs, etc. Handles metals up to  $\frac{1}{4}$ " thickness depending upon hardness. Shipped complete with  $\frac{1}{8}$ ",  $\frac{3}{16}$ " and  $\frac{1}{4}$ " punches and riveting dies. Check or money order must accompany order. No C.O.D.'s. Money will be refunded if not fully satisfied.

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# Universal LAWN MOWER GRINDER!

Enjoy a profitable lawn mower sharpening business of your own. No previous experience needed. Place a hand or power mower on the UNIVERSAL GRINDER. With only ONE SET-UP you quickly grind the stationary blade and all the reel blades to proper clearance WITHOUT REMOVING A SINGLE BLADE from the mower.



**PROOF**

G. Spurlock, of Arkansas, writes: "I have my Universal Grinder two months and made a net profit of \$227.00".

C. E. Hardy of Miss. writes: "I am doing a fine business with the Universal Grinder. I spent 40¢ for a newspaper ad and have done nearly \$500.00 of business." Write today for FREE FACTS about Big Profits in Lawn Mower Sharpening.

**ROGERS MFG. CO., DEPT. M-102  
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Schools and Home Workshops

Make your own castings of aluminum, copper, bronze, silver. Foundry sets are available in three sizes including 2400 Deg. F. blast Furnaces. \$22.50; \$29.50; and \$42.00. f.o.b. Kansas City. Free Circular.

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SEND  
**30¢**

stamps or coin for  
3 oz. sample can

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A few drops of Cabot's TASGON—the fast-working, penetrating rust solvent—will do wonders for you in freeing frozen nuts, bolts, joints. Cuts through gummed-up oil and paint quickly and effectively.

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The simple sensible Red-i-Kut way as thousands have—**SAVE HALF. SHOP TESTED PLANS "SPIRIT OF THE CENTURY"** Narrow waist 35" tall or stately straight side "SPIRIT OF AMERICA." **EASY-TO-FOLLOW** photographs PLANS tell all—plus **BROCHURE** of heavy brass weight Westminster, tube chime, movements, gorgeous dials,  $\frac{3}{4}$ " solid mahogany case kits. Send \$1.00 today — Both plans \$1.50 NOW.

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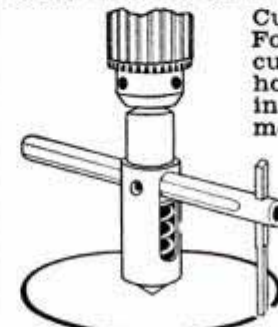


SAY YOU SAW IT IN POPULAR MECHANICS

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### CUSHION CENTER HOLE CUTTER

Cuts Holes or Discs— $1\frac{1}{4}$ " to 8" Diameters



Cuts wood, plastic or light metals. For drill press or lathe. Clean, even cuts up to 1" depth. Cushion center holds work in place. No center holes in work. Fast work. Quick adjustment. The  $\frac{1}{2}$ " straight shank fits all  $\frac{1}{2}$ " chucks or adapters. Hardened tool steel cutter, ground for wood and plastics. Special direct-from-factory price, \$4.50 postpaid. No COD. Order today!

**Satisfaction Guaranteed**

If you are not satisfied, return tool for prompt refund. Complete instructions with tool.

**IVAN TOOL CO.**

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LOWEST PRICES ON

# WAR SURPLUS and OTHER SPECIALS



## AIRCRAFT QUALITY HYDRAULIC EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.



**ITEM #42**—Double acting hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for... **32.50**

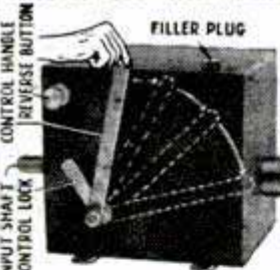
**ITEM #16C**—Double acting hydraulic cylinder, 1 1/2" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$55.00 value. Now only. Postpaid **16.95**

**ITEM #6**—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1 1/8" stainless steel shaft. Ship. wt. 26 lbs. F.O.B. Chicago. **28.00**

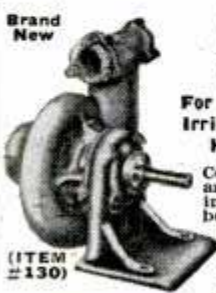
**ITEM #126**—Four-way, open center control valve with built-in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8 1/4 lbs. An outstanding Buy! F.O.B. Chicago **21.50**

### HYDRAULIC SPEED REDUCER

**(ITEM #115) WITH FINGERTIP CONTROL** Delivers variable output speed from 0 to input speed. Uses input power from 1/4 to 1 1/2 HP. Standard 3/8" input and output keyed shafts. Input speed—not to exceed 750 RPM, rotation—counter-clockwise facing shaft. Adjustable relief valve set at 100 inch pounds may be reset to 180 inch pounds. Made by Westinghouse-Oil Gear. Overall dimen. 7 1/2" x 7 1/2" x 1 1/2". Gov't. acq. cost \$428. Complete with full instructions and 2 qts. of oil. Shipping Wt. 31 lbs. F.O.B. Chicago. **54.50**



**ITEM #160**—PESCO GEAR TYPE HYDRAULIC PUMP—Compact—Powerful—Reliable. Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for 3/8" hold-down bolts. Standard 1/2" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 PSI at 2800 RPM with 3 HP. Will actuate one Item #6, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel gears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago. **22.50**



## General Motors — Allison CENTRIFUGAL PUMP 200 GALLONS PER MINUTE

For Draining Basements • Fire Fighting  
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Converted for high volume commercial, home, and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/4" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago. **39.50**

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**ITEM #183**—3000 to 4000 WATT GENERATOR SET—FEATURES—Power for your home or business. Simply connect to power panel or house circuit. Constant voltage regardless of load. Push button start or stop. Easily made full automatic start or stop. **SPECIFICATIONS**—Size 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three phase power, 2 or 3 wire. Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over \$1200.00. **SALE PRICE, 465.00**

**ITEM #178**—350 watt—110 volt—60 cycle A.C. direct coupled to 1 cylinder Midco engine. Shpg. Wt. 116 lbs. F.O.B. Chicago. **125.00**

**ITEM #178**—3 KW—110 Volts D.C. This mighty unit develops 3 KW—28.5 amps. D.C. Standard Deico generator direct coupled to a Model ZZF Briggs and Stratton 1 cylinder, 5-7 HP, air cooled, rope starting gas engine. Instruments include voltage control rheostat and voltmeter. Wt. 275 lbs. F.O.B. Chicago. **295.00**



### UTILITY CENTRIFUGAL PUMP

**ITEM #30**—For draining cellars, laundry tubs, irrigating gardens, etc. Die-cast construction, inlet and outlet fits standard garden hose. Has standard 1/2" shaft with flat for pulley attachment. Maximum capacity 2400 gallons per hour. Use 1/8 to 1/2 HP. Overall dimensions 5 3/4" x 6 3/4" x 5 1/2". Postpaid **6.95**



### G-1 TANK

Slightly Used—Like New tanks for tire inflators, on compressors, pulsation chambers, floats, buoys, fluid and milk containers, etc. Tough, light, shatterproof, 450 PSI, 2100 cu. in. (approx. 9 gals.) int. vol. 24"x12", 1/4" threaded openings at both ends. Wt. 19 lbs. F.O.B. Chicago. **5.95**

**ITEM #63**—Use these tanks for tire inflators, on compressors, pulsation chambers, floats, buoys, fluid and milk containers, etc. Tough, light, shatterproof, 450 PSI, 2100 cu. in. (approx. 9 gals.) int. vol. 24"x12", 1/4" threaded openings at both ends. Wt. 19 lbs. F.O.B. Chicago. **5.95**

### 1/4" ELECTRIC DRILL KIT STANDARD DUTY • MODEL 77-5

**ITEM #348**—contains 1/4" Electric Drill with 3-jaw knurled chuck, double pole automatic electric switch, 10' rubber covered—oil and gasoline resistant cord and pistol grip handle. Drill has universal 115 volt AC-DC motor, precision heat-treated alloy steel gears enclosed in grease tight housing. Accessories include drill bits in graduated sizes, sanding discs, lamb's wool buffer, wire buffer wheel, mounted grinders, etc. All enclosed in sturdy, metal box. Shipping weight 8 lbs. A terrific buy! F.O.B. Chicago. Only. **20.95**



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for Stationary or Portable Use. **HEAVY DUTY RANGE TO 250 AMPS. NEW 'MAGIC TERMINAL' FOR LOW CURRENT 30 TO 100 AMPS. IDEAL FOR • FARM • FACTORY • GARAGE • WORKSHOP** These precision engineered D.C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have over-sized lifetime grease-sealed ball bearings, air cooled commutator, dial type rheostat for easy pin-point control, a high-low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep. 7 1/2 HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V-belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps., 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Ship. wt. 107 lbs. \$350.00 value. **119.50**



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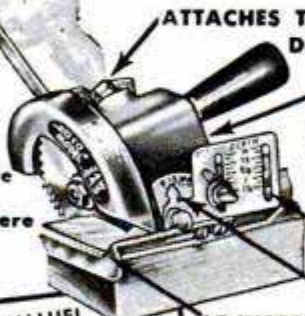
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SAVE WORK — SAVE TIME**  
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**ATTACHES TO ANY 1/4" ELECTRIC  
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**ANGLE DRIVE  
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ELIMINATES  
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**ADJUSTABLE BEVEL GAGE,  
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**Also has VISUAL GUIDE  
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**CUTS 1 1/4",  
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**THE SAFEST CIRCULAR  
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COMPARE THESE QUALITY FEAT-  
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**TOP  
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6-inch Blade..... **\$1.75** 7-inch Blade..... **\$1.95** 8-inch Blade..... **\$2.15**  
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**CONVENTIONAL TYPE BLADES ALSO AVAILABLE IN  
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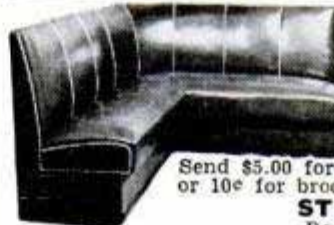
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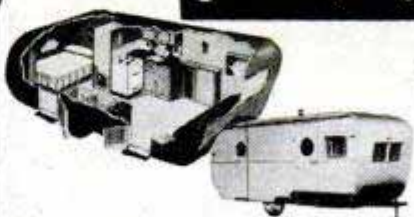
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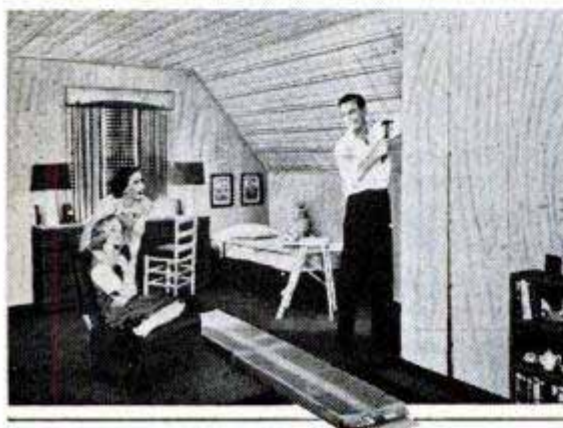
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## Pre-finished Hazelwood Plankweld →

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PM-10-52

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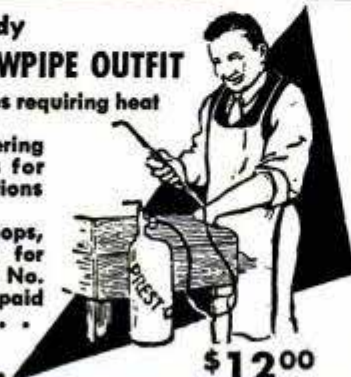
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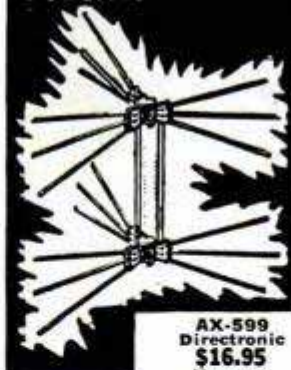


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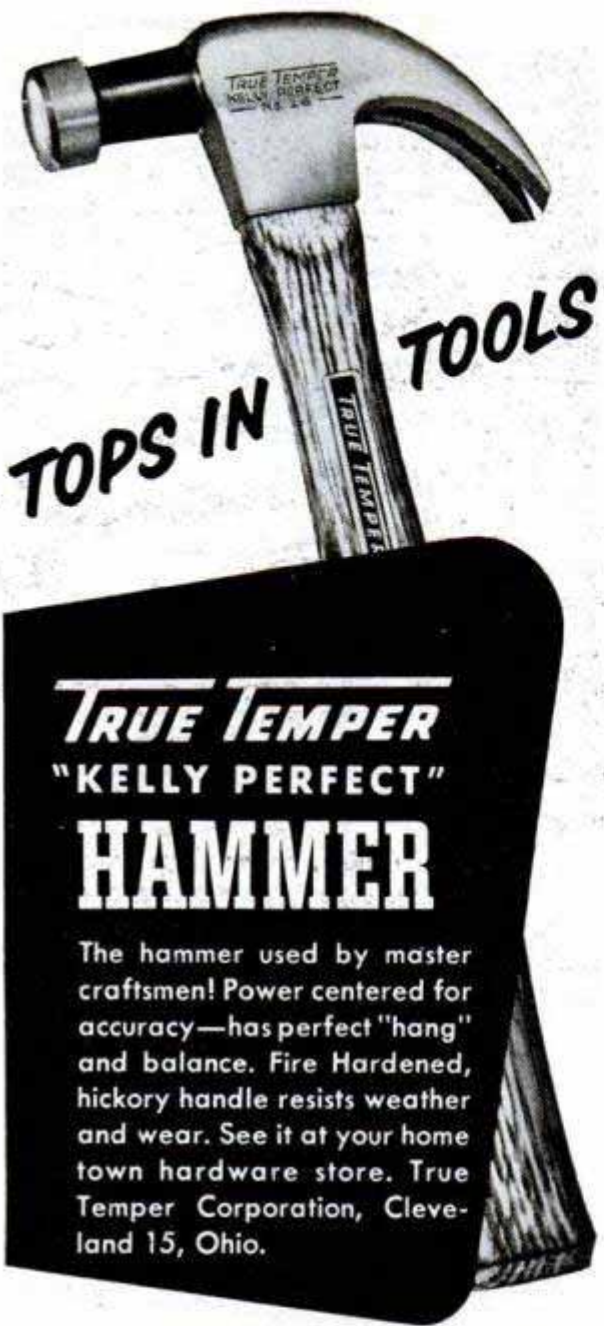
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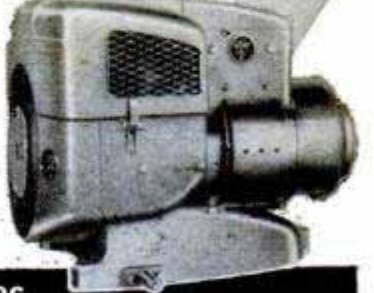
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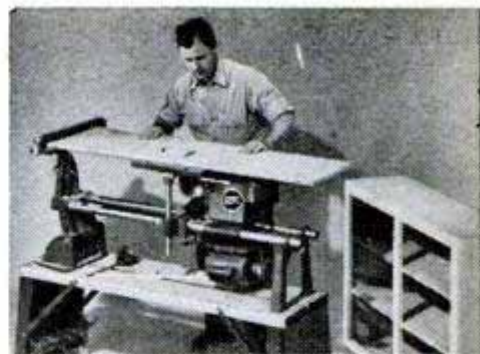
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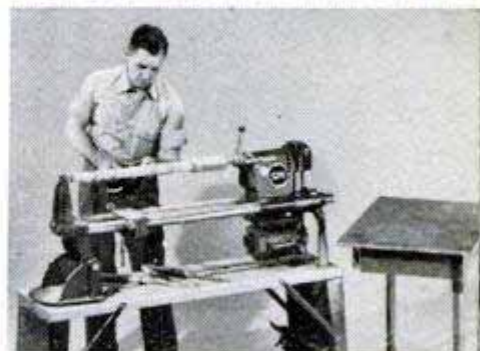
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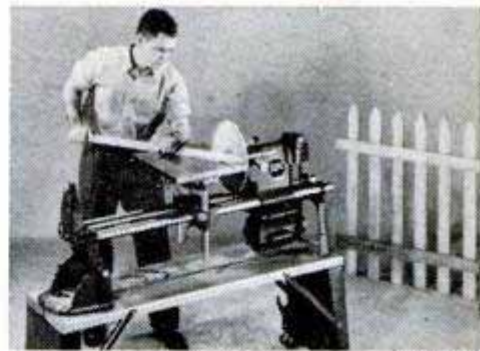
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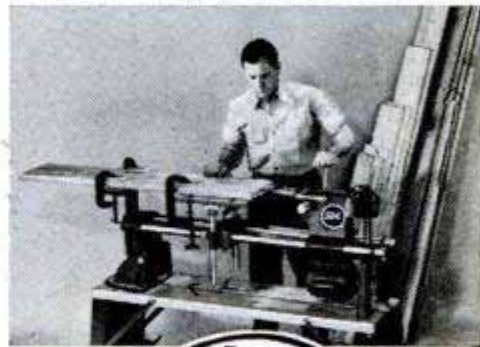
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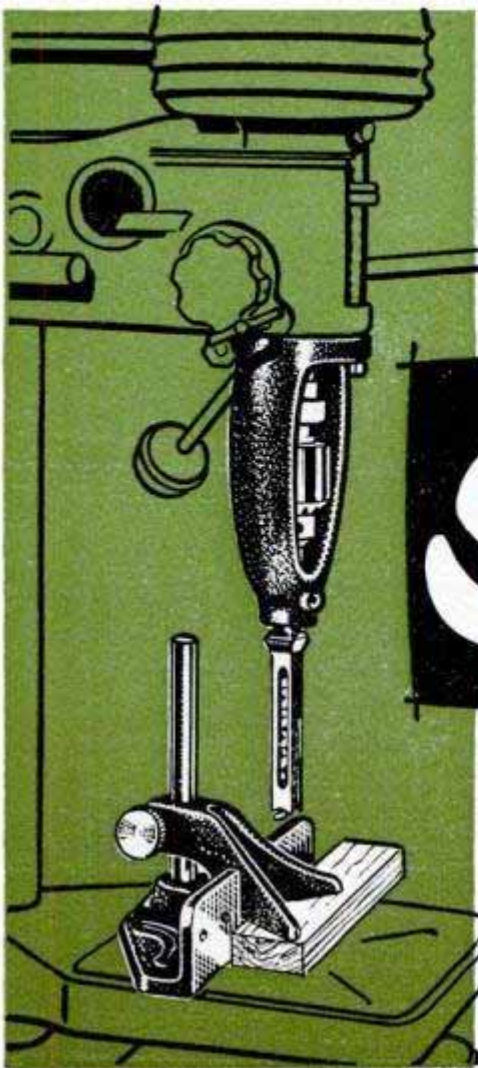
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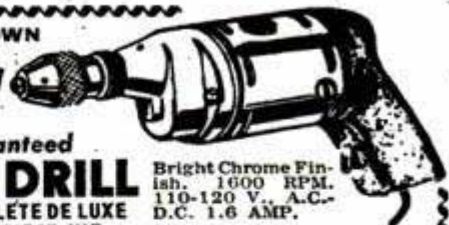
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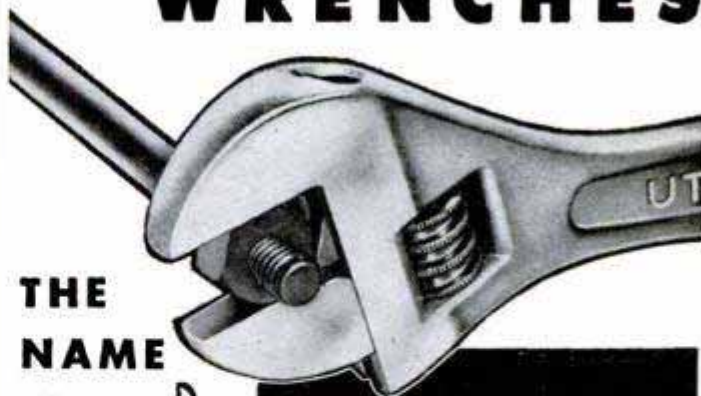
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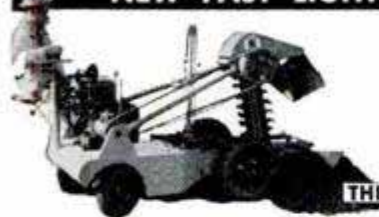
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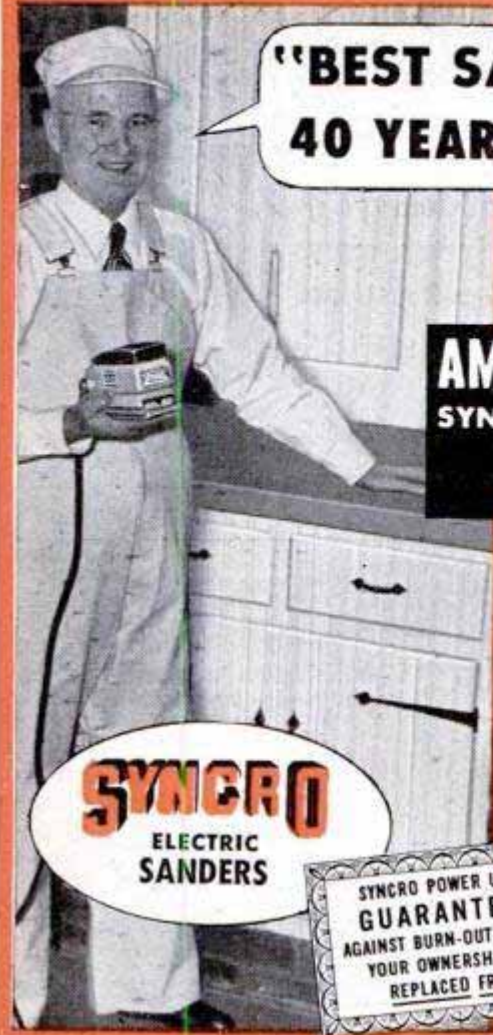
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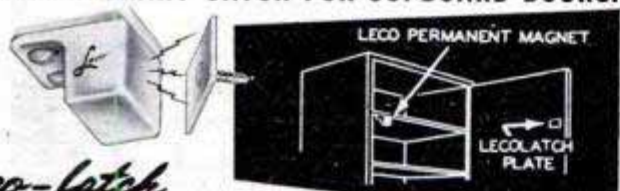
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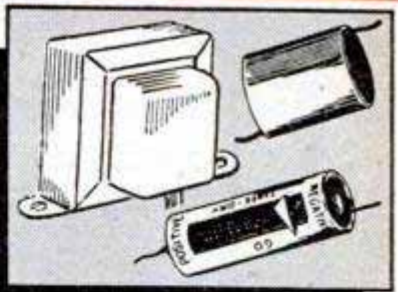
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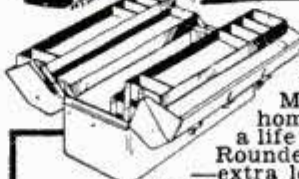
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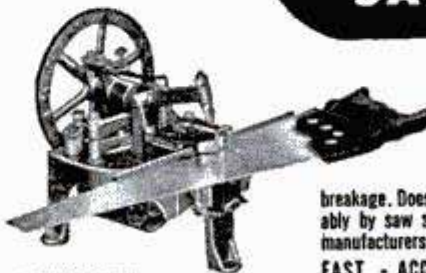
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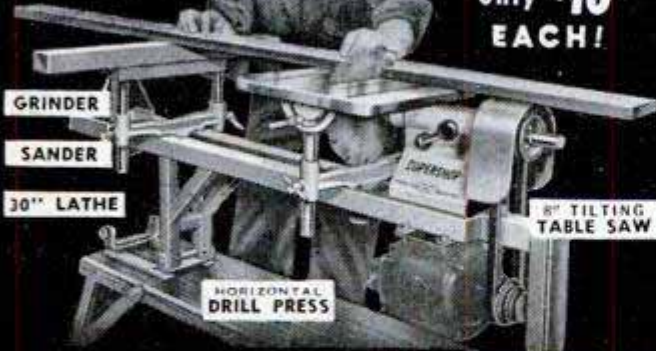
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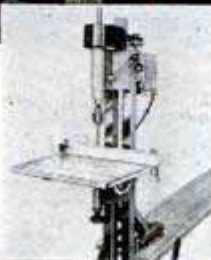
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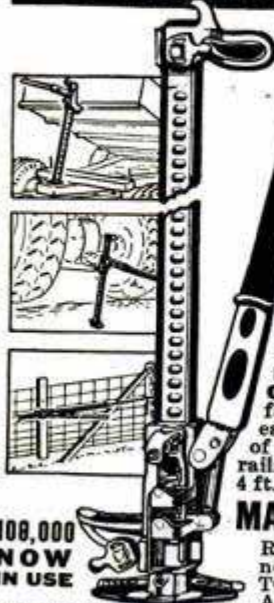


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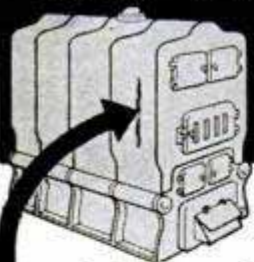
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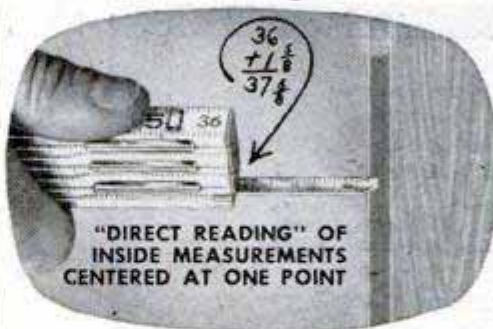


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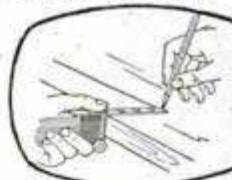
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Make no mistake, the new Stanley "100 Plus" Extension Rule is the handiest, most versatile folding rule you can buy.

Read it four ways — on inside measurements using slide, entire reading is centered at one point — no chance for errors; may also be used as an ordinary extension rule for inside measurements, and as a regular folding rule reading from either end.

Use it as a marking gauge for measurements in 2" and 4" multiples.



**CHECK THESE "100 PLUS" RULE FEATURES:**

- Easy to read Big Black Numbers on White Sticks.
- Square ends — butt flush with work.
- Opens to even inches at end of each stick.
- Handy for end-to-end measurements — opens in 6" multiples to full length, 72".
- 8-inch Brass slide removable for use as depth gauge.
- New plastic finish wears four times longer.
- Extra Thick Rock Maple Sticks graduated all edges.

For real rule value ask for the X226 at your hardware dealer's. **\$2.65 each.**

**STANLEY TOOLS, New Britain, Connecticut**

THE TOOL BOX OF THE WORLD



Reg. U.S. Pat. Off.

Hardware • Tools • Electric Tools • Steel Strapping • Steel



P1

**TOY PATTERNS—6 for 25c**

Ideal gifts for the youngsters.

Two sets — 6 full-size patterns in each.



P2

**SEND TOY PATTERNS NOW!**

Stanley Tools, 3102 Elm St., New Britain, Conn.  
(In Canada: Stanley Tool Co. of Canada, Ltd.,  
3102 Stanley St., Roxton Pond, Quebec)

Enclosed is.....Send Patterns checked  
.....Patterns P1 (25c) .....Patterns P2 (25c)

Name.....

Address.....

City and State.....

# WYTEFACE

TRADE MARK

## STEEL TAPES

No squinting, no guessing when you use WYTEFACE Steel Tapes. Jet black markings (foot numbers in red) on a white background. Easier to read in any light. Faster, more accurate measurements. Rust-resisting, hard to kink, simple to clean.

Protected by U. S. Patent 2,089,209

*"I'll take the WHITE one every time!"*

**KEUFFEL & ESSER CO.**

## PARTS FOR MILITARY TRUCKS

FOR JEEP, DODGE, CHEV., GMC, STUDEBAKER, 4 WHEEL DRIVE AND 6 WHEEL DRIVE. ALSO PARTS CATALOG. WRITE

### AXLES FOR TRAILERS

(Surplus) Heavy Duty axles suitable for building of many types of trailers, farm wagons, etc. Standard width straight axle, 2 inch square and is complete with Hubs, Tinkens bearings, 6 Hole

750x20 or 825x20 wheels, without brakes, only \$69.50

Dual Wheels..... add \$15.00 extra

### NEW JEEP TOPS and CURTAINS

Military type, easily adapted to civilian type Jeep. Complete top & back curtain, side curtains, snap-on doors, 5 windows. Waterproof, OD color. 25 lbs. FOB, K.C. \$59.50

All prices quoted good 30 days FOB, Kansas City  
25% DEPOSIT REQUIRED ON ALL ORDERS

## American AUTO PARTS CO.

1830 LOCUST - DEPT. PM  
KANSAS CITY, MISSOURI.

### CAPE COD CHAIRS TRELLISES • ARBORS DUTCH WINDMILLS

Chairs style B-C-A PLANS 50c Ea., all 3 only \$1.00. 12 different trellis designs PLAN of all 12 only 50c. Authentic 40" high Dutch Windmill Detailed PLAN only 75c. Unique 40" high Lighthouse having copper lantern, ideal for garden or on lake shore of summer home. Large detailed PLAN 75c. SPECIAL all plans above \$3.00 val. Only \$2.50. Send 10c for catalog

Craftsman's Model Co. Dept. P45 DELAFIELD, WIS.

### Life Time WALL TILE Plastic

**34c Per Square Foot Buy Direct & Save 34c**

Modernize your kitchen or bathroom. We teach you, instructions free. Earn big money modernizing your neighbors' homes with Plastic Wall Tile. Send \$2.00 for kit of samples—20 smart colors—complete with instructions. Cost of kit credited against first order.

**MONEY BACK GUARANTEE**

O'NEIL TILING CO., Dept. T, 1521 W. 87th St., Chicago 20, Ill.

## 6 GREAT SHAW DU-ALL

Plow  
Plant  
Cultivate  
Mow  
Rake  
Cut  
Trees  
Saw Wood

Walking or Riding Tractors  
1 1/2, 3, 5 H.P. walking models. 5, 8, 12 H.P. riding tractors. Get just the power you need in Shaw extra strength superior traction machines. All wanted tools, attachments. Dependable for nearly 50 years. See a Shaw dealer. Write for FREE literature, low prices—today.

**SHAW Mfg. Co.** 4510 Front St., Galesburg, Ks.  
668-G N. 4th St., Columbus, O.

### MADE RITE CORPORATION

Trailer Running Gear

58" 2 TON AXLE \$8.00 RETAIL SPECIAL PRICE TO DEALERS PAT PENDING.

F. O. B. 6454 EPWORTH BLVD.  
DETROIT 10, MICHIGAN

## AS MUCH FUN AS A CIRCUS

# 52 BALLOONS \$1

THAT MAKE GIANT

# CIRCUS ANIMALS

Some blow up 3 ft. to 4 ft. Easy to make GIANT CIRCUS ANIMALS—Instructions included. 4 ft. Ostrich, 3 1/2 ft. Giraffe, a yard full of 12" kittens. Make a big SANTA CLAUS and a set of REINDEER. FREE with each \$2.00 order, a genuine baNoon squawker. FREE with each \$5.00 order, 50 plastic toys (A Complete Western Rodeo). Send for FREE Catalog of tricks—magic.

CIRCUS BALLOONS, Dept. PM-10  
62 Garth Rd., Scarsdale, N. Y.

## Amazing!

# 3in1 JIG SAW SANDER FILER

with built-in electric motor

**CUTS SCROLLS LIKE MAGIC!**

U. S. Patent No. D-161025

**EXTRA if you order TODAY!**

Reg. \$1.00 Set of 10 PROJECT PATTERNS that make it simple to make toys, household items . . . most anything, given as your FREE BONUS GIFT when amount in full accompanies order. (We pay postage.)

**A terrific value For "Boys" 6 to 60 \$16.95**

Complete with

- 3 PROJECT PATTERNS
- 3 SAW BLADES
- ALLEN WRENCH
- 1 (4" x 9") VENEER

**10 DAY TRIAL • MONEY BACK GUARANTEE**

KENLEE Industries, Dept. PM10, 2817 No. Clark St., Chicago 14, Ill.

Enclosed is \$16.95 (check or M.O. in full)  
Send 3 in 1 Saw and \$1.00 FREE GIFT both POST PAID.

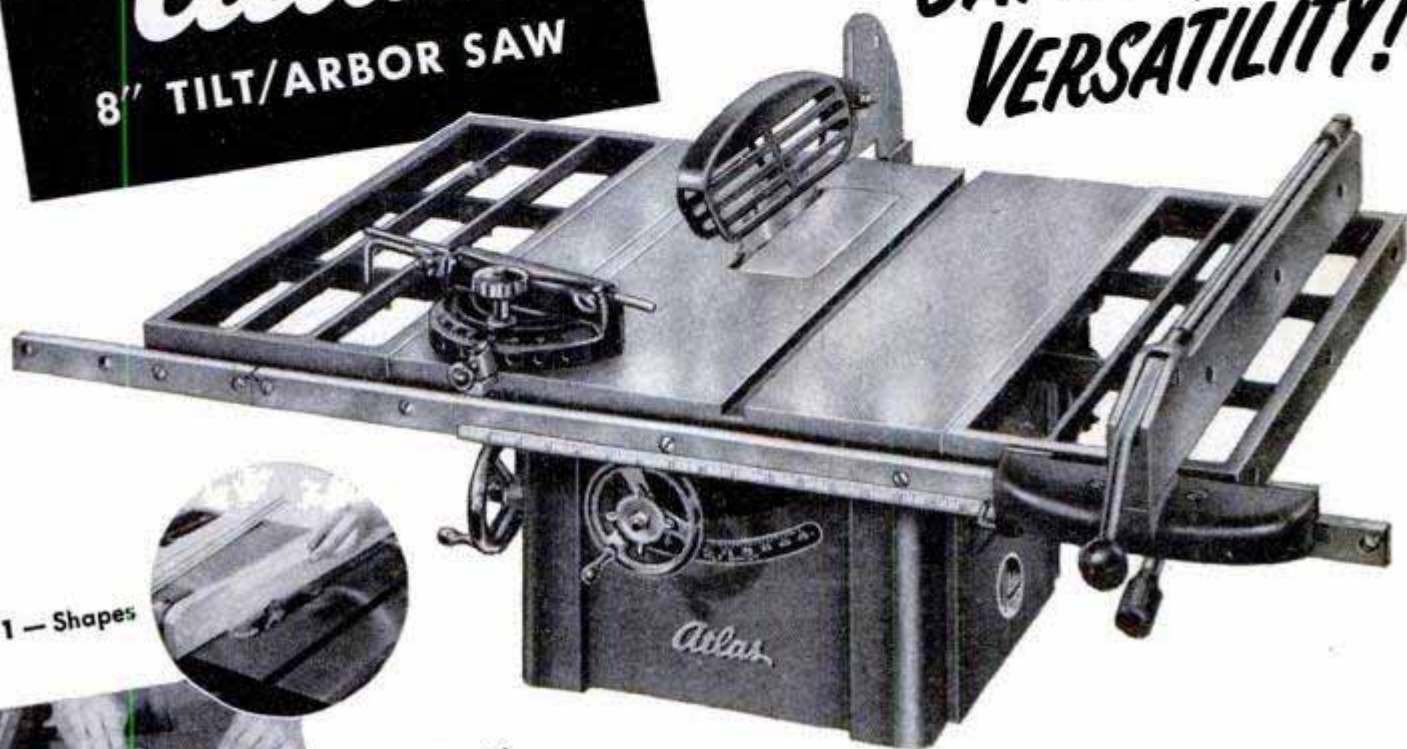
Enclosed is \$2.00 part payment. I will pay postman balance plus postage on C.O.D. delivery.

Name \_\_\_\_\_  
Address \_\_\_\_\_ Zone \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

# Every Time You Use It...

**YOU'LL VALUE ITS  
CAPACITY AND  
VERSATILITY!**

**Atlas**  
8" TILT/ARBOR SAW



1 — Shapes



2 — Cuts tapers



3 — Dadoes



4 — Bevels, chamfers (Table always flat)



5 — Cuts tenons



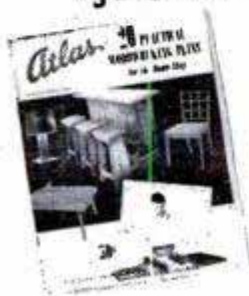
## SPECIFICATIONS

Max. Depth of Cut.....	2 3/8" *
Table Ahead of Blade.....	10 3/4" *
Rip to Center of.....	19" panel
With one extension.....	36 1/2" panel

Saving you time, money and improving work accuracy *every* time you rip or crosscut a board to size is *just the beginning* of this saw's usefulness.

It handles easily and accurately such sawing operations as cutting angles, double angles, chamfers, bevels, tenons. And with low cost Atlas accessories it cuts all dadoes... handles a host of straight shaping and moulding operations.

Atlas is *the* saw for your shop. Its double-locking patented fence is the best you'll find on any saw. Blade tilts — your work stays flat — for safe accurate angle sawing. Has sealed-for-life ball bearings. Precision-ground grey-iron table. Grill extensions, original with Atlas, for handling big stock. See these and many other features at your Atlas dealers, or send for catalog today.



### NEW 20-PLAN BOOK ONLY 50¢

20 original, practical projects for your home and family... drawings photos, step-by-step instructions. Send check or cash (no stamps), \$1.65 outside U.S.A.

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Model 413D

Your

# "OUTING PALS"

for Good Food  
Good Light  
Wherever You Go!

You always have good food with a Coleman Camp Stove along. You're sure of plenty of light in camp at night with a Coleman Lantern. Unsurpassed for emergency uses in floods, disasters, power failures.



Model 200



## CAMP STOVE • LANTERN

**Easy Meals**—The Coleman Camp Stove cooks like a city gas range. Instant lighting. Two and three-burner models. Make and burn their own gas from gasoline. Safe—help prevent forest fires. Fold up and carry like a suitcase.

**More Fun** with the powerful Coleman All-Purpose Lantern. Floodlights 100-ft. area. Compact; light weight; sturdier built. 8 to 10 hours lighting service from one filling. Safe; can't spill fuel. Stormproof. Coleman REFLECTOR makes it a high-power spotlight. See it lighted—ask your dealer.



THE COLEMAN COMPANY, INC., WICHITA, KANS.

**MAIL COUPON TO** The Coleman Co., Inc.  
Dept. 207-PM2, Wichita 1, Kansas

Please send me free literature about Coleman Camp Stoves, Lanterns and other Coleman Appliances.

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CITY \_\_\_\_\_ STATE \_\_\_\_\_

## Hot Rods Burn Up the Desert

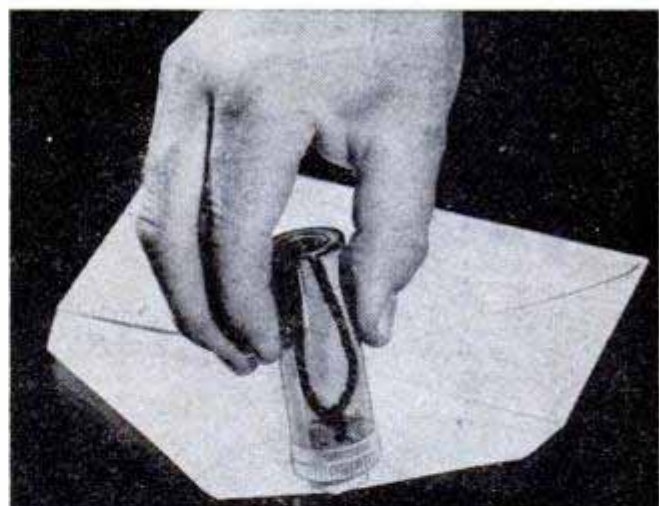
(Continued from page 128)

reworked Mercury engine that uses a new kind of fuel-injection system instead of carburetors, developed by Clem TeBow and Don Clark. Running on alcohol, the engine develops 250 horsepower on the dynamometer, 320 horsepower when running on a 50-50 mixture of alcohol and nitromethane.

For the engineering that went into it, for its performance, and its safety features, the car was awarded the Maremont trophy that carries with it a \$1000 university scholarship and other prizes. An editor of *Popular Mechanics* served as one of the judges who made the decision.

The City of Burbank's safety was graphically demonstrated during the second of its two runs. At an estimated 240 miles per hour the right rear tire blew apart and the left rear tire lost much of its tread. Hill kept the car under control until it came to a stop, unharmed. The full mile had been traveled at a speed of 233 miles per hour which, averaged with a previous slower run, gave a two-way speed of 230.16 miles per hour.

When amateur hot-rod enthusiasts can build a car that goes as fast as this and that proves to be as safe as this one, it won't be long before they are shooting at the "big time" record—the world's unlimited record for the mile. ★★★



## Miniature Moistener

Designed to save wear and tear on the tongue, a thumb-sized moistener eliminates the nuisance of licking stamps, labels and envelope flaps. Filled with water, the three-inch moistener will remain wet on top until its contents are exhausted. A cellulose sponge plugging a hole in the removable cap connects to a double wick that reaches the bottom of the container which is one inch wide and three inches long.

# Careful, Son!

*those are mighty  
important people  
you're shooting!*



Don't be nervous when we tell you, sonny, but you're about to take a picture of the most important twosome in the world!

Sure it's your mom and dad... and that means they're pretty big people to you.

But thousands of folks you don't know look up to them with respect, too, and try in every way to win their friendship.

These other folks are the people who manufacture brand name products... who want every mom and dad to buy the things they make, again and again.

These brand-makers carry on continuous programs of research and product improvement,

employ scientists and testing engineers... all in an effort to make better products that will please more people.

That is what brand names mean... signs of the pride and responsibility of the firms that make the products. They tell you at a glance: these are made by manufacturers who care.

Read the advertisements in this magazine carefully and remember the brand names of the products you like. You save time shopping that way, get exactly what you want. Most important, you keep yourself the "boss" of the most productive industrial system in the world.

*Yes, in the factories of the brand-makers, yours is the final word. Your free choice of branded products makes you the boss. You can keep it that way by demanding the brands you want.*

*Brand Names Foundation*  
INCORPORATED

A NON-PROFIT EDUCATIONAL FOUNDATION • 37 WEST 57TH STREET, NEW YORK 19, N. Y.

Make \$20 to  
\$30 a Week

**EXTRA  
MONEY**



## MACHINE SAW FILING PAYS UP to \$3 or \$4 an HOUR

• Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$3 or \$4 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

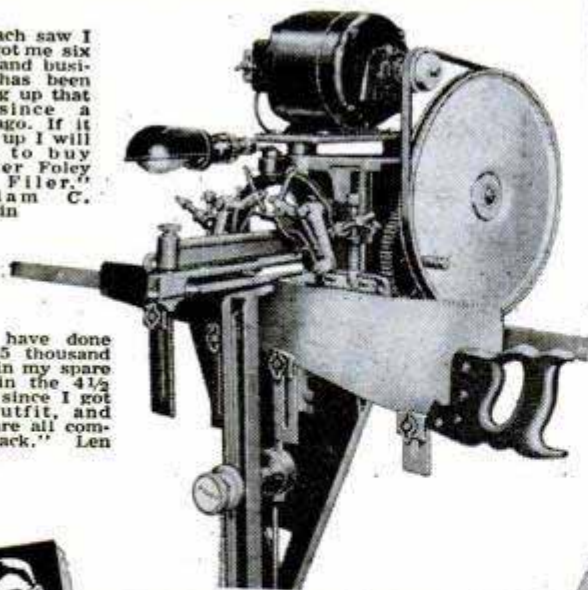
You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

## SEND FOR FREE BOOK "MONEY MAKING FACTS"

Shows how you can get business from home owners, farmers, carpenters, schools, factories, etc. With a small investment, no overhead, no stock of goods to carry, you can get right into a cash business,—and possibly later on develop into a full-time repair shop. Send coupon today for Free Book. No salesman will call.

"Each saw I filed got me six more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer."  
William C. Baldwin

"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back." Len Crego



Send Coupon for **FREE BOOK**

**FOLEY MFG. CO., 1016-2 Foley Bldg.  
Minneapolis 18, Minnesota**

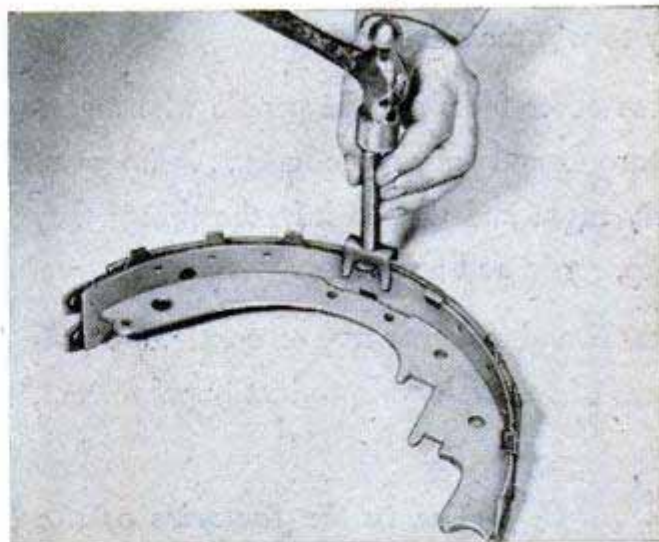
Send **FREE BOOK**—  
"Money Making Facts"

Name.....  
Address.....



## Magnet Holds Micrometer For Checking Wheel Alignment

Portable and easy to use, a micrometer to determine wheel alignment on cars, trucks and busses fastens to the hub flange by means of a powerful magnet. The unit has a built-in level and a calibrated dial to measure the various angles. The angles are indicated in positive and negative gradations on the dial.



## Bonded Brake Linings Applied With Machinist's Hammer

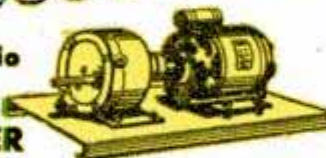
Rivetless brake linings, bonded to a metal backing plate, are installed on any brake shoe in 10 minutes with ordinary hand tools. Tabs on the backing plate are bent over the brake shoe with a crimping tool or machinist's hammer. Available in 13 sizes, they fit almost all American cars.



# BUY from C&H - you'll save and be sure!

ALL ITEMS GUARANTEED AS REPRESENTED Order with confidence from C&H

## 80-1 ratio GEAR REDUCER



Double reduction. Operates on any 1/8 to 1/2 HP electric motor. 23 RPM. Can be used as winch, barbecue, dummy elevator, operate turntable, electric garage door opener, television antenna. REGULARLY \$45.00. NOW ONLY.....\$28.50

## 54 to 1 BOSTON Speed Reducer



Reduces speed of ordinary 1750 rpm electric motor to 33 rpm. Lists at \$55.00. Our price.....\$29.50

## ELECTRIC HAND SAWS

Compare these sensational prices! All NEW Brand Name SURPLUS Electric Saws. 110v. AC-DC fan cooled motors, lightweight design, balanced for easy handling in any position. Can be adjusted for depth and angle of cut. Ripping guide included.

6 3/4".....	\$32.50
7 1/2".....	\$42.50
8 1/4".....	\$59.50



## SEALED BEAM HEADLAMP

6" G.E. sealed beam headlamp in streamlined black enamel steel housing. An ideal light for tractors, trucks, boats, workshops, drive-ways, etc. 5/8" mounting bolt. 6 or 12v. Only \$3.00 ea. or 2 for \$5.00

## ALARM HORNS • SIRENS

Motor driven (not a vibrator). Heavy duty with great power and long life. Adjustable for high, medium or low tone. 110v. AC current. Weather proof. For alarm on boats, school yards, factories, air raid siren, etc. List price \$47.00. Our price NEW.....\$15.45



## HOT ROD SUPERCHARGER

Extra soup and go at a price you can't afford to miss. SEE HOW SIMILAR SUPERCHARGER is used in PICTURE and article on p. 67 AUG. '50 issue of POPULAR MECHANICS. Mfr'd by Borg-Warner. Specifications: 7 1/2" deep, 7" high. Wgt. 17 lbs. Compact and sturdy. 4 base mounting holes. 3/4" outlet. 5/8" shaft with female Lovejoy coupling. Priced today at \$85. OUR SPECIAL SALE PRICE.....\$31.00

## POWER and HAND WINCHES

For—BOATS, TRUCKS, FARMERS, LOGGERS, CONTRACTORS, ETC.

Hand winch, 3-1 ratio, 600 lb. pull, drum has 1 1/2" spool. 6" flange, takes 7/8" cable, stop locking pawl, wgt. 26 lbs. \$18.95

Ball bearing Hand winch, low ratio 1-1, high ratio 3-1, 600 lb. pull.....\$29.50

Same as above with bronze worm gear, 2 speeds, 1-1 & 12-1, and hand brake—\$39.50

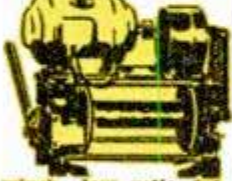
1/2 HP electric ball bearing model; releasing brake starts motor, brake on-motor off; compact gear box, 12 rpm drum speed. \$135.00

3/4 HP, same as above, 3" drum.....\$165.00

Heavy duty, 10-1 ratio, double drum model with jaw-type clutch, wgt. 280 lbs. \$49.95

CABLE, 1/4" preformed stainless steel aircraft, 100 ft. or less.....17c/ft.

Over 100 ft.....15c/ft.



## BOOSTER FANS

Fits any 8", 9", 10" furnace pipe. 1500 RPM motor with 6" cord, mounting frame, 7" blade. Motor 110 volt 60 cycle 1550 RPM. Easy to install. Silent operation. Warm those rooms with long runs. Stock #583. Regular \$11.95. Your price \$6.95

Steel framed, easily mounted SIGNAL exhaust fans. Operate in vertical or horizontal position. Quiet, long life ball bearings.

FANS	FAN SHUTTERS
10".....	\$12.95 \$4.50
12".....	\$16.95 \$4.95
16".....	\$23.95 \$5.95
20".....	\$39.95 \$6.95

## High Volume BLOWERS

Top performance for forced draft, ventilating, exhausting, cooling and drying, 110v. AC.

75 cu. ft. per min.....	\$10.95
150 cu. ft. per min.....	13.95
300 cu. ft. per min.....	17.95
500 cu. ft. per min.....	36.00



## BUILD YOUR OWN INCLINE or DUMB WAITER ELEVATOR

Get all the convenience of a dumb waiter elevator for store, shop, restaurant and home—or the convenience of an incline elevator on steep lake shores, hills, ravines, etc. at lowest cost. We furnish complete parts. Steel Car—Guide Rails—Worm Gear—Limit Switches—Electrical Control—Steel Cable. SEND 25c for completely diagrammed instructions with list of parts, kits and prices.



## ELECTRIC HOT WATER HEATER

Heat water faster, easier with this immersion unit. 115 v. AC—1250 watt Westinghouse or Chromolox element. Manual unit, \$42 value, \$6.95; thermostatic Fenwall control \$8.95. Element with Fenwall thermostat \$8.95. 10 gal. steel tanks 12x21" — \$9.95; 8x42" — \$11.95; 18" cord #12/2 or 3 conductor with plug \$2.25.



## "JANITROL" AIRCRAFT HEATERS

Warms up fast—just the thing for heating trucks, buses, garages, etc. Has an output of 50,000 BTU's per hour. 24 volts DC. Length 33" diameter 13". weight 14 lbs. Original cost \$130. Our special sale price NEW, only.....\$19.95



## AUTOMATIC AIR COMPRESSOR UNIT

Compressor with 2x1 3/4" piston controlled for intermittent duty by regulator and check valve. Heavy duty capacitor motors 110/220 v. AC. 12x24" tank mounted on rubber tired wheels. 1 1/2 hp. \$99. 1 1/2 hp. \$109. Tank only \$149.50.



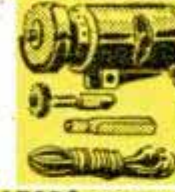
## Flexible Shaft Grinder

"MALL" PORTABLE 1 1/2 HP. 3450 RPM, 110-220 volt dustproof motor mounted on universal trunnion. Heavy base has a convenient tool tray and large easy rolling casters. Flexible shaft is equipped with both full speed and angle spindle and straight spindle. List price \$172.00. Your price with all attachments, NEW.....\$99.00



## NEW TOOL POST GRINDER

1/4 hp. AC-DC 7000 rpm motor with 3 1/2x3 1/2" external grinding wheel, smaller internal wheel, 7 ft. rubber cord, switch and attachments. Lists at \$90. Only \$49.50



# SAVE OVER 50%

ON THESE BRAND NEW WAR SURPLUS POWER UNITS

BE PREPARED for any emergency!

300 WATT 110-220 volt AC, 60 cycle light plant powered by 1 HP gas engine, direct drive, mounted base, wgt. 40 lbs. Ideal for campers, P.A. systems, house trailers, etc. Equipped with handle for easy carrying.....\$99.00

750-1000 WATT 110 volt AC, powered by Briggs & Stratton gas engine.....\$169.00

1000-1200 WATT 110 volt AC.....\$194.00

2000-2500 WATT 110 volt AC, 60 cycle, slow speed generator, 5.10 HP Briggs & Stratton gas engine. NEW.....\$294.50 To make plant 110-220 add \$40.00 for transformer.

2500-3000 WATT 110 volt AC, 60 cycle, Leland generator—runs at slow speed (1800 r.p.m.) for longer life, 8.25 HP Briggs & Stratton gas engine. You can rely on this plant for all average home needs—freezer, stoker, pump, hot plate, radio, etc.—and overloads from starting motors. Reconditioned and fully guaranteed. \$295.00, NEW \$345.00 Plants, same as above, built in 1951, with tools and spare parts. Lists at \$790.00, Our price.....\$426.00 To make plant 110-220 add \$48.00 for transformer.

3000 WATT, 110-220 volt with push button starter. Starter battery is automatically charged by plant. Gas engine same as in plant above.....\$465.00

5000 WATT, 120 volt, 60 cycle AC, Hercules 4 cyl. gas engine, Hobart generator, completely automatic, radio & TV filtered, power cable plus, exhaust pipe and manual. Lists at \$1800. Our price \$795. Extra parts and tools \$25. 150' reel 2-wire #8 rubber cable with connectors \$90. 150' 3-wire remote control cable & switch \$25. Plant complete with parts and 2 reels of cable \$895. To make plant 110-220-v., add \$75 for transformer.

Write for FREE circular on the following plants.

7500 WATT 110 volt AC, 4 cyl. gas engine, NEW \$995.00

10,000 WATT 110-220 AC, Recond'nd \$1195, NEW \$1494

25,000 WATT 220 v AC, 3 phase, or 110-220 v AC, single phase. Reconditioned.....\$1995.00 NEW.....\$2495.00

35,000 WATT 110-220 volt, Diesel, Rebuilt.....\$2995.00

50,000 WATT 240 v. AC, 3 phase. Diesel, NEW.....\$5900.00



## HEAVY DUTY RUBBER ELECTRIC CABLE

(Nothing less than 50 ft.)

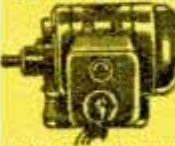
4 Wire #18 Neoprene standard, per ft.....	7c
18 ft. with plus.....	\$3.00
Wire 14 50 to 225 ft., per ft.....	16c
Wire 12 12 ft. with plus.....	\$3.50
Wire 10 75 ft., per ft.....	28c
Wire 10 80 to 225 ft., per ft.....	30c
Wire 10 75 ft. length, per ft.....	35c
Wire 8 75' reel and connectors.....	\$ 70.
2 Wire #4 Concentric 50 to 250 ft. underground, per ft.....	60c
1 Wire #10 Rubber, 50-500', per ft.....	94c
15 Cond. #18 GE Stranded 50-300' O.D. 1 3/16", per ft.....	50c
10 Cond. #18 Solid, per ft.....	10c
Telephone wire, 250', per ft. 2c; 1000' 1 1/2c	



## GENERATORS

300 Watt, R.P.M. 3400, 110 and 220 volt, 3 1/2" shaft, \$40.00, 2500-3000 Watt, R.P.M. 1800, 115 volt, AC. \$235.00, 3000 Watt, R.P.M. 2800, 110 volt, DC. Deleo ball bearing, 1" shaft. List \$343.00. To you at only \$99.00, 5000 Watt, 115 volt, R.P.M. 1800, single phase \$259.00, 10,000 Watt, 110-220 volt, 60 cycle, 1200 R.P.M.....\$550.00

TRACTOR DRIVEN GENERATOR 2500 W. 110-220 volts with floating mount to keep belts tight \$287.00. Generator only.....\$235.00



## and other bargain items

GOODRICH RUBBER HOSE 2" I.D. 2 ply, 25 lengths, worth \$25, at \$3.95; 3 lengths \$10.00

AIR COMPRESSORS from 1/2 HP, 12 gal. tank at \$39.00, to 10 HP, 80 gal. tank at \$777.00

WELDING ROD—Manufactured by Murex. All purpose type 8, AC-DC 5/32", 50 lb. box \$3.00

OHMMETERS, Read 25 to 0, in leather carrying case, Reg. \$29.95, Only.....\$7.95

FYR FTYERS, Fire extinguisher approved by Underwriter's, Reg. \$14.05, Only.....\$6.95

1/2 TON SHOP Utility WAGONS, steel frame, rubber tires, ball bearings.....\$48.50

## COASTER WAGON POWER UNIT

You'll thrill the kids with this simplified power attachment. Made of heavy gauge steel with lever controlled power engagement. Easily attached to ordinary coaster wagon or midget auto. Special \$15. Unit & 1 1/4 HP gas engine, \$54 value, ONLY.....\$49.50



## SEE THE ADVANCE DESIGN

### THE NEW DART RULE

"CLEAR VISION" DESIGN



**\$1.25**

6' length

- "Clear-Vision" for easier reading of inside measurements.
- "Anti-Pop-Out" blade design
- Blade stays put at any length
- Available in all lengths — 6', 8', and 10'
- Easy-to-Read white blade

**DART**  
Mason, Mich.

AT YOUR HARDWARE STORE

## DOES DOZENS OF HOUSEHOLD JOBS



Your All-Purpose  
**WELLER Gun**

Homecraftsmen —  
Hobbyists—Here's your  
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WELLER Guns cut rubber and composition floor tile—remove old putty from windows—repair rain spouting, radio and TV sets, furniture finishes, electrical wiring—heat-seal home-freezer packages—build model railroads—solder costume jewelry—re-groove guto tires. Dozens of other money-saving jobs, too. See dual-heat (high or low) WELLER Guns with low-cost replaceable tips at your Hardware Dealer.

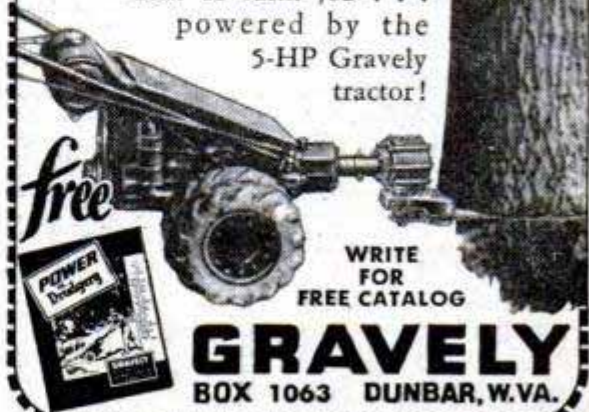
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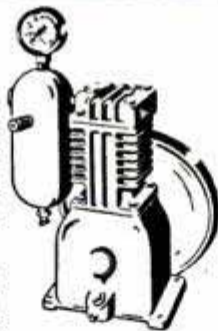
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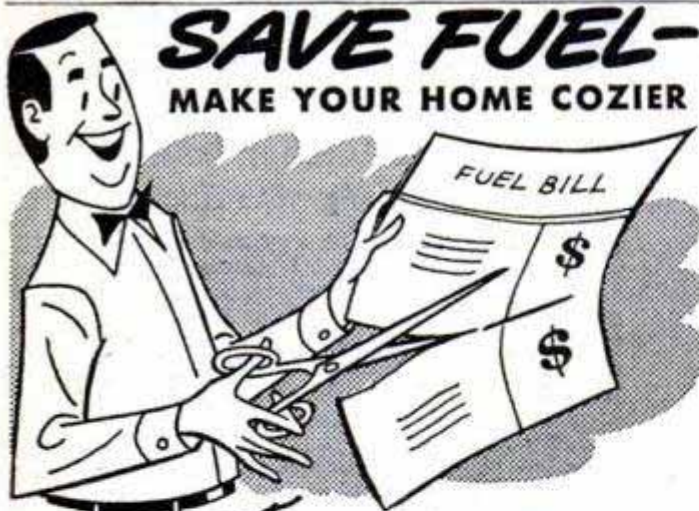
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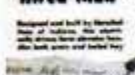
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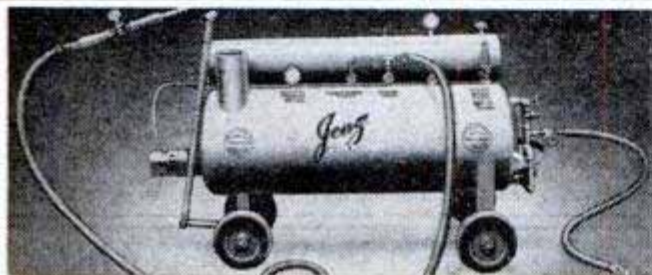
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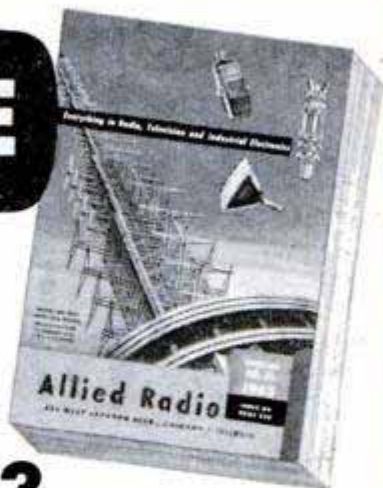
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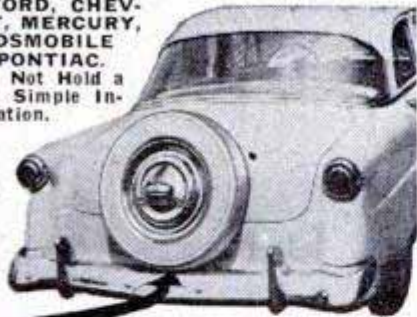
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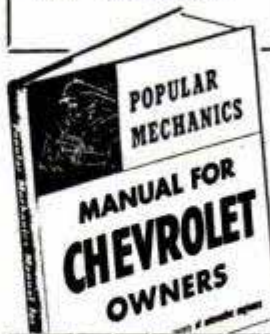
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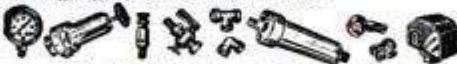
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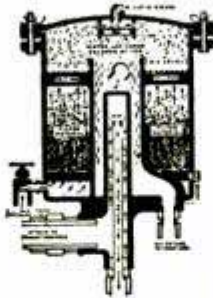
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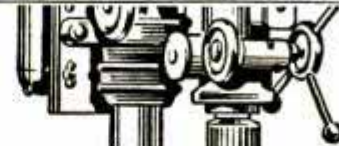
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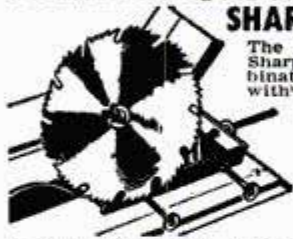
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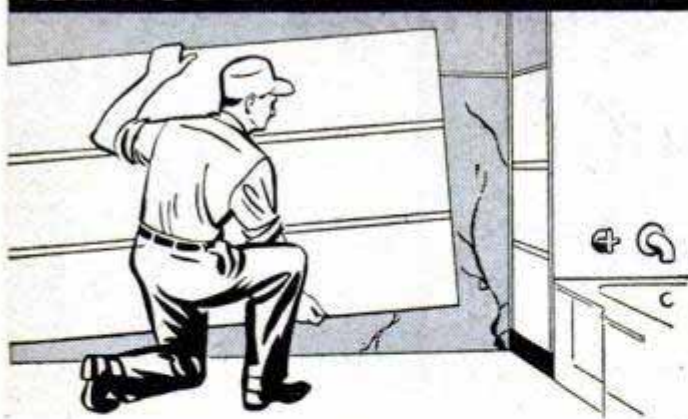
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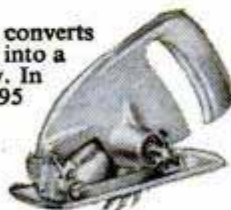


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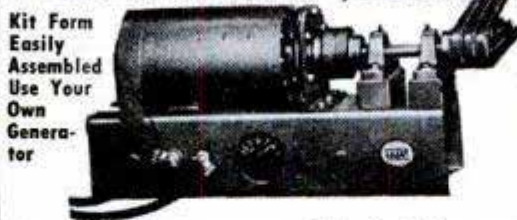
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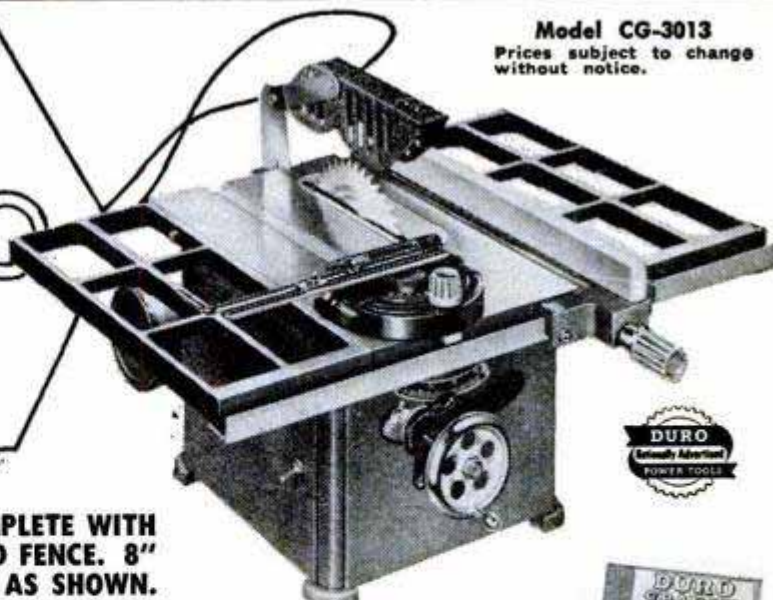
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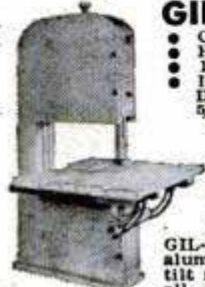


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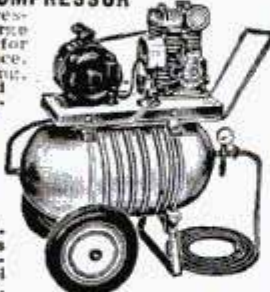
## HI-LINE 6000 WATT PLANT

(Item 182) Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth \$995.00. With self starter. **\$645.00**  
Factory Spec. **\$645.00**  
Generator and control box only, belt driven. Use your engine or tractor. **\$345.00**  
Wt. 240 lbs.

Write for information on any sizes not listed. Buy Wholesale—Direct From Factory—World's Largest Direct Selling Light Plant Factory. You can pay more—but you can't buy better.

## MASTER AIR COMPRESSOR

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter, Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12" x 24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Note low factory prices. With 1 1/2 hp 110 v. A.C. motor (Reg. \$175.00) (Item 209) **\$98.50**  
With 1/2 hp motor (Reg. \$199.50) (Item 209A) **\$119.50**  
With 2 hp Briggs Gas Engine (Reg. \$199.50) (Item 209B) **\$109.50**  
Compressor only (2" x 3 1/2") (top quality) (Item 209C) **\$20.50**  
Larger Compressor (2" x 2") (none better) (Item 209D) **\$24.50**  
Giant Compressor (twin 2 1/2" x 2") (Item 209E) **\$54.50**



A complete line of spray guns and air tanks available at factory prices.

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### HEAVY DUTY D-C ARC WELDER



(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 3/4" plate using 1/4" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better **\$99.75**

**DUAL CONTROL MODEL** same as above but with built-in dual rheostat for low heat **\$119.50**  
**WELDING KIT.** Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at. **\$10.50**

### EXTENSION CORD



(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2 1/2 lbs. Usually \$4.50—Special 40 ft. **\$1.99**  
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **\$4.95**  
100 foot length (one piece) **\$4.85**  
**WIRE ONLY (Item 50):** No fittings, 100 ft. **\$4.00**

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#12-2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. U.S. Surplus.  
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Professional quality. A complete set of Master Mechanic tools featuring the famous Stanley brand. All neatly arranged in a beautiful sturdy 32" hvy. steel tool box. Set includes: Powerful 1/2" Electric Drill (optional), 3 Stanley Wood Chisels, 29" Spring Steel Saw, Steel Bench Vise, Tin Shears, 9 Drill Bits, Sharpening Stone, 8" Plane, 24" Stanley Level, Hack-saw, Stanley Rule, 5 Double End Wrenches, 13 Ass'd. Hacksaw Blades, Stanley Hand Drill, 10" Vise Wrench, Comb. Square, Stanley Hammer, Stanley Ratchet Brace Coping Saw, 7 Coping Saw Blades, Steel Wrecking Bar, 4 Screw Drivers, Offset Screw Driver, Nail Set, 4 Ass'd. Files, 8 Pc. Allen Wrench Set, Auger Bit Set and many other tools. Worth at least \$150.00 if purchased separately. Save cost of tools on one or two jobs. A terrific value.  
Item 242, Wt. 41 lbs. **\$39.50** (without Electric Drill)  
Item 242A, Wt. 45 lbs. **\$49.50** (incl. Electric Drill)  
Tool box only **\$8.95**  
Item 243, Wt. 15 lbs.

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Power Driven—Foot pedal speed control. New compact modern design. Precision built to meet exacting requirements of professional artists—the finest wheel ever built. Mechanism fully enclosed for safety and to exclude moisture and clay. Foot-controlled variable speed drive provides instant, smooth speed range of 30 to 150 rpm. Equipped with adjustable arm rests. Easy to operate—even for handicapped persons. Reversible 10" throwing head—back side recessed for casting plaster bats. Larger 18x18" throwing table; wedging wire attached; removable water cup inside. Heavy bronze bearings pre-lubricated, sturdily built for long, dependable service. Use 1/4 hp motor (not incl.). Shipped fully assembled—just mount wheel and motor on table or sheet of 3/4" plywood. Self storing—tip up on edge. Wt. 45 lbs. List price \$125. Factory special. **\$64.50**

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It's a power sickle It's a bulldozer  
It's a cultivator It's a rotary tiller

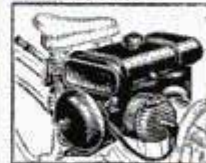


Tractor shown with Snow Blow Attachment

Here at last is a power unit that does everything at a price that can't be matched. Built-in power takeoff to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Basic self propelled 2 hp tractor with Briggs

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Commando Motor only, with complete mounting kit and instructions (can easily be installed on any bike in an hour).  
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2 cyl., item 91 **\$149.50**  
All Commandos shipped prepaid in U.S.

### 32 pc. SOCKET SET

32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautifully matched chrome alloy, absolutely the best. Complete range of 21 sockets from 1/4" thru 7/16" in 1/4" drive and 7/16" thru 1-1/16" in 1/2" drive; 2 extensions, reversible 1/2" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, 1/4" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth \$41.50. While they last. **\$16.95**



### 45 pc. SOCKET SET

(Item 205) Contains a complete set of sockets in 1/2" drive, 3/8" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all unbreakable, guaranteed against breakage. Beautifully matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price \$62.90. Factory Special. **\$26.95**

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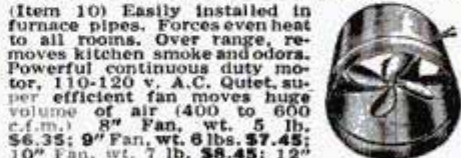
(Item 201) Same top qual. as above—includes 7 sockets 3/8" thru 3/4", reversible ratchet, extension flex. handle, cross bar, 3 punches, metal tool box. Wt. 5 lbs. **\$9.95**  
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Wt. 15 lbs.  
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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.)  
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Heavy-duty 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 12 lbs. Item 10D **\$12.95**

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Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13 1/8" x 11 3/8"; inlet 8 3/4". Height 19". Width 18". Depth 16 1/2". C.F.M. 1/4" S.P. 1600; outlet vel. 1575. Wt. 45 lbs. **BLOWER LESS MOTOR AND DRIVE. \$27.50**

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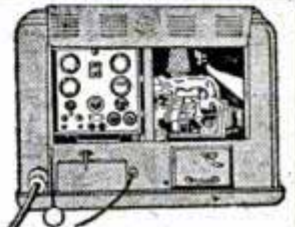
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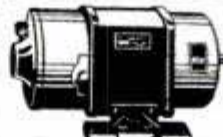
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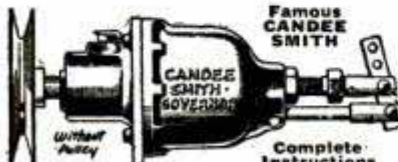
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MOTOR 325

GEAR BOX NEW 295 USED 675

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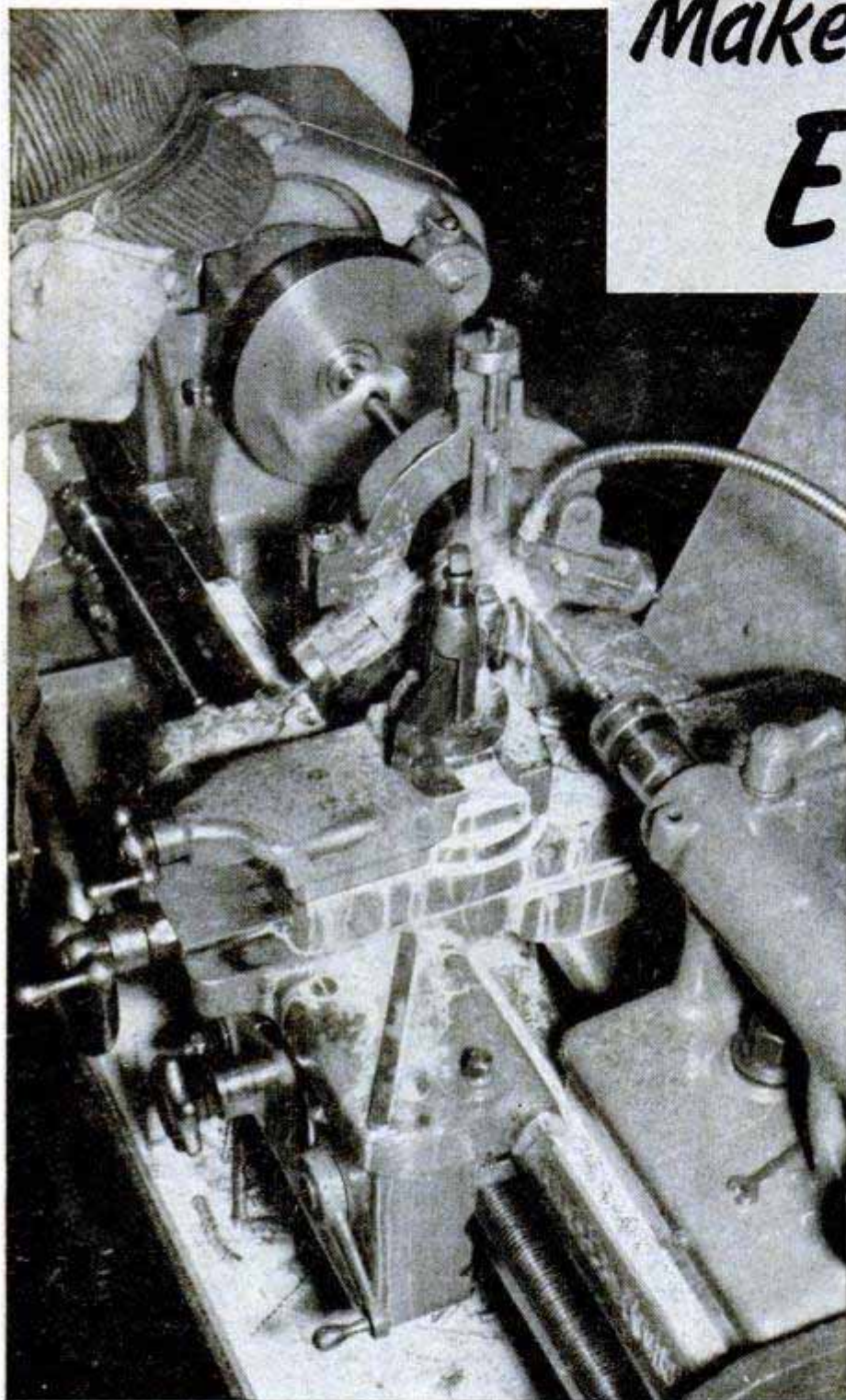
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