

# ANNUAL AUTO ISSUE

50 PAGES ABOUT CARS - PLUS ALL REGULAR FEATURES

FEB.  
1957

LANCOLN

# POPULAR MECHANICS

## MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

BEST TRADE MARK, GREAT DESIGN, NO. 40434

REG. U.S. PAT. OFF.

DODGE



CHRYSLER 300C



MERCURY



PLYMOUTH



BUICK



CHEVROLET



CORD



PACKARD



IMPERIAL



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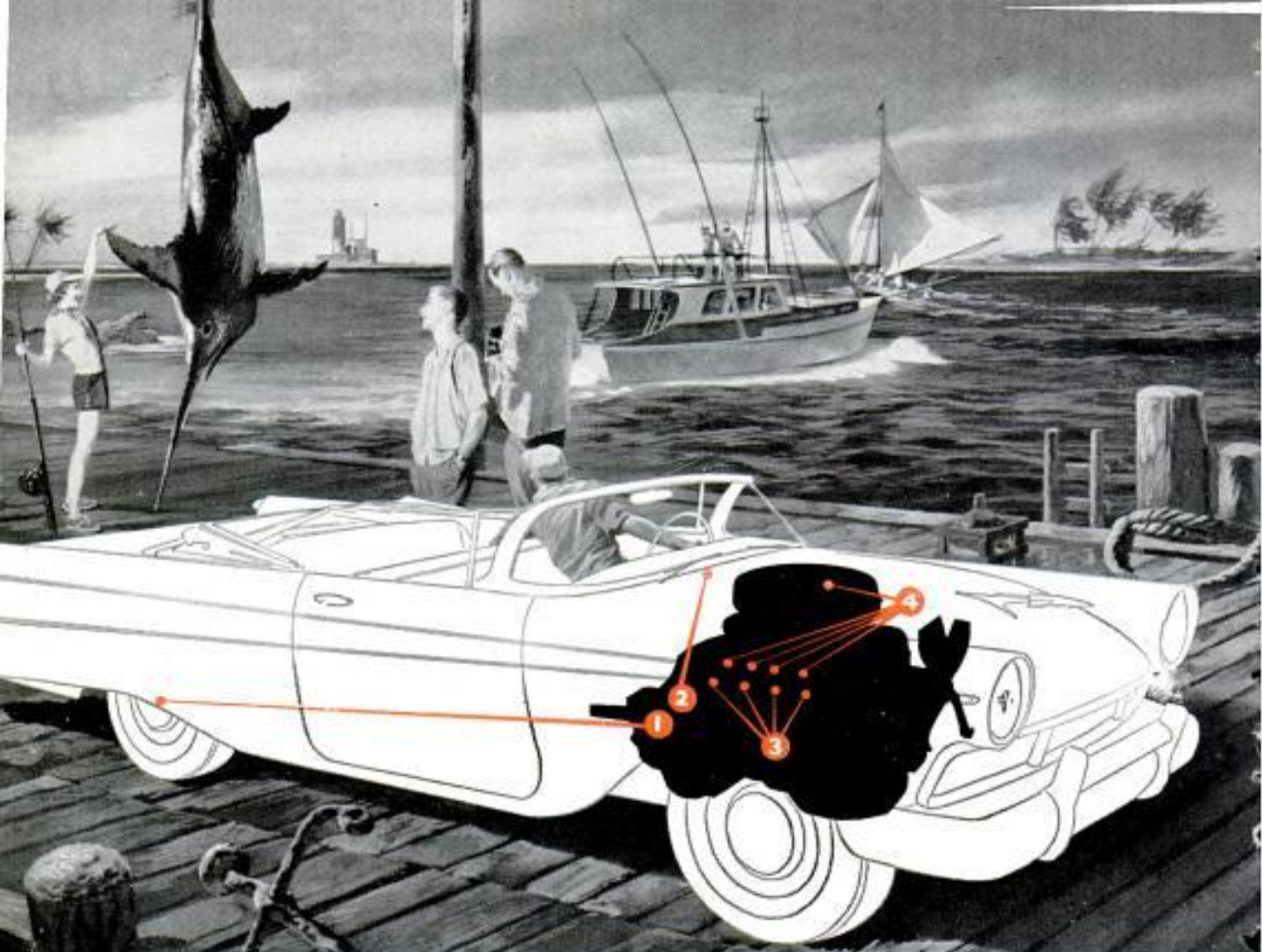


CHRYSLER



OLDSMOBILE





**1 More road horsepower**—If you haven't changed your spark plugs recently, new 5-rib Champions can give you an *immediate* increase in road horsepower—the actual power delivered at your rear

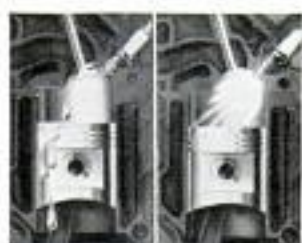
wheels. Independent tests prove most cars get an increase of 6% to 31%—for better hill climb and *safer passing!* No wonder 9 out of 10 racing drivers—men who really know cars—insist on Champions!

If you haven't changed your plugs in about 10,000 miles—

## You can make your car 4 ways newer with Champion spark plugs!



**2 Quicker starts**—New 5-rib Champions cut starting time 39% on the average—in tests with cars whose regular plugs had gone 10,000 miles or more. New Champions will give you quicker starts...



**3 Less engine wear**—When old plugs misfire (left), raw gasoline drains into the crankcase... dilutes engine oil. New full-firing Champions (right) in your car will protect oil from dilution... help



**4 Lower cost-per-mile**—Champion's great new Powerfire electrode stands up better than ordinary types under identical use... gives top power and gas economy for life of plug. Always insist on



**CHAMPION**

# How a man of 35 can retire at 55 with \$300 a month



**N**EVER knew I was a born craftsman until I retired. But, believe me, nothing has ever given me more satisfaction than the first shelves I built with my own two hands. Today I'm working on our hi-fi set. I've been turning out some really beautiful furniture in my basement workshop. But if it weren't for that \$300 check each month, I'd still be at the plant worrying about production figures.

"In a way, I have my father to thank that I'm retired at 55. Twenty years ago we were right in the middle of the depression. My father had always hoped to retire at 65, but when the time came, he hadn't saved enough. I was 35 then. My job promised a good financial future, so I went from day to day without thinking ahead.

"Then one day my father pointed out that he had had the same kind of promising job when he was my age. He and my mother lived comfortably, sent us children through

college, traveled. Somehow the money went as fast as it came in.

"I began to think seriously. With a wife, two children and a third on the way, I hadn't saved much. As the children grew older, expenses would go up. And even if I were able to save, I might outlive my savings.

"I read everything I could on ways to retire. One day I saw an ad for a plan that seemed different—the Phoenix Mutual Retirement Income Plan. Provided I started young enough—and I was definitely young enough—this plan could provide an income from \$10 to \$300 a month for life.

"I clipped the coupon and sent for the booklet. I discovered I'd be able to retire at 55, ten years earlier than the age my father had suggested. That fact was enough to make me decide on Phoenix Mutual, but I carefully compared it with other plans. It was still Phoenix Mutual for me.

"That was only twenty years ago—twenty short years of feeling secure about my future. When my first check for \$300 came, I retired. I've started a new career in my workshop—my secret ambition for years."

## Send for Free Booklet

This story is typical. Assuming you start at a young enough age, you can plan to have an income of \$10 a month to \$3,600 a year or more—beginning at age 55, 60, 65 or older. Send the coupon and receive, by mail and without charge, a booklet which tells about Phoenix Mutual Plans. Similar plans are available for women. Don't delay. Send for your copy now.

ESTABLISHED 1891

## PHOENIX MUTUAL

*Retirement Income Plan*

**GUARANTEES YOUR FUTURE**

OVER 100 YEARS OF LIFE INSURANCE PROTECTION  
FOR BUSINESS AND FAMILIES

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FEBRUARY 1957

PHOENIX MUTUAL LIFE INSURANCE CO.  
205 Elm Street, Hartford 15, Conn.

Please send me, without obligation, your free 28-page book showing new retirement income plans.

Plan for Men  Plan for Women

Name \_\_\_\_\_

Date of Birth \_\_\_\_\_

Business Address \_\_\_\_\_

Home Address \_\_\_\_\_

**This One**



9YNH-NP1-F6A4

# ANNOUNCING THE MIGHTY CHRYSLER 300-C



## AMERICA'S MOST POWERFUL CAR! 375 HP!

Chrysler's proud engineers poured all their high-performance know-how into the Chrysler 300-C, the car that out-seats, out-corners, out-controls, and out-powers anything on wheels in this hemisphere. This car is really a bomb!

The Mighty Chrysler 300-C has all the spacious comfort of any of the 1957 Chrysler models. But this is no souped-up stock car; it is built from the ground up to handle the mightiest force ever put under an American hood.



The 300-C's mighty airplane-type engine boasts two four-barrel carburetors and exclusive Chrysler aircraft-type hemispherical combustion chambers. It generates 420 ft. lbs. of torque at 4,000 rpm.



A magnificent leather interior carries out the sports car theme of the Chrysler 300-C—is compatible with choice of body colors. Controls are skillfully arranged for maximum driving ease and safety.

**SEE YOUR CHRYSLER DEALER ABOUT THE 300-C**

*Hardtop and Convertible body types... five new colors to choose from.*

# Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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



## Next Month

"OLD IRONSIDES" lives again on the pages of next month's issue. A product of 25 years' effort by two men, this scale model of the USS Constitution is 14½ feet long and 11 feet high. Its tiny cannon really fire. The ship's pumps actually draw water. Make this true sea story "must" reading for yourself and family.

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for other items and manufacturers of available products

FEBRUARY 1957



# Tubeless Tires *can* be safely repaired

# IF

*... your tire repairman  
has proper equipment  
and materials*

**M**any car owners have had "sad" experiences with tubeless tire repairs. This has been true because the repairman did not recognize that you cannot use old methods and materials for tubeless tire

repairing. It just can't be done that way.

Remember, it's the tire that has to hold air now . . . not the tube and this means that new methods and materials had to be developed.

## For SURE, SAFE Tubeless Tire Repairing

*look for the*

# BOWES

*Tubeless Tire  
Repair Expert*



As the largest manufacturers of tire repair materials in the world it follows that Bowes would start, long before the actual announcement of tubeless tires, on exhaustive research and tests.

Today, the Service Station or Tire Dealer equipped with Bowes Tubeless Tire repair materials, equipment and "Know How" offers you the sure safe results of these several years of research and exhaustive highway testing.

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Start developing your valuable talents today—and go places *faster*—in the U. S. Air Force. See your local Air Force Recruiter—or mail the attached coupon.

M-79-PM

**Paste Coupon on Postcard and mail to:**

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Please send more information on my opportunities for enlisting in the U. S. Air Force. I am between the ages of 17-34 and reside in U.S.A. or possessions.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_ AGE \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

# Shakespeare SPIN-WONDEREEL



SO EASY  
SO SIMPLE  
YOU CAN OPERATE IT  
BLINDFOLDED



No. 1755L



**"Made Me a Better  
Fisherman"**  
SAY VETERAN  
SPIN-FISHERMEN

*"I switched because, with  
cone design, it's trouble-  
free at night and in the  
wind," says John Cook,  
of Minneapolis.*

When experts switch, the reasons are important! With Shakespeare's SPIN-WONDEREEL, the line is always at your fingertip; you simply pick up the line, back up the crank, and cast. So easy . . . so simple, you can operate it blindfolded. Even beginners can make long, effortless casts right from the start. No groping for a bail or knob; nothing exposed to foul the line. Smooth, adjustable drag. No. 1755 L (above) latest non-reverse crank model, factory-filled with 150 yards new, extra-limp 6-lb. test Tynex monofilament line . . . **\$18<sup>95</sup>**

(Other models from \$13.50 to \$27.50.)



LOOK FOR THIS DISPLAY AT YOUR DEALERS

See how easy and simple it is to operate a Spin-Wondereel or the Wonder-Spin . . . easiest-to-use of all open-face reels.

**5 BRAND NEW  
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Latest in fishing tips and tricks by the experts. Covers spinning, bait casting, push-button, fly and salt water fishing. Send today!



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## ACROSS THE DESK



### Camping in a VW

J. R. Bruman of 5055 Westslope Lane, La Canada, Calif., sends us these photographs of his Volkswagen "Kombi" as converted



for family camping expeditions. One picture shows its interior arranged for daytime use, with a "dinette" table installed. The large drawer pulls out from beneath the middle seat. The bed shown in the other photograph can be used while traveling if desired. The total sleeping space in the car accommodates two adults and three children—the seats permitting anyone up to five feet tall to lie down comfortably.

### To the Editor:

For many years now I have been a reader of your excellent magazine and always look forward to receiving each issue.

During the last six months here in Australia, television has received the okay

(Continued to page 8)





If...

YOU WANT TO ENJOY AN

# ACCOUNTANT'S CAREER

## INVESTIGATE THIS OPPORTUNITY TODAY!

**IF** you're that person, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000 and up!

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they can be!

Why not, like so many before you, investigate LaSalle's Problem Method of training for an accounting position?

Just suppose you were permitted to work in an accounting firm under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method. You cover accounting from Bookkeeping and Basic Accounting right through Accounting Systems and Income Tax Procedure. As you go along, you absorb the principles of General Accounting, Auditing and Basic Cost Accounting. Then you may choose Commercial Accounting, Industrial Accounting or Public Accounting and prepare for the CPA examinations.

Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

### Send today for Free Book "Accountancy, The Profession That Pays"

For your own good get all the facts about this completely new and modern accounting training. Write for free book "Accountancy, The Profession That Pays," which will prove that accounting offers brilliant futures to those who aren't afraid of serious home study, and will show the wide range of opportunities that exist today. No cost or obligation. If you want a position of higher income, greater prestige, **MAIL THE COUPON NOW!**

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Address.....  
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...less fuel**

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CARBURETOR**

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It's loaded with helpful information  
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**GUMOUT DIVISION**

Pennsylvania Refining Company  
2671 Lisbon Road, Cleveland 4, Ohio

from the federal government and one station in Melbourne and one in Sydney [have been] providing two hours a day test programs prior to commencement of regular transmissions [which began] Nov. 4, 1956. Present programs are of films imported from the United States and England. They are of an educational nature. Only black-and-white TV will be seen here during the next few years, but the programs will be up to world standard. Many top United States TV shows are listed for showing here.

In Melbourne, where I live, station HSV, channel 7, is the first local station to commence telecasting. It broadcasts 12 hours a week, six hours of which are test pattern for the use of manufacturers and service men installing sets. The sets use the 525-line method and use FM sound. Seventeen-inch sets are very popular, the price ranging from 205 to 250 Australian pounds. Larger types, 21 and 24 inches, cost from 250 to 300 pounds.

All three Melbourne stations will have their aerials built on the same mountain, Mount Dandenong, some 25 miles east. This means that only one aerial will be required per home, as all signals will come from the same direction, a considerable saving in the cost of installing a set. Aerials are simple folded dipoles in most places in the suburbs. Studios are in and around the city and signals are beamed by microwave to the main transmitters for general broadcast. The Melbourne stations are HSV7, GTV9 and one government-controlled.

Mount Dandenong is about 2500 feet high. HSV7 has a mast of some 450 feet.

Although operating on only 1/10 its actual power HSV7 has been received 150 miles away; 1000 watts is the permissible output. Present frequencies are all VHF, but UHF will be available in several years for use in inland areas.

G. J. Wilson,  
1327 Nepean Highway,  
Cheltenham S. 22,  
Victoria, Australia

**To the Editor:**

Enclosed is a picture of an interesting stunt we used in dismantling some Butler huts, later to be assembled in a new location. The side walls were removed in large panels while the roof was merely rolled up like a carpet. (The roof panels are of thin-gauge aluminum.) This saved lots of time.

I am a supervisor teaching Arabs to be craftsmen and this one (at left in photo) Saleh bin Mohammed, is an avid reader of *Popular Mechanics*. We both are with

(Continued to page 10)

# Can you profit by their mistakes?

## "Not getting enough education"

You needn't make that mistake. You can get that better job, those big promotions, the regular raises that so many I. C. S. students report. And you can do it without

"going to school," without interfering with your present job or your social life.

**YOU can study with I. C. S. at home, in your spare time!**



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When you study with I. C. S. you have 256 courses to choose from. And part of our job here at I. C. S. is not only giving you instruction

but making sure you pick the course that's right for you!

**YOU get expert guidance FREE from I. C. S.!**



## "Failed to seize opportunities"

Your opportunity is right here on this page. Don't pass it by. Don't put it off. Mail the coupon now and let us send you our 3-book career kit.

**YOU get 3 FREE books if you mail the coupon today!**

1. 36-page gold mine of information, "How to Succeed."
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For Real Job Security—Get an I. C. S. Diploma! I. C. S., Scranton 9, Penna. Member, National Home Study Council

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- Magazine Illustrating
- Show Card and Sign Lettering
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- Auto-Engine Tune Up
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- Traffic Management

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- Chemical Engineering
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- General Chemistry
- Natural Gas Prod. & Trans.
- Petroleum Engineering
- Plastics
- Pulp and Paper Making

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- Construction Engineering
- Highway Engineering
- Reading Struct. Blueprints
- Sanitary Engineering
- Structural Engineering
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- Architectural Drafting
- Electrical Drafting
- Mechanical Drafting
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- Plumbing Drawing and Estimating
- Structural Drafting

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- Electrical Maintenance
- Electrician  Contracting
- Lineman
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- Commercial  Good English
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- Mathematics

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- Finishing and Dyeing
- Loom Fix'g  Textile Des'ing
- Textile Eng'g  Throwing
- Warping and Weaving

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- Ocean Navigation
- Professional Engineering
- Short Story Writing
- Telephony

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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_ Working Hours \_\_\_\_\_ A.M. to P.M. \_\_\_\_\_

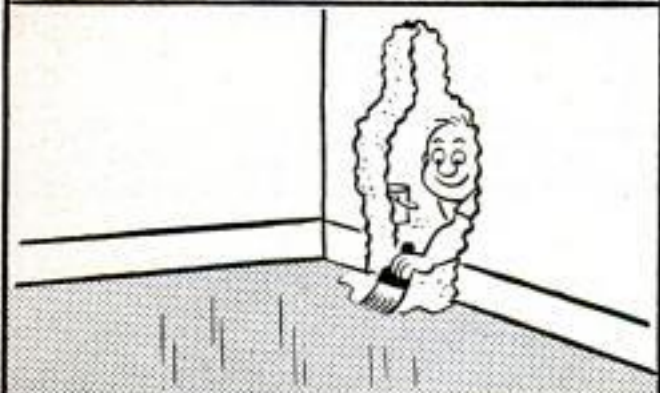
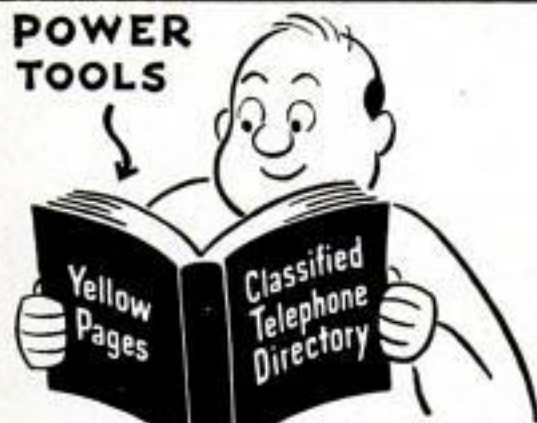
Occupation \_\_\_\_\_

Canadian residents send coupon to International Correspondence Schools, Canadian, Ltd., Montreal, Canada. . . . Special tuition rates to members of the U. S. Armed Forces.

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TOOLS**



**FROM PAINT  
TO POWER TOOLS  
WHATEVER YOU NEED**

**Find It Fast  
In The  
Yellow Pages**



Ads with this emblem make your shopping easier

(Continued from page 8)



Bechtel International working for Aramco in the Arabian oil fields.

M. V. Bailey,  
International Bechtel Builders  
Arabian Division,  
Dhahran, Saudi Arabia

### To the Editor:

The enclosed snapshot is of my portable "boat." Its over-all dimensions are nine feet by three feet six inches . . . two rubber



pontoons attached to plywood top. I fitted the seats and fixed the bicycle wheels to either side; also the shafts that protrude out the front end and the motor mounting.

Wheeling to the water is easy with the boat inverted. The outboard is just slipped between the seats; petrol, camping gear, etc., ride between pontoons. At the water's edge, the outfit is lowered onto shaft ends and turned completely over to ride in water.

J. Armstrong,  
Panania, N.S.W.,  
Australia

### Float Planes

Single-engine planes with wheels cannot legally take off from Canada to fly across the Atlantic or Pacific Oceans. But planes having pontoon floats instead of wheels can make these trips with the law's blessing.

More than 400,000 air travelers pass through the northern terminal of Gander, Newfoundland, every year.



**J. E. SMITH**  
President, National Radio Institute. 40 years' experience training men at home for Radio-TV.

*I Will Send You A*  
**SAMPLE LESSON FREE**  
*to show you how easy, practical it is to*  
**Train at Home for Good Radio-Television Jobs**



**America's Fast Growing Industry Offers You Good Pay Plus a Bright Future**

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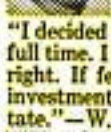
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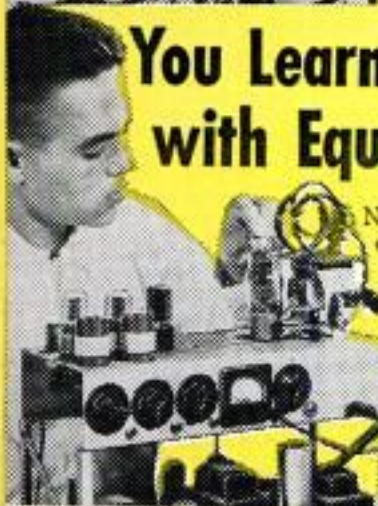


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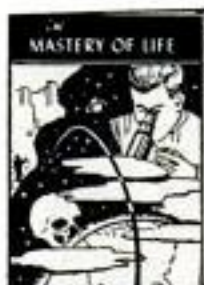
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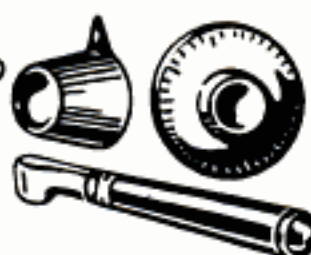
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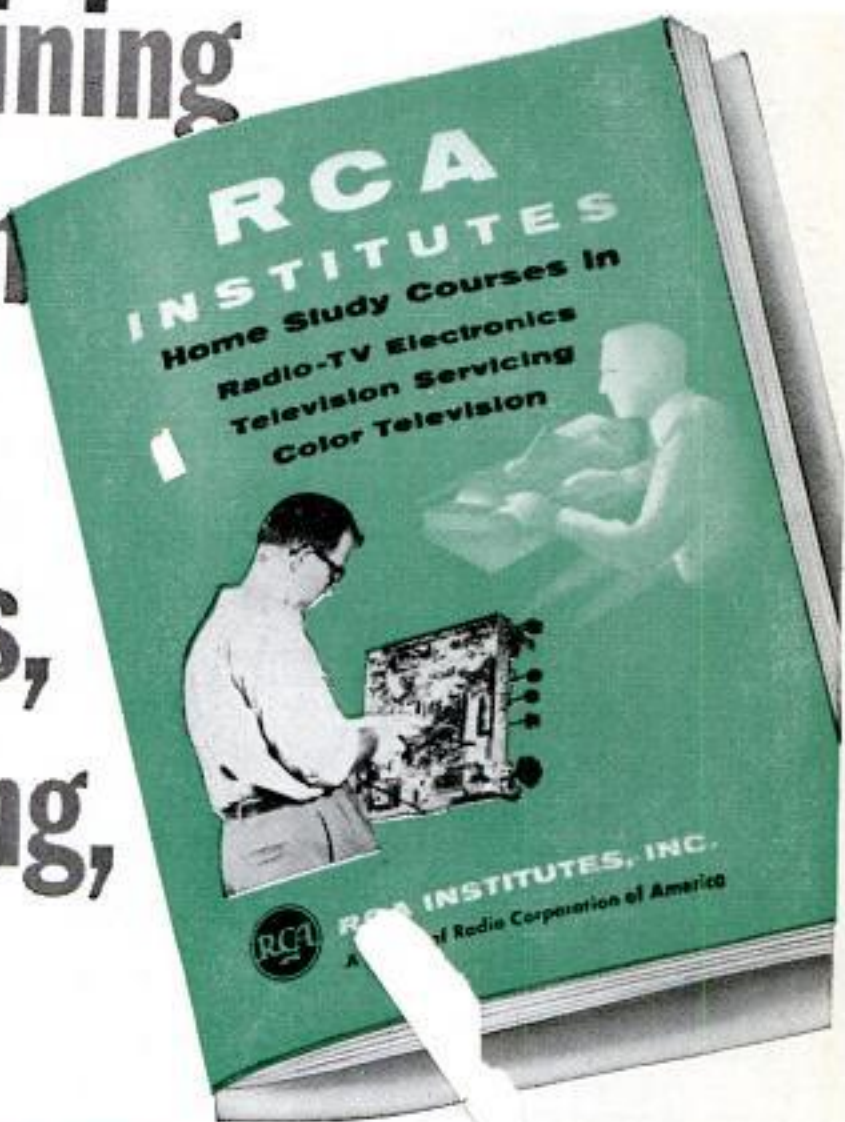
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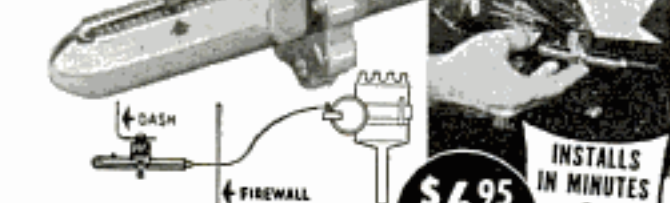
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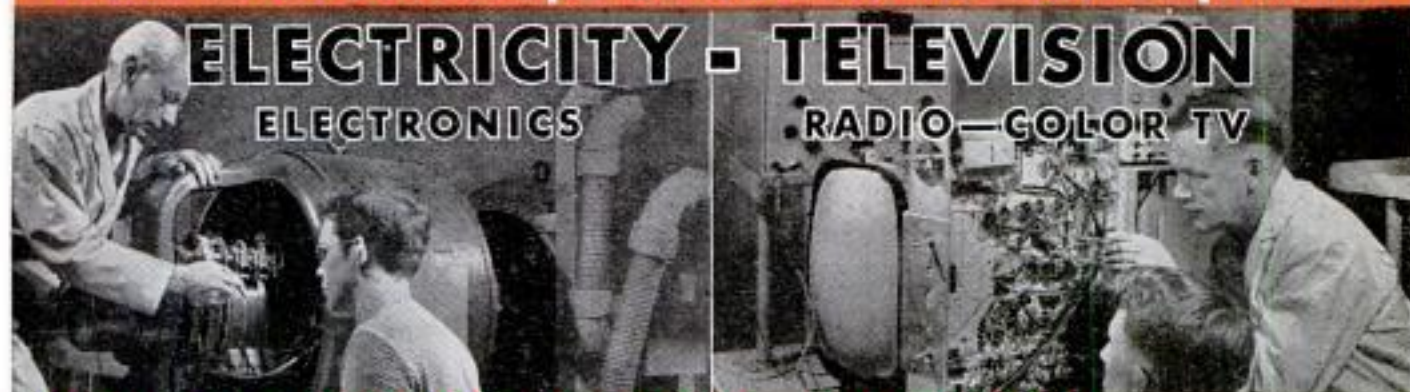
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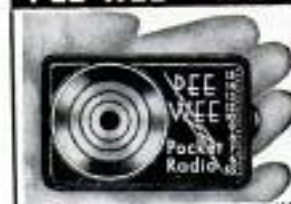
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—Ohio

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FABULOUS FLOWER**

**In Your Own  
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**Home Growers Coast  
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Growing Orchids for profit lets me have my business at home. When I first saw your ad. I had never seen an Orchid.  
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Orchids offer rich reward in leisure. There is financial reward for one interested commercially, as I am. Thanks a million for everything.  
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This is the book that has started thousands on the road to success as home Orchid growers.





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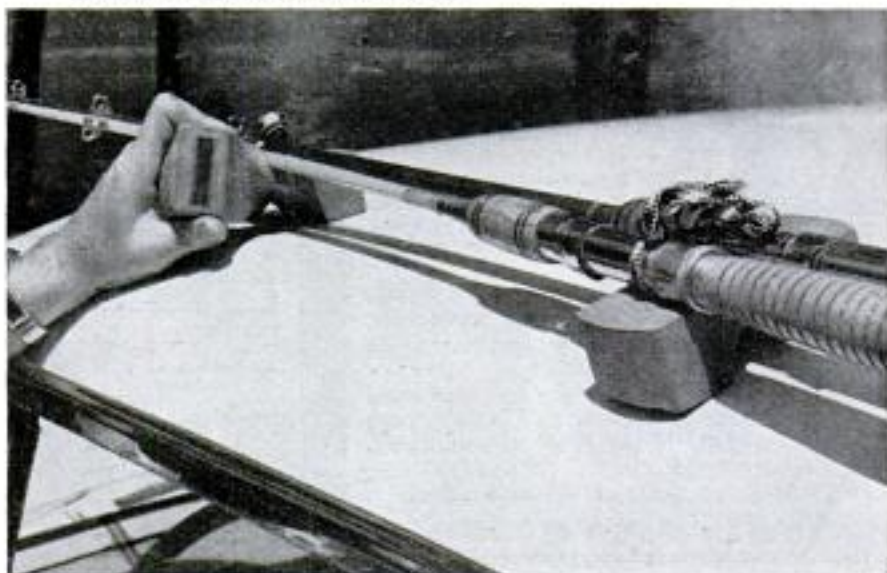
## Car-Window Grille Keeps Pets Inside

Pets riding in automobiles cannot jump out when the rear windows are equipped with chrome-plated grilles. The grille hooks around the window molding and is held firmly by springs. The window can be raised and lowered with the grille in place. The device is also useful in keeping children from putting their arms or heads out of the window.

←Grille covers window to protect pets. Kids, too

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←Beds are a foot high, provide storage space beneath

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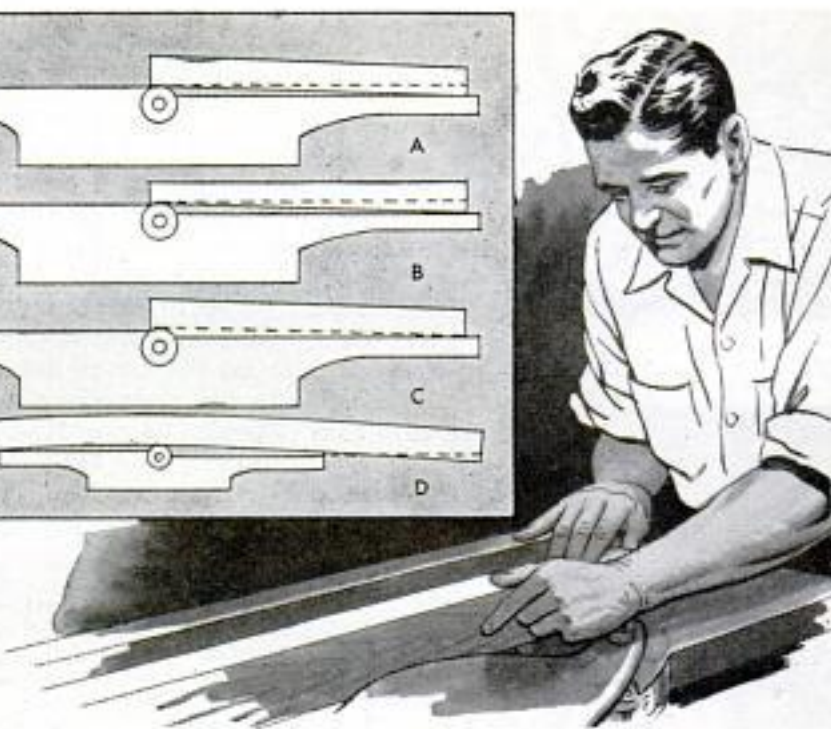
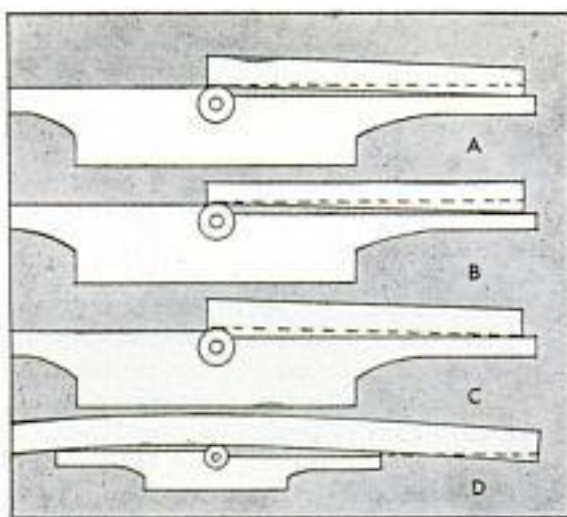
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# Know-How Increases Versatility of Shop Jointer

In addition to its regular uses, a jointer, or planer can be used to taper a board, remove an unwanted taper from a board or to plane a surface on a length of warped lumber. Before performing any of these operations, be sure the knives are flush with the top of the front table. To taper a board, measure the difference in width from one end to the other, then lower the rear table that amount. Place the forward corner of the board on the front table and run the board through the jointer, as in Fig. A. To remove a taper in a board, repeat the operation, but run the board over the knives in reverse, as in Fig. B. Another way to remove the taper in a piece of stock is shown in Fig. C. A line is drawn the length of the stock, showing the width desired. The wide end is fed into the knives as the rear table gradually is lowered until the knives cut to the line. The board then is reversed and run over the knives. The cut will, of course, come out even with the cut made in the other end. If a board is bowed,



high center over the knives, as in Fig. D, and move it forward over the knives. Then reverse the board, start from center and cut to the other end. Several passes, with the table set lower each time, may be necessary to cut a true surface. When performing the operations described, the jointer guard must be in place to protect the hands as shown in the illustration.

C. H. Sanders, Portland, Ore.

## Sideboards on Lime Spreader Triple Load Capacity

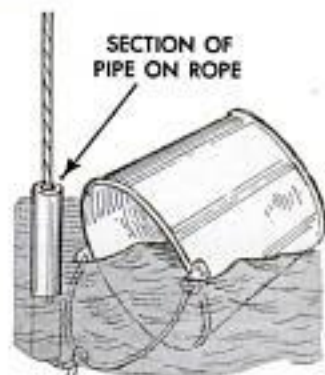
The capacity of a pull-type lime spreader was tripled, with subsequent savings in time, by installing a bottomless box on top



of the hopper. Bridging of the increased amount of lime or fertilizer was prevented by raising the agitator on its shaft. The front and two ends of the box are made of  $\frac{3}{4}$ -in. lumber 12 in. wide, the back being heavy sheet metal bent to the curvature of the hopper.

## Weight Tips Bucket

If it is necessary to dip water from a cistern, well or deep excavation, slip a short length of pipe over the rope to rest against the bucket bail. This will weight the bail sufficiently to tip the bucket when it rests on the surface of the water. File the ends of the pipe smooth to prevent them from fraying the rope.



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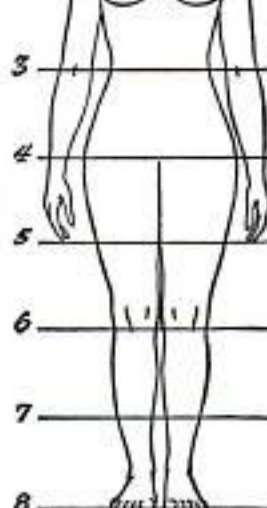
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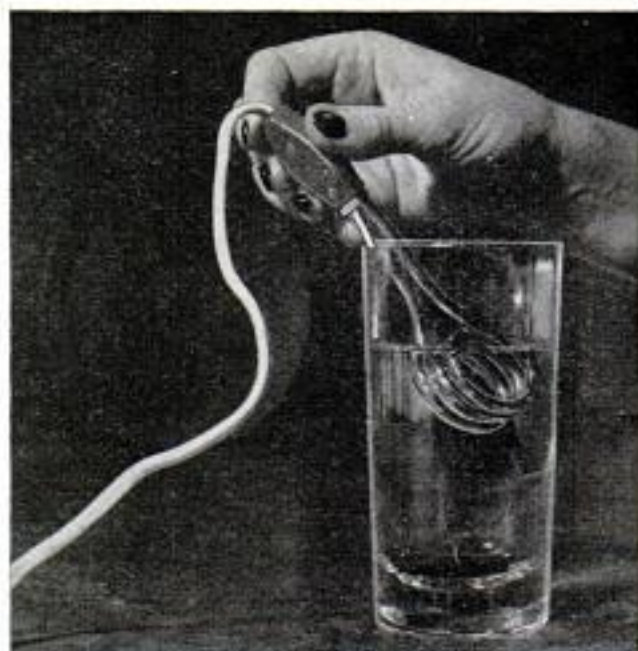
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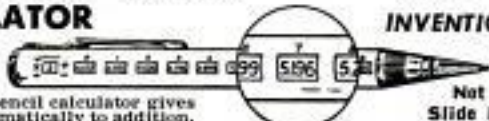
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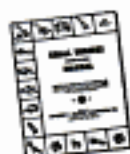
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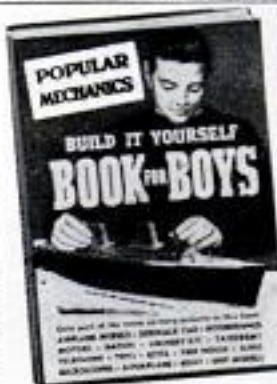


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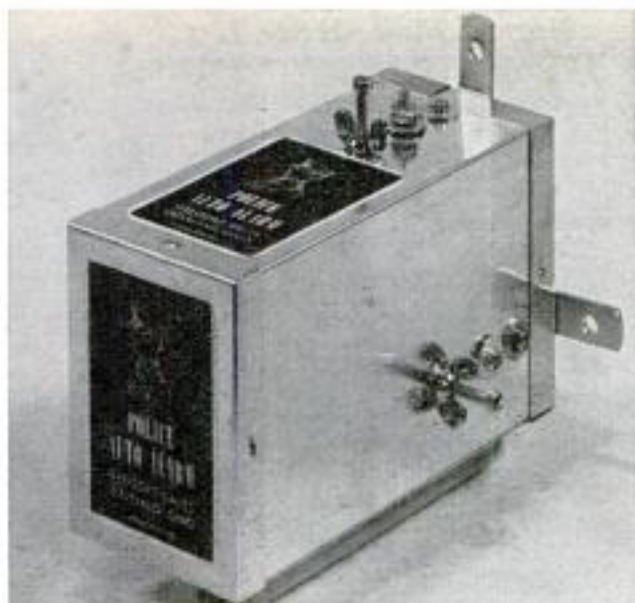


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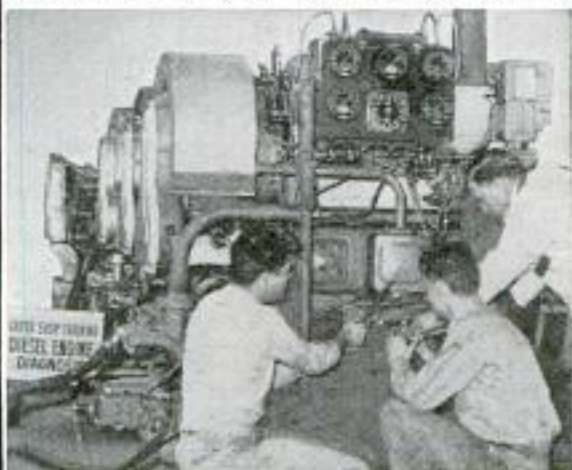
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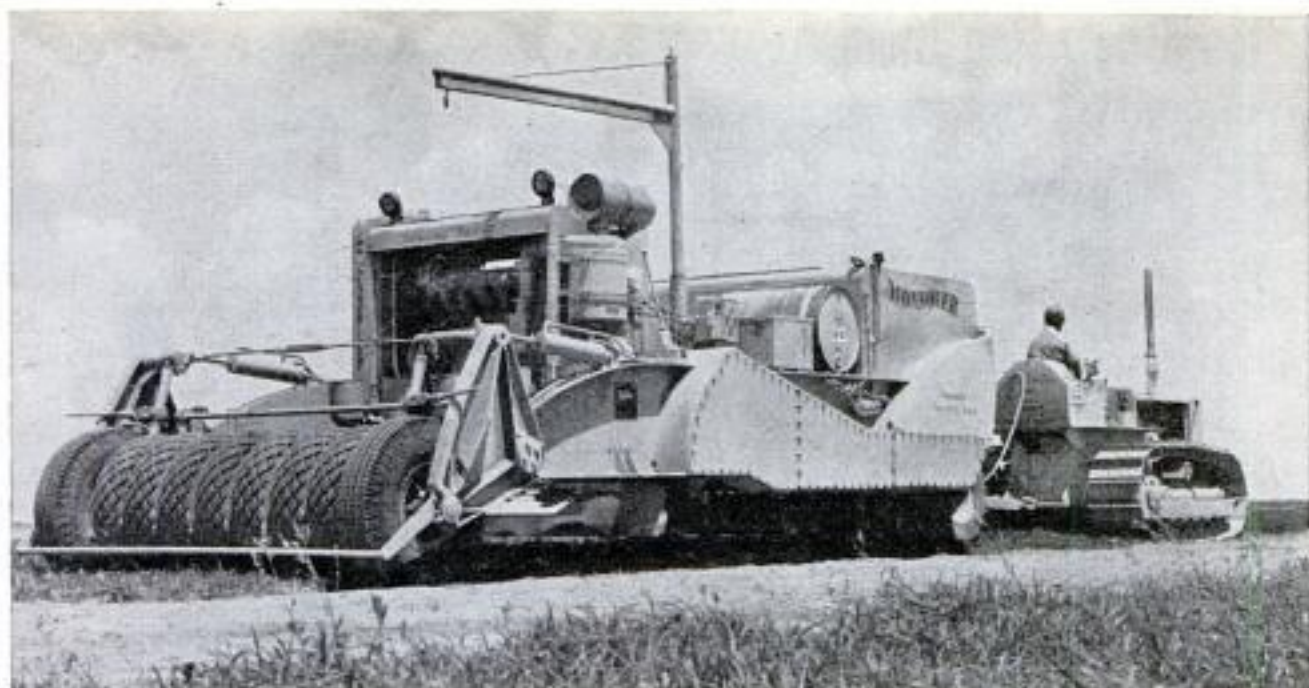
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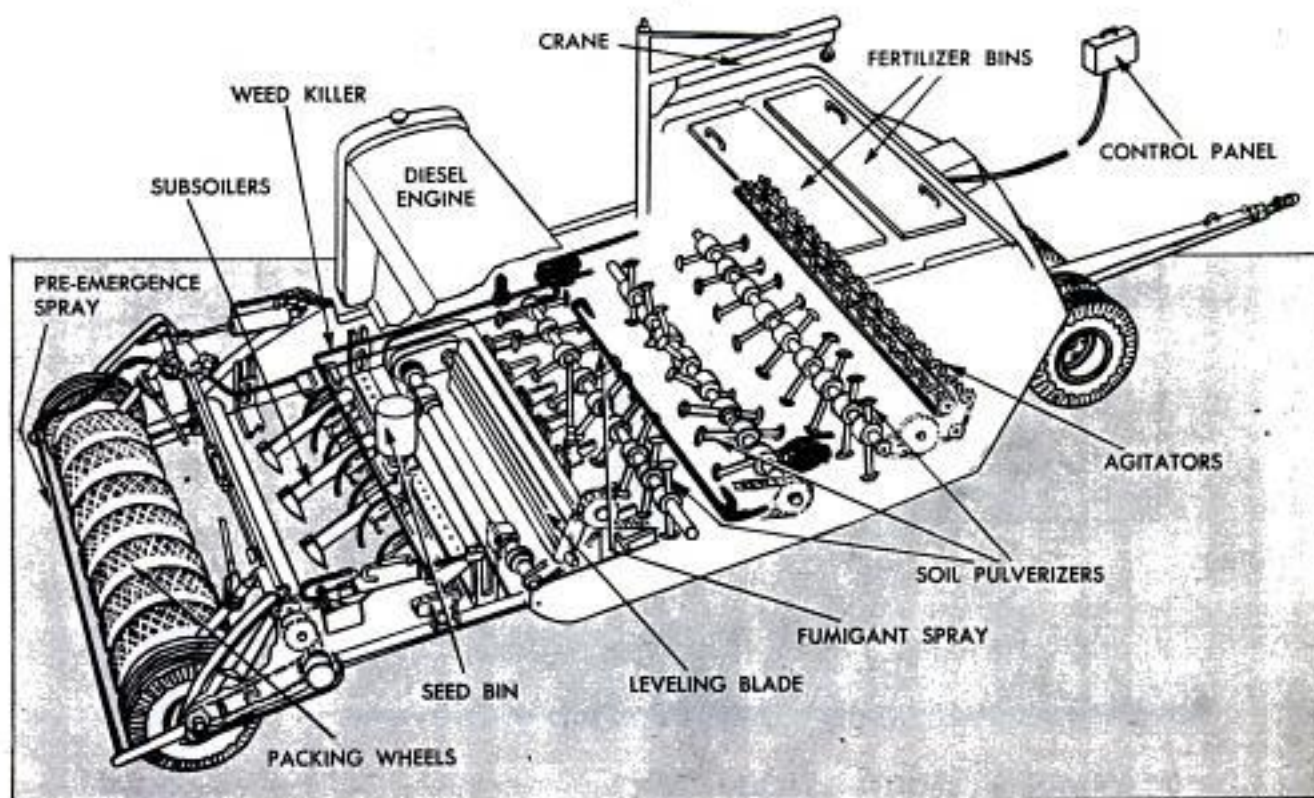
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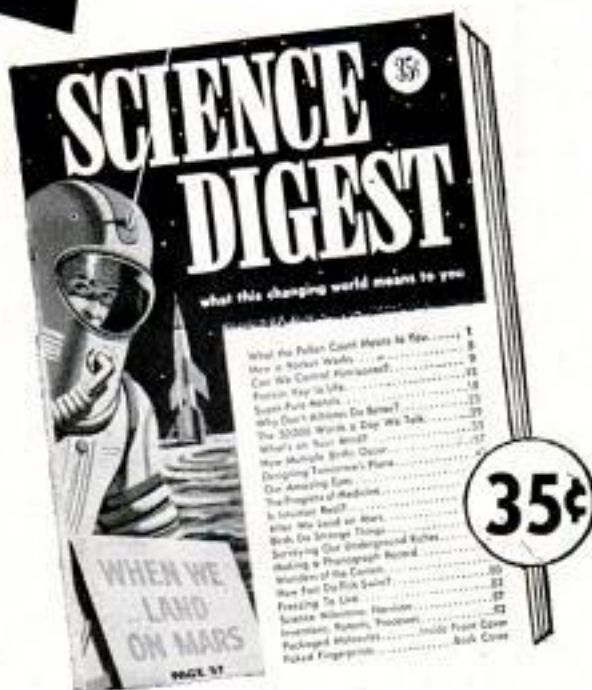
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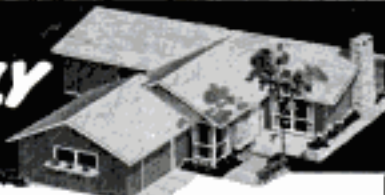
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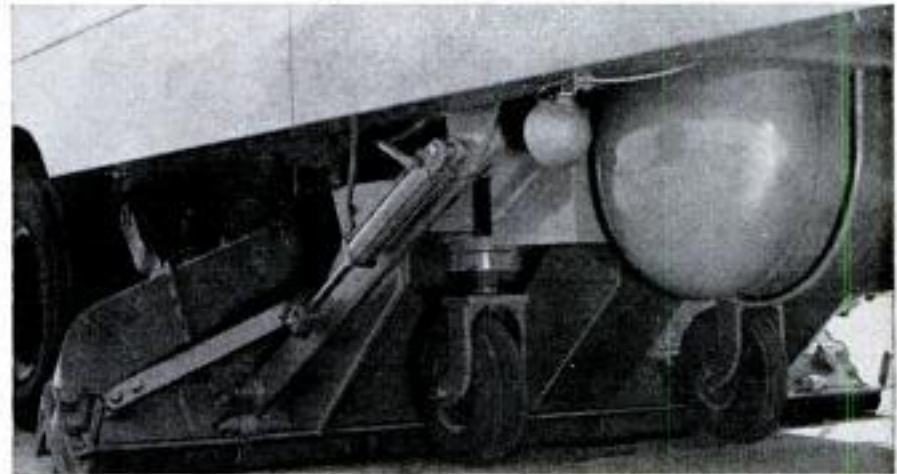
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## Massachusetts Church for Four Persons Is Only Five by Eleven Feet



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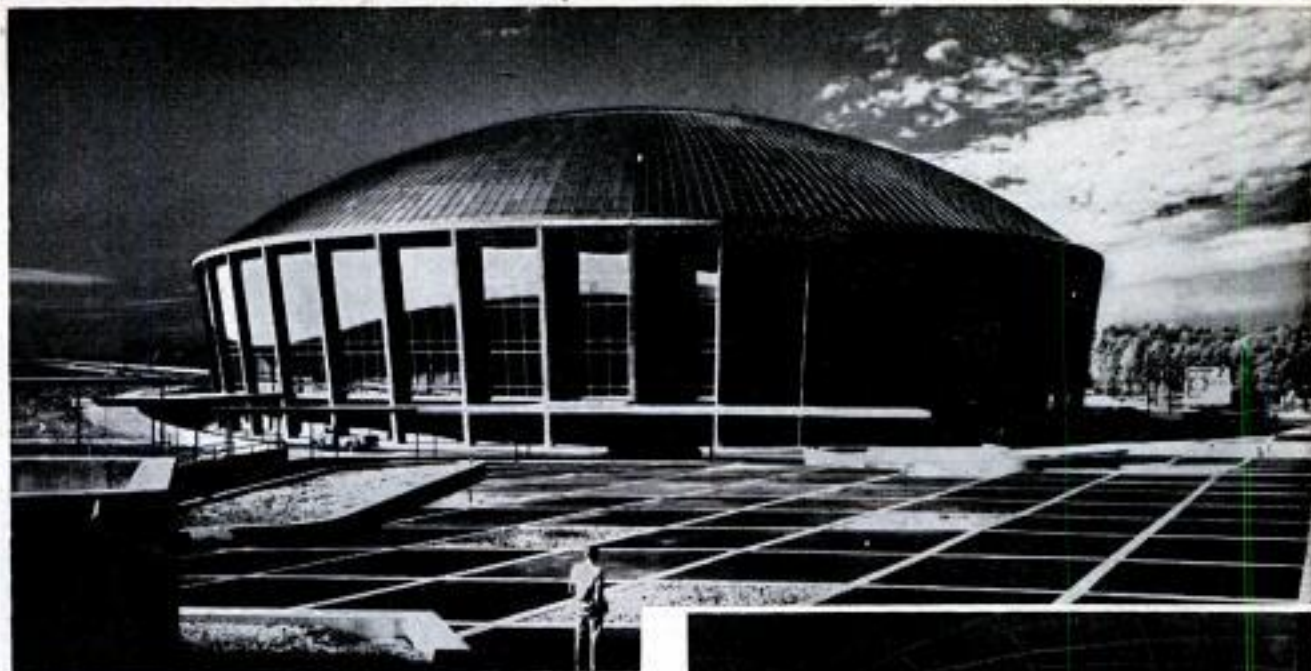
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## Fiat 600 Beach Wagon Has U-Shaped Seat

Fresh air is what you get plenty of in the Pinin Farina-designed body for Italy's popular Fiat 600. But then, fresh air is what you want at the beach and the new body is called "Spiaggia" which in Italian means

beach. A U-shaped bench wraps around the rear passenger compartment to provide seating for four or five persons. The engine and chassis are the same as in the conventional Fiat 600, an Italian family car.



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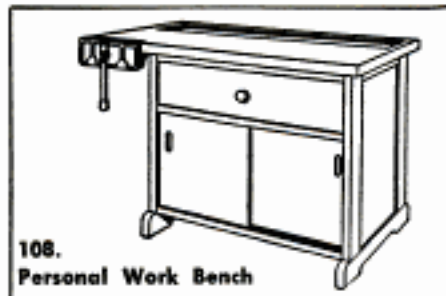
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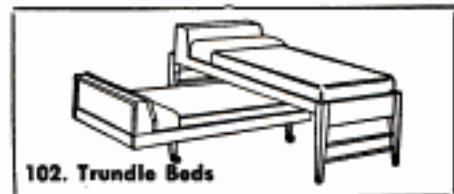
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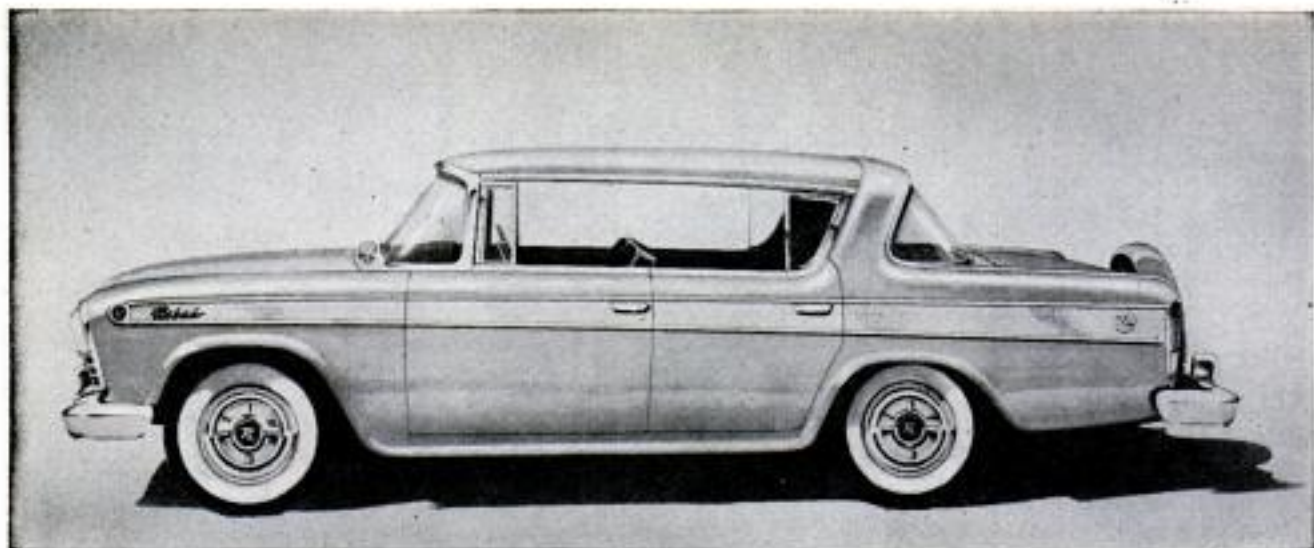
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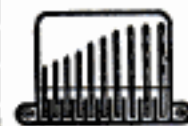


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**ACCORDIONS** Wholesale—10 day trial. Free catalog. American Accordion Center, 5329-PM-2 Belmont, Chicago.

**INDEPENDENT** Songwriters agency, wants songpoems, songs. P.O. Box 16A, New York City 19.

**SONGWRITERS:** Recording company wants new songs. Royalty basis. National sales, promotion if selected. Send material. Music Makers, Dept. E-30, Box 2507, Hollywood, Calif.

**POEMS** Songs wanted! Recording, publishing. Bengol, 93 Jefferson, Chelsea 50, Massachusetts.

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**FREE** Cadillac, \$10,000 yearly. Cars, accessories wholesale. Strateway, 6228E, Charlotte 7, N. C.

**MAILORDER** Envelope business in your home. No investment. Omaha Envelope Company, 4721-A California, Omaha 3, Nebr.

**START** Mail order discount business at home. Offer gifts, appliances, cookware, housewares, cutlery, dinnerware, silverware, jewelry, watches, etc., at discounts up to 75%. No stock needed. We ship your orders under your label. Catalogs printed with your name can cost you nothing. Postcard brings sample catalog, complete details. Topval Corp., Lindenhurst 218, N. Y.

**RAISE** Nutria—America's newest opportunity. Luxurious fur. Easily and economically raised. Disease free. Guaranteed market with exceptional profits. Visit or write. Cabana Nutria of Illinois, Rushville, Illinois.

**OPERATE** Money making international "drop-ship" business. Western Activities, 1518 Pl Wilton, Los Angeles 19, California.

**PRINT** Without a printing press! Amazing new method! Print colorful signs, banners, cards, posters, glassware; anything at home. Big profits. Money-making opportunity! We supply everything. Beautiful sample, home-business plan free! Write Screen-Print Company, PM-PY, Los Angeles 61, California.

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

**OWN** Your business. Water softener dealers wanted. \$3,000 needed for minimum stock. High profit item on nationally advertised line. Training program. Write today. P-M, Dept. D, 600 S. Michigan Ave., Chicago 5.

**MAKE** Money in landscaping—Start your own business, part or full time. Many good paying positions open. Earn while learning. Send for free book. National Landscape Institute, Dept. M-27-C, 310 S. Robertson Blvd., Los Angeles 48, Calif.

### **MONEYMAKING OPPORTUNITIES**

**MEN** And women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to \$9.80 an hour without previous experience. Full particulars free by mail. Send postcard to Roberts, 1512 Jarvis, Room 7-B, Chicago 26, Ill.

**PROFIT** Raising flowers. \$1.00 tells how! Wells Gardens, Washington, Michigan.

"HOME Business Digest" has money-making opportunities galore. Sample 25¢. Donovan, 79-PM Greenbelt, Levittown, New York.

**WHOLESALE!** Sell yourself, sell neighbors aluminum awnings; beautiful baked enamel finish. Write: Jack, Box 10254, Tampa, Fla.

**MEN — Women!** Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room 7-B, 1512 Jarvis, Chicago 26, Ill.

**MAKE** Money writing short paragraphs! No tedious study, I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-B, 7464 Clark, Chicago 26.

**START** A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, Hertel Station, Buffalo 16-D1, New York.

**FREE!** "301 Profitable Small Businesses!" Amazing shoeing plans! Work home! Start sparetime! Deumant Surveys, Kenmore 23-R, N. Y.

**START** Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room 7-B, Chicago 26, Ill.

**WE** Pay \$100.00 each for certain Lincoln head pennies. Sort all U.S. coins for us spare or full time. All coins are now in circulation and can be found by anyone. Send \$1.00 for catalog listing our paying prices. \$1.00 refunded on our first purchase we make from you. Viroqua Coin Company, Dept. P-5, Viroqua, Wisconsin.

**SELL** Nothing—Yet have a reserve! Free packet. "Secret Journal," 919 secrets—plans! Work home. Publica, Oceanside, Calif.

**OWN** Collection agency office. Pays big. Free details. Franklin Credit, Roanoke 4, Virginia.

**PROFITABLE** Opportunities, plans, ideas. Send 25¢. Monix, 3652 Puuku Makai Drive, Honolulu, T. H.

**100% PROFIT** Mailing postcards. Write PCO, 322½ Brady, Davenport, Iowa.

**YOU** Can sell metal bird feeders and insulated bird houses. Good profit, fast sales. Sample feeder \$6.00, sample house \$2.00 postpaid. Specialty Manufacturing, Box 236, Cassopolis, Michigan.

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**UP** To \$4.00 hourly! Make old, unused articles into saleable items. Free circular. P. Warman Publishers, Uniontown, Penna.

**FASCINATING** 12 Tool stainless steel sportsman's knives. 200% profit. Sample \$3.00. Malik Sales, 1617 Scoville, Berwyn, Ill.

**MONEY** Making opportunities. Copper Hill Sales Service, Copper Hill, Va.

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**\$45.00 PROFIT** From one bag of cement. Complete instructions and formula \$1.00. McComb & Son, Hometown, Indiana.

**LEARN** Technical metaphysics and insure your future. Easy, inexpensive correspondence course. Simplest method known. Diploma. Write: Premier College of Technical Metaphysics, 2532 McKenzie St., Vancouver 8, B. C., Canada.

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**FREE** Book "505 Odd, Successful Businesses." Work home. Pacific, Oceanside, Calif.

**PRIZE** Contests provide fabulous and confidential home income opportunities! Here's how and where to win your share! Send stamp! National Contest Bulletin, Box 2685-P, Miami 16, Florida.

**START** A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. Send this ad with your name and address to: Agency Bureau, Dept. PM, Hearst Magazines, 250 West 55th St., New York 19, N. Y.

**EARN** \$50.00 Daily making mats, shoes and mud guards from old tires. S and S Patents Inc., 1307 North Clark St., Chicago 10, Ill.

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**LAMINATING** Supplies. Free price list. Solomonson, 46 Cornhill, Boston 8, Mass.

**LEARN** Plastics fabrication for spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 13, Ore.

**CARDS**, Photos, plastic sealed by machine. Wallet size 50¢, 3 for \$1.00. Box 516, Davenport, Oklahoma.

**PLEXIGLAS**, Fiberglass, polyester, acetate. Instructive wholesale-retail catalog free! Gem-O'-Lite, 5529 Cahuenga, North Hollywood, California.

**BOXES**, Plastic. Free list. Althor, 170 Bay 23 Street, Brooklyn, N. Y.

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**CASTING** And embedding course. Easy method with liquid plastic, flexible molds. Details free. Plastic Arts, 416 El Camino, San Carlos, California.

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VITA-Zest. Health producing vitamins and minerals. Whirlwind seller. Great repeater. Amazing profits. Free details. Vita-Zest Co., 210R East South St., Orlando, Florida.

"SUPER Glo" signs. Earn \$25.00 day. Magic flashlight test. Advance profits. Prospects everywhere. Sample kit and catalog help you sell on sight. Active Display Advertising, 1702 West 19th Street, Chicago 8, Illinois.

FREE! Sunshine's Studio everyday assortment. Special introductory offer to big profits available selling Sunshine exclusive everyday cards, imprinted stationery, gift wraps, deluxe 21 card assortment, etc. Free catalog. Send postcard today for sample kit on approval. Sunshine Art Studios, Inc., Dept. PM3, Springfield 1, Mass.; Pasadena 1, California (East of Rockies address Springfield).

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MAKE Extra cash—Quickly! Show newest big value \$1, \$1.25, \$1.50 assortments of birthday, get well, Valentine, Easter greeting cards, gift wrappings, stationery, gifts—In spare time. Big profits, bonus. Friends, others buy on sight. Write for samples on approval, free gift offer, details. Hedenkamp, 361 Broadway, Dept. PM-46, New York City.

GREETING Cards—\$50.00 cash from 40 boxes sensational all-purpose assortment. Big money all year from special occasion cards—Mother's, Father's day, birthdays, Eastern Star. Best all-occasion assortments, stationery, gifts. Bargain specials. Color catalog. Samples on approval. Midwest, 1113 Washington, Dept. 707-B, St. Louis 1, Mo.

IF You want to earn money fast, I'll send you free sample stocking of newest stretch DuPont nylons to sell at only \$1 a pair. American Mills, Dept. 604, Indianapolis 7, Ind.

MEN, Women, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags, and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1½ years or replaced free. Write Wilknit, 1772 Wash., Greenfield, Ohio.

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IF You're interested in making money in selling, see the hundreds of exceptional opportunities in Salesmen's Opportunity Magazine. Send name for your copy, absolutely free. Tell us what you're selling now. Opportunity, 848 N. Dearborn, Dept. 46, Chicago 10, Illinois.

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60% PROFIT On cosmetics — Famous nationally advertised Hollywood cosmetics pay 60%. Make \$25 day up. Hire others. For free samples, details, write Studio Girl, Glendale, Calif., Dept. 1272G.

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CATALOGS! General merchandise, clothing, tools; each \$1.00; jewelry 50¢; Gifts, 25¢. Edith's, Deep River, Conn.

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**IS** \$150 Weekly worth 2¢ postcard to you? Send name, address, shoe size for sensational "dollar-a-second" demonstration and amazing new footwear on approval. Flexiclogs, Box 27X-B, New Holstein, Wis.

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18 FULL-Size patterns. Save money with easy-to-use, professionally designed full-size patterns. Make money selling beautiful, useful furniture. Make modern step and cocktail tables; metal lamps; cupola; 12-foot outboard. All patterns test-built; sold with money-back guarantee. Get your free list of these convenient, economical patterns today. Popular Mechanics Press, 200-HH E. Ontario Street, Chicago 11, Illinois.

**CLOCK** Movements—Gorgeous dials, plans, kits. See ad page 325.

**DO-it-yourself** family trampolines. American Trampoline Company, Jefferson, Iowa.

**GRANDFATHER** Clock movements, blueprints, kits. Wholesale catalog 25¢. Mason-Sullivan, Noroton, Conn.

**MAKE** A burner from scrap pipe, fittings. Makes hottest whitest flame, no smoke, cannot explode. Uses drained crank-case oil, crude oil of any kind. Hundreds of uses, fire, a forge fire, a boiler, 1 or a thousand h.p. Protects orchards from freeze, etc. Makes it in hrs. time. Makes its own power. Will fire a boiler from cold start to steam in minutes. Send \$3.00 for pictures, complete instructions, how to make and operate. Universal Engineering Services, 202 West Dunn Avenue, Killeen, Texas.

**BUILD** Your own optical instrument! New book—"Fun With Optics" tells you how! 32 exciting pages. Full diagrammed instructions on how to build telephoto lenses, telescopes, microscopes, slide viewers, artist drawing projectors, binoculars, magnifiers, riflescopes, etc. We can furnish the lenses, prisms and parts you'll need. To get this terrific book send your name and address and only 50¢, full price. Request Stock No. 9050-CY. Edmund Scientific Company, Barrington, New Jersey.

#### WATCHES, OLD GOLD, JEWELRY

**COSTUME** Jewelry supplies. Catalog and samples. 35¢. Largest line in America. Milady-Fair Co., G.P.O. Box 1323, New York City 1.

**HIGHEST** Cash for old gold, broken jewelry, gold teeth, watches, diamonds, silverware, spectacles, platinum, mercury. Free information. Rose Refiners, Heyworth Bldg., Chicago 2.

**WATCH** And clock repairing books. Free catalog. North American, 2320-AB Milwaukee, Chicago 47, Ill.

**WATCHMAKERS**—Jewelers', machinists' tools. Watchmaking course. Catalog 25¢. Bengale, Culver City, California.

**COSTUME** Jewelry. Samples and list \$1.00. Mulheim's, North Industry 10, Ohio.

**WATCHES** Completely repaired \$4.00. Guaranteed. Freeman's Watch Repair, Rosston, Okla.

**COPPER** Enameling supplies, rhinestones, pearls, jewelry settings. Catalog 10¢. J & M Novelties, Dept. CB-3, Griffith, Indiana.

**COPPER** Enameling, jewelry findings, rhinestone supplies. 87 page catalog 25¢. Bergen, 300-PM Southwest 17th Avenue, Miami, Florida.

**PREFERRED** Source for quality settings and stones. Manufacture costume jewelry at home. Extensive catalog 25¢. A. V. Cutt Co., 210-F Fifth Ave., New York 10, N. Y.

#### RAZORS, BLADES, SHARPENING

**TEN** Double edge blades 10¢; hundred 75¢; thousand \$6.00. Enterprises, 605 Wells, St. Paul 1, Minnesota.

#### FOR THE HOME

**FOAM** Rubber furniture cushions. Factory seconds. 50% discount. Free catalog. Perma-Foam, 238C Rhode Island Ave., East Orange, New Jersey.

**BE** Your own plumber. You can. Few inexpensive tools and our instructive book, "Home Plumbing Guide," shows and tells you how. Hundreds of photographs and diagrams. Easy to follow. 160 pages. \$3.50. Catalog free. Popular Mechanics Press, 200PG East Ontario St., Chicago 11, Ill.

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**HOME** Plans. 10 architect designs of 2, 3, and 4 bedroom contemporary ranch homes, carefully selected for livability, economical construction and beautifully illustrated exteriors. Send \$1.00 for information and plan collection to make your choice. Blue prints available. (\$1.00 refunded first blue print order). S. & P. Plan Service, P. O. Box 333, Cincinnati 14, Ohio.

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**FREE.** Finest tableware made like sterling. Newest patterns. Join: The Gift Club, Dept. M., Box 81, Beecher, Ill.

**EARN** Money at home. Learn invisible reweaving at home. Licensed, approved school. Free details. Eastern School of Reweaving, 73 Main Street, Dept. 827, Hempstead, N. Y.

**EMBROIDER** Stamped linens. Buy direct from manufacturer and save. Send for free catalog. Merrilee, 16 West 19th St., Dept. 342, New York 11, N. Y.

**GOOD** Money in weaving. Weave rugs at home for neighbors on \$89.50 Union loom. Thousands doing it. Booklet free. Caricraft Co., Polk St., Boonville, N. Y.

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**WANT** To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes, disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 8332-S Prairie, Chicago 19, Illinois.

**SELL** Fine fabrics. Get yours wholesale. Box 863, Norwalk, Conn.

**BOOKS:** Hundreds of subjects. Big catalog free. Popular Mechanics Press, 200-BC East Ontario St., Chicago 11.

**MAKE** New greaseless doughnuts in kitchen. Sell stores. Free recipes. Morgan Ray, 3605 South 15th, Minneapolis 7, Minn.

"8 MISTAKES Parents Make." Every parent should have this new book about child training. It is free; no obligation. Simply address Parents Association, Dept. 672, Pleasant Hill, Ohio.

**RAISE** Money! Making, selling artificial flowers, corsages, novelties. Big illustrated catalog 25¢ (refundable). Profitkrafts, 4513B21 Lorain, Cleveland 2, Ohio.

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"HOW Can I find out?" You can! Information confidentially developed. Any matter, person, problem. Worldwide. Officially licensed. Established 1922. William Herman, 170 Broadway, New York City.

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**HONOLULU,** Hawaii, Box 5238. Personal or business address. Other services.

**HOLLYWOOD!** Your letters remained! Postmarked anywhere within U.S.A. \$1.00! Box 972, Santa Barbara.

**SIMPLE** Television repairs. Marvelous booklet 25¢. Free catalog. Popular Mechanics Press, 633 N. St. Clair St., Chicago 11.

**SASKATCHEWAN** The oil province. Regina newspaper classified airmailed \$1. Stenseth, Box 231, Regina, Sask., Canada.

**YOUR** Key to popularity and success. A revealing booklet, \$1.00. P.O. Box 601, Ironwood, Michigan.

**BILLS!** Bills! Bills! Pay them quickly with cash loan by mail, \$100.00 to \$600.00. Repay in small monthly installments over 20 months. Your payments may run 1/2 less than now; have money left over to spend. Loan order blank mailed free in plain envelope. Advise amount you need. State Finance Co., 323 Securities Bldg., Dept. J-227, Omaha 2, Nebr.

**REMAIL 25¢.** 12 Assorted California scenic postcards \$1.00. Remailed free. Los Angeles Sunday classified \$1.00. Mexico shopping. Write your wants. Wynn's, 1165 E. Ramsey, Banning, Calif.

**DYNAMIC** Booklet reveals difference between synthetic and natural vitamins and minerals. Free. Bonnie, 1605 N. W. 79th St., Miami 47, Florida.

**WONDER** "Master Formula" changes and improves your life and affairs. Write: Teocritic-PM, Box 27683, Hollywood 27, California.

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**SECRET** Mail receiving, forwarding system. \$3 month. Hedgpech, Box 830, Alhambra 23, California.

**HOLLYWOOD,** Beverly Hills, Los Angeles, Santa Monica remails 25¢. View-cards 5¢ each. Danchak, P.O. Box 1065, Santa Monica, California.

**COLUMBUS** Mail forwarding-receiving address for rent. Details free. William McLaughlin, 800 Stewart, Columbus 6, Ohio.

**TRENTON:** Remails 25¢. Matelena, 3576 E. State Extension, Trenton, N. J.

**BRAZILIAN** Rearmails 50¢. Forwarding service. Mauricio, Caixa Postal 515, Anapolis, Golas, Brazil.

**SAN Fernando, Calif.**—Remails 25¢. Mail received—forwarded \$3.00 month. 5 scenic cards \$1.00, remailed free. Los Angeles Sunday classified \$1.00. Homer, 13247 Sayre Street, San Fernando, California.

**HOLLYWOOD-Long Beach** remail 25¢. Receiving-forwarding address. Lenormans, 722 Magnolia, Long Beach, California.

**BEAUTIFUL** Pictorial view cards New York City. Only 10 for 25¢. Remailed 10¢. B. Grant, 385 East 144 St., Bronx 54, New York City.

**UNITED Nations** stamped and remailed. 30¢. Zwirn, 430 Livingston Ave., New Brunswick, N. J.

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**LITHIUM.** The wonder metal. Free booklet describes prospecting information, uses, etc. Nu Age, Box 142, North Battleford, Sask., Canada.

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**BOOKS:** Hundreds of subjects. Big catalog free. Popular Mechanics Press, 200-BC East Ontario St., Chicago 11.

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**70 BIBLE** Lessons, 25¢. Bulletin, Box 87, Cathedral Station, New York City 25.

**DRESSES** 24¢; Shoes 39¢; men's suits \$4.95; trousers \$1.20. Better used clothing. Free catalog. Transworld, 164-S Christopher, Brooklyn 12, N. Y.

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**BEAUTIFUL** Portraits done in oils from photographs. Anyone can afford my reasonable prices. Free particulars. Elmer Brunow, 2452A No. 17 St., Milwaukee 6, Wisconsin.

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**INTERESTED** In puzzle contests? Valuable information free. Unique, Box 99, Mt. Vernon, Ill.

**JAPAN:** Buy gifts from Japan. Kimono, artistic handicrafts, novelties, others. Business information \$1.00. Send money orders. Clarence Yamagata, Room 202, Naka 7 Bldg., Marunouchi, Tokyo, Japan.

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**MEN,** Help safeguard your hat from being snatched up by mistake with identifying hat cards placed inside. Dozen 25¢ coin. Simplex, P.O. Box 193, South Bend, Indiana.

**HOW** To read blueprints. Amazing booklet 25¢. Free catalog. Popular Mechanics Press, 631 N. St. Clair St., Chicago 11.

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**BIO** Malls, four months listing, 25¢. Wright Publications, 2270 Hubbard, Memphis 8, Tenn.

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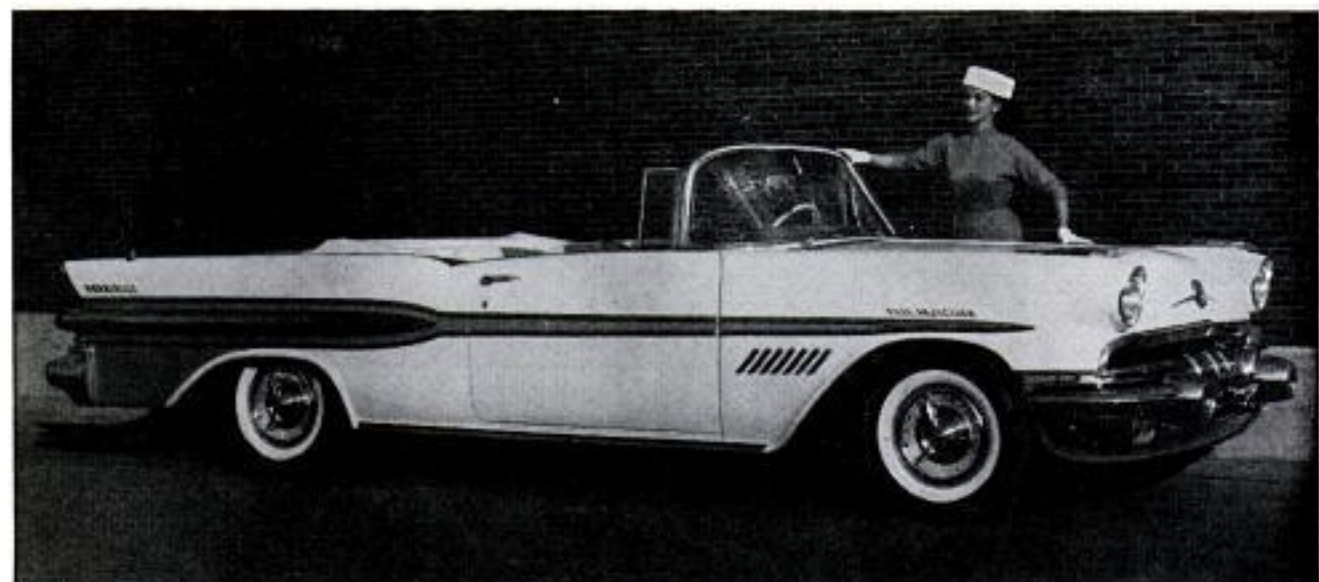
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**VERY** Important. Cost a dollar, worth a million. Particulars a stamp. Johnson, B552, Memphis 1, Tenn.

**CIGARETTES.** Make 20 for 9¢. Facts free. Moberly, Box 810, Owensboro, Ky.

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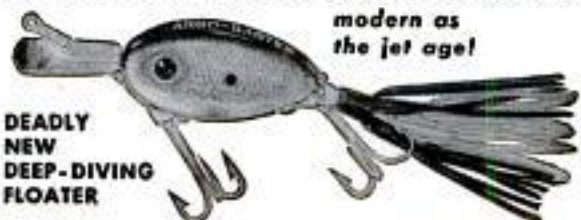


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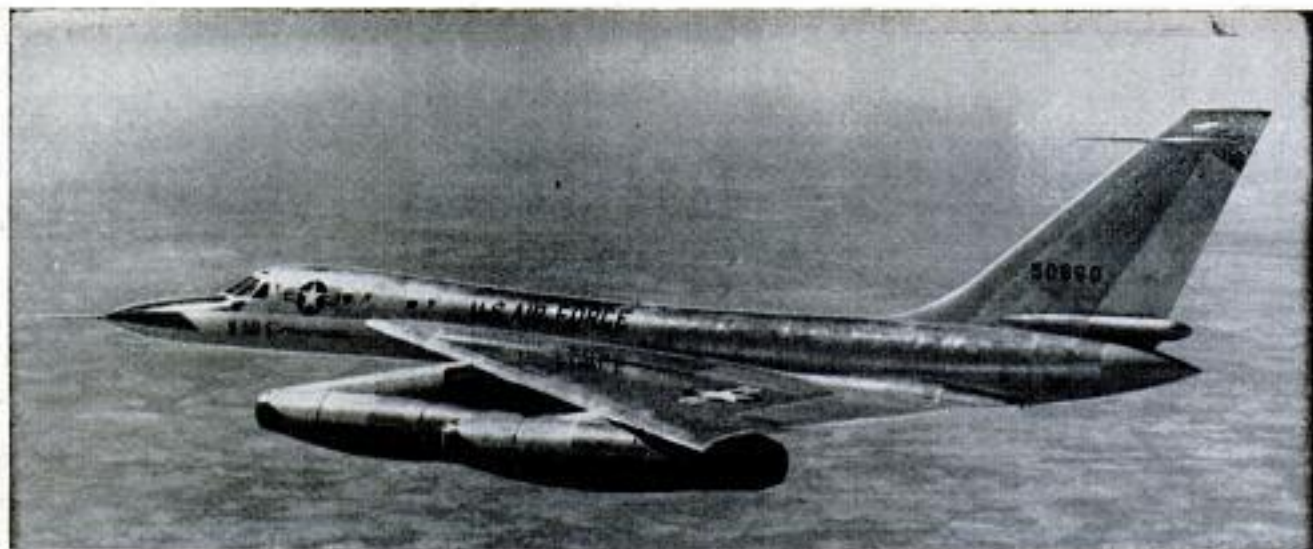
"Others weren't catching 'em, but we got near-limits every day with new Reflector-finish Arbo-gasters," says B. C. Joyner, Memphis, Tenn. (left) and N. Simich, Akron, Ohio. Largest of 11 bass from Horse-shoe Lake, Ark. was 6 lbs. Large lip keeps Arbo-gaster deep! Amazingly snagless, controls perfectly. Sparkling, non-fade Reflector finish or Standard Colors. 5/8 oz. or 1/4 oz.—\$1.35 each.



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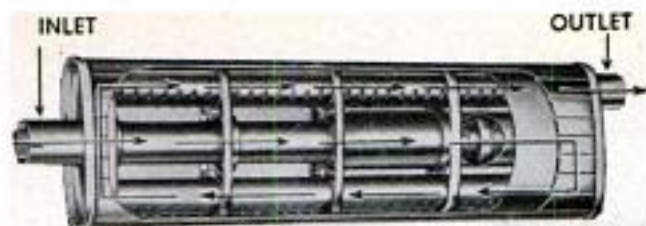
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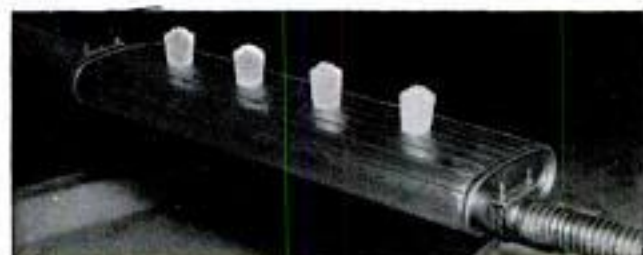
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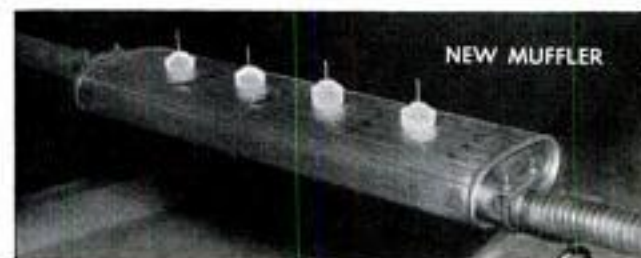
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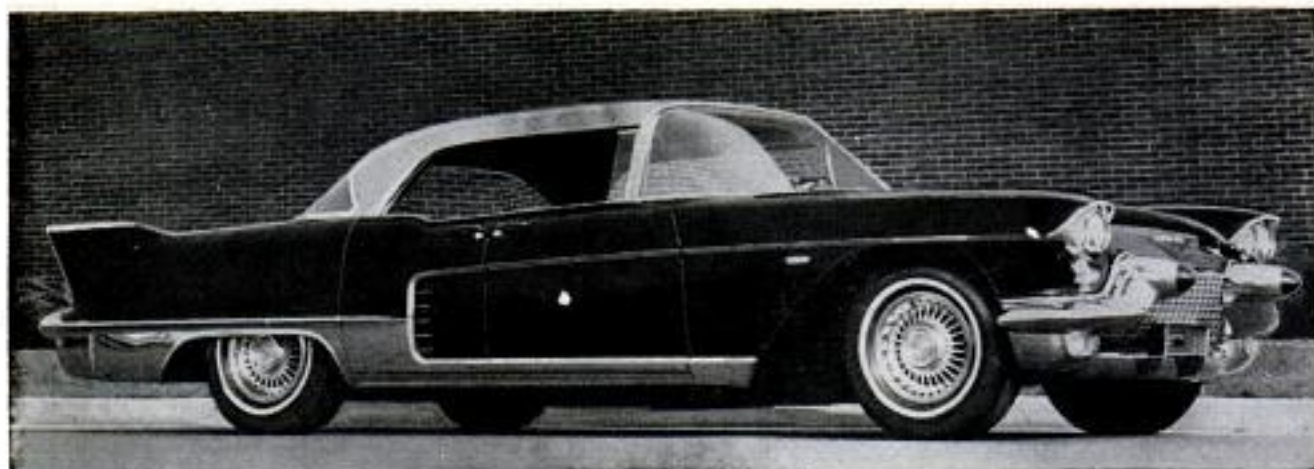
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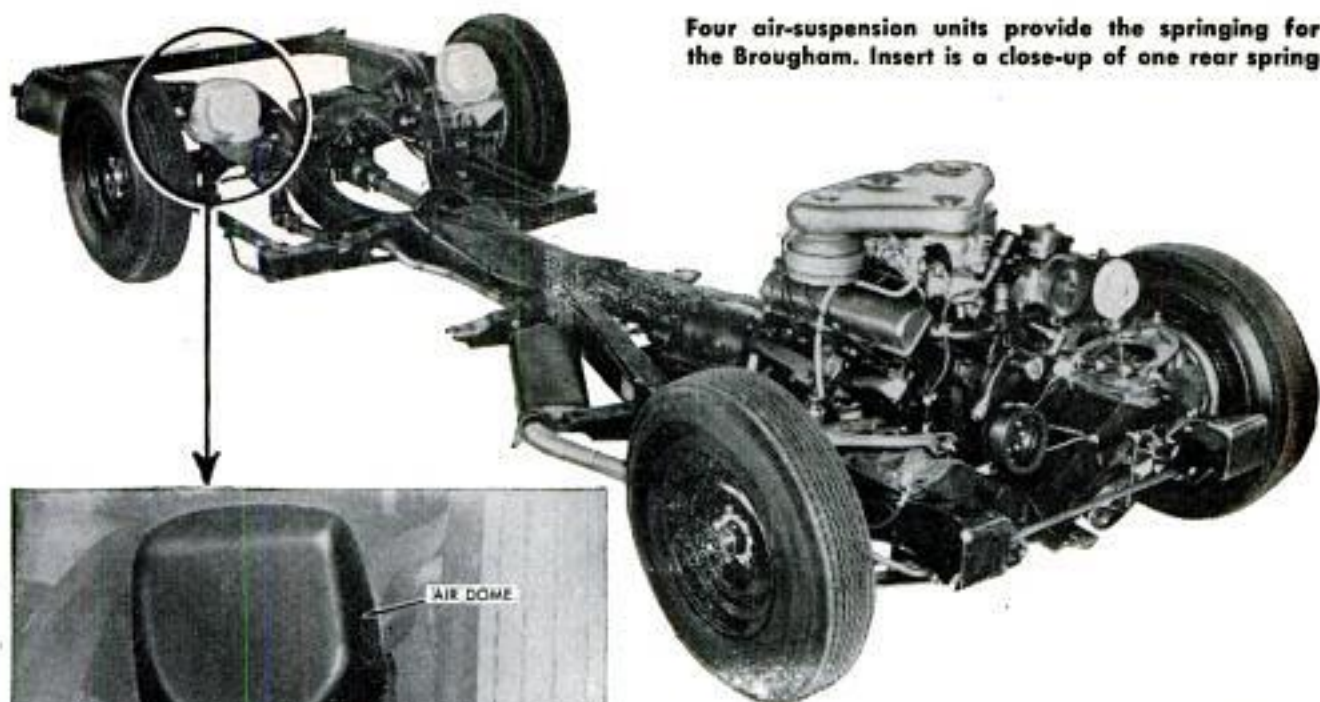
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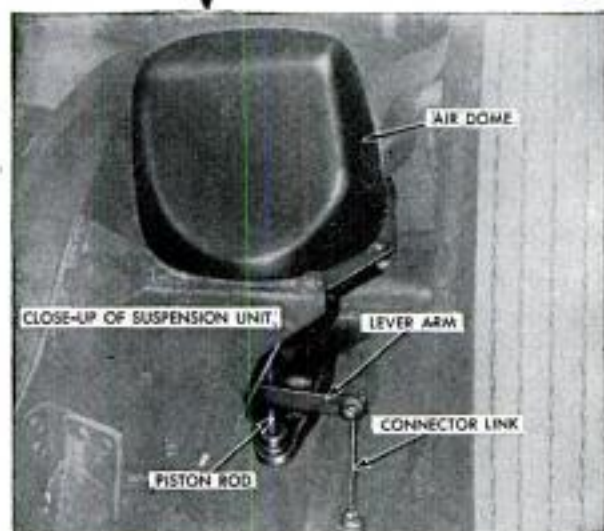
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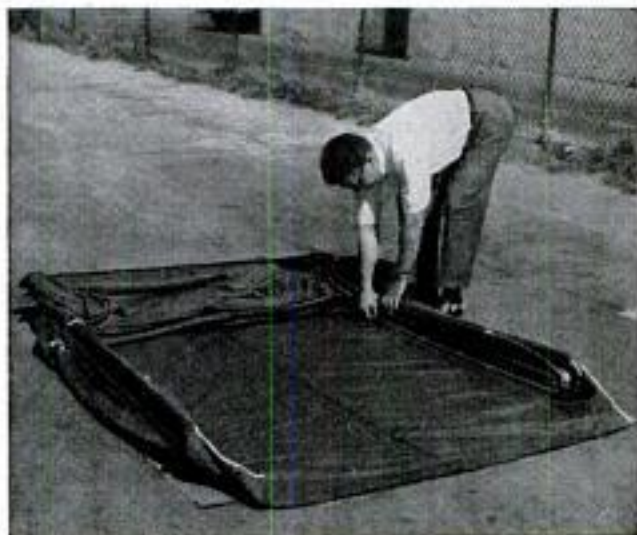
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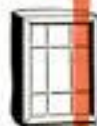


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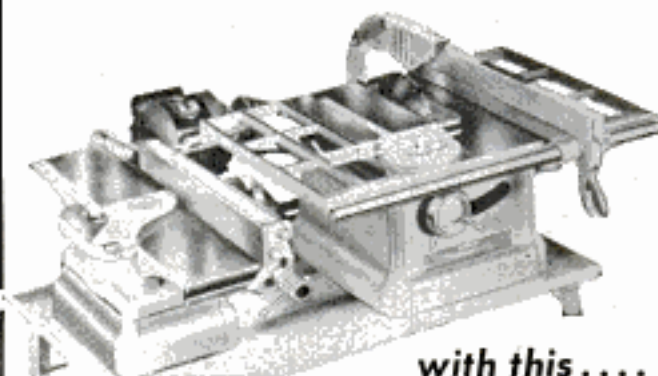
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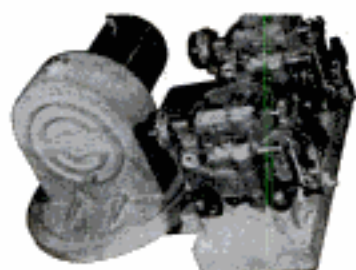
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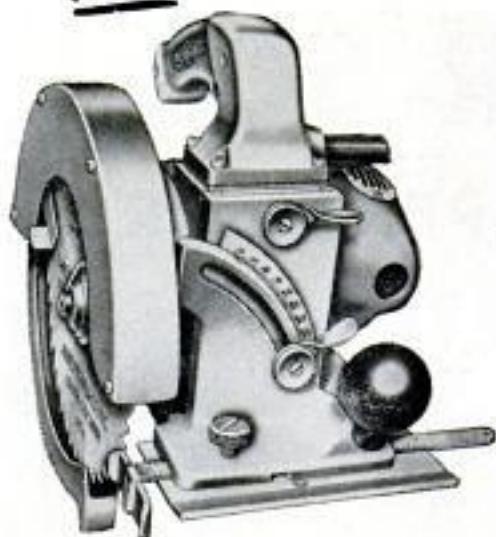
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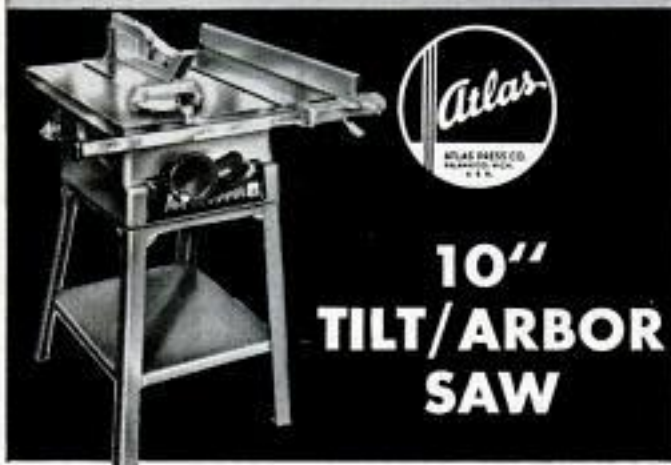
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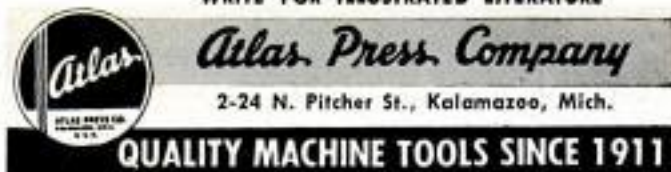
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### Fold-Up Spare Tire

Drivers can replace flat tires with a 10-pound spare that requires storage space less than the size of a football. Conventional, inflated tires weigh 2½ times as much and take up five times the space. When a tire blows, the motorist takes it from the rim with a special pulling apparatus, places the unfolded spare on the rim, and inflates it with a bottle of carbon dioxide. The new tire is good for 1000 miles.





# GUIDE



Watch  
WIDE WIDE WORLD  
NBC-TV



Presents  
a BIG  
Difference in  
Headlamps

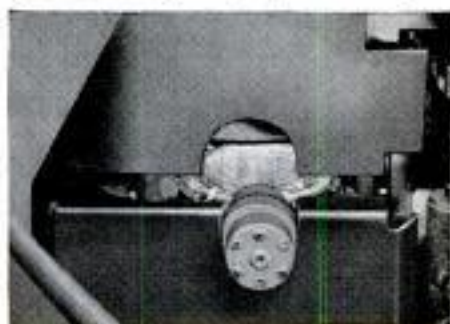
*Extra 3-Step Electronic Check Builds in Industry's Most Accurate Safety-Aiming!*



**1** Special machine accurately locates center of light beam for every Guide T-3 Headlamp that comes down the line. Once this "center" is found, lamp is locked in place . . .



**2** . . . electronic brain measures height of each "Guide Point" and automatically computes amount of grinding necessary. This information is then stored and passed along . . .




**3** . . . automatic grinder takes "Guide Points" down to proper height with gem-like precision. When grinding is complete, lamps can then be aimed with amazing precision.

**YOU GAIN** because perfect aim is a must these days when new industry-approved advances build greater power and a new, more efficient pattern into most headlamps. However, to get the benefits of this increased power (10% more light on the high beam) and improved pattern (80 feet more "seeing distance" on the right for "low-beam" driving) headlamps *must be perfectly aimed*. This means lamps must be within a fraction of a degree for horizontal aim, and must be held to even closer tolerances in the vertical plane.

That is the whole point and purpose of the gem-ground "Guide Points" on the face of every Guide T-3 Headlamp.

Perfect aim in minutes, in daylight! And, only Guide can guarantee it! They're standard equipment on all General Motors cars and trucks. See your nearby authorized Guide dealer now.

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

Buy in pairs where you see





You may have to wait for this, but...

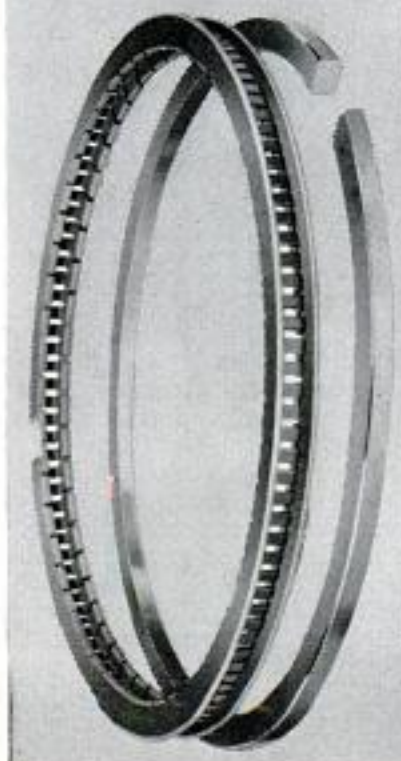


Designed by Raymond L. Jordan

## right now you can enjoy that “New Car Feel”

While you're waiting for your “dream car” there's no need to put up with sluggish performance in the car you're now driving. Your Doctor of Motors—your skilled mechanic—knows how to restore the responsive power of your car's engine and to bring back that satisfying “New Car Feel.”

Your Doctor of Motors also knows that there is no better way to restore full-power performance with positive oil control than to install Perfect Circle 2-in-1 Chrome piston rings. Perfect Circles are plated with thick, solid chrome that resists wear, more than doubles the life of cylinders, pistons and rings. See your Doctor of Motors for an engine check-up today! Perfect Circle Corporation, Hagerstown, Ind., The Perfect Circle Co., Don Mills, Ontario.



Install

# PERFECT CIRCLE

2-in-1

Chrome Piston Rings



You'll be surprised how quickly and economically your Doctor of Motors can bring back the “New Car Feel” to your car!

**WITH TREES** like anything else, there can be too much of a good thing. Plant an infant, and in a few years your home grounds are threatened by a lusty monster. A pruning knife just seems to stimulate its growth all the more.

That's why dwarf trees have been arousing so much interest in the home landscaper—as well as the orchardist who wants fruit in a hurry from trees easy to spray and pick.

But not till you see the dramatic research results at Arnold Arboretum do you realize how near we're getting to an era of trees measured-to-order.

Here, near Boston, at "America's Greatest Garden," its expert, Dr. Karl Sax, can deftly peel off a half-inch-high ring of apple bark, then "graft" it back on—but up-

# POPULAR FEBRUARY 1957 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 107 NO. 2

side down this time. A rubber band clamps it snug. The wound heals, but the tampered tree now turns its energy to making fruit instead of wood.

Or take a shade tree, say a maple. Invert a two-inch band of bark when the tree has grown two thirds of the way up to an overhead telephone wire. The full story

## THE TRICKS HE PLAYS ON TREES!

By  
**William  
Gilman**

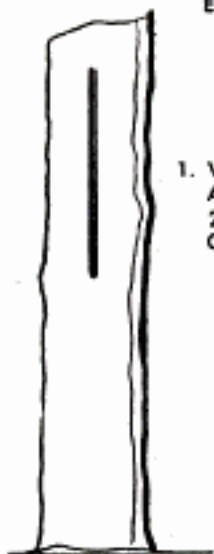


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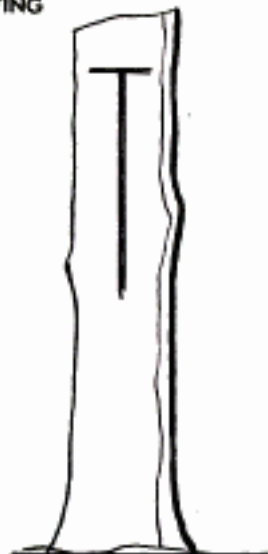
EIGHT STEPS FOR GRAFTING



A sharp knife is used to make a vertical cut in Nanking cherry sapling to which will be grafted bud of an elephant-heart plum



1. VERTICAL CUT ABOUT 2" LONG 2" TO 4" ABOVE GROUND LEVEL



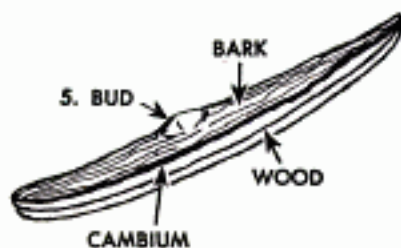
2. HORIZONTAL CUT TO FORM TEE ABOUT 1/2" WIDE



3. T-CUT HAS BEEN GENTLY PRIED OPEN WITH KNIFE



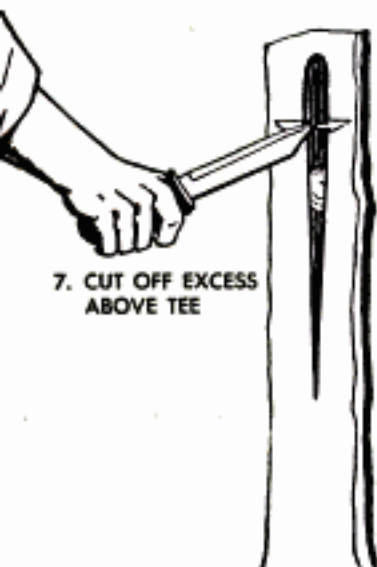
4. SLICE PLUMP BUD FROM "BUD STICK" TAKING SLIVER 1 1/2" OR 2" LONG WITH BUD NEAR CENTER



5. BUD  
6. WITH BUD POINTING UP SLIVER IS INSERTED IN T-SHAPED INCISION



The graft was a success. Here the plum bud is opening on the cherry stock. The upper part of cherry sapling has been cut off



7. CUT OFF EXCESS ABOVE TEE



8. TIE UP GRAFT WITH FLAT RUBBER BAND BUT DON'T COVER BUD





Eleanor Gilman photos

Branches of dwarfed McIntosh apple tree are looped for added dwarf effect. First loop is just atop trunk

isn't in yet, but research indicates the tree can be braked before it engulfs the wire.

Almost any young tree can be dwarfed by this "bark inversion" method, says Doctor Sax, the arboretum's noted botanist-horticulturist and former director. He's done it on trees up to six inches in diameter. For even faster results in slowing down the tree, he can reverse two bands of bark, one above the other.

Just what happens? Its leaves manufac-

ture the tree's food which sap then carries down to the roots for growth of the tree. Inverting the bark slows that sap flow, puts the roots on a restricted diet.

Eventually after several years the sap will regain its normal pace. That's the time for another bark inversion.

Admittedly, this method is for the experienced green thumb. But there are many dwarfing tricks that Sax plays on trees, several of which are not only eye openers

With plastic wrap, Sax shows how you can pot a tree while it is in bloom. His tub is sawed-off wooden keg

Another looping experiment has dwarfed pear top that was grafted to ordinary hawthorn rootstock



Copyrighted material



This rare cherry shrub—not a tree—was created by Dr. Karl Sax by crossing young Asiatic cherry trees

but within the grasp of ordinary hands.

Most curious, perhaps, is looping. Just that single loop called the overhand knot. It's tied in early summer when the tiny tree's little trunk is a limber whip. In a couple years, the enlarged trunk shows a pretzel-like bulge and you have a healthy dwarf.

Sax started this as a quick method for saving space in his testing orchard where experimental varieties have to spend several years. Five years later, his knotted trees are only half the size of normal ones growing nearby.

Using radioactive tracer methods, he's found this dwarfing is again caused by

slowing those nutrient juices which descend from leaves by gravity. In that loop circuit, the sap doesn't want to flow uphill. The effect is like standing the tree on its head.

Like other dwarfing methods, this does more than keep the fruit tree's head down to six feet or so. With more nutrient remaining above in the buds, their increased vigor means fruit earlier and larger. So you have a dwarf apple fruiting in its third year—five years or more ahead of the same variety growing normally.

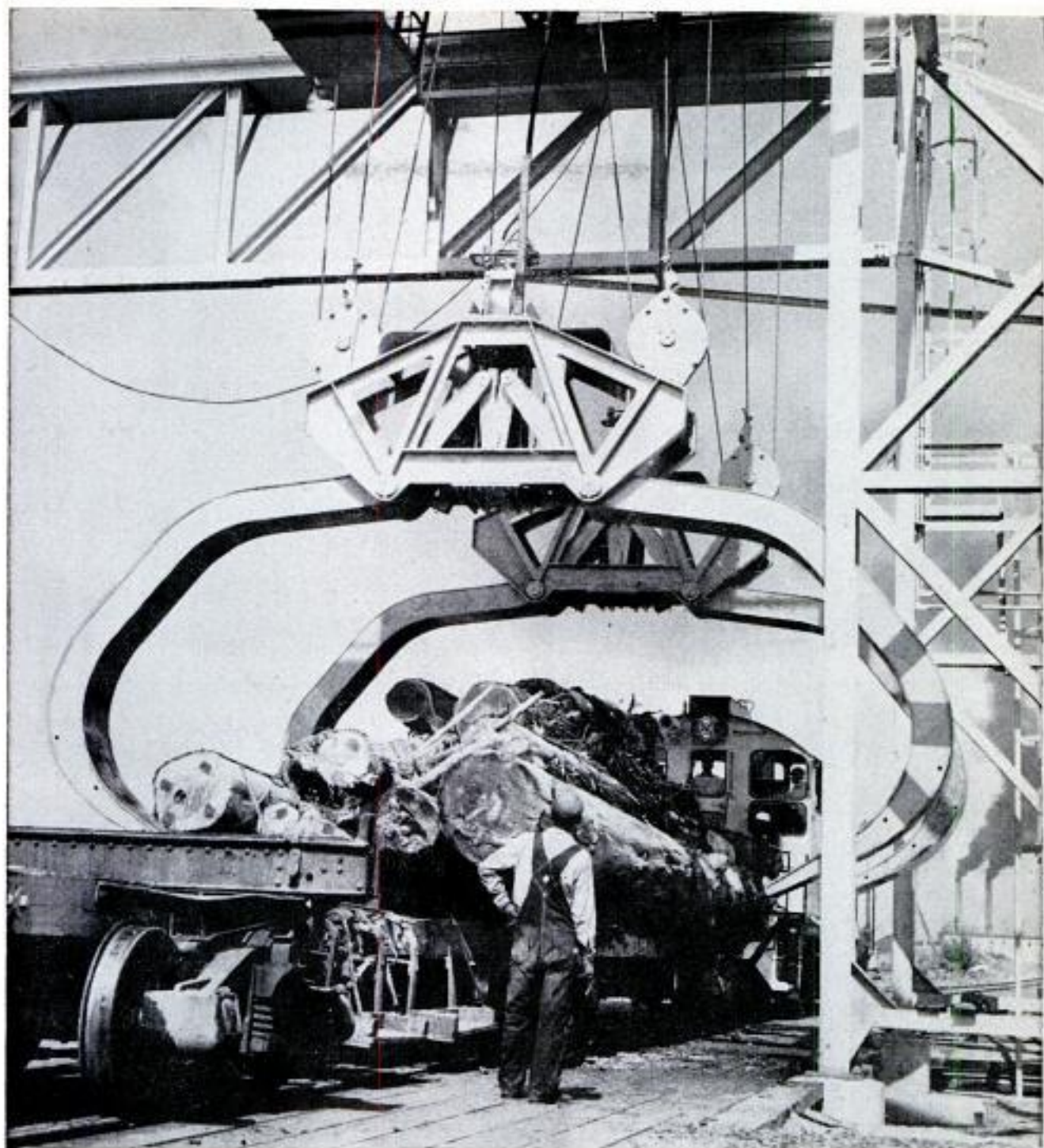
Sax points out that more conventional midgets—with special rootstocks to do the

(Continued to page 318)

Left, knot was tied in three-year-old apple tree to dwarf it when the tree was only one year old

Center below, Sax looped poplars to study growth effect. Below right, "bark inversion" dwarfs a tree





## GIANT TONGS UNLOAD A LUMBER TRAIN

"GRAPPLER" AND "STACKER," operated in the Pacific Northwest, daily transfer tons of huge logs from trucks to storage sites without breakage. At Longview, Wash., the 95-ton, one-man grappler crane unloads 250 railroad cars each day at a 2½-minute cycle. With a clear span of 100 feet, the crane has a 75-ton capacity. Electrical power moves the crane and drives the compressor to activate air grapples that open to a 16-foot width. Main power comes from a torque converter diesel engine. In the 27-ton stacker at Grays Harbor, Wash., one operator at a single control panel "lifts" a truckload of logs as high as a three-story

house. Curved prongs move forward and down to wrap around the load from the top; three prongs go underneath, and other prongs push logs from the carrying forks to the storage pile after the 33-foot boom has been tilted forward for stacking. With a 25-ton capacity the stacker handles 50 logs per bite in a five-minute cycle. The stacker is 33 feet long, 30 feet high and 12 feet wide. A 300-horsepower diesel engine provides a.c. and d.c. power to two generators. Each of the four wheels on the stacker has its d.c. motor. Fork lift, steering gear, prongs and tilt each has its individual a.c. motor.

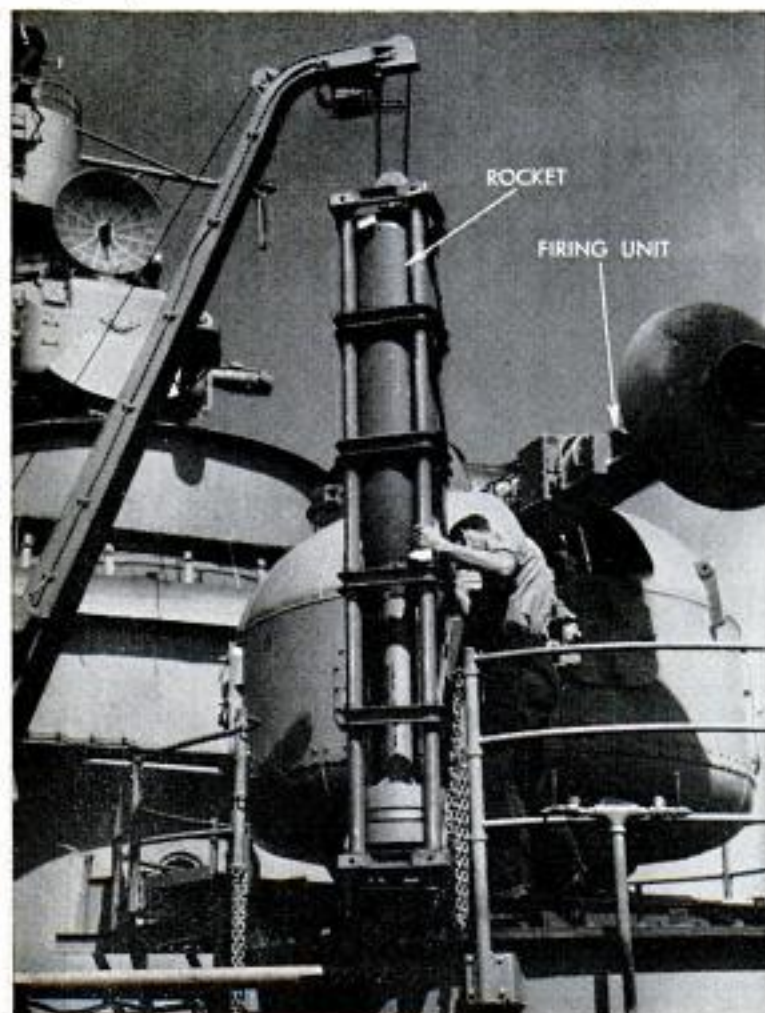


U.S. Navy photo

Propelled by rockets, an atomic depth charge blasts toward an enemy submarine miles from the launcher

## Flying Depth Charges "Kill" Enemy Subs Miles Away

Crewman readies a rocket depth charge for insertion in the firing unit, which can move in an almost complete circle



Dropped by aircraft or projected from a surface warship for delayed detonation, atomic depth charges and rocket-borne missiles now can sink enemy submarines miles away from the point of explosion. The atomic missiles can be set to explode at depths considerably greater than practiced with usual antisubmarine charges. Prior to atomic depth bombs, the rocket-borne missile (shown in photos) has held the spotlight in this phase of warfare. Launchers capable of training in an almost complete circle fire more effectively in wider areas and at greater distances from their targets than previously.

### "Electric" Rubber

Silicone rubber that conducts electricity without wires and resists temperatures up to 400 degrees F. can be used to make antifogging heater pads on aircraft cameras. Since this substance can be made into electrically conductive tubing or hose, it may be effective in draining static charges, preventing sparking in hospital operating rooms, or handling of explosive gases or dusts.



## Sweden's Volvo Gets New Style

Best-selling car in Sweden, the Volvo (at right and below) has a reputation for tough, rugged construction and fine workmanship. Now it adds a stylish body to its line. The new body, called the Amazon, has four doors and slab sides. Its four-cylinder 96-cubic-inch engine is famed for reliability. Coil springs are used all around. Older models had only two doors.



## Deep-Diving Record Goes to 600 Feet

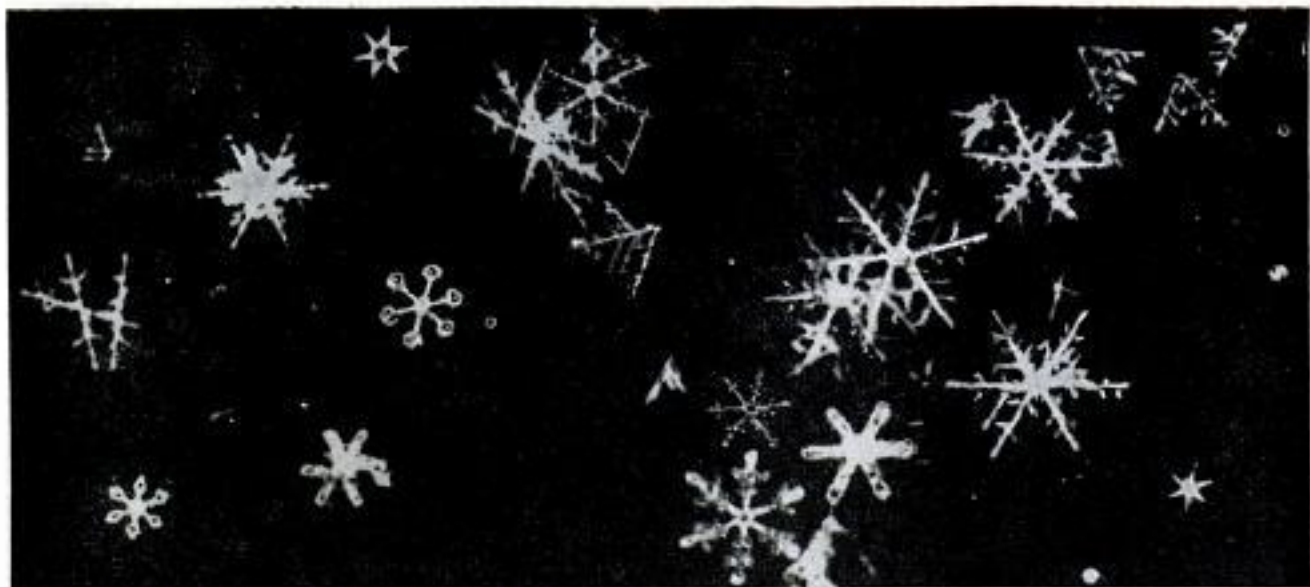
Diving to 600 feet in Norwegian waters, a British sailor has broken the previous record of 535 feet set in 1948 by another British sailor. George Wookey, wearing a helmeted diving suit and supplied with an oxygen-helium mixture for breathing, made his record plunge from H.M.S. *Reclaim*, an experimental undersea-research ship. The British Navy has been studying problems of diving to great depths as a safeguard for men trapped in sunken subs.

## "Through the Wall" Fireplace Heats Both Rooms

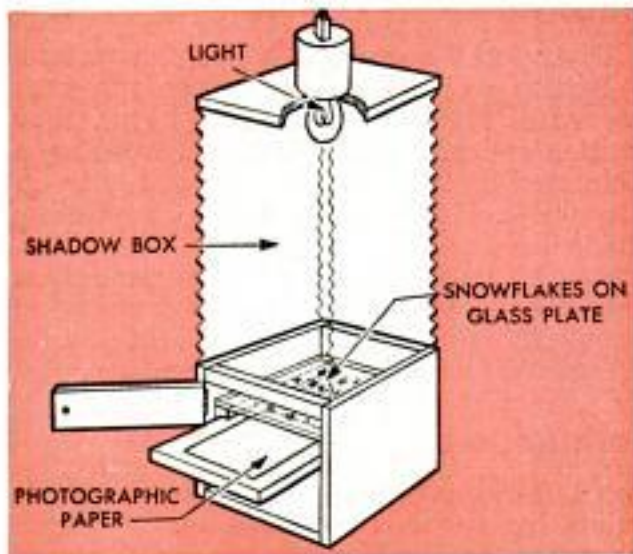
With a new prefabricated fireplace unit you can view the fire from two different rooms. In the past, one disadvantage of a "through the wall" fireplace was the lack of a back wall to reflect the heat into the

room. The prefabricated fireplace has air inlets from each room. The air is heated beneath the firebox, passes up through channels in the sides of the fireplace and is discharged into both rooms.

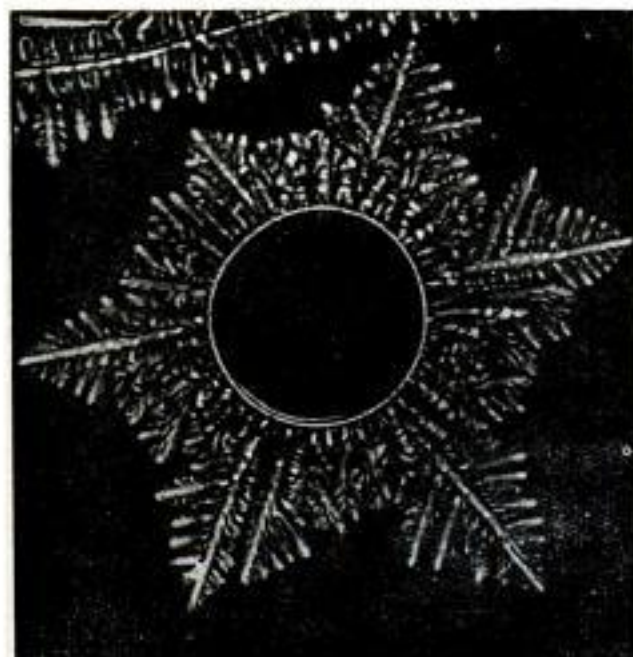




Pictures of snowflakes above were made with Japanese weatherman's shadow box diagrammed below



Chilled glass plate is taken outdoors during snow-storm and then replaced atop film holder in the box. Below, close-up photograph of ice crystal in water



## Shadow Box Snaps Image of Snowflakes

PHOTOGRAPHING SNOWFLAKES in actual size usually is reserved for people with thousand-dollar cameras and infinite patience. Then, the chance of snapping a picture before the lacy filaments dissolve into nothing is slim.

Plagued by these facts, plus a slender budget for his snow-crystal research at Hokkaido University in Japan, meteorologist Keiji Higuchi invented and built his own snow camera. His shadow box is simple to make and easy to operate. All you need is a two-foot-long, light-tight carton measuring three by four inches inside, a single-cell flashlight, a 2¼ by 3¼ cut-film holder with slide and several sheets of clear glass, three by four inches. A small base constructed of plywood scrap contains the film holder on simple slide strips. The surface of each glass sheet is treated with silicone oil to repel water and the entire apparatus is cooled to outside temperature. A glass plate exposed briefly to falling snow is put into the dark box directly on top of the film holder. By removing the slide from the film holder and illuminating the glass plate from above with the flashlight bulb for a few seconds, shadows of the crystals are produced on the photographic paper. The image is created in nearly true scale and outlines the snow crystals in every detail.

Doctor Higuchi's work with his shadow camera was conducted in an igloo half way up Mount Tokachi on Hokkaido Island. He found that different types and sizes of snowflakes fall during one storm. A 1½-inch flake contained as many as 4000 crystals. He uses the box for "shadow-graphing" many transparent objects including soap film and ice crystals in water.



Advertising a bowling-pin spotter, a studio built a king-size alley, used girl "pins" and huge bowling ball

*Live pins topple before a monstrous bowling ball . . . paper cutouts play tennis . . . a cake of soap does a strip tease . . . it's all*

## Backstage Wizardry of the TV Commercials

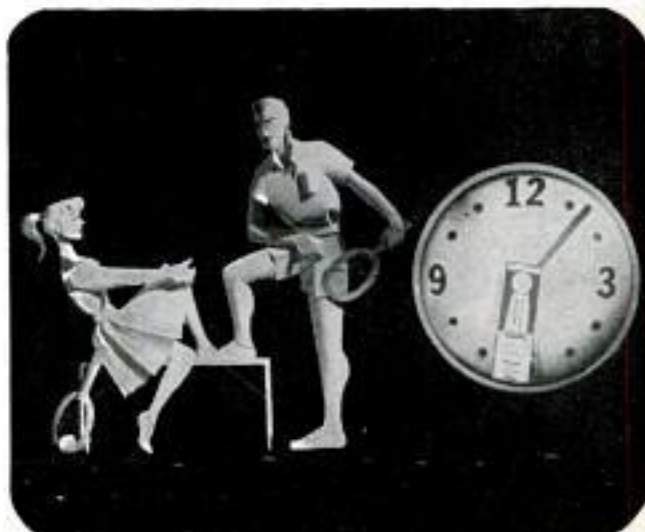
By Richard F. Dempewolff

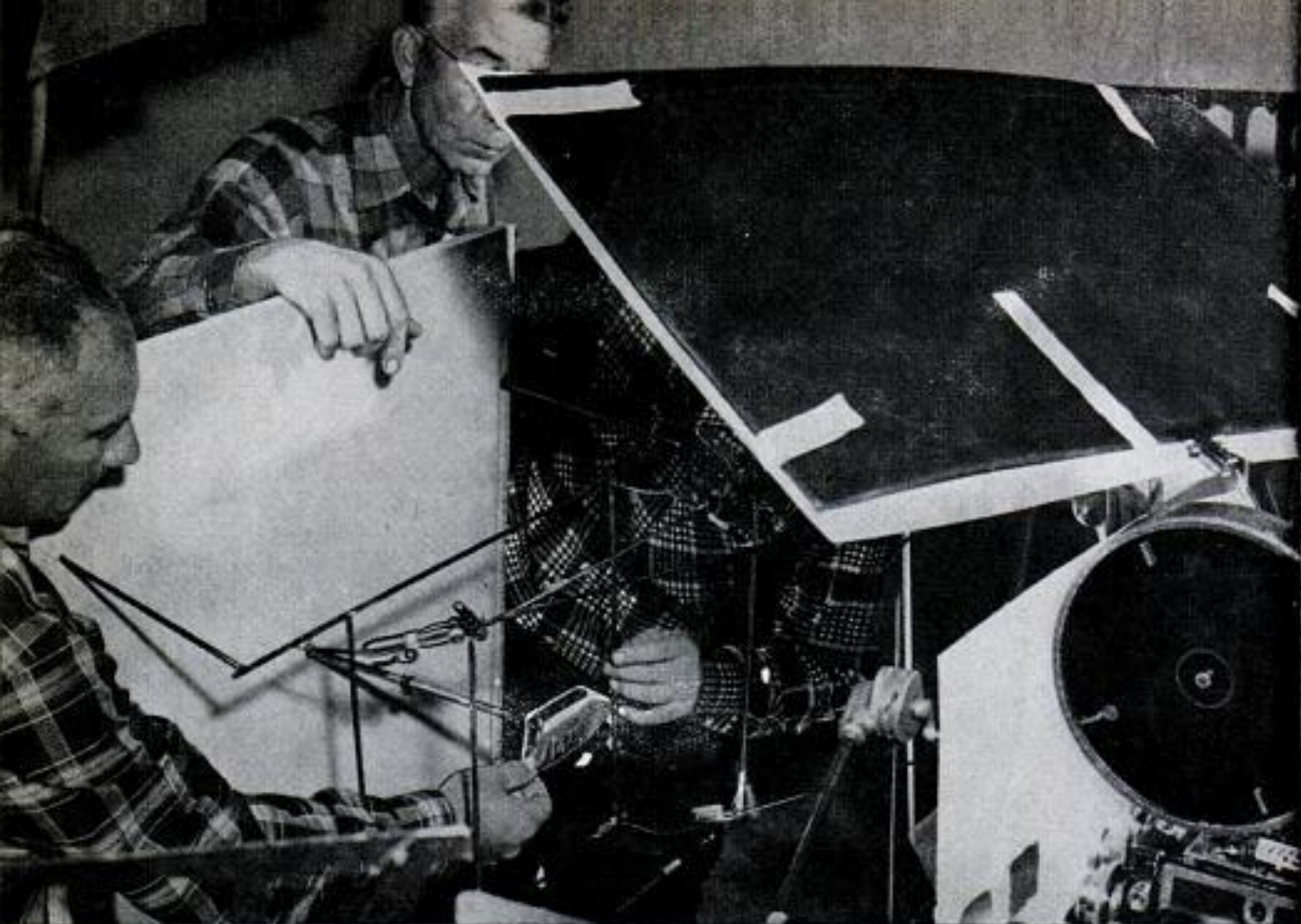
**R**INGING TELEPHONES, glaring klieg lights, harried people stumbling across snarls of rubber cable, make a madhouse of a small well-equipped movie studio on New York's west 56th Street. Two live children dangle from the ceiling by wires, clawing idly at the air. Somebody shouts at a pair of dejected donkeys that stand sadly in the middle of the set.

"Take 16," yells a director. Cameras swing toward the melee. People and animals untangle themselves for the sixteenth go at a sequence in which humans are supposed to fly, and animals turn into machines. Eventually, the twentieth or the thirtieth "take" is successful and another TV commercial is completed.

Marty Ransahoff, head man at Filmways, a company that produces 500 TV commercials yearly, winces when he recalls that particular filming. "It looked pretty

Stop motion promotes a deodorant. Cutout figures on the table move past the clock in a 60-second spot





In stop motion this Universal Pictures' rig enables the camera to show a bar of soap unwrapping itself

cute on the story board prepared by the advertising agency," he says. "The scene showed a boy and girl riding across a desert on burros. They meet a chuck wagon and eat some famous breakfast food. Their burros turn into bicycles and they fly off through the sky because of the extra energy they absorbed. Sounded easy.

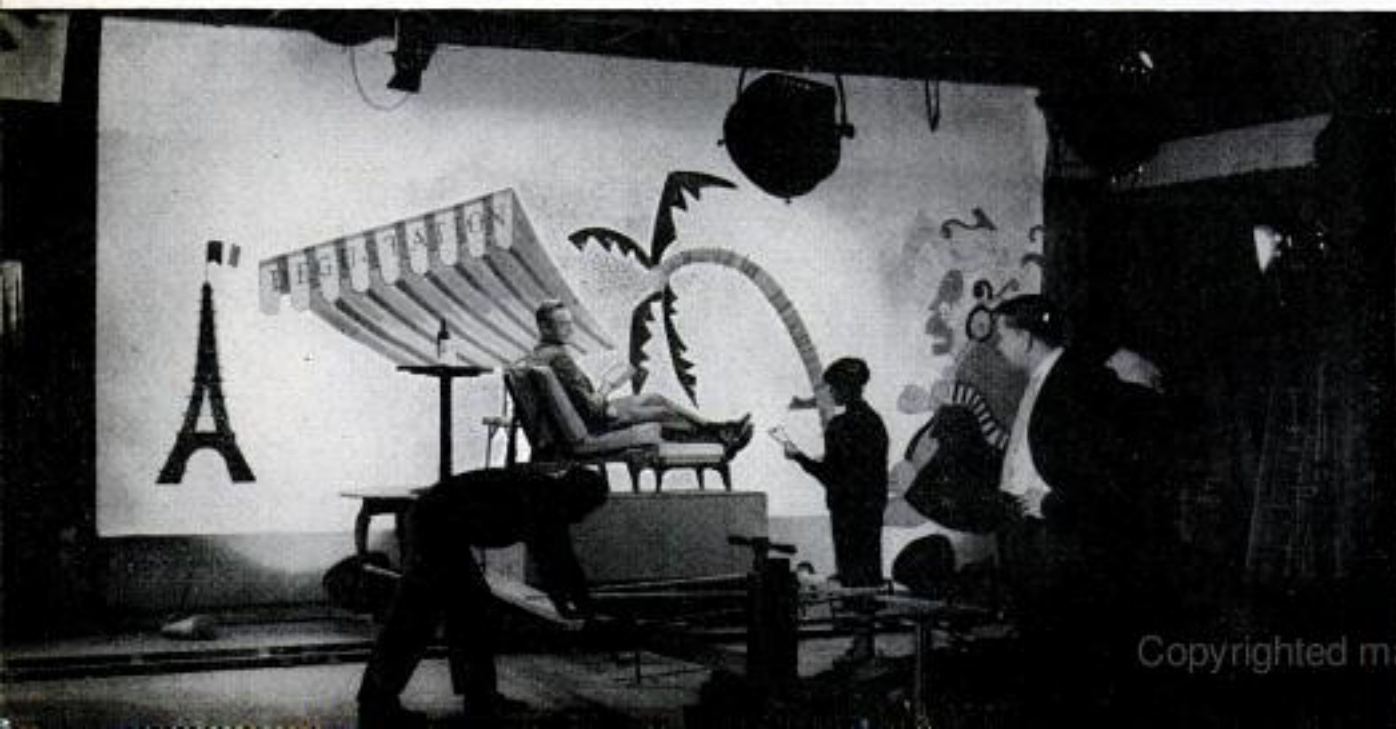
#### Burros Have Different Ideas

"It wasn't. The burros were completely unmanageable. They wouldn't let the kids

stay aboard, so we had to build a fence along the stage and have a man ride an electric dolly behind it, leading the animals with hidden reins. For days we rigged invisible traveling wires to lift and carry the kids on their bikes. Nothing worked. We finally just hoisted them off the floor and used a sky-and-cloud rear projection to provide a moving background that made them appear to soar through the air."

If you happened to see that commercial, you may remember that it lasted 60 sec-

Sitting in a lounge chair, this "traveler" rides a cart on rails through "four countries" within 30 seconds





Plugging playshoes, this spot had models on backs under a sheet with legs poked through clouds of dry ice

onds. But it gave Marty and his crew a week of headaches, cost thousands of feet of film, and required one solid day of shooting before it looked right.

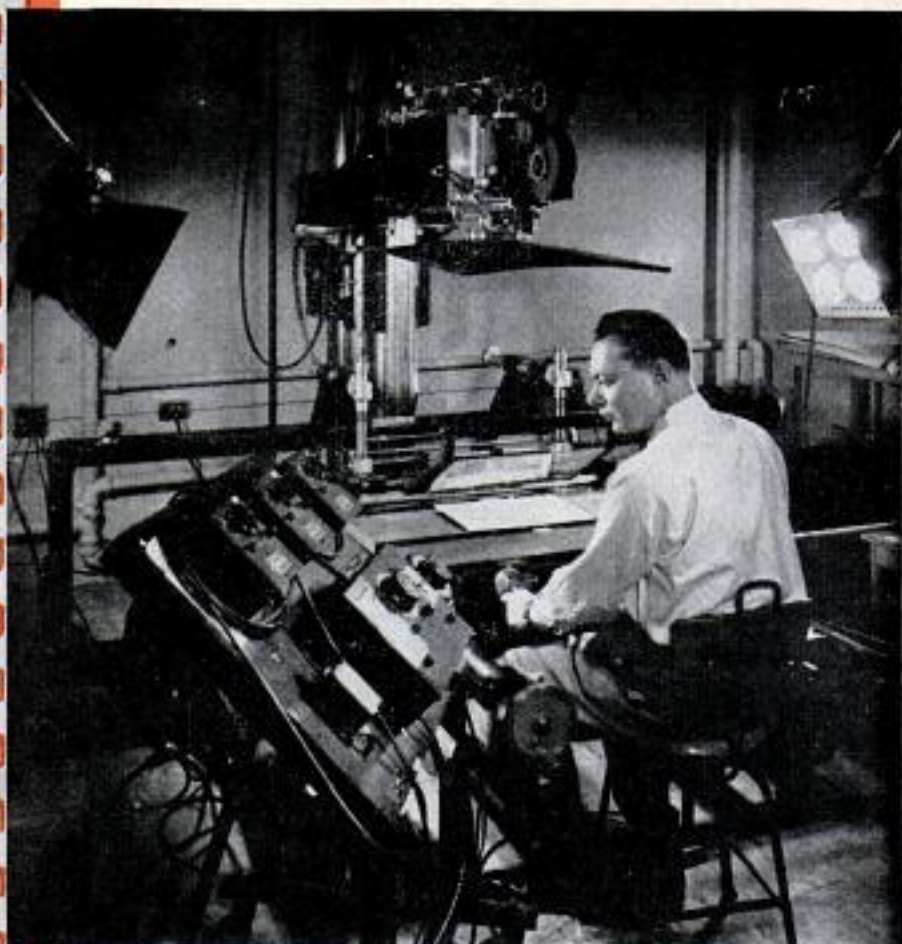
#### Commercials Are Big Business

Ransahoff's outfit is only one of a mushrooming crop of studios specializing in production of the snappy commercials that pepper your favorite TV programs, a lucrative new industry that divides an annual \$30,000,000 plum.

Sarra, a New York producer who turns out 300 to 500 spots each year, once had his cameramen working underwater in a tank for nearly a week to shoot a one-minute commercial of a water purifier in action. Over at United Pictures, scenery experts built a complete duplicate of the American Stock Exchange as it was in the 1800s when it operated from street curbs. Another time, the job of shooting a 10-second sequence of eight spanking-new cars riding in a circle was accomplished by renting a

After each exposure in this stop-motion shot, technicians make microscopic changes in puppet poses





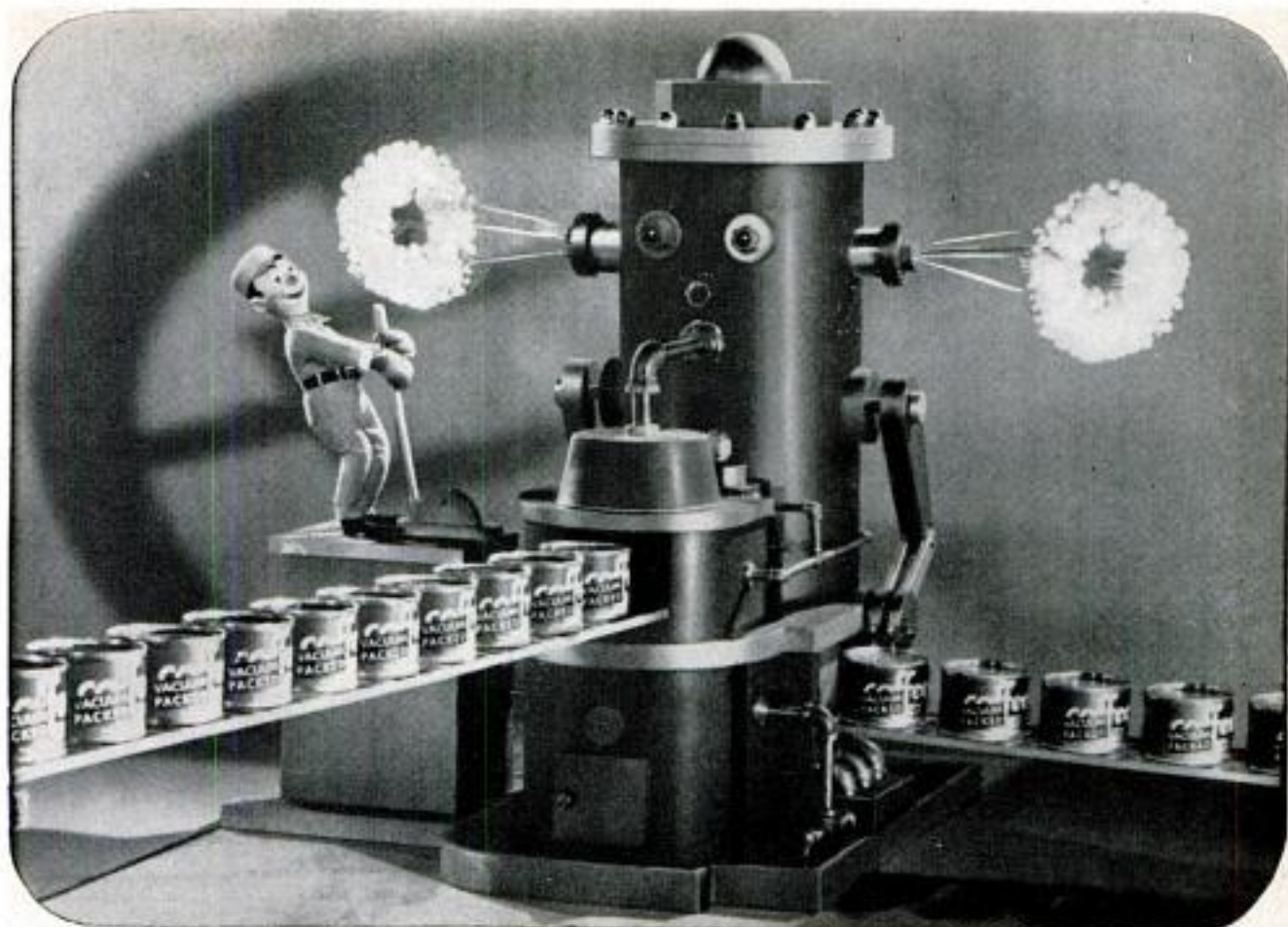
Electronic cameras photograph animated-cartoon commercials by shooting 1440 individual drawings to make up one 60-second spot

10-story derrick and building a special camera platform. This was hoisted 100 feet in the air so cameramen could shoot the entire parade from above.

To accommodate the sponsor of a 60-second extravaganza plugging a cosmetic, Steve Elliot, top kick at Elliot, Unger and Elliot in New York, scoured the town for the miles of pipe and gallons of refrigerant it took to construct a genuine ice-skating pond surrounded by snow-covered woodlands in the studio.

The 23-second problem of displaying a new line of ladies' playshoes (which look better upside-down than right-side-up in pictures) was lavishly solved at Bill Miesegaes' Transfilm studios. A dozen barelegged models were hired to lie on their backs and kick playshoe-clad feet through a 25 by 30-foot cloud of swirling vapor. Dry ice, dipped in pans of hot water spotted around the rim of a huge bin, created clouds that were wafted gently around the kicking legs by fans. A huge plastic sheet was hung over the area about a foot off the floor. Holes, big enough to accommodate thighs, were cut in it for each girl. Lying on their backs under the sheet, the girls stuck their legs through the elastic-rimmed holes, which assured a tight fit so the carbon dioxide couldn't smother them.

Production of a TV commercial begins when the advertising agency sends the studio a "story board," a series of boxed sketches like a comic-book layout—indicating sequences that are to be shot. Along with it goes a script, detailing scenery, props and dialogue. A one-minute spot may run from \$1500 to more than \$15,000. A studio may have to shoot 5000 feet of film



**On TV this stop-motion spot will show cans moving into machine, the man pumping and smoke being emitted**

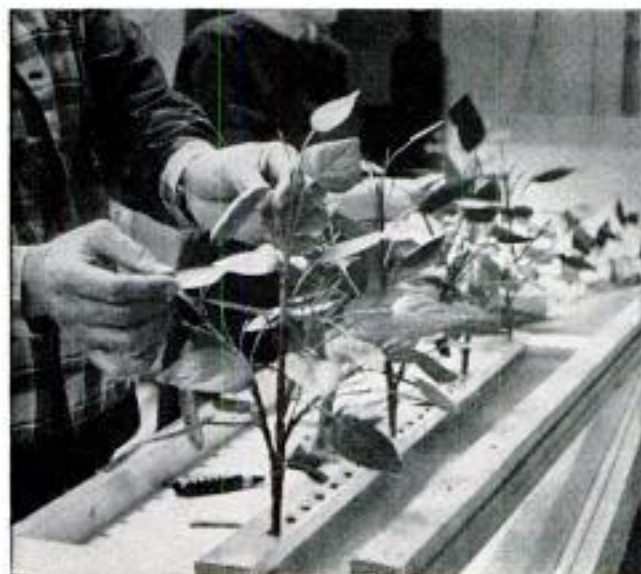
before a complex "30" (half-minute spot) is ready to be "aired." "I've seen story boards for 60-second spots that Cecil B. deMille couldn't produce in a two-hour movie," claims Morris Behrens, Sarra's right-hand man. One recent commercial filled a special studio with 40 actors, six famous beauty queens, Guy Lombardo and his orchestra and Jinx Falkenberg. It lasted four minutes. So did a complete series of

spot commercials that sent scouts from Science Pictures out to sign up six elephants, a chimpanzee, two tugboats, a pair of diesel locomotives and a five-story pile driver.

"It was for a tire account," explains John Thayer, Science Pictures' vice-president. "The idea was to try to destroy the client's product on TV. The chimp was dressed up, handed an ice pick, and was supposed to

Out of season, these plants are made of paper. They will have real lima beans tied to their stalks

Real spinach plants and soil are installed in the studio-built garden. Most foods on TV are authentic





While a model primps with cosmetics at a two-way mirror, camera crews photograph from mirror's other side

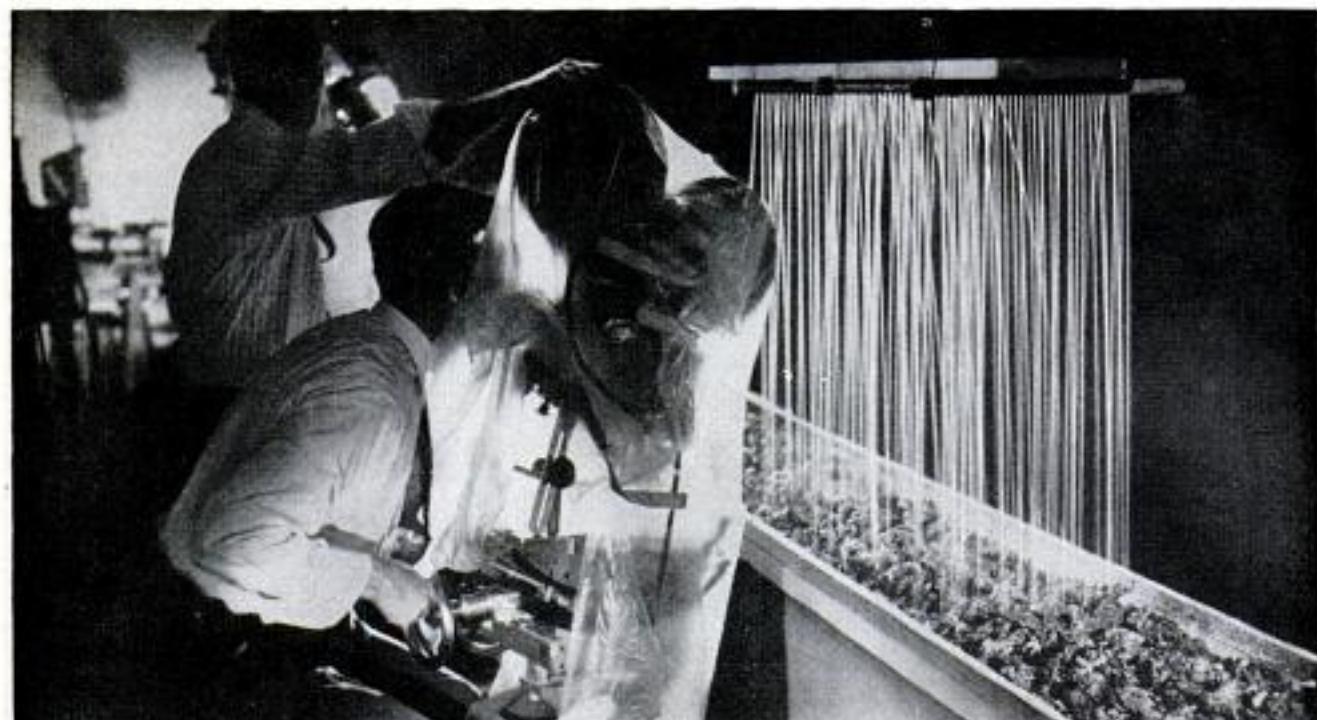


Above, refrigerator shelves supported by invisible wires "float" in black. Below, plastic covers camera photographing the washing of fresh spinach

jab away at the tire to prove it was blow-outproof. But the monkey wasn't having any. He screamed, leaped all over the set, jabbed at everything but the tire most of a day, before settling down to business.

"After that, we staged a tug o' war with six circus elephants—three on a side, with the tire in the middle. When the elephants couldn't yank it apart, we tied the tire between two tugboats on the East River. The tire didn't break, but we spent days hunting for heavy Manila mooring line that could stand the strain. Then, we set up the cameras in a freight yard and had diesel engines ram the tire simultaneously from opposite directions. They crimped the steel

(Continued to page 310)





# Blizzards From Sprinklers Cover Slopes With Snow

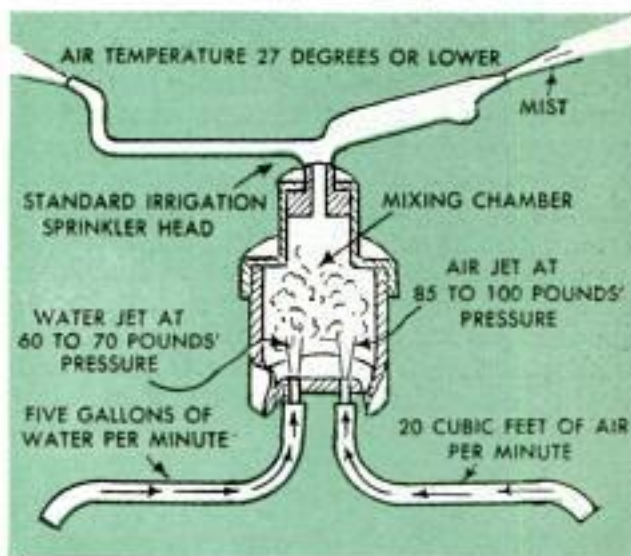
SKI-RESORT OWNERS across the country, watching their profits melt away in cloudless skies, are resorting to a new technique—making their own snow. To create blizzards they stretch two hose lines up the ski slope, one carrying water and the other compressed air. Under high pressure the water and air mix inside a sprinkler and the mixture is ejected in a fine mist. All nature must do is provide a temperature a few degrees below freezing and presto—snow! The flakes can be coarse or fine depending upon proportion of water to air.

Some resorts have permanent installations buried below the frost line. At others, men drag the sprinklers from place to place to distribute the snow evenly.

Out on Moonridge Mountain, near Big Bear, Calif., there's a six-man crew working to cover a slope the size of four football fields. The snow makers brew their blizzards at night, building a foot-deep base on the first cold night, then adding six or eight inches each ensuing night to keep the slope in good shape following the activities of skiers during the day.

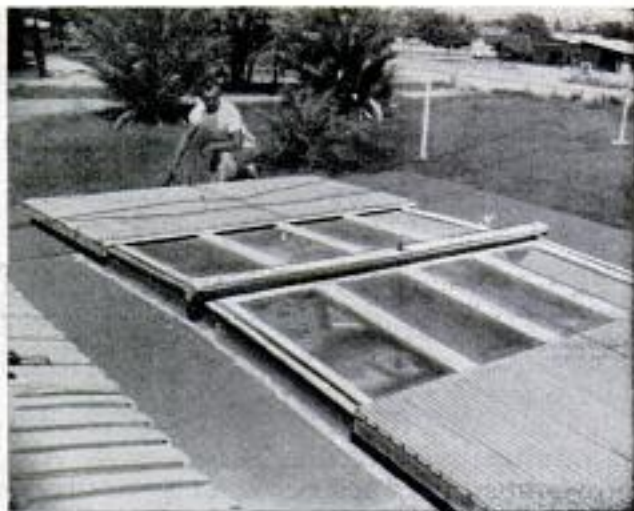
One group of men, calling itself the "pneumonia detail," occasionally throws vegetable dye into the water system, just to amaze the customers. Sure enough, out comes colored snow.

Top right, snow maker points to standard sprinkler used to create the blizzards. Drawing shows how water and compressed air are combined to make snow.





Moving on roller-skate wheels and channel-iron track, this rolling roof is closed from the room below



Here sliding roof sections covered with corrugated metal are rolled back to let in the Arizona sunshine

## Roof Rolls Back on Roller-Skate Wheels

SLICING OUT an eight by nine-foot opening in the ceiling of his home's fun room, John Vykruta of Tempe, Ariz., has installed a rolling roof. He and his family now have year-round access to sunshine or starlight in privacy and comfort. Vykruta, a carpenter, first made rustproof screens with white pine borders to go inside the opening. Then, framing the "skylight," he screwed channel-iron track to it. On wood skeletons fitted to the dimensions of the gap, Vykruta fastened corrugated-metal, waterproof roofing material. These sections were laid on the frame over the opening. Removing eight wheels from a pair of roller skates, he put these "ball bearings" on the track under the outer edges of the movable sec-

tions. To make the roof a rolling unit, a system was devised with 50 feet of control cable connected to pulleys at either end of the roof top. The cable led to eight feet of sprocket chain which dropped vertically on the side of the house to a miniature ship's wheel in the fun room. A person moving this wheel slightly can open or close the hatchlike roof. Additional waterproofing is provided by a metal-covered center piece that runs along the ridge of the roof to overlap top edges of the sections when they are closed. Board facing on the sides of these sections gives added strength and unity to the moving roof. This durable setup has survived 80-mile-per-hour winds.

Looking up from inside his home's fun room, John Vykruta inspects the screens on his "movable skylight"

Cable on the rolling roof connects to this chain and leads into the fun room to a ship's wheel



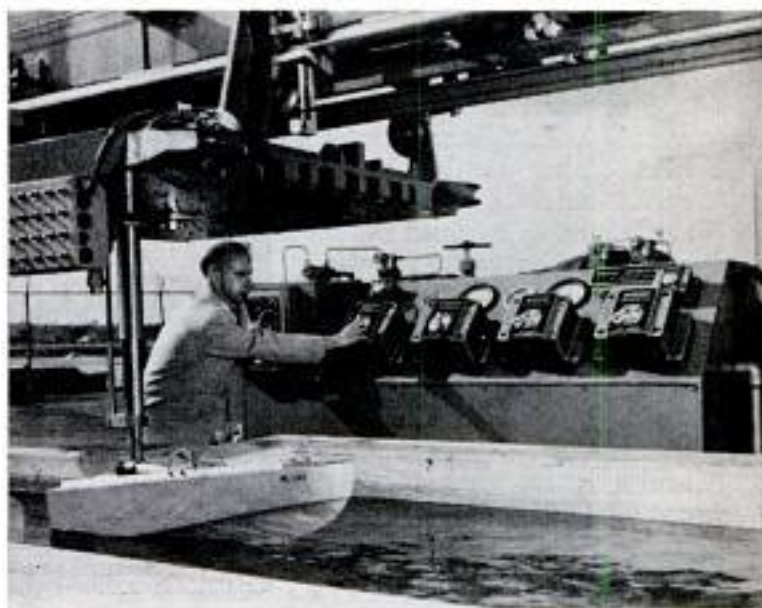


Seaplane hulls can be tested at speeds up to 68 miles per hour in Convair's new hydrodynamics laboratory

To save time and reduce development costs of advanced-type seaplanes, Convair is installing an \$800,000 hydrodynamics laboratory at its San Diego, Calif., plant. The laboratory will consist of two 300-foot towing tanks, joined in the center by a 100-foot-square turning basin. Each towing tank is 12 feet wide and six feet deep, and models of seaplane hulls can be run through them at speeds up to 68 miles per hour. Instruments on the models, as well as high-speed cameras located along the sides of the tank, will record the characteristics of the model being tested. A stainless-steel cable on a drum driven by hydraulic pumps pulls the model through the water, accelerating it to top speed in about 50 feet of run. The first of the 300-foot tanks is already completed.

## Hull-Testing Tank for Seaplanes

Battery of instruments records the characteristics of models



## De-Inking Process Reclaims Old Newsprint

Newsprint can be reclaimed for repeated use by a de-inking process that supersedes older, expensive, complicated methods. The economical, efficient new method yields pulp equal in color, brightness and strength to original pulp. Shredded paper is placed in water with a detergent and salt that loosen and separate the ink from the cellulose fibers. The mixture is heated and charged with an electric current to increase separation before the water is removed and the fibers are washed and bleached.

## 100 Barrels of Asphalt Yield 105 Barrels of Products

Combining asphalt and by-product hydrogen, oil-refinery researchers have developed a hydrogenation technique that produces 105 barrels of products from 100 barrels of asphalt. Previous conversion of asphalt into fuel products has resulted in loss to less valuable materials, such as coke and "drygas." From 100 barrels of asphalt the yield is as much as 20 barrels of gasoline and heating oil, 40 barrels of gas oil suitable as catalytic cracking feed stock, and 45 barrels of material of fuel-oil quality.



## Bicycle Built of Two

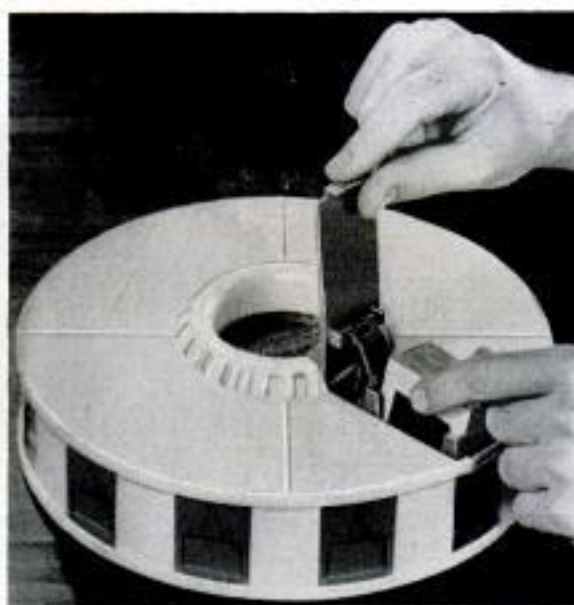
Only the wheels of a bicycle are evident in a bicycle act performed by two young Italian acrobats. Their own bodies form the framework of the vehicle. The rear member of the team pedals a unicycle while grasping the ankles of his partner, who steers with her hands. The youngsters planned a debut in Paris.

## Vaccine for Worst Cattle Disease

Rinderpest is considered the world's worst cattle disease, killing millions of head of cattle in Africa and Asia annually. So far the disease has not spread to this country, though American cattle are highly susceptible to it. Now a team of government scientists has developed a vaccine which is considered the most effective ever produced to protect cattle from the disease.

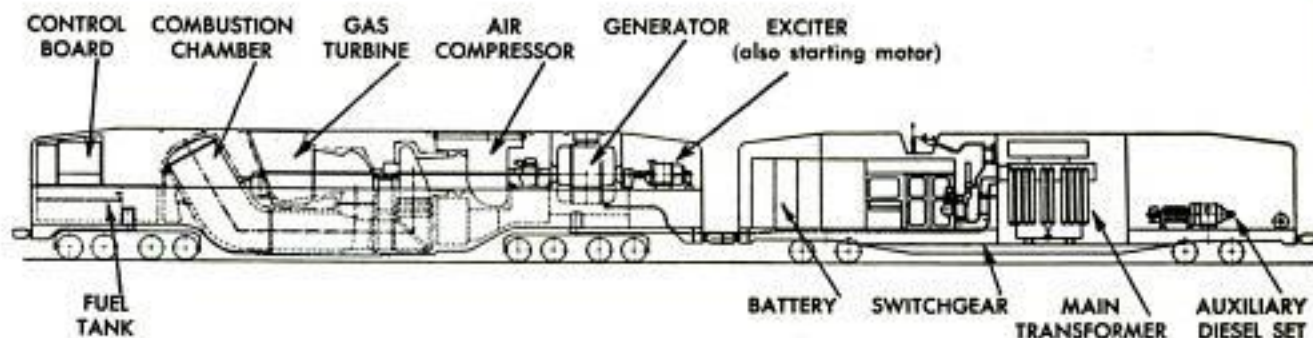
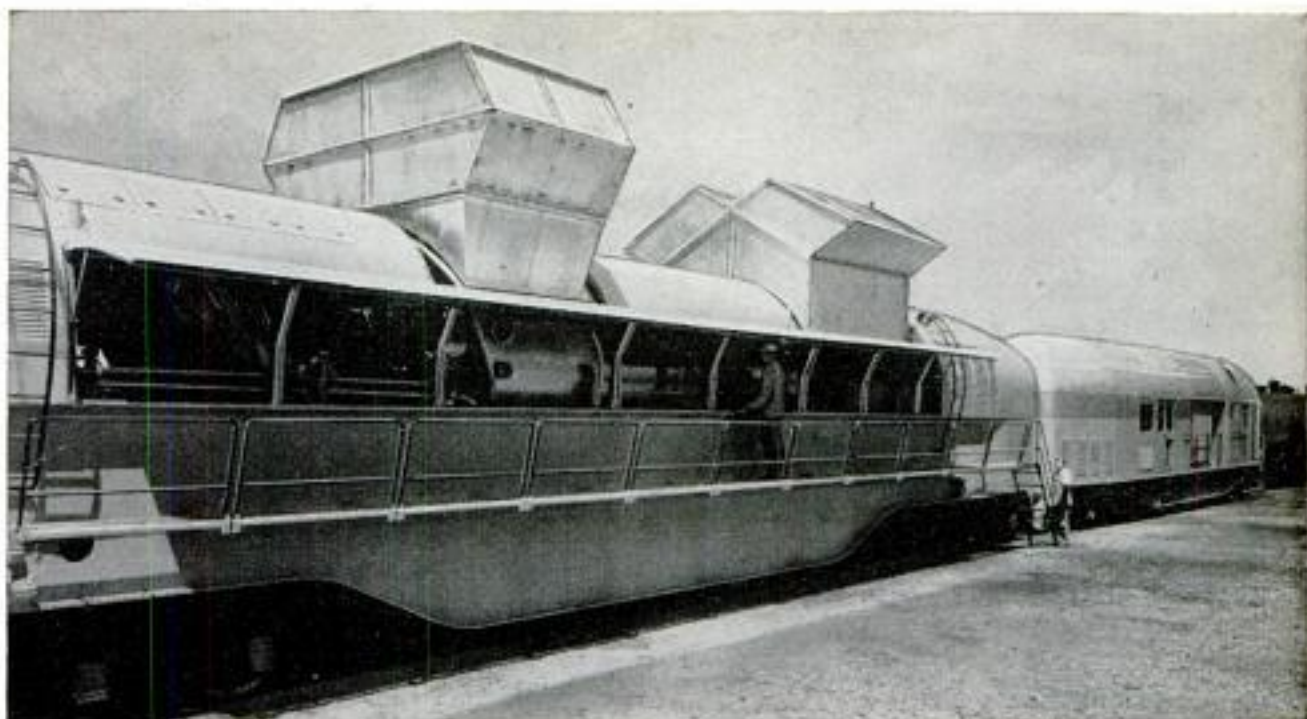
## "Lazy Susan" Stores 300 Slides

Storage for 300 slides made from 35-millimeter film takes only small space using a "Lazy Susan" type of cabinet made of high-impact plastic. Twelve compartments in the cabinet hold 25 slides each, making individual slides easy to locate. The top of the cabinet rotates over the compartments and a lifting bar raises the contents of each compartment for easy removal from the unit.



## Hydrojet Boat

At a speed of 20 miles per hour, a hydrojet boat built in New Zealand can turn in its own length. It is steered simply by changing the angle of its jet pipe. A 10-horsepower English Ford automobile engine works a pump that sucks up water and forces it out the jet at the back. The boat, which has traversed some of the most dangerous and remote rapids of New Zealand's fast-flowing, shallow rivers, can float in only four inches of water. It was recently developed by Charles Hamilton.



## Mobile Gas-Turbine Power Station

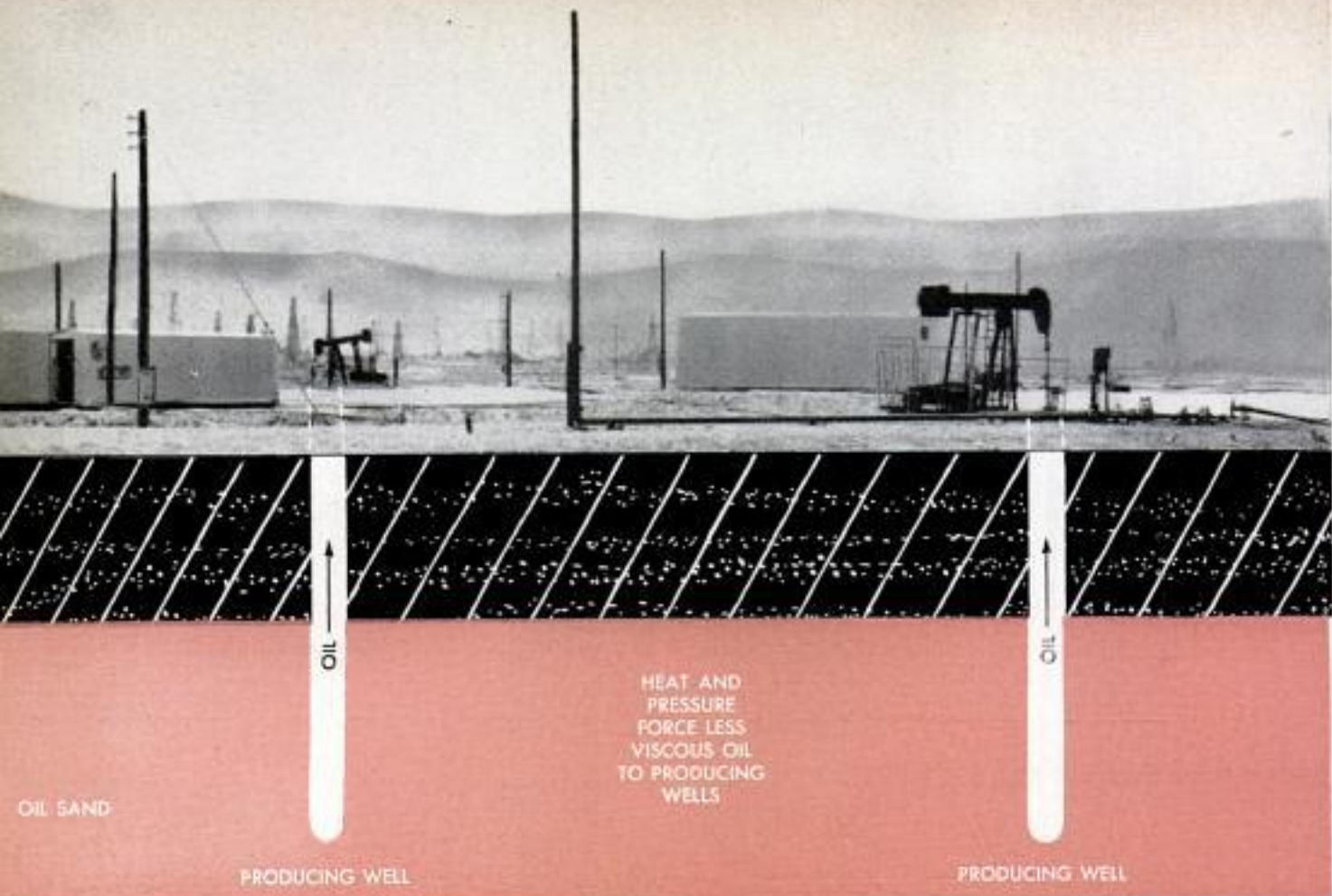
Enough electric power to supply a small town comes from a gas-turbine generating plant housed in two railroad cars. Made in Switzerland for Mexican use, the 6200-kilowatt emergency unit can be set up in a day. Housed in the 75-foot front van is the compact power plant, consisting of a compressor, combustion chamber, turbine and generator. The second 60-foot car holds the

transformer and switchgear, electric-control room, a battery and a small diesel starting engine. At an installation, side panels on the power plant are opened, inspection platforms mounted along the sides, the air-inlet and gas-outlet silencers fitted on the roof, a fuel line run to a tank car behind, and the transformer connected to the town's power system.

## Extractor Finds Mosquito Eggs

Finding a needle in a haystack is simple compared to the job undertaken by Prof. William R. Horsfall and his graduate students at the University of Illinois. They find mosquito eggs in soil samples. Such eggs may lie dormant on dry soil for a year and then hatch upon being submerged in floodwaters. The researchers have devised an extractor for finding the tiny eggs. Soil samples are placed in a fine-mesh drum. A washing process eliminates most of the material, and the residue is washed through three more screens. The final residue then is put in a salt-water solution and the eggs rise to the top.





Scientist, below, turns knob of igniter to set off underground fire at oil field, above, near Maricopa, Calif.

# Underground Fire Revives Oil Well

By William T. Rintoul

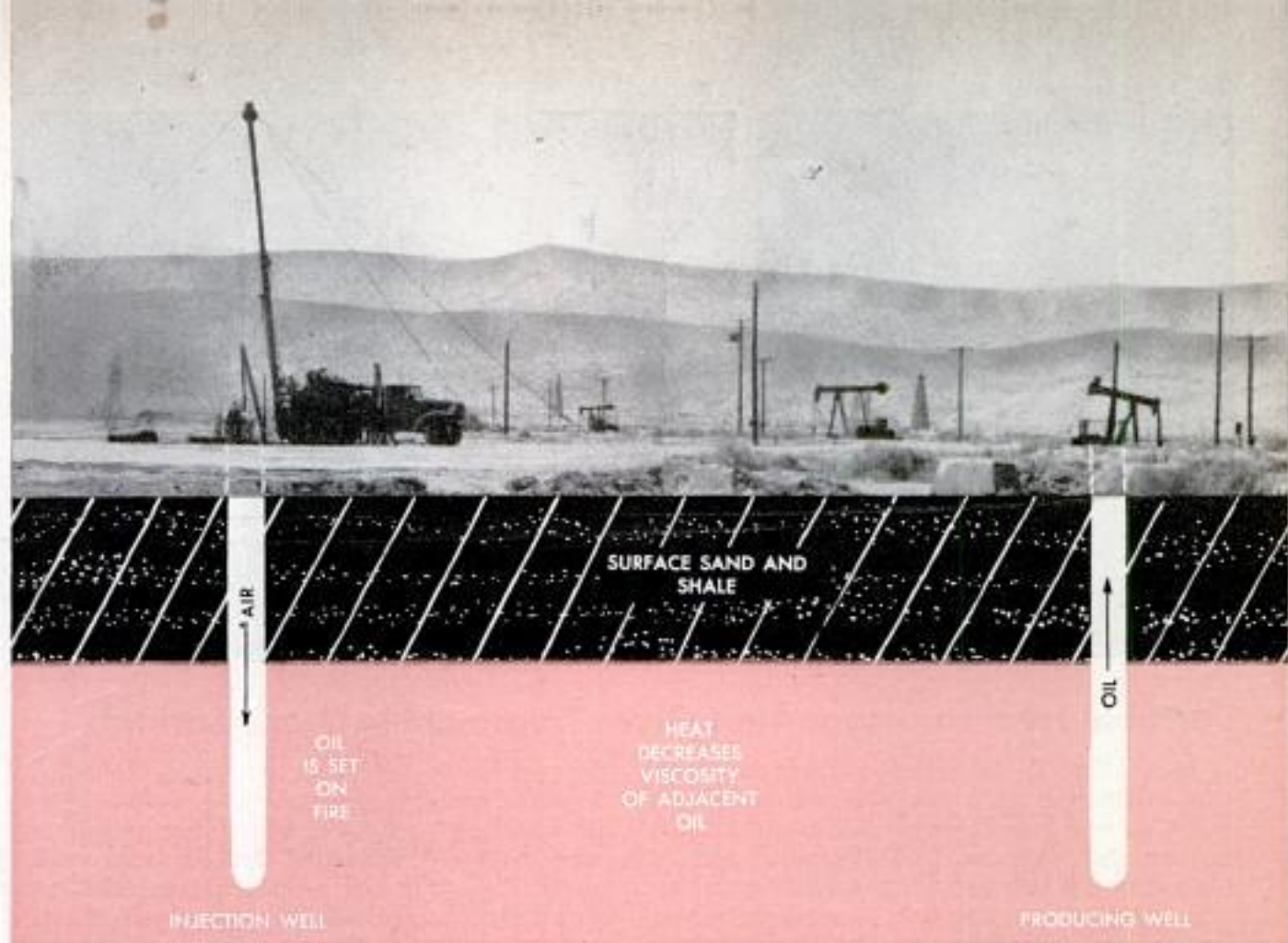
**P**ETE SIMM AND HIS TEAM of imaginative scientists are literally setting the world on fire. It's all part of a bold experiment to boil more oil out of the earth and has resulted in the creation of an underground inferno in California.

"It may not be as hot as Hades," one of Simm's fellow scientists says wiping his brow in 100-plus heat, "but it's the closest we could come." The temperature 2000 feet below him, where thin oil sands have been set on fire, is over the 1000-degree-F. mark.

## Experiment Near Maricopa

The scene of this operation is the dusty Midway-Sunset oil field near Maricopa—a world removed from the publicized tourist attractions of California. If the thermal recovery experiment proves successful, it could revive fading oil fields





Regulated compressed air is forced into injection well to control fire after it is started with air and gas

and possibly add millions of barrels of needed oil to the nation's reserve.

Oilmen have known for years that they can't recover all the oil in a given pool by present production methods. Sometimes they leave more than 75 percent of the oil in the ground because there simply is no way to get it out. The experiment at Maricopa is an attempt to solve the problem in a new way—by setting depleted oil sands on fire to force more oil from them. It is being conducted by California Research Corporation, subsidiary of the Standard Oil Company of California.

### Special Tool Ignites Oil

At Maricopa, scientists are injecting high-pressure compressed air down an injection well to depleted sands. Oil in the vicinity of the injection well is ignited with a specially designed tool. The resulting heat front is forced outward toward three production wells, located about 200 feet from the injection well in different directions, to boil out previously unrecovered oil.

Here's how the ignition system works: An electrically operated igniter energizes a heating coil at the bottom of the injection well. Three minutes after the knob is turned on the igniter, a "thermistor" at the bottom of the hole tells scientists in the control house that the underground fire is raging. Initially both gas and air are in-

jected into the well to insure combustion of the oil sand.

Simm says there is no danger of the fire flaring out of control. The thermistor sets off an alarm in the control house if the heat begins to get out of hand. By regulating compressed air going to the combustion front, operators can keep the situation under control.

### Compressor Aids Fire

A 600-horsepower air compressor is providing sufficient capacity for the experiment. Special metering, gauging and sampling facilities have been installed to observe the test, production increases of wells, and changes in composition of the hydrocarbon system as combustion proceeds. Scientists are keeping a 24-hour watch at the site. They say the big question is not whether underground combustion will work, but whether or not it will prove to be economically sound. The technique was tested successfully by Cal Research and The California Company, another Standard subsidiary, in the Irvine-Furnace oil field in Kentucky.

The Maricopa experiment is costing about a million dollars and is expected to take a full year to complete the tests. Final results will not be computed by any one individual or group. The scientists plan to use an electronic computer. ★ ★ ★



## Portable Hydromassage Unit Gives Treatment in User's Bathtub

Any bathtub becomes a hydrotherapy tank with use of a portable agitator that bubbles and swirls water to soothe frayed nerves and muscles. The 25-pound unit is placed in the tub and plugged into an electric outlet. A float switch turns it on when water level reaches seven inches. The noz-

zle can be adjusted for gentle or forceful flow or turned to one side to provide overall whirling action. A hose attachment is used to treat sprained ankles and sore spots. The unit can help athletes, victims of arthritis, bursitis, spastic paralysis, rheumatism and polio.

## Machine Monitors Radar Units

Machine-monitoring of radar may replace the human operator subject to "radar hypnosis" induced by staring at the screen. An automatic device sounds an alarm when a distant object is sighted by radar or when the monitoring unit or radar apparatus fails.

## Electronic Trail Markers Guide Drivers in the Arctic

Electronic trail markers forecast future Arctic travel as safe as a midnight raid on the family refrigerator. Developed by Army researchers and tested on 100 miles of Greenland icecap, this safety system consists of two parallel wires and a vehicular-mounted radio-type receiver. Alternating current is fed into wires, buried under snow on each side of the trail, to electrically mark the route. Indicators in the vehicle give the driver his position on the trail and warn him, when his snowmobile goes out of bounds across a current-transmitting trail wire, to return between the wires.



## Bamboo Scaffolds Made To Go Up 15 Stories

Bamboo scaffolds up to 15 stories high are used to construct buildings in Hong Kong. Poles are lashed together with bamboo strips. No nails are used. The structure forms a secure frame from which concrete work, plastering and painting can be undertaken. Bamboo, plentiful in the Far East, is light, strong, cheap and can be reused repeatedly.

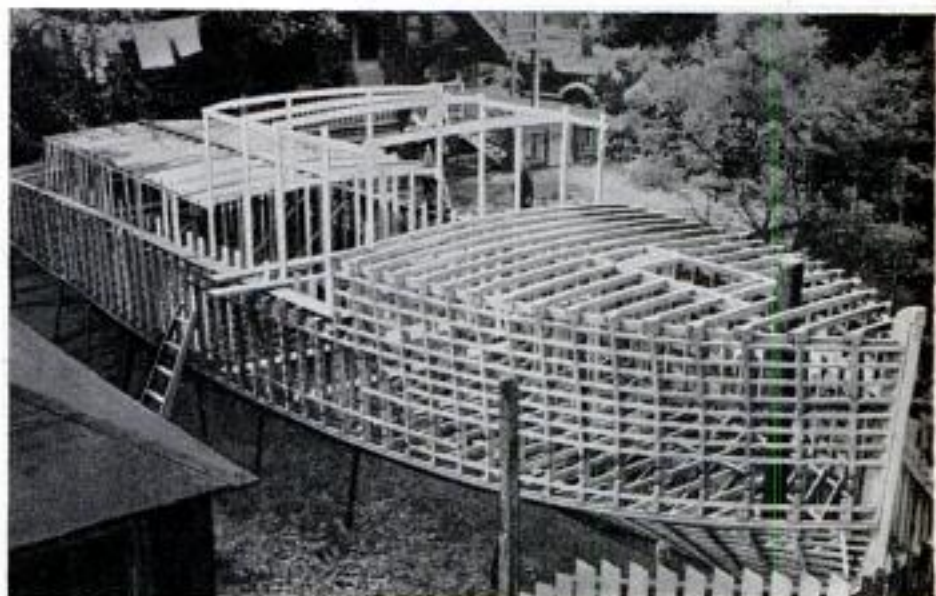
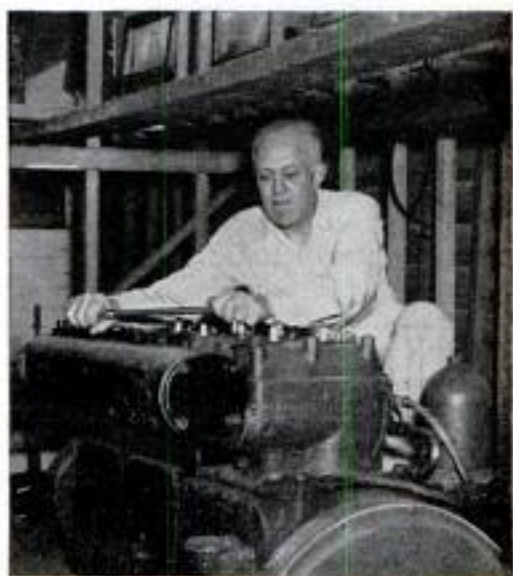




## Back-Yard "Ark"

LIKE NOAH, Eugene Kane of McHenry, Ill., set out to build his own boat in his back yard. Unlike Noah, he'll use the boat to cruise the world. Sixteen years ago, while living in Chicago, Kane started building an 18-ton cabin cruiser in the tiny yard behind his apartment building. He worked steadily on it for years until it outgrew the yard, then hired a house mover to move it to the back yard of his new home in McHenry. He figures it will take him about four more years to finish it. He then will retire from his job as auto-shop teacher in a high school, and he and his wife will set off to see the world. The boat will have three state-rooms, two baths, a galley and a sun deck. Two 125-horsepower engines, bought as scrap and overhauled, will give it a top speed of 15 miles per hour. Kane figures the *Galilivant* will be worth \$75,000.

Kane fits window in cabin of 50-foot cruiser as craft rests on blocks in his back yard. Right, boat will be powered by two 125-horsepower engines which he bought as scrap and overhauled. Below, craft outgrew tiny yard behind Kane's apartment building in Chicago





## Mechanical Gold-Panner Makes "Old Timer's" Methods Obsolete

Panning for gold now, you drive a Jeep with a trailer to a location, back the trailer to the river's edge and start the mechanical gold-panning device in the trailer. Then you start shoveling gravel from the river bottom into the machine, which will handle up to 20 cubic yards per day. Motion of the machine duplicates hand-panning. It has a coarse top screen where oversize gravel is washed and discharged, a fine screen and nugget trap and two pans with matting for trapping heavy grains. Later when you've worked the surface gravel, you attach a



dredge probe which can be extended to a maximum length of 15 feet for working deep and inaccessible pockets.



## Clothes Rack Fits Over Rear Cushion of Auto

Fitting over the back cushion of the rear seat, a convenient clothes rack for the car does not interfere with the use of the rear doors. Nor does it block rear vision. It is easily removed when destination is reached. With two of the racks in position, vacationers can carry a dozen or more garments in a non-wrinkling position that saves time in packing a suitcase as well as bills for pressing.

☐ At a peak traffic hour on a summer day, nearly 25,000 people ride aboard 665 commercial airliners in the skies over the United States.



Making first rescue flight from the scene of an accident to a hospital, an RCAF copter lands with patient

## Canada's Copter King

*—He found a new way to land whirlybirds  
on mountain peaks*

**By Carson Kerr**

ONE MORNING LAST MAY, a dozen members of the Vancouver, B.C., Alpine Club were climbing 4890-foot Mount Seymour a few miles north of the city. As they set their sights on a snow-covered peak, one of the mountaineers, Mrs. Olive Bavins, suddenly lost her balance and fell 100 feet down the steep slope. Her husband and other climbers found her almost unconscious, lying 15 feet below the edge of a crevasse. Hurriedly constructing a makeshift stretcher, they raised the injured woman to the ledge. Her back had been broken.

Quickly they telephoned for aid from the Royal Canadian Air Force Rescue Flight unit stationed at Sea Island Airport, Vancouver. While helicopter and crew were en route, Mrs. Bavins was carried several hundred feet up the mountainside to the only level landing space

available, a plot less than 50 square feet in area. Shortly, pilot-officers Don Park and Ray Steen set their twin-rotor Piasecki copter on the "postage stamp" field, took Mrs. Bavins aboard, and whirled her to Shaughnessy Hospital in Vancouver, saving her life. The incident marked the

**Mrs. Olive Bavins, who suffered a broken back in a mountainside fall, credits her complete recovery to a helicopter rescue mission**





Helicopter student pilots learn to laugh at obstacles like Black Tusk Peak, shown here in the background



Training starts with landings on water in an open area of park with pontoon-equipped helicopters



Above, student pilots progress to trickier landing sites, such as this rocky spot in a creek bed. Below, with skis the copter and pilot search out a "postage stamp" field for a practice landing



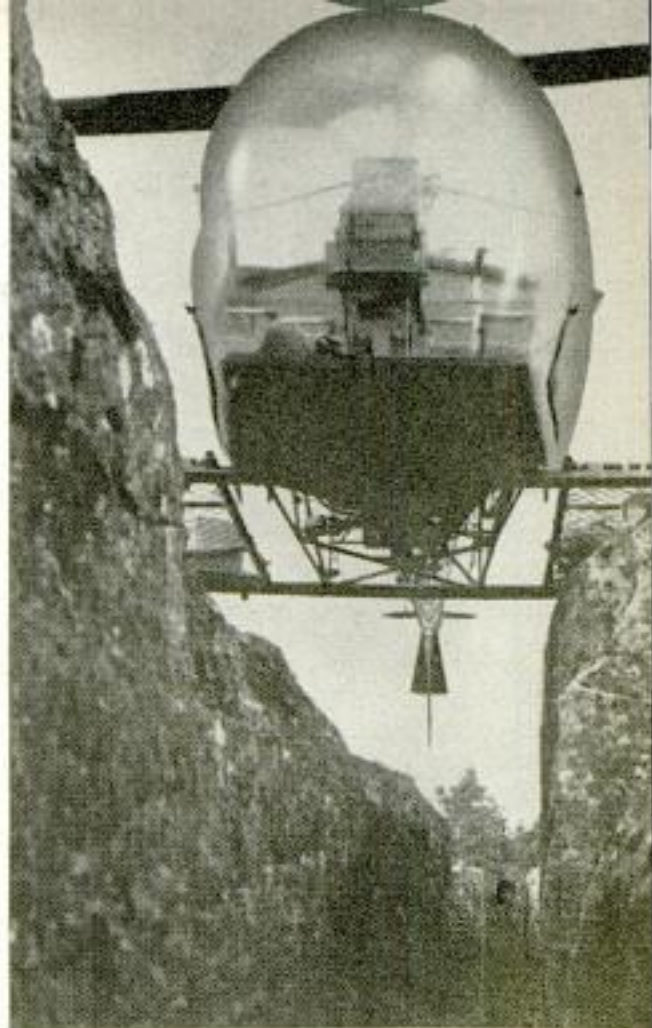
Above, toward the end of the 12-week course, daredevil copter pilots carry relief cargo to an "air-strip" in rugged terrain. Below is the final test: A pinpoint landing of supplies in a snowbound area



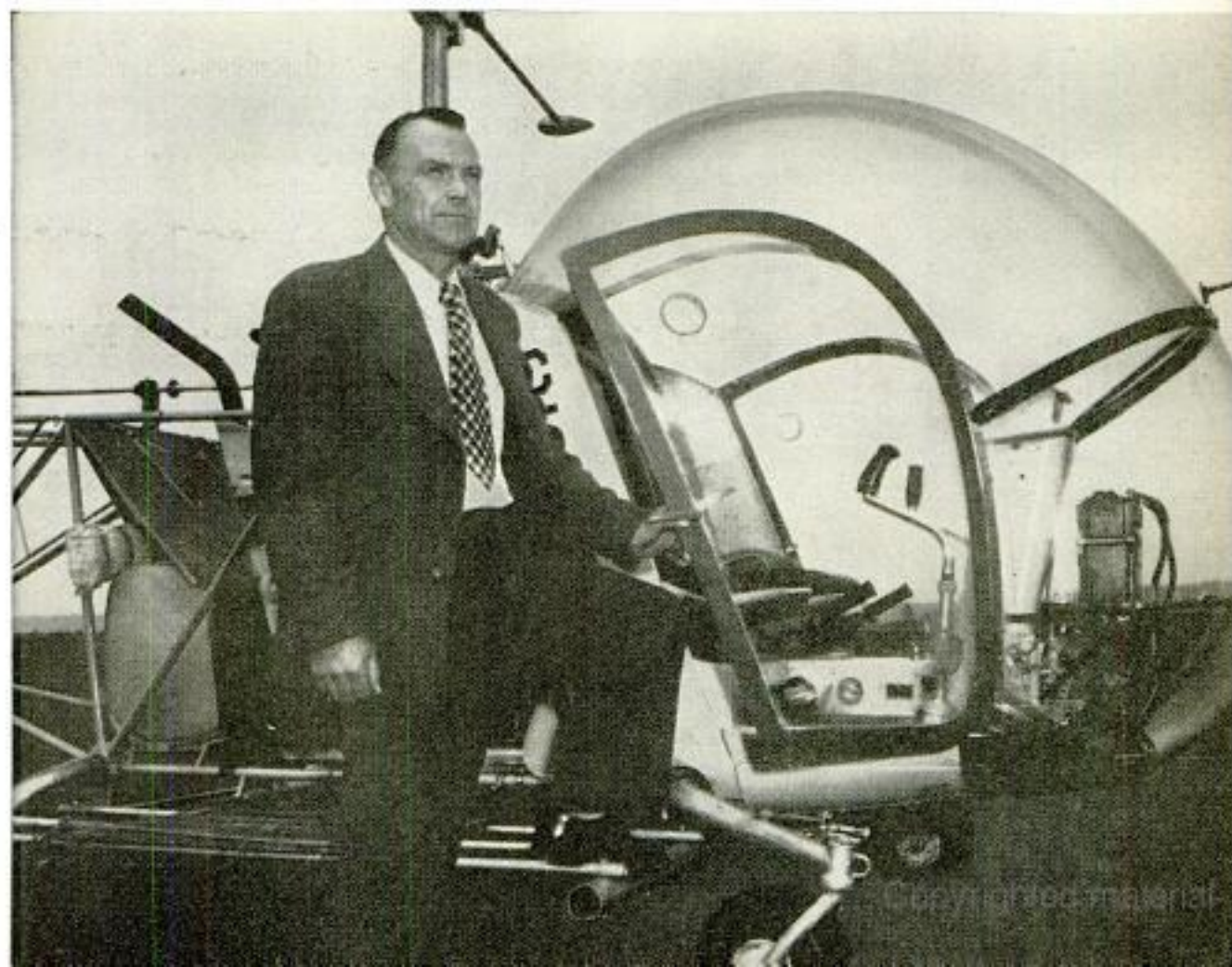
first time in Canada that an injured person had been flown directly from the scene of the accident to a hospital. This new type of RCAF rescue service had been tested experimentally only six weeks earlier. The altitude-landing techniques used in this service were developed by Carl Agar, Canada's "copter king."

Agar's foolproof landing method again succeeded a week after the rescue of Mrs. Bavins. District Forester D. B. Taylor requested RCAF assistance in battling a blaze that had broken out high above Sechart Inlet, where cliffs were too steep for men to scale with a load of any kind. While Taylor's crew climbed up to the fire, pilots Park and Steen ferried fire-fighting equipment to a pinpoint site at the 1400-foot level on the burning mountainside. What could have been a very serious outbreak was soon brought under control. This specialized type of copter landing has made possible many "impossible" projects, including mountain construction of dams, power stations, transmission lines, pipelines, railroads and roads, as well as fishery, mining, mapping and military surveys throughout Canada and the far north. Pilots Park and Steen each hold one of Agar's "diplomas for daredevils," signifying they are graduates of his school of instruction in mountain helicopter flight.

Back in 1948 when anyone who even talked about flying a helicopter at high



Above, new straddle technique allows copter to land on level ledges of chasms. Below, Carl Agar, Canada's copter king, stands by a whirlybird, an aircraft that he learned to fly 10 years ago. He is now 55





Steadily decreasing speed and altitude in approach, the Agar method permits zero ground-speed landing

"Flare out" landing requires a vertical sloop, putting strain on the engine and making crash possible

altitude was considered harebrained, Agar accepted the challenge of wicked winds, destructive updrafts and downdrafts and precarious perches. The area he chose for his initial test, selected from air photos, was 5300-foot Mount Wahleach. While not the highest peak in the Canadian Rockies, its conical summit made it one of the most treacherous. His landing spot was a little frozen lake, less than 50 yards across at its widest point, cupped in the side of a precipitous 60-degree slope in such a way that the lake was almost concealed from view.

Recalls the dean of daredevils: "A copter landing surface *can* be microscopic but it *must* be flat. Because I had no idea what the texture of the ice would be like, I decided against the surface of the lake. Instead, after careful study, I picked a small lip of rock at its edge. It took seven passes before I set her down—six of which I was

Platforms like this, located at the 3300-foot level, were landing fields for the famous Alcan project



sure would be my last—but this slow process enabled me to hit on a brand-new landing technique."

### Zero Ground Speed

The unexpected discovery led to his arrival over the landing place at zero ground speed and near-zero altitude, without at any time exceeding the power boost required to hover. This was opposed to the old landing method, still used by many copter pilots, involving a violent "flare out" stop that puts a heavy strain on the motors. In making the Mount Wahleach landing, Carl's approach was long, gradual and horizontal, with a steady decrease in speed and altitude all the way in. This made it easy for him to obtain the boost necessary for hovering and lowering his machine the final few feet to the ground.

A conventional flare-out approach would have meant faster, vertical descent, ending with an upward sloop. The motor would have had to counteract downward movement and provide the power boost, making failure a distinct possibility. When a copter motor fails before it has overcome descent speed, the machine frequently is unable to autorotate to the ground; this has been the cause of more helicopter crashes than anything else. The technique pioneered by Agar has been learned since by pilots from Canada, the United States, France, South America and Indonesia.

"In mountain flying, where the thinner air not only makes the motor less efficient but reduces the 'bite' of rotor blades, the Agar approach is an absolute must," points out pilot Park. "We use it at all times, even for landing on an airfield, for the simple reason that we believe it to be the safest and surest method. But altitude landings call for a much more extensive knowledge of air currents."

Carl's pioneering paid off in the form of a continuing contract with the British

(Continued to page 278)



Plaster and sisal fibers at joined corners of the house are trimmed to allow placing of brick veneer

## Prefab Plaster Walls Cut Building Costs

PREFABRICATED walls of plaster that support upper floors and roofs are cutting the cost of homes and office buildings in Australia. The walls—only 2½ inches thick—are reinforced with 6-inch galvanized-iron mesh. Tests show they are strong enough to support many times the load of a normal roof.

Australian architects and builders describe this revolutionary construction method as "the biggest structural change in building techniques in centuries." Government officials are considering the plaster walls for public buildings. Foreign countries are taking notice and one (Burma)

Construction began here seven days ago. Carpenters, tilers and bricklayers work simultaneously



FEBRUARY 1957

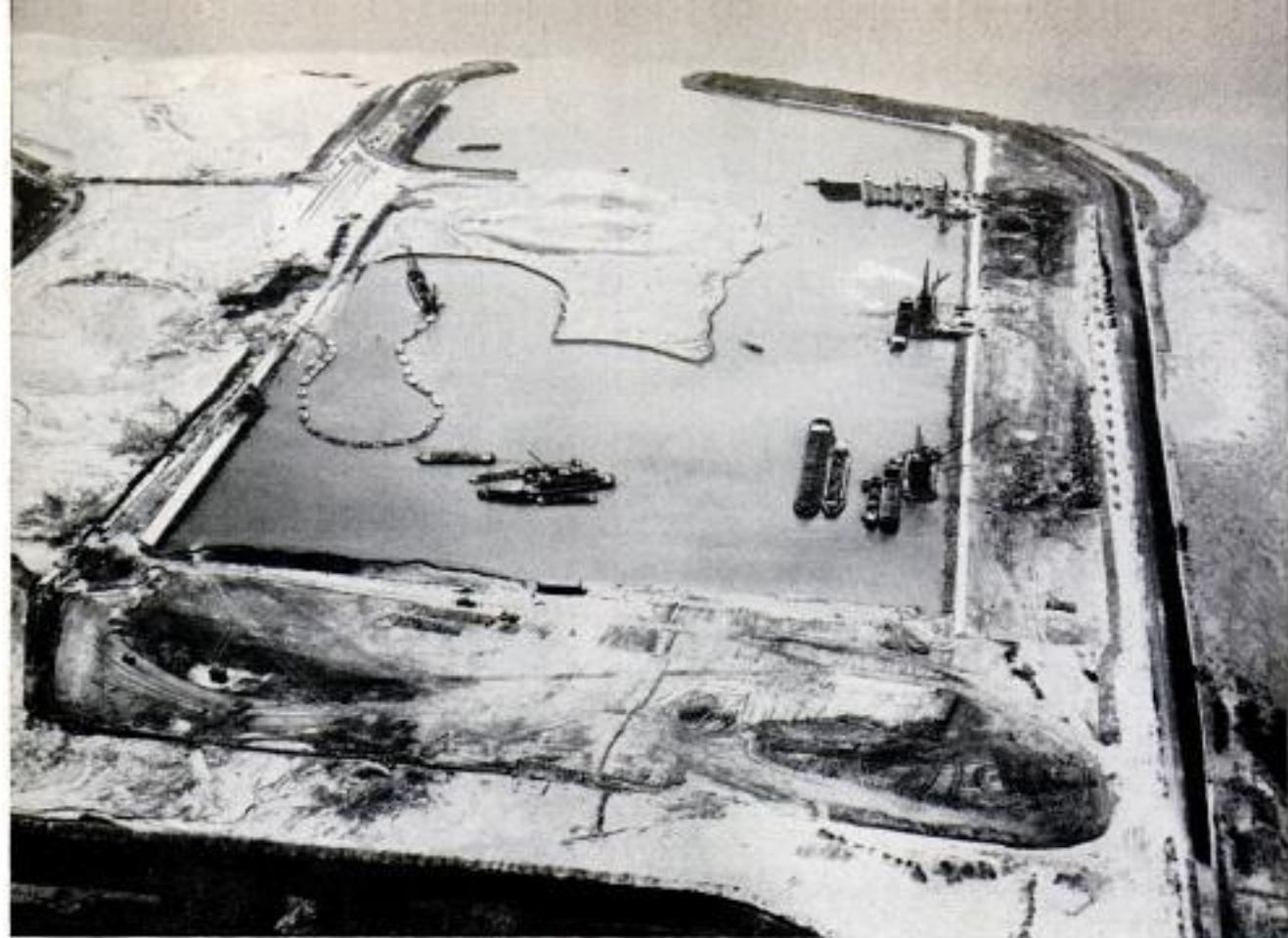


With the conventional foundation and floor joists in position, plaster walls are installed by crane

sent a mission of five top experts to study the new building method.

Plaster-wall buildings can be weather-proofed with brick veneer, wood or asbestos siding. Whatever siding is used, the house is considerably less expensive than a conventionally framed home.

With the same labor force it takes to complete a conventional 1300-square-foot, three-bedroom home in 65 working days, an identical structure with prefabricated plaster walls can be built in 15 working days. Almost all of the craftsmen needed on the total job can work at the same time.



Establishment of a dam here near the new city of Hellevoetsluis will be the first phase of "Deltaplan"

## HOLLAND REMAKES ITS MAP

**H**OLLAND, the most densely crowded land in Europe, is fighting back against the sea with a billion-dollar program that in 25 years will create 781 square miles for new industries, port installations, living and recreational areas. This project, called the "Deltaplan," is to include reclamation of 58.5 square miles from islands fringing the country's southwestern coastline.

### Disastrous Tides

The gigantic scheme is due partly to overflowing spring tides which in 1954 swept tragically through the low country, drowning 1600 persons. These plans are also intended to counteract the effects of a fast-multiplying people in a nation which has coupled a high birth rate with the lowest death rate in the world, according to the World Health Organization. Combined with the need for national safety against nature is the ominous urgency of absorbing an expected one-million-person increase in population by 1980 in towns between Amsterdam and Rotterdam alone. The new venture, it is believed, will help to assimilate this increase.

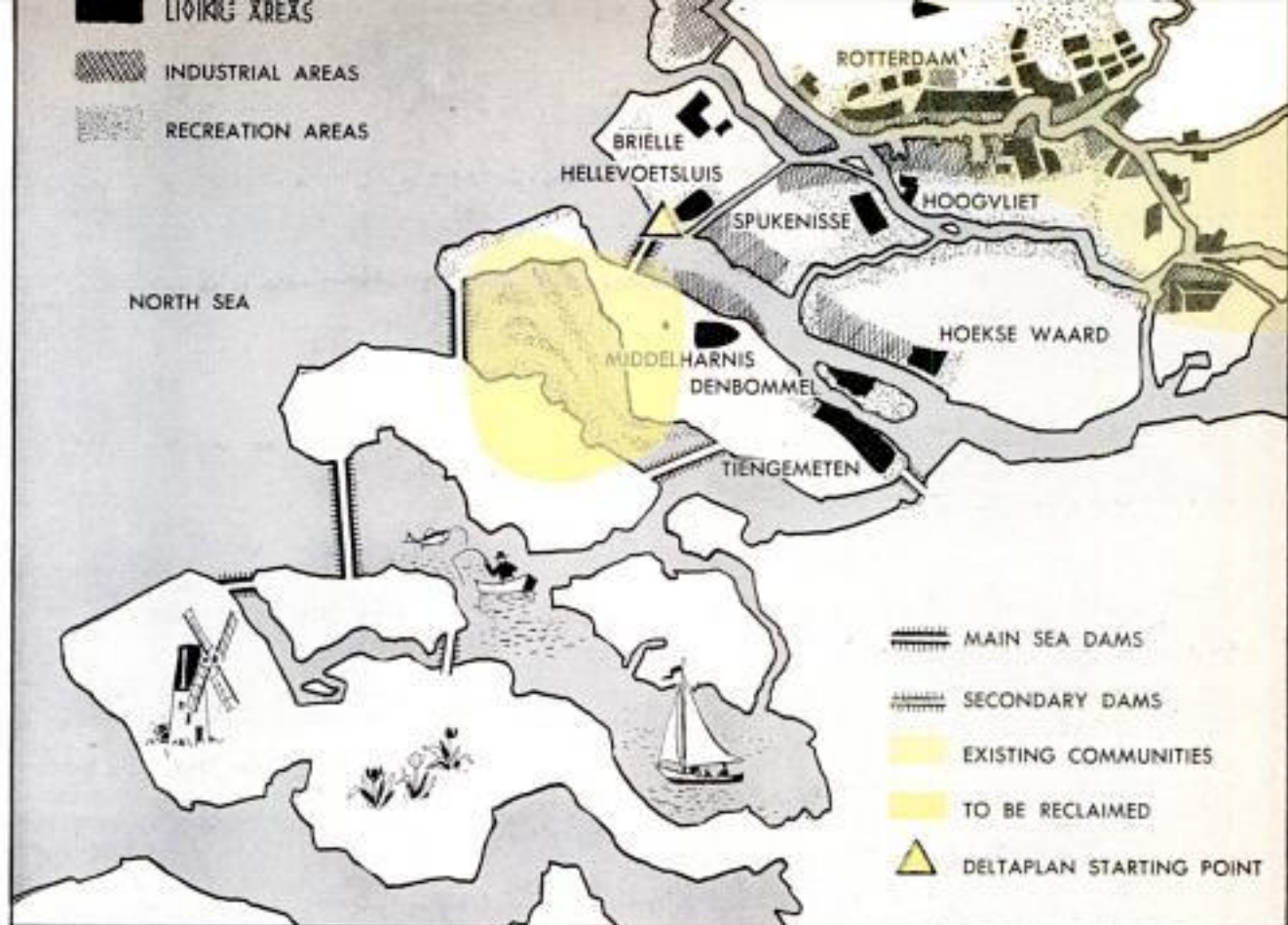
New land will be devoted to agricultural purposes to feed the compact citizenry. Other tracts will be assigned to industry,

and nine new cities will be laid out to contain 100,000 occupants each. Certain existing waterways will be closed and various new ones created. State engineers will re-route railway lines and build new roads for the enterprise. In effect, Holland is having its chin remodeled.

Companion project to the current agriculturally aimed Zuider Zee works program, the Deltaplan initially calls for damming of specific southwestern waterways. The one exception is to be the Schelde River connecting Antwerp, Belgium, with the North Sea. Work has begun near the new city of Hellevoetsluis, where mattresses of interwoven brush and poles have been lowered to the bottom of the Haringvliet River to protect its banks from erosion. Hundreds more such mattresses will be installed in this dangerous, broad stream during the 12 years required to build the dam. Other new communities to be established are: Brielle, Spukenisse, Hoogvliet, Hoekse Waard, Middelharnis, Tiengemeten and two sister cities sharing the name Denbommel.

Haringvliet River basin, starting point for the endeavor, will be a satellite port for Rotterdam. A new canal will connect this port and its industrial center with the





On this map are the existing communities, the area to be reclaimed and sites of Deltaplan's new cities

## WITH ACRES FROM THE SEA

New Waterway, an artificial river bringing ships from the North Sea to Rotterdam and linking Antwerp to Rotterdam by canal.

Three highways and numerous small roads will tie the remainder of Holland to the new terrain. Tunnels will be built below the New Waterway and the Haringvliet to connect Delta territory to the land north of Rotterdam. Among new railroads scheduled for construction is a line shortening the route for international trains to Brussels, Belgium, and Paris.

### Big Vacation Area

A section 42 miles long and 18 miles wide is to be set aside, with the Grevelingen locale as its nucleus. Two million residents are anticipated. Based on the total 500,000 acres of Deltaplan, including 37,500 reclaimed acres, plans are being made to service 600,000 daily visitors and 100,000 vacationers. Lakes will accommodate 10,000 sailboats at the same time, and the entire recreational location will be less than 24 miles from the nine new municipalities. Hotels, camping and sports facilities are to be available, and along one of the rivers will be a wooded park of 6250 acres.

Dutch engineers had considered possibilities for closing various sea branches even

before World War II. But the 13.1-foot variation between ebb and flood tides, causing tremendously destructive currents, made it a certainty that any mattresses, stones or other damming materials would be carried away by rampaging waters. However, technological progress in hydraulic engineering now has made attainable the closing of these sea branches. For the first time in almost 50 years the various rivers and waterways involved in this program can be restrained satisfactorily through use of dams, sluices, and similar water-controlling devices.

Such an achievement has come about, not only by putting to work the most promising ideas gleaned from other countries, but through an active investigative series of experiments undertaken in the Dutch government's own hydraulic laboratories. Here, the wash of waves can be reproduced accurately, as can the action of underwater currents, or other marine conditions.

In reshaping its national map, the Netherlands is providing for the welfare of its people, while taking back from an unrelenting Nature the prize that modern science has made accessible: Land and water on which to thrive in security. ★★★



Riding on its three legs, this boat moves higher in the water as it gains speed. Front wings of the vessel have movable fins to keep the boat from rolling badly

## German Wing Boat "Walks" Through Water

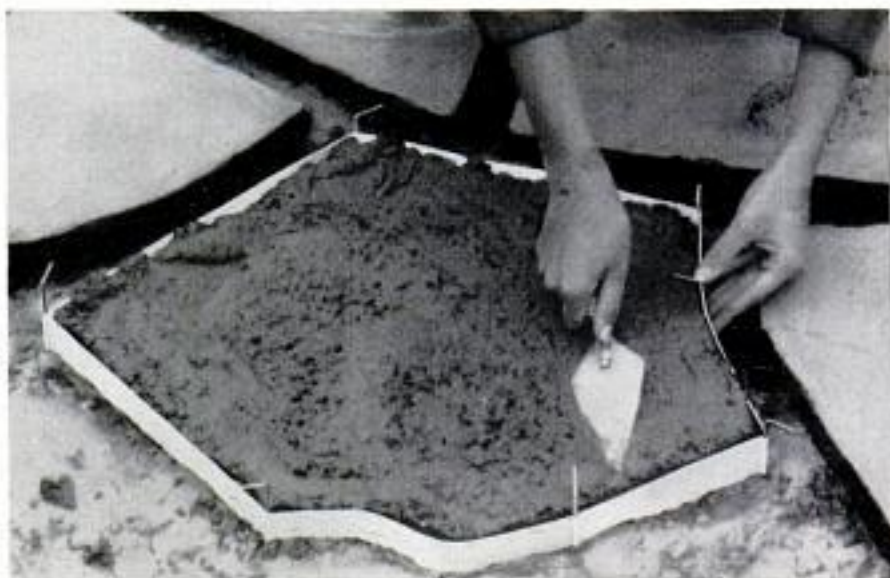
Demonstrated in the Elbe River, near Hamburg, Germany, a new wing boat designed by a German engineer "walks" through the water on three legs. Each of the legs has a small wing near its foot. The lower part of the rear leg is movable and is used to steer the boat, while propellers on the two front wings drive it. The faster the boat travels, the higher it rides, and at full throttle the legs are halfway out of the water. The front wings also have movable fins to help keep the craft from rolling in rough seas.



## Flagstone Mold Has Flexible Form

Preshaped flagstones for walks, patios or paving projects may be made by adding or removing parts from a flexible form on the ground. The user pours concrete into the mold and trowels on desired colors. This flagstone kit has eight pieces.

☐ A flexible drinking straw that contains a chocolate filler to flavor milk has been marketed.





**5. USING A CUP OF CHLORINE BLEACH** weekly, a home chlorinating unit prevents water pollution for families with private wells. This unit can purify 75,000 gallons of water daily, if necessary

Clayton Mark and Co., 1900 Dempster St., Evanston, Ill.



**6. COOKED FOODS CAN BE KEPT HOT** in two thermostatically controlled covered stainless-steel drawers with individual humidity controls. The unit, working on 110-volt current, fits in a cabinet

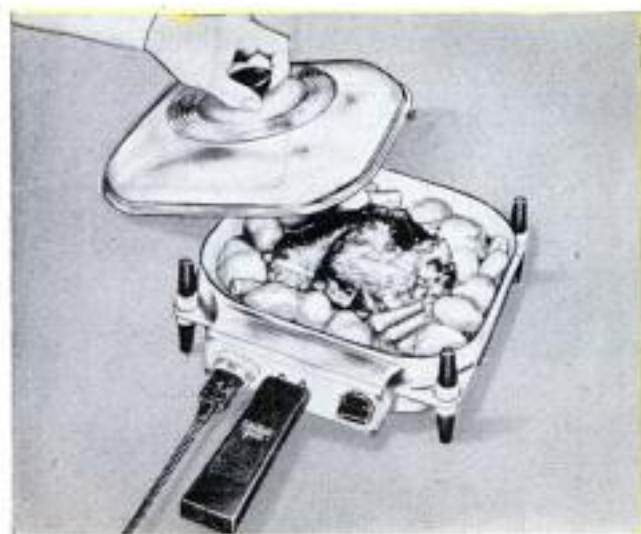
Toastmaster Products Div., McGraw Electric Co., Elgin, Ill.

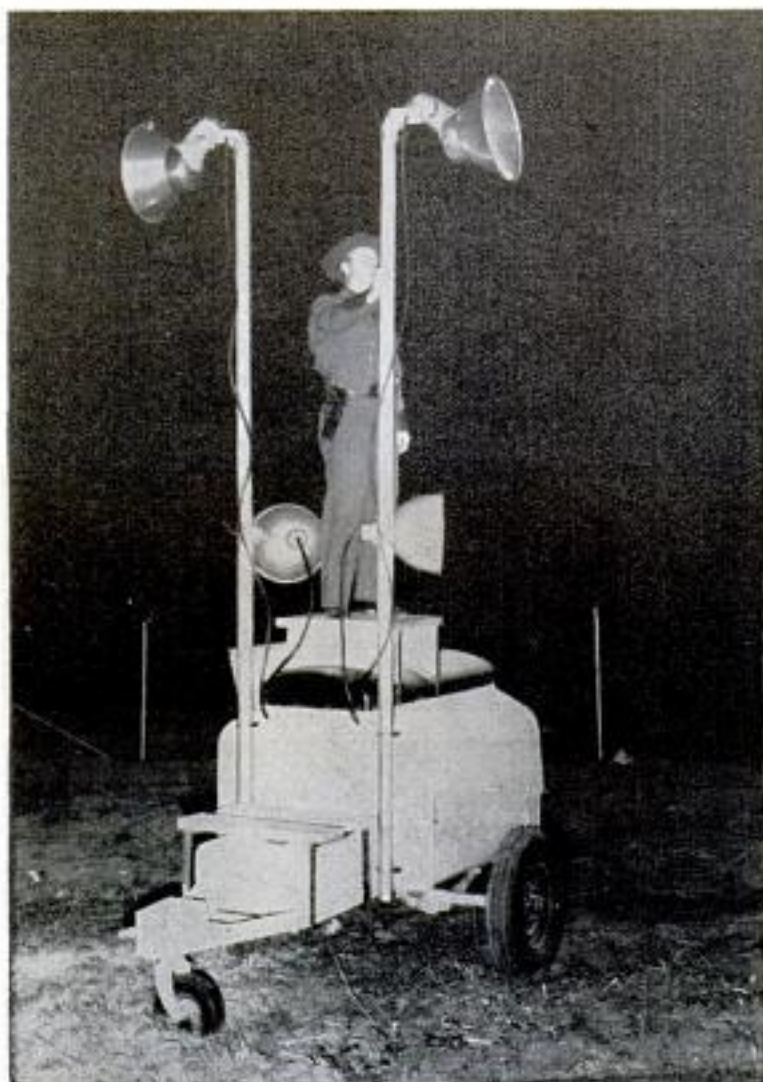
**7. SELF-CONTAINED, AUTOMATIC HUMIDIFIER** can be plugged into a heating duct of a warm-air heating system already installed. Warm air, passing through duct, carries evaporating water

Skuttle Manufacturing Co., Milford, Mich.

**8. DOUBLE-DUTY COOKING APPLIANCE** has a frying-pan on one side and a broiler on the other—both operating at the same time, if needed. This electric unit can plug into any household outlet

J. Franklin Industries Inc., 2906 Peterson Ave., Chicago





## Patrol Spotlights Smuggling Activities

"Curb-service daylight" stops smugglers from crossing an illuminated 1520-foot gap of river bed between San Ysidro, Calif., and Tijuana, Baja California, Mexico. Source of this lighting is a unit built around a 115-volt, 5000-watt, 60-cycle generator and powered by a four-cylinder, four-cycle, 25-horsepower gasoline engine.

Operated by a two-man U.S. Border Patrol team, the unit's top lights can be extended quickly from six-foot traveling height to 12-foot operating level. Top lights use 1500-watt bulbs. Bottom lights have 500-watt bulbs. Each light is in a reflector.

Patrolmen can put the unit into action within three minutes of arrival at a specific spot. The top aluminum section telescopes into the bottom section. An L-shaped screw handle, threaded through a boss, locks the top section in desired heights and positions. The unit consumes one gallon of gasoline per hour of operation.

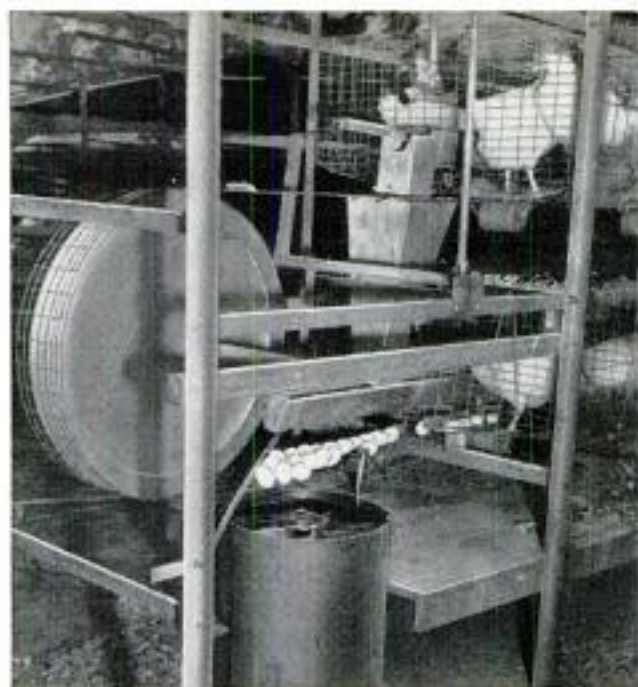
**Portable spotlight unit exposes dry river bed between U.S. and Mexico**

## Portable Drilling Rig for Prospecting Requires No Water

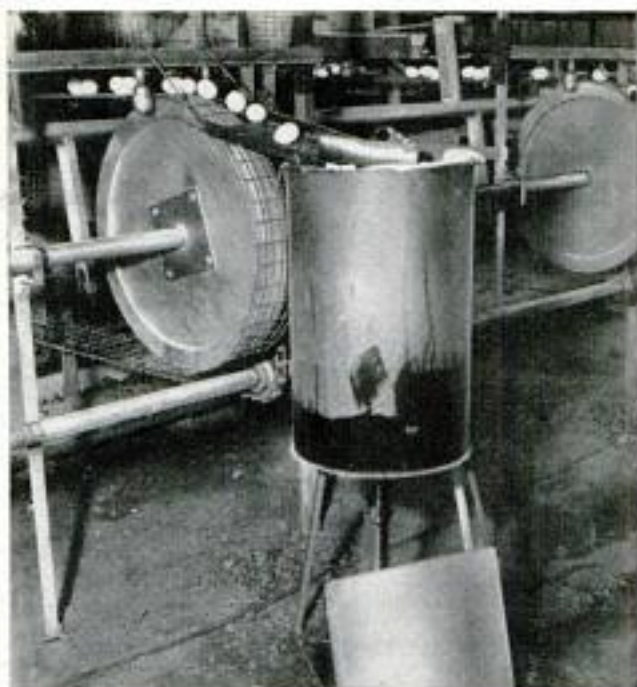
Prospectors and miners can explore for ore as deep as 100 feet with a drilling rig that requires no water and deposits its cuttings in glass jars for inspection and assaying. Entirely self-contained, the exploration drill weighs 125 pounds. It can be carried in a car, packed by two men into difficult country and set up in a few minutes. The device uses a vacuum pump to pull air down in the hole and then up through the drill pipe. Movement of the air helps keep the bit cool, prolonging its life, at the same time the cuttings are carried to the surface. The drill may be swiveled to bore at any angle from the surface and has a manual pull-down to control the speed of drilling. It is designed for all types of mining exploration and for shallow oil and water prospecting.

Powered by a nine-horsepower gasoline engine, portable drilling rig cuts a hole 1 $\frac{3}{4}$  inches in diameter





Eggs roll down the sloping cages onto a continuous belt made of wire. The belt moves twice a day, depositing the eggs gently in basket inside water tank



Top side of belt collects the eggs from the upper tier of cages, depositing them at the other end of the line. Below, poultryman lifts out filled basket

## Moving Belt Gathers Eggs In Tanks of Water

Assembly-line methods have even taken over the old-time kid's chore of gathering the eggs. George Carver has installed an automatic egg collector at his San Fernando, Calif., ranch. The chickens live in two tiers of cages. When an egg is laid, it rolls down the sloping floor of the cage and on to a continuous belt made of welded wire. The belt, powered by an electric motor, passes around two wooden wheels, one at each end of the line. At each end of the line the eggs are forced off the belt and fall into a tank of water, which drops them gently into an egg basket in the bottom. A time clock turns on the motor for four minutes twice a day. At the end of each four-minute period the poultryman lifts out the full baskets of eggs.



## Pistol-Grip Camera Mount

Long-focal-length lenses are focused and held steady with the same hand when the camera is mounted on a new pistol grip. The other hand is then free to release the shutter at the moment the action is at its peak. When the trigger is pulled all the way back, the lens is focused on infinity. When the trigger is released, the lens focuses on points closer than infinity. If desired, the infinity setting can be adjusted to a precise point, such as the basket on a basketball court, so you can quickly focus on it at any time simply by squeezing the trigger to its limit.



Jim Simmons stands beside his handcraft: A stylized deer head, owl, wading bird, and a wooden plaque

# WOOD SCULPTURE THAT "JUST HAPPENS"

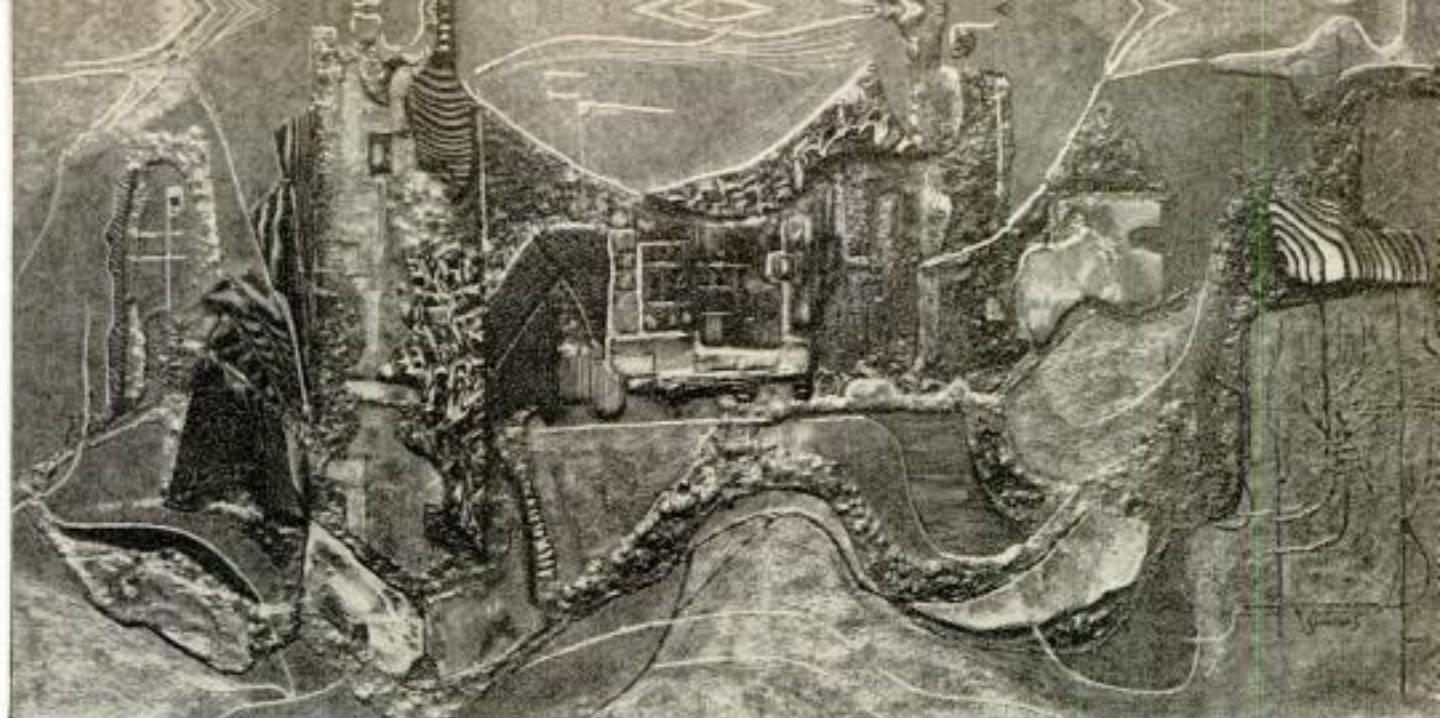
By Robert M. Hyatt



Before this woodworker has finished a product, he may have sawed, burned, wire-brushed, or rubbed it with a variety of paint colors

**A**N ALLIGATOR peered out of a rough slab of wood that Jim Simmons of Taos, N. Mex., picked up one day five years ago. The 'gator glared at him, a fantastic saurian formed naturally in the grain.

Jim thought he might improve a bit on the critter. He cut, chipped, gouged and planed, then rubbed paint into the grain. When the job was done, Jim had a water dragon like none ever seen in the swamps. He set the monster on the mantel and asked his wife, Mildred, what she thought of it.



Here is one of the fascinating wooden plaques made by this artisan from a hunk of wood found in the forest

"It's crazy," she told him, "but it's clever. Maybe you can find other animals in wood."

Jim did. He was looking for a way to make money; perhaps this was the making of a new art that would sell. In the next few days he came up with the beginnings of an owl, a gull, a bear and a fish. After he had given them the same treatment as the 'gator, he had a bizarre group of creatures. At a local art store his collection sold readily. Orders came in for more.

"I really got busy then," says Jim. Practice and a rapidly growing market spurred his creative instinct, fostered already by professional training at art school in Indianapolis. He began turning out long-horned "deer" heads, birds on the wing, and long-billed wading birds never seen by Audubon. He made several large flat plaques with improbable but fascinating scenes.

Later he gouged from knotty blocks a

half dozen fruit bowls. These became one of his best-selling items. Since his product was strictly woodsy, he gave it the name of Taos Sylvanesque ware. Today he is unable to keep abreast of demand for it.

The Simmons workshop is a one-man operation. Production is limited to the number of pieces of raw materials that can be found with natural markings which might resemble something after the materials are processed. When Jim starts working on a chunk of wood, he follows no set pattern. Often, he has little idea of just what he is going to make.

"I simply let nature, tools and paint go to bat," he explains. "And sometimes the result startles even me."

With saw, torch, brush and elbow grease, Jim Simmons is making a living from "crazy wood" art . . . a case of improving nature's handiwork. ★ ★ ★

Chipping out an oversize fruit bowl from wood, the "crazy wood" art manufacturer finds lucrative work



Wire-brushing is one of the techniques used to bring out the character of knotty wood pieces



*Machines—some more specialized,  
some more versatile—are setting  
new trends in agriculture.*

## FARM EQUIPMENT ON PARADE



**SPECIALIZED PRIME MOVER** to take over much of the work of the tractor is one of the latest developments. Shown here is the "Uni-Tractor." Implements such as the hay baler mount on the side of machine. The inset shows the same power unit operating an ammonia-fertilizer applicator. Four other implements are available

Minneapolis-Moline Co., Box 1050, Minneapolis 1, Minn.

**GRAIN COMBINE** is as much at home in a wheat field as in corn. The same rasp-bar cylinder that knocks wheat kernels from the hulls also shells corn. The two-row cornpicker with snapping rollers fits on the front and can be replaced in an hour with grain platform

Deere and Co., Moline, Ill.







O. H. Sheldon and Joe Amoral, Hughson, Calif.

**ORCHARD CULTIVATOR**, mounted on the end of a tractor tool bar, digs weeds from around trees. Small wheel serves as bumper. When wheel hits tree, heavy coil spring stretches and lets cultivator swing around the trunk

**CRANE** takes the backache out of many heavy lifting jobs. Mounted on the rear of the tractor, it is powered by the tractor's hydraulic system. Here a heavy drum is lifted by a chain looped over the crane's hook  
Tractor and Implement Div., Ford Motor Co.,  
Birmingham, Mich.



**CONCRETE MIXER** spun by the tractor's power take-off saves time and labor on farm concrete jobs. Hydraulic arms dump the contents of drum, which has a one-bag capacity at a five-to-one mixing ratio. Attachment will mix concrete while tractor is on the way to the pouring site. It also can be used to mix feed and seed

Universal Pulleys Co., Inc.,  
230 N. Mosley, Wichita, Kans.





**PLASTIC CARPET** to cover strawberries speeds ripening of the fruit, guards against mold rot caused by damp weather and keeps the soil beneath soft and moist in dry weather by retarding evaporation. Holes along the edges let water reach the roots. The thin film of plastic is unrolled from a reel mounted on the tractor. Earth is tamped along the sides. Holes then are punched in the film and plants are drawn into the open by hand

Extruders Inc., Hawthorne, Calif.



**MOTOR SCOOTER** now has taken its place on the farm. Truck body for the little scooter is large enough to haul calves and other livestock. Scooter can be used to carry feed, is economical transportation for errands around farm and ranch

Cushman Motor Works,  
900 N. 21st St., Lincoln, Neb.

**CROP DRIER** drives literally tons of water from a bin loaded with small grain or shelled corn. The oil-fueled heater-blower also can be used to dry hay, permits early harvesting before crop deteriorates. Drying unit can be hooked up to the mobile bin as below or to permanent bin

New Holland Machine Co.,  
New Holland, Pa.





**MIDGET BROTHER** for big tractors has a complete line of 22 implements for yard and garden work. Equipped with automotive-type steering and brakes, the midget has a sealed transmission and scaled-down tractor tires. Power comes from either a 2½ or 3½-horsepower engine

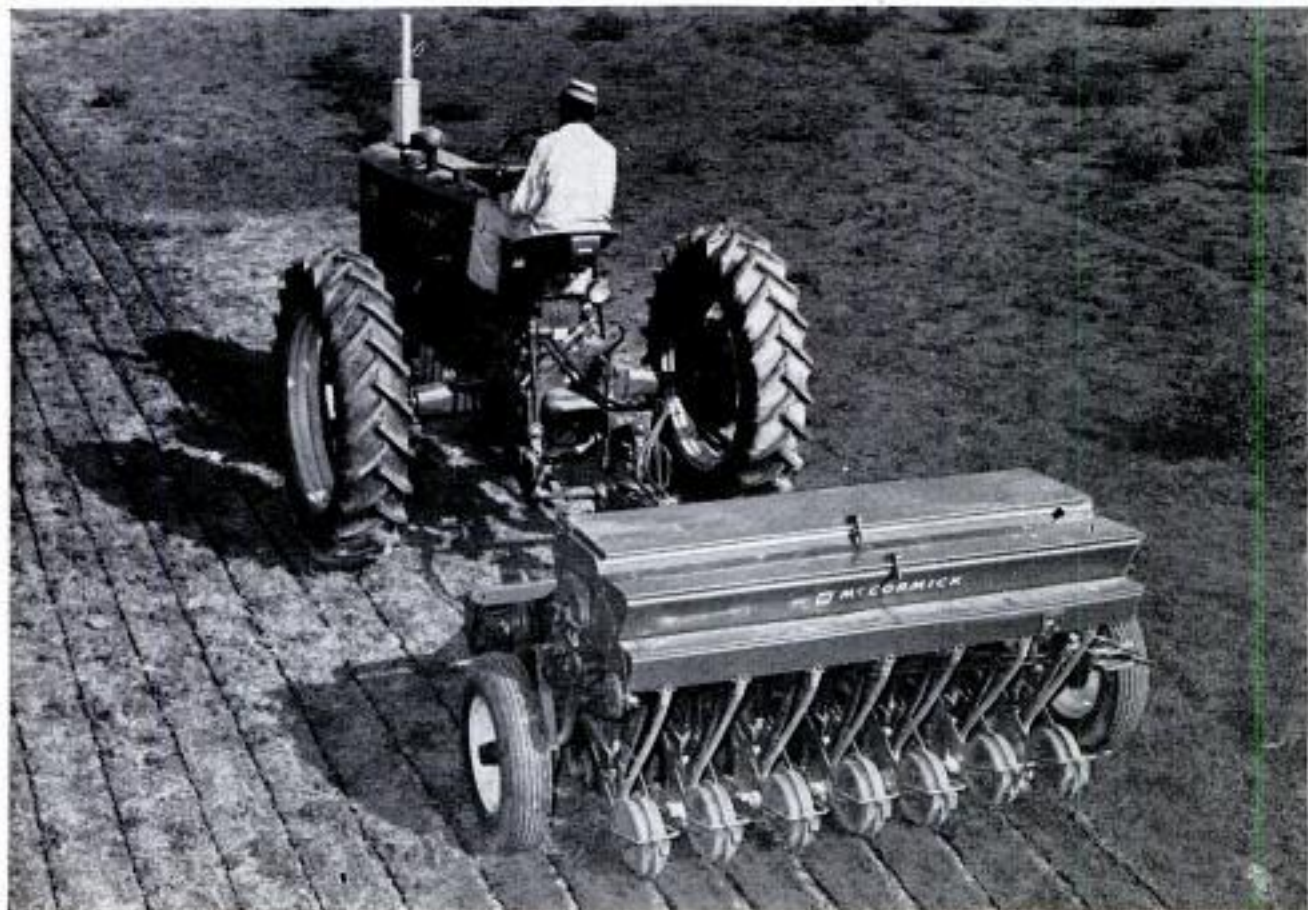
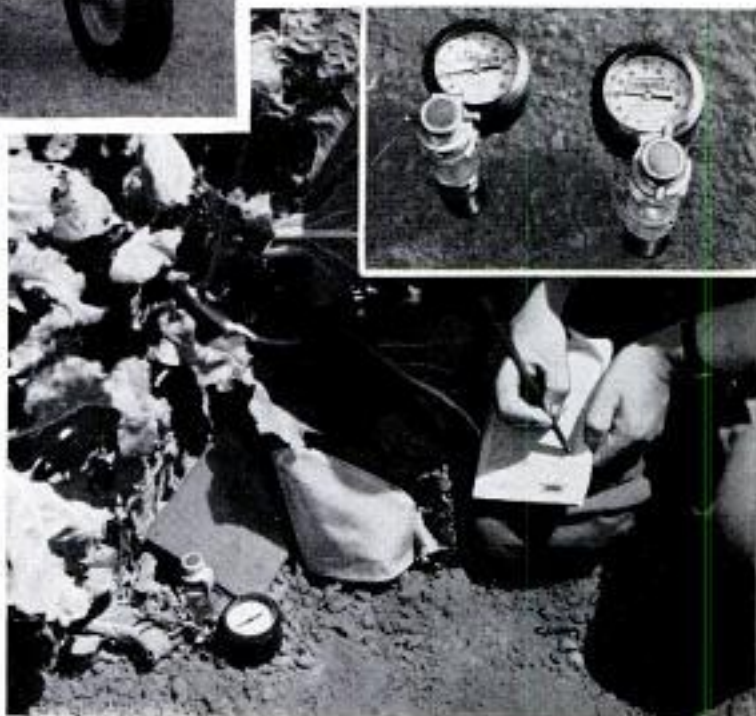
Wheel-Horse Products Co., 2643 Dixie Hwy. North, South Bend 17, Ind.

**MOISTURE METERS** help outwit the weather by continually registering the available soil moisture on gauges. One meter has a short rod, the other a long rod. The rods are spiked into the soil where they measure moisture at different depths to indicate when and how much water is needed from irrigation systems in dry farm areas

T. W. Prosser Co., Elvertale, Calif.

**PASTURE RENOVATOR** cuts through sod to deposit fertilizer at one level and grass seed at another. This eliminates the time and labor required for plowing, disking and harrowing, and permits grazing while pasture is being renovated. The soil and sod are undisturbed. Power for driving the feed mechanisms comes from the wheels

International Harvester Co., 180 N. Michigan Ave., Chicago 1



# UP-TO-DATE TRACTOR SPECIFICATIONS

Make and Model	Engine	Max. Drawbar HP (On Gasoline Where More Than One Fuel Is Available)	Rated RPM	Cylinders and Dis- placement	Com- pression Ratio	Speeds Forward	Speeds Reverse	Advised Speeds	No. and Size of Plows	Cultivating Clearance (Inches)	Power Take Off	Hy- draulic Power Unit	Size of Rear Tire
<b>ALLIS-CHALMERS</b>													
B	Own	20.60	1500	4-125	6.25	3	1	2.75, 4.25, 8.5	1-16, 18	21.75	Opt.	Opt.	9 x 24
CA	Own	23.55	1650	4-125	6.75	4	1	2.0, 3.5, 4.5, 11.25	2-14	22.5	Std.	Std.	10 x 24
G	Cont'l	9.59	1800	4-62	5.62	4	1	1.6, 2.25, 3.5, 7.0	1-12	17.3	None	Opt.	6 x 30
WD-45	Own	40.0	1400	4-226	6.45	4	1	2.6, 3.75, 5, 11.25	3-14	29.4	Std.	Std.	12 x 28
WD-45 Diesel	—	—	1625	4-230	—	—	—	—	—	—	—	—	—
<b>J. I. CASE</b>													
311	Own	Not yet tested	1750	4-148	7.1	4 or 12	1 or 3	2.6, 3.8, 5.0, 12.4	3-14	22.0	Opt.	Std.	11 x 28
411	Own	47.21	1450	4-251	6.5	8	2	1.3, 1.9, 2.6, 3.7, 4.7, 6.7, 9.1, 13.2	4-14	24.2	Opt.	Std.	12 x 38
500 Diesel	Own	56.55	1350	6-377	15.0	4	1	2.69, 3.70, 4.91, 10.19	5-14	—	Opt.	Opt.	14 x 30
<b>BLACK HAWK COCKSHUTT</b>													
30	Cont'l	26.74	1800	4-140	6.75	4	1	2.3, 3.5, 5.0, 12.5	1, 2-14	21.8 (A.A.), 24.3 (Tri)	Opt.	Opt.	10 x 24
30	Buda	26.43	1650	4-153	6.2	4-8	1-2	3.1, 4.5, 6.2, 13.5	2, 3-14	23.5 (A.A.), 16.5 (Axle)	Opt.	Opt.	10 x 38
35	Hercules	—	1650	4-198	6.5	6	2	1.6, 2.7, 3.7, 4.6, 6.3, 10.5	3	27.0 (Tri)	Opt.	Opt.	11 x 38
40	Buda	40.06	1650	6-230	6.2	6	2	1.6, 2.7, 3.7, 4.6, 6.3, 10.5	3, 4-14	24.0 (A.A.), 17.0 (Axle)	Opt.	Opt.	12 x 38
Golden Eagle	Perkins	—	1650	4-269.5	17.5	6	2	1.6, 2.7, 3.7, 4.6, 6.3, 10.5	4	24.0 (A.A.), 17.0 (Axle)	Opt.	Opt.	12 x 38
50	Buda	51.51	1650	6-273	6.6	6	2	1.6, 2.7, 3.7, 4.6, 6.3, 10.5	4, 5-14	26.5 (Tri)	Opt.	Opt.	14 x 34
<b>JOHN DEERE</b>													
429	Own	—	1850	2-113	7.0	4	1	1.6, 3.1, 4.2, 12.0	2, 3-14	21.0 (A.A.), 21.0 (Tri)	Std.	Std.	10 x 34
50 Gas	Own	27.49	1250	2-190	6.1	6	1	1.5, 2.5, 3.5, 4.5, 6.0, 10.5	2, 3-14	22.4 (A.A.), 24.1 (Tri)	Std.	Std.	10 x 38
60 Gas	Own	38.94	975	2-321	6.0	6	1	1.5, 2.5, 3.5, 4.5, 6.0, 11.5	3, 4-14	23.1 (A.A.), 25.3 (Tri)	Std.	Std.	11 x 38, 13 x 26, 13 x 30
70 Gas	Own	44.21	975	2-379	6.15	6	1	2.5, 3.5, 4.5, 6.5, 9.0, 13.0	4, 5-14	23.1 (A.A.), 25.3 (Tri)	Std.	Opt.	12 x 36, 14 x 30
70 Diesel	Own	45.66	1125	2-376	16.0	6	1	2.5, 3.5, 4.5, 6.5, 9.0, 13.0	4, 5-14	23.1 (A.A.), 25.3 (Tri)	Std.	Opt.	12 x 36, 14 x 30
80 Diesel	Own	61.76	1125	2-471	18.0	6	1	2.5, 3.5, 4.5, 5.5, 7.0, 12.5	5, 6-14	—	Opt.	Opt.	14 x 34
<b>FERGUSON</b>													
35	Cont'l	31.68	2000	4-134	6.6	6	2	1.33, 1.99, 3.65, 5.30, 7.96, 14.59	2, 3-14	21.0	Std.	Std.	11 x 28, 13 x 24
40	Cont'l	32 approx.	2000	4-134	6.6	6	2	1.33, 1.99, 3.65, 5.30, 7.96, 14.59	2, 3-14	20.25	Std.	Std.	11 x 28, 13 x 24
Hi-40 (4-Wheel)	Cont'l	32 approx.	2000	4-134	6.6	6	2	1.5, 2.25, 4.12, 5.99, 9.00, 16.5	2, 3-14	25.25	Std.	Std.	11 x 38
Hi-40 (Single-Wheel Tricycle)	Cont'l	32 approx.	2000	4-134	6.6	6	2	1.5, 2.25, 4.12, 5.99, 9.00, 16.5	2, 3-14	25.25	Std.	Std.	11 x 38
Hi-40 (Dual-Wheel Tricycle)	Cont'l	32 approx.	2000	4-134	6.6	6	2	1.5, 2.25, 4.12, 5.99, 9.00, 16.5	2, 3-14	25.25	Std.	Std.	11 x 38
<b>FORD</b>													
600 (SU-4-Wheel)	Own	29.37	2000	4-134	6.6	4	1	3.72, 4.79, 6.59, 13.74	2-14	20.35	None	None	10 x 28
630 (SU-4-Wheel)	Own	29.37	2000	4-134	6.6	4	1	3.72, 4.79, 6.59, 13.74	2-14	20.35	None	None	10 x 28
640 (4-Wheel)	Own	29.37	2000	4-134	6.6	4	1	3.81, 4.89, 6.73, 14.00	2-14	21.02	Std.	Std.	11 x 28
650 (4-Wheel)	Own	29.75	2000	4-134	6.6	5	1	2.39, 3.79, 5.04, 6.96, 12.38	2-14	21.02	Std.	Std.	11 x 28
660 (4-Wheel)	Own	29.75	2000	4-134	6.6	5	1	2.39, 3.79, 5.04, 6.96, 12.38	2-14	21.02	Std.	Std.	11 x 28
740 (Tricycle)	Own	29.22	2000	4-134	6.6	4	1	3.54, 4.56, 6.26, 13.06	2-14	21.49	Std.	Std.	11 x 28
820 (SU-4-Wheel)	Own	39.80	2200	4-172	6.75	5	1	2.16, 3.43, 4.56, 6.30, 11.21	3-14	20.21	None	None	10 x 28
850 (4-Wheel)	Own	40.18	2200	4-172	6.75	5	1	2.30, 3.66, 4.87, 6.72, 11.96	3-14	21.36	Std.	Std.	12 x 28
860 (4-Wheel)	Own	40.18	2200	4-172	6.75	5	1	2.30, 3.66, 4.87, 6.72, 11.96	3-14	21.36	Std.	Std.	12 x 28
950 (Tricycle)	Own	40.62	2200	4-172	6.75	5	1	2.30, 3.66, 4.86, 6.71, 11.95	3-14	21.44	Std.	Std.	12 x 28
960 (Tricycle)	Own	40.62	2200	4-172	6.75	5	1	2.30, 3.66, 4.86, 6.71, 11.95	3-14	21.44	Std.	Std.	12 x 28

Make and Model	Engine	Max. Drawbar HP (On Gasoline Where More Than One Fuel Is Available)	Cylinders and Dis- placement	Com- pression Ratio	Speeds Forward	Speeds Reverse	Advised Speeds	No. and Size of Plows	Cultivating Clearance (Inches)	Power Take Off	Hy- draulic Unit	Size of Rear Tire
<b>INTL. HARVESTER</b>												
Cub	Own	9.4	4-60	6.5	3	1	2.4, 3.2, 7.3	1-12	20.5	Opt.	Opt.	8 x 24
Cub Le-Boy	Own	9.4	4-60	6.5	3	1	2.3, 3.1, 6.9	1-12	14.0	Opt.	Opt.	7 x 24
100	Own	18.99	4-123	6.5	4	1	2.3, 3.7, 4.8, 10.0	1-16	22.0	Opt.	Opt.	9 x 24
200	Own	22.27	4-123	6.5	4	1	2.4, 3.9, 5.1, 10.7	2-14	23 (A.A.), 23.5 (Tri)	Opt.	Std.	10 x 35
300	Own	35.87	4-168	6.8	10	2	1.68, 2.50, 2.58, 3.82, 3.48, 4.15, 4.65, 5.60, 10.80, 15.11	3-14	19.0 (A.A.), 25.5 (Tri)	Opt.	Opt.	11 x 38
400	Own	47.34	4-264	6.13	10	2	1.09, 2.20, 2.60, 3.35, 3.26, 4.83, 4.53, 6.71, 11.27, 15.70	4-14	22.5 (A.A.)	Opt.	Opt.	12 x 38
300 Utility	Own	29.48	4-169	6.8	10	2	2.6, 1.8, 4.0, 2.7, 5.4, 3.6, 6.9, 4.6, 16.7, 11.3	3-14	21.0	Opt.	Opt.	10 x 28
W-400	Own	47.38	4-264	6.4	10	2	1.6, 2.4, 2.0, 3.7, 3.1, 4.7, 4.4, 6.5, 10.9, 16.1	4-14	26.0 (Tri)	Opt.	Opt.	14 x 30
600	Own	—	4-350	5.4	5	1	2.4, 3.2, 4.5, 5, 15.8	5-14	—	Opt.	Opt.	14 x 34
<b>MASSEY-HARRIS</b>												
Pacer	Cont'l	17.31	4-91	6.1	3	1	2.88, 3.77, 7.25	2-12	20.5	Opt.	Std.	9 x 24, 10 x 24, 6 x 30
MH50	Cont'l	31 approx.	4-134	6.6	6	2	1.33, 1.99, 3.84, 5.32, 7.96, 14.57	3-14	21.3, 26.9	Std.	Std.	10 x 38, 11 x 38
333	Cont'l	40.50	4-208	6.5	10	2	1.43, 2.16, 2.44, 2.87, 3.68, 3.73, 4.36, 6.36, 7.97, 13.6	3, 4-14	24.5	Opt.	Opt.	11 x 38, 12 x 38, 12 x 38, 13 x 38
444	Cont'l	46.00	4-277	6.25	10	2	1.43, 2.16, 2.44, 2.87, 3.68, 3.73, 4.36, 6.36, 7.97, 13.6	4-14	25.0	Opt.	Opt.	12 x 38, 13 x 38, 13 x 30, 14 x 30
555	Cont'l	60.45	4-382	5.8	4	1	2.96, 4.22, 5.22, 12.07	5-14	—	Opt.	Opt.	15 x 34
<b>MINNEAPOLIS-</b>												
<b>MOLINE</b>												
BF	Hercules	25.11	4-133	6.5	4	1	2.4, 3.7, 5.2, 13.0	2-14	22.0 (A.A.), 26 (Tri)	Opt.	Std.	10 x 28, 10 x 38
BG	Hercules	—	4-133	6.5	4	1	2.3, 3.5, 4.9, 12.5	2-14	20.5 (A.A.)	Opt.	Std.	11 x 24
GB	Own	61.45	4-403	5.74, 10.3	5	1	2.7, 3.8, 4.4, 6.3, 14.7	5-14	14.75	Opt.	Opt.	15 x 34
U, JB Series	Own	40.00	4-283	6.3, 8.5	5	1	2.6, 3.6, 4.2, 6.1, 14.1	4-14	25.0 (Type N) 18.0 (Type S) 20.0 (Type E) 19.8 (Type U) 25.0 (Type U) 25.0 (Type N) 12.2 (Type S)	Opt.	Opt.	12 x 38
Z, ZB Series	Own	33.36	4-206	4.7, 6.2, 7.7	5	1	2.4, 3.6, 4.6, 6.3, 13.1	3-14	—	Opt.	Opt.	11 x 38
445	Own	40.0	4-206	5.8, 10.04	5 or 10	1 or 2	1.46, 2.78, 2.93, 4.26, 3.44, 6.48, 5.28, 10.05, 8.09, 15.4	3-14	25.5 (A.A.), 25.5 (Tri)	Opt.	Opt.	11 x 28
<b>OLIVER</b>												
Super 55-HC	Own	36.75	4-144	7.0	6	2	1.6, 2.4, 3.3, 5, 6, 12.5	2, 3-14	19.75	Opt.	Std.	10 x 28
Super 55-D Diesel	Own	28.97	4-144	15.5	6	2	1.6, 2.5, 3.3, 5, 6, 12.5	2, 3-14	19.75	Opt.	Std.	10 x 28
Super 66-HC-RC	Own	29.69	4-144	7.0	6	2	2.3, 3.6, 5.1, 6, 10.4	2, 3-14	24.1	Opt.	Opt.	9 x 38
Super 66-D-RC Diesel	Own	29.09	4-144	15.5	6	2	2.1, 3.6, 5.1, 6.1, 10.4	2, 3-14	24.8	Opt.	Opt.	9 x 38
Super 77-HC-RC	Own	40.16	6-216	7.0	6	2	2.45, 3.2, 4.3, 5.6, 6.6, 11.5	3, 4-14	24.8	Opt.	Opt.	11 x 38
Super 77-D-RC Diesel	Own	40.04	6-216	15.5	6	2	2.5, 3.2, 4.3, 5.6, 6.6, 11.5	3, 4-14	24.8	Opt.	Opt.	11 x 38
Super 88-HC-RC	Own	49.81	6-285	7.0	6	2	2.5, 3.2, 4.3, 5.6, 6.8, 11.8	4-14	25.6	Opt.	Opt.	12 x 38
Super 88-D-RC Diesel	Own	49.58	6-285	15.5	6	2	2.5, 3.2, 4.3, 5.6, 6.8, 11.8	4-14	25.6	Opt.	Opt.	12 x 38
Super 99-HC	Own	61.00	6-302	6.2	6	2	2.5, 3.2, 4.4, 5.7, 7.2, 12.8	4, 5-14	11.81	Opt.	Opt.	14 x 34
Super 99-D Diesel	Own	60.90	6-302	15.5	6	2	2.5, 3.2, 4.4, 5.7, 7.2, 12.8	4, 5-14	11.81	Opt.	Opt.	14 x 34
Super 99-GM Diesel	General Motors	71.44	3-213	17.0	6	2	2.6, 3.5, 4.7, 6.1, 7.7, 13.7	5, 6-14	11.81	Opt.	Opt.	15 x 34

\*Adjustable Axle †Tricycle



### Barrel-Shaped Airplane Tires Permit Rough-Field Landings

Aimed at making it possible to land a light plane in plowed fields, clearings and other rough areas, a soft, barrel-shaped tire is being tested by Goodyear. Called Terra-Tires, they carry from three to

eight pounds of pressure, are 24 inches wide, and roll softly over rough ground and small obstacles. Such tires are expected to prove useful to flying farmers and ranchers, Army observers and bush pilots.



### Frogmen Recovered From Water By Giant "Slingshot"

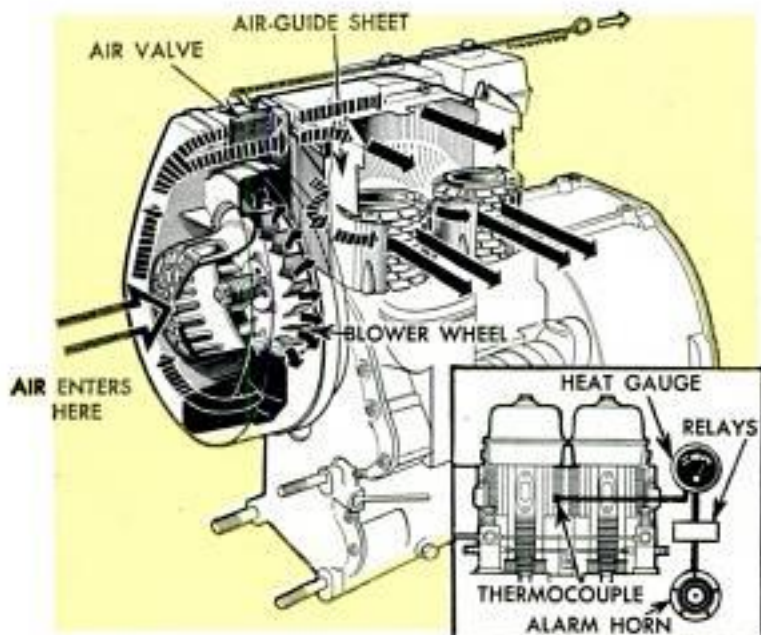
Navy frogmen can now be recovered from the water after completion of their missions in three seconds or less by means of a slingshot type of device. As the recovery boat, traveling at 14 knots, passes the frogman he is thrown a large loop attached to a tensioned cord. The force of the swimmer's acceleration, from zero speed in the water to the speed of the boat, stretches the cord. The cord then snaps back, pulling the swimmer out of the water and into a rubber boat.



## Stork Gets New Bill From Aluminum Sash

Ol' Tin Horn, a black European stork at Crandon Park Zoo in Miami, Fla., couldn't eat and almost died of starvation after he broke off the end of his lower bill. But Zoo Director Robert Mattin came to the rescue with a replacement made from an aluminum sash, and attached it with machine screws. The bird can now eat as before, easily picking up small fish.

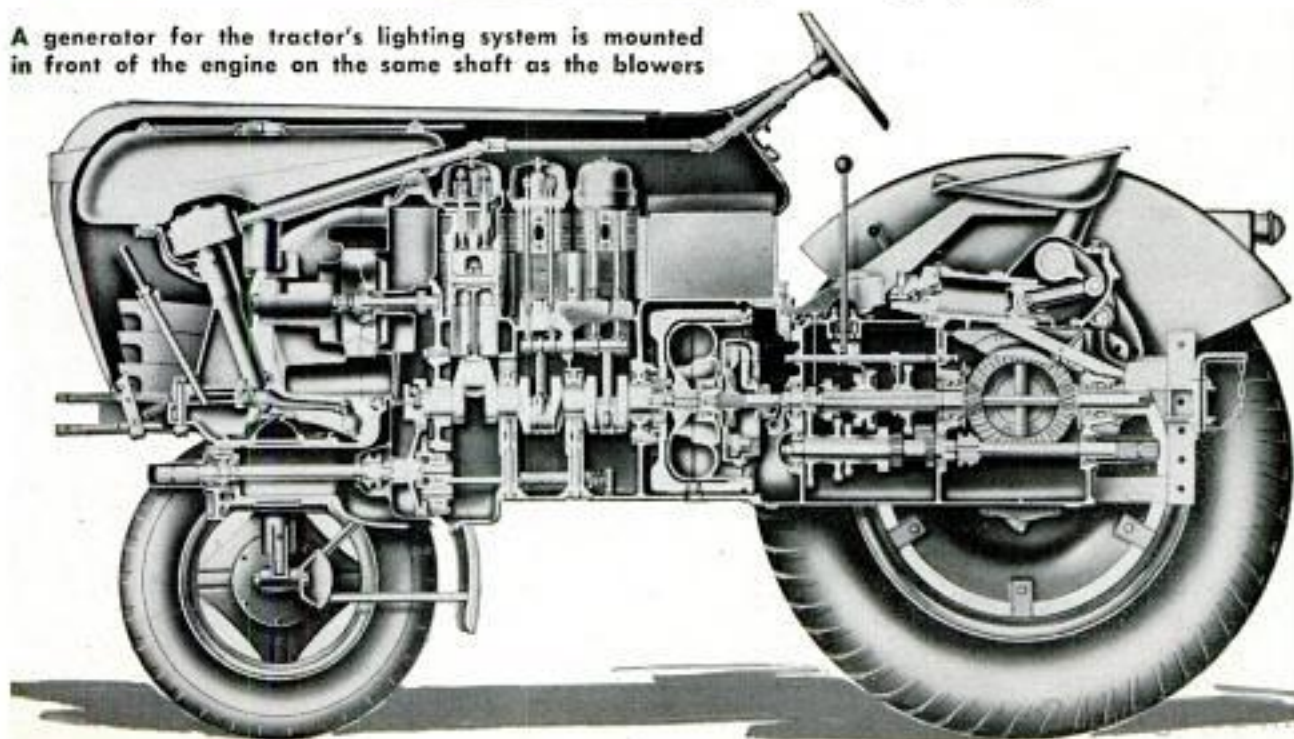
Starving after he broke his bill, this stork now struts happily around with an aluminum-reinforced beak



## German Diesel Tractor Has Air-Cooling System

Air cools a diesel tractor engine developed in Germany by the makers of Porsche automobiles. Air is sucked into a housing at the front of the engine by a 24-vane blower and directed around the cylinders to cool them. A thermocouple takes the engine's temperature to control a heat gauge and sound an alarm horn if the engine gets too hot. Two-cylinder and three-cylinder engines are made by this firm. The tractor also has a fluid coupling, or clutch, in front of the conventional transmission that prevents a heavy load from stalling the engine.

A generator for the tractor's lighting system is mounted in front of the engine on the same shaft as the blowers



THIS IS YOUR YEARBOOK of automobiles for 1957. On the following pages *Popular Mechanics* presents the story of the automotive industry for this year. The full-color section is devoted to eight memorable days in man's eternal quest for speed. There were many memorable days, and there will be more, but these paintings depict eight days which cannot be omitted from any discussion of the subject. Also included in the section are articles on racing, durability tests, economy cars, carburetors and the first of a two-part article showing you how to build your own personal sportster. In addition, of course, are specifications and photographs of all 1957 models.

## EIGHT MEMORABLE DAYS in the History of Speed

By **ARTHUR R. RAILTON**, *Automotive Editor*

Paintings by Robert Korta, *PM artist*

**M**AN LIKES to go fast.

To some men, speed is a compulsion. Only overwhelming compulsion can explain why men sacrifice time, money and, not infrequently, their lives for speed.

There are rewards, of course. But they don't match the risks. The one guarantee to the successful is the satisfaction of knowing that, temporarily at least, he is the world's fastest driver. For those who fail, there is nothing.

From the day man first put wheels under a platform, he has raced against his fellow men. When that platform became an automobile, he began racing the clock.

This was the start of the Golden Era of Speed—50 years of enormous achievement.

It was only 50 years from December 1898 when Comte de Chasseloup-Laubat set the first record of 39.24 miles per hour, until September 1947 when John Cobb covered the mile at an average speed of 394.20 miles per hour.

A mile a minute, that

frightening speed once dreamed of as the ultimate, turned out instead to be only a starting point. A short four months after the first speed record was set, Camille Jenatton tore along a French road at 65.79 miles per hour. In the crowded, exciting half century that began in 1898, man multiplied the speed he could travel across land about 10 times.

In those 50 years, the wheeled platform changed from a small, top-heavy machine on which the driver sat like a cowboy on a horse to a ground-hugging monster in which the driver fits like a hand in a glove.

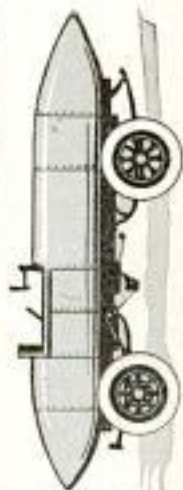
But the drivers changed little if any. They were all determined, daring men who wanted more than anything else to go fast—faster than anybody had ever gone before them. The difference between 39 miles per hour in 1898 and 394 miles per hour in 1947 was a difference in machines, not men.

In the eight pages of this full-color section, *Popular Mechanics* pays tribute to

(Continued to page 169)

Reprints of these eight paintings printed on one side only and suitable for framing are available (as long as the supply lasts) for 25 cents in coin to cover costs. Address requests to Bureau of Information, *Popular Mechanics*, 200 East Ontario St., Chicago 11, Ill.





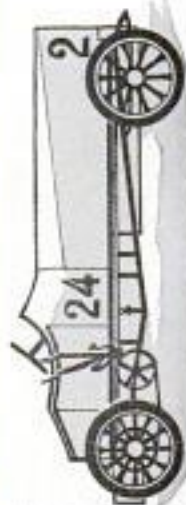
## **JENATZY 1899—60 miles per hour**

The story of automotive speed begins in April 1899 when, on a road at Acheres, France, an electric-powered car driven by Frenchman Camille Jenatzy was the first to go a mile a minute, averaging 65.79 miles per hour for one kilometer.



## ***RIGOLLY 1904—100 miles per hour***

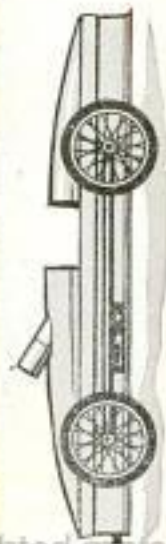
First to hit 100 was another Frenchman, M. Rigolly who, on July 21, 1904, in a four-cylinder, angular-bodied Gobron-Brillie averaged 103.56 miles per hour for one kilometer along a dusty road at Ostend, Belgium.





## **MARRIOTT 1906—120 miles per hour**

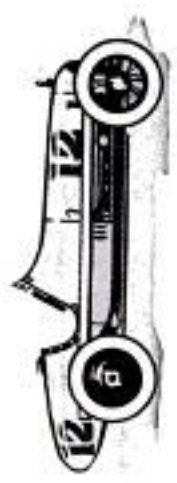
First to go two miles a minute was American Fred Marriott who, on January 27, 1906, drove the sleek, unbelievably simple Stanley Steamer Rocket at 127.66 miles per hour for one mile along the hard sands at Daytona Beach, Florida.

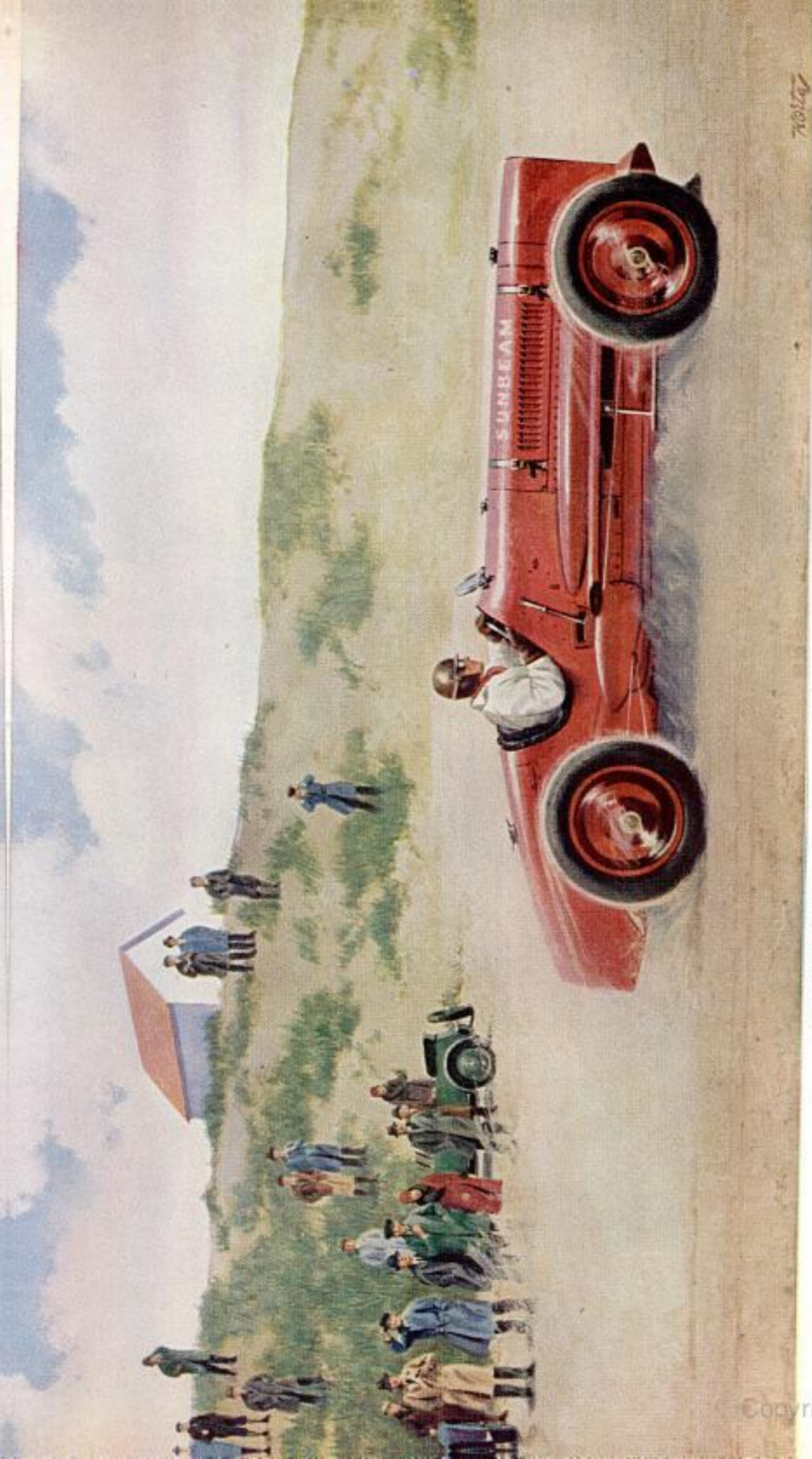




## ***DePAOLO 1925—100 miles per hour at Indianapolis***

First to break 100 for the 500 miles of the famous Indianapolis Race was Pete De Paolo who averaged 101.13 miles per hour in a supercharged Ducsenberg on May 30, 1925, beating out a Miller Junior Eight by less than a minute.

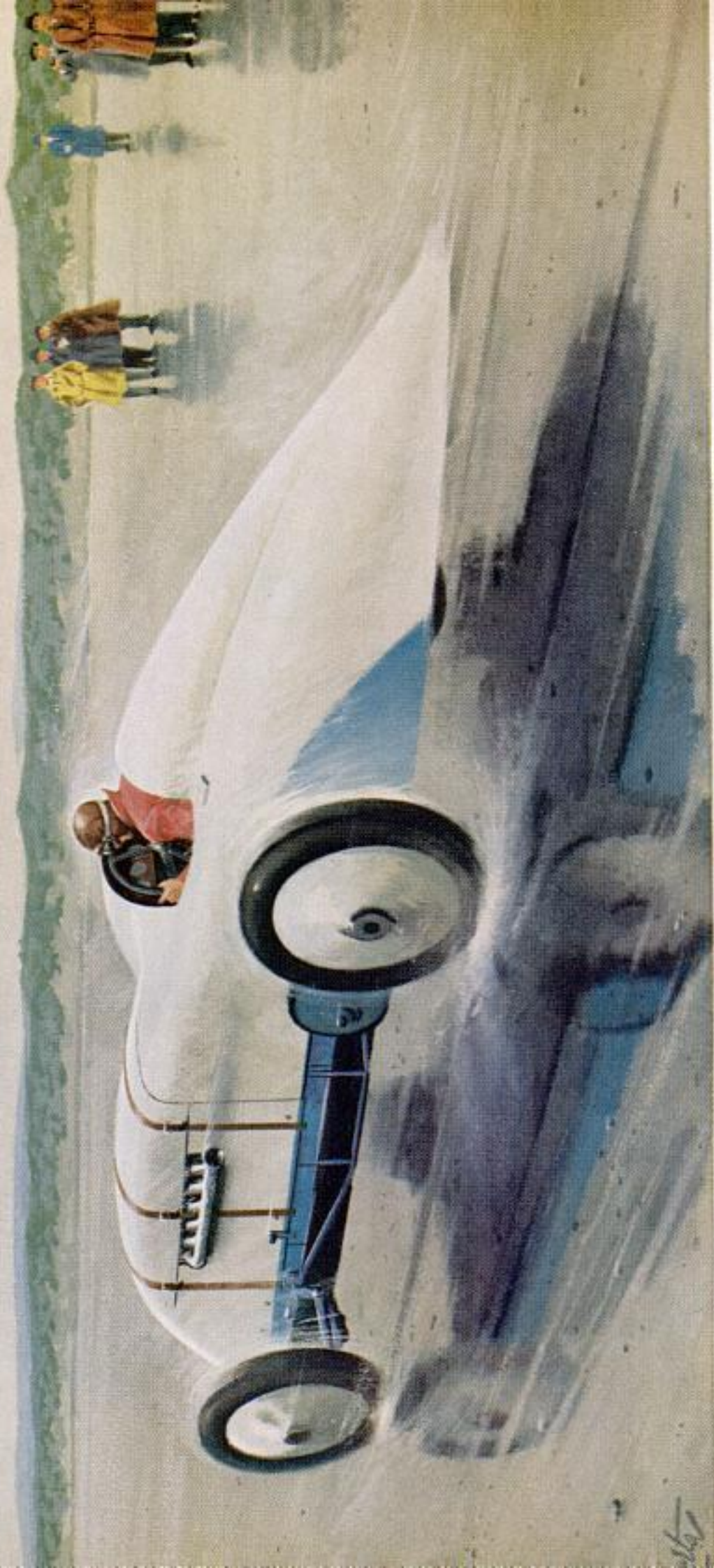




## **SEGRAVE 1926—Last of the Normals**

On Southport sands, England, on March 17, 1926, H.O.D. Segrave hit 152.33 miles per hour in his four-liter Sunbeam V12, the last of the true racing cars to hold the record. After this, aircraft-engined, specialized giants took over.

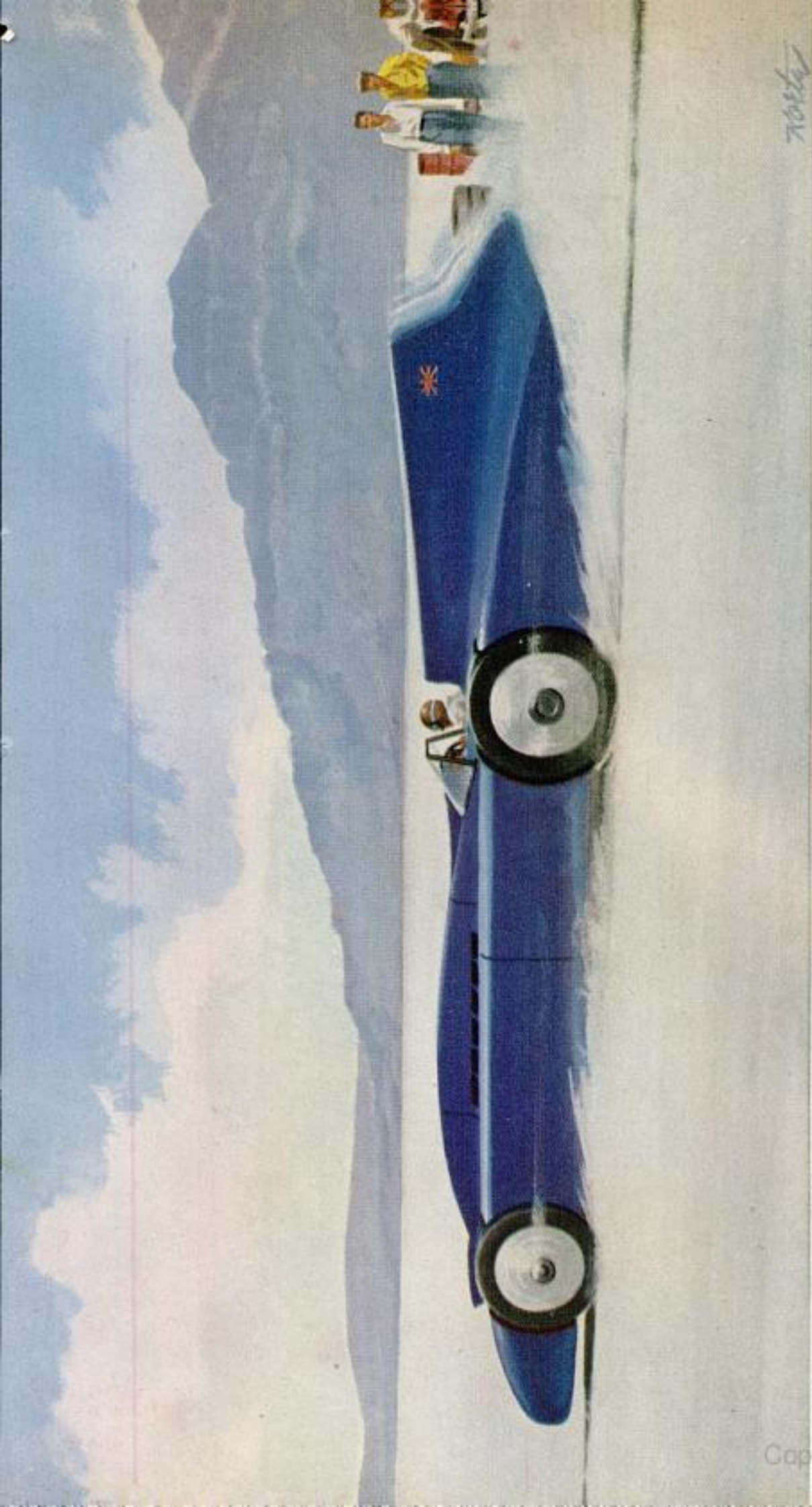




### ***THOMAS 1926—First of the Leviathans***

To begin the reign of the giants, Britisher Parry Thomas drove a record 171.02 miles per hour on a wet beach at Pendine, Wales. His car with its V12 Liberty aircraft engine had a displacement seven times larger than that of Segrave's.

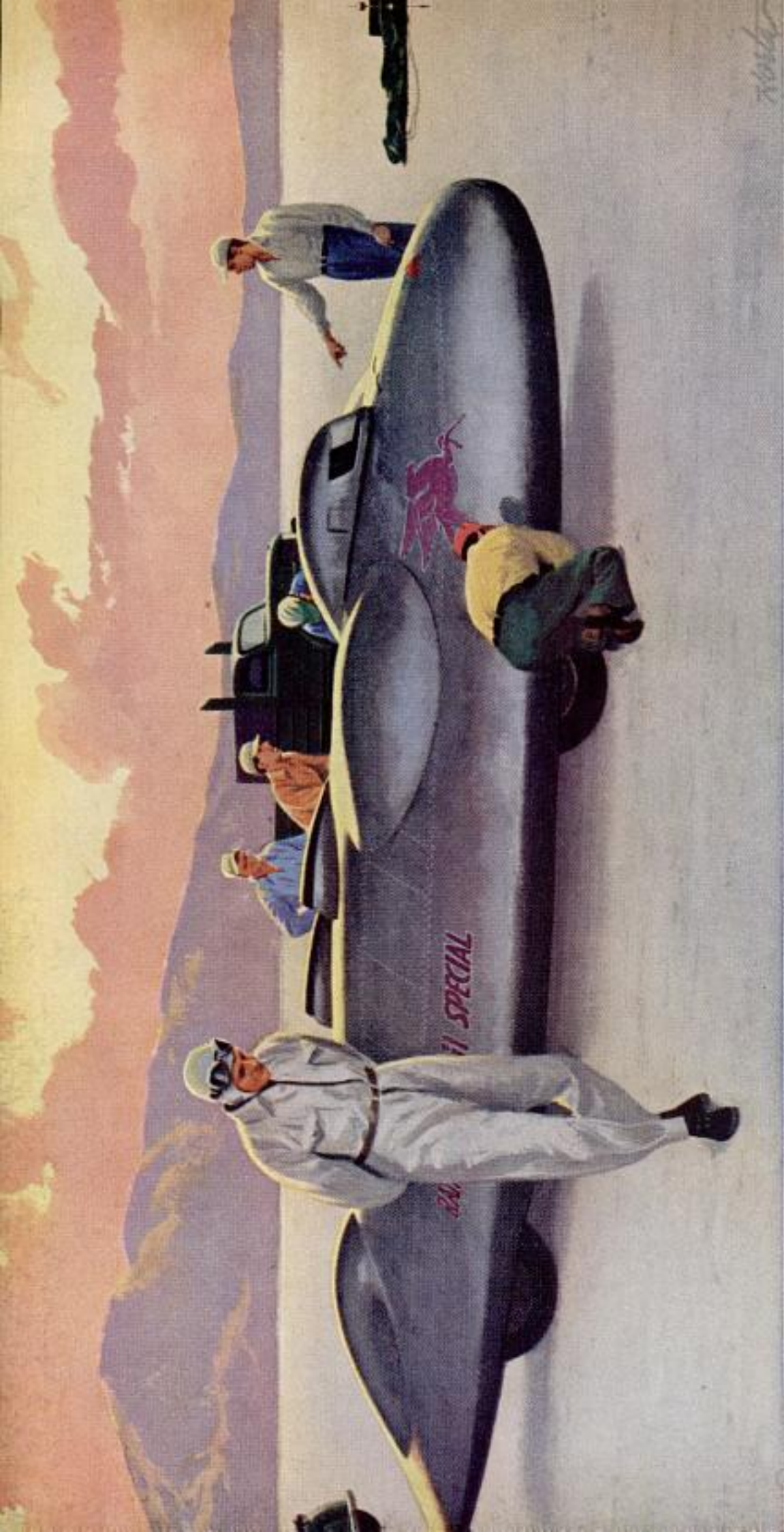




## **CAMPBELL 1935—300 miles per hour**

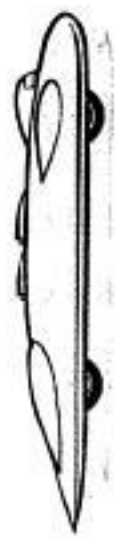
On the parched whiteness of Bonneville Salt Flats, Utah, Sir Malcolm Campbell became the first to go 300 miles per hour when he drove his 2500-horsepower aircraft-engined Blue Bird at a record 301.129 miles per hour September 3, 1935.





## ***COBB 1947—400 miles per hour***

John Cobb of England paces nervously as his Railton Special is readied for its speed runs at Bonneville, September 16, 1947. One run was timed at 403.14 miles per hour. His two-way average of 394.196 miles per hour is the present record.





those men who have devoted their efforts to speed. On these pages are pictured eight memorable days in the continuing quest for faster land transportation. Many important events had to be omitted. Those chosen were picked as representative of the half century.

Omitted, too, were the failures—some of which were magnificent. Perhaps the most magnificent of all was the tragic failure of the American, Frank Lockhart, who was killed at Daytona Beach while driving his Black Hawk Stutz more than 200 miles per hour. Lockhart's car had two engines with a combined displacement of only three liters. He was trying to break a record held by cars many times larger. And he would perhaps have succeeded except for the bumpy condition of the beach. His would have been, as one British writer describes it, "a triumph of technical skill over brute force almost without parallel in motoring history."

The story begins on a road outside Paris where in December 1898 two pioneers began competing for the speed crown. Both, realizing the inadequacies of the gasoline engines of the era, put their faith in electricity.

After a series of alternating record-setting runs, Jenatzy came out victorious in April 1899 with a speed of 65.79 miles per hour, becoming the first person to drive a mile a minute (actually he was driving over a kilometer course and probably did

not realize he had hit the magical mile-a-minute figure).

His competitor, Chasseloup-Laubat, will be remembered as being the first speed-record holder with his initial run of 39.24 miles per hour in the electric Jeantaud in December 1898.

Electricity gave way to steam in 1902 when Serpollet in a streamlined steamer averaged 75.06 miles per hour, nearly 10 miles faster than the fastest electric.

It wasn't until August 1902 that the gasoline engine came into the picture. An American, W. K. Vanderbilt (in a European Mars car, however), went to Ablis, France, and raised the steamer's mark to 76.08 miles per hour.

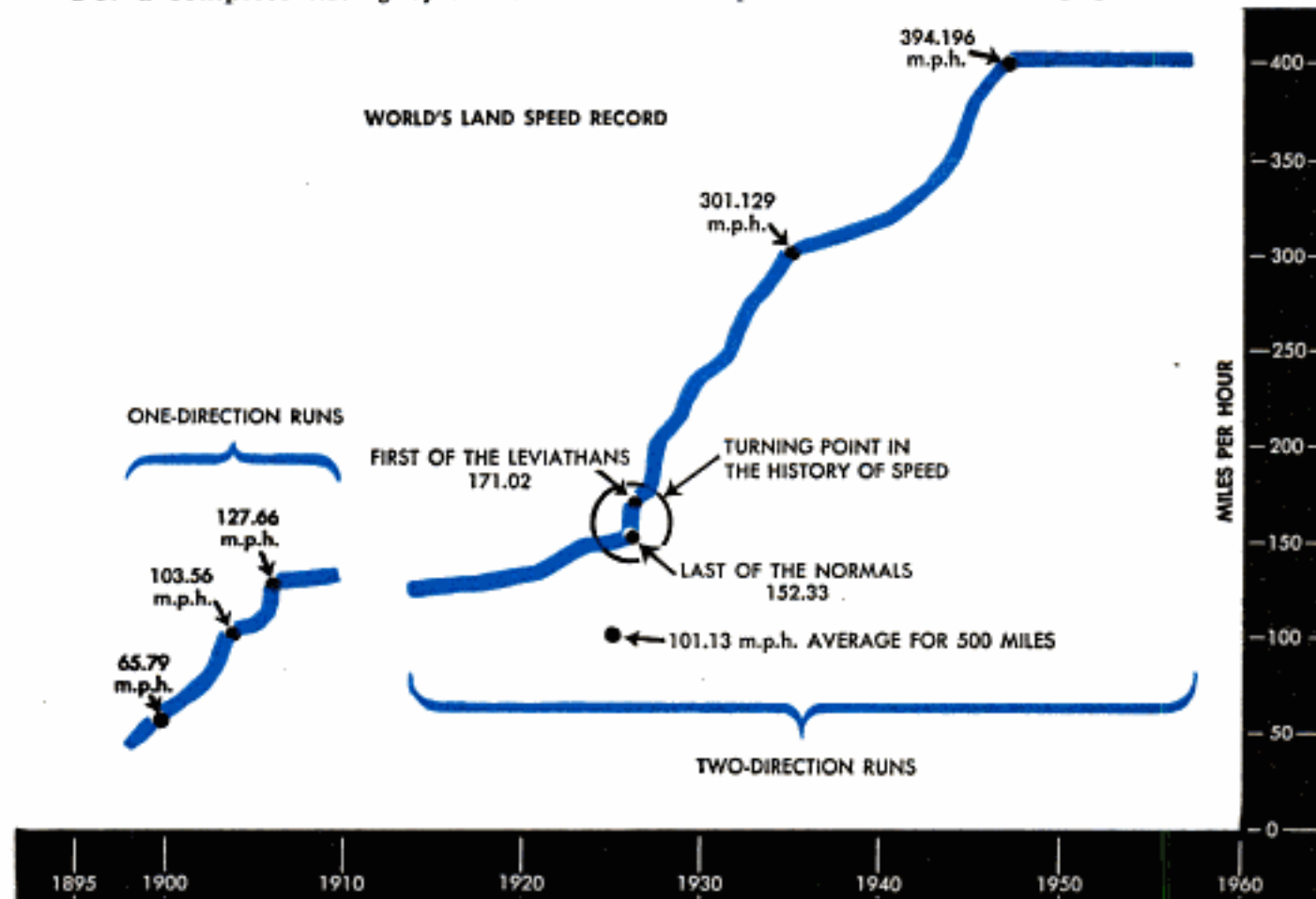
Gasoline remained king for three years through a succession of record-breaking runs that included one by Henry Ford in the Ford 999, a gearless, clutchless monster, that hit 91.37 miles per hour on the ice at Lake St. Clair, Wis. Ford's speed fame was short-lived, however, as two weeks later, Vanderbilt in a Mercedes raised the record to 92.30 miles per hour at Daytona.

Steam made its brief comeback when Fred Marriott in the Stanley Steamer Rocket, a fragile looking ultrastreamlined speedster, averaged 127.66 miles per hour at Daytona to become the first man to go two miles a minute.

In 1914 rules were established requiring that speed runs be made in two directions

(Continued to page 286)

For a complete listing of the World's Land Speed Records turn to page 288



# PARADE OF '57 CARS

IT'S A YEAR of change—dimensional changes, for the most part.

To be sure, there are important engineering changes, but most of them came because the stylists said that the 1957 cars must be lowered drastically.

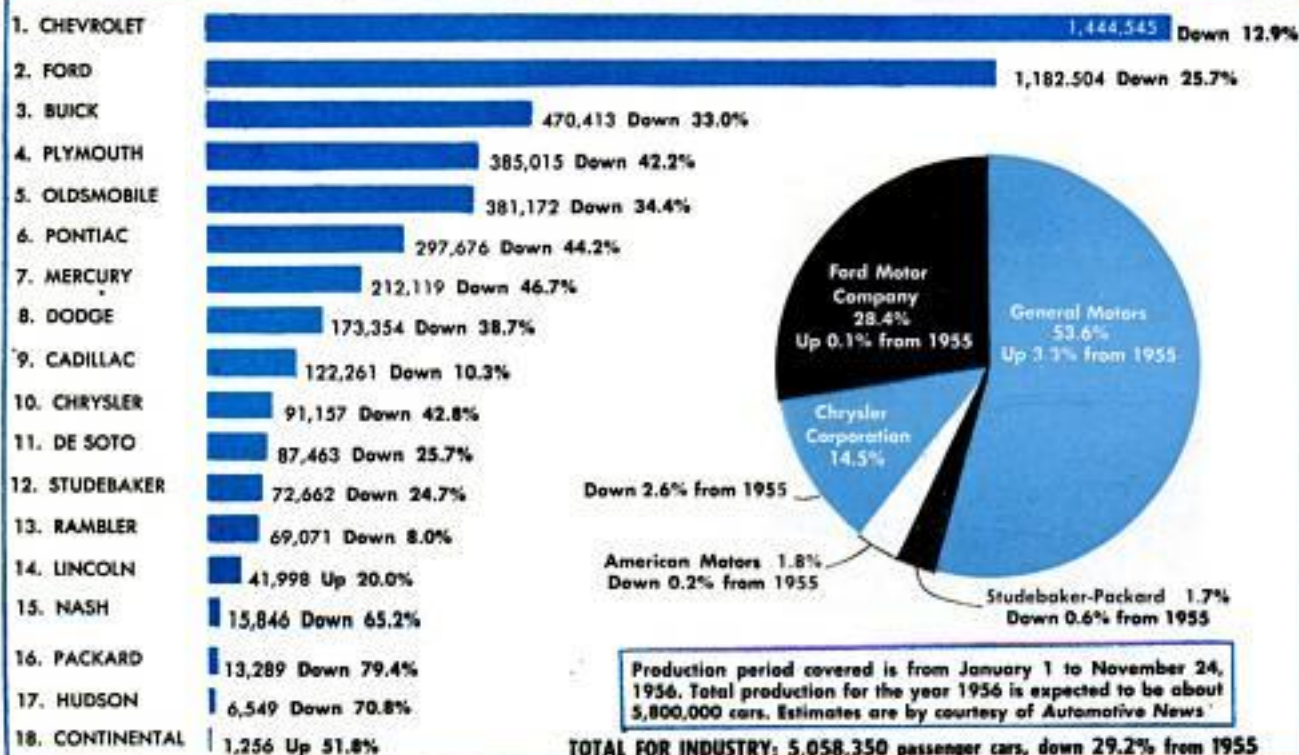
The decision to make the new cars lower (and the average 1957 car is 2.1 inches lower than last year's model) forced engineers to redesign frames, bodies, shells, suspensions and wheels.

Almost unanimously, the industry adopted the 14-inch wheel. Frames are new and in great variety, ranging from the sturdy X-frame of the Cadillac, to the straight-through Chrysler Corporation frame, to the billowing curves of the Ford frame.

Horsepower is up, but it is less shouted about this year in advertisements. (Safety also seems to be quietly ignored in the ads, this year.) In 1957, average horsepower is 234.6 compared with 209.4 in the

(Continued to page 296)

PRODUCTION OF PASSENGER CARS DURING 1956





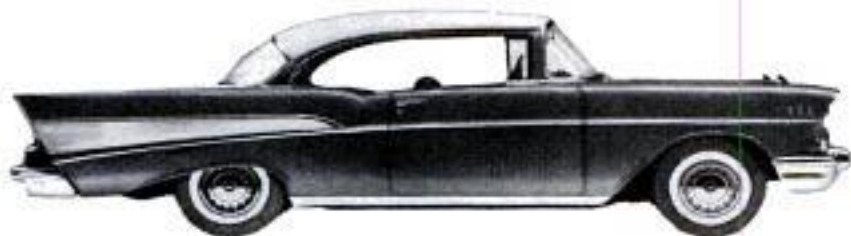
## BUICK

Completely new, Buick retains its identity. Still present are the identifying "holes" in the front fenders, the full fender cutouts for all wheels, the characteristic Buick grille. It's longer, lower and more powerful. It's also more expensive. Prices range from \$2545 to \$3994—up 8 percent.



## CADILLAC

Seen head-on, Cadillac looks much the same, but from the side and rear it takes on a new look. Most apparent is the new shape of the tailfin, Cadillac's trademark for so many years. Taillights are now mounted low, just above the bumper and the tailfin tapers to a featheredge, as did the Eldorado's last year. Prices range from \$4609 to \$7586—up 10 percent from 1956.



## CHEVROLET

After one of its most successful years, the Chevrolet has made only minor changes. It is the same basic car with all-new front sheet metal and grille, plus entirely new rear-end styling. It now has large tailfins and a massive front grille that looks somewhat like a Buick. It is 2½ inches longer, but at 200 inches is the second shortest in the industry. Prices range from \$1968 to \$2827—up 6.7 percent.





## CHRYSLER

You won't believe it until you measure them, but the new Chryslers are shorter than last year's. The low line and the wedge shape deceive you. Horsepower is 325 on New Yorkers, 295 on Saratogas (a new line this year) and 285 on Windsors. Prices range from \$3030 to \$4574—up 4.5 percent.



## CONTINENTAL

It's still the Mark II and there are no outward changes to identify it as the 1957 model. Under the sheet metal, though, there have been many engineering changes. Most important is a 28-pound reduction in weight as a result of changes in the frame construction. Announced this year was a convertible model built by a custom-body shop in Texas. Price is \$9695—up 1.5 percent.



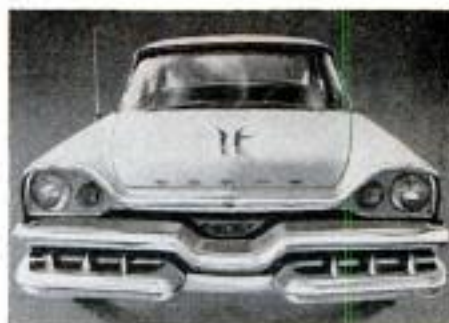
## DE SOTO

De Soto has added a new series to its line—the Firesweep. This is a clever combination of Dodge and De Soto that adds a lower-price model. Its front grille is different from the rest of the line, sharing Dodge sheet metal. All De Sotos have the flattened-U rear styling that makes them instantly recognizable. Prices range from \$2724 to \$3830—up 6.9 percent from 1956.



## DODGE

Although it increased wheelbase two inches, Dodge added only a fraction of an inch to over-all length. Its tucked-in tailfin styling makes it look about a foot lower (it's 3.8 inches lower). Styling is dramatically different. Displacement is up sharply to 325. Prices range from \$2329 to \$3091—up 5 percent.



## ELDORADO

Still awaited but due in the showrooms this month is the Eldorado Brougham (not shown here). Less fabulous, but fine nonetheless, are the Eldorado Seville hardtop and Biarritz convertible. Basically Cadillacs, they have sharply different rear-end styling. The \$10,000-plus Brougham will be different under the skin, too. Prices range from \$7218 to something over \$10,000.



## FORD

You have a choice of two sizes of Fords for '57, both being longer than the 1956 models. The big Fairlane is 9.2 inches longer. Promised for delivery this month is a hardtop convertible that converts (see *PM*, Jan. '57, page 115)—the first in the industry. Prices range from \$1953 to \$2746—up 5.1 percent (these do not include the as-yet-unpriced retractable hardtop).





## HUDSON

By changing the curve of the roof panel, Hudson has been able to lower its over-all height almost two inches while retaining the same body. It also adopted the 14-inch wheel. Prices range from \$2750 to \$3030—down 11.2 percent from 1956.



## IMPERIAL

There's no mistaking the Imperial. It's a completely distinctive car in the Chrysler family. The bomb-sight taillights are styled into the trailing edges of the rear fenders, no longer do they stand upright defiantly. Simulated tire cover on trunk lid is optional, as are dual headlights. From \$4661 to \$5646, apparently down from 1956, but it is impossible to be precise because models are not comparable.



## LINCOLN

Lincoln has given its front-end styling a new look by mounting four headlights in vertical pairs. Rear-end styling is drastically changed by sharply canted tailfins. New for 1957 is the four-door hardtop, first such model Lincoln has offered. All have dual exhausts, all develop 300 horsepower. Optional are electric door locks, nonslip differential. Prices range from \$4576 to \$5309, up 11.8 percent.





## MERCURY

Adding the Turnpike Cruiser, Mercury has invaded the upper-medium price field to leave space for the new Edsel below it in '58. The Cruiser has dual headlights, lowerable rear window and other innovations. Prices range from \$2536 to \$3500—up 7.9 percent on comparable models.



## NASH

Styling changes at Nash include an all-new front end with four small headlights. These lights have been moved out of the grille and into the normal location in the ends of the fenders. Taillights are larger, although similar in design to last year's. The roof is lower by two inches. Fourteen-inch wheels are used. From \$2750 to \$3030—down 9.4 percent.



## OLDSMOBILE

You'll have no trouble identifying the 1957 Oldsmobile despite its all-new styling. The typical Oldsmobile look is retained. It is much lower and longer. Innovations include a printed-circuit dashboard, power-assisted heater controls. Also new are four station wagons, two of which have pillarless hardtop styling. Prices range from \$2691 to \$4167—up 11.4 percent from 1956.





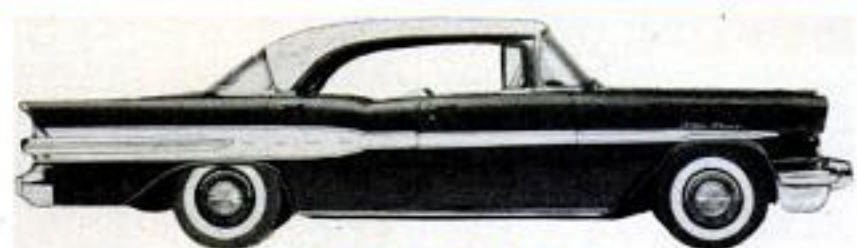
## PACKARD

Packard is making a new start with its Packard-Clipper series. The traditional prestige-laden Packard is gone. This new car is a Studebaker with Packard identification. It is powered by the Studebaker V8 with supercharger. Prices not yet available, but probably lower than in 1956.



## PLYMOUTH

Plymouth represents high styling at Chrysler Corporation and on it rests the company's hopes. It has performance, too. Engineering changes include torsion bars in front and a new frame. Rear-spring mountings are changed to reduce windup on starts and stops. Prices range from \$1978 to \$2608 (wagon prices not yet available)—up 5.2 percent from the 1956 series.



## PONTIAC

Slightly longer than last year's, the new Pontiac features a projectile-type side treatment that seems to add feet to its over-all length. It also, for the first time in years, has no Silver Streaks of chrome to identify it. Displacement is up with a longer stroke. The V8 engine has vented valve stems to keep oil from being sucked by during deceleration. Prices range from \$2428 to \$3446—up 8.3 percent.





## RAMBLER

Rambler offers a V8 engine, for the first time, in addition to its usual Six. The new V8 develops 190 horsepower with only a 250-cubic-inch displacement. Styling changes, after last year's all-new body, are minor. Prices range from \$1925 to \$2657—up 5.3 percent.



## STUDEBAKER

Studebaker increased its width and length for 1957, but its basic styling is unchanged. It has also introduced a four-door station wagon to the line. Offered this year is a special safety mounting for seats to prevent them from being torn loose in an accident. Prices range from \$2001 to \$2666—up 4.7 percent from 1956. For information on the Hawks, turn the page.



## VOLKSWAGEN

For the first time, a foreign car has moved ahead of some domestic cars in sales. That car is the Volkswagen. No changes were made for 1957 except the use of tubeless tires. In fact, Volkswagen styling has not changed since 1947. Prices range from \$1495 to \$2550, also unchanged.



# The Specials—Sports-Type, Personal Cars

A PHENOMENON of the American automobile industry is the special sports-type car. Examples are shown on this page.

Not a sports car (although the Corvette comes close) and not a family car, the sports-type car is often called a personal car, which means, apparently, that it isn't

roomy enough for the wife and children!

Whatever else the sports-type car is, it must be high-powered and fast. It is expensive, also. It is designed to appeal to the man who wants a sports car, but doesn't want to sacrifice the comfort and convenience of the reliable American automobile.



## CHRYSLER 300C

Consistently a winner of championships, the Chrysler 300C has 375 horsepower, the industry's top. It also has brake-cooling air intakes below headlights. In a Chrysler-run test, it went 145.7 m.p.h. Built as a two-door hardtop and convertible, prices are not yet available.



## CORVETTE

For \$480 extra you get fuel injection to give the Corvette 283 horsepower and with only 283 cubic inches! It comes either as a convertible or hardtop (with power windows and top). Price: \$3427.



## GOLDEN HAWK

Supercharged and loaded with power, the Golden Hawk develops 275 horsepower. The supercharger provides peak power in acceleration and cuts out for economy at cruising speed. Tailfins are new this year. Price is \$3182.



## THUNDERBIRD

If you want performance plus, the Bird's optional 312-cubic-inch engine has 285 horsepower. Standard Bird engine develops 212 horsepower. The rear end is longer and the spare is now back inside the trunk. Hard and soft tops are available. Price: \$3367.

# SPECIFICATIONS OF THE 1957 CARS

	Lowest-Price 4-Door Model	Shipping Weight	Wheelbase	Over-All Length	Over-All Width	Over-All Height	Turn-Circle Diameter	Displacement	Max. Hp.	Comp. Ratio	Max. Torque	Bore and Stroke	
<b>VOLKSWAGEN</b> Two-door sedan	\$1495	1600	94.5	160.0	60.5	59.0	36.0	72.7	36	6.0		3.031x2.520	<b>VOLKSWAGEN</b> Two-door sedan
<b>RAMBLER</b> Deluxe Six Custom V8	\$1925 \$2285	2801 3179	108.0 108.0	191.1 191.1	71.3 71.3	58.0 58.4	37.5 37.5	195.0 250.0	125 190	8.25 8.00	175 240	3.125x4.250 3.50 x 3.25	<b>RAMBLER</b> Deluxe Six Custom V8
<b>FORD</b> Custom Six Custom 300 V8 Fairlane 500 V8	\$2004 \$2219 \$2395	3197 3334 3452	116.0 116.0 118.0	201.7 201.7 207.7	77.0 77.0 77.0	57.2 57.2 57.2	40.1 40.1 40.6	223.0 271.0 292.0	144 100 212	8.6 8.6 9.1	212 270 297	3.62 x 3.60 3.62 x 3.30 3.75 x 3.30	<b>FORD</b> Custom Six Custom 300 V8 Fairlane 500 V8
<b>CHEVROLET</b> One-Fifty Six Two-Ten V8 Bel Air V8	\$2020 \$2246 \$2405	3281 3291 3353	115.0 115.0 115.0	200.0 200.0 200.0	73.9 73.9 73.9	59.9 59.9 59.9	41.5 41.5 41.5	235.5 265.0 283.0	140 162 220	8.0 8.0 9.5	210 257 300	3.56 x 3.94 3.75 x 3.00 3.87 x 3.00	<b>CHEVROLET</b> One-Fifty Six Two-Ten V8 Bel Air V8
<b>PLYMOUTH</b> Plaza Six Plaza V8 Belvedere V8	\$2025 \$2125 \$2380	3260 3405 3475	118.0 118.0 118.0	204.0 204.6 204.6	78.2 78.2 78.2	56.5 56.6 56.6	42.4 42.4 42.4	230.0 277.0 301.0	132 197 215	8.0 8.0 8.5	205 270 285	3.25 x 4.63 3.75 x 3.13 3.91 x 3.13	<b>PLYMOUTH</b> Plaza Six Plaza V8 Belvedere V8
<b>STUDEBAKER</b> Champion Six Commander V8 Pres. Classic V8 Silver Hawk Six Silver Hawk V8 Golden Hawk V8	\$2040 \$2173 \$2558 \$2142 \$2263 \$3182	2810 3140 3270 2790 3185 3400	116.5 116.5 120.5 120.5 120.5 120.5	202.4 202.4 206.4 203.0 203.0 203.0	75.8 75.8 75.8 71.3 71.3 71.3	59.5 59.8 59.9 54.7 54.7 55.1	39.5 30.5 41.0 41.0 41.0 41.0	185.6 250.2 280.0 185.6 280.0 280.0	161 180 225 101 78 275	7.8 7.8 8.3 7.8 7.8 7.5	152 260 305 152 300 333	3.00 x 4.375 3.563x3.250 3.563x3.625 3.00 x 4.375 3.563x3.250 3.563x3.625	<b>STUDEBAKER</b> Champion Six Commander V8 Pres. Classic V8 Silver Hawk Six Silver Hawk V8 Golden Hawk V8
<b>DODGE</b> Coronet Six Coronet V8 Custom Royal V8	\$2410 \$2518 \$2826	3470 3620 3690	122.0 122.0 122.0	212.2 212.2 212.2	77.0 77.0 77.0	56.6 56.8 56.8	43.8 43.8 43.8	210.0 325.0 325.0	138 245 260	8.0 8.5 8.5	208 320 335	3.25 x 4.63 3.69 x 3.80 3.69 x 3.80	<b>DODGE</b> Coronet Six Coronet V8 Custom Royal V8
<b>PONTIAC</b> Chieftain V8 Super Chief V8 Star Chief V8	\$2492 \$2620 \$2804	3560 3585 3630	122.0 122.0 124.0	206.8 206.8 213.8	75.0 75.2 75.2	60.0 60.1 60.1	42.5 42.5 43.0	347.0 347.0 347.0	227 244 244	8.5 8.5 8.5	333 338 338	3.94 x 3.56 3.94 x 3.56 3.94 x 3.56	<b>PONTIAC</b> Chieftain V8 Super Chief V8 Star Chief V8
<b>MERCURY</b> Monterey V8 Montclair V8 Turnpike Cruiser	\$2605 \$3148 \$3500	3800 3905 4050	122.0 122.0 122.0	211.1 211.1 211.1	79.1 79.1 79.1	56.6 56.6 56.6	43.3 43.3 43.3	312.0 312.0 368.0	255 255 290	9.75 9.75 9.75	340 340 405	3.80 x 3.44 3.80 x 3.14 4.00 x 3.66	<b>MERCURY</b> Monterey V8 Montclair V8 Turnpike Cruiser
<b>BUICK</b> Special V8 Century V8 Super V8 Roadmaster V8	\$2609 \$3256 \$3623 \$3981	4001 4156 4354 4469	122.0 122.0 127.5 127.5	208.4 208.4 215.3 215.3	74.8 74.8 77.6 77.6	58.4 58.7 59.4 59.3	43.2 43.2 44.5 44.5	364.0 364.0 364.0 364.0	210 300 300 300	8.0 10.0 10.0 10.0	340 400 400 400	4.125x3.40 4.125x3.40 4.125x3.40 4.125x3.40	<b>BUICK</b> Special V8 Century V8 Super V8 Roadmaster V8
<b>DE SOTO</b> Fireweed V8 Firestone V8 Fireflite V8	\$2724 \$2898 \$3427	3675 3955 4025	122.0 126.0 126.0	215.8 218.0 218.0	78.2 78.2 78.2	56.7 57.0 57.0	43.8 45.3 45.3	325.0 341.0 341.0	245 270 295	8.5 9.25 9.25	320 350 375	3.69 x 3.80 3.78 x 3.80 3.78 x 3.80	<b>DE SOTO</b> Fireweed V8 Firestone V8 Fireflite V8
<b>HUDSON</b> Hornet Super V8	\$2750	3589	121.3	209.3	78.0	60.4	42.0	327.0	255	9.0	345	4.00 x 3.25	<b>HUDSON</b> Hornet Super V8
<b>NASH</b> Ambassador V8	\$2750	3507	121.3	209.3	78.0	60.4	42.0	327.0	255	9.0	345	4.00 x 3.25	<b>NASH</b> Ambassador V8
<b>OLDSMOBILE</b> Eighty-Eight V8 Super 88 V8 Ninety-Eight V8	\$2750 \$2988 \$3601	4000 4040 4347	122.0 122.0 126.0	208.2 208.2 216.7	76.4 76.4 76.4	58.2 58.2 58.2	42.0 42.0 43.0	370.7 370.7 370.7	277 277 277	9.5 9.5 9.5	400 400 400	4.0 x 3.687 4.0 x 3.687 4.0 x 3.687	<b>OLDSMOBILE</b> Eighty-Eight V8 Super 88 V8 Ninety-Eight V8
<b>PACKARD</b> Clipper V8	N.A.	3400*	120.5	211.8	76.0	60.1	40.5	280.0	275	7.8	333	3.563x3.025	<b>PACKARD</b> Clipper V8
<b>CHRYSLER</b> Windsor V8 Saratoga V8 New Yorker V8 300C	\$3030 \$3660 \$4108	3905 4165 4315	126.0 126.0 126.0 126.0	210.2 219.2 219.2 219.2	78.8 78.8 78.8 78.8	57.0 57.0 57.2 54.7	45.3 45.3 45.3 45.3	354.0 354.0 392.0 392.0	285 295 325 375	9.25 9.25 9.25 9.25	365 390 430 420	3.94 x 3.63 3.94 x 3.63 4.00 x 3.90 4.00 x 3.90	<b>CHRYSLER</b> Windsor V8 Saratoga V8 New Yorker V8 300C
<b>CADILLAC</b> Series 62 V8 Series 60 V8 Series 75 V8 Eldorado Seville	\$4713 \$5539 \$7348 \$7218	4505 4755	129.5 133.0 149.8 129.5	215.9 224.1 236.2 221.1	80.0 80.0 80.0 80.0	59.1 59.1 61.6 57.0		365.0 365.0 365.0 365.0	300 300 300 325	10.0 10.0 10.0 10.0	400 400 400 400	4.00 x 3.625 4.00 x 3.625 4.00 x 3.625 4.00 x 3.625	<b>CADILLAC</b> Series 62 V8 Series 60 V8 Series 75 V8 Eldorado Seville
<b>LINCOLN</b> Capri V8 Premiere V8	\$4722 \$5222	4660 4660	126.0 126.0	224.6 224.6	80.3 80.3	60.2 60.2	45.5 45.5	368.0 368.0	300 300	10.1 10.1	415 415	4.00 x 3.66 4.00 x 3.66	<b>LINCOLN</b> Capri V8 Premiere V8
<b>IMPERIAL</b> Imperial V8 Crown V8 LeBaron V8	\$4764 \$5325 \$5646	4646 4740 4765	129.0 129.0 129.0	224.0 224.0 224.0	81.2 81.2 81.2	56.7 56.7 56.7	46.4 46.4 46.4	392.0 392.0 392.0	325 325 325	9.25 9.25 9.25	430 430 430	4.00 x 3.90 4.00 x 3.90 4.00 x 3.90	<b>IMPERIAL</b> Imperial V8 Crown V8 LeBaron V8
<b>CONTINENTAL</b> Two-dr. hardtop	\$6695	4797	126.0	218.5	77.5	56.0	45.3	368.0		10.0		4.00 x 3.66	<b>CONTINENTAL</b> Two-dr. hardtop
<b>THUNDERBIRD</b> Two-door hardtop Optional engine	\$3367	3290	102.0	181.4	72.8	51.6	34.0	292.0 312.0	212 245	9.1 9.7	297 332	3.75 x 3.30 3.80 x 3.44	<b>THUNDERBIRD</b> Two-door hardtop Optional engine
<b>CORVETTE</b> Two-door hardtop With fuel injection	\$3437 \$3917	2730	102.0	168.0	70.5	51.1	36.9	283.0 283.0	220 283	9.5 10.5	300 290	3.875x3.00 3.875x3.00	<b>CORVETTE</b> Two-door hardtop With fuel injection

## NOTES

\* Estimated.  
† Overdrive standard.  
‡ With optional engine.  
§ Automatic transmission standard.  
All specifications except Studebaker Hawks, Chrysler 300C, Cadillac Eldorado, Continental, Thunderbird, Corvette and Volkswagen are for four-door models. For those cars that do not offer four-door sedans, specifications are for the equivalent four-door hardtop.

All dimensions are in inches except turn-circle diameters which are in feet.

Prices are the advertised-delivered price and include federal taxes and all charges except freight to your city, optional equipment, state and local taxes.

All horsepower ratings are for standard equipment models only, except as noted. Additional horsepower is available on many cars with various extra-cost options.



# Compare the 1957 Cars

**S**PECIFICATIONS can be confusing when you have nothing to compare. Properly organized, they will save you time and effort.

Here, in order, are various vital statistics on the new cars. Also shown are industry averages. All are for four-door models when they are available.

These lists will be helpful if you have a long-legged mother-in-law who demands plenty of room in the back seat. If garage space is a problem, the answers are here also.

Prices shown include Federal taxes and everything but freight to your city, optional equipment and state or local taxes.

## Displacement

Imperial	392.0
Chrysler New Yorker	392.0
Oldsmobile	370.7
Continental	368.0
Lincoln	368.0
Mercury Turn. Cruiser	368.0
Cadillac	365.0
Buick	364.0
Chrysler Windsor	354.0
Chrysler Saratoga	354.0
Pontiac	347.0
De Soto	341.0
Nash	327.0
Hudson	327.0
De Soto Firesweep	325.0
Dodge	325.0
Mercury	312.0

**Average 306.50**

Plymouth	301.0
Packard	289.0
Studebaker Classic	289.0
Plymouth Plaza V8	277.0
Ford Custom V8	272.0
Chevrolet V8	265.0
Studebaker Commander	259.2
Rambler V8	250.0
Chevrolet 6	235.5
Dodge 6	230.0
Plymouth 6	230.0
Ford 6	223.0
Rambler 6	195.6
Studebaker Champ	185.6

## Horsepower

(Standard equipment only)

Imperial	325
Chrysler New Yorker	325
Cadillac	300
Buick Roadmaster	300
Buick Super	300
Buick Century	300
Lincoln	300
Chrysler Saratoga	295
De Soto Fireflite	295
Mercury Turn. Cruiser	290
Chrysler Windsor	285
Oldsmobile	277
Packard	275
De Soto Firedome	270
Dodge Cust. Royal	260
Hudson	255
Nash	255
Mercury Montclair	255
Mercury Monterey	255
De Soto Firesweep	245
Dodge Royal	245
Pontiac Super Chief	244
Pontiac Star Chief	244

**Average 234.58**

Pontiac Chieftain	227
Plymouth Savoy V8	215
Plymouth Belvedere V8	215
Ford Fairlane 500 V8	212
Buick Special	210
Studebaker Classic	210
Plymouth Plaza V8	197
Rambler V8	190

Ford Custom V8	190
Studebaker Comm. V8	180
Chevrolet V8	162
Ford Custom 6	144
Chevrolet 6	140
Dodge 6	138
Plymouth 6	132
Rambler 6	125
Studebaker Champion	101

## Shipping Weight

Continental	4797
Imperial LeBaron	4765
Cadillac 60	4755
Imperial Crown	4740
Lincoln	4660
Imperial	4646
Cadillac 62	4595
Buick Roadmaster	4469
Buick Super	4354
Oldsmobile 88	4347
Chrysler New Yorker	4315
Chrysler Saratoga	4165
Buick Century	4156
Olds Super 88	4049
De Soto Fireflite	4025
Buick Special	4001
Oldsmobile 88	4000
Chrysler Windsor	3995
De Soto Firedome	3955
Mercury Montclair	3905
Mercury Monterey	3890

**Average 3818.2**

Dodge Custom Royal	3690
De Soto Firesweep	3675
Pontiac Star Chief	3630
Dodge Royal	3620
Nash	3597
Hudson	3589
Pontiac Super Chief	3585
Pontiac Chieftain	3560
Plymouth Belvedere	3475
Dodge 6	3470
Ford Fairlane	3452
Plymouth Savoy	3415
Plymouth Plaza	3405
Packard (estimated)	3400
Ford Custom	3334
Chevrolet 6	3300
Chevrolet V8	3291
Studebaker Classic	3270
Plymouth Plaza 6	3260
Ford Custom 6	3197
Rambler V8	3179
Studebaker Comm. V8	3140
Rambler 6	2891
Studebaker Champ. 6	2810

## Over-all Length

Cadillac	236.2
Lincoln	224.6
Cadillac 60	224.4
Imperial	224.0
Chrysler	219.2
Continental	218.5
De Soto Firedome	218.0
De Soto Fireflite	218.0
Oldsmobile 98	216.7
Cadillac 62	215.9

De Soto Firesweep	215.8
Buick Super	215.3
Buick Roadmaster	215.3
Pontiac Star Chief	213.8
Dodge	212.2

**Average 211.89**

Packard	211.8
Mercury	211.1
Hudson	209.3
Nash	209.3
Buick Special	208.4
Buick Century	208.4
Oldsmobile 88	208.2
Olds Super 88	208.2
Ford Fairlane	207.7
Pontiac Chieftain	206.8
Pontiac Super Chief	206.8
Studebaker Classic	206.4
Plymouth	204.6
Studebaker Comm.	202.4
Studebaker Champ	202.4
Ford Custom	201.7
Chevrolet	200.0
Rambler	191.1

## Pounds Per Horsepower

(Standard equipment only)

Packard (estimated)	12.36
Chrysler New Yorker	13.28
De Soto Fireflite	13.64
Buick Century	13.85
Chrysler Windsor	14.02
Hudson	14.07
Nash	14.11
Chrysler Saratoga	14.12
Dodge Custom Royal	14.19
Imperial	14.30
Oldsmobile 88	14.44
Buick Super	14.51
Olds Super 88	14.62
De Soto Firedome	14.65
Pontiac Super Chief	14.69
Dodge Royal	14.78
Pontiac Star Chief	14.88
Buick Roadmaster	14.90
De Soto Firesweep	15.00
Mercury Monterey	15.25
Mercury Montclair	15.31
Cadillac 62	15.32
Lincoln	15.53
Stude. Pres. Classic	15.57
Pontiac Chieftain	15.68
Oldsmobile 98	15.69
Cadillac 60	15.85
Plymouth Savoy V8	15.88
Plymouth Belvedere V8	16.16
Ford Fairlane V8	16.28

**Average 16.62**

Rambler V8	16.73
Plymouth Plaza V8	17.28
Studebaker Comm.	17.44
Ford Custom V8	17.55
Buick Special	19.05
Chevrolet V8	20.31
Ford Custom 6	22.20
Rambler 6	23.13
Chevrolet 6	23.57
Plymouth Plaza 6	24.71
Dodge 6	25.14
Studebaker Champ. 6	27.82

### Front Hiproom

Cadillac 75	65.5
Buick Super	65.5
Buick Roadmaster	65.3
Cadillac 62	65.2
Cadillac 60	65.0
Nash	65.0
Hudson	65.0
Imperial	63.5
Chrysler	63.0
De Soto	63.0
Dodge	63.0
Plymouth	63.0

Average 62.59

Buick Special	62.5
Buick Century	62.5
Oldsmobile 88	62.5
Olds Super 88	62.5
Oldsmobile 98	62.3
Chevrolet	62.1
Pontiac	61.9
Lincoln	61.7
Mercury	61.3
Ford Custom	60.3
Ford Fairlane	60.0
Rambler	59.8
Continental	59.6
Packard	59.5
Studebaker	59.5

### Rear Hiproom

Cadillac 60	65.0
Cadillac 62	65.0
Buick Super	65.0
Buick Roadmaster	64.8
Hudson	64.5
Nash	64.5
Lincoln	63.8
Imperial	63.2
Pontiac	63.1
Chevrolet	63.0
Mercury	62.9
Chrysler	62.7
De Soto	62.7
Dodge	62.7
Plymouth	62.7
Buick Special	62.2
Buick Century	62.2
Oldsmobile 88	62.2
Olds Super 88	62.2

Average 62.20

Olds 98	62.0
Ford Custom	60.3
Ford Fairlane	60.1
Rambler	60.1
Packard	59.0
Studebaker	59.0
Cadillac 75	57.8
Continental	56.6

### Front Legroom

Imperial	46.2
Plymouth	45.9
Dodge	45.5
Chrysler	45.5
De Soto	45.5
Cadillac 60	45.2
Cadillac 62	45.0
Lincoln	44.8
Chevrolet	44.7
Oldsmobile 88	44.4
Ford Custom	44.3
Olds Super 88	44.2
Oldsmobile 98	44.2
Mercury	44.2

Average 44.11

Packard	44.0
Buick Super	44.0
Buick Roadmaster	43.6
Cadillac 75	43.5
Buick Special	43.4
Pontiac	43.4
Buick Century	43.3
Ford Fairlane	43.2
Rambler	43.0
Nash	42.5
Hudson	42.5
Continental	42.5
Studebaker	42.5

### Rear Legroom

Cadillac 60	45.3
Cadillac 62	45.2
Buick Super	45.0
Buick Roadmaster	45.0
Imperial	45.0
Chrysler	43.0
De Soto	43.0
Dodge	42.5
Lincoln	42.5
Buick Special	42.4
Buick Century	42.3

Average 42.05

Rambler	42.0
Pontiac Chieftain	42.0
Ford Custom	41.8
Pontiac Star Chief	41.8
Pontiac Super Chief	41.8
Oldsmobile 98	41.8
Oldsmobile 88	41.8
Olds Super 88	41.6
Plymouth	41.5
Mercury	41.4
Packard	41.0
Studebaker Classic	41.0
Ford Fairlane	40.7
Nash	40.1
Hudson	40.1
Chevrolet	39.8

Continental	39.1
Studebaker	39.0

### Front Headroom

Cadillac 75	36.6
Studebaker	36.5
Packard	36.5
Hudson	36.4
Nash	36.4
Chevrolet	36.0
Rambler	36.0
Pontiac	35.8
Buick Super	35.8
Lincoln	35.4
Oldsmobile 88	35.3
Plymouth	35.3

Average 35.27

Buick Century	35.2
Continental	35.1
Cadillac 62	35.0
Olds Super 88	34.9
Ford Custom	34.9
Oldsmobile 98	34.8
Chrysler	34.8
De Soto	34.8
Dodge	34.8
Buick Roadmaster	34.6
Imperial	34.5
Mercury	33.9
Ford Fairlane	33.9
Cadillac 60	33.9

### Rear Headroom

Pontiac	35.8
Chevrolet	35.6
Studebaker	35.5
Packard	35.5
Cadillac 75	35.3
Hudson	35.3
Nash	35.3
Rambler	35.0
Buick Super	35.0
Cadillac 62	34.9
Cadillac 60	34.7
Chrysler	34.6
De Soto	34.6
Continental	34.6

Average 34.50

Buick Roadmaster	34.3
Dodge	34.2
Imperial	34.2
Plymouth	34.2
Lincoln	34.1
Oldsmobile 88	33.8
Olds Super 88	33.8
Buick Century	33.8
Ford Custom	33.6
Ford Fairlane	33.6
Mercury	33.5
Oldsmobile 98	33.4
Buick Special	33.3

## ADVERTISED-DELIVERED PRICES

(Lowest-price 4-door models except as noted)

<b>\$1400</b>	Volkswagen 2-dr. ....\$1495	<b>\$2300</b>	Ford Fairlane V8.....\$2349	<b>\$3000</b>	Chrysler Windsor.....\$3030
<b>\$1500</b>	Metropolitan 2-dr.....\$1527		Chevrolet Bel Air V8...\$2362	<b>\$3100</b>	Mercury Montclair.....\$3148
<b>\$1900</b>	Rambler Deluxe 6.....\$1925		Plymouth Belvedere V8..\$2380	<b>\$3200</b>	Buick Century .....\$3296
<b>\$2000</b>	Ford Custom 6.....\$2004	<b>\$2400</b>	Ford Fairlane 500 V8...\$2395	<b>\$3400</b>	De Soto Fireflite.....\$3427
	Chevrolet 150 6.....\$2020		Stude. President V8....\$2407	<b>\$3500</b>	Mercury Turnpike Cruiser..\$3500
	Plymouth Plaza 6.....\$2025		Dodge Coronet 6.....\$2410	<b>\$3600</b>	Buick Super .....\$3623
	Stude. Champion.....\$2049		Pontiac Chieftain V8...\$2492		Chrysler Saratoga.....\$3660
	Rambler Super 6.....\$2065	<b>\$2500</b>			Oldsmobile 98.....\$3691
<b>\$2100</b>	Ford Custom V8.....\$2104		Dodge Coronet V8.....\$2518	<b>\$3900</b>	Buick Roadmaster.....\$3981
	Ford Custom 300 6.....\$2119		Stude. Pres. Classic V8...\$2538	<b>\$4100</b>	Chrysler New Yorker....\$4108
	Chevrolet 150 V8.....\$2120	<b>\$2600</b>		<b>\$4700</b>	Cadillac 62.....\$4713
	Plymouth Plaza V8.....\$2125		Mercury Monterey.....\$2605		Lincoln Capri.....\$4722
	Chevrolet 210 6.....\$2146		Buick Special.....\$2609		Imperial .....\$4764
	Rambler Custom 6.....\$2155		Pontiac Super Chief....\$2629	<b>Over \$5000</b>	Lincoln Premiere.....\$5222
	Plymouth Savoy 6.....\$2164		Dodge Royal.....\$2657		Imperial Crown.....\$5325
	Stude. Champ. Deluxe...\$2171	<b>\$2700</b>			Cadillac 60 Special.....\$5539
	Stude. Comm. V8.....\$2173		De Soto Firesweep.....\$2724		Imperial LeBaron.....\$5646
	Rambler Super V8.....\$2195		Hudson Super.....\$2750		Eldorado Seville 2-dr....\$7218
<b>\$2200</b>	Ford Custom 300 V8....\$2219		Nash Super.....\$2750		Cadillac 75.....\$7248
	Ford Fairlane 6.....\$2249	<b>\$2800</b>	Oldsmobile 88.....\$2756		Cadillac 75 Limousine...\$7586
	Chevrolet Bel Air 6.....\$2262		Pontiac Star Chief.....\$2804		Continental 2-dr.....\$9695
	Plymouth Savoy V8.....\$2264		Dodge Custom Royal....\$2826		
	Plymouth Belvedere....\$2280		De Soto Fire dome.....\$2898		
	Rambler Custom V8....\$2285	<b>\$2900</b>			
	Ford Fairlane 500 6....\$2295		Hudson Custom.....\$2940		
	Stude. Comm. Deluxe V8..\$2295		Nash Custom.....\$2940		
			Olds Super 88.....\$2988		

## WHAT IS A HORSEPOWER?

Officially, the definition of a horsepower is 550 foot pounds of work per second or 33,000 foot pounds of work per minute. That is the amount of work that James Watt decided a healthy horse could perform. But it doesn't mean much to most of us.

To give you an idea of what one horsepower is here is a different example:

If you weigh 165 pounds or so, climb one flight of stairs (about 10 feet of vertical climb) in three seconds and you are developing one horsepower.

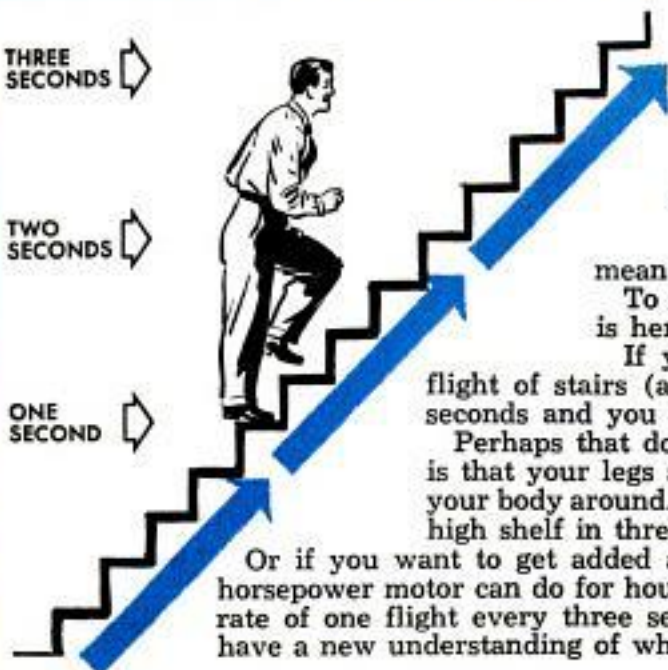
Perhaps that doesn't seem like much work. The reason is that your legs are strong and are accustomed to lifting your body around. Try raising a 165-pound box to a 10-foot-high shelf in three seconds and you'll be more impressed.

Or if you want to get added appreciation of how much work a one-horsepower motor can do for hours on end, climb those stairs all day at a rate of one flight every three seconds! After the first few flights you'll have a new understanding of what one horsepower really is!

THREE SECONDS

TWO SECONDS

ONE SECOND



# WHERE DO THE HORSES GO?

By Dale Kelly, SAE

**I**F ALL THE power developed by an automobile were available to accelerate the car, 70 horsepower would, according to simple engineering calculations, take a 4000-pound car from a standstill to 60 miles per hour in 13 seconds.

Yet modern cars capable of such performance have to develop, on a chassis dynamometer, a rear-wheel horsepower of 100 to 110 and they require an advertised engine output of around 200 horsepower. Apparently, considerable power is lost in converting gasoline energy to automobile performance.

This article, based in part on a series of

papers presented before the Society of Automotive Engineers, will show the various ways in which the heat energy of the gasoline reaching the carburetor is lost or wasted before a small fraction of it becomes available at the rear wheels to accelerate the car.

For illustration purposes, we will describe what happens in a car equipped with power steering, air conditioning, an engine with an advertised horsepower of 200, and a weight with two passengers of 4000 pounds. This imaginary car corresponds roughly to a so-called "loaded" car in the low-price field.

An engine advertised at 200 horsepower, running wide open on a test stand, uses about 15 gallons of gasoline per hour. The heat energy of this amount of gasoline would be equal, if completely converted to mechanical energy, to 750 horsepower or six times as much as can be obtained from the same amount of dynamite.

But even in the best of today's engines about half of the heat energy of the fuel is lost in the hot exhaust gases and almost half of what's left is carried to the radiator by the cooling water. Older, low-compression engines waste even more energy in the form of heat.

The remainder is converted to mechanical power and delivered to the tops of the pistons. This power can be measured with a cylinder-pressure indicator and is known as the indicated horsepower.

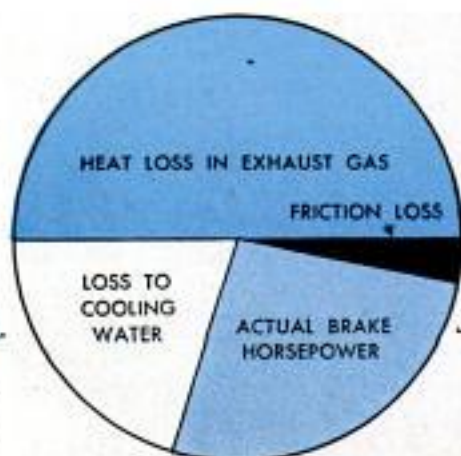
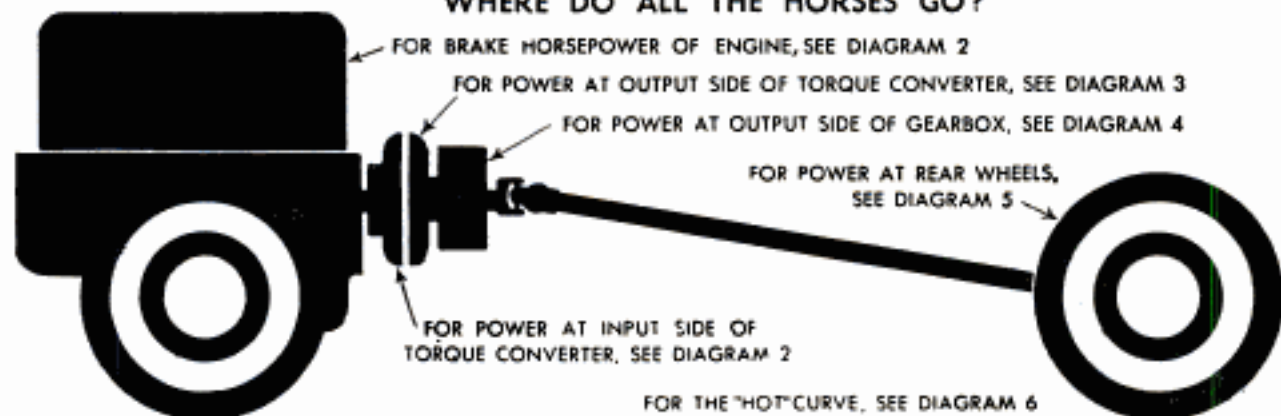


FIGURE 1

Horsepower ratings of cars go up every year. Engines of 300 horsepower are not unusual anymore. 200 horsepower seems to be a bare minimum for a family car these days. What happens to all this power? What is it used for? *PM* asked its engineering authority, Dale Kelly, to explain where all this horsepower goes. Here is his report with explanatory graphs.

### WHERE DO ALL THE HORSES GO?



But this indicated horsepower can do no work without moving pistons and other parts of the engine. That means additional power is lost in piston and bearing friction and in driving the oil and water pumps.

The remainder, about a quarter of the total energy in the fuel, is delivered to the dynamometer or "brake" with which an engine is loaded while on test and is known as the brake horsepower.

The dotted curve shows the indicated horsepower at various engine speeds. The curve just below it is the brake horsepower. The highest point on the brake-horsepower curve is the advertised horsepower.

Advertised horsepower is obtained on an engine not encumbered by a fan, generator, muffler or air cleaner. No heat is applied to the inlet manifold to inflate the air and reduce the weight the engine can draw in, and the ignition is advanced to maximum power setting regardless of whether ordinary gasoline would knock at such a setting.

Finally, the results are based on the relatively favorable atmospheric conditions adopted as standard by the Society of Automotive Engineers. These conditions include: Sea-level pressure, no water vapor to dilute the oxygen supply, and air entering the carburetor at a cool 60 degrees. That's how advertised horsepower is obtained. It is not the horsepower you get when you drive the car.

When the engine is installed in a car, the horsepower at high speed is reduced 7 percent by dual mufflers or 14 percent by a single muffler and another 3 percent by the air cleaner. These losses, however, are much less at medium speeds and negligible at low speeds.

Power is reduced from 1 to 5 percent by the amount of manifold heating usually supplied to give good warmup in cold weather and is reduced another 1 to 6 percent (more at low speed, less at high speed) by ignition timing necessary to prevent knocking on present fuels.

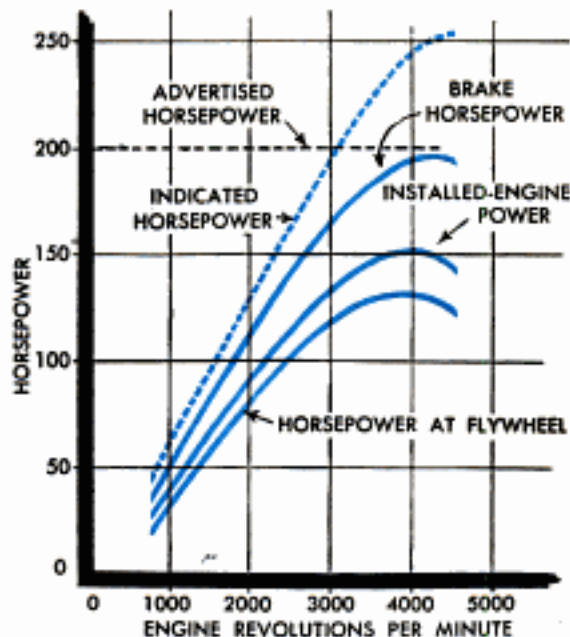


FIGURE 2

Driving in the average Detroit weather (instead of the SAE standard) would reduce the power at all speeds by about 10 percent.

The third curve on the graph (installed-engine power) shows that when all these factors are taken into account, our original 200 horses at 4400 revolutions per minute have shrunk to 153 at 4000 r.p.m. But this is only the beginning!

The generator drag depends on the

battery condition and on the electrical load.

With no load except the ignition, the generator requires about one horsepower when the battery is fully charged and about two horsepower when it is almost dead. This drag is increased about  $\frac{1}{4}$  horsepower by the headlights and  $\frac{1}{10}$  horsepower by a typical car radio.

A typical fan requires just over  $\frac{1}{2}$  horsepower at an engine speed of 2000 r.p.m., but the drag goes up with the third power of the speed. At twice the speed the fan requires eight times ( $2 \times 2 \times 2$ ) the power or  $4\frac{1}{2}$  horsepower.

This is inherently wasteful, because while  $\frac{1}{2}$  horsepower is occasionally needed to cool the engine at 2000 r.p.m., nothing remotely approaching  $4\frac{1}{2}$  horsepower is needed to move enough cooling air at any speed, slow or fast. If the fan were driven only when needed by a thermostatically controlled clutch, it would be idle most of

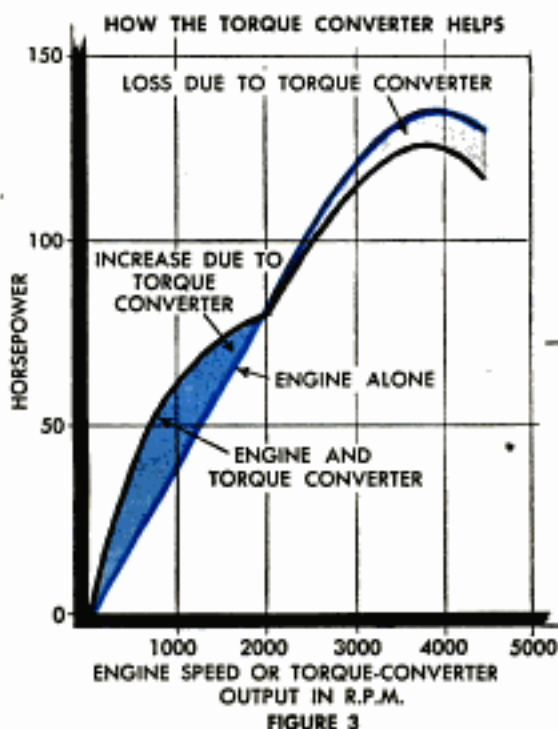
the time. Mercury now has such a clutch.

Air conditioning and power steering take engine power, too. The hydraulic pump used in power steering takes about 2 horsepower at 4000 r.p.m. when the car is moving straight ahead, more when turning.

A typical air-conditioner compressor takes 9 horsepower at an engine speed of 4000 r.p.m., but it does not run under load all the time unless the weather is extremely hot and the thermostat set for maximum.

The refrigerant condenser used in air conditioning is mounted ahead of the radiator and the size or speed of the engine fan increased. It may take  $7\frac{1}{2}$  horsepower.

From all the above you can see (by looking at the bottom curve in Figure 2) that the engine rated at 200 horsepower actually delivers 135 horsepower to the transmission when installed in a car with power steering and air conditioning and operated in hot weather.



The power developed by any internal-combustion engine is nearly proportional to its speed. In other words, it is poor at low engine speeds.

This fact, illustrated by the curves in Figure 2, is the reason why to get good performance at low car speeds you have to increase engine speed and, therefore, rear-wheel power by a transmission.

In most modern automatic transmissions, power from the engine flows first to a torque converter. At high car speeds, the entire torque converter locks together and turns as a unit, giving virtually no increase in engine revolutions. But at low car speeds the converter permits engine speed and power to increase and the added power is delivered in the form of increased torque at the converter output. This is shown by the blue area on the graph. The solid blue line shows what the power would have been without a converter.

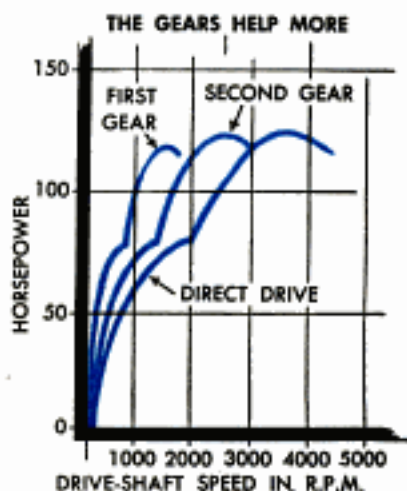
Note that the peak power at high speeds is somewhat cut down by losses in the torque converter (gray area). The lost power is evident as heat in the converter oil. At low speeds, the power is increased by the converter (black line).

Still more power at low car speeds can be obtained if the power output of the torque converter is made to pass through a gearbox with one or more gear ratios that can be engaged as needed.

Most modern transmissions have a planetary gear train with one or two forward speeds, in addition to direct drive and a reverse.

The power-output curve of the gearbox is similar in shape to the solid-black line shown in Figure 3, but it is pushed to the left by an amount which depends upon the gear ratio in use.

You can see that we have developed a more horizontal power curve. This is desirable for good performance under a variety of car speeds.





Combining those parts of the curves in Figure 4 that are used in a typical automatic transmission and deducting 5 percent for losses in the rear axle, we get the maximum power available at the rear wheels.

The lower solid-blue curve (marked "total power required to go at this speed") shows how sharply the need for more power increases as speed increases. Most of this sharp increase is due to wind resistance. Tire friction and front-wheel-bearing friction increase more gradually as speed increases.

The point where the two solid-blue lines come together is, of course, the maximum speed you can get from this car.

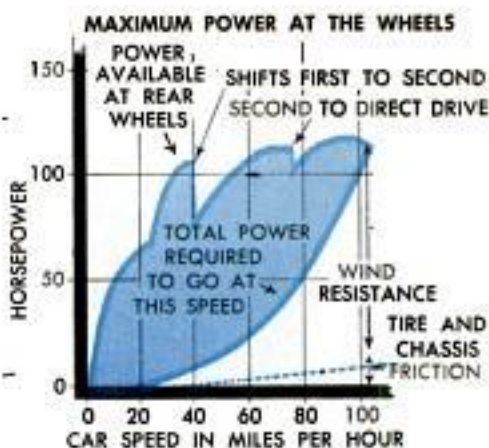


FIGURE 5

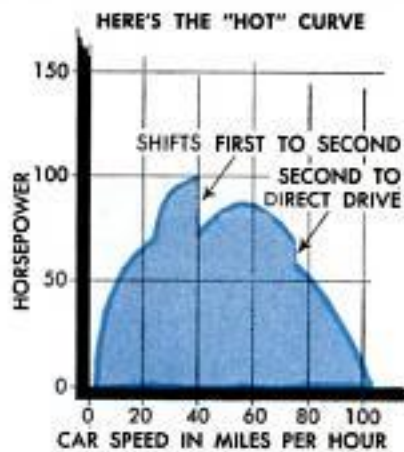


FIGURE 6

The height of this curve is equal to the height of the blue area in Figure 5.

It shows how much reserve power a motorist, cruising on the level, can call on by tramping down to accelerate or climb a hill. This is the horsepower curve that tells you how "hot" the car is. It is the only horsepower curve that does.

The curve drops to zero at a standstill

and at the maximum speed, but the horsepower is fairly constant in the middle-speed range where most driving is done. In the car considered here, reserve power is between 80 and 90 at most speeds from 20 to 70 miles per hour. From the standpoint of road performance, therefore, this car could be better described as an 85-horsepower car than as a 200-horsepower car.

Acceleration at any speed can be figured from the reserve horsepower at that speed. Simply divide the reserve power (per 1000 pounds of car weight) by the acceleration requirement below for any given speed. The result is the acceleration in miles per hour per second.

Speed, m.p.h.	20	30	40	50	60	70	80
Power requirement:	3.0	4.1	5.2	6.4	7.6	8.9	10.1

Thus if you have a reserve power of 100 at 60 miles per hour in a 4000-pound car, you can accelerate at a rate of 5.7 miles per hour per second from that speed.

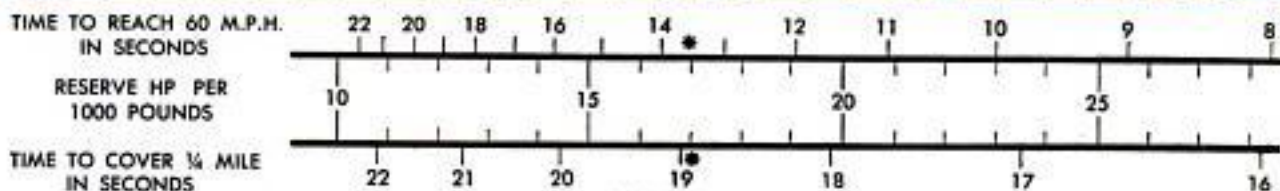


FIGURE 7

The approximate time required to reach 60 miles per hour or to cover a quarter of a mile from a standing start can be determined from the average reserve power.

For example, the car we are considering has an average reserve between 0 and 60 miles per hour of about 70 horsepower or about 17 horsepower per 1000 pounds. It will, therefore, reach 60 in about 13 or 14 seconds and cover a quarter mile in about 19 seconds (see asterisks on scale).

Conversely, if you have measured the time for 0-to-60 or for a quarter mile from a standing start, the chart shown here will give you the average reserve horsepower.

Incidentally, don't let anyone tell you that engine torque, rather than horsepower, is the real tipoff to car performance.

No matter how high the engine torque, the car can't give good all-around performance without a high ratio of reserve horsepower to weight.

Likewise, barring an improper rear-axle ratio or the use of the wrong transmission gear (for example, accelerating a manual-transmission car from 20 miles per hour in high gear) a good power-to-weight ratio will always give good performance, with perhaps some sacrifice in engine durability, no matter how low the torque.



Mystery: Find the road! Spectators come to the rescue of drivers mired in the soupy Australian quagmire



# The World's Toughest Car Test

By Roland Burggraf

Drivers help each other when the going gets too rough. If not, one stuck car will hold up the entire parade





It's midnight, but crowds await the cars in mid-Australian towns. Note the kangaroo guards on front of car

**A**USTRALIANS BELIEVE in legalized torture—at least of cars and drivers in the famed 'round-the-continent Reliability Trials.

Every year Australians put on two torturous car tests apparently designed to prove that anything will break if it is bent often enough!

Each trial covers as many as 8500 miles of snow, mountains, deserts, tropical bogs and rock-covered plains. And the object seems to be to avoid anything as civilized as a road wherever possible.

Prizes worth more than \$75,000 are at stake. One of the trials, the Mobilgas Trial, is open to all stock cars built since 1950. The other, the Ampol Trial, permits stocks of any year.

In the two trials, 210 cars took part last year. Only 55 of them finished. Dozens of drivers ended up in hospitals, some seriously injured trying to maintain the almost impossible average speed of 40 miles per hour required to keep from being penalized. Two drivers were killed when their car plunged over a cliff.

Four teams of drivers nearly died of thirst and starvation when their vehicles broke down in the baked desert country deep inside the big continent. Many others were saved from a similar plight by rescue aircraft.

Of the cars taking part, about half were written off as complete wrecks. The others ended up in dealers' showrooms as proof of their durability.

And proof it is indeed. The course is laid out to be as torturous as possible. Highways and roads are skirted wherever a goat

track can be found. Survey teams take about eight weeks to plot the course (a different course is used each year). Each trial tries to outdo the other in sadistic achievement.

Competitors are expected to cover the 8000 miles in two weeks. On various legs of the route, average speeds are even greater than 40 miles per hour.

In one trial, a maximum rest period of 12 hours for the crews met with bitter protests. Drivers complained that such a schedule made the trial more an endurance test for humans than a reliability test for cars.

There is actually a lot of both in the trials. Both driver and car have to be outstanding to come through successfully.

If the route turns out to be too easy, custom calls for the addition of a surprise section known as the "horror stretch." This section involves new, sadistic trails blazed into the heart of the mountainous timber country, and spiced with a sprinkling of virtually impassable creek beds and treacherous mud bogs. These horror stretches are usually saved for last-minute inclusion should a particularly skilled (and lucky) driver appear to be coming through without too many penalty points.

Thousands of spectators watch the trials across the continent, ranging from well-to-do socialites in Sydney to primitive aboriginals who roam the inland deserts in tribes. Helpful fans follow behind the cars in some areas or wait beside likely spots to help lift them out of bogs and creek beds. Every town provides hot food for weary drivers.



Home is a long way off at a time like this! Each trial has a "horror stretch" through the tropical jungle

When the trial does happen to be routed along a road, the cars are driven wide open to build up precious time advantage so there are extra minutes for engine adjustments and repairs at the next control point. Speeds of 100 miles per hour over gravel roads are not unusual—often with unfortunate results as the cars spin out, ending up in the ditch.

The most common hazard is the kangaroo. These mammals, which grow to a height of 10 feet and often weigh 500 pounds, frequent the center of the con-

tinent in packs numbering hundreds of thousands. When they decide to play tag with the contestants, there's little a driver can do. Their amazingly powerful hind legs carry them upward and forward in leaps of 40 feet or more. They bounce along in front of the cars with complete unconcern and sometimes, as the saying goes, they zig when they should have zagged or vice versa!

Over one 3000-mile stretch two well-known trials drivers drove continuously without sleep to pile up a fine record only to meet disaster when they hit a kangaroo, wrecking their car. Not only did the impact wreck the car, but the 'roo was thrown through the windshield scattering glass and hospitalizing both drivers for cuts and concussions.

One stage of the run that covered 1339 miles had to be covered in 36 hours and included only one two-hour meal break during the whole period. To meet that schedule required an average of almost 40 miles per hour for 36 hours with most of it on poor roads or no roads at all, in the normal meaning of the word.

There are other problems, too. Drivers complain that signposts are sometimes changed (either by unfair competitors

Too much speed, a soft, slick corner and this old-time Airflow Chrysler was out of the race. About 75 percent of the cars fail to make it home





On stretches like this, the cars are driven wide open to pick up valuable minutes for needed rest and repairs

or by local residents who resent the fact that the cars ruin their primitive roads) and as a result, cars wind up in dead-end canyons in the dark of night.

Thus far the trials have been dominated by the light European cars. Competing against dozens of big American and British cars, such light cars as the Renault, the Volkswagen and the Peugeot have taken almost all honors. The one exception was in 1953 when a 1948 Ford V8 won the open event.

This year, Volkswagen almost monopolized the winnings, taking the open and team events in the 7000-mile Ampol Trial and also in the 8500-mile Mobilgas Trial.

Of the American cars, the only recent success was chalked up by a Ford Customline which won the class and team events for the over-2500-cubic-centimeter class. However, it was 162 points behind the 1500-class Volkswagen in the open.

Drivers claim that the short body and almost complete lack of overhang, plus the indestructible air-cooled engine in the rear, make the VW the ideal trial car. Large American cars, though things of engineering beauty and artistic styling, are at a tremendous disadvantage in woods and swamps.

One thing is certain: Any car that finishes either trial can be proud of its stamina. There's no tougher car test in all the world!

★ ★ ★



Above, one De Soto hit a kangaroo and still finished. It was lucky. Often a total wreck is the result of such a collision. Below, crossing a bridge over an icy mountain stream. Part of the trial is along snow-covered roads in the Australian Alps



# DO SMALL CARS

**T**O FIND OUT for its readers how economical the small, foreign car is, *Popular Mechanics* set up a commuting test run from suburban Elgin, Ill., to downtown Chicago.

The one-way distance is about 39 miles. Half of it is on a four-lane highway with speed limits from 45 miles per hour to unlimited. The other half is on traffic-clogged city streets with 25-mile-per-hour limits.

Eight foreign cars were tested, ranging in price from about \$1200 to \$3400. They range in luxury from the austere Lloyd to the deluxe Borgward and Magette. They represent four countries: England, Ger-

many, France and Sweden, plus the British-American Metropolitan.

Three 1957 American cars were used for comparison: Chevrolet, Ford and Plymouth. No attempt was made to select the most economical model. Instead, the most popular model was used, this being the deluxe series with standard V8 engine and automatic transmission. This combination was considered the "normal" car bought and used by the man who drives to work.

Each car was driven morning and night over precisely the same route at the height of rush-hour traffic. The driver was alone in the car. The same driver made all runs.



## CHEVROLET:

Average miles per gallon: 14.02  
Weekly gasoline bill: \$8.35  
Gasoline cost per mile: 2.1 cents

**H**ERE IN THE United States something strange is taking place: Sales of small foreign cars are increasing faster than the sales of domestic cars (but they still are a mere one percent of the total market).

Foreign-car dealers report that orders are coming in faster than they can be filled. Many are months behind in deliveries. And, the dealers say, there has been a sudden switch in buyer interest from the small racy sports cars to nonglamorous, workaday family car.

What has brought this about? Is economy the reason? Is there enough economy of operation in the small car to override its disadvantages? *PM* wanted to find out.

To learn just how much an owner of a small car saves, *PM* tested eight foreign

cars in the manner described at the top of the page. Here, in summary, is what was learned:

- Small cars will save you considerable money if you drive many miles a day. The more you drive, the more you will save. On the commuter's route *PM* used (admittedly a long one) the saving on gasoline amounted to more than \$300 a year when the most economical small car was pitted against the least economical American car. Oil and tire savings are likely to be on the side of the lighter car also.

- Small cars will probably save you money on service because, being simpler, they are less likely to get out of order. And, when they do need servicing, they require less time because they are easier to work



## FORD:

Average miles per gallon: 12.82  
Weekly gasoline bill: \$9.13  
Gasoline cost per mile: 2.3 cents

# MAKE CENTS?

No attempt was made to squeeze maximum economy from any of the cars. They were driven so as to get the "owner" to work and back as quickly as possible.

A count was made of each stop so no car would be handicapped by extreme traffic situations. Standing time (stop lights and jams) was clocked and recorded. These delays averaged out over the trial period and all cars met about the same general conditions. What differences there were do not seem important enough to change the results of the test.

Finally, completely separate from the main test, a single one-way run was made to get the maximum economy. Speed was held to 55 miles per hour. No fast starts were made. In traffic, cars were driven along with the normal flow. No attempt was made to "get there first." The more economical results of this "relaxed" driving are described in the text of the article.



## PLYMOUTH:

Average miles per gallon:	13.81
Weekly gasoline bill:	\$8.48
Gasoline cost per mile:	2.2 cents



on and time is money in the repair shop.

- Small cars will probably save money on depreciation (with some exceptions) because they cost less and therefore drop less in value each year.

But does all this economy offset the disadvantages of the small car? Here are some limitations to be considered:

- Service is often not easy to obtain and, in some cases when obtainable, is not very good. However, this situation is improving as more foreign cars are sold.

- Comfort and roominess are sacrificed in the very small cars (in the larger "small" cars such as the Magnette and Borgward there is ample room for most uses). Passenger comfort suffers most. The driver in all these cars has plenty of room and, because he drives more effortlessly and with more maneuverability, he is likely to be excessively enthusiastic about his small car. But passengers, deprived of the fun of driving, may complain about the cramped quarters and of being tossed about by the quickness of the turns. Most of the small cars will seat only four adults. Some will seat five. Only one, the Borgward, will seat six persons.

- Very small cars are not likely to have the same prestige or social values as a new American car. Nor are they likely to be as frequently admired. They attract attention all right, but as often as not it will be critical. The small car looks fragile in traffic and is usually scorned by owners of bigger American models. It is also likely to be "pushed around" in traffic by big-car bullies.

Now let's discuss each of the 11 cars tested in more detail.

## Chevrolet Bel Air

Most economical of the three American cars tested was the Chevrolet Bel Air V8 with Powerglide automatic transmission.

During the test runs it averaged 14.02 miles per gallon on regular gasoline. It was a new car at the time the test was made and it is possible that it might require premium fuel (at an added cost per gallon but no added mileage) as it carbons up.

Average cost per mile for gasoline was 2.1 cents and, on the test run, its fuel bill was \$8.35 a week.

In the special "light footed" driving test, the Chevrolet averaged 17.15 miles per



**CITROEN 2CV:**

Average miles per gallon: 47.78  
Weekly gasoline bill: \$2.45  
Gasoline cost per mile: 0.6 cent



**LLOYD:**

Average miles per gallon: 35.45  
Weekly gasoline bill: \$3.30  
Gasoline cost per mile: 0.8 cent



**RENAULT DAUPHINE:**

Average miles per gallon: 35.08  
Weekly gasoline bill: \$3.34  
Gasoline cost per mile: 0.8 cent



**VOLKSWAGEN:**

Average miles per gallon: 31.22  
Weekly gasoline bill: \$3.75  
Gasoline cost per mile: 1.0 cent

gallon, the second best of the three American cars.

The 1957 Chevrolet is an extremely well assembled car, has excellent handling characteristics and responds well to the driver who sits high and has excellent visibility. The hood seems short (in fact, the entire car has a feeling of compactness despite its over-all length of 200 inches).

**Plymouth Belvedere**

Second best of the American cars in over-all economy was the Plymouth Belvedere V8 with the new three-speed Torqueflite automatic transmission.

The Plymouth averaged 13.81 miles per gallon during the test. In the special economy run, it took top honors among the American cars by averaging 17.38 miles per gallon.

The Plymouth V8 did not require premium gasoline and, although new at the time of the test, it probably will not ever require this extra-cost fuel because of the low-octane requirement of the engine.

Average cost per mile for gasoline was 2.2 cents, the weekly fuel bill was \$8.48.

The 1957 Plymouth suffered from those initial assembly troubles that plague all manufacturers when a new model is brought out. Interior fits were poor in several places.

Handling is excellent although the low front seat seems to make the driver feel the car is bigger than it is (actually it is slightly shorter than the 1956 Plymouth). Until accustomed to them, the high tailfins in the rear-view mirror may startle the driver into thinking somebody is right behind him. The rear-view-mirror location on the top of the dashboard is not good when there are three in the front seat, but it does eliminate a previous blind spot in the center of the windshield.

**Ford Fairlane 500**

Ford's Fairlane 500 was equipped with the standard V8 engine and Fordomatic transmission. It had about 1000 miles on it at the time of the test.

In the over-all mileage test, Ford averaged 12.82 miles per gallon to place third among the Big Three. Its weekly gasoline bill was \$9.13 and its cost per mile for gasoline was 2.3 cents. In the special economy run, the Ford averaged 16.29 miles per gallon, about one mile per gallon under the other two.

The Ford performed well on regular gasoline, although it is possible that premium fuel would be required when the engine carboned up.

Ford, too, handled very well in the traffic test. It, like the Plymouth, feels bigger than it is and requires some experience



before the driver is confident enough to slip into tight places in traffic.

The car seems to have exceptional acceleration from zero to 30 and caution is essential when feeding gas to the engine. The throttle foot has to be moved carefully or you may climb right up on the rear of the car ahead of you.

Production fits of the interior trim of the Ford were very good considering the fact that it is all new.

### Citroen 2CV

By far the most economical of all the cars tested was the uniquely ugly Citroen 2CV, a French import. It sells for about \$1300 in this country. It averaged an amazing 47.78 miles per gallon over-all and in the special economy run it went 50.78 miles to the gallon. Only regular gasoline was used. Fuel cost per mile was  $\frac{9}{10}$  cent—just over a half cent.

Driving the Citroen is an experience. The shift lever pulls in and out of the dashboard instead of shifting in the normal H-pattern. The two-cylinder air-cooled engine drives the front wheels and on sharp turns at low speed the car grabs as the wheels "dig" into the pavement. The model tested had an automatic clutch which made it impossible to stall the engine. Whenever the car stopped the clutch automatically disengaged. The clutch pedal had to be used for shifting, however. Shifting is easy to learn, and the car can be driven in town using only two speeds, second and third.

Top speed is a mere 45 miles per hour. Jackrabbit starts are impossible (this accounts for the relatively minor increase in economy of the light-footed run over the regular runs). Strong headwinds slow the car down noticeably.

Its front-wheel drive makes it an excellent winter-driving car and it should plow through snow effortlessly. It can be driven across fields and through ditches without damage. In France, the 2CV is the farmer's favorite "beast of burden."

Its ride is softer than anything you've experienced. If anything, it is too soft. On undulating surfaces, it is likely to start bobbing like a boat. Seats are extremely comfortable and can be lifted out quickly for use as lawn furniture.

### Lloyd

Another two-cylinder, air-cooled, front-drive import, the German Lloyd is better looking but not so impressive as the 2CV.

It is basic transportation and not much more. Despite a very small engine it does have excellent top speed, being capable of 60 miles per hour. However, at that speed it is noisy and not at all comfortable.

(Continued to page 300)



**BORGWARD ISABELLA:**

Average miles per gallon: 25.18  
Weekly gasoline bill: \$4.65  
Gasoline cost per mile: 1.2 cents



**VOLVO:**

Average miles per gallon: 24.38  
Weekly gasoline bill: \$4.79  
Gasoline cost per mile: 1.2 cents



**METROPOLITAN:**

Average miles per gallon: 24.02  
Weekly gasoline bill: \$4.87  
Gasoline cost per mile: 1.2 cents



**MG MAGNETTE:**

Average miles per gallon: 21.53  
Weekly gasoline bill: \$5.44  
Gasoline cost per mile: 1.4 cents

## PM Asked the Experts— the Men Who Tow Away the Wrecks

**They Say:**

# Cars Are Getting Safer, But . . .

**SLOW DOWN, MISTER,** slow down! That's the advice of the men who respond to auto-accident calls—the men who run the tow services of the nation.

Cars are getting safer, they say, but the public drives too fast. The best way to make cars safer would be to lower the top speed. These tow men feel that most accidents are caused by driving too fast. "Slow down and live" describes their viewpoint exactly.

Popular Mechanics asked 1000 operators of wrecking services all over the country about the 1956 cars. In 1956, you'll recall, such safety features as seat belts, crash-proof door latches, padded dashboards and visors and recessed steering columns were highly publicized.

These safety-stressed cars have been on the road for a year and we wanted to find out if the safety emphasis paid off.

Here is what these experts told us:

### ✓ Are the safety features in the 1956 cars saving lives?

Yes .....	70.9%
No .....	19.0%
Don't know.....	10.1%

### ✓ Which features are most effective in saving lives?

Seat belts.....	40.9%
Safety door latches.....	22.1%
Padded dashboards.....	19.7%
Deep-dish steering wheel.....	11.8%

There was considerable agreement, as you can see, on the value of seat belts, but in almost every case there was the qualification "if they were worn." Many owners apparently are sitting on their seat belts instead of wearing them. The wrecker servicemen emphasize that belts must be worn all the time, not only when driving fast.

### ✓ What is the value of seat belts?

Excellent, if worn.....	83.4%
Don't recommend them.....	8.6%
Don't know.....	0.8%

### ✓ Which features are least effective in saving lives?

Padded dashboards.....	11.8%
Padded visors.....	10.2%
Deep-dish steering wheels.....	8.0%
Safety door latches.....	7.1%

### ✓ Do safety door latches keep doors closed in accidents?

Yes, they do.....	57.5%
No, they don't.....	24.4%
Sometimes or don't know.....	18.1%

### ✓ Do hardtop roofs offer as much protection as sedan roofs?

No, they don't.....	63.0%
Yes, they do.....	24.4%
About same or don't know.....	12.6%

### ✓ How can present cars be made safer?

Lower the top speed.....	21.3%
Provide less horsepower.....	15.0%
Improve the brakes.....	14.1%
Only by driver education.....	14.1%
Build stronger frames, bodies.....	13.4%
Install roll bars.....	8.0%

**WE WENT** to the Auto Show—the 42nd National Automobile Show in New York, the first national show since 1940.

But unlike most of those who attended, our interest was not in 1957, but in 1958—and after. What comes next?

We asked a lot of questions. We talked to scores of persons from the beautiful models in the Pontiac exhibit (who, by the way, don't like high tailfins) to Harlow H. Curtice, president of General Motors (who doesn't like them either!).

Here are some impressions of interest, things you didn't read in the newspapers:

- There will be no unit body in the General Motors line for 1958 despite lots of rumors to the contrary. Take it from Mr. Curtice, who stated so with finality.

- There will be an all-new Chevrolet and an all-new Pontiac that, for the first time, won't be sisters under the skin. As Ford and Mercury did for 1957, Chevrolet and Pontiac will part company in 1958 with two separate body shells. And they will be even lower than the low cars of today. Look for Chevrolet to offer fuel injection at a much lower price in 1958. That \$480 price tag on the Ramjet system is completely unrealistic. It doesn't cost anything close to that to build. The aim of the high price is to keep too many buyers from ordering it. By next year, the system will be better suited for mass production and servicing and you will see it with a much lower price.

Ed Cole, general manager of Chevrolet, told this reporter that in three years he expects fuel injection to be on 30 percent of the Chevrolets sold. The extra price would be only about \$50, he guessed. (Actually, very few engineers seem ready to argue that there is anything spectacular about fuel injection except that it's the latest, the newest and therefore the best sales pitch they can offer. You can get just about the same performance from three two-barrel carburetors at a lower price.) With fuel injection and some other engine tricks, Chevrolet will probably offer at least 300 horsepower in 1958.

- There is no evidence that the industry is taking up the small-car challenge. Mr. Curtice told this reporter that even if Volkswagen sales jumped to more than 150,000 units a year in this country it wouldn't be enough to warrant GM's entering the market (current VW sales: 60,000 a year). Tooling costs (everything would have to be new—body, engine, running gear) would make the price too high unless sales were 200,000 or so.

But George Romney of American Motors is not of the same opinion. He says he could make money on a much smaller number of units. He may go into the mar-

# Detroit Listening Post



By Art Railton

ket seriously after 1958, but his first aim is to get through 1957 with a profit. Romney didn't say it, but it is known that American Motors is working on a four-passenger version of the Metropolitan. AM seems to have tied its future to the small car. It is probable that the Met and the Rambler will become the basic cars of the company in a few years. Romney did state that the Hudson and Nash would remain distinctive in size from the Rambler in 1958. So there apparently is no plan to drop the big cars.

If plans work out, look for future Hudson-Nash models to have swivel seats, lounge chairs, high-fidelity radio and record players, television and other special comfort features that will set them apart as long-distance high-comfort cars. The Rambler will then become the normal-use family car. The Met will be the grocery-store, down-to-the-station car.

- Edsel, Ford's new car for 1958, will have plenty of interchangeability of parts with both Ford and Mercury.

- Studebaker-Packard unveiled the 1957 Packard for the first time. It is, as stated here months ago, a big Studebaker with Packard trim. It is to be called the Packard Clipper. Eventually, it may be the Studebaker Clipper.

Harold E. Churchill, president of S-P, said that the rest of the industry is just catching up with the advanced styling of the 1953 Studebaker. He's right, but in this business it's just as dangerous to be ahead of the trend as to be behind it.

Kaiser-Frazer had slab sides, low belt lines, low seats, 1958-style steering wheels and many other features of today's cars, but they failed despite them. Styling awards rarely go to cars that sell—it's the prize-winners that seem to go broke.

- Buick will have its new transmission ready for 1958. It is basically the same design as the new Chevrolet transmission although nothing about it is the same in production. This Chevrolet job (known as

(Continued to page 308)



Photo courtesy Autocar Magazine

Start of British Grand Prix at Silverstone. Schell (arrow) failed to finish. Winner was Fangio in a Ferrari

# *I Race in the Big*

**G**RAND PRIX racing is to Europeans what the World Series is to Americans. And if I ever won the championship, I would feel the way Don Larsen must have felt when he pitched the perfect game last fall.

Because I'm a Grand Prix race driver. Racing is as much a part of me as my blood. It's something I couldn't stop doing

even if I wanted to—and I will never want to.

I'm an unusual figure on the race course—an American Grand Prix racer. Most Americans have never heard of it, or if they have, they probably don't know how to pronounce it (incidentally, it's "Grahnd Pree").

Grand Prix racers drive the ultimate in

Harry Schell, who tells his story here, corners the Vanwall Grand Prix racer on the circuit at Silverstone





Photo courtesy Autocar Magazine

Seconds after the start of the Belgian Grand Prix, Schell runs sixth (arrow). He finished in fourth place

# Leagues

By Harry Schell

AMERICA'S ONLY GRAND PRIX DRIVER

Schell, an American who lives in Paris, is the only full-time G.P. driver wearing the blue and white of America. Here he is after a Vanwall victory at Castle Coomb



Schell's big thrill was just ahead at this moment—the start of the French Grand Prix at Reims. The arrow points to Schell's car which failed only two laps later. He then continued the race in a teammate's car and battled it out with the three Ferraris that lead the field here. Fangio, world's champion driver, is in the lead Ferrari, number 14



automobiles. Each car is designed to do everything as perfectly as it can be done.

It must accelerate fast. It must corner fast. It must brake fast. It must do all these things continuously for hundreds of miles, its engine roaring at top speed all the time. It must be the finest piece of machinery man can put together.

In the German Grand Prix circuit at Nurburgring, there is a corner coming up every three seconds! Drivers make gear changes every 15 seconds. It's a 14-mile course with more twists and curves than a basket of pretzels. It climbs to a height of 2000 feet and descends quickly to 600 feet. I've never counted them, but I've been told there are 180 curves in the course.

That may sound like an obstacle course—and it is. But the amazing thing is that the lap record for the 14 miles is an average of 87.74 miles per hour. That record was set by the world's champion and the world's greatest driver, J. M. Fangio of Argentina, in a Ferrari last summer.

Compared with someone like Fangio, the greatest driver of the generation, I am an all-thumbs novice, but I've battled it out with him on occasion. He always wins, though.

My biggest thrill came last July in the Grand Prix of Reims in France. I was number-one driver of the Vanwall team. The Vanwall is a British four-cylinder car built by Tony Vanderwell. It has done very well so far and promises to be a great car in this year's racing.

I started in the second row alongside my Vanwall teammate, Mike Hawthorn. Ahead of us in the front row were three Ferraris, driven by Fangio, Collins (the world's number-three driver) and Castellotti.

My orders from Tony Vanderwell were: "Watch the engine limit of 7100 r.p.m. Please don't break my car. Do the best you can."

To be told to do what you want in a race like this against the world's greatest is a wonderful expression of confidence. It is also a tremendous responsibility.

With the high-pitch bark of the Ferraris leading the way, the race started.

For the first two laps I was



Here's how they were in the great attack at Reims: Fangio, Castellotti, Collins, Schell (arrow) and Moss

fourth, hanging tight to the tails of the three Ferraris. Then, bang, went my big dream!

The rear axle broke. I limped into the pits. The race we had prepared so hard for, had worked night and day to win, was over in two quick laps. Such are the heartbreaks of racing.

Repairs were made and I went back into the race, but far behind the leaders. I

was feeling hopelessly beaten when suddenly my teammate, Mike Hawthorn, roared past making a signal as he went by. I understood instantly.

Mike was giving me another chance. He was asking me if I wanted his car. He was right up there with the leaders. I sped around the course as fast as my car would make it and waited in the pits for Mike to come in.

What a magnificent gesture he was making! He, an Englishman, driving an English car, was offering to turn it over to me, an



Schell drives his blue-and-white Maserati to the lead in the Grand Prix of Argentina. He was later relieved in a state of exhaustion

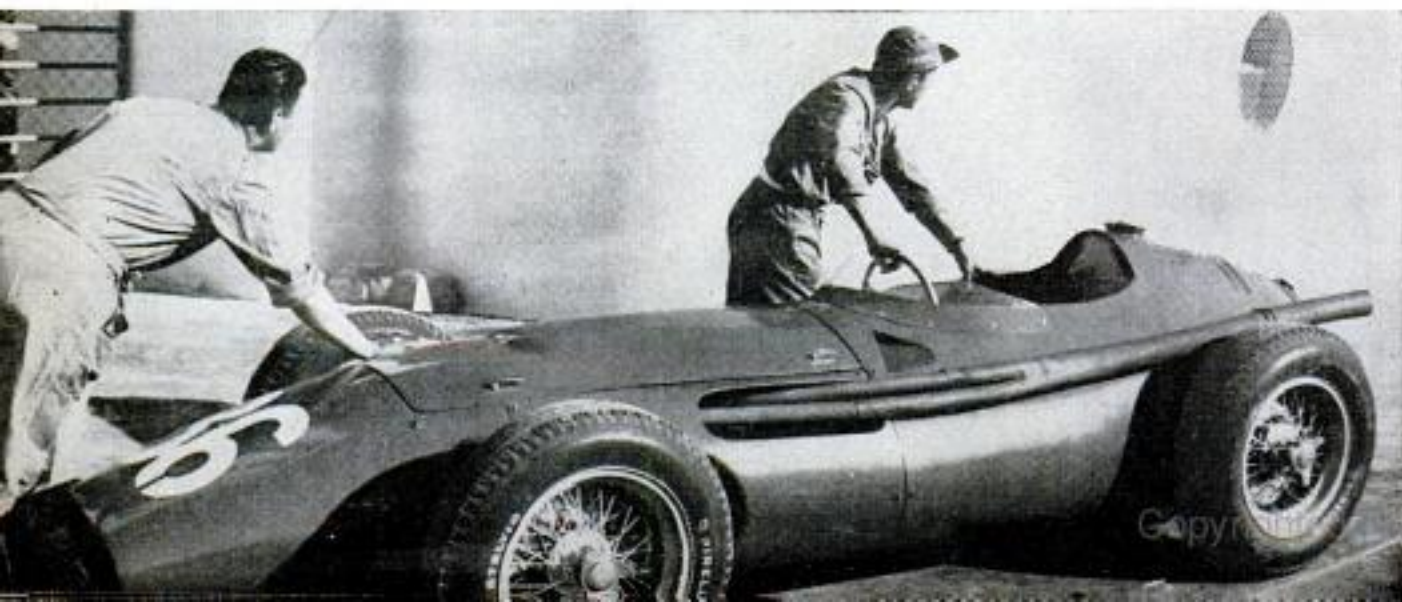


Road & Track Magazine photo

Lots of smoke and ruined hopes—the end of Schell's Vanwall in the British Grand Prix only three laps before the finish of race



Above, here's what happens to tires on the rugged Monza circuit. Below, beautiful and powerful new Maserati Grand Prix race car



American. I shall always remember this.

Hawthorn roared into the pits. In nine seconds we changed drivers. I jumped in his car and took off after the leaders. I was 52 seconds behind.

The fantastic chase began. The crowds began to sense the excitement. The funny-looking green Vanwall began to move up on the great Ferraris. The three leaders felt comfortably in the lead. I began to gain steadily on them at about five seconds a lap.

I moved into sixth place on the 17th lap, then into fifth on the 20th. On the 21st I was in fourth place, gaining steadily.

By the 23rd lap I was only 24 seconds behind, on the 25th only 12.5 seconds, on the 27th lap 11.2 seconds.

On the 30th lap I was right on the tail of Collins in the third-place Ferrari.

My heart was pounding. I was never going to let go if I could help it. It was my great chance. But Fangio had other ideas!

Suddenly he started off like a bomb, taking the others with him. For three laps they wouldn't let me pass. Fangio was in the lead and Collins and Castellotti were trying to pass each other to keep me from attacking Fangio.

It was too much for me. I couldn't stand it any more. I had to plan my attack. I would pass on the braking at the Thillois curve. By going far into the corner without braking I could, with a bit of luck, get past the first two. Then, still with luck, I

(Continued to page 290)





## Build "THE BUG"

### Your personal sportster for \$400

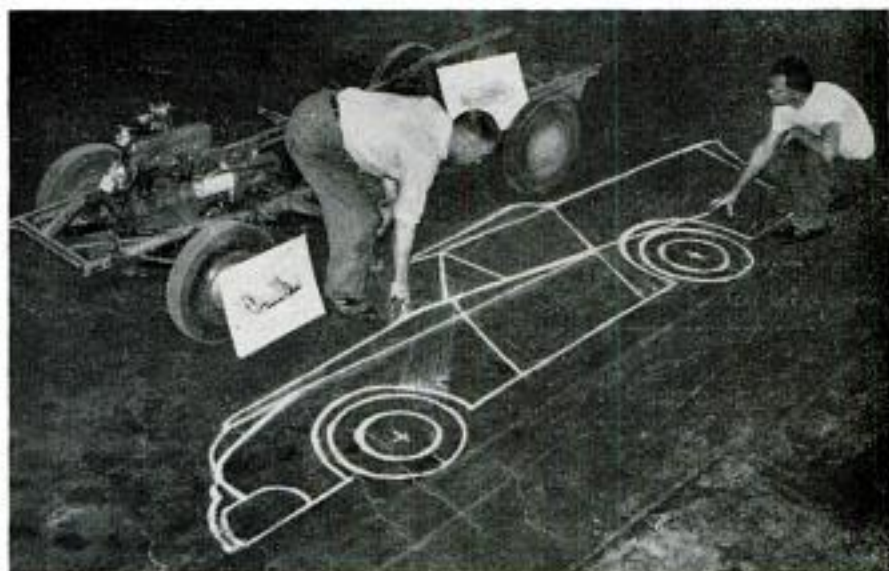
#### PART I

**H**AVE YOU EVER WANTED a personal sports car completely different from anything else on the street? Here's your chance to build such a car—and you won't have to mortgage the old homestead to pay for it.

This car (which we have affectionately nicknamed "The Bug") was designed specifically for *Popular Mechanics* readers and has been engineered to make construction as simple as possible. Building the ex-

tremely strong tubular "space frame" is no more complicated than putting together a model airplane from a drawing. Compound curves have been almost completely eliminated from the body, yet the car's over-all appearance is low, racy and modern. The prototype car, which was used for all illustrations in this article, was assembled from Crosley components, but the basic construction methods and techniques described can be used to assemble the sportster with components from any car. For that reason no dimensions are given, as they will vary

Right-hand photo shows method of drawing the full-size side elevation on a concrete floor with chalk. Lengths of steel tubing then are placed over drawing and welded together as shown in left-hand photo

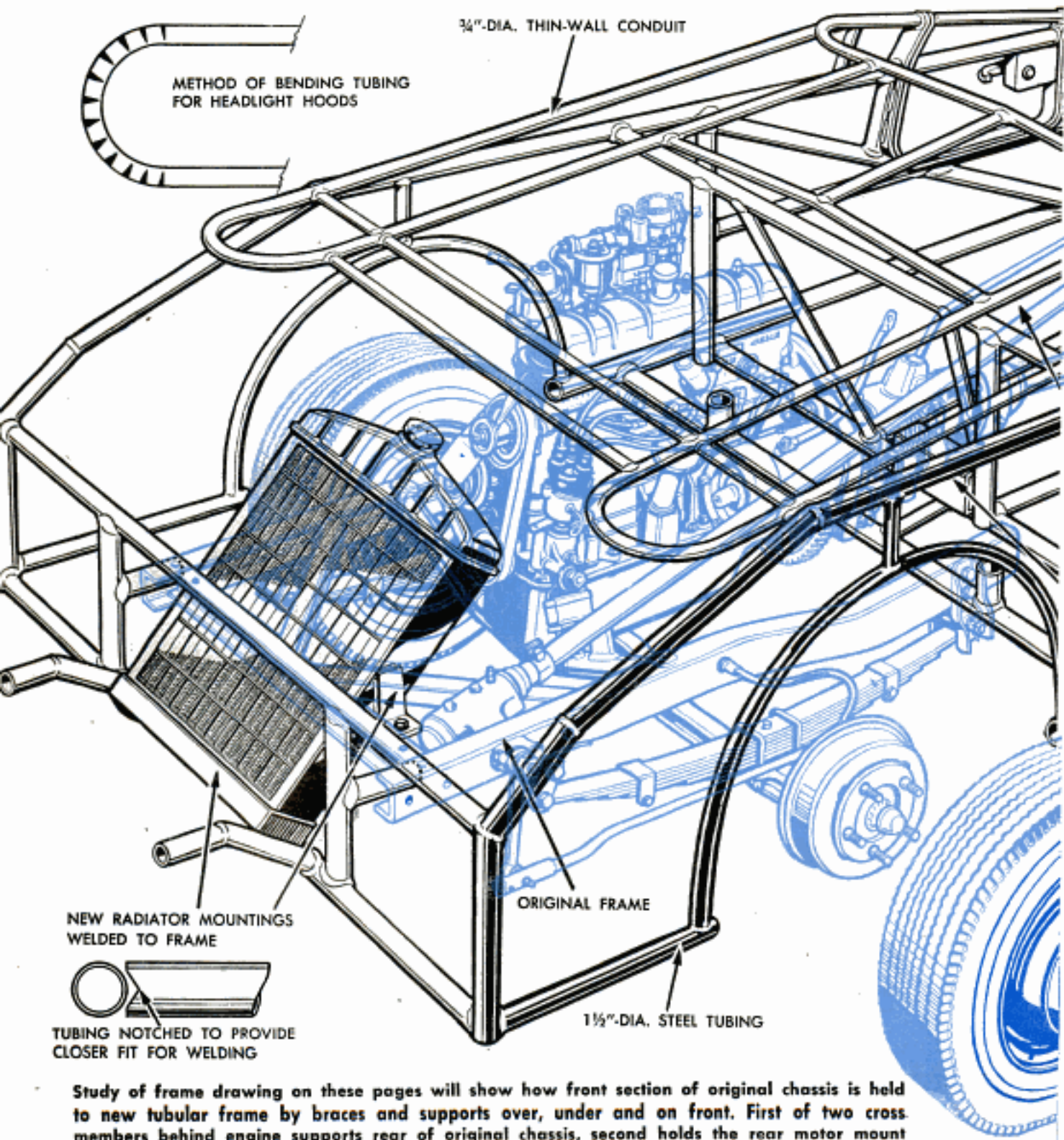


with each car and with each builder. Any second-hand or junked car can be used for components, but it is suggested that it be one with a small six or four-cylinder engine to keep down costs and to produce a lighter-weight finished car.

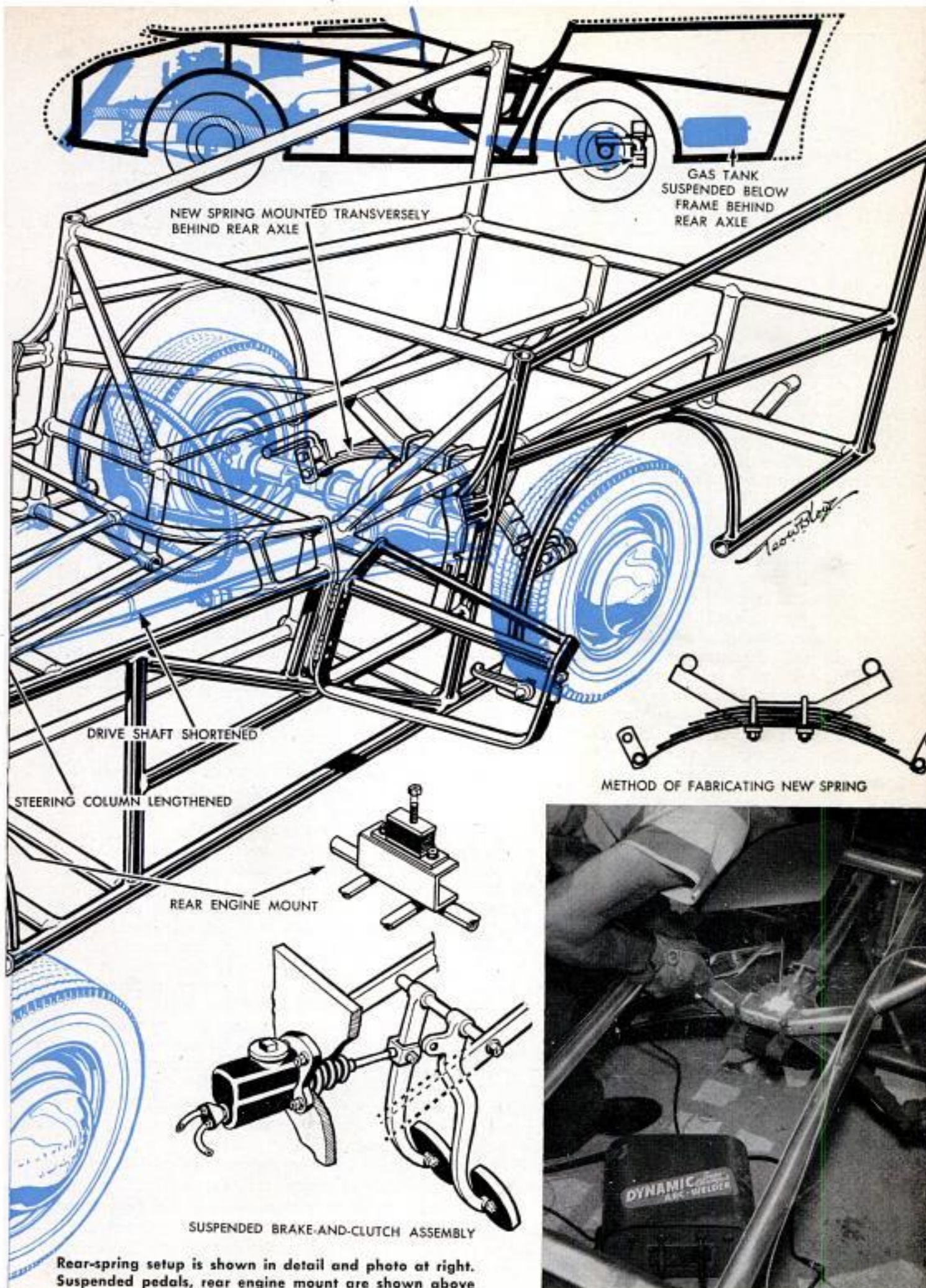
Start by stripping the car down to its chassis and wheels, saving instruments, door and trunk locks and hinges and any other items that can be reused. Overhaul the engine, transmission and brake system as necessary. Wheelbase of the sportster should be about 100 in. After determining how much the original wheelbase must be

reduced, have the drive shaft shortened that amount at a shop that specializes in this type of work.

Place the stripped chassis on a concrete driveway or garage floor and draw a full-size side elevation of the tubular frame alongside it with chalk, lower right-hand photo, page 201. Keep the lower frame members slightly above the bottom of the differential case, which generally is the lowest part of a car's running gear. Your own styling ideas, leg length and height as well as the location of the engine and other components will determine the design



Study of frame drawing on these pages will show how front section of original chassis is held to new tubular frame by braces and supports over, under and on front. First of two cross members behind engine supports rear of original chassis, second holds the rear motor mount



Rear-spring setup is shown in detail and photo at right. Suspended pedals, rear engine mount are shown above

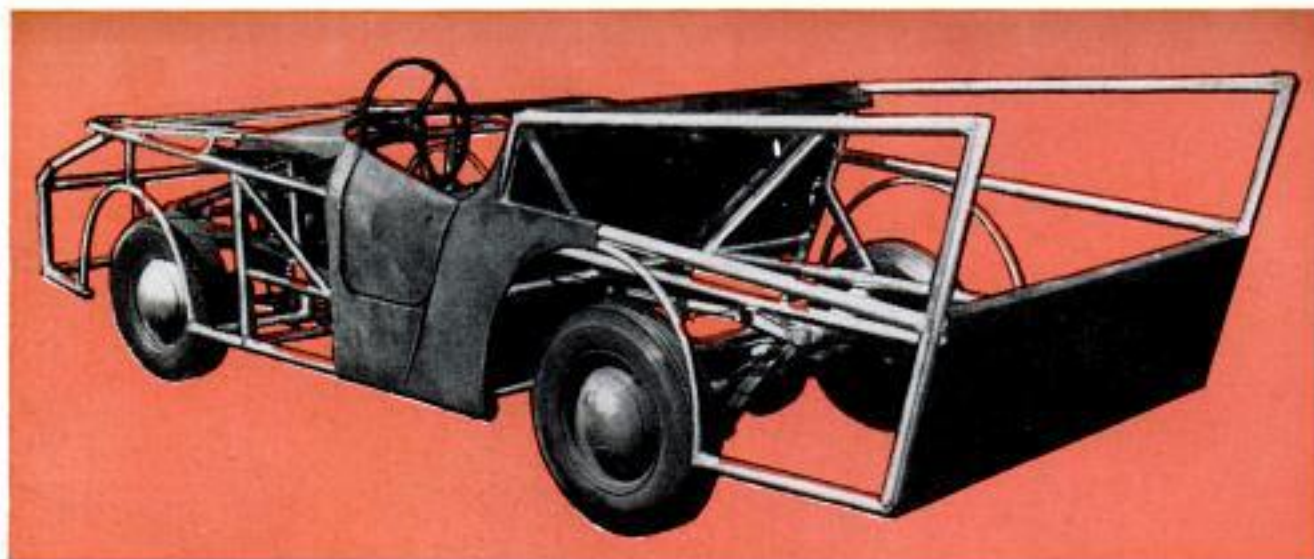


Photo above shows general appearance of partially finished sportster. Body is "wrapped" over frame

of the elevation. The basic plan shown on pages 202 and 203 can be modified in an infinite number of ways. Welded steel tubing, 1½-in. dia., with a wall thickness of .020 in., was used for the prototype in which the Crosley components were installed, and with sufficient cross bracing, this tubing will make a frame strong enough to handle most of the smaller engines. If a larger power plant is used it will be necessary to use tubing of 2-in. dia. or larger, and it should be seamless steel. Chrome-moly tubing is used for cars that are raced in competition, but this type tubing is quite expensive, and since the sportster described in this article is not designed for racing, chrome-moly tubing will not be considered as frame material. The top of the forward portion of the sportster frame, and the wheel openings, are formed from ¾-in. thin-wall conduit. Although the 1½-in. tubing used for the main frame can be used only in straight lines, the thin-wall conduit is shaped readily with a bending tool and presents a chance for individual styling of the hood area of the sportster, as well as any desired shape for the wheel openings.

After the full-size drawing has been made, cut pairs of lengths of 1½-in. tubing required to make the frame sides and weld together each side directly over the drawing, left-hand photo page 201. When both sides have been welded solid and matched to assure they are the same, cut cross pieces to go between them. The cross pieces all are the same length, and should be long enough to keep the inside of the side frame members about 2 in. outside the hub caps of the axle with the wider tread, if there is a difference in treads. Now, place an assembled frame side on each side of the original chassis and block them up to provide correct ground clearance in a vertical

position. Also, block up the original chassis to keep it level. Fit and tack-weld as many cross pieces between the frame sides as is possible over and under the original chassis. The front section of the original frame, including spring hangers and motor mounts, is to be retained, so tack-weld tubular braces and supports between it and the new frame wherever convenient, page 202. Next, move the rear axle forward and reconnect the now-shortened drive shaft. With a cutting torch, cut the old frame just behind the rear hangers of the front springs and remove it. Recheck the alignment of the tubular frame sides, then locate the rest of the cross pieces and other bracing members and weld all joints solidly. Cut a section of channel from the old chassis and shape a spring support for the transverse spring used behind the rear axle. Transverse mounting of the rear spring permits the frame to be positioned lower in relation to the axle, and the spring is clear of the cockpit, which would not be the case if two springs were used and mounted in the more conventional fore-and-aft position. The spring used for the transverse setup should be one from a heavier car. For the Crosley, a Plymouth spring was used. Cut the main leaf to fit the spring supports, allowing for the length required to heat and bend new eyes. Other leaves are fitted on top of the main leaf and are bent with progressively smaller radii or angles so they are compressed under tension when clamped to the spring support. Install 3 or 4 leaves at this point in construction to support the car. When the sportster is completely finished it is necessary to use trial-and-error to determine whether more or less leaves are required to provide correct springing and handling. Location of the tubular shock absorbers—

(Continued to page 276)

# Automatic Chokes

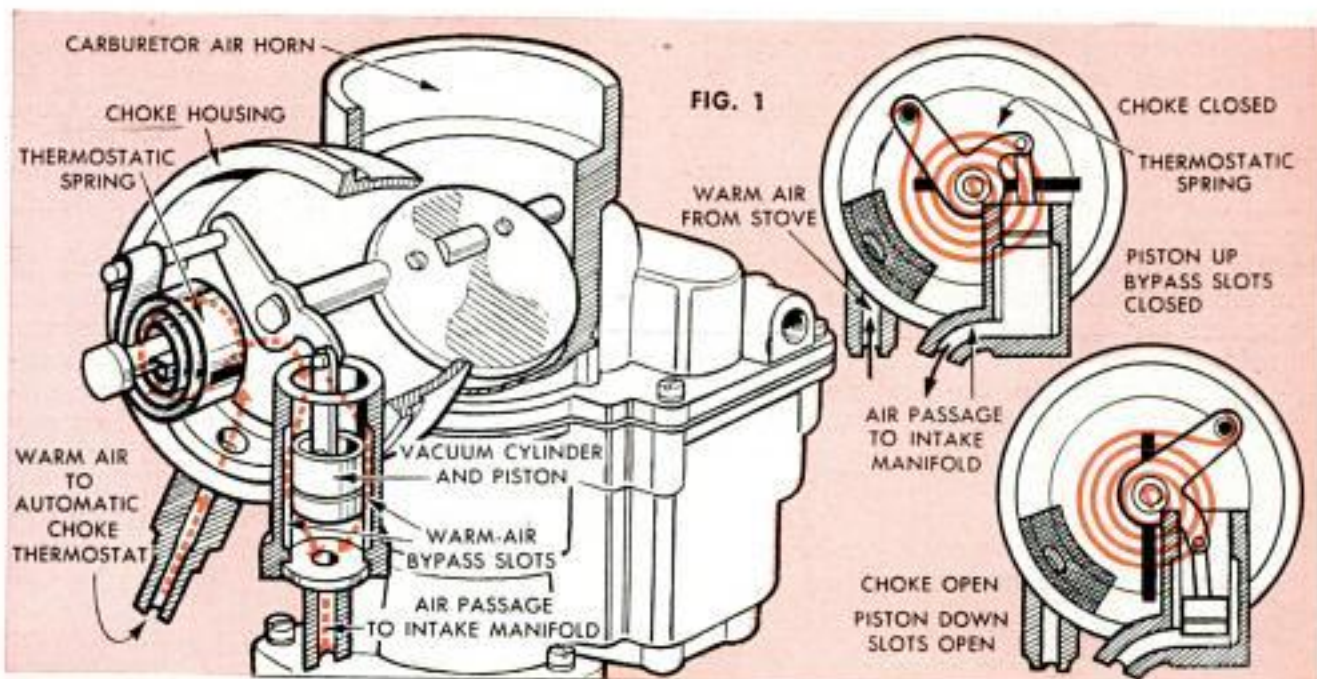


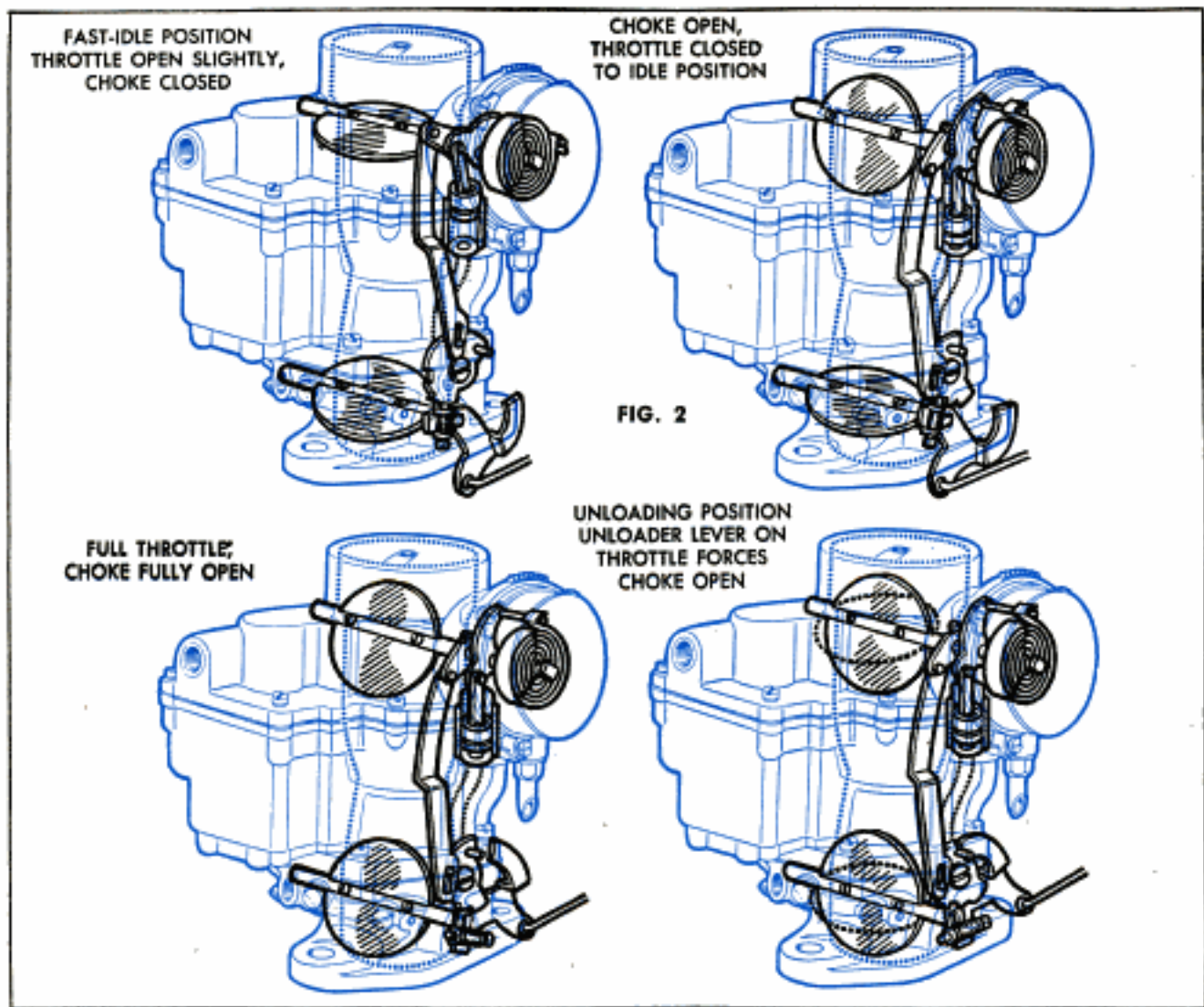
By George R. Willys

**B**ECAUSE THEY HAVE become so dependable, automatic chokes generally are ignored until an automobile engine becomes hard to start. As much as any other part, the automatic choke is responsible for the easy-starting, smooth-running, long-lasting qualities of the modern automobile engine. Valves no longer need regrinding every few thousand miles, and engine wear is minimized when a cold engine is started because adequate lubrication is assured.

Almost all cars now use the type of automatic choke that consists primarily of a heat-sensitive coil spring, or thermostat, that pulls on a lever to close the choke valve. As the spring is warmed by engine

heat, it stretches and releases the choke valve. The latter is offset on the choke shaft, so that its own weight aids in its opening. Fig. 1 is a schematic drawing of this type of choke. Heated, fresh air is introduced into the choke housing through a tube that leads to a "stove" or heating chamber located inside, or against the exhaust manifold. Three types of stoves are shown at the right in Fig. 3. The center type is one that is used on some V8 engines and is a U-shaped length of tubing located inside the exhaust manifold. One end of the tubing is open to the fresh air, the other end discharges into the choke housing, as do all tubes supplying heated air to choke





Drawings by George How

housings. To further assist in positive opening of the choke valve, a vacuum piston is linked to the opposite end of the choke lever from the thermostatic spring, Fig. 1. Intake-manifold vacuum pulls the piston downward the moment the engine starts, and thus applies tension on the thermostatic spring. When the piston travels a short distance it uncovers bypass slots in the cylinder through which warm air entering the choke housing is discharged into the intake manifold. This action assures a constant supply of freshly heated air to expand the thermostatic spring. The colored arrows and dotted lines in the carburetor in Fig. 1 show the path of this air. Since the air is discharged into the intake manifold, less air is required through the carburetor throat to provide the correct air-to-gasoline ratio to the engine, and all carburetors with automatic chokes are calibrated to compensate for this extra air. This is one reason why installing a hand choke on a carburetor that originally was equipped with an automatic choke results in poorer performance and mileage.

#### Starting a Car

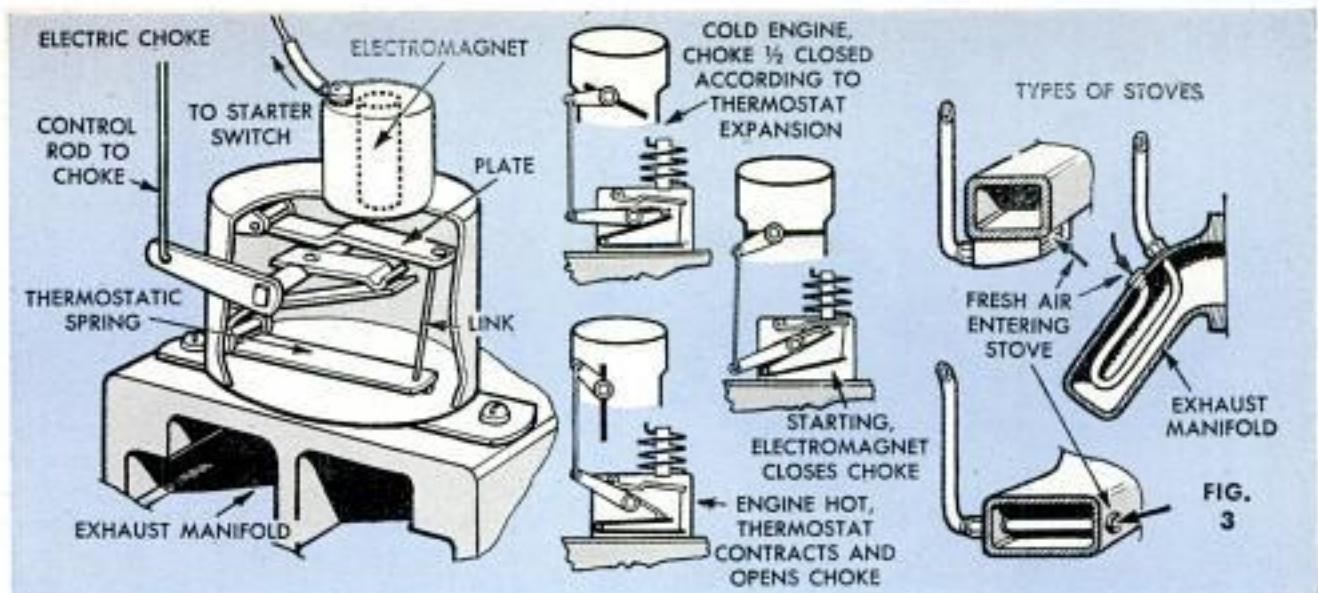
When a car has been standing overnight

the choke valve will be wide open, and must be closed to "choke" the engine. On most cars it is necessary only to depress the accelerator pedal halfway to release a fast-idle cam and lever, which permits the thermostatic spring to close the choke. The next step is to engage the starter. On cars that combine the starter with the accelerator pedal, it is necessary only to depress the accelerator until the starter engages. Do not depress the accelerator all the way. To do so overrides the choke control and the unloader lever opens the choke valve as shown in the lower right-hand detail in Fig. 2.

When the choke has been actuated by depressing the accelerator, and the starter has started the engine, the fast-idle cam will open the throttle slightly and the carburetor will be fully "choked," upper right-hand detail, Fig. 2. The engine will supply full power so the car can immediately be driven, and the fast-idle cam will hold the throttle at an idle speed that will assure adequate lubrication to the cold engine.

#### Proper Air-to-Fuel Ratio

When vaporized gasoline and air are drawn into a cold engine, much of the fuel



condenses on the cold metal walls of the manifold and cylinders. Therefore, unless an excess of gasoline is pulled into the engine by means of "choking," the fuel mixture remaining in vapor form will be "lean," meaning there is an excess of air. Gasoline burns only when combined with air in the proportion of about 13 or 15 to 1. Thus, when a cold engine is run with the choke open, air that does not combine with gasoline in combustion simply is pulled through the engine and discharged out the exhaust. As the air passes over the red-hot exhaust valves it combines with the glowing steel and burns the valves. Since an automatic choke does not allow a lean mixture to enter the engine, it thus protects the valves against burning.

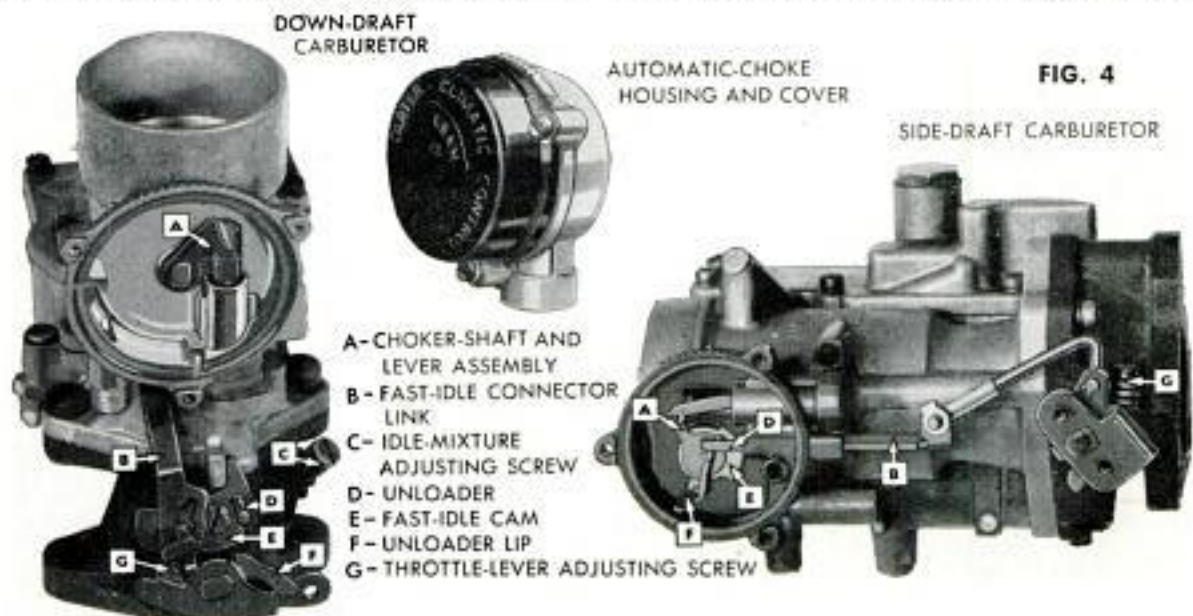
### Using the "Unloader"

When an engine has been run only a few minutes, then shut off and allowed to stand for a short while, difficulty is experienced in starting the engine because it "floods." This is due to the fact that the choke ther-

mostat cools quickly when warm air is not pulled through the choke housing, and it contracts and closes the choke valve. The engine itself is still warm inside and cannot burn the rich mixture supplied by the closed choke. The "unloader" mechanism is used in this circumstance. Press the accelerator pedal to the floor and hold it down while engaging the starter. This procedure causes the unloader lever to open the choke valve and the throttle valve also is held open. As soon as the excess gasoline has been discharged through the exhaust so the remaining mixture is of the proper fuel-air ratio, the engine will fire and start.

### Types of Mechanisms

Fast-idle cams and unloader levers can be located either on the throttle shaft out in the open as indicated on the down-draft carburetor in Fig. 4, or can be located inside the automatic-choke housing, as shown on the side-draft carburetor in the same figure. In either case the mechanism functions exactly the same. Fig. 2 shows



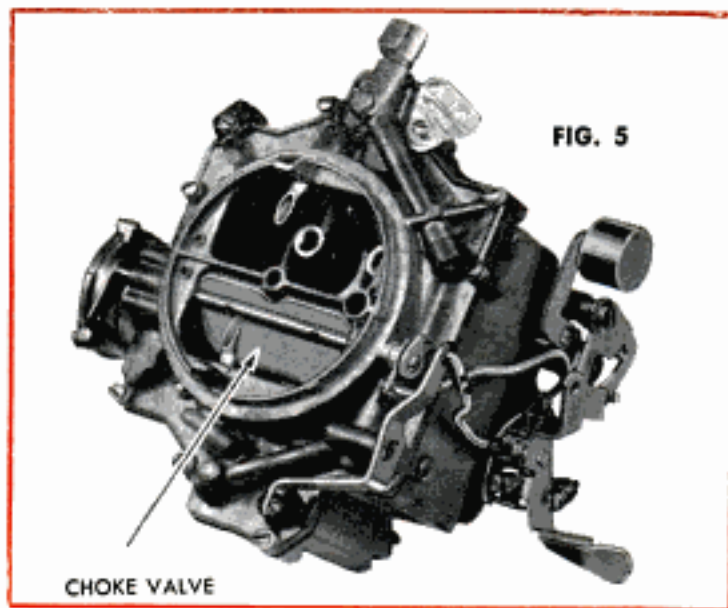


FIG. 5

CHOKE VALVE

ENGINE COLD, CHOKE CLOSED, PRIMARY THROTTLES IN FAST-IDLE POSITION READY TO START, SECONDARY THROTTLES LOCKED IN CLOSED POSITION

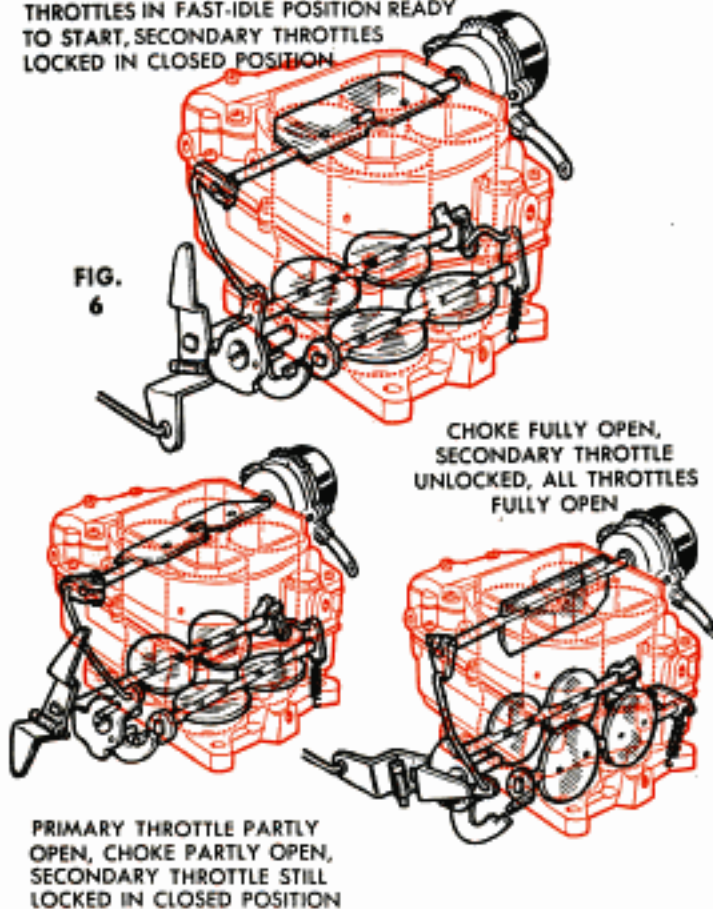


FIG. 6

CHOKE FULLY OPEN, SECONDARY THROTTLE UNLOCKED, ALL THROTTLES FULLY OPEN

PRIMARY THROTTLE PARTLY OPEN, CHOKE PARTLY OPEN, SECONDARY THROTTLE STILL LOCKED IN CLOSED POSITION

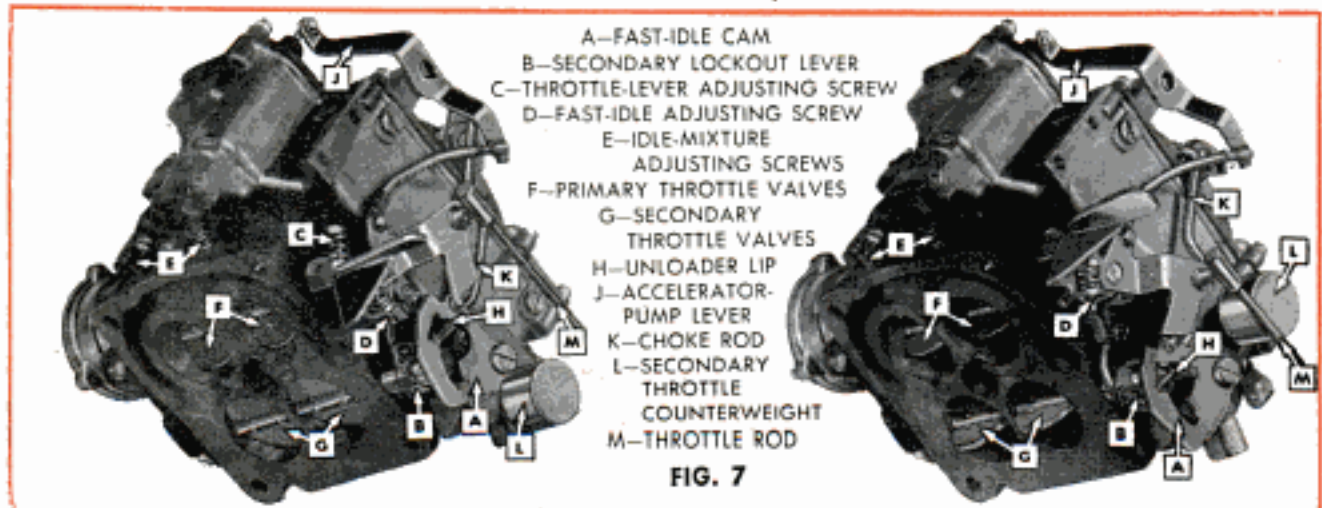
a representative carburetor, and indicates the various positions assumed by the choke and throttle valves, fast-idle cam, unloader, vacuum piston and thermostatic spring. All automatic chokes and their mechanisms function in a similar manner.

### Four-Barrel Carburetors

Automatic chokes on four-barrel carburetors function in exactly the same manner as single units, but operate only on the primary barrels, since the auxiliary barrels cannot be opened until the engine reaches operating temperature. On some four-barrel units, as shown in Figs. 5, 6 and 7, the automatic choke is given the additional job of keeping the auxiliary throttles closed until the choke has opened completely.

### Electric Automatic Chokes

Electric chokes, left-hand detail, Fig. 3, still are used on some cars. This type choke is actuated by stepping on the starter. Electric current from the starter switch then flows to an electromagnet in the choke. The magnet attracts a pivoted metal plate that is under tension from a flat, U-shaped thermostatic spring. The shaft on which the plate pivots is linked to the choke valve and thus closes it. The choke mechanism is mounted on the exhaust manifold and, as the thermostatic spring is heated, it collapses slowly, removing tension from the plate. Also, when the starter switch is released, the electromagnet no longer is energized and so the plate lowers with the spring, opening the choke. If, subsequently, the engine is restarted, the plate will be too far away from the magnet to be affected, and the choke will not reclose. ★ ★ ★



- A—FAST-IDLE CAM
- B—SECONDARY LOCKOUT LEVER
- C—THROTTLE-LEVER ADJUSTING SCREW
- D—FAST-IDLE ADJUSTING SCREW
- E—IDLE-MIXTURE ADJUSTING SCREWS
- F—PRIMARY THROTTLE VALVES
- G—SECONDARY THROTTLE VALVES
- H—UNLOADER LIP
- J—ACCELERATOR-PUMP LEVER
- K—CHOKE ROD
- L—SECONDARY THROTTLE COUNTERWEIGHT
- M—THROTTLE ROD

FIG. 7



## CRAFTSMAN



*An unusual piece for your living room, this charming coffee table in mellow pine takes its authentic design from a*

## QUAINT OLD COBBLER'S BENCH



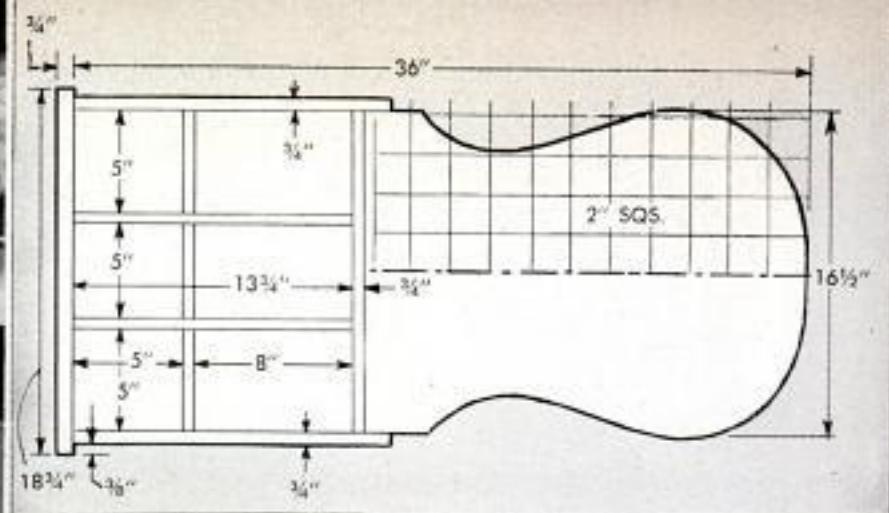
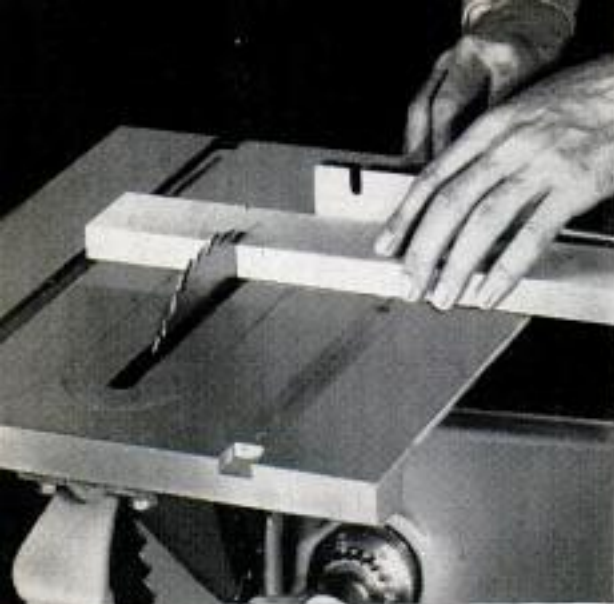
**By John N. Bergen**

**I**F YOU LIKE the warmth and charm of early pine furniture, you'll be eager to start making this unusual coffee table which is a replica of the old-time cobbler's bench. The traylike nail compartments will hold cigarettes, candy and nuts, while the roomy drawer provides a handy place to keep playing cards, chessmen, extra cigarettes and the like.

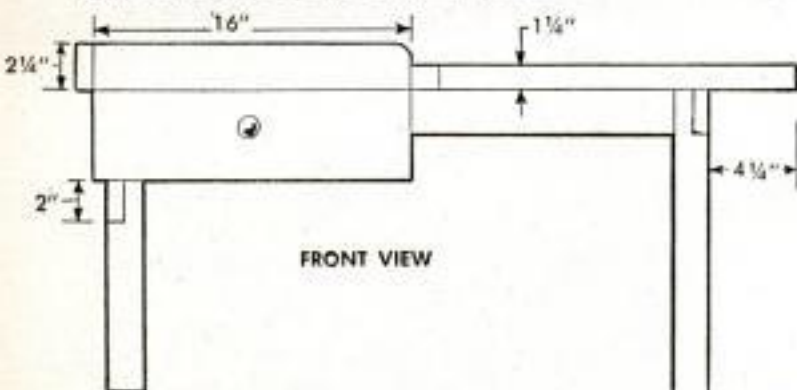
Start by making the drawer compartment. This is built around an open drawer frame, measuring  $14\frac{1}{2} \times 16\frac{7}{8}$  in., which has a  $\frac{3}{4} \times 1$ -in. drawer runner added at the center. Front and rear members of the frame are grooved in the edges to take tenons on the ends of the side members. The sides of the compartment measure  $4\frac{1}{2}$  in. wide. These are nailed together at the rear corners and fastened to the edges of the drawer frame with glue and screws driven from the inside. The leg assemblies are made alike, differing only in over-all

Worn effect is simulated by carving away certain edges where wear would normally occur. Be careful not to overdo it

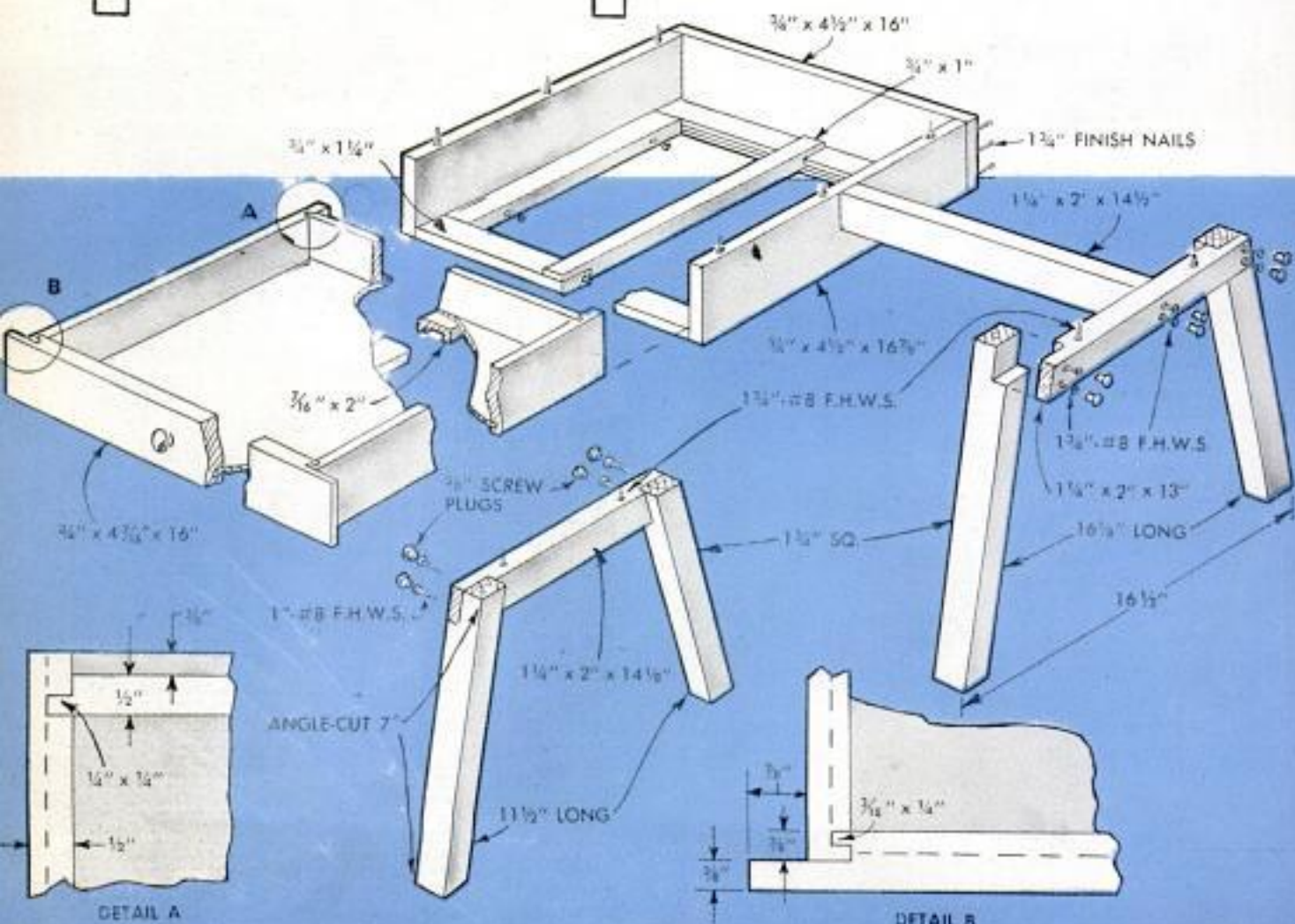
size, and in each case are half-lapped at the upper corners. Screws in counterbored holes, plus glue, are used to fasten the lapped corners and then wooden screw plugs are used to cap the holes. Screw holes also are made in the leg crossrails for attaching them to the top. The top itself is cut from  $1\frac{1}{4}$  or  $1\frac{1}{8}$ -in. material. Chances are you'll have to glue several boards together edgewise to make a  $16\frac{1}{2}$ -in. panel. A  $2\frac{1}{4}$ -in.-wide railing is added

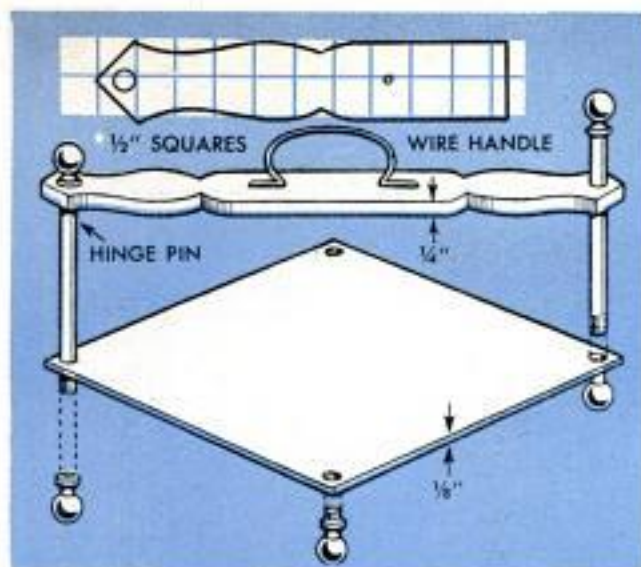


Except for the rounded end of the top, all parts are cut to size with a circular saw



to three sides of the square end of the top after the rounded end is band-sawed to shape. The strips that compartmentize the top measure  $\frac{5}{16}$  x  $\frac{3}{4}$  in. and can be half-lapped where they cross or merely butted. The drawer is made to fit the opening. Note in detail B that the ends of the drawer front protrude to lap the sides of the compartment. Finally, a  $1\frac{1}{4}$  x 2 x  $14\frac{1}{2}$ -in. rail is added to the underside of the top between the drawer compartment and the right-hand set of legs to add rigidity to the latter. Finish with light stain and wax. ★ ★ ★





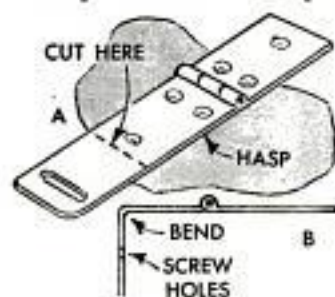
## All-Metal Napkin Holder of Unusual Design

This all-metal holder keeps paper napkins neatly stacked and, because of its weight, is ideal for use outdoors. Steel, brass or bronze materials can be used for any or all parts, and the holder may be finished as desired. The base is a  $\frac{1}{8}$  x 8 x 8-in. plate, the two vertical posts are hinge pins and the crossbar is cut from  $\frac{1}{4}$ -in. stock as indicated in the squared detail. The ball feet are cutoff hinge pins.

The hinge pins are threaded at the ends to screw into tapped holes at opposite corners of the base and project to take ball feet, which are drilled and tapped to screw onto them. The other feet are similarly drilled and tapped for short studs, which screw into tapped holes in the base. The wire handle on the crossbar is peened in holes counterbored on the underside.

Bertram Brownold, Cedarhurst, N. Y.

### Hasp Makes Drop-Leaf Hinge



When you need to replace a single hinge on a drop-leaf table there's no reason to buy a pair. Make the single hinge from a long hasp. Just cut the long leaf

of the hasp to the required length and drill and countersink additional holes for screws. Or if a tool-chest hinge is needed bend the leaf 90 deg.

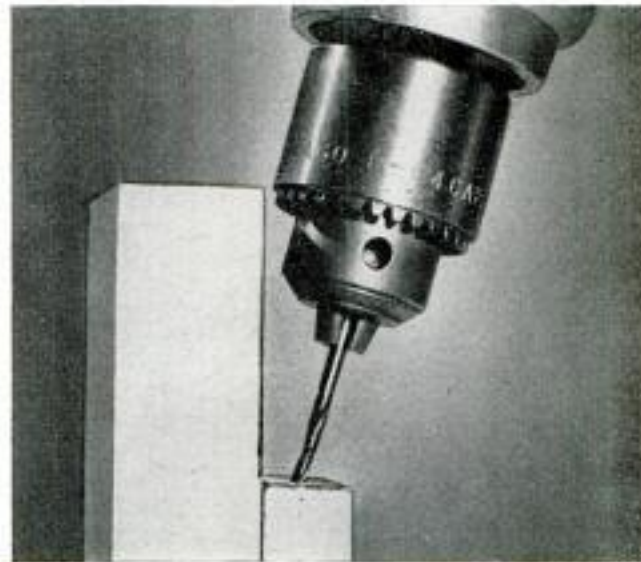
### Prebored Guide Block Aids In Sharp-Angle Drilling

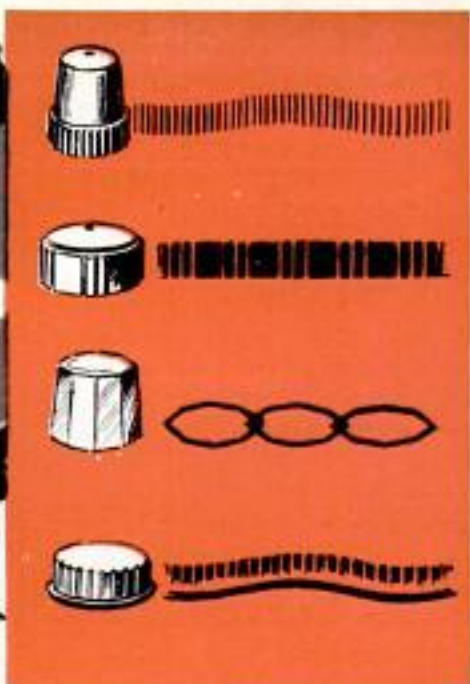
When drilling a hole at a sharp angle to a surface, try drilling a hole at the same angle in a scrap block of wood and clamping it in the vise next to the work to guide the bit as shown in the photo. For more accurate work, drill a second hole through the guide block at a right angle to the first one and joining it at the point of exit, so that the bit can be positioned exactly at the desired point of entry.

### Quieting Electric-Clock Motor

When his electric clock became noisy due to lack of lubrication, one man removed the sealed motor from its frame and placed a few drops of light oil around the clock gear. The motor then was held over a light bulb until it became warm and air escaping from the bearing of the sealed motor bubbled out through the oil. When the bubbling stopped, the motor was removed from the heat and allowed to cool. Atmospheric pressure then forced the oil into the space from which the air had been evacuated by the heat.

Stanley Clark, East Bradenton, Fla.





## PLASTIC BOTTLE TOPS HAVE MANY USES

By J. W. Rocke

PLASTIC CAPS, such as are used on toothpaste and shaving-cream tubes, medicine bottles and other containers have not outlived their usefulness when the containers are empty. Made in a wide variety of shapes and sizes, and varying in composi-

tion from hard and brittle to soft and flexible, the caps can be utilized for "special effects" inking rollers, as indicated in the illustration and detail, for electrical insulators and for nonscratching furniture legs. Some caps can be used as replacements for wheels lost from plastic toys, others as tiny cups and plates for doll dishes.



Multiposition switches for model-train control and other low-voltage applications are made by slotting plastic cap, fitting it with shim-stock contact arm. Assembly is mounted on a piece of hardboard with a circle of small screws acting as contacts for individual voltage settings. Rotation of the knob causes shim to bridge circuits

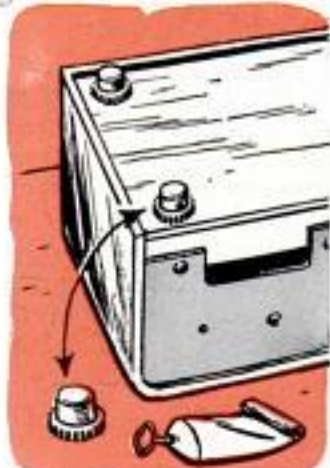


Handle of twisted wire fitted on plastic cap provides handy spoon for measuring powdered glue and other materials. Flat cap is used for the purpose, so it can be placed flat on workbench without problem of having it tip over, as with kitchen spoon. A number of the spoons in various sizes will assure correct quantity measure

Insulated screw-on terminal caps for electrical test equipment that provide both protection against shock and neat appearance, are made by cementing brass nuts in plastic caps. Fill cap with wood putty, then press nut into place. If the terminal post is quite long, it may be necessary to drill all the way through the cap

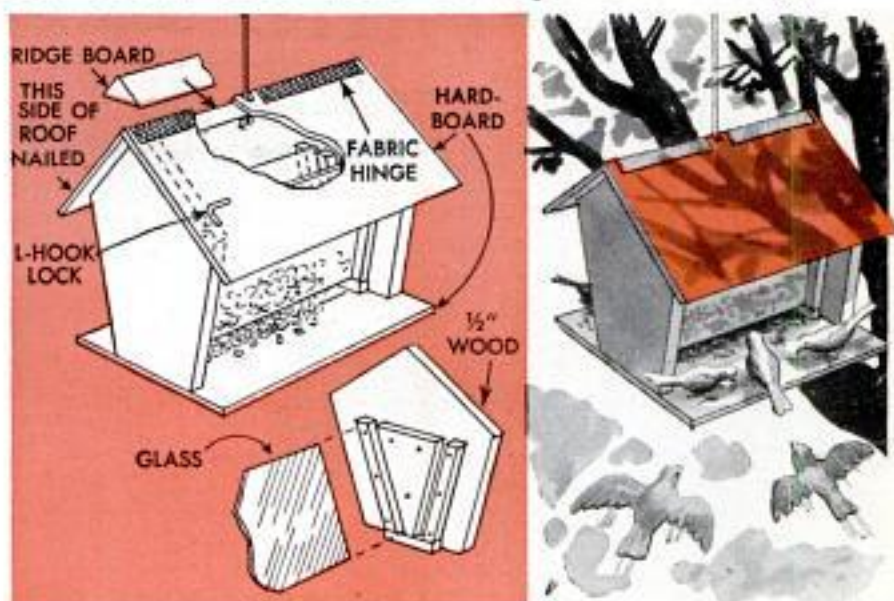


Soft plastic caps used on some pill containers make ideal nonmarking "feet" for small chests and cabinets. As indicated in the drawing of a radio cabinet, the caps simply are glued to the bottom with rubber or household cement. The top of the cap is cemented to the cabinet and the resilient lower portion that will not mark or scratch



## Bird Feeder Suspended From Tree Has Transparent Trough

This easy-to-make bird-feeding station features a visible feed supply seen through transparent sides of glass or plastic. The roof and floor are cut from  $\frac{1}{4}$ -in. tempered hard-board and the ends from  $\frac{1}{2}$ -in. stock. Form slots for the windows on the inside of the end pieces by nailing on small strips of wood. Cut the windows shorter than the height of the slots to allow for a prop under the lower edge. The amount of opening is determined by the size of the feed placed in the feeder. Nail one half of the roof to the end pieces and hinge the other section to it with a strip of canvas to provide access for filling the feeder. An L-hook locks the hinged section in the closed position. Install a triangular ridge



block under the peak of the roof and run a length of wire up through a hole in the center of it, as shown. Suspend the feeder from a tree at a height convenient for refilling and watch the birds have a picnic.

## Laundry Table Rests on Tubs

A flat surface for sorting the laundry is easy to make by cutting a panel of plywood or hardboard to fit over the top of the laundry tubs with a little overlap. Wood cleats screwed to the underside of the panel to fit inside the tubs will keep it in place. If hardboard is used, the screws will have to be driven down from the top side.

## Suede-Shoe Brush Cleans Wood-Bit Screw Point

A suede-shoe brush is just the thing to clear the screw points of wood-boring bits that have become clogged with wood fibers or pitch. The brass bristles of the brush clean the screw points thoroughly without damaging the thread.



## Shutter on Box Camera Altered To Accommodate Fast Film

The only alteration necessary to increase the shutter speed of an inexpensive box camera is to cover about two thirds of the shutter opening with a strip of black masking tape as shown in the photo. This will result in a shutter speed of about  $\frac{1}{100}$  second, permitting use of the new, faster films when it is desirable to stop motion, such as a running play at a football game.

Ken Murray, Colon, Mich.



# SOLVING Home Problems



**MEDICINE CABINET** hung on an open area of the bathroom wall is out of reach of all except grownups. Its location discourages all attempts of young adventurers to reach contents



**HALF OF A RAW POTATO** dipped in fine pumice makes a good scouring pad for kitchen utensils. Contains just the right amount of moisture to hold abrasive

**GUARD FOR SHARP POINT** of a meat thermometer is made by centering a hole in a short length of dowel. Hole is just large enough to take point snugly



**STRIP OF ADHESIVE TAPE** placed over the locking bolt in the bathroom door will effectively prevent small fry from locking themselves in the bathroom

**LUMINOUS TAPE** locates a tumbler of water or any other object placed on a night stand. Cut a small square of tape and attach to tumbler at a point about halfway between the bottom and the rim. Other objects may require longer tape strips placed either vertically or horizontally



**CUP HOOK** screwed to inside surface of any convenient drawer front keeps that spare car, house or garage-door key always at hand when needed. Several keys can be stored in this manner in a single drawer. Cup hooks also can be attached to kitchen-cabinet door

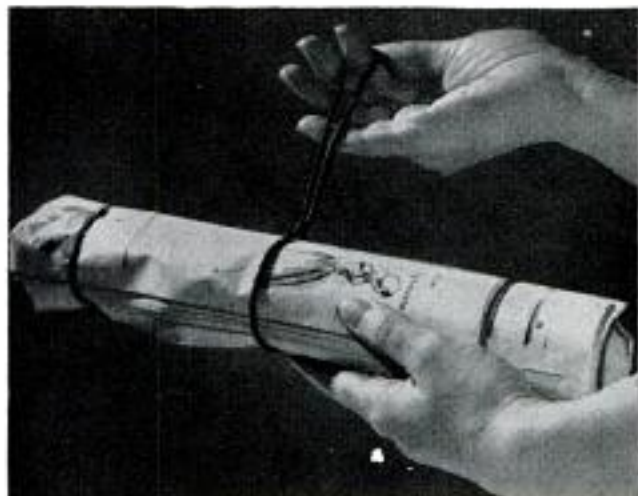




**ADHESIVE-TAPE SPOOL** is just the thing for storing lengths of fancy ribbon. Spools come in different widths for different sizes of tape. The spool selected should be slightly wider than the ribbon to avoid curling or tearing the edges on the spool flanges



**CELLULOSE SPONGE**, also a rubber sponge, makes a good clothesbrush, especially when traveling. It is light, packs in small space and washes clean in a jiffy. Will pick up finest lint dust from rough fabrics



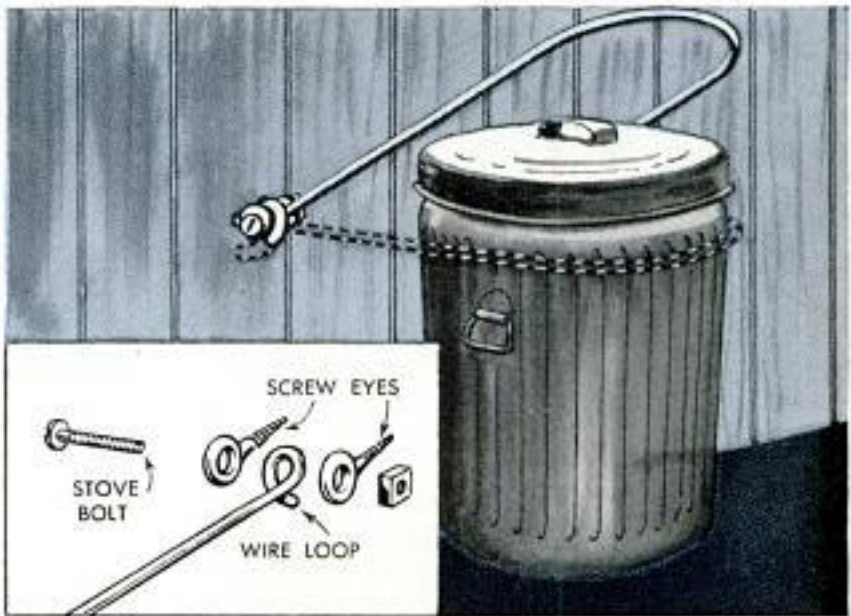
**COAT HANGER** for emergency use is made by rolling a newspaper tightly. Place rubber bands around roll near ends, then loop a cord tightly at the center

**ROLL-TYPE MEMO PAD** can be made in a few minutes from a block of hardwood, two film spools, four angle brackets and screws. Assemble as pictured, then load one spool with a roll of adding-machine paper



**CANDLES** will remain straight in the hottest weather if you dip them full length in shellac which has been thinned with alcohol. Pour thinned shellac in tall container

**GARBAGE CAN** can't be upset by dogs or rolled away by high winds if you secure it with this holder. Bend a length of 1/4-in. steel rod to a U-shape, form loops in the ends and attach with screw eyes and bolts



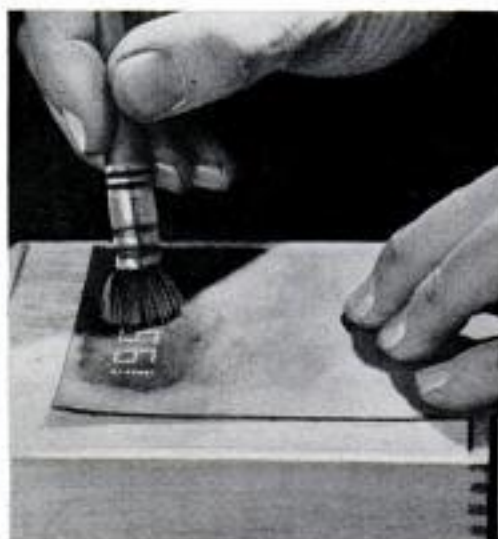
# Ways to Hang Valance Boards on Trim or Wall



These four simple ways to hang window valance boards permit them to be removed and replaced instantly. The two upper details, A and C, show screw eyes driven into the ends of open-top valance boards to slip over a finishing nail in the window trim, or an L-hook in a stud. An alternative method, shown at the lower right, detail D, is the use of a metal angle having a T-slot that hooks over a wood screw. Wherever the weight of a valance is carried by the ends, these should consist of plywood since ordinary wood is likely to split when screws are driven near the edges. The lower detail, B, shows a closed-top valance board drilled to fit over a finishing nail in the window trim, or to engage an L-hook driven into the wall. All of the hanging methods suggested still allow dust covers to be added to the tops of the open valances.

## Quickly Made Marking Stencil

Here is a quick way of making stencils for marking boxes, drawers and other bulky items. Punch out the characters with a series of perforations in a thin sheet of brass shim stock resting on cardboard or soft wood. A scribe or phonograph needle in a holder may be used as a punch, and the resulting burr on the reverse side of the sheet can be removed with a file. To transfer the punched design, apply stencil or stamp-pad ink with a heavy bristle brush. A similar-type mask can be used as



a negative for reproducing designs or characters photographically.

Walter E. Burton, Akron, Ohio.



## Modified Pencil Sharpener Cuts Extra-Long Points

A wall-mounted pencil sharpener can be made to cut a long, sharp point such as is desired by draftsmen and artists, with one slight modification. Simply file a small notch across the metal ridge at one end of the cutter holder as shown in the photo (cutter cylinders have been removed). This permits deeper penetration of the lead between the cylinders while sharpening.

Instead of using a blotter to blot a large blob of ink on writing paper or other surface, touch the hot tip of an extinguished match to the wet ink. Most of the liquid will be evaporated instantly and the balance absorbed by the porous match head.



# PICTURE a NAME

By John Hosack



**V** is for Valerie  
Our little girl  
She is precious to us  
Just like a pearl



**A** is for action  
Running in the park  
Having lots of fun  
'Till almost dark



**L** is for lady  
And also for love  
A sweet little girl  
Soft as a dove

IT IS FUN picturing a child's name in the manner shown on this page. The name is your "shooting script." A short name of three to five letters is the easiest to picture and make into a wall display as indicated in the tinted sketch. If the name is longer, try to shorten it or use a nickname.

First, think up a word to go with each letter of the child's name. For example, using the name BOB, the first letter suggests ball, B is for ball; then, O is for orange; and, B is for bank. Take pictures of Bob with a ball, with an orange and with his bank, and write as many additional lines for the verse under each picture as desired. Keep the picture situations simple, direct and to the point to strengthen the relationship between name and picture, and use prints with similar tonal values. Cement the prints on pieces of mounting board, using rubber cement.



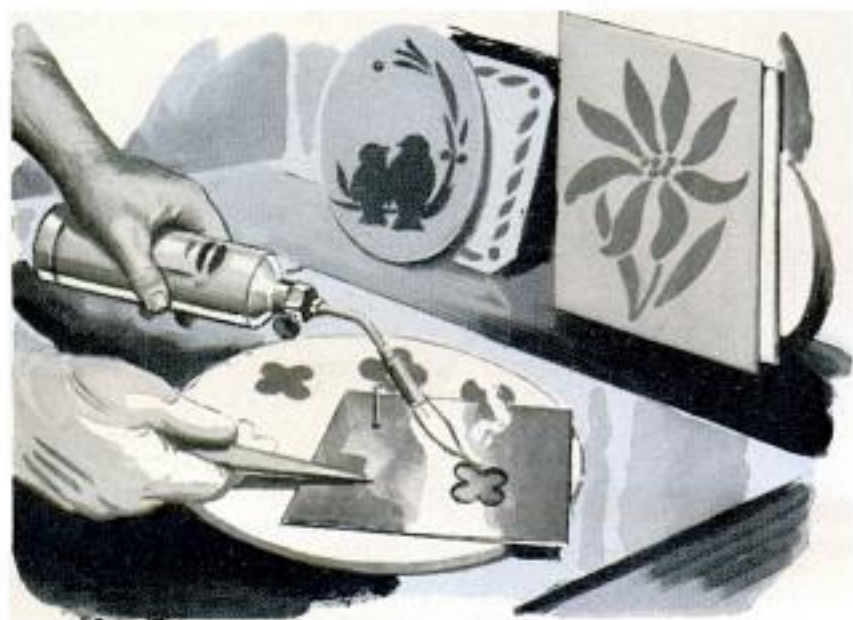
## DECORATE WOOD WITH A TORCH

By *Walter E. Burton*

USING THE TINY, superhot flame from a soldering torch as a "stenciling brush" you can produce any number of attractive decorative designs on wood. To do this type of "pyro stenciling," you use sheet-metal cutouts or any flat object, such as a key, as reverse "stencils," or shields, to produce white outlines on a dark background, the white being the natural color of the wood, of course. In the reverse process, the outline of the object is cut through the metal, or incised, the process producing a silhouette, or silhouettes, on a white

background, the latter in the natural color of the wood.

Basswood is probably the best wood for the purpose as it blackens, or chars, more uniformly. White pine is the best second choice, white-pine plywood being ideal for the key caddy and such items as large wall plaques. The trick in charring the wood to a uniform color is to use a torch tip giving a medium, pointed flame, and to keep the flame moving uniformly over the surface of the wood. Care must be taken not to heat the metal to the point where it chars the wood underneath. Take precaution against fire. Wear a leather glove. ★★★



## WALL PLAQUE

You can make most attractive and novel wall plaques by "pyro stenciling" various floral and pattern designs on basswood or pine-faced plywood. In this work the sheet-metal stencil, or template, has the design cut through, or incised. The design is first laid out on the surface of the metal and then cut through with a coping saw, using a fine-toothed blade. Blades used by jewelers are just the thing. Before lighting the torch, cover the bench top with a sheet of asbestos. Clear away wood chips

## JEWEL BOX

Small boxes made from bass-wood are available ready-made. They come unfinished and of a size suitable for storing costume jewelry, cards, cigarettes and other small items. Although originally designed for decorating with self-hardening clay or enamel, these boxes are just the thing for pyro stenciling in a variety of designs, only one of which is pictured, a simple diagonal "tiger" stripe which is burned on the wood in the manner shown, using a small rectangular piece of sheet metal cut with one edge straight. Playing flame along straightedge gives a blackened stripe, one edge straight, one somewhat irregular. Space stripes uniformly



## INITIALS

By using sheet-metal letter cutouts you can stencil initials, letter signs, estate name plates, business signs. The letter cutouts (each one an individual letter except in larger sizes) should be cut from 18-ga., or heavier, sheet metal so that they will lay flat on surface of wood. Due to the relatively small area covered by the metal and the necessity for producing sharp, clean edges, flame-stenciling letters requires somewhat more careful handling of the torch than necessary in other cases

## HOT PAD

Procedure in stenciling hot pads is very similar to that followed in making plaques. One novel method is illustrated, stencil being of the incised type, which is cut to a V-shape and pivoted near the point as shown. By moving stencil you can make repeat designs equally spaced around center point of round pad. In following out this procedure be sure not to overheat the sheet-metal stencil. Permit it to cool at intervals, or dip in cold water. In working white on black, care must be taken when stenciling stems or any narrow parts that flame does not work under metal and char the wood

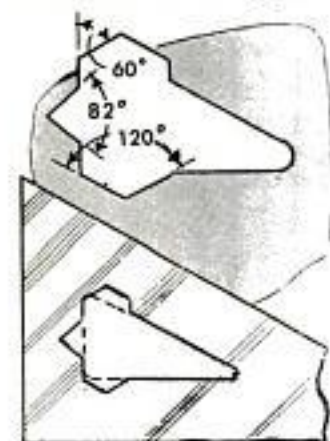


## Neater Method for Taping Signs To Inside of Store Windows



Instead of pressing strips of removable gummed tape diagonally across the corners of small paper signs to fix them to the inside of windows, try the much neater method illustrated. Holes about  $\frac{1}{2}$  in. in diameter are punched through the sign near the corners, then pieces of tape are stuck to the back of the sign across the holes. The gummed surfaces of the tape exposed through the holes are pressed against the glass. For a touch of color, use colored tape.

## Frequently Used Angles Filed in Triangle

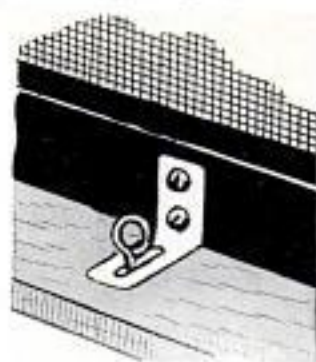


Mechanical draftsmen can save a great deal of time by having a few frequently used angles filed in the center of their triangles. As shown, two adjacent sides of a hexagon, arranged in alignment directly opposite each other, will save the need for turning

the triangle over repeatedly when laying off hexagons of the same or smaller size. Another angle that proves to be highly convenient is the 82-deg. angle of countersinks and flat-headed or oval-headed screws and bolts, which are often used in mechanical drawings.

## Metal Hasp Locks Window Screen

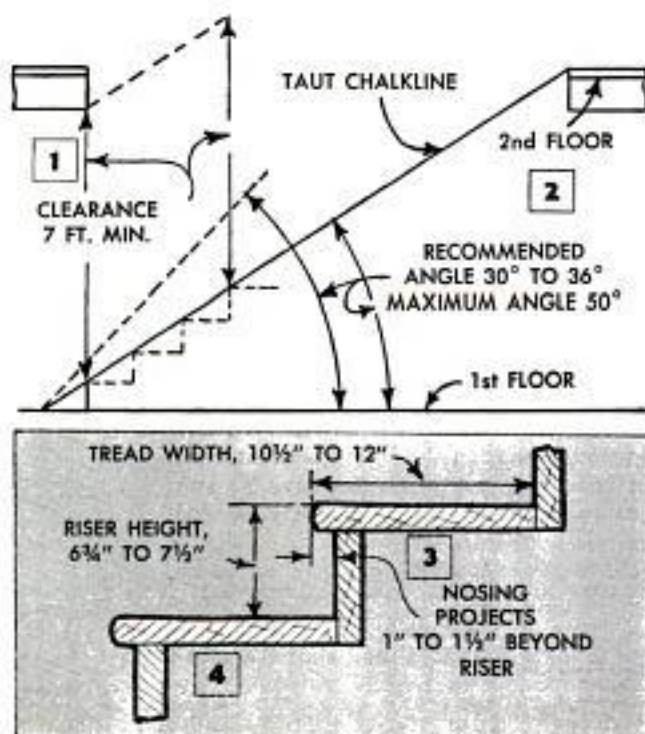
The danger of small children opening a window screen and falling out may be practically eliminated with this simple hasp. It is made by slotting and bending a small strip of tin or aluminum and attaching it to



the screen as indicated. A screw eye driven into the window sill engages the slot in the hasp and, when turned at right angles to the slot, locks the hasp.

## Four Steps in Planning a Stairway

When laying out a stairway, there are four things to consider to assure ease in climbing and maximum safety. First, clearance from tread to ceiling should be at least 7 ft. Second, angle of stairs should be from 30 to 36 deg. and never over 50 deg. Third, width of the treads should be between  $10\frac{1}{2}$  and 12 in., and the height of the riser from  $6\frac{3}{4}$  to  $7\frac{1}{2}$  in. Fourth, all risers and treads in a stairway should be equal. To find the number of steps in a proposed stairway divide the vertical distance between floors (given in inches) by 7, the average riser height. Exact riser height is then found by dividing the whole number of the above answer into the vertical dimension. If the decimal in the first answer was over .50 the next higher whole number should be used as the divisor in the second computation.



# PRINT IN *Your Signature*

YOUR SIGNATURE printed in photographically not only personalizes the print, it identifies the picture as your own work. The first step is to copy the signature, using a fast-processing film. Then cut an opening near the lower right-hand corner of a large piece of cardboard and mount the signature negative on the underside, centering it in the opening. Of course, the opening in the cardboard must be far enough from the edges so that the signature can be positioned on the print in the easel without any of the sensitized paper being exposed outside the edges of the cardboard. To locate the signature, slide a piece of opaque paper under the negative and turn on the enlarger light. With the image (picture) projected on the cardboard, just move the latter until the signature is located. Ordinarily, the signature should be printed in an area of comparatively light tone, as in the upper right-hand photo. Now, turn off the enlarger, withdraw the opaque paper and print in the signature, using a pocket flashlight as in the photo below. Also, your customers will always know how to order reprints if you stamp each print with an order number and your address as shown by the facsimile.

Eugene A. Hancock, Loveland, Colo.



The signature should be located in a comparatively light area of the print so that it is readily seen

**FOR MORE PRINTS  
Of This Picture - Ask For**

**No. 16875**

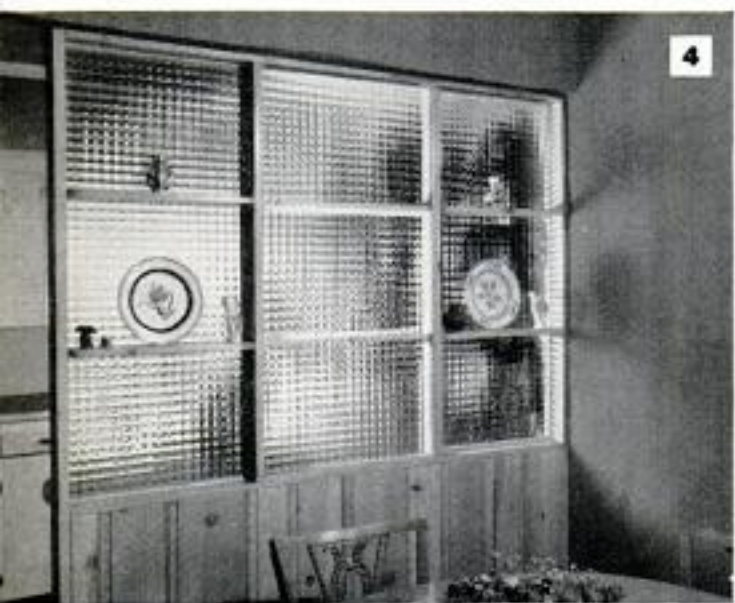
*Hancock Studio*  
**Loveland, Colorado**

Above, stamp the back of each print with your address and an identifying number. Below, how the signature is printed in through an opening in the cardboard





## New Look for INTERIOR WALLS



By Enno R. Haan

**B**EFORE STARTING to build a new home or remodel an older one, you will want to investigate some of the exciting possibilities for smart room planning offered by the use of the various materials available for modern dry-wall construction.

### Some Dry-Wall Advantages

Prepared wall coverings do not require a drying-out period which may cause work delays, and the installation cost is negligible if the homeowner does the work himself. Many wall-covering materials come prefinished, which eliminates the need of subsequent painting, while others come primed to facilitate one-coat finishing.

### Variety of Materials

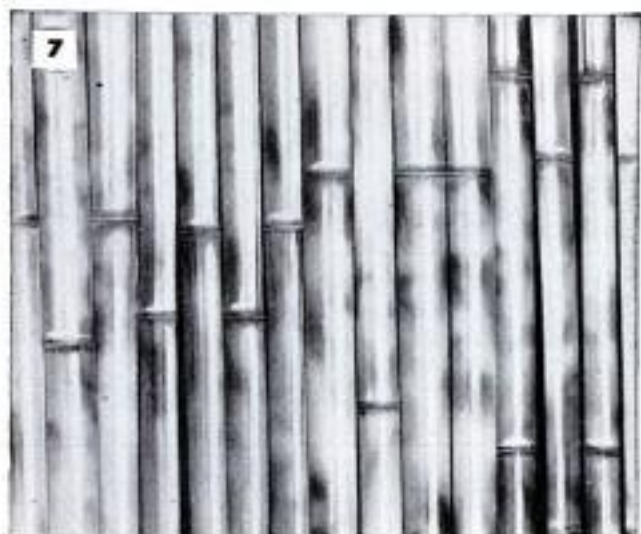
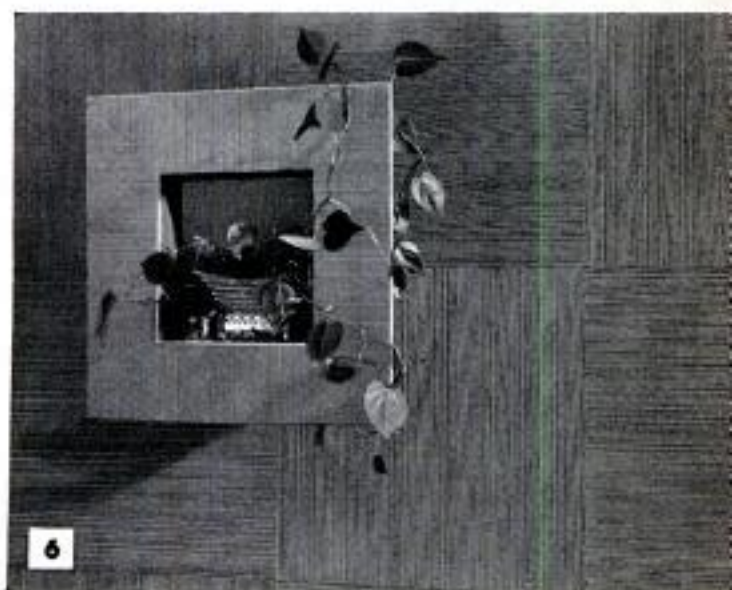
Glass fiber, Figs. 1 and 2, is a comparatively new and colorful material. Lightweight, translucent and shatterproof, it is available in flat or corrugated panels of various sizes. Used for screens and partitions, it gives contrast and variety for accent touches in decorating.

Extreme durability and no need for subsequent decorating are the features of hard, laminated plastics, which can be used on kitchens and bathroom walls as in Fig. 3. Colored structural glass has similar application. This must be pre-cut and drilled by manufacturers to specifications. Trans-



lucent decorative glass, available in many textured surfaces, can be used for partitions as in Fig. 4. Another interesting variation in glass is the use of glass blocks for partitions. These are strikingly modern but strictly non-load-carrying.

Strips of bamboo, Fig. 7, obtainable in 4 to 8-ft. lengths, can be used to produce a cool garden motif or oriental atmosphere. Other wall-covering materials that have been produced in a variety of new forms for greater usefulness and convenience include wood and plywood, hardboards and the less-dense insulating boards, asbestos-cement and gypsum wallboards, plastic, sheet-metal and ceramic tile; also thin, flexible sheet materials, including various kinds of plastics, cork and linoleum.





9



10

### Surfaces and Finishes

Striated surfaces have become quite popular. Large expanses can be given the effect of greater height or width if the lines are arranged vertically or horizontally. Fig. 6 shows a checkerboard styling of squares of striated material. An unusual texture in plywood is accentuation of grain as shown in Fig. 8. Recently developed, corrugated and perforated hardboard, Figs. 9 and 10, are valuable for breaking up the monotony of continuous, flat surfaces. One new form of hardboard is both corrugated and perforated for more versatile and smart application.

Acoustical tile, Fig. 15, is of softer consistency than hardboard and is perforated with small holes or narrow slots that absorb sound vibration. Some wall-covering materials are backed by foil, or with a water-resistant coating, to act as a vapor barrier. Foil also serves as reflective insulation. A number of wall-covering materials come prefinished as, for example, the baked-on enamel on some tiles. Other materials may be encased in tough Manila

paper printed to simulate wood grain. Color also can be uniform throughout the material, as in some plastics.

### Forms of Rigid Wall Coverings

Most rigid wall-covering materials come in one or more of the following forms: (1) Tiles or blocks, Figs. 6, 12, 14, 15, 17 and 20, up to 16 x 32 in. in size. (2) Planking, Figs. 5 and 11, which comes in 8 to 16-in. widths and usually has lapped or tongue-and-groove edges. It may be applied either vertically or horizontally. (3) The large 4-ft.-wide panels known as building board, Figs. 13, 16 and 19. This sometimes is scored to simulate planking or tile and, if the material is hard and dense, may have pre-drilled holes for nailing. (4) Panels of other sizes as in Figs. 1, 2 and 3.

### Nailing Bases

Ceilings are covered first, then walls from the top down. Most wall-covering materials are fastened with nails, staples or clips to wall studs and ceiling joists, Figs. 13 and 16, to furring strips, Figs. 11



11



12





13



14

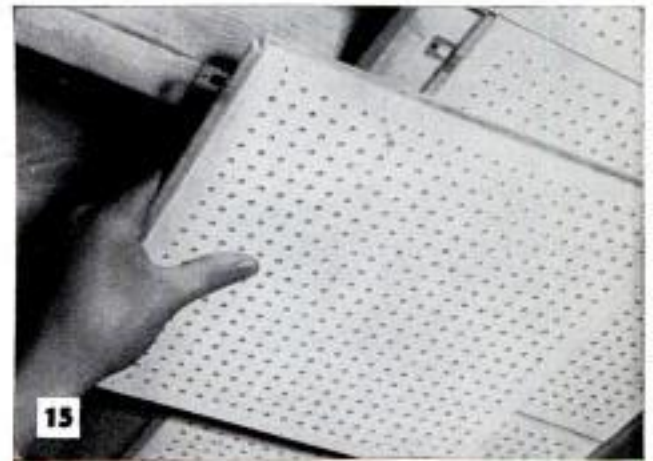
and 14, or directly to the surfaces of walls as in Figs. 5, 12 and 17. Studs and joists generally are spaced 16 in. on centers, but furring strips are spaced from 6 to 12 in., depending on the product and the manufacturer's instructions.

Furring strips usually are nailed at right angles to studs and joists. Hardened, spiral-shank concrete nails often can be used to fasten furring vertically or horizontally to green concrete or to mortar joints of masonry. When concrete or mortar is too hard for such penetration, holes are drilled with a carbide-tipped bit. The holes then are plugged with tight-fitting dowels into which nails are driven, or suitable screw anchors are used instead.

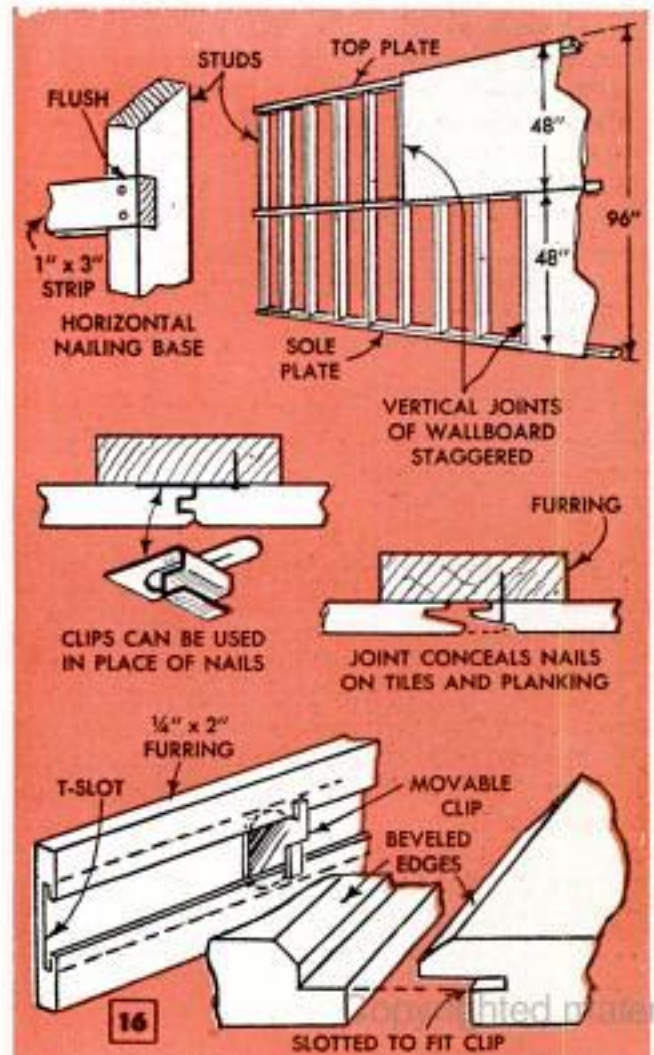
Most types of building board require suitable nailing bases for rigid support at all edges. The sole and top plates of partition framing provide that at the bottom and top of a wall. When building board is arranged horizontally, a nailing base should be installed for the midway joint as in Fig. 16. Spaces between joists at the edges of a ceiling should have nailing bases unless other means of support are provided. An exception to this general rule of providing nailing bases under all edges exists with gypsum wallboard. Here perforated tape, which is used in conjunction with cement to reinforce edges and seal cracks, produces strong joints that need not be nailed at points between studs and joists.

#### Fastening With Nails and Staples

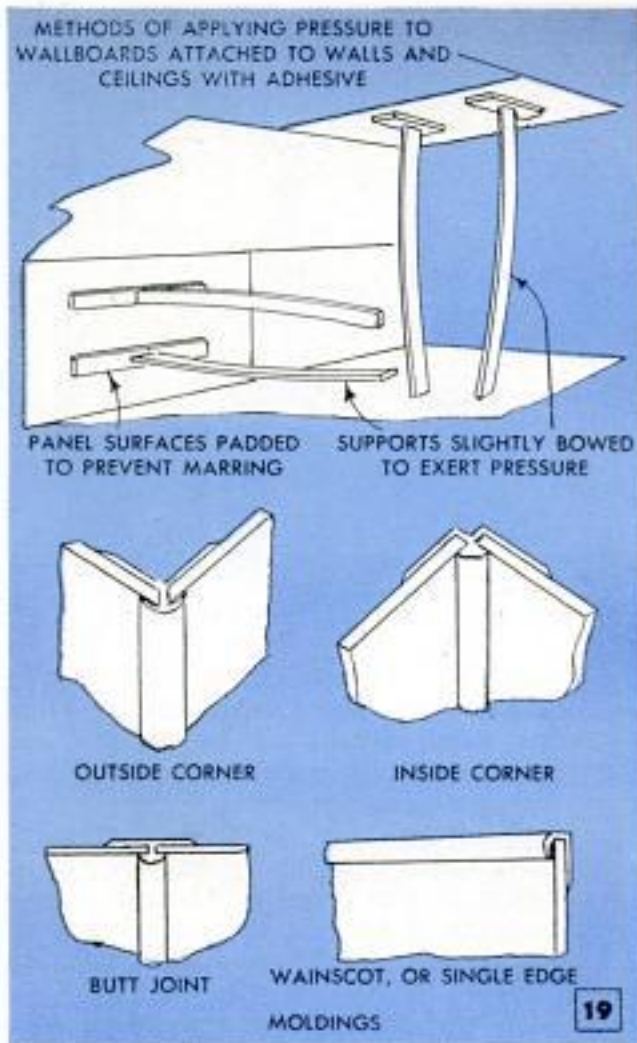
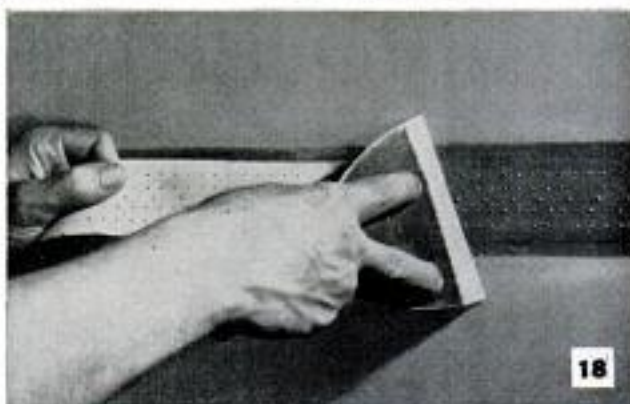
Different kinds of wallboards require different nails in respect to kind and size, as recommended by manufacturers. Nails should penetrate nailing bases no less than  $\frac{3}{4}$  in., sometimes more. Often nailheads are concealed by sinking them slightly below the wallboard surface, and then "spotting" them with a special filler or



15



16



cement. Nails holding tongue-and-groove planking and tiles are driven into the lip edges as in Fig. 16 and concealed by the overlap of the adjoining plank or tiles.

The usual procedure in applying building board is to nail it to intermediate studs, joists or furring strips from the center out, and then nail it at the edges. However, for asbestos-cement board, it is recommended that one edge be nailed first, after which nailing proceeds from this edge across the sheet to keep it flat.

Stapling, Fig. 14, is a fast method of attachment but is confined to the less dense types of wallboards. The staples should be rust-resistant and of suitable size for the thickness of wall covering used.

#### Clips for Tiles and Planking

Metal clips as shown in Figs. 11, 12, 15 and 16 often are preferred to nails for tiles and planking. Clips provide complete support yet permit slight movement of the material when it expands or contracts. Fig. 16 shows a novel clip arrangement for holding  $\frac{1}{4}$ -in. plywood planking to furring strips that have a T-slot to hold clips, which also fit a cut under the tongue edge of the planking, thus eliminating nails and the problem of concealing the heads.

Most wallboards as well as structural glass, plastic and metal tile can be installed with suitable adhesives. When an adhesive is used, the backing must be flat, rigid, in good condition and firmly anchored. Peeling paint or enamel and all traces of wallpaper must be removed, cracks should be filled and damaged spots repaired.

Adhesive can be applied by using a correctly notched spreader to apply daubs or ridges of the adhesive to the wallboard. On large panels the daubs may be from  $\frac{1}{8}$  to  $\frac{1}{4}$  in. thick, about 3 in. in diameter and spaced about 10 or 12 in. apart. On small tiles daubs are deposited near the corners as in Fig. 17. Ridges of adhesive often are deposited on planking, lengthwise, at center and edges, using a special tool. Large panels can be kept in firm contact with a backing such as a plastered wall, until the adhesive has set sufficiently, by using braces and wedges as shown in Fig. 19. Another method is to use a few finishing nails where necessary, sinking them below the surface and covering them later.

#### Edge and Corner Treatments

Examples of the most common types of molding available from various wallboard manufacturers are shown in Fig. 19. The molding may be wood, metal or plastic.

Wallboard having beveled or rounded edges forms V-joints when assembled and these are left uncovered.

Joining edges of recess-edge gypsum board are covered with perforated tape embedded in cement and covered with it as shown in Fig. 18. Three separate applications of cement, well feathered out, are usually required. When dry, the joints are sanded. Inside corners are similarly done with the tape which then is creased lengthwise at its center. Outside corners are provided with a special metal-reinforced tape.

### Tile-Laying Hints

Some important details not to be overlooked when applying wall tile are as follows: Remove all loose, scaly paint and put the wall in good condition. Unless you start at a vertical corner molding, you will need horizontal and vertical guide lines. These you snap with a chalk line after carefully locating their positions so you will not have to cut tile to narrow widths when fitting them at the edges of the wall.

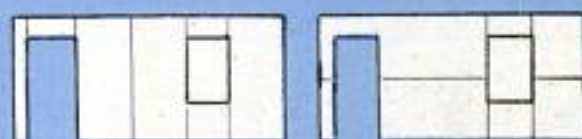
Adhesive and tile should be kept at room temperature for several hours before application. Rigid tile generally is "snapped" on previously applied adhesive, Fig. 20, so it comes about  $\frac{1}{8}$  in. from tile already in place, after which it can be moved by pressing on the tile gently with the tips of the fingers. When installing plastic tile at registers, place a suitable thickness of asbestos paper between the metal and tile.

### Working With Wallboard

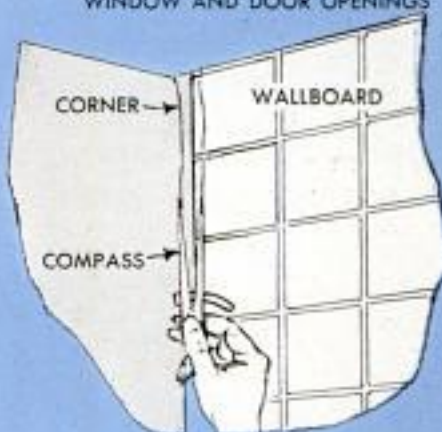
When the softer types of wallboard are located where they are vulnerable to impact and consequent damage, a strong, rigid backing of plaster, wood or other equally suitable material should be provided behind them for support.

When building board is applied horizontally, using lengths that extend across the entire wall, and the wall is not higher than 8 ft. 3 in. (gap at the floor to be concealed by baseboard), there will be a minimum amount of joining edges to be concealed. Building board should be installed vertically where walls exceed 8 ft. 3 in. in height. Basic arrangements of building board for best appearance of joints are shown in Fig. 21. Some materials, like gypsum and asbestos-cement wallboard can be fractured along a scored line.

Hardboard is available in regular and in tempered varieties. The latter has about seven times as much strength and ability to withstand abrasion as the former. Because hardboard changes slightly in size with changes in humidity, the moisture content of wall panels should be maximum at the time of installation. This can be



PLACEMENT OF WALLBOARD AROUND WINDOW AND DOOR OPENINGS



MARKING WALLBOARD TO FIT IRREGULAR CORNER

assured by placing wet cloths or newspapers between pairs of panels arranged with the smooth sides facing outwards for about 12 hours.

Often the corners of rooms are not very straight and then wallboard must be cut to fit it accurately. You can mark the wallboard for cutting by transferring the variations of the corner to it by using a pair of dividers as shown in Fig. 21. ★ ★ ★

Photos in preceding article were used through courtesy of following: Fig. 1, Piton Plastics Corp.; Fig. 2, L.O.F. Glass Fibers Co.; Fig. 3, Formica Co.; Fig. 4, Libby-Owens-Ford Glass Co.; Fig. 5, United States Plywood Corp.; Fig. 6, Chapman Mfg. Co.; Fig. 7, Thomas S. Crandall; Fig. 8, Georgia Pacific Plywood Co.; Figs. 11 and 12, Masonite Corp.; Fig. 13, Colotex Corp.; Fig. 14, National Gypsum Co.; Figs. 15 and 17, Wood Conversion Co.; Fig. 18, United States Gypsum Co.; Fig. 20, Vikon Tile Corp.

## Lower Shelves of Open Bookcase Are "Off Limits" to Tykes



You can make the lower shelves of an open bookcase temporarily inaccessible to roaming tots who take great delight in turning a room upside down. Simply cut a panel of plywood or hardboard to suit the width of the bookcase and attach two friction catches to the inside to hold the panel in place. Two finger holes let an adult remove the panel quickly.

## Mucilage Container-Applicator Made From India-Ink Bottle

India-ink bottles now on the market make ideal container-applicators for mucilage and thin glue, as the bottle stoppers operate in much the same manner as a medicine dropper. After the contents have been used, the bottles are cleaned and filled with glue which can be applied in a line or a single spot simply by squeezing the bulb of the filled stopper.



## Sawhorse Has Leg Extenders

Sawhorses fitted with adjustable leg extenders as shown can be used for many more jobs than ordinary ones. To make the conversion, simply screw two pipe clamps to the inside of each leg and drill three or four holes two inches apart and starting about two inches above the uppermost clamp on each leg. Then, insert a length of steel pipe in each pair of clamps and place a bolt in the hole in each leg that will provide the desired leg height. Use wing nuts to fasten the bolts for easier changing and place rubber crutch or cane tips on the exposed pipe ends to prevent damage to floors.



O. C. Grant, Springfield, Mass.

## Marbles Spot Railing Holes In Concrete Stoop

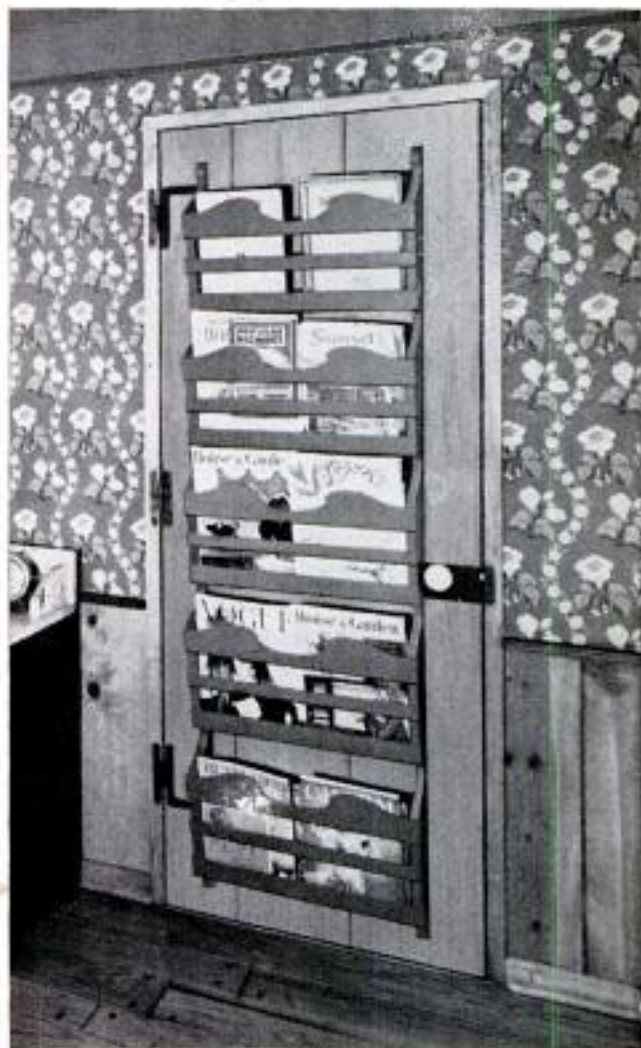
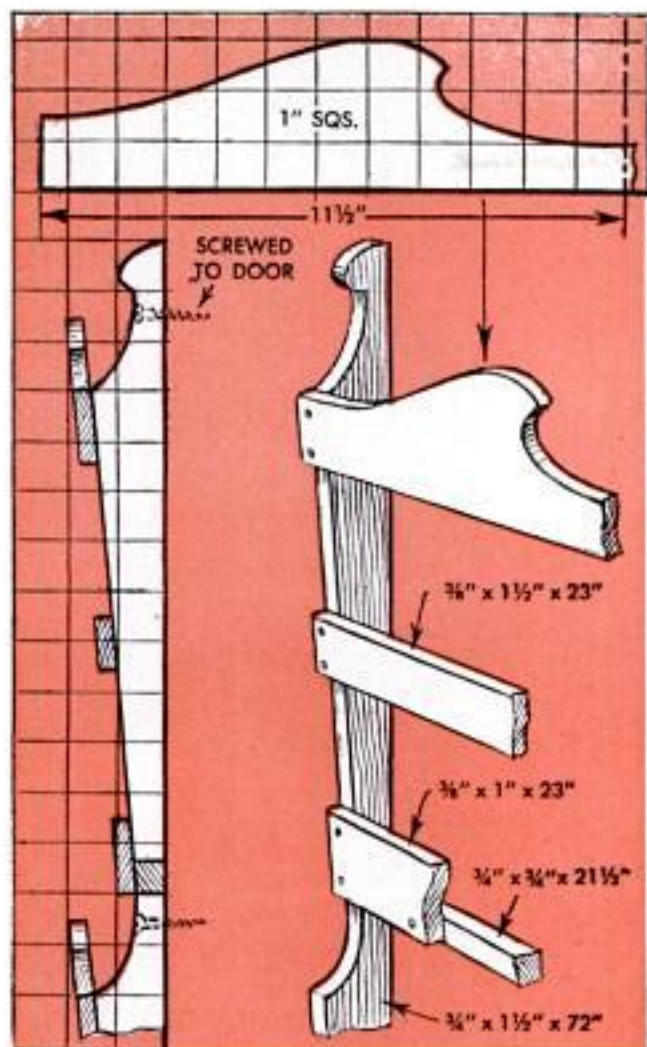
Using glass bottles to form anchor holes for ornamental-iron railings in a concrete stoop is a common stunt, but usually the bottoms of the bottles are left exposed to show their locations. Where the railing is to be installed at a future date, a less conspicuous way of spotting the bottles is to center a marble on the bottom of each one so it just peeks through the troweled surface. Then when you are ready to break open the holes at a later date, it's an easy matter to spot the marbles and tap them with a hammer to break the glass.—Frank A. Javor, Newark, N. J.



## Graphite From Pencil Lubricates Miter-Gauge Groove on Bench Saw

A bench-saw miter gauge will slide freely in its groove if given an occasional lubrication with the graphite from a carpenter's pencil. Simply run the point up and down the groove until a sufficient amount of graphite is deposited on the bearing surfaces. Oil should not be used, since particles of dust mix with it and cause the gauge to stick. Oil also might get on the work and stain it.

# This On-A-Door Rack Holds Magazines Galore



Your magazines are not only always conveniently at hand when kept in this on-a-door rack, but the array of colorful covers will help to add a bright touch of color to a family room. It's a perfect jigsaw project, the scrolled sides being a repeat pattern the height of the door. The sides are screwed to the door first,

then the plain and scrolled cross pieces are nailed to them with small finishing nails. A  $\frac{3}{4}$ -in.-sq. piece forms the bottom of each magazine compartment. The original rack was done in Chinese red to contrast against a natural-finish door. Width of rack, of course, must suit door.—Hi Sibley, Nuevo, Calif.

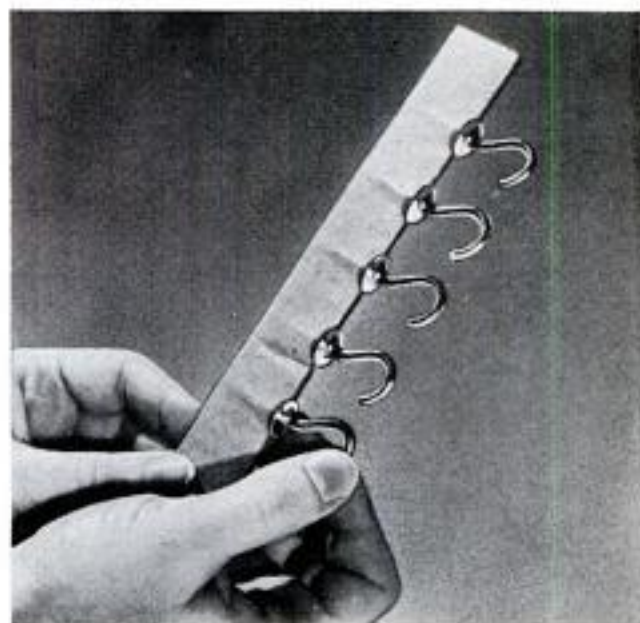
## Strip of Corrugated Board Stores Cup Hooks

Cup hooks are classified among those small household items so easily lost or misplaced, especially those few left over from the last purchase you made. Of course you put them away, but where? Cup hooks are easy to locate if you take the time to cut a narrow strip from corrugated board and screw the hooks into the edge as pictured. Extra screws can be stored this way too.

## Rejuvenating Scuffed Luggage

If you have a piece of luggage that is badly scuffed and should be discarded, you may be able to improve its appearance for a few more trips by coating it with liquid shoe polish. When dry, coat with thin white shellac which will give the luggage the appearance of a glazed finish.

Doris Fenn, Chicago.





Whether enlargement of entire negative, above, or only main subject, below, treatment is effective

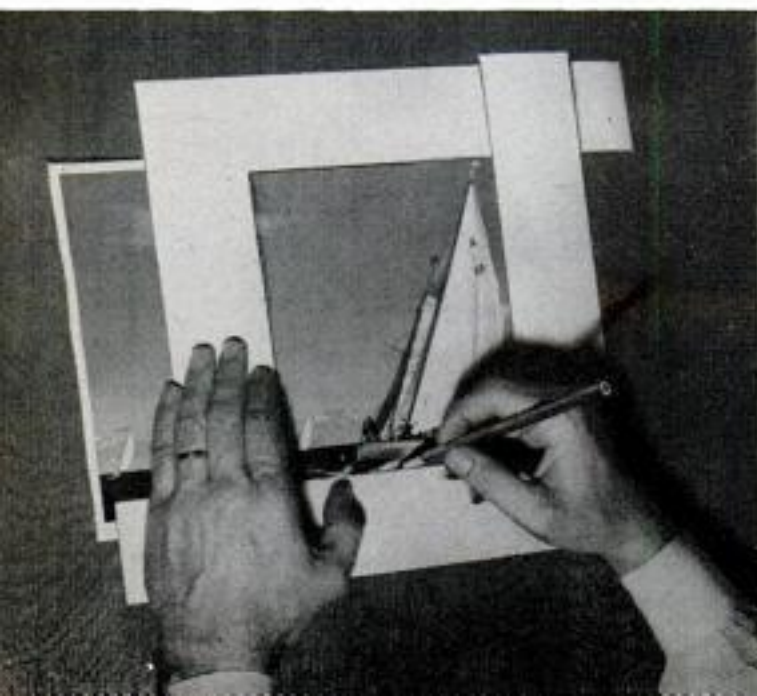
## One Negative

**N**O MATTER how carefully you compose a picture in the view finder of your camera, there will almost without fail be some unwanted material at the top, bottom or sides that should be eliminated—"cropped away"—when making prints. With two L-shaped "rulers" and a print made from the entire negative the best composition can be selected, as shown in the photo on the bottom of this page, and enlarged. Lines drawn with a grease pencil at each corner of the area selected serve as guide lines to aid adjusting and focusing the enlarger. After a print of one combination is made, wipe off the guide lines and try another



Photos and information courtesy  
Eastman Kodak Co.

Below, L-shaped "rulers" cut from cardboard enable photographer to select and "view" best composition more easily before making enlargement of it





Right, removal of small boat makes number 18 underdog in race. Left, removal of big boat changes picture

## *How Many Pictures?*

combination that will present the subject differently.

Cropping a picture close to the main subject helps to focus attention on it and strengthens vertical lines when only the sides are cropped, lower left. Maximum enlargement and close cropping on all sides reduces the picture to its essentials for a dramatic view, lower right. ★ ★ ★

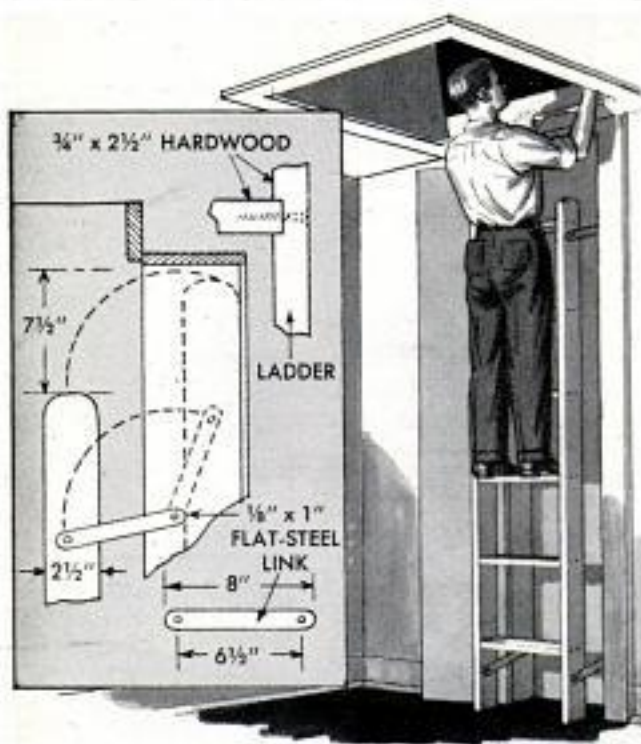
Below at left, number 18 boat is center of interest while smaller boat creates illusion of distance

Center, with all but larger boat eliminated from picture just one strong center of interest remains

Right, maximum enlargement and picture cropped to essentials produces more dramatic, intimate view



# Attic Ladder in Wall Cabinet Is Always Handy

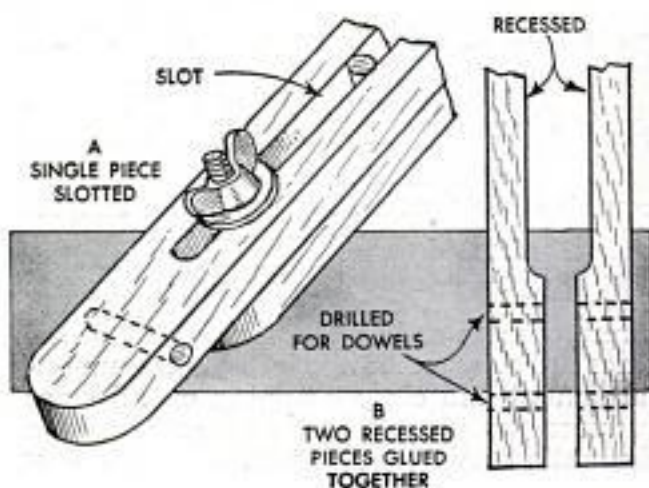


Going after a ladder whenever you want to go up into the attic is no longer necessary when one is permanently installed below the ceiling opening. It can be built into the wall like an ironing board or housed in a shallow floor-to-ceiling cabinet attached to the wall. Attached to pivoting links, the ladder is merely lifted up and out to bring it into ready use. Four flat-iron links, all parallel to each other, pivot the ladder to the cabinet. Bolts and washers are used to attach the links to the ladder; screws and washers to the cabinet. Outside width of the ladder should be about  $\frac{1}{2}$  in. less than the inside width of the cabinet. Note how the ladder rests against the cabinet back with the links resting at an angle slightly beyond the vertical, which prevents the ladder from falling out of the cabinet.

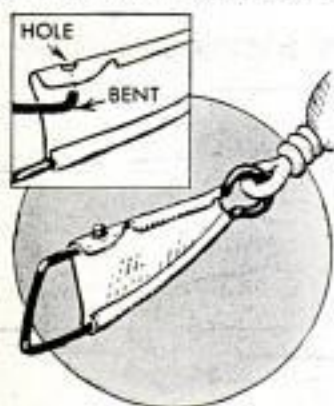
Reduce corrosion stains from nails, hinges, screens and downspouts by painting or varnishing the affected surfaces.

## Slotted Wooden Strips Can Be Reinforced With Dowels

When a piece of wood is slotted lengthwise to serve as an adjustable sliding member of an assembly, and it is subject to weight or pressure, the ends should be reinforced with dowels to prevent them from splitting. Drill holes across the ends and glue the dowels in place. When the glue has dried, cut off the projecting ends of the dowels and sand them flush with the surrounding surface. An alternative for a slotted wood strip is to recess two narrower strips along one edge as shown, applying glue to the joining edges as well as to the dowels. A third method would be to use carriage or stove bolts instead of dowels.



## Fishing-Lure Fastener Altered So It Will Not Pull Open



If you have ever lost a hooked fish because the snap fastener holding the lure was pulled open, you will appreciate the value of this simple alteration that will prevent such trouble. Drill a hole in the catch as indicated and bend the end of the wire

hook at right angles so it engages the hole. The fastener then can be subjected to many times the previous pull without opening.

## Bench-Mounted Abrasive Disk For Sanding Small Surfaces

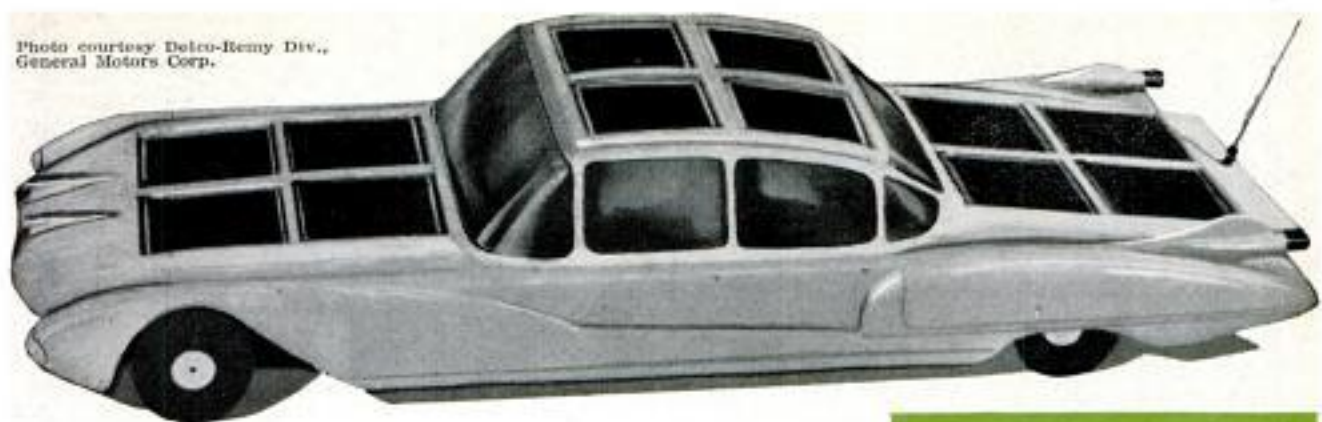
With a sanding disk mounted horizontally on a block of wood clamped to his workbench as shown, one home craftsman was able to sand small pieces of wood, plastic and metal more quickly and accurately than possible with a sanding block. To mount the disk, a hole is drilled in the block of wood to accommodate the mounting shaft.



Walter E. Burton, Akron, Ohio.



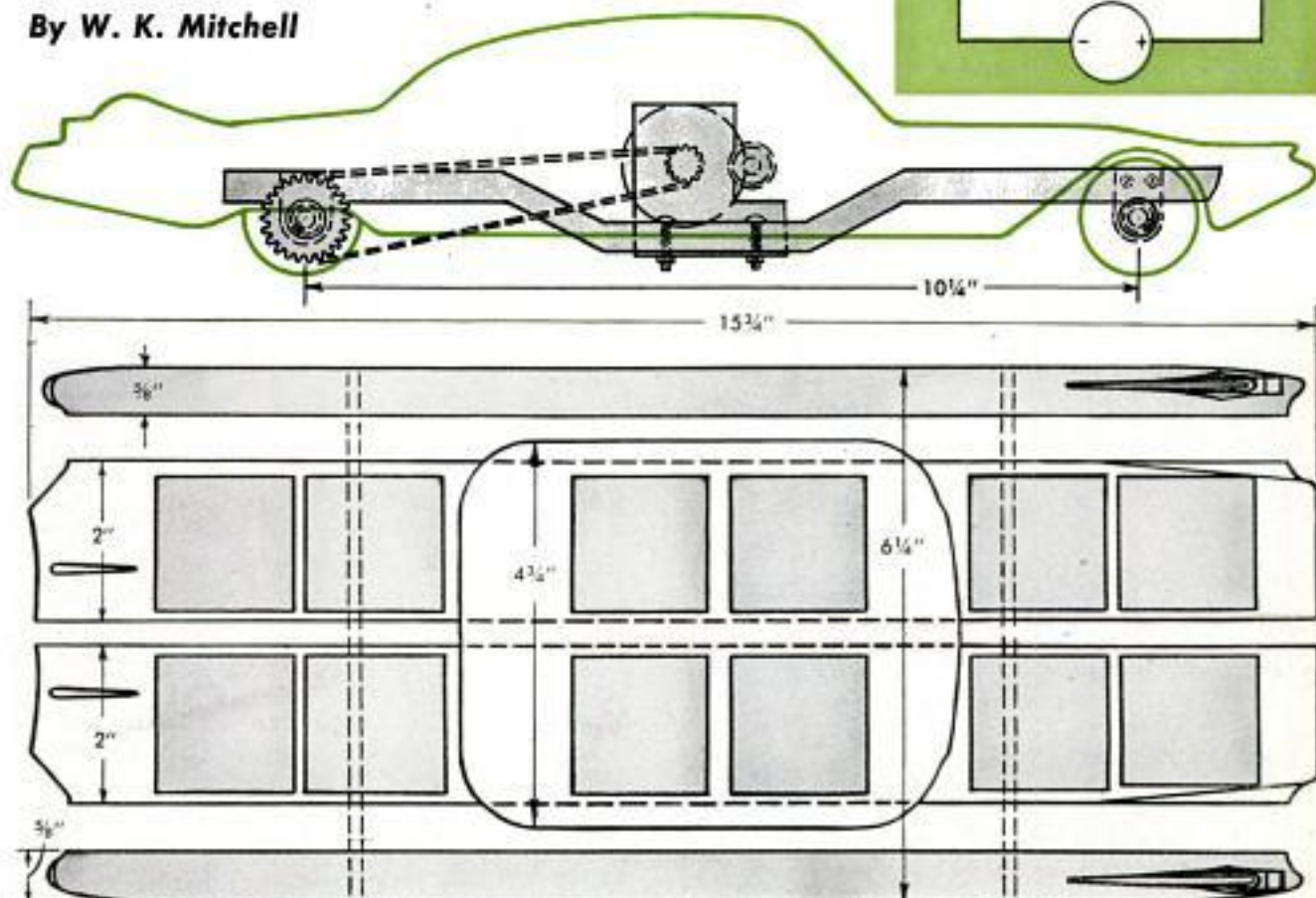
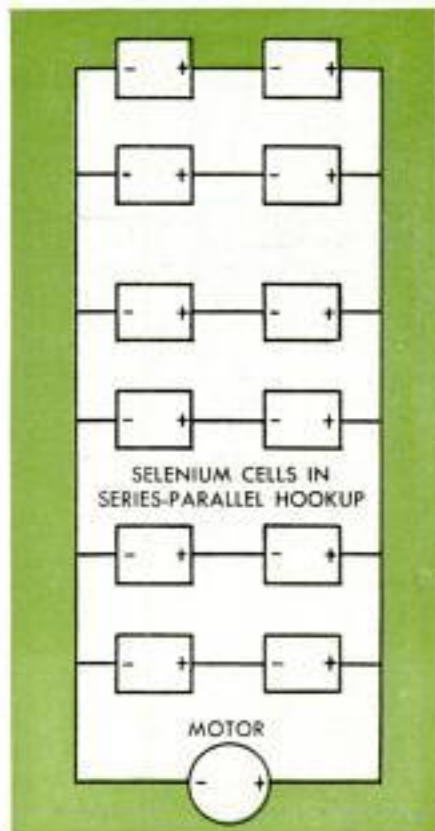
Photo courtesy Delco-Remy Div.,  
General Motors Corp.



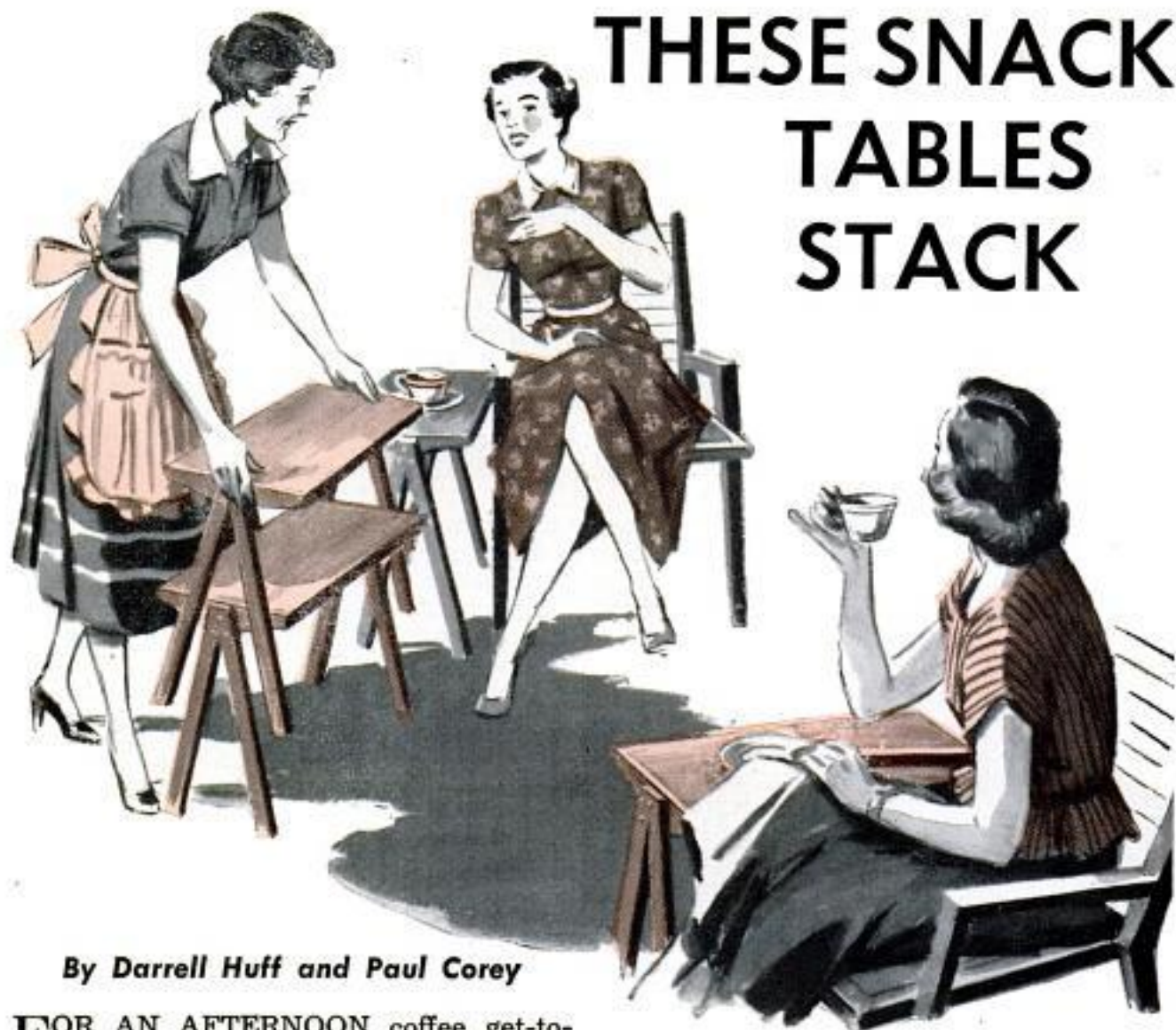
## Sun-Powered Car

SUNLIGHT IS THE FUEL used to power this model car, solar energy being converted directly to electricity through 12 selenium cells hooked in series-parallel and connected to a low-inertia electric motor. The motor operates on 1.5 v., rotating at 2000 r.p.m. The car body is made of balsa wood in five sections, the two center sections being hollowed out to receive the pine chassis, motor and drive mechanism. Power is transmitted from the motor to a drive shaft rotating parallel to it by means of precision gears with a 3 to 1 ratio, the smaller gear being on the motor shaft. The drive shaft delivers its rotation to the rear axle through a ladder-type chain that runs on sprockets on the drive shaft and axle. Wheels for the car are 1½-in.-dia. aluminum with rubber tires. Axle size is ⅛ in. and the wheels can be obtained at most hobby shops. No. 20 stranded, insulated copper wire is used to connect the rectifiers to the motor as shown in the wiring diagram at the right.

By W. K. Mitchell



# THESE SNACK TABLES STACK

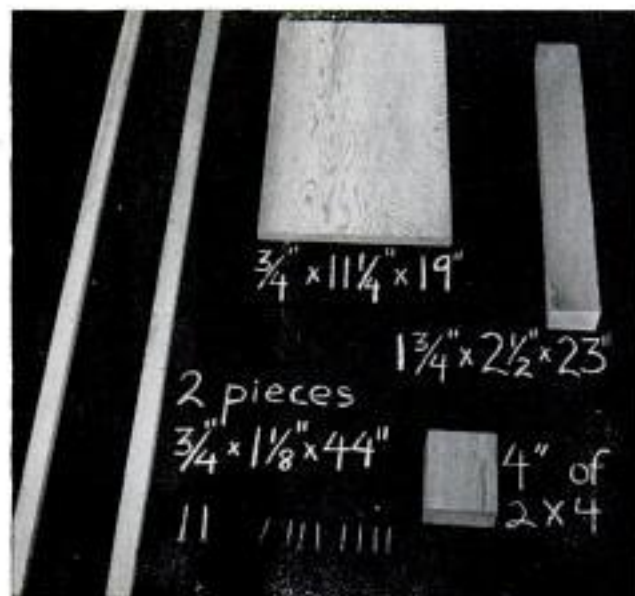


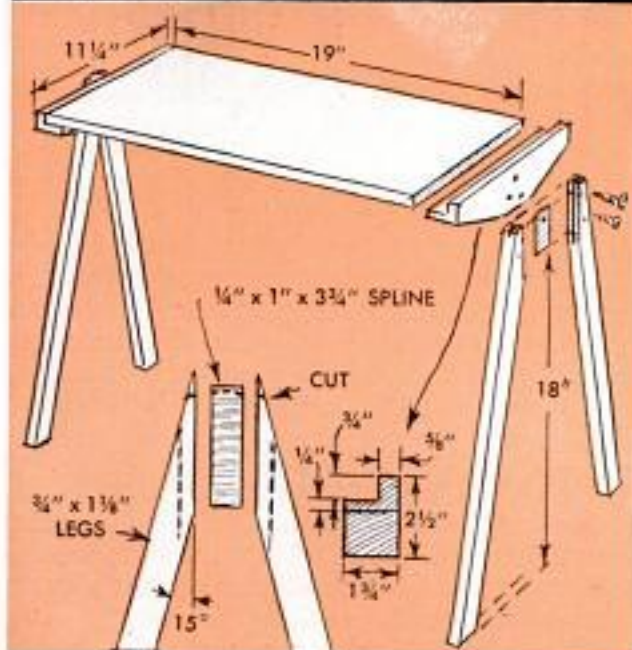
By Darrell Huff and Paul Corey

FOR AN AFTERNOON coffee get-together or a late TV snack, these little individual serving tables are the handiest things, and their V-shaped legs permit them to be stacked four, six or eight high to save space when stowed away in a closet. They also can be put to work as end tables, and two of them stacked make a fine telephone stand with a shelf between for a

directory and a pencil and note pad.

All cuts can be made on a circular saw, and since the tables are alike, any number can be mass-produced quickly by using simple guide blocks and fixtures to assure uniformity. Plywood is best for the tops, although flat solid stock will do. The ends of the tops are housed in rabbets cut in  $1\frac{3}{4}$ -in.-thick end pieces to which the legs are fastened. Make the rabbets with a dado saw and tilt the table, or the saw, as the case may be, about 1 deg. so the legs, when attached, will cant outward a bit to facilitate stacking. The legs are assembled in pairs by grooving the angle-cut ends for  $\frac{1}{4}$ -in. splines. When glued and dried, the points are sanded off and the ends rounded. The rabbeted end pieces are attached to the ends of the tops with glue and wood screws, the latter being driven into the tops from the underside. Each pair of legs is attached to the end pieces with three oval-head wood screws. A simple finish consists of three coats of water-white lacquer. Lacquer sealer for the first coat will do a better job. Light rubbing with fine sandpaper between coats is recommended. ★★★





Upper photo, the rabbeted end pieces are fastened to the ends of the tops with glue and screws. Sawing the rabbets at a slight angle cants the end pieces slightly so that legs, too, will slant outward

Below, drive upper screw first, then, when the table top is leveled by measuring from each corner, drive the other two screws. Use a 2-in. screw at the top and No. 8 1 1/4-in. screws below. Glue the legs also

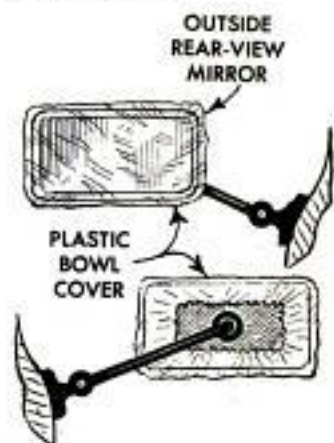


FEBRUARY 1957

## Bowl Cover "Weatherproofs" Outside Rear-View Mirror

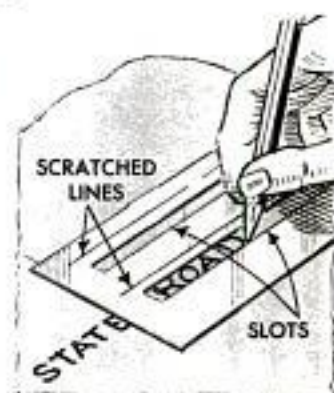
If your car is parked outside during the winter, exterior-mounted rear-view mirrors can be kept free of ice and sleet by covering them with plastic bowl covers. Available in sizes to fit any mirror, the covers also can be chosen in a color to match the car. When not

in use, they can be stored under the front seat.—Irwin F. Combs, Oswego, N. Y.



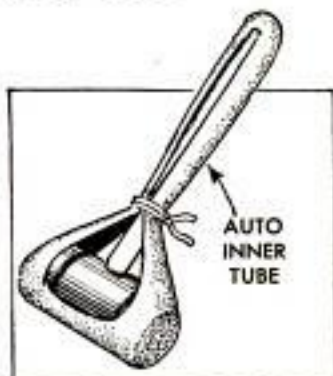
## Slots in Lettering Guide Save Ruling Lines

There's no need to spend extra time ruling groups of parallel height lines when adding lettering to drawings. All you need is the plastic guide shown. By penciling the lettering within the slots, the height is automatically kept uniform. A scratched line above and parallel with each slot is used to space each line with the lower edge of previous lettering. The slots are easily cut in thin plastic or celluloid with a razor blade.

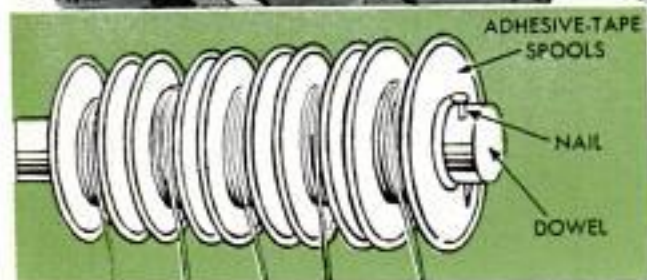
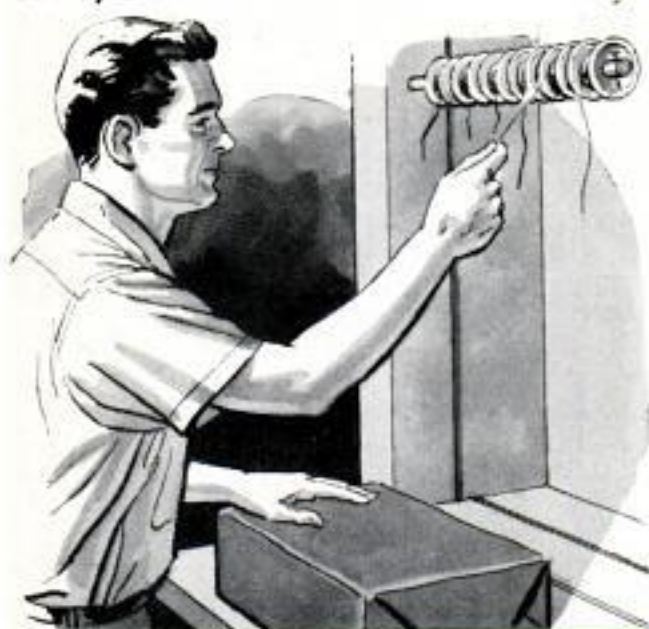


## Wooden Mallet Made Nonmarring With Section of Inner Tube

When it is necessary to strike tight-fitting parts of an assembly without causing surface damage, and a rubber mallet is not available, you can cushion a wooden mallet with a strip of inner tube for this purpose. Simply stretch a wide section of auto inner tube over the head and handle as shown. Tie the rubber to the handle just behind the head so that the handle can be gripped conveniently.



## Adhesive-Tape Spools Dispense Wire, Solder and Twine



Empty adhesive-tape spools placed on a dowel over the workbench as shown provide handy storage for wire solder and wire or twine of various sizes used in the shop. The dowel, which is glued in a hole drilled through a wall stud, should be strong enough to support several spools of material yet not too large for easy turning of the spools.

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

## Lead Shot Anchors Screw In Enlarged Hole

One home craftsman has found that a screw can be made to fit tightly in an enlarged hole by forcing a small lead shot in the hole before driving the screw. Turning the screw into the hole not only forces the shot into the wood, but the screw threads also cut into the lead to provide a doubly secure anchorage.

G. E. Hendrickson, Argyle, Wis.

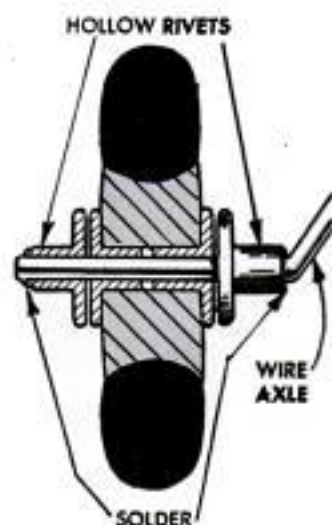
### *Shopping for a Trailer?*

There are two important things to consider to assure safe, trouble-free trailering; overload springs and weight-distributing hitches. In a March feature Clinton Hull points out their importance and tells how to determine the right type best suited to meet individual trailer requirements

## Brass Bearings and Hubs For Model Wheels

Wooden wheels on models can be equipped with brass bearings and hubs by using automobile brake-shoe rivets installed as shown in the detail. First, drill a hole large enough to admit the axle through the center of each rivet and another hole through the center of each wheel so that the rivets used as bearings will fit snugly in the wheel. After removing all burrs from the rivets, coat them on the outside with glue or liquid solder and press them in place. Paper shims should be used between rivetheads when soldering the hubs on axles to maintain sufficient clearance.

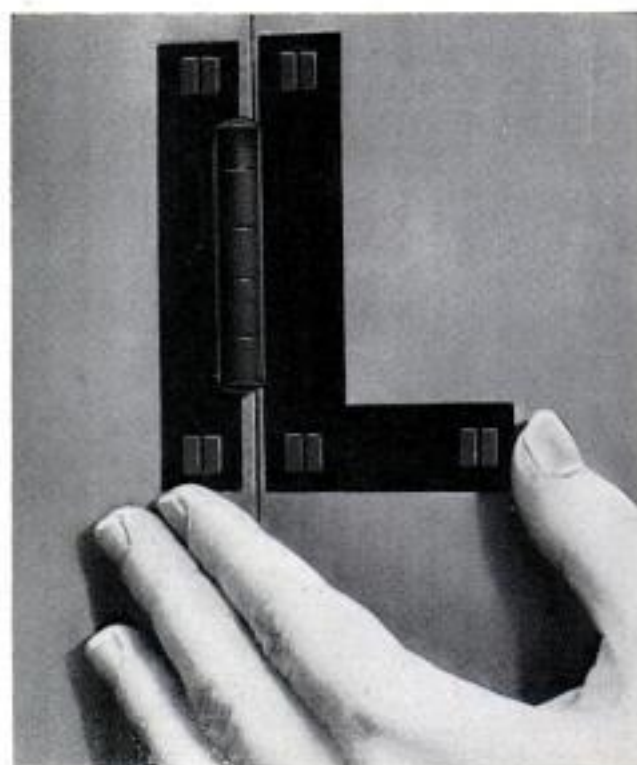
Robert Thompson, Clinton, Iowa.

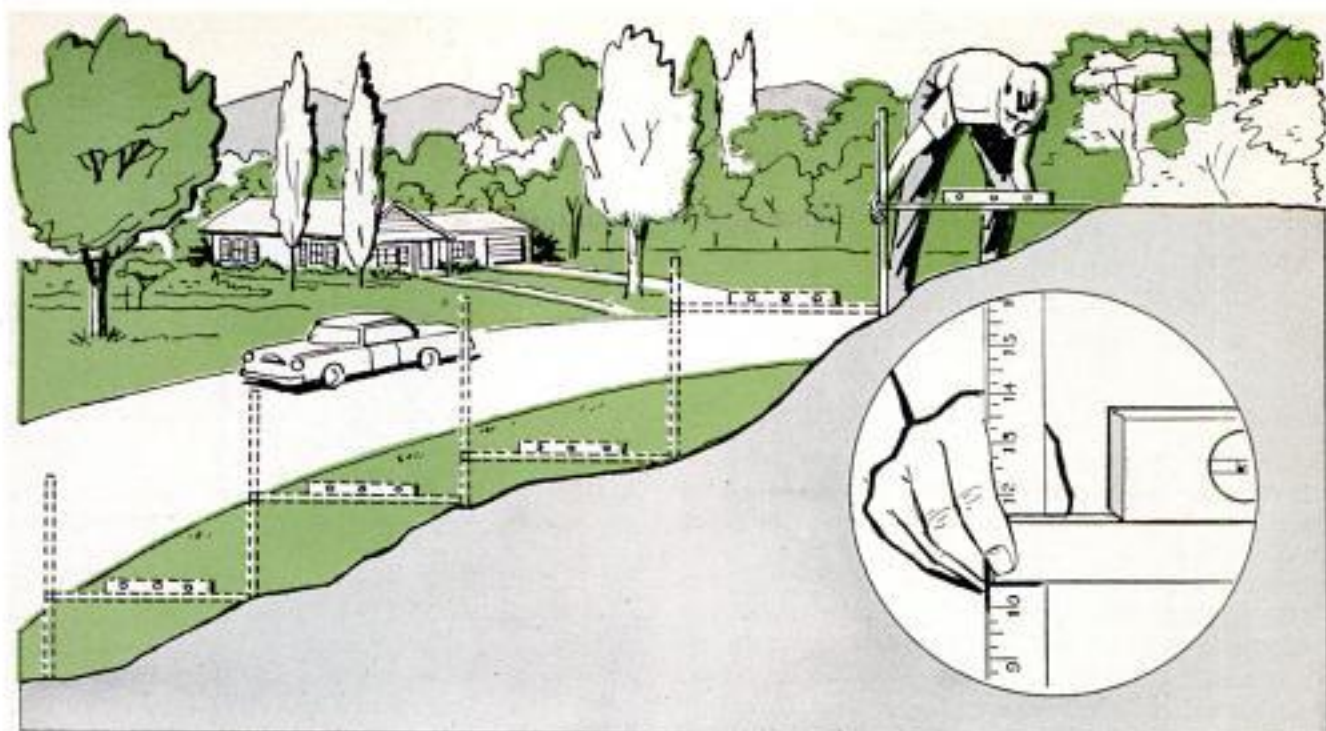


## Imitation Wrought-Iron Hinges

An ordinary butt hinge becomes a wrought-iron L-hinge by the simple addition of three strips of hardwood. Rip the strips to about  $\frac{1}{16}$ -in. thickness, cut to length required and screw in place as pictured, using square-headed screws. Paint the exposed portion of the butt hinge and the strips flat black before installing.

Frank A. Javor, Newark, N. J.





1. Illustration and detail indicate how yardstick, level and length of wood are used to measure slope

## MEASURING A HILLSIDE LOT

By Ralph Wellner

**I**N MANY CASES, building lots that have a beautiful view are on a hillside, which presents added problems to anyone looking for a site on which to have a home built, since the exact degree of the slope must be known by an architect when he designs a home for that location. Also, if the prospective home builder has already chosen a house plan, it will be necessary to determine whether that house can successfully be adapted to the hillside being considered.

It would be impractical, of course, to check the slope of every hillside shown to the buyer, and it would be prohibitively expensive to have a professional surveyor make a topographical plat of each lot, but with the simple method described in this article, it is possible to check the slope of locations that seem particularly desirable. The results are accurate enough that the elevation of a house plan can readily be superimposed on a scale drawing of the slope to determine the feasibility of constructing a particular house on that hillside lot.

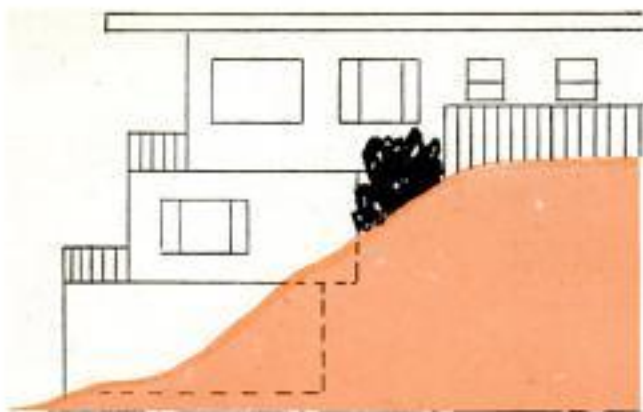
Tools required for the measurement of grade slope are: A yardstick, a 2 or 3-ft. length of wood and a level. Unless the slope is extremely steep—one that can hardly be climbed—a 3-ft. length of wood will be accurate enough. The three tools are used as illustrated in Fig. 1. Hold the yardstick as nearly vertical as possible,

hold the 3-ft. stick horizontally from the slope to the yardstick and true it with the level. Read the figure on the yardstick which shows beneath the stick and write it down. Repeat this operation every 3 ft. either up or down the slope, from lot line to sidewalk or reverse, and make a table as shown in Fig. 2. The first column is the horizontal distance, in 3-ft. increments, the second column is the reading on the yardstick at each step. The third column is obtained by adding each new height measurement to the previous total, and thus shows the elevation at any point.

To get a complete picture of the slope, one that can be used to show how a house

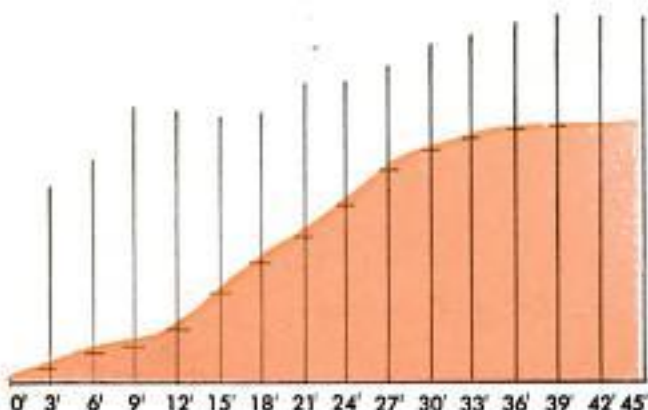
2. SAMPLE TABLE

DISTANCE	HEIGHT	TOTAL
0	—	—
3'	16"	1'-4"
6'	11"	2'-3"
9'	7"	2'-10"
12'	19"	4'-5"
15'	27"	6'-8"
18'	23"	8'-7"
21'	25"	10'-8"
24'	25"	12'-9"
27'	29"	15'-2"
30'	20"	16'-10"
33'	10"	17'-8"
36'	5"	18'-1"
39'	2"	18'-3"



3. When measurements on table are converted to graph form, house-plan elevation can be superimposed

would appear on the lot, as in Fig. 3, use the figures in the table to make a graph like the one in Fig. 4. First, draw a horizontal line on a large sheet of paper, then rule vertical lines every  $\frac{3}{4}$  in. to represent the 3-ft. distances used to measure the slope. The graph will be  $\frac{1}{4}$ -in. scale, which means that if a 2-ft. stick were used, the vertical lines should be spaced  $\frac{1}{2}$  in. apart and measurements taken at 2-ft. intervals. Now, on the graph, measure up the scale a distance equal to the number shown in the



4. Figures from table are converted to graph form by marking scale measurements on vertical lines

total column opposite 3 ft. in the table. Do the same on the 6-ft. mark, and continue through all the vertical lines in the same manner. When all the vertical lines have been marked, carefully draw in a gently curving line to connect all the marks. You now will have a cross section of the hillside, and any house-plan elevation drawn to  $\frac{1}{4}$ -in. scale can be superimposed on this line to accurately determine how it will appear when the house is built on the lot, as in Fig. 3. ★ ★ ★

### Plastic Coaster Under Knob Protects Drawer Front



Plastic coasters or discarded tops from plastic refrigerator dishes protect the finish around drawer or door knobs when fastened under the knobs. To install the plastic remove the knob and drill a hole in the center of a coaster so that the knob screw

will turn through it when reinstalled. With this protection smudges around the knobs can be wiped off as often as you like without damaging the finish of the furniture.

### Rope End Is Disposable Acid Brush

When a brush is needed to apply acid to a soldering job or glue on wooden joints, a disposable one can be made by wrapping a short length of rope with soft wire. Leave about 1 in. of the rope unbound at one end so that the fibers fan out like the bristles on a brush.

□ Double-hung window sash that binds can be made to run free by rubbing floor wax on the sash grooves of the frame.

### Line Taped on Spinning Reel Prevented From Unwinding

Here is a practical way of securing the end of a line on a spinning reel when it is not in use. Simply press a short strip of adhesive tape over the end of the line and against the body of the reel. When the line is needed again, the tape is pulled back far enough to release it and the tape is then replaced for later use.

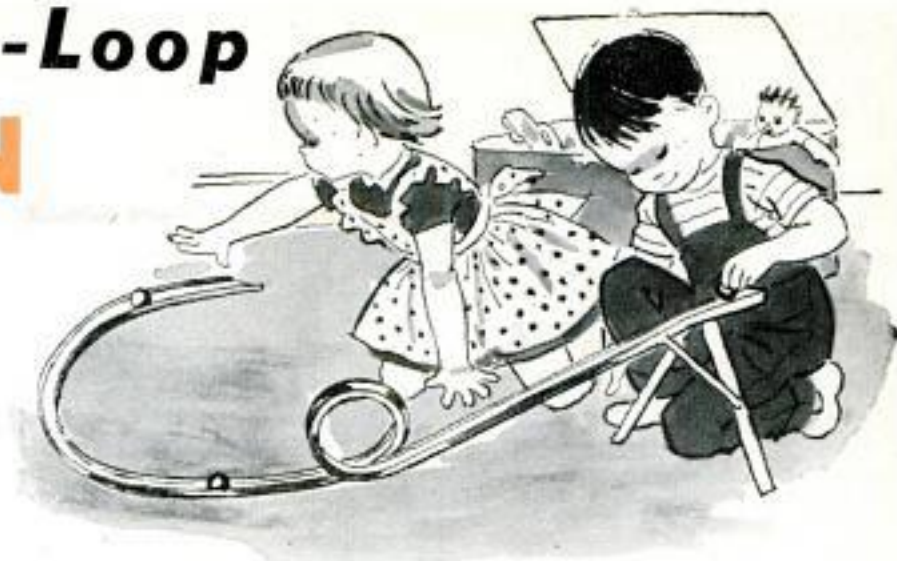
John Krill, Jr., North Lima, Ohio.



# Loop-the-Loop

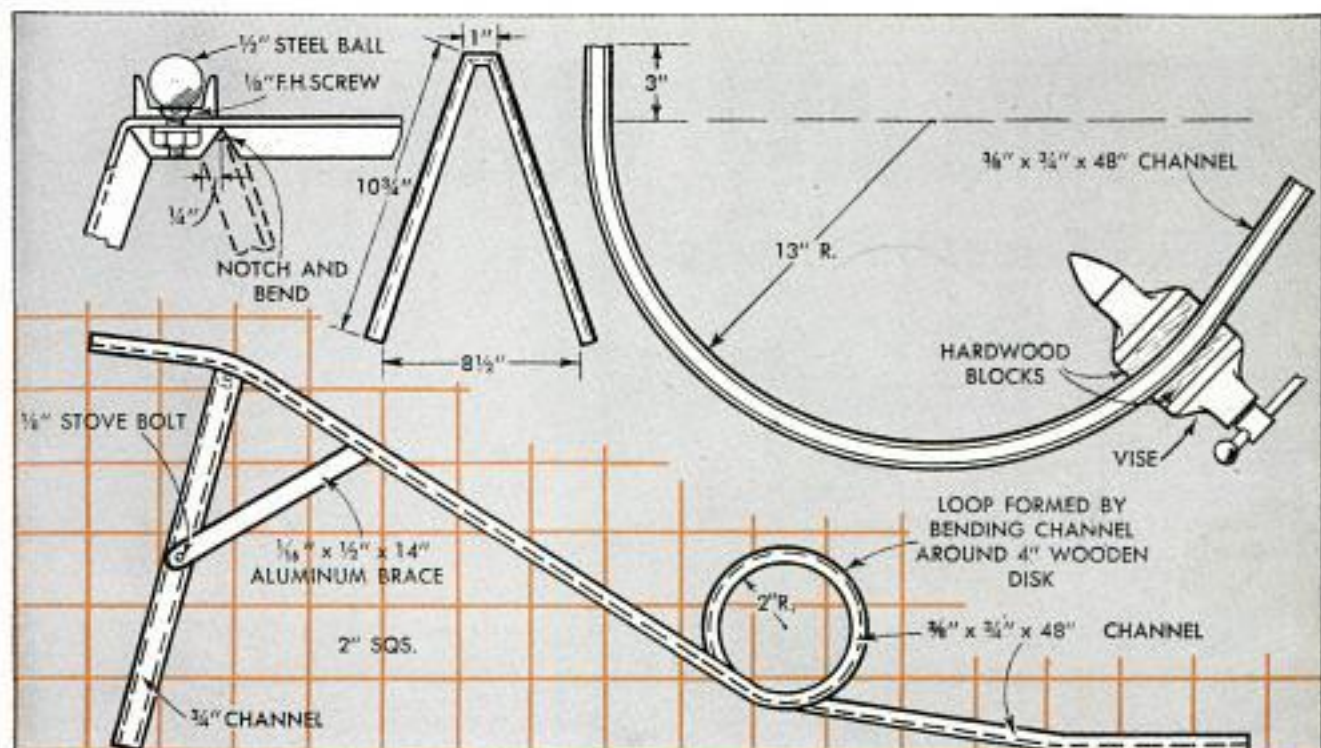
## ACTION TOY

By Ralph T. Moore



CONSISTING primarily of a length of curved channel down which steel balls are rolled, this toy was designed to include the feature required of any toy made for very young children—simplicity of operation. The channel measures  $\frac{3}{8}$  x  $\frac{3}{4}$  x 48 in. and can be steel, although this metal probably will require heating to permit it to be bent. Light aluminum channel can be bent cold if care is taken not to bend it too rapidly. The flanges of the channel will spread apart when it is bent in a loop, but they can be bent back by placing the channel on its side and reshaping with a wooden mallet. Legs for the channel are bent from a single piece of the same size channel as used for the curved track. It is

notched and bent as indicated. The brace between the channel track and the legs is bent from flat stock  $\frac{1}{16}$  x  $\frac{1}{2}$  x 14 in. to form a U-shape and is fastened to the underside of the channel by  $\frac{1}{8}$ -in. flatheaded screws that are countersunk so the heads are slightly below the inside surface of the channel. Although not shown in the detail, a brace between the legs near their lower ends would prevent them from being forced apart should a child lean on the upper end of the channel. Steel balls,  $\frac{1}{2}$  in. in dia., are used to loop the loop.



### Replacing Missing Fragments in Broken China Figurine

When assembling the fragments of a shattered china figurine with household cement, there usually are two or three very small pieces missing. In such a situation, fit pieces of light cardboard in the

openings and paint them to match the china. When the paint is dry, apply a china "glaze" by brushing on a thin coating of transparent cement.

Walt White, Indianapolis, Ind.

## Small Trunk Is Toy Chest For Children's Room

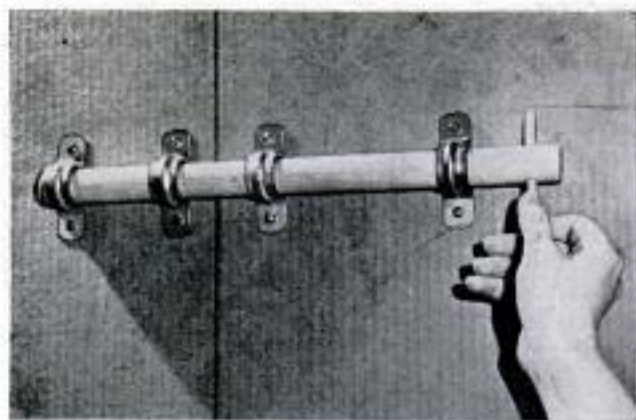


An old trunk fitted with casters and decorated in gay colors is a good place to keep toys. The attractive chest shown, with flowers and the child's name painted on the sides, provides a place to store toys and playthings out of the way.

Arthur G. Patterson, Minneapolis, Minn.

Heel marks on linoleum floors can be removed with fine steel wool saturated with soap.

## Heavy-Duty Cellar-Door Bolt Improvised From Pipe



A length of pipe or broom handle fitted to a cellar door with pipe hangers makes a sturdy and inexpensive door bolt. Select pipe or broomstick that will slide easily under strap-type pipe hangers, one pair of which should be spaced close together on the doorframe and the other pair about a foot apart on the door. The latter will support the bolt when it is pulled aside in the open position. The whole assembly should be given a slight downward tilt so that the bolt will remain in the closed position. A small crosspin installed at the high end of the bolt will prevent it from sliding out.

Frank A. Javor, Newark, N. J.

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## AUTO-POWERED ARC WELDER

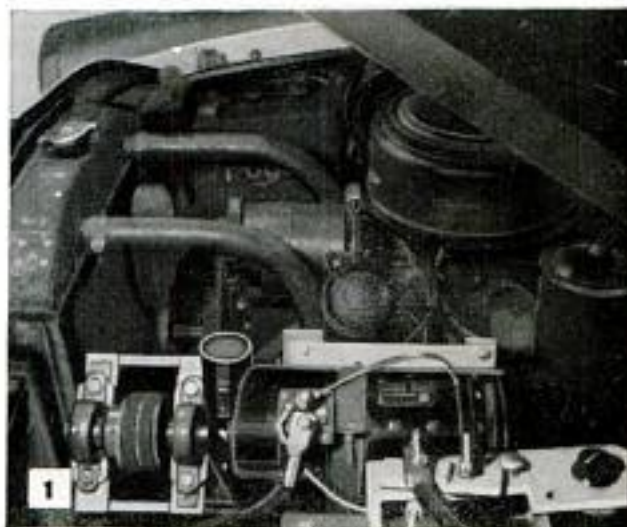
By Norman E. Schultz

**S**MALL ENOUGH to be hidden beneath the hood of a passenger car, yet powerful enough to handle electrodes up to  $\frac{3}{16}$ -in. dia., this 200-amp. welder is powered by the engine of the car in which it is installed, and can be taken anywhere that an automobile can be driven.

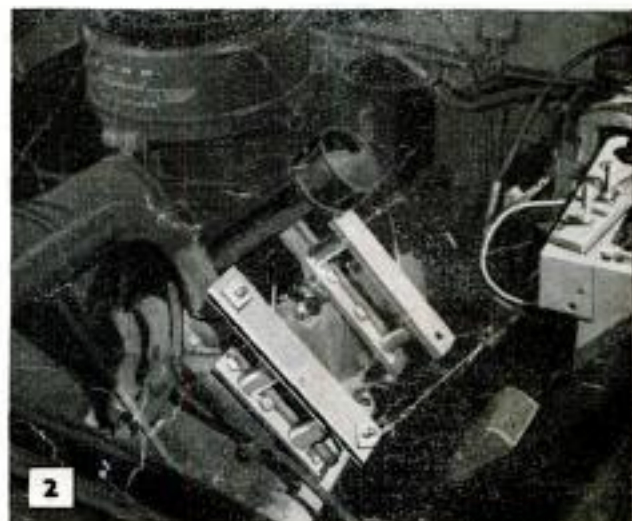
The main component of the welder is a war-surplus Delco Remy P-1 aircraft generator that is rated at 24 v. and 200 amp. at 2500 to 4000 r.p.m. Since this generator has a counterclockwise rotation, it must be turned end for end and driven from the commutator end when rotated by a car engine. This requires that the floating shaft, which drives the free-turning armature, be removed from the generator and modified. First, cut this shaft about  $1\frac{1}{2}$  in. from the driving spline. Next, center-drill the end of a 7-in. length of  $\frac{3}{4}$ -in. steel shafting to provide a press fit for the cutoff shaft. Force the  $1\frac{1}{2}$ -in. length into the hole in the new shaft and braze or weld it in place. Mill a  $\frac{3}{16} \times \frac{3}{16}$ -in. keyway 4 in. long in the end of the shaft to hold the pulleys and bore a clearance hole for the shaft in the end housing of the generator opposite the original location. The shaft now will project from the end of the generator in which the air scoop is located, Fig. 4.

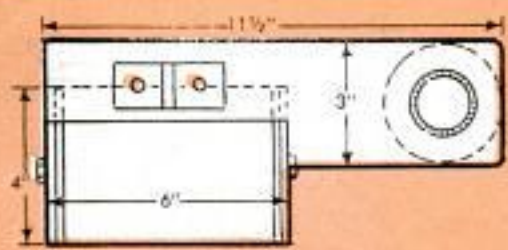
### Frame and Supports

Fig. 4 gives the dimensions and method of assembling the supporting frame for the

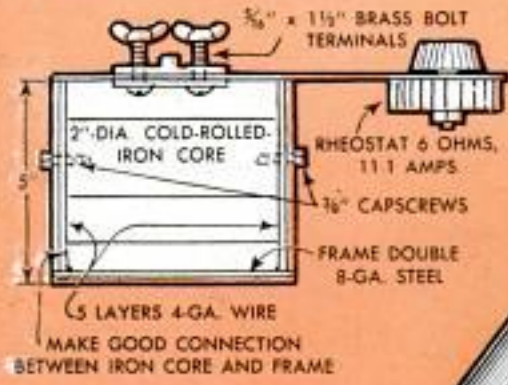


Above, welder connected and ready to run. Below, support frames bolted to head, ready for welder

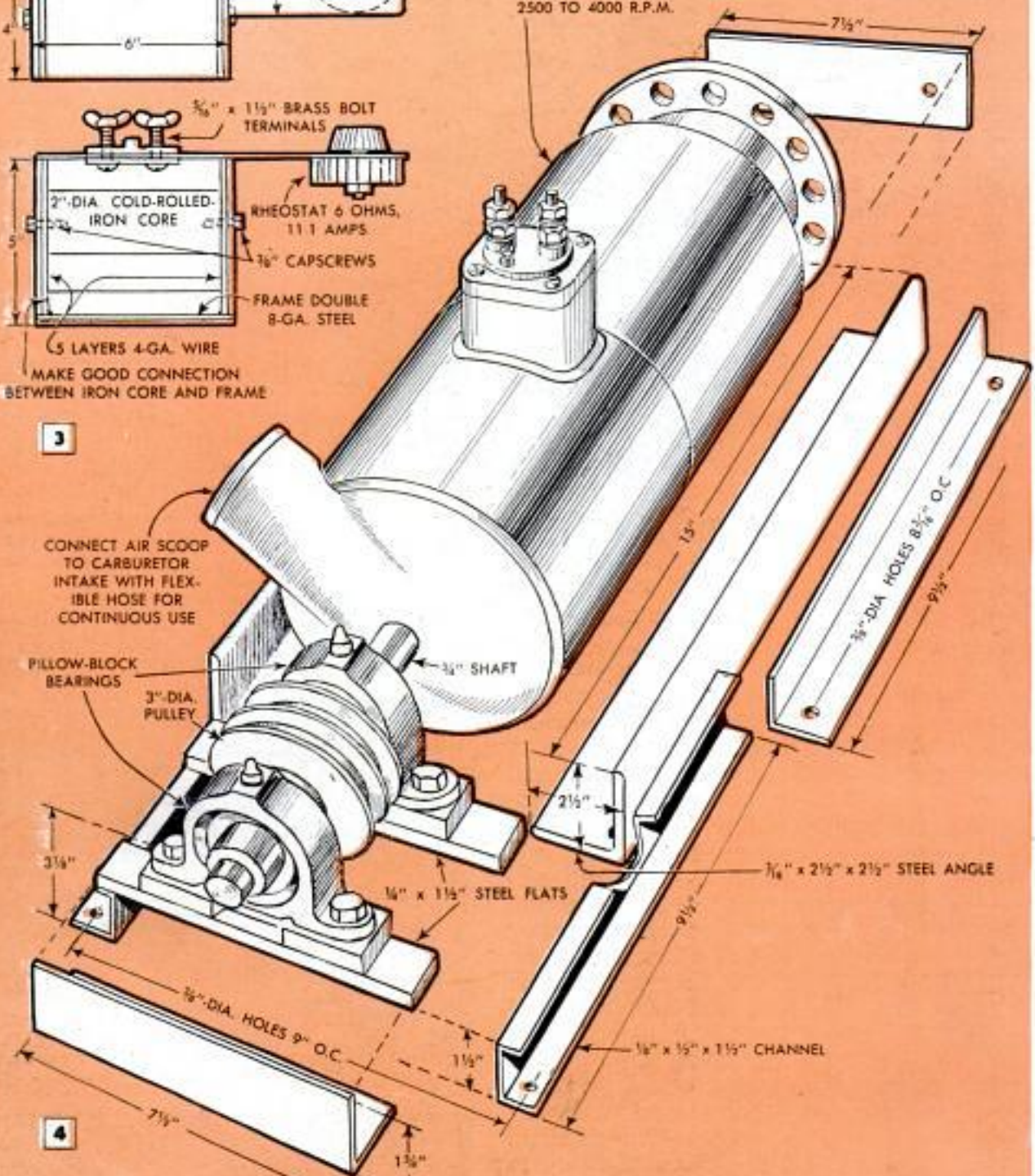




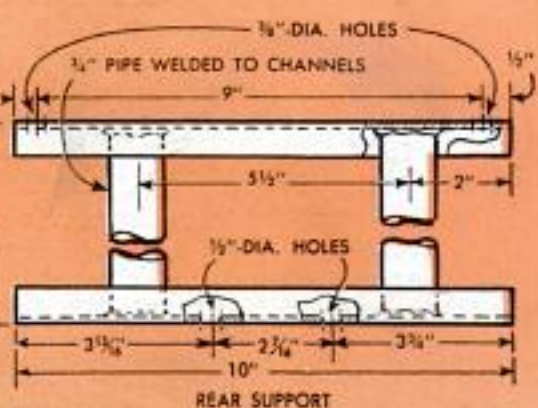
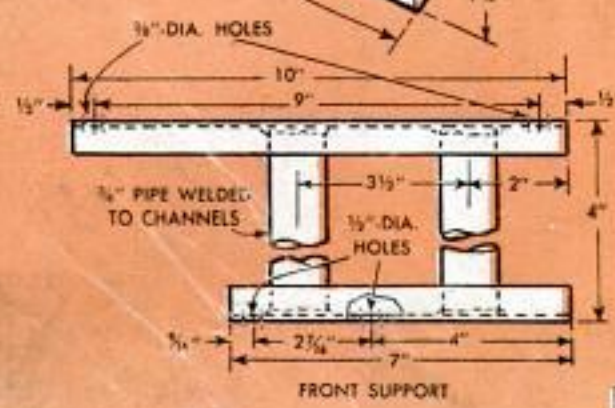
P-1 AIRCRAFT GENERATOR  
200 AMPS.—24 VOLTS AT  
2500 TO 4000 R.P.M.



3



4



5

generator. One flange of the  $\frac{1}{8} \times 1\frac{1}{2} \times 1\frac{1}{2}$ -in. channel is cut back to  $\frac{1}{2}$  in. as indicated. When assembling the frame, first mount the two self-aligning, pillow-block bearings on the shaft; then adjust the various frame members to keep the shaft aligned properly while they are welded together.

Front and rear supports for the generator frame are shown in Fig. 5. These supports were designed to hold the frame above the spark plugs when they are bolted to the head of a 1953 or 1954 "flathead" V8 engine, Fig. 2. Supports for bolting the generator frame to in-line-type engines and overhead-valve V8 engines will have to be modified or redesigned to suit a particular engine. Steel angles, spaced by lengths of  $\frac{3}{4}$ -in. pipe, were used on the original supports. Holes in the bottom angles are  $\frac{1}{2}$ -in. dia. to fit over the head bolts while holes in the upper angles are  $\frac{3}{8}$ -in. dia., and are matched by holes in the generator-support frame. When considered necessary for more rigid mounting, a center support also can be used.

### Drive Pulleys

A 3-in.-dia. double V-pulley is fitted on the welding-generator shaft. A 6-in.-dia. double V-pulley is welded to the crankshaft pulley of the car engine. Care must be taken in the latter operation to make sure the double pulley is centered on the crankshaft pulley to prevent misalignment. The center of the double pulley is cut out to permit tightening the pulley nut on the crankshaft. Because the engine fan will strike the modified pulleys, it is necessary to reposition it. Remove the blades from the fan hub, insert spacers and rivet the blades to the hub as shown in Fig. 8. On a different type of engine, more or less modi-

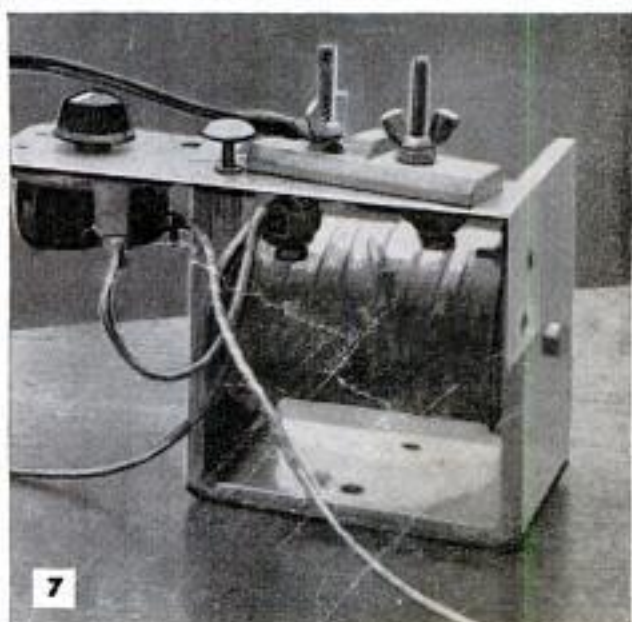
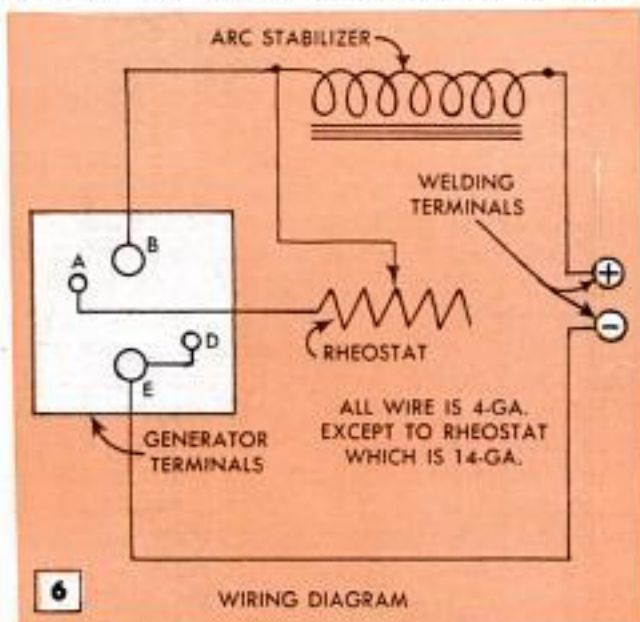
fication of the fan may be required. When the fan is moved forward it requires that the radiator be moved forward a similar distance to keep the fan blades clear of it. On the original car, four  $\frac{5}{8}$ -in. hardwood blocks were used as spacers to relocate the radiator. Sheet-metal pans at the top and bottom of the radiator may require cutting or bending to allow the forward movement of the radiator.

### Arc Stabilizer and Rheostat

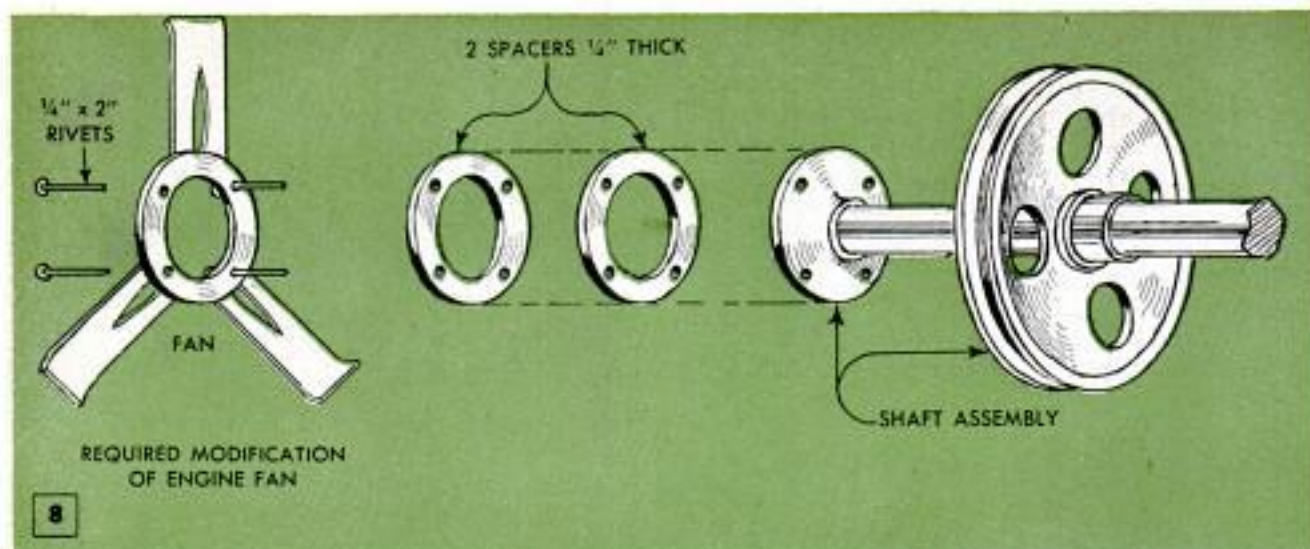
To assure that the welder produces a steady arc, an arc stabilizer must be wired into the welding circuit. The stabilizer, Figs. 3 and 7, consists of a core of 2-in.-dia. cold-rolled steel approximately  $5\frac{1}{2}$  in. long. First, a layer of insulating cloth is wrapped on the core, then four layers of 4-ga. enamel-coated copper wire are wrapped on the core, each layer being separated by insulating cloth. Finally, the completed core is wrapped with tape and tied to make sure the wire stays wrapped tightly. The beginning and end leads are left about 9 in. long to permit attaching them to the terminals. Make sure the ends of the stabilizer core make good contact with the metal frame which is made of double 8-ga. sheet steel. Short flanges are bent along the edges, then mitered at the corners and welded to provide additional strength as shown in Fig. 7.

The frame for the stabilizer also is used to support the rheostat, terminal connections and throttle for controlling engine speed, Figs. 3 and 7. The rheostat is a heavy-duty type, rated at 6 ohms, 11.1 amp. Fig. 6 is a wiring diagram, showing the connections between the stabilizer, welder and rheostat. Note that all wires in this circuit are 4 ga., except the lines to the

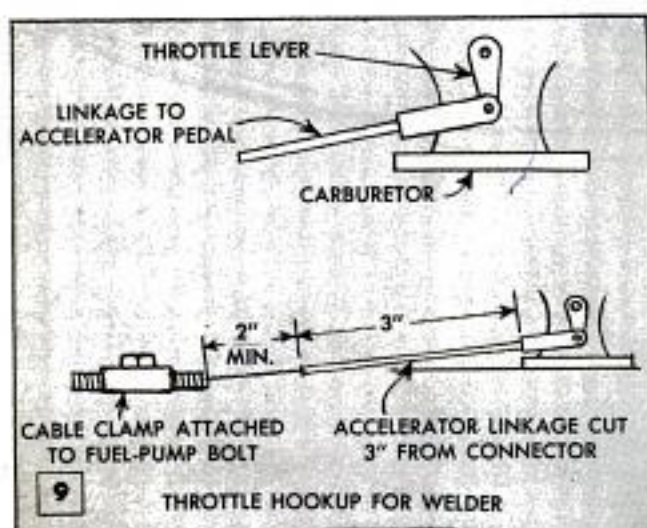
Wiring diagram showing how welding generator, arc stabilizer and rheostat are connected in circuit



Arc-stabilizer-rheostat assembly. Note how flanges are bent on stabilizer frame for added rigidity



Original engine fan was modified by removing blades from hub, adding spacers, then riveting blades



One method of controlling engine speed requires choke cable to which linkage is welded as shown

rheostat which are 14 ga. As shown in Figs. 1 and 2, the stabilizer-rheostat assembly is bolted to the inside of a fender. Large washers on the underside prevent the bolts from pulling through the sheet metal of the fender.

### Throttle Hookup

To control the speed of the car engine and thus the r.p.m. of the welding generator, it is necessary to add an auxiliary throttle control to the carburetor. As shown in Fig. 9, some cars are equipped with throttle linkage that has spring-loaded connectors that easily snap off without tools. An extra piece of the linkage is welded or brazed to the end of a choke cable that leads to the stabilizer frame where it is easy to reach when operating the welder. To change from control by foot throttle inside the car to hand control at the welder requires only unhooking one control and hooking on the other.

On engines with other types of linkage connectors it may be possible to locate the

choke cable so that it can be hooked onto the throttle lever without the necessity of removing the regular foot-control linkage. In some cases, the latter-type linkage is bolted together and requires the use of wrenches for disassembly. The less time required to connect the welder to the engine, the more time used profitably for welding, so it is important that any shortcut in making the hookup be considered.

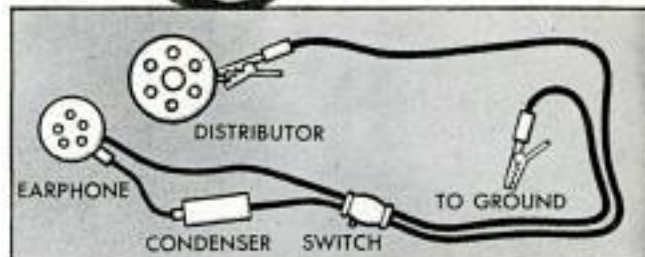
### Operating the Welder

Two heavy-duty V-belts are used to drive the welder from the crankshaft. Belts for the original installation were 54 in. long. Belts for other type installations are selected by measuring the distance around and between both sets of pulleys. To install the belts on the generator pulleys, the front pillow-block bearing is removed, both belts slipped over the pulleys, then the bearing is reinstalled. To fit the belts on the crankshaft pulleys, tip the forward end of the welder frame down, loop the belts over the crankshaft pulleys, then level the welder. Belt tension is adjusted by fitting thin washers or sheet-metal shims between the forward ends of the welder frame and the support frame.

When the welder is to be run continuously for some time on a big job, connect the air scoop of the welding generator, Fig. 5, to the air horn of the carburetor with flexible tubing. Carburetor vacuum will draw air through the generator housing, thus cooling the generator. An ammeter and voltmeter are not wired into the welder, and since each welder will differ in characteristics due to being custom-built, no precise calibration of the rheostat is suggested. After a few jobs with the welder, the operator will become familiar with the machine and can make his own calibrations, which can be marked on the frame under the rheostat dial. ★ ★ ★

## Portable Ignition Tester "Broadcasts" Diagnosis

When regular ignition-testing equipment is not available, one mechanic uses a portable device small enough to be slipped into his pocket. It consists of a radio earphone, a line switch and the condenser from an automobile distributor wired as shown in the detail and fitted with "alligator" clips. One wire is clipped to the primary lead on the distributor and the other is grounded, while the wires are led to the front seat of the car so the driver can control the switch and listen to the clicks caused by the opening and closing of the breaker points as transmitted through the earphone. As the engine is speeded up, the clicks will merge and become a buzz. If the buzz or clicking skips at the point where the engine misses, it indicates that the ignition is at fault. If the miss does not occur when the tester is on, it is quite likely that the condenser in the distributor is faulty since the condenser in the tester is now doing the job. As a double check on this latter condition, examine the distributor points. If they appear a dark blue, it

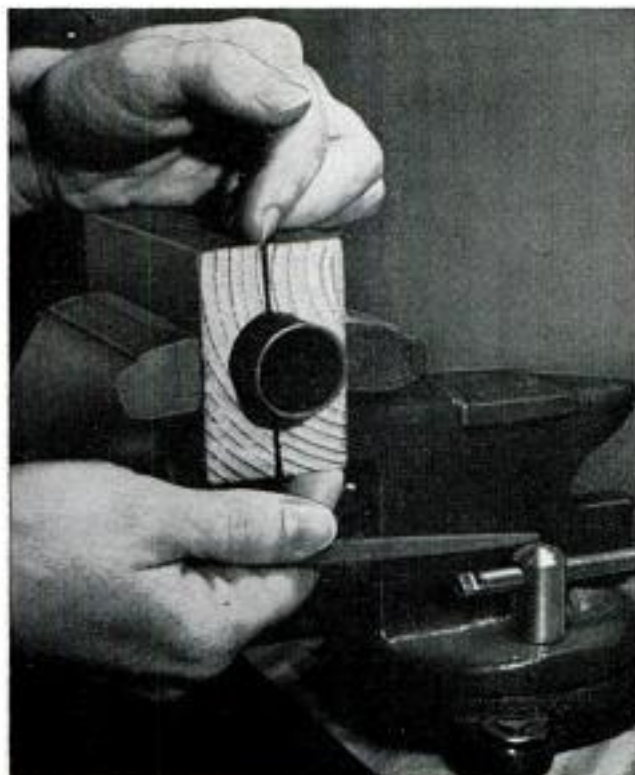


is an indication that the condenser should be replaced as soon as is practicable.

C. G. Launius, Chicago.

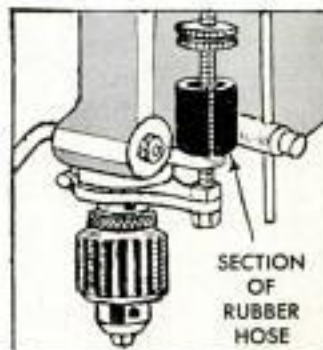
## Wooden Vise Jaws Grip Tubing

Thin-walled conduit and tubing can be held in a vise without crushing out of round or burring by using auxiliary soft-wood jaws. For tubing up to 1 in. in diameter cut a 4-in. length from 2 x 4 stock. Drill a hole lengthwise through the block so the hole is the same diameter as outside diameter of the tubing. Saw the block through at the center.



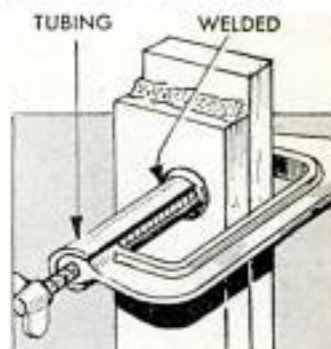
## Hose Spacers Eliminate Resetting Of Depth Gauge on Drill Press

Constant resetting of the depth gauge on a drill press can be avoided by fitting interchangeable pieces of split rubber hose, around the shaft of the gauge as shown. Cut to specific lengths, the hose spacers will stop the drilling at the desired depth yet when removed permit drilling to full depth.

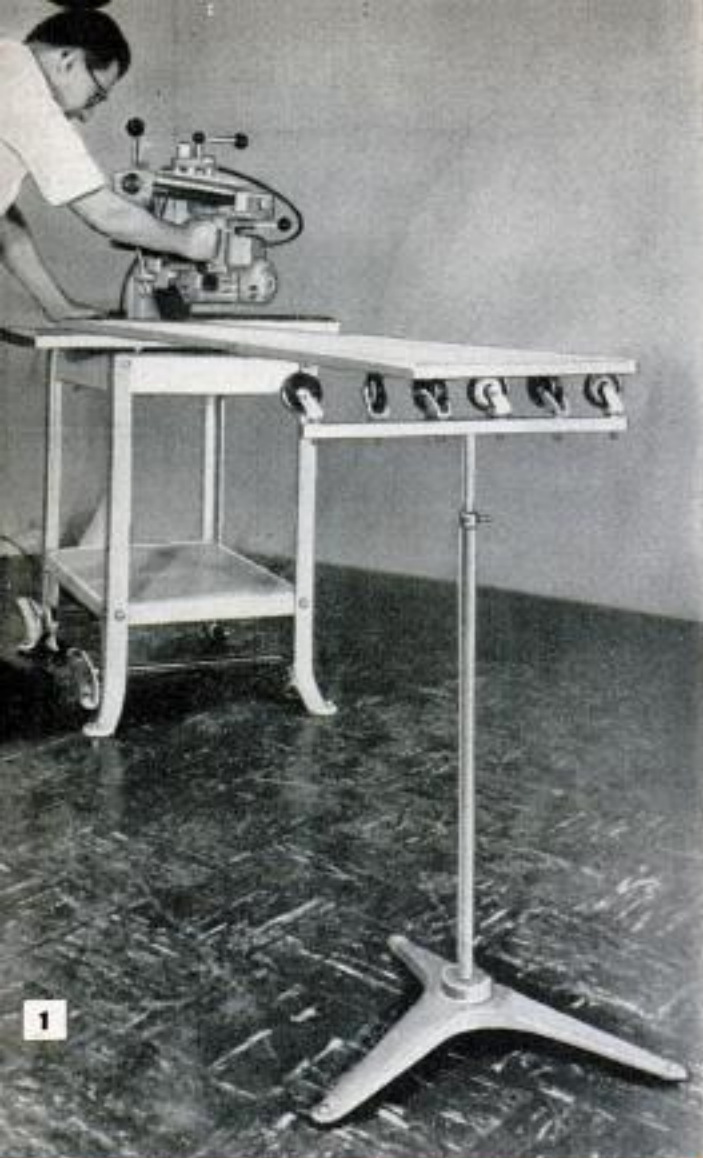


## Tubing on C-Clamp Screw Keeps Weld Spatter Off Threads

To keep weld spatter from collecting on the threads of a C-clamp adjusting screw, weld a slotted piece of tubing to the swiveling pad on the end of the screw. As the clamp is adjusted, the shield travels longitudinally with the pad, thus covering the screw thread.



# SHOPPING



1



2

**1. UNIVERSAL WORK SUPPORT** solves the long-board problem in small shops and light industrial applications. The six-caster head not only supports the work at the desired height, it also permits it to be moved in any direction while cut is being made

Delta Power Tool Div., Rockwell Mfg. Co.,  
452 N. Lexington Ave., Pittsburgh 3, Pa.

**2. JAWS OF THIS WRENCH** consist of hardened-steel rollers that lock with a camming action. Especially designed for tube fittings, nuts of soft brass, aluminum and plastic. Tightens or loosens without damaging corners of hex or square nuts. Has ratchet action

TKP Co., 920 Fisher Bldg., Detroit 2, Mich.

**3. MASON'S MODULAR RULE** for spacing masonry units fills a need among bricklayers and masons working with concrete blocks, tile and glass blocks. Inside of folding rule is marked with 6 different scales in a 16-in. module for various types of work

Lufkin Rule Co., Saginaw, Mich.

**4. SCREW-ANCHOR "GUN"** speeds up the job of installing screw anchors in hollow-wall construction. Drives 6 to 8 anchors per min. in prepared holes. Makes perfect installations without chipping edges of holes or marking the wall. Fits into any small toolkit

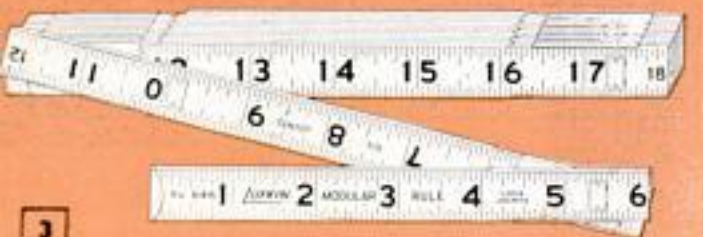
Molly Corp., Reading, Pa.

**5. NONSLIP BELT**, described as a herringbone-indexing type, gives the same positive drive as gears with a greater flexibility of speed range and less error due to backlash. Wedging action of the belt teeth centers the belt in the tread of the gears

Kinevox Div., Electromation Co., Burbank, Calif.

**6. UNIVERSAL TENONING JIG** has adjustable guides and clamps which will hold either hard or soft-wood stock in any position for making end cuts on a circular-saw table. Jig slides in miter-gauge slot, holds the stock vertically to make tenons, lap joints, spline cuts

Sears, Roebuck & Co., Chicago 7



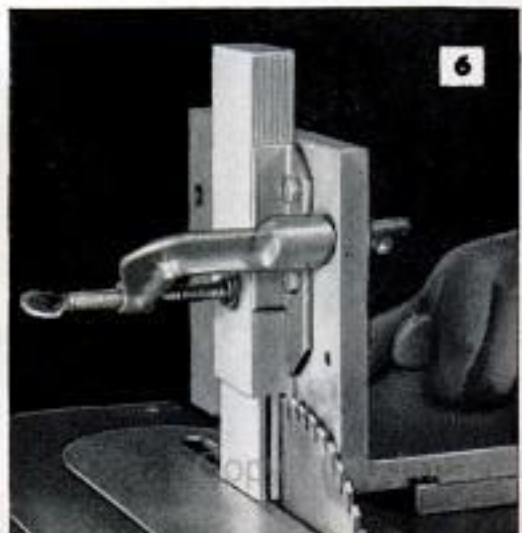
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# FOR TOOLS



**7. PROTRACTOR ATTACHMENT** for builder's level measures inches-per-foot drop and angles from 0 to 45 deg. Dial rotates past register, or witness, marks on a metal plate. For measuring drop, dial can be pre-set and the level will indicate the correct fall for ditches and runs of tile or pipe. Graduated dial can be locked in any desired position with setscrew

J. H. Scharf Mfg. Co., 6120 Binney St., Omaha, Neb.

**8. SCAFFOLD BRACKET** has simple, safe foot lift to raise the scaffold platform to any desired position. Platform is lowered by means of crank. Can't slip or tilt while being raised or lowered. Brackets move up and down on uprights consisting of two 2 x 4s bolted together and braced to building. Combination guard rail and workbench brackets also available

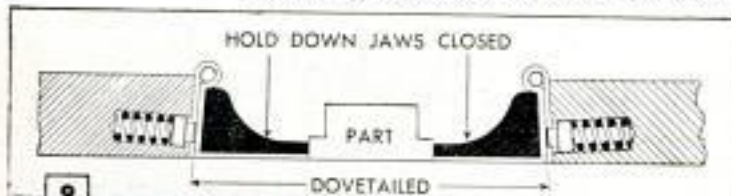
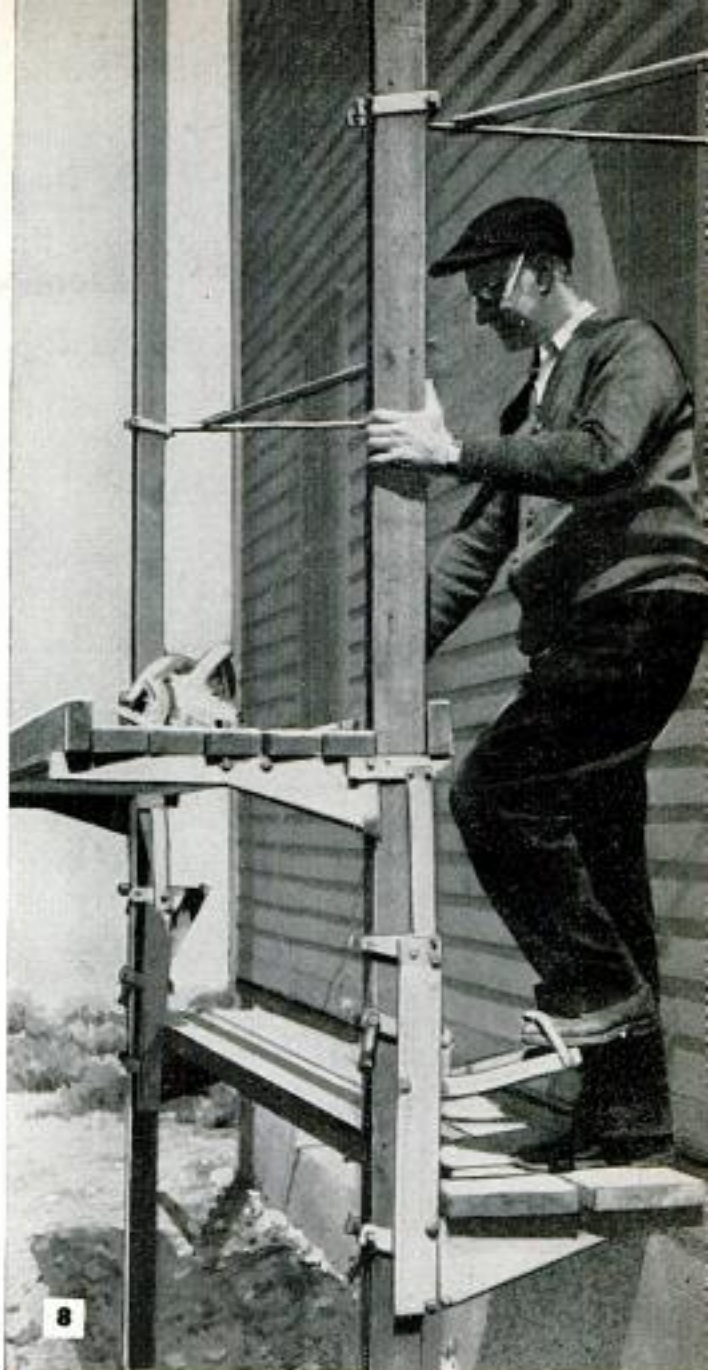
P. Holtsma Adjustable Scaffold Bracket Co., 261-263 E. 23rd St., Paterson 4, N. J.

**9. "HOLD-DOWN" MACHINE VISE** has new-type hinged jaws that are positioned to exert a downward pressure on work when tightened, this action being shown in accompanying detail. Low height of jaws eliminates use of parallels on all work except that of very thin section. Center line of clamping screw is in line with center of jaw, holding work seated on base

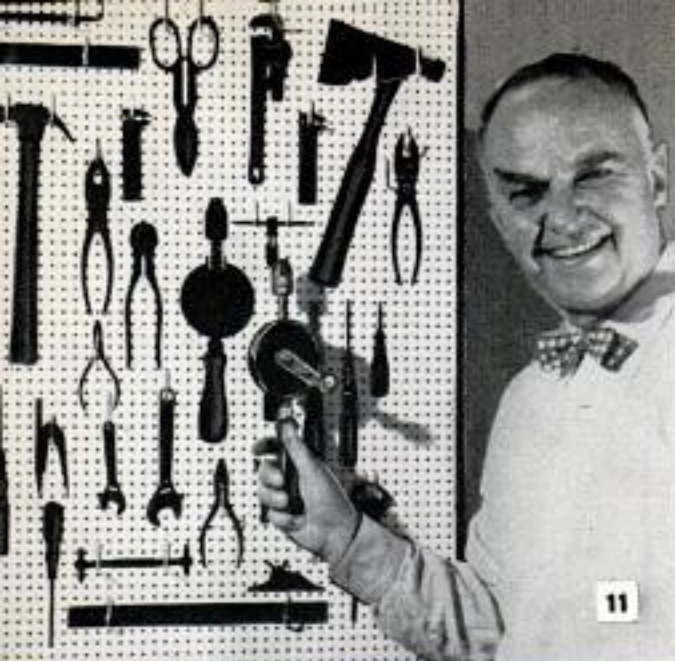
Illinois Metal Products, 420 W. Superior St., Chicago 10

**10. HOME-WORKSHOP SIZE**, these machines come with continuous-duty, built-in motors. Jointer handles stock 4½ in. wide and cuts rabbets to a depth of ¾ in. Both the infeed and outfeed tables are adjustable. Two models of the tilting-arbor saw are available, one having somewhat greater capacity for handling wide stock. Both saws are supplied with ¾-hp. motors

Toolkraft Corp., Plainfield St., Springfield, Mass.



## SHOPPING FOR TOOLS



11

**11. HAND-TOOL CUTOUTS** are die-cut to full-size silhouettes of 42 basic hand tools. Coated on one side with a pressure-sensitive adhesive they stick to any dry, smooth surface. Enables you to keep the tool panel well organized, every tool always in its place. Cutouts soon will be available for other types of tools

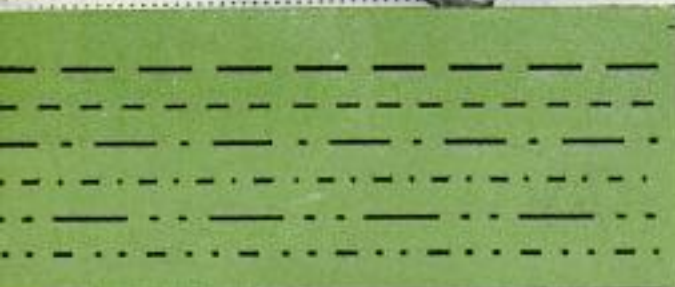
Tool Shadows, 109 E. 81st St., New York City 28

**12. LINE TEMPLATE** enables artists and draftsmen to draw dot-and-dash lines with fast strokes of ball-point pen or pencil. Dots and dashes are of uniform length and spacing. Produces 6 different lines: short and long dash, long dash and dot, long dash and two dots, short dash and two dots, short dash and dot

Dot-N-Dasher, P.O. Box 668, Crosskill, N. J.

**13. MOTOR MOUNT** saves time when transferring motor from one machine to another. Consists of two parts, one attached to machine, the other to motor base. Motor base slides into part attached to machine. When in position, motor base is pinned to machine base. Additional machine bases are available

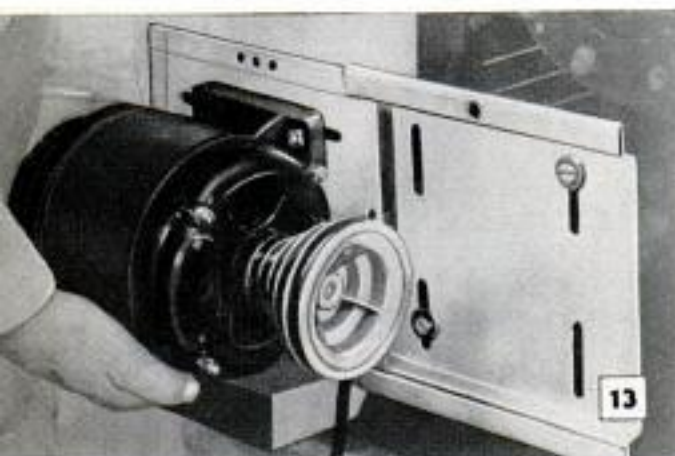
Warren Williams Productions, 5247 W. Adams Blvd., Los Angeles 16, Calif.



12

**14. PORTABLE JIGSAW** has 1-in. stroke. Cuts 2-in. stock at 90 deg., 1 $\frac{3}{4}$ -in. stock when tilted to 45 deg. Motor housing forms operating handle and an auxiliary knob gives firm, two-handed grip for making short-radius cuts at an angle. Sawdust is removed from line of cut by means of a special built-in blower

Black & Decker Mfg. Co., Towson 4, Md.



13

**15. BARBED-WIRE REEL** is driven by the front wheels of tricycle-type tractor. Safe. Wire can't injure driver should it break while being reeled in. Wire is unreeled by backing tractor at slow speeds. Wire reel can be removed from driving spindle and another substituted. Reel holds 80 rods of barbed wire

Wire Reel Co., Mendota, Ill.

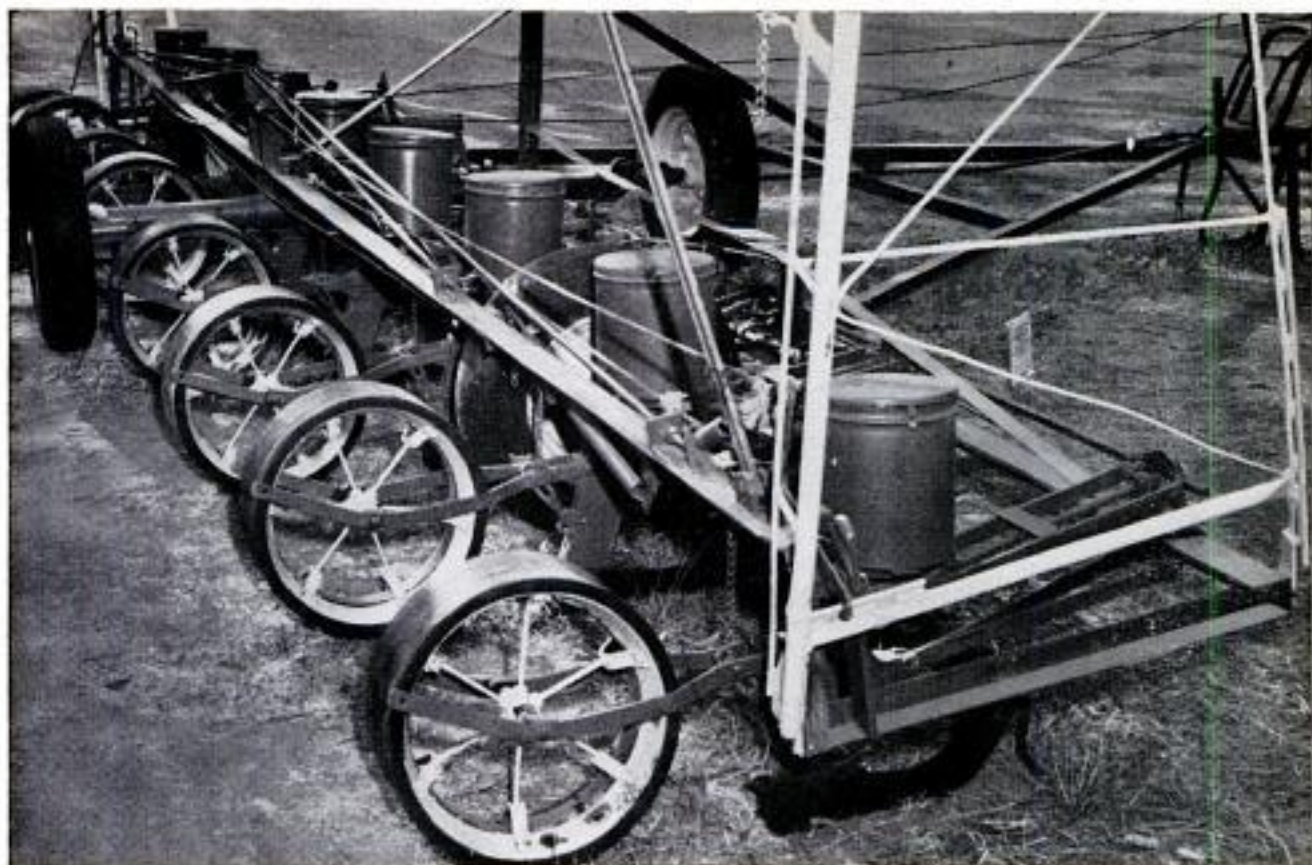


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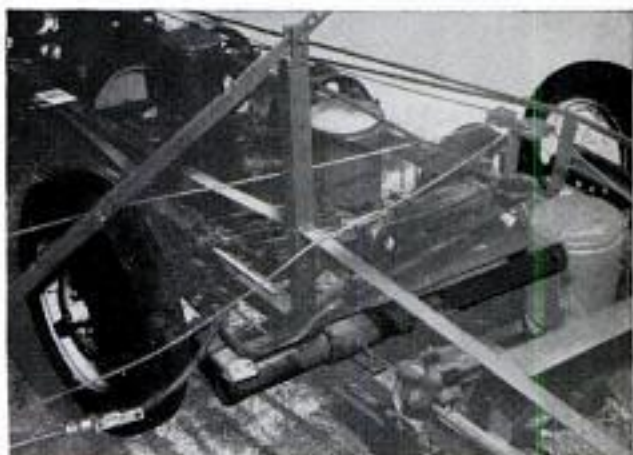


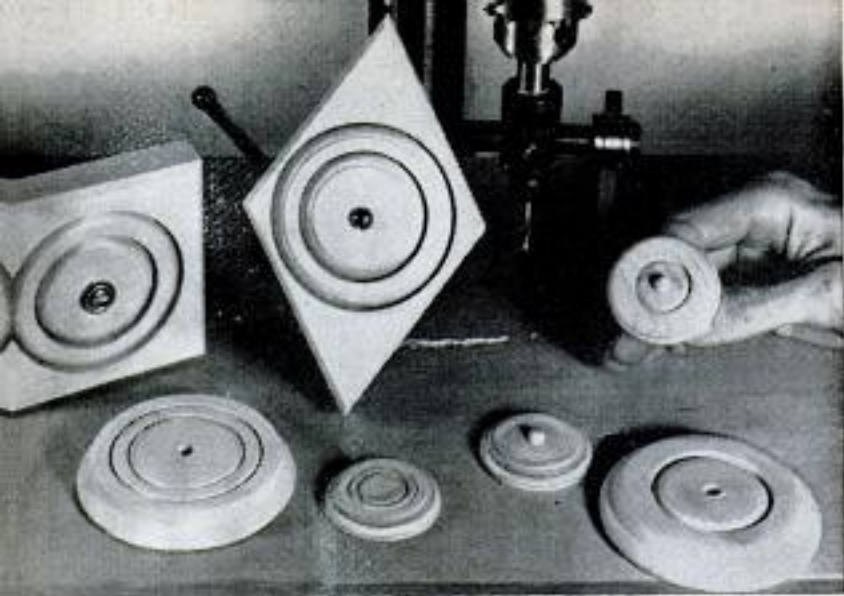
## HYDRAULIC CARRIERS For Farm Machinery

A MULTIPLE-SECTION rotary hoe, corn planter or other unusually wide piece of farm equipment can be towed sideways on a public road or through farm gates, when a rubber-tired carrier like one of the types shown in the photos is attached to the implement and operated from the tractor's hydraulic system. The 8-row corn planter, above, was made from four 2-row planters attached to an angle-iron frame mounted on a car-axle assembly. The assembly is lowered by means of a hydraulic-lift unit installed on it, while the hitch bar that is used when the planter is in operation is folded against its upper framework where it is secured for towing.

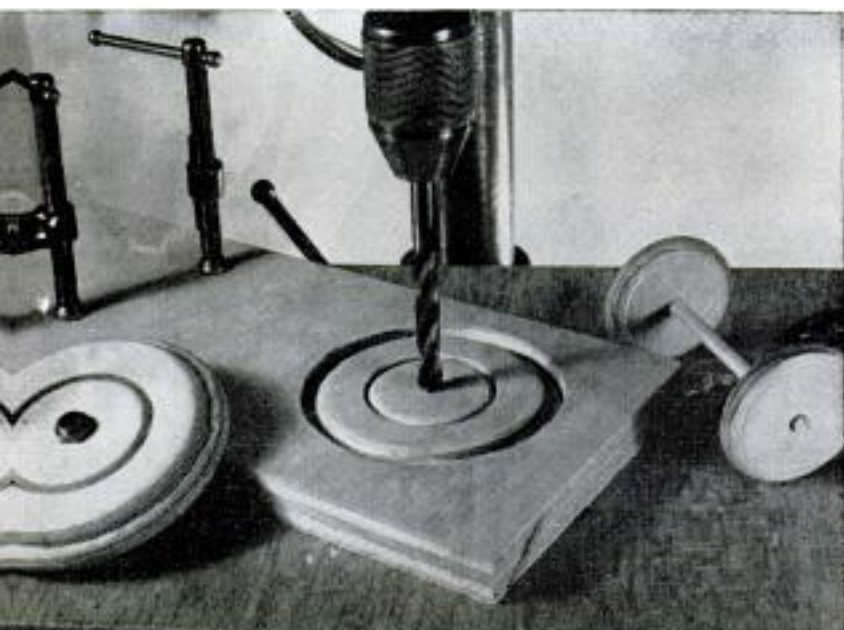
The multiple-section rotary hoe shown at the bottom of the page is transported between farmyard and fields by means of a detachable carrier, also operated from the tractor's hydraulic system. Chains are crisscrossed under the sections of the rotary hoe and fastened to hooks on an inside edge of the I-beams forming the side rails of the carrier. The hydraulic unit shown pivots the axle to raise or lower the carrier as desired. Similar hydraulically operated carrier equipment can be devised and built for almost any wide implement used on a farm.

A. M. Wettach, Mt. Pleasant, Iowa.





1. Rosettes of many designs can be "turned" by using a circle cutter, as shown above. Pilot hole is plugged with dowel or screw. Dowel is sanded flush, or rounded to finish pattern. Screw plugs hole and also provides means of attaching rosette



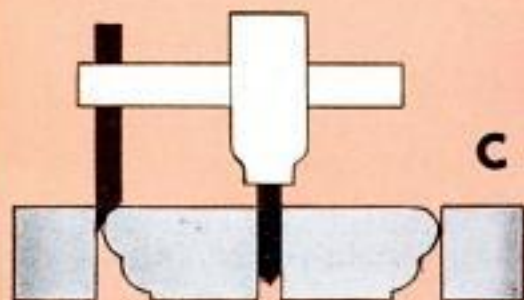
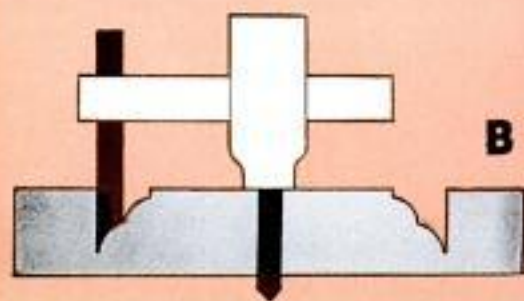
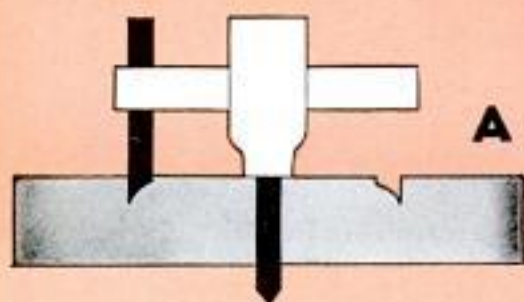
2. Wheels of various sizes, and with designs limited only by imagination, are made with circle cutter. Small wheels are glued to dowel axles, larger wheels are fitted with bushings

3. Tapered hardwood dowel chucked in drill press accommodates pilot holes drilled by circle cutter and permits disks to be sanded while rotating. Moisten dowel to raise grain, add friction



# "TURN" IT *with a* CIRCLE CUTTER

By R. W. Johnson



**G**ENERALLY USED by most home craftsmen as an oversized, adjustable wood bit, a circle cutter actually is a versatile tool with many uses, and can do some operations ordinarily done on a lathe. For example, light-duty V-belt pulleys can be made by cutting two wooden disks, then gluing and screwing them together so the bevels formed by the angle of the cutter provide a V-groove on the circumference.

Protect the paint around the handles of kitchen-cabinet doors and drawers by installing backing plates cut from plastic laminate that matches the material used on the counter tops. Thin materials, such as plastic laminates and sheet metal, should be sandwiched between sheets of 1/4-in. plywood when being cut with a circle cutter, both to hold them flat and to prevent them from spinning and cutting fingers.

Rosettes for decorating doors, furniture and window cornices can be made in an almost unlimited number of designs by using the circle cutter, Fig. 1. Pilot holes can be plugged with dowels that are sanded flush or rounded to finish a design. Screws can be inserted to plug the holes and also to provide a means of fastening the rosettes. Details A and B show how a rosette first is cut to shape. Detail C shows how the stock then is inverted and the rosette cut free. This same method is used when forming wheels with a circle cutter.

Wooden wheels of various sizes are simple to make with the hole cutter, Fig. 2. Small wheels are glued to dowel axles, larger ones are redrilled to receive short lengths of pipe or tubing to act as bushings. To accurately redrill pilot holes, clamp a piece of stock to the drill-press table and cut a hole of a size that will hold a wheel snugly. Then, without moving stock or table, replace the circle cutter with a drill bit of the proper size, fit the wheel in the cutout and rebore the hole to size.

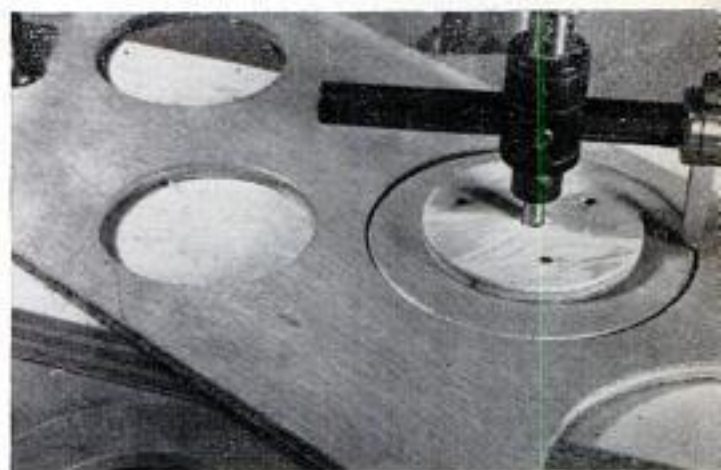
Wooden disks cut by the circle cutter can be sanded on the drill press by forcing the pilot hole onto a slightly tapered hardwood dowel chucked in the press, as in Fig. 3.

Wooden rings are made by first cutting a number of holes in the stock of the correct inside diameter. Next, cut a disk of slightly thicker stock and nail it to a piece of plywood. Adjust the circle cutter for the outside diameter of the rings, fit the holes over the disk and cut the rings, Fig. 5.

The handy tape dispenser in Fig. 6 consists of two wooden disks cut to fit inside the rolls. The disks turn on dowels forced into a piece of plywood. Corrugated fasteners soldered to 6d finishing nails provide cutters. When cutting circles in fairly long stock, Fig. 4, it can be hand-held. Shorter pieces must be clamped. ★ ★ ★



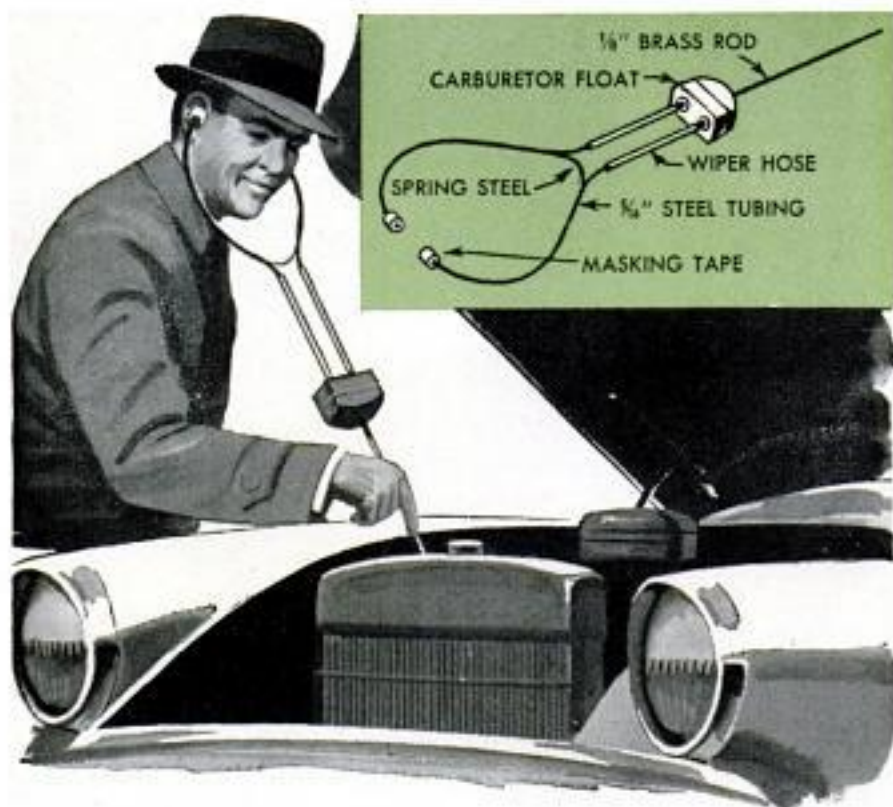
4. Above, long pieces of stock can be hand-held when using circle cutter, small pieces are clamped to table for safety. 5. Below, wooden rings are cut by using disk as jig to center holes, cut to inside diameter of rings, under circle cutter. Cutter is readjusted for outside diameter of rings and second cut is made



6. Shop tape dispenser consists of two wooden disks that fit inside tape rolls and turn on dowels fitted in board. Corrugated fasteners provide tape cutters, slotted coffee cans protect tape against dust and dirt



# "Stethoscope" Aids in Diagnosing Auto Ills



Diagnosing the source of erratic noises in the engine, transmission or even the body of an automobile is much less of a problem when a "stethoscope" is used. Patterned after the familiar instrument carried by every doctor, this automotive stethoscope uses a carburetor float as a sound-amplifying device. The probe, or sound pickup, is a 15-in. length of  $\frac{1}{8}$ -in. brass rod soldered to one side of the float. Two 1-in. lengths of  $\frac{1}{16}$ -in. copper tubing are soldered to the opposite side of the float over two holes drilled in it. The "earphones" of the stethoscope consist of two lengths of  $\frac{5}{16}$ -in. steel tubing bent as indicated and held together with a

length of flat-steel spring, silver soldered. Windshield-wiper hose is used to connect the earpiece tubing to the float.

Stanley Clark, East Bradenton, Fla.

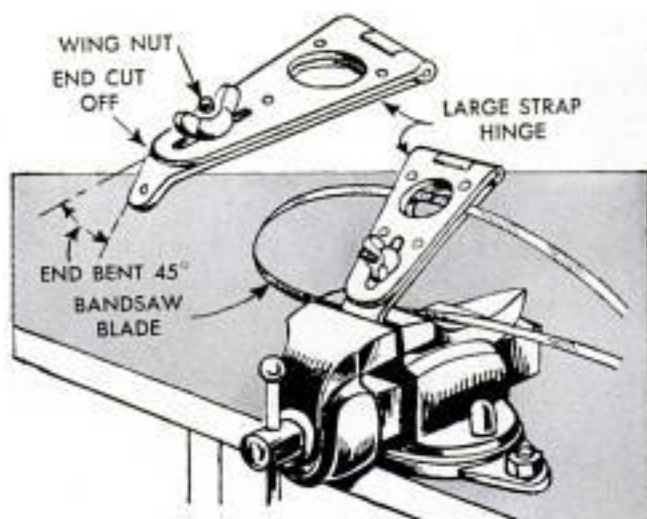
## Windmill Ladder in Haymow Aids in Stacking Bales

Good use is made of the ladder leg of a dismantled windmill on this farm. The ladder is secured to a roof column in the hay barn, where it provides easy access to the baled hay, no matter how high it is piled.—A. M. Wettach, Mt. Pleasant, Iowa.



## Clamp to Braze Bandsaw Blades Made From Strap Hinge

Ends of a bandsaw blade can be held in position for brazing by means of a clamp made by modifying a large strap hinge. The end of one leaf is shortened, and the end of the other leaf is bent at 45 deg. as indicated. When the bent leaf is gripped in a vise the clamp will hold the work in a convenient position. A large hole drilled through both leaves of the hinge exposes the ends of the blade for brazing. Bevel the ends of the blade so they may be lapped.



## Drilled Holes Kept in Perfect Alignment by Pilot Pin

When drilling a piece of work in which holes in two legs, or projections, must be in perfect alignment, here is one method of doing it. Clamp the work on the table of a drill press or vertical miller and drill a hole in one projection. Next, clamp a  $\frac{1}{2}$  or  $\frac{5}{8}$ -in. steel plate to the table and drill a hole of the same diameter in it. Into this hole fit a steel pin of equal diameter and slip the work down over this pin as shown in the lower detail. Now, when a hole is drilled in the upper projection it will be in exact alignment with the hole in the lower projection of the work.

Frank La Saracina, New York City.

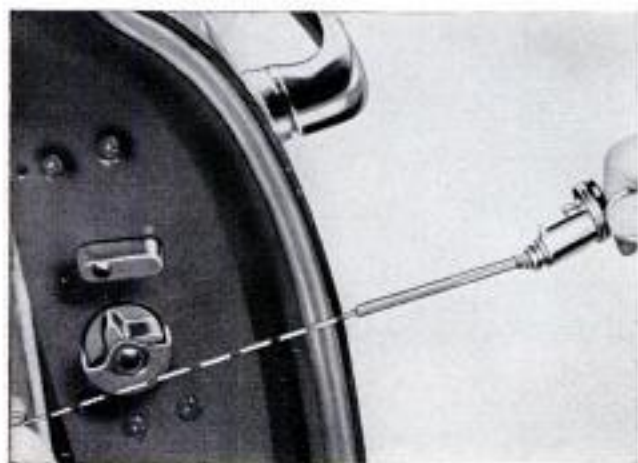
## C-Clamp on Ladder Holds Hammer

Holding a hammer safely at hand when working on a ladder may be done by attaching a large C-clamp to the ladder. Be sure the clamp is tightened against the ladder rail.

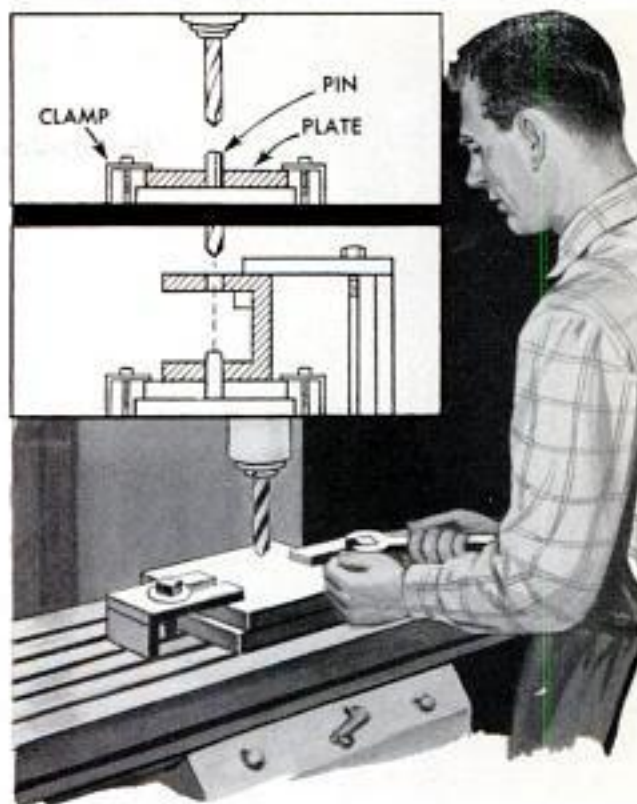


## Tool Bent From Coat-Hanger Wire Aids Changing Car-Door Lock

Changing the cylinder in an auto-door lock is not difficult if the bar extending from the cylinder can be guided through the door mechanism. To accomplish this easily, form a tool by filing a point on one end of a length of coat-hanger wire and bending a loop for a handle on the other end. Push the point of the tool through the door upholstery opposite the lock and lead it through the opening in the door. Fit the end of the lock-cylinder bar over the point of the tool and push the bar through the door opening. The tool will permit moving the bar in any direction to facilitate threading it through the door mechanism.



FEBRUARY 1957



## Pushing or Towing Cars Equipped With Automatic Transmissions

When it is necessary to push or tow a car equipped with automatic transmission, proper procedure for the specific car must be followed. When pushing cars equipped with Fordomatic, Hydra-Matic, or Powerglide, begin with the ignition Off and the shift lever in Neutral, and when the car reaches a speed of 20 m.p.h. turn on the ignition and shift into Drive. Cars with Borg-Warner, Dynaflow, PowerFlite, or Ultramatic Drive should be pushed with the ignition On and the shift in Neutral until a speed of approximately 20 m.p.h. and then shifted into the Drive position. However, before pushing a car with Borg-Warner transmission the automatic choke must be set by depressing the accelerator to the floor once. Fluid Drive, Gyro-Matic, Presto-Matic, Tip-Toe Shift and Vacuumatic-equipped cars should be set in Low gear with the ignition left Off until the car reaches 15 m.p.h., at which time the ignition is turned on. Hy-Drive transmissions are set in the Drive position and the car ignition turned On preparatory to pushing.

Most cars with automatic transmissions can be towed a reasonable distance on the rear wheels at a speed of about 30 m.p.h. if the shift lever is first put in the Neutral position. But, with Hydra-Matic the drive shaft must be dropped or the car towed on the front wheels. If an automatic transmission is inoperative, the car should be towed on front wheels with rear wheels raised.

# Make This Electric LAWN TRIMMER-EDGER

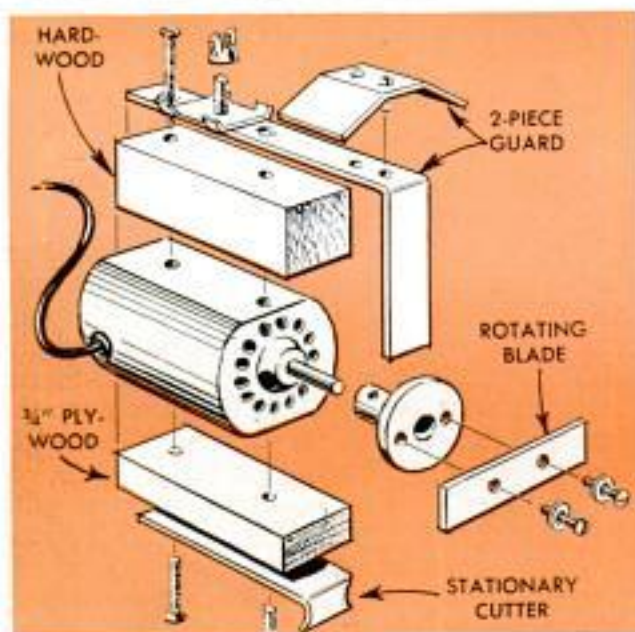
By W. G. Waggoner



HERE IS an electric lawn trimmer-edger that you can make in a few hours out of an old sewing-machine motor or other small motor, a few pieces of wood and metal and a trimmer blade. The only item that need be purchased is the blade. The handle was fabricated from a length of thin-wall conduit in which the wires that supply current to the motor are inserted. A bolt and wing nut, used to attach the handle, allow the unit to be held in two positions—one for trimming around shrubs or next to walls or fences as shown below, and one for edging a lawn around sidewalks or stepping stones as shown in the illustration at left.

The stationary cutter, as detailed in the drawing, forces grass away from the sidewalk and into the blade for a better job of edging. It also serves as a spacer for obtaining a uniform edge around the lawn while preventing the blade from striking the sidewalk or other object around which the lawn is being trimmed. The two-piece guard is made of  $\frac{1}{8}$ -in. flat steel and serves the dual purpose of protecting the operator from flying debris that might be thrown by the whirling blade, and functions as a retainer to prevent the blade assembly from flying off its shaft should the blade come loose.

Handle, secured to machine by bolt and wing nut, used in normal position, above, when edging lawn, reversed when unit is used as trimmer, below. Guard prevents contact between blade and other objects



## Rack on Front of Tractor Serves as Grille Guard and Pusher

Small equipment and sacks of feed can be carried on this rack, which pivots on the front of the tractor so that it can be raised up in front of the grille to protect it when pushing wagons and implements. Frame of the rack, which is 18 x 26 in., is welded together from square iron tubing, and has pieces of a leaf spring welded across it to provide cushioning for pushing. Mounting of the rack will vary with different tractors. The rack shown is pivoted to the upturned ends of the tractor frame and rests on a bumper, also added for pushing, when in the lowered position. A bolt fitted through a hole in the rack and into the end of the frame locks the rack in the vertical position.



## Field Drag of Square Timbers More Efficient Than Blade

Square timbers, strapped together to form a field drag, are used by one farmer because the timber drag has less tendency to "plow under" than a conventional blade type. Bottom edges of the drag—formed by the timber corners—are fitted with steel angles to minimize wear.

C. F. Marley, Nokomis, Ill.



## Modified Screwdriver Blade Removes Carburetor Jets

An ordinary screwdriver can be modified for use on carburetors by grinding down the blade so it will fit into the openings in the castings. Keep the edges of the blade parallel, so the tip will extend the full width of the slots in the jets, as shown in the photo. The jets are brass, and a too-narrow screwdriver blade will easily damage them.—Ed Packer, Oak Park, Ill.

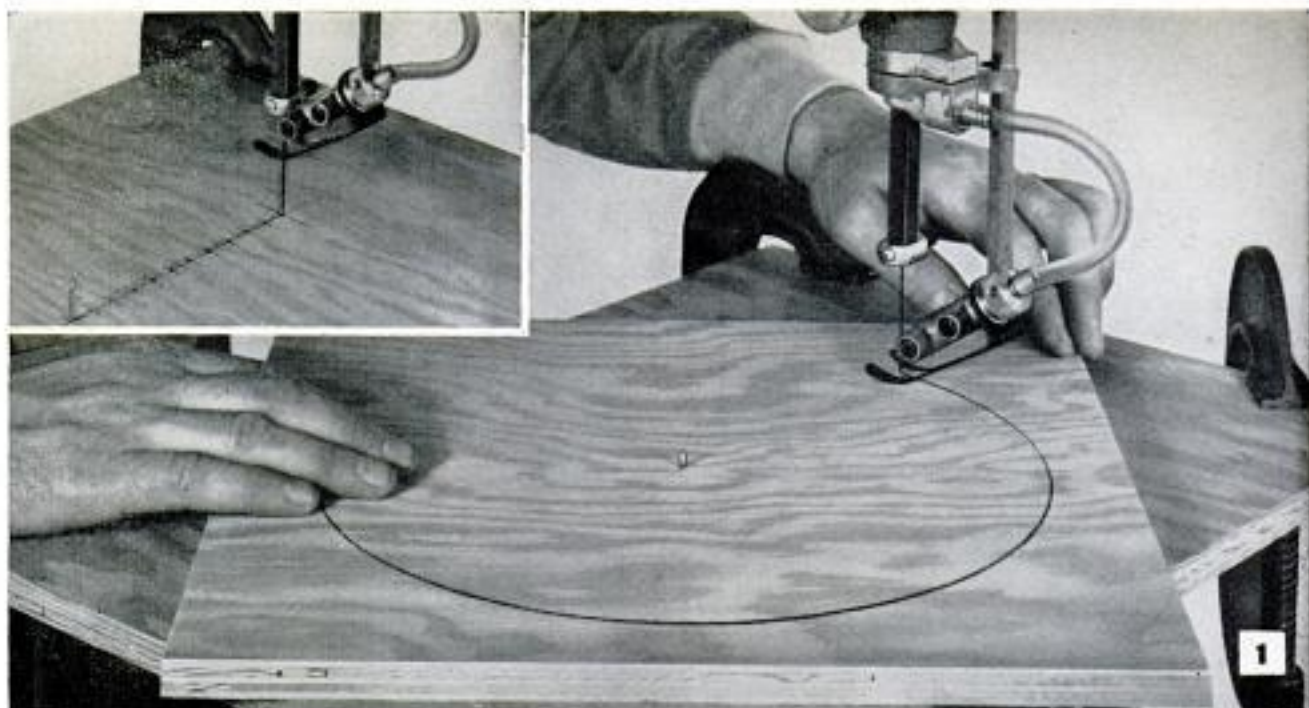


## Feed "Sled" Made From Old Boiler Is Towed Behind Tractor

This welded silage and feed trough is built like a sled so that it can be "skidded" behind a tractor to any location around the farm. A discarded hot-water boiler was cut in two lengthwise with a torch and one end was removed from each boiler half. The open ends of the two halves then were welded together to form a trough 10 ft. long and 2½ ft. wide. The framing and skids are 1½-in. pipe, with uprights spaced 2 ft. from each of the ends and 3 ft. apart. Cross bracing between the end up-

rights is cut from steel angles and is welded in place. After assembly the trough was wire-brushed to remove rust, then painted with aluminum paint.





## How Would You Do It?

By Chris Nelson

**1. Q—How can you make a simple, variable-size jig that will assure cutting true circles on a jigsaw?**

A—Drill a series of blade-size holes  $\frac{1}{4}$  or  $\frac{1}{2}$  in. apart in a piece of  $\frac{3}{4}$ -in. plywood. Drive a nail from beneath for a pivot as in inset. Slip blade through hole that gives correct diameter circle and clamp jig to saw table. Rotate work against blade

**2. Q—What should be done with the protective paper covering on sheet plastic when cutting it with a jigsaw?**

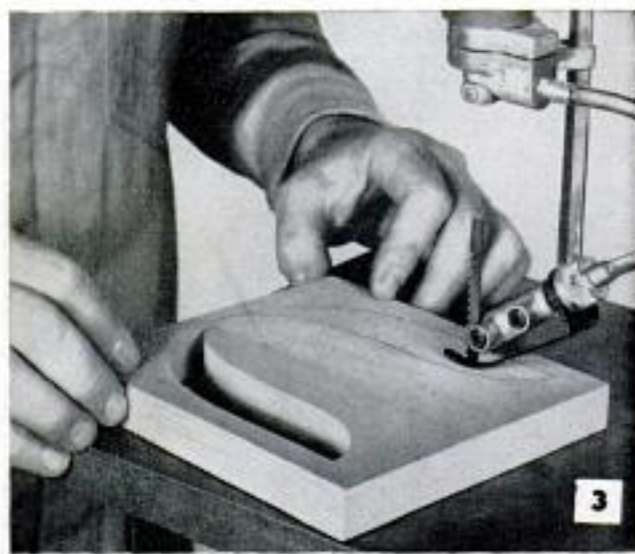
A—Leave the protective paper on the plastic until all work is finished. The paper will prevent the plastic from being scratched while being handled, sawed and filed. Woodcutting blades can be used on plastic, but special "skip tooth" blades are better

**3. Q—In what manner can a jigsaw be modified to cut oversize stock and also make internal cuts quickly?**

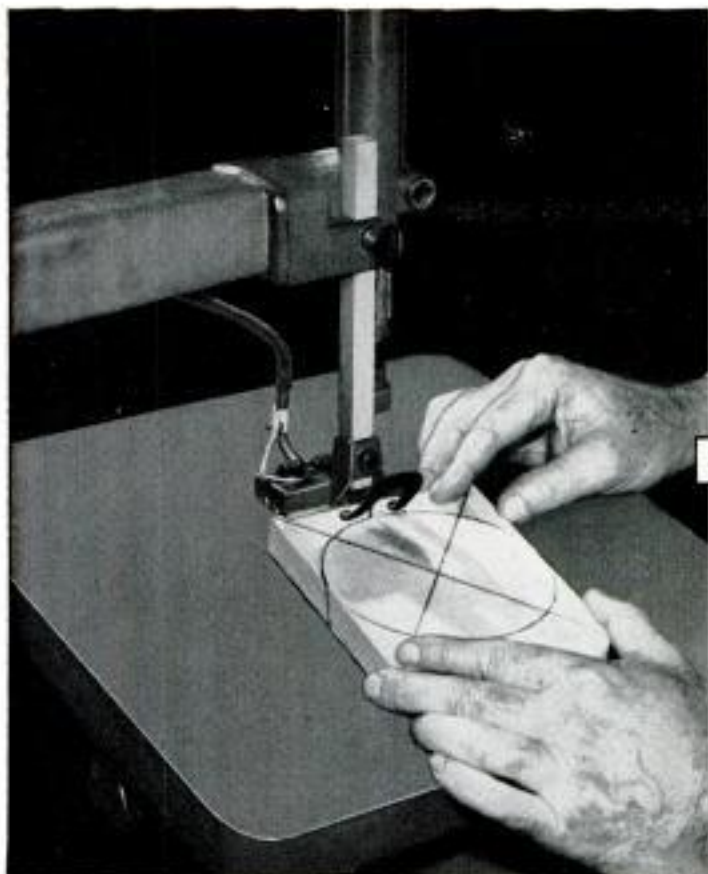
A—Remove the upper arm of the jigsaw and set it up as a saber saw as shown in the right-hand photograph below. There then will be no limit to the size of stock that can be handled on the saw, and internal cuts can be made without removing the blade

**4. Q—How can bevel-cutting produce three-dimensional, stock-saving lamp bases?**

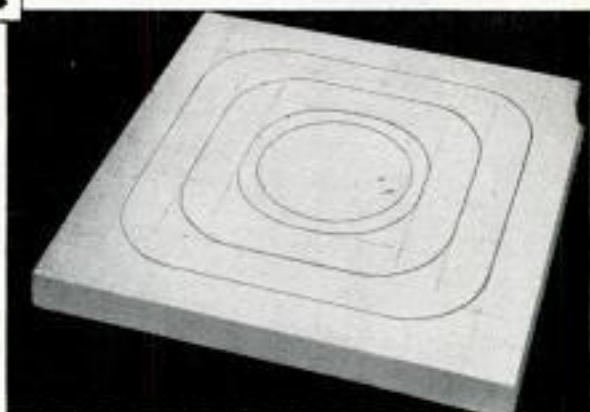
A—Make a series of bevel cuts, such as drawn on stock in lower right-hand photo. Push pieces toward narrowest part of openings to produce shape as in upper right-hand photo. The important thing to remember when bevel-cutting is that work should always be on same side of blade as in left-hand photo







4



**5. Q—What accessory or attachment is available for a jigsaw to permit using it as a power tool for fast smoothing of the edges of cutouts made on the jigsaw?**

**A—**Machine files, designed to be gripped in the lower jaw of a jigsaw, are made in a variety of shapes. The inset shows how the file is gripped in the chuck; the larger photo shows the file being used to smooth the edges of a light-gauge sheet-metal cutout that has been made on the jigsaw



5

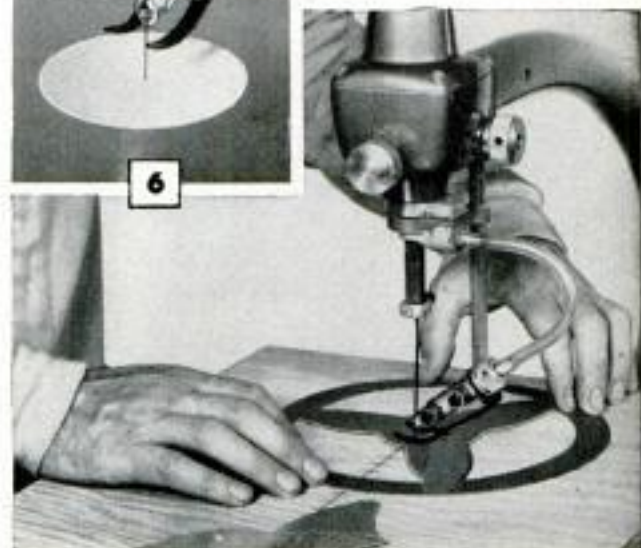


**6. Q—When cutting thin sheet metal or sheet plastics, what modification should be made to the jigsaw table to prevent these lighter-gauge materials from being bent under the blade?**

**A—**Use an auxiliary table to keep thin materials from bending. It can be a sheet of plywood drilled to accommodate the blade, or a special insert of wood, metal or hardboard as shown in inset photo that temporarily replaces the regular table insert



6



## Handles Permit Better Grip On Steel-Post Driver



Two lengths of iron rod shaped as shown and welded to a steel-post driver make it easier to use. Gripping the handles is less fatiguing than gripping the pipe, especially when driving posts in hard ground.

C. F. Marley, Nokomis, Ill.

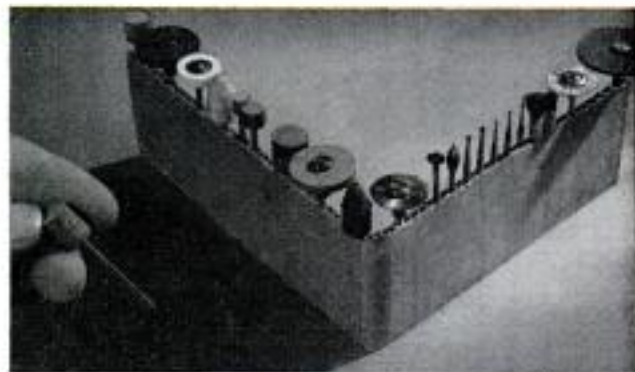
## Hanger Positions Hammer Ready for Use

Your hammer is always within handy reach when you store it in this novel hanger. Using the hammer head as a guide, drill and shape a beveled hardwood block to take the head as pictured. Fit of the head in the block should be fairly loose for easy removal. Attach to tool panel with a pair of screws driven from the back.



## Corrugated-Cardboard Rack Holds Small Power-Tool Accessories

A strip of double-faced, corrugated cardboard serves as an ideal holder for small power-tool accessories. The shaft of each accessory is slipped into one of the "pockets" formed by the corrugations with the working end exposed for easy selection. The holder can be attached to a wall or shelf in a convenient location, or placed on a workbench as shown.



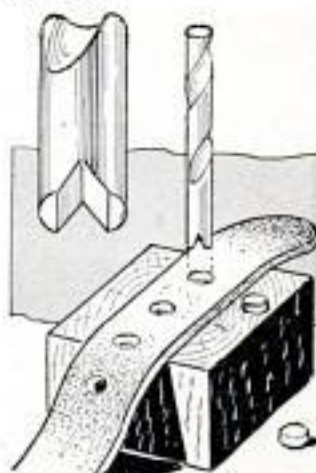
## Threading Die Holds Short Screw For Grinding and Cutting

When grinding or making end cuts in setscrews or short machine screws first place them in a thread-cutting die and they can then be more easily handled. Loosen the adjusting screw on the die after work is in place and the die will close around it. Detail shows die being held in position by magnetic chuck on surface grinder table.



## Drill Bit With Notched Shank Provides Leather Punch

Modifying the shank end of a drill bit by filing or grinding a V-notch in it as indicated will provide a serviceable punch for cutting holes in leather and light-gauge sheet metal. The two lips formed on the bit make a shear cut through the leather.



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*for Do-It-Yourselfers*



1

**1. FLOWERPOT HOLDER** comes in two sizes to take 4 and 6-in. pots. Attaches securely to decorative metalwork, iron porch railings and columns. No screws or bolts required. Weight of pot locks holder

Tennessee Fabricating Co., 1490 Grimes St., Memphis, Tenn.

**2. JELLED SEMIGLOSS ENAMEL** comes in a collapsible tube. Apply to the brush like toothpaste. Spreads easily just like ordinary enamel but without thinning or stirring. Comes in medium and large-size tubes

American-Marietta Co., 101 E. Ontario St., Chicago 11

**3. DOORSTOP**, or bumper, attaches to the door hinge rather than baseboard and is adjustable for regulating distance door can open. To install, remove hinge pin, insert pin in door bumper and then replace

Clifford's, 922 N. Fourth St., Milwaukee 3, Wis.

**4. MODERN FURNITURE PULLS** in bright brass finish are available in various design combinations, several of which are shown in the accompanying sketches. A number of modern furniture designs are available

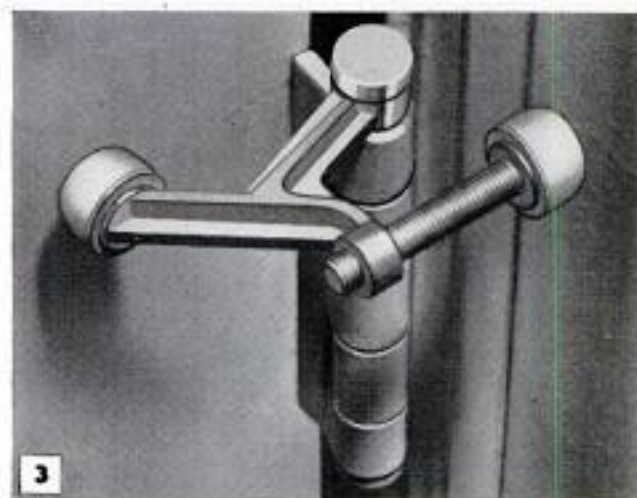
Paultless Caster Corp., Furniture Hardware Div., Evansville 7, Ind.

**5. PREQUILTED UPHOLSTERY** is a combination cushioning and covering material consisting of a plastic facing heat-sealed to a plastic "foam" cushion having fabric backing. Comes in various patterns, thicknesses

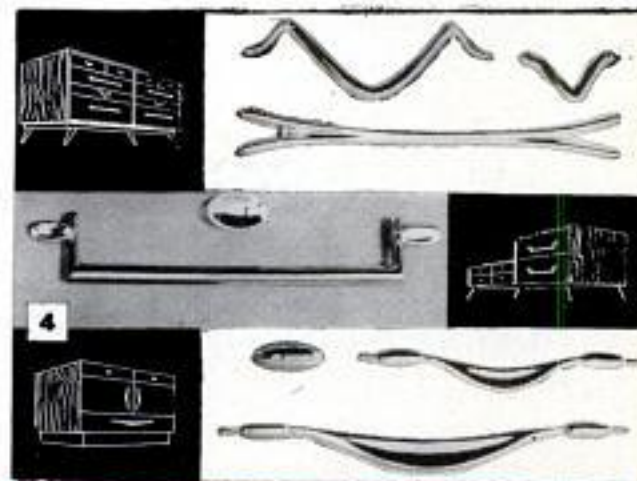
General Tire & Rubber Co., Bolta Products Div., Lawrence, Mass.



2



3



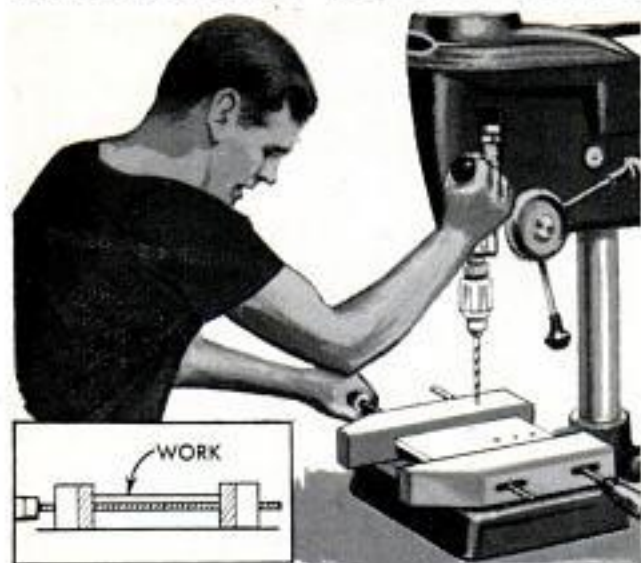
4



5



## Drill-Press Vice Improvised From Woodworker's Hand Screw

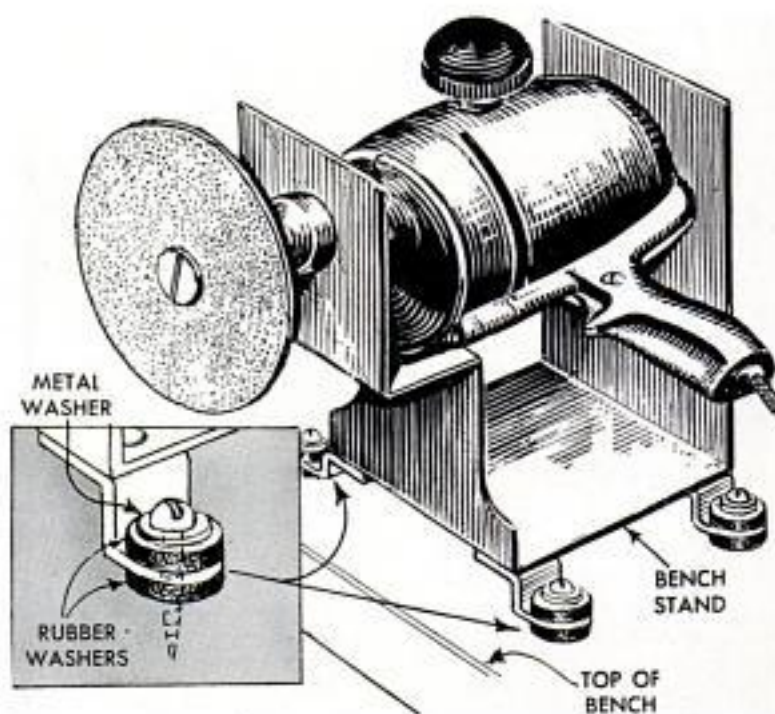


You'll find a woodworker's hand screw highly useful as a drill-press vice for safely holding thin work which is larger than the capacity of a regular drill-press vise. Simply open the jaws wide enough to accept the work and rest it on the threaded spindles of the clamp. Then tighten the jaws. The spindles give good support and hold the work parallel with the table. Another method of clamping work in a hand screw is to fasten cleats to the top of the jaws  $\frac{1}{2}$  in. or so in from the edges. The work is laid on top of the jaws and tightened against the cleats to hold it.

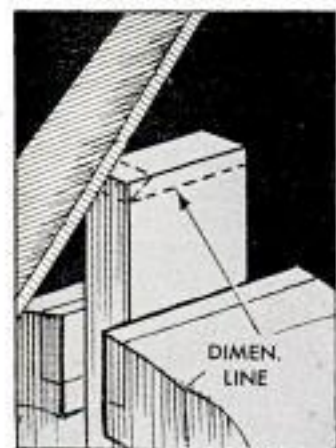
Phonograph-record albums are ideal for storing sandpaper. The pockets permit "filing" the various grades separately.

## Rubber Washers Dampen Noise of Power Tools

Two rubber washers placed on each of the screws that fastens a tool stand to the workbench, so that the base of the stand is sandwiched between them, will effectively cut the amount of noise produced by the tool. Mounting screws should be  $\frac{1}{8}$  in. smaller than the diameter of the holes in the stand base and should be centered and tightened sufficiently to prevent vibrations from being transmitted down through them to the bench. A metal washer under the head of each screw will keep it from wearing through the hole in the top cushioning washer. Use  $\frac{1}{4}$ -in.-thick washers.—J. B. Sullivan, Garden City, N. Y.



## Bevel Aids Filing Metal To Dimension Line



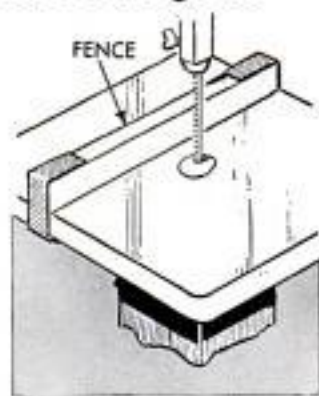
When shortening a piece of metal to a dimension line, first file a bevel on the marked side to the dimension line as shown, and then file the metal squarely down to the base of this bevel for easier filing and more accurate results. If the metal is quite thick, it

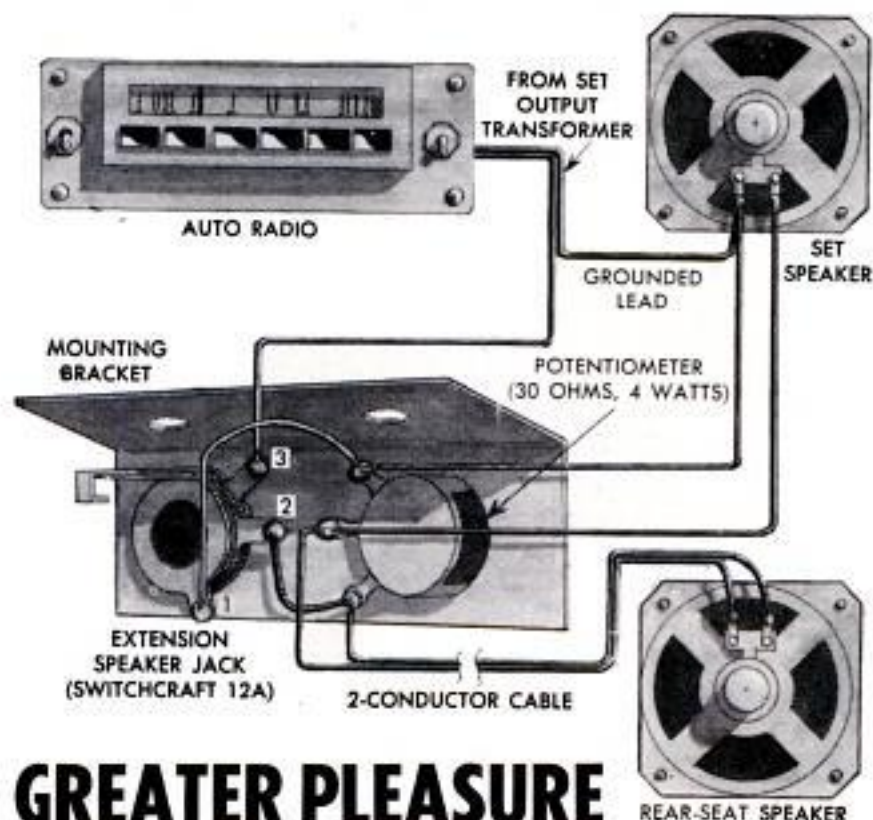
will be easier to file bevels on both edges first.—Howard E. Moody, Upper Jay, N. Y.

## Masking Tape Replaces C-Clamps For Holding Rip Fence on Jigsaw

When C-clamps are not available, or are being used on other work, strips of masking tape can be substituted for the clamps to hold a wooden rip fence in place on the table of a jigsaw.

Apply the tape lengthwise of the fence, starting on the top surface of the wood as indicated and running it around and under the edges of the table to assure maximum holding power.





## GREATER PLEASURE FROM CAR RADIOS

THERE IS NO DOUBT that automobile radios contribute greatly to the pleasures of modern driving. Yet, in spite of their wide acceptance, such receivers usually fail to take advantage of all their capabilities. In most cars, for example, the radio is equipped with only a single dash-mounted speaker, which does not provide adequate rear-seat coverage unless the volume is turned up to a level which is uncomfortable to the driver and other front-seat occupants. Furthermore, for high-speed country driving, where the companionship of the radio is most desirable, the high noise level within the car often makes radio listening difficult, if not impossible. And finally, auto-radio listening is often restricted to areas in the immediate vicinity of the car itself by the lack of an extension speaker jack which would permit the use of an externally placed speaker for lawn parties, picnics and other outdoor activities.

By fashioning a simple control panel using only two inexpensive parts, and making some minor wiring changes, these handicaps can be eliminated.

The pictorial diagram, above, shows the simplicity of the necessary wiring, while the resulting performance can be determined from the schematic on page 272. Instead of having a single speaker connected to the output transformer of the set, we now have an additional rear-seat speaker wired in series with the original one. The top lead of the rear-seat unit is connected through the normally closed contacts 2 and 3 of a jack to the output transformer. As long as no plug is inserted in the jack, the signal from the transformer will divide between the two speakers.

A potentiometer is connected to the speakers in such a way that the position of its rotary contact determines the signal distribution to the two speakers. In the center position the signal is equally divided. But as the control is rotated, the volume of one of the speakers is gradually

(Continued to page 272)

# AUTOMATIC CONVERTIBLE- TOP CLOSER

By Byron G. Wels

Photos by Kinner Photo Service



FARMERS are not the only folks concerned with the weather these days. With the approach of the spring and summer seasons, every convertible owner will try to outguess the weatherman each time he parks his car. An overcast sky may cause him to raise the top, only to find, on his return, that the weather has cleared and the temperature in the car closely resembles that of a Turkish bath. A wrong guess in the other direction can have more damaging consequences as seat covers and contents are soaked by a sudden shower.

But, if you own a convertible, you don't have to gamble on the weather. For a small investment of time and money you can install this automatic top-closing circuit which literally "raises the roof" the minute it starts to rain.

## How It Works

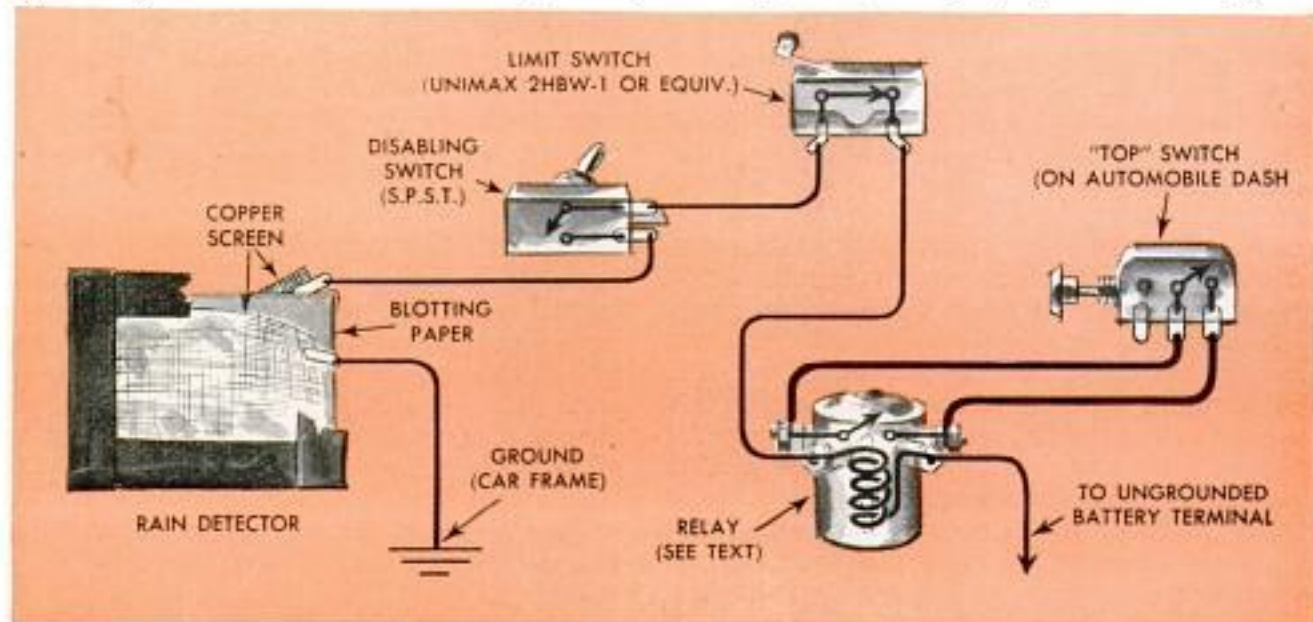
The operation of the system is really quite simple, as shown in the diagram below. A homemade rain detector is wired in

series with two switches and a relay coil across the automobile battery. As long as the detector is dry, it represents an open circuit, and no battery current can flow. But, when a few drops of rain strike the detector, this unit automatically shorts out, and the resulting current (if the disabling switch is closed) activates the relay. As a result, the relay contacts will close and short out the "top closing" portion of the "top switch," causing the top to rise.

The limit switch is mounted near the top of the windshield frame, Fig. 2, so that the closing top will activate the leaf-spring actuator of the switch when the top has reached the limit of its travel. This interrupts the current through the relay coil and shuts off the top-closing motor. The disabling switch cuts out the automatic circuit and permits manual operation.

The heart of the entire system is the rain detector which can easily be made from two pieces of fine-mesh copper screening, about 4 in. square, and a piece of blotting

Fig. 1. Diagram of automatic convertible-top-closing circuit. Top switch, at right, is part of car equipment



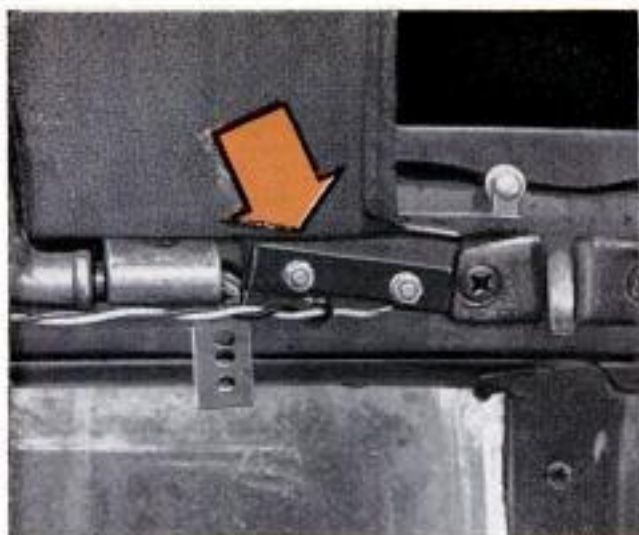


Fig. 2. Limit switch installed near top of windshield shuts off motor when top has reached end of travel

paper (the kind with blotting paper on both sides). Thoroughly soak the blotting paper in a saturated solution of salt water and permit it to dry completely. Now, solder a length of wire to each of the screens and form a "sandwich," as shown in Fig. 1. The blotting paper should extend about  $\frac{1}{4}$  in. beyond the screening on all sides. Cover the edges of the "sandwich" with cloth tape, bringing the wires out through a slit in the tape.

The detector is ultimately fastened to the top portion of the front seat, as illustrated in Fig. 3. Allow the detector to follow the curvature of the seat, as this will assure good contact between screens and blotter.

### Components

The two switches are standard items, listed in all catalogues of major radio-parts distributors. The choice of the proper relay, however, depends upon the voltage of the car battery and upon the original top-closing circuitry. The relay coil must have the same rating as the battery voltage, and its contacts must be able to withstand the current which would normally flow through the dash-mounted switch. In most cases, the dash switch merely activates another relay, so that the current through the switch is relatively small. In this event, any ordinary 6 or 12-v. radio relay will do the job. But, if the circuit is wired so that the entire current drawn by the top-closing motor must flow through the switch, a special relay is needed. The motor current can be in the neighborhood of 90 to 100 amps., and the relay contacts must be rated at that value or more. A Struthers-Dunn relay, type CX1535, is suitable for a 12-v. battery system, while a Leach, type 7220-24, relay will handle the requirements of a 6-v. system. Both are listed in a catalogue distributed by Relay

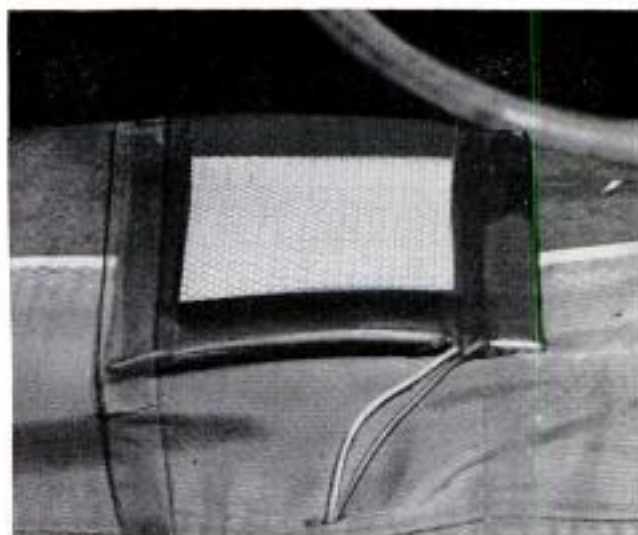


Fig. 3. Rain detector is taped to top of front seat, grounded screen up, to prevent possible short circuit

Sales Inc., Box 186, West Chicago, Ill.

If a heavy-duty relay is needed, the wires from its contacts to the dash-mounted switch must also be heavy enough to handle the required amount of current.

### Installation

The manually operated top-closing switch is usually located just under the dashboard. It is normally a s.p.d.t. switch having three lugs. As shown in Fig. 1, the relay contacts must be connected to the center lug and that particular end lug which, when shorted out, causes the top to rise. To determine which end lug to use, merely open the top halfway and momentarily short the center lug to one of the others, using a short length of heavy-gauge wire. If the top continues to move "up," you have located the correct lug.

The relay may be mounted under the dash near the top-closing switch, and the disabling switch should be fastened to the dash within easy reach of the driver.

Some care must be used in mounting the limit switch to the windshield frame. This switch should be mounted on a rigid bracket and so positioned that, with the top fully closed (but not locked), the spring actuator of the switch is fully depressed by the top. Any slight final adjustment can be made by bending the actuator. The interconnecting wires must be soldered to the normally closed contacts of the switch.

Once the detector has gone through its operation, the disabling switch must be shut off (opened) before the top is lowered by means of the manually operated switch. Failure to observe this precaution may result in damage if the detector is not completely dry before the top is lowered. Once the top is down, this switch can again be closed, and the circuit will be ready for another cycle.

★ ★ ★

# ADDITIONAL INDICATORS AID IN CHECKING CAR PERFORMANCE

By Dale Kelly

TODAY'S AUTOMOBILES are equipped with one of two types of dash indicators to help the driver check the operation of his car: dash gauges or panel lights. Both systems have advantages and disadvantages. The gauges provide an accurate indication of the performance of a particular system, but do not necessarily draw the driver's attention to a possible defect. The panel lights are likely to be noticed much sooner in the event of trouble, but do not give an exact indication of the car's performance.

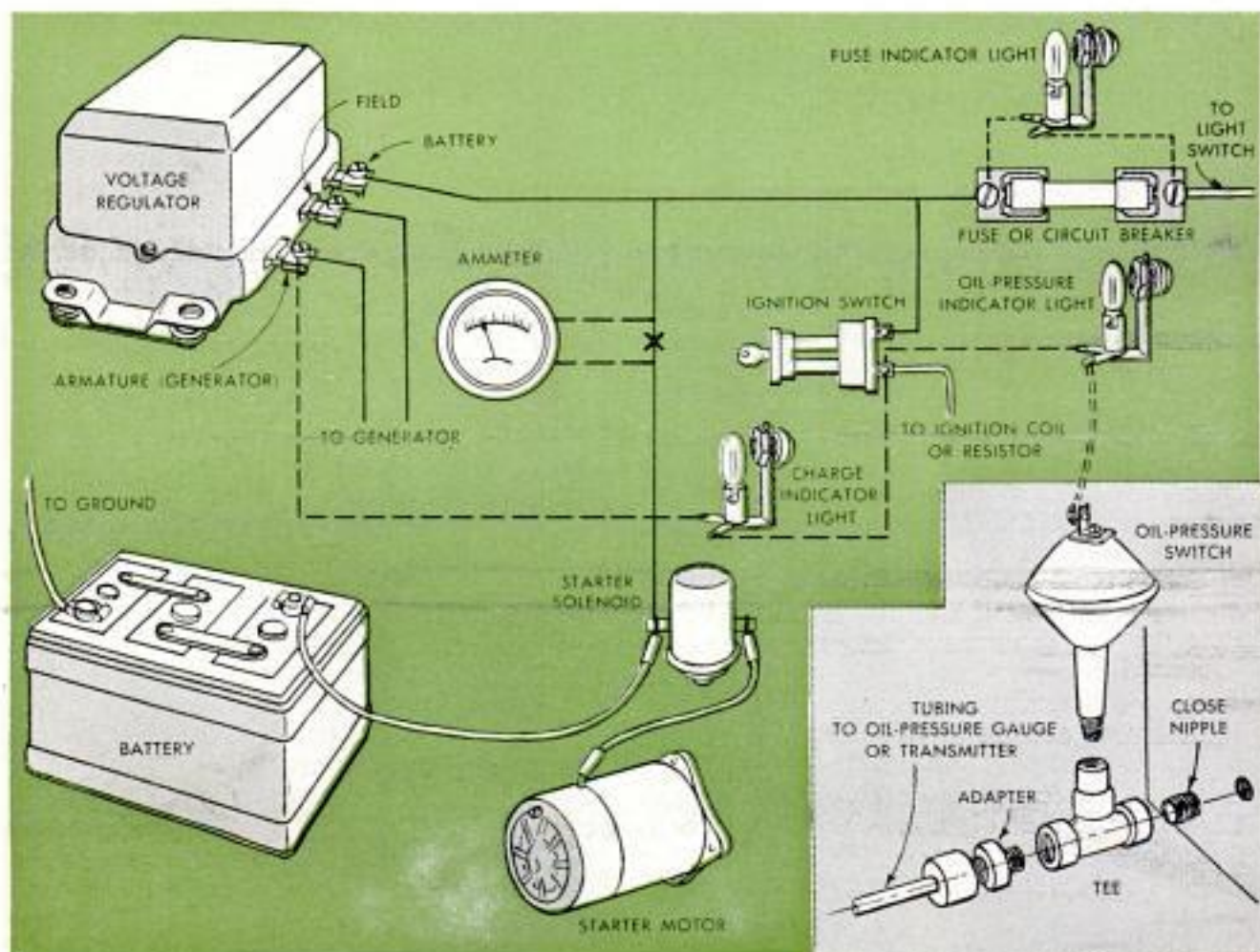
The illustration below shows how to add panel lights to a car equipped with gauges, and an ammeter to the system which employs only lights. To install the ammeter, locate the heavy cable running from the battery terminal to the starter solenoid. From one end of this cable, a smaller wire ("X" in the illustration below) leads to generator, ignition, lights, etc. Disconnect the small wire from the solenoid. Now, run a pair of wires from a dash-mounted ammeter (50-0-50 amperes) into the engine compartment. Connect one of these to the

previously disconnected wire, and the other to the solenoid terminal from which the wire was removed. Disconnect the grounded battery lead while doing this, to prevent an accidental short circuit.

Installation of the charge and fuse indicator lights needs little explanation. In each case, just add two wires as shown by the dotted lines in the illustration. The charge indicator will light if the generator stops charging while the motor is running and will give warning if the ignition is left "on" when the car is not in use. A lit fuse indicator means that the fuse or circuit breaker to the lights is open. This may be due to an overload in the lighting circuit.

To add the oil-pressure light, you will have to buy a few items of hardware and an oil-pressure switch, as shown in the lower right portion of the drawing. The switch shown is a Chevrolet part No. 1998149, handled by car dealers. Buy the other fittings from builders' supply houses.

The bulbs should be about 3 c.p. and 6 or 12 v., to match the voltage of the car battery. Bayonet-base bulbs and corresponding sockets should be used.





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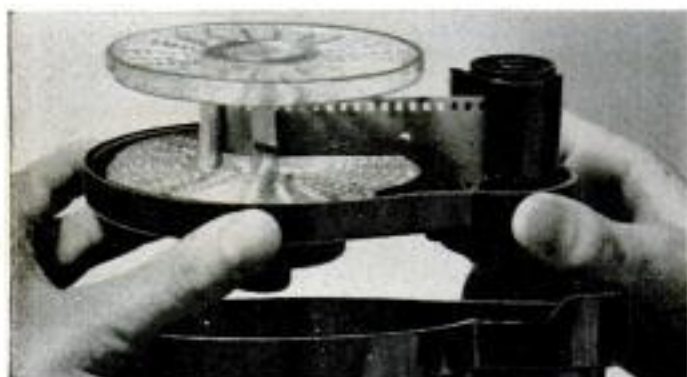
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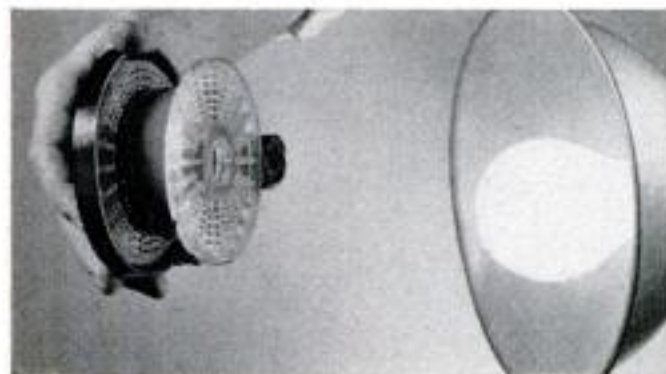
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**RE-EXPOSING** the color film (to reverse the images from negative to positive) takes only 60 seconds. No need to touch the film with the fingers because light reaches all portions of it through slots in the tank reel. After re-exposure, film receives final processing baths.



**FULLY DEVELOPED** film is dried in the usual way. Individual frames are cut to size with trimming guides, then inserted in cardboard mounts provided. Edges of each mount are sealed with a warm iron.

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Makes the most practical, beautiful and durable natural finish for hard or soft wood! So quick-drying you can apply 3 coats a day. SATINLAC is so easy to maintain!



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Satinlac  White Firzite  Clear Firzite

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## Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of Popular Mechanics invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.

### Pool Leaks

Q—I have a large lily pool which has leaked each season since it was built 3 years ago. It is of concrete, about 20 in. deep, with a stone curb and there are cracks in the walls at several points. I have tried a number of methods of filling these cracks, but none has been fully successful. Do you have any suggestions? —Y. L., Ohio.



A—Cracking of the walls probably is due to frost action, although, of course, there could be other causes, such as unstable soil, for example. Whatever the cause, it is more or less apparent from your description that the only permanent remedy is to break up the walls, perhaps the entire pool, and rebuild with reinforced concrete of sufficient cross-sectional area to prevent cracking under ordinary conditions. However, it may be worthwhile to attempt a temporary repair by first cleaning all loose material from the cracks and filling either with a bituminous material or with a new-type concrete "glue" which is available. This is mixed with a special topping material to a puttylike consistency and forced into the cracks. The repair thus made may have to be renewed each year, but the treatment should prevent leaks throughout the season.

### Concrete Piers

Q—I have planned to build an open porch. The floor will be supported on wooden posts. My carpenter says the posts should be supported on concrete piers. I had thought that supporting each of the posts on a fairly large flat stone would be sufficient. Should I follow my carpenter's advice? —B. H., Mo.



A—Yes. Even though the initial cost will be somewhat higher, we gather from your description that the porch is a permanent structure and, if this is so, then the posts should be supported on concrete piers as your carpenter recommends. The piers will require comparatively little additional labor as holes dug with a posthole auger to the

(Continued to page 270)

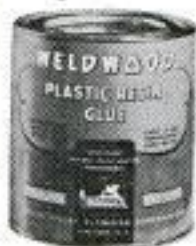
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# Sealed Power PISTON RINGS

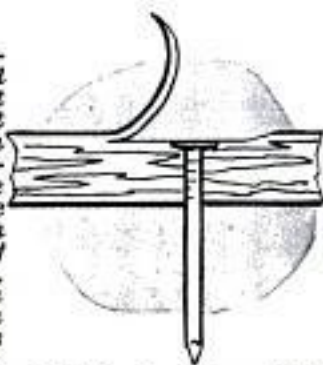
**BEST IN NEW CARS! • BEST IN OLD CARS!**

(Continued from page 268)

required depth and filled with concrete should be sufficient. You do not give the over-all size of the porch so it is not possible for us to suggest the number of piers you would require, or how they should be spaced. Ordinarily, the distance between piers should not exceed 6 ft. but, of course, this is only a general recommendation.

### Concealed Nails

**Q**—Recently I had occasion to remove the warped top from a very old chest of drawers. I found that it had been attached with long nails of the old-fashioned kind which are square. What puzzled me was how the craftsman concealed the heads of the nails so effectively, there being no indication that nails were used. Can you tell me how it was done? — C. T., Conn.



**A**—There is an old method of blind nailing which was frequently used by individual craftsmen. The procedure does conceal the heads of the nails very effectively. In some instances the heads of screws are concealed in the same way. The trick is to lift a chip with a wide-sweep gouge from the top surface of the work without breaking it from the wood. Then the nail or screw is driven in the concavity, the head set flush with the wood, and the lifted chip glued back into place. Use a glue that does not discolor the wood. In carrying out this procedure the greatest care must be taken not to break the chip. The gouge should be ground with a long bevel and the edge honed razor-sharp. If the procedure is carefully carried out and the wood smoothly sanded after the glue has set, it will be difficult, if not impossible, to discover where the nails or screws have been driven. Should you intend to replace the top it may necessary to cut off the original nails flush with the underside of the top, and replace either by nailing or using screws in the manner described. Of course, nails or screws will have to be driven in new locations. There is danger of splitting the wood should you attempt to withdraw the original nails.

### Removing Rust Stains From Concrete

**Q**—There are rust stains on my concrete walk at a point where a downspout emptied into a drain-tile. All gutters and downspouts have recently been replaced and I would like to know how to remove the rust spots. They cover an area about 2 ft. square. I've tried scrubbing with soapy water and a steel-bristle brush. This helped some, but the stains are still noticeable. Is there a solution that will remove the stain completely?—E. L., Ala.

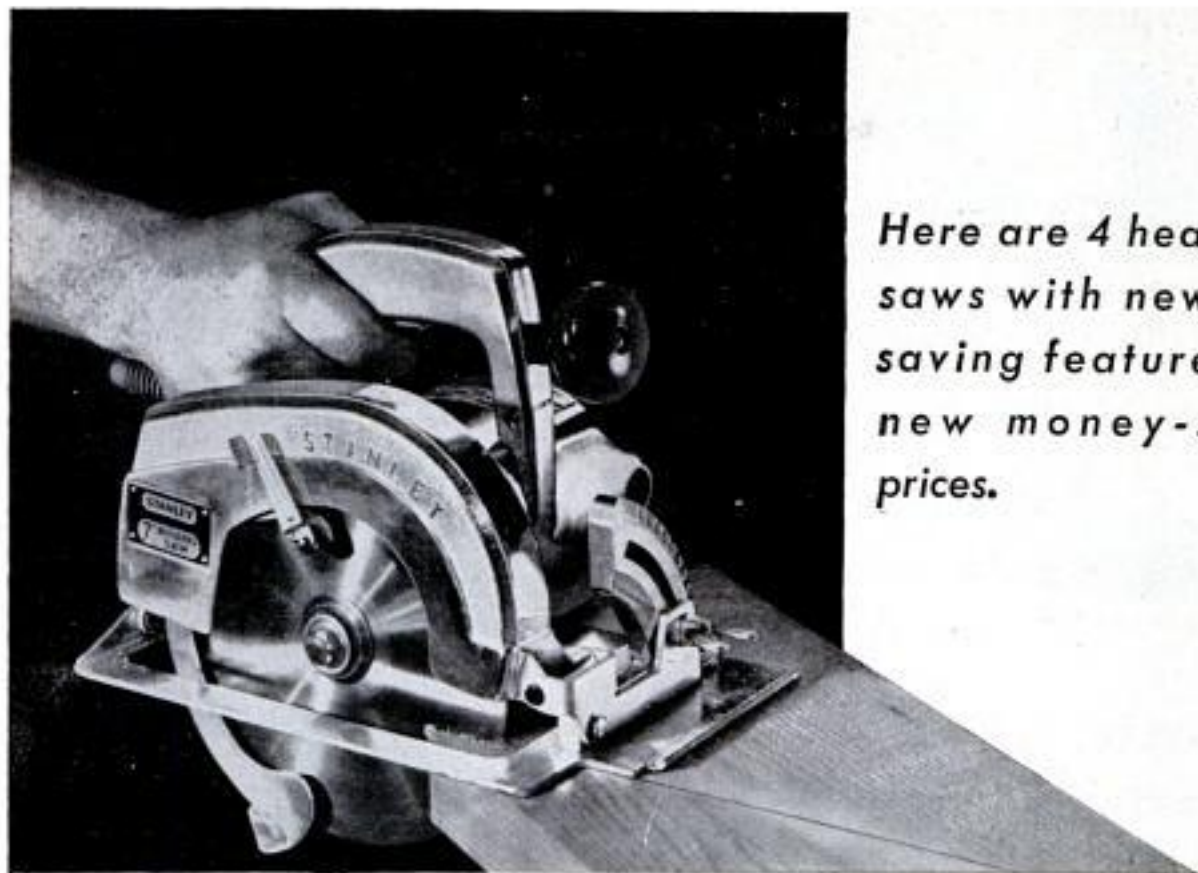
**A**—Although we would be rather doubtful about the success of the venture, it might be worthwhile to try scrubbing the stains with a fairly strong solution of trisodium phosphate. Often this step proves fairly successful. Another method employs sodium citrate, commercial glycerin, water and whiting mixed to a paste which is spread over the discoloration and left until dry. To make the mixture add 1 part sodium citrate to about 6 parts water, then add the glycerin, also about 6 parts. Then mix in enough whiting to form a paste the consistency of thick cream and spread this thickly over the stained area.

### Wood Ashes as Fertilizer

**Q**—I've been told that I should save all wood ashes from my fireplaces (I have two) and use these as fertilizer for shrubs and garden plants. Is it true that wood ashes are good to use as fertilizer? Y. L., Kans.

**A**—Ashes of nearly all woods contain valuable potash and other trace elements which are in themselves plant foods. Of course, the quantity of available plant food will vary somewhat, depending on the kind of wood, or woods, which were burned to form the ash. Ashes also contain certain inert materials which are helpful in loosening soils which tend to puddle when wet and harden when drying out.

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# STANLEY



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Oil-pumping is the first sign of worn-out piston rings. And worn-out piston rings mean power drop-off—costly wastage of gas and oil—expensive repairs later on.

The sooner you act, the less it will cost. See your motor specialist the minute oil-pumping warns you there's trouble ahead. When he recommends new piston rings, ask him for Hastings. They're engineered exclusively for replacement service . . . to provide the additional lubrication worn engines need . . . to stop oil-pumping, save gasoline and restore lost performance. Truly the best money you can spend on your car.

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# HASTINGS

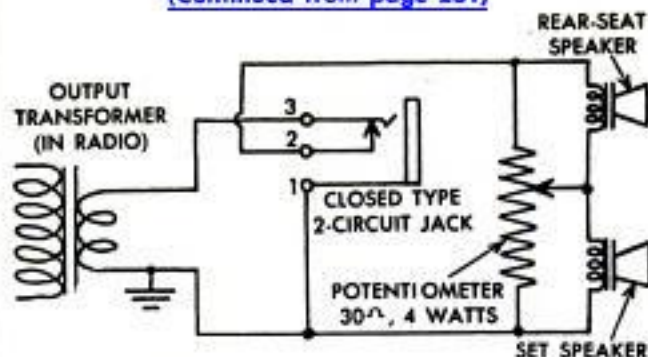
## PISTON RINGS

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Buy these Hastings Products with confidence:  
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## Greater Pleasure From Car Radios

(Continued from page 261)



Schematic diagram of necessary wiring changes for increasing the versatility of automobile radios

reduced until, in either extreme position, one of them is completely shut off.

When a phone plug is inserted in the jack on the control panel, contacts 2 and 3 of the jack are opened and both car speakers are deactivated. All of the signal is channeled to an extension speaker or earpiece which may be connected to the plug. A personal hearing-aid-type earpiece can be used to good advantage in bringing the radio sound directly to the ear where it is not masked by the high noise level within the car even at high speeds.

For an extension speaker, any 3.2-ohm unit is suitable. The cable between this speaker and the control panel may be several hundred feet in length without causing serious attenuation.

### Wiring Procedure

The voice coil of the car-radio speaker is normally connected to the set with two wires or a two-conductor cable. One of these wires is usually grounded by being soldered directly to the radio chassis. If the speaker is mounted within the radio, the entire unit will have to be removed from the car before the required wiring changes can be made. In this event, the grounded lead can be located by removing the radio cover and observing which of the speaker wires is soldered to the chassis. Once this is found, the other wire, the ungrounded one, is detached from the speaker voice-coil lug and soldered to lug 3 of the jack. A separate wire is soldered between the now open speaker lug and the center terminal of the potentiometer. Another wire is connected between the grounded speaker lug and the top terminal of the control. This, and all subsequent wiring, is clearly shown in the pictorial diagram.

If the set speaker is mounted separately from the radio, and is easily accessible, neither the radio nor the speaker need be

(Continued to page 274)



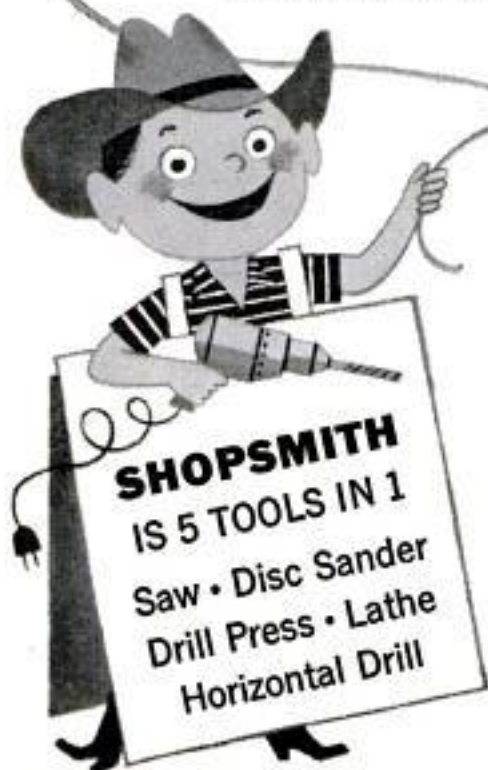
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FEBRUARY 1957

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removed from the car. However, it is necessary to determine which is the ungrounded speaker lug. To do this, solder a wire to both the negative and the positive terminals of an ordinary flashlight battery. Connect the other end of one of these wires to an unpainted metallic part of the car frame or dash, and momentarily touch one of the speaker lugs with the other wire. If a click is heard through the speaker, that particular speaker lug is *ungrounded*. The wiring can then proceed as explained in the preceding paragraph.

The rear-seat speaker may be installed under the package shelf behind the rear seat. This involves cutting a speaker opening into the shelf panel. Alternatively, the speaker can be installed in a small cabinet and placed in any desired location. In either case the interconnecting cable can be hidden beneath the floor mats.

#### Materials

The extension-speaker jack and control are mounted on a small bracket which can easily be made from a piece of aluminum. The bracket should be fastened to the dash within easy reach of the driver. Both the extension speaker and rear-seat unit may be of any desired size, but should have 3.2-ohm voice coils. The midget earpiece for personal listening should also be of the low-

impedance type. A suitable 8-ohm unit, as well as all other needed components, are listed in a number of catalogues from radio-parts distributors. A list of some major distributors who issue free catalogues is available from the *Popular Mechanics* Radio and Electronics Department upon receipt of ordinary letter postage. ★ ★ ★

#### Aurora Recorder

Northern lights too faint for detection by human eyes will be recorded automatically during the International Geophysical Year starting July 1, 1957. An automatic aurora recorder will produce tabulated data directly. The sky's light is caught on a mirror that automatically tilts to different positions from horizon to horizon every five minutes. A second mirror reflects the light beam through a light chopper, lens and aperture to a photomultiplier. This device records readings directly on a strip chart for immediate viewing and as numbers on punched tape for later study or automatic analysis. Power consumption is 280 watts.

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IF I WIN THAT GAL!

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CAN'T BITE!

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THEN YOU'RE  
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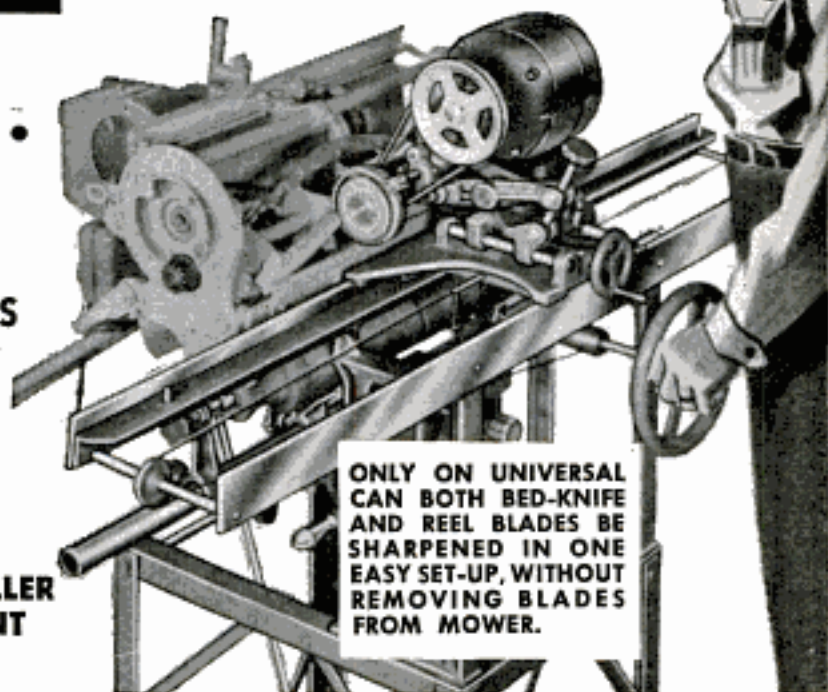
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LAWN MOWERS...**

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UNIVERSAL GRINDER  
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BETTER, FASTER, AND EASIER  
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ALL THESE ADVANTAGES**

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EASY SET-UP, WITHOUT  
REMOVING BLADES  
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and have done nearly  
\$500.00 worth of busi-  
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er grinding business,  
with my Universal  
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gold mine these last two  
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If you are now working, you can start this  
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sharpened every year. A good number of these  
are in your very community. Commercial  
mowers at golf courses, cemeteries, hospitals,

parks, schools, etc. bring even larger fees; and,  
with the speed, ease, and accuracy of opera-  
tion the Universal provides, you can build a  
business that will provide a lifetime future. It's  
a business that no one is too young to earn a  
good living in; and, likewise, one that you  
never grow too old to operate at a good profit.  
(Some of our most successful users are re-  
tired). You can shape your own future, make  
your business as modest or as large as you  
wish. You are your own boss, to come, go, and  
do as you like.

As long as grass continues to grow, mowers  
will have to be sharpened in order to cut it.  
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enable you to get your share of this profitable  
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You can operate your business from home—no  
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business. It's easy, profitable work; so easy a  
boy can do it. It's pleasant, convenient, and,  
best of all . . . it's highly profitable. Others  
are enjoying the happy, carefree life of being  
their own boss—why not you? Whether you  
want the security and independence of a full-  
time business of your own, or the extra living  
comforts spare time profits can bring, you  
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## Build "THE BUG"

(Continued from page 204)

not shown—also must be figured on a trial-and-error basis. In most cases, the front shock absorbers can be used as is.

Rear-axle spring hangers are lengths of  $\frac{3}{4}$  or 1-in. steel round bent to an L-shape and welded to the top of the rear-axle housing. Short lengths of pipe are welded to the ends of the hangers to accommodate the spring-shackle bolts and bushings. Regular shackles are used, but must be cut to fit a particular setup, detail page 203. Gas welding was used in assembly of the frame, but a small arc welder proved invaluable for heavier work, photo page 203, and was used extensively for assembling the body. The concentrated heat of the arc has less tendency to buckle sheet steel.

Unless it is necessary, do not reposition the steering-gear box, as this will affect steering geometry. Instead, lengthen or shorten the steering column. Because the floor of the car is so low, it is necessary to suspend the brake and clutch pedals from beneath the cowl. The original pedals and cross-shaft probably can be used, but the rods between the pedal arms and pedal pads should be shortened or eliminated to provide more legroom, detail page 203. Two master cylinders of the type that bolt to the fire wall are mounted ahead of the pedals and connected by threaded rods and clevises. The brake cylinder is used in the normal manner, but the clutch cylinder is used to actuate the original master cylinder which is modified to be a "slave" cylinder for operating the clutch throwout arm. The reservoir is cut off the cylinder and both vent holes are welded shut. Hone out the cylinder and rebuild it with a new kit, but leave out the compensation valve. Bolt the cylinder to the frame so it lines up with the clutch throwout arm and couple the cylinder and arm with a threaded rod and clevis to provide adjustment for clutch wear. Steel tubing and brake hose are used to connect slave and master cylinders.

Location of the radiator is indicated on page 202, but this unit can be mounted in any position as long as the filler pipe is above the engine cylinder head to assure water to the top of the head. The gasoline tank is shown behind the rear axle, which keeps it low and clear of the cockpit. Depending on personal choice, the filler tube for the tank can be extended through the side or rear of the body of the sportster. For safety the end of the filler tube must be outside the body. Do not end the tube inside the trunk where gasoline fumes could collect and present a hazard.

(Continued next month)



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## Canada's Copter King

(Continued from page 140)

Columbia Government Topographical Division. Operations of his company, Okanagan Helicopters, have enabled the division to accomplish as much in one year as it previously did in five. His next move was into the prospecting field, and he is credited with the success of much of the recent new development of Canada's natural resources. Searching for uranium, oil or other well-hidden deposits, he and his staff use aerial photography and such instruments as the scintillometer and the magnetometer. In the proving of likely locations, as much as 30 tons of construction and drilling equipment have been carried by copter to a single site, individual components weighing up to 1000 pounds. Both Bell and Sikorsky helicopters are used, the latter carrying the heavier loads, and it is expected that use of the Sikorsky 58 will mean even greater weights can be airlifted.

For the construction of a water-storage dam at Palisades Lake in the Rockies, all materials and supplies—including concrete mixers—were moved in by these airborne "pack horses." In the initial survey of this virtually inaccessible area, Agar found the approach to the only possible landing place blocked by a tree 100 feet high. It was impossible for lumberjacks to fell it, because it was rooted on such a steep slope. Nor was it feasible for a whirlybird to get close enough to lower men to do the job. Carl solved this problem by flying "bush expert" Herk Skuce to the tree and hovering while Herk blasted the top away with a 30-30-caliber rifle.

Okanagan Helicopters' reputation spread with the construction of the Aluminum Company of Canada's Kemano-Kitimat power project in the Cascade Mountains of northern British Columbia. Agar and his associates first surveyed the dam sites and transmission-line routes, then carried out an exacting triangulation survey for construction of a 10-mile tunnel. Donkey engines, pumps, rock drills, prefabricated houses, kitchen ranges and refrigerators were among the heavier types of supplies dropped from Sikorskys, without the copters even coming in contact with the ground. In the more inaccessible areas the smaller Bells were used, after carpenters and lumber had been lowered and landing platforms erected. The copters weren't used as a cure-all but as a trail-blazing and emergency method of transportation for men and materials. In six years, starting in 1949, this project alone required over 47,000

(Continued to page 280)

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helicopter landings, and more than two million pounds of freight were ferried in with the "flying egg beaters."

Engineers estimated that copters cut at least two years from the time it took to complete the Alcan project. Mother Nature was given a hand when helicopters were used to speed the spring thaw at Tahtsa Lake, 3000 feet above sea level. After a 12-mile strip of its frozen surface had been sprayed with lampblack, the resulting absorption of the sun's rays made the 30 feet of snow disappear at the rate of one foot per day. Icebreaking barges were then operated in the cleared swath, and a route for transportation of 500 construction men and tons of heavy equipment established ahead of schedule.

Okanagan's copters contributed importantly to construction of the 700-mile Trans-Mountain oil pipeline, stretching across the Rockies from Edmonton to Vancouver, and now patrol this pipeline three times a month. The company maintains patrols of the Alcan transmission lines and last winter was instrumental in restoring facilities through locating damage done by a snowslide and transporting men and materials to effect repairs. Last year Okanagan crews took part in Operation Franklin, a geological survey of islands in the Arctic Ocean less than 300 miles from the Magnetic Pole, ferrying teams of dogs as far as 160 miles from base camps. Agar's helicopter know-how also has been used in Canada as the "eyes" of tractor trains crossing the snowbound wilds, for timber-cruising, forest reseeding and the dropping of poisoned bait used in rodent-eradication campaigns.

From a two-man, one-machine outfit with a gross revenue of \$6152 in 1947, Okanagan Helicopters has an estimated 1956 gross in excess of \$1,500,000. The only copter company licensed to operate from Vancouver Airport, it now boasts a fleet of 26 Bells, 6 Sikorsky 55s and 4 Sikorsky 58s, valued at more than \$2,000,000. The firm's 105 employees (90 percent of them stockholders) represent 1145 years of aviation experience and over 40,000 hours of flying time. Subsidiaries stretch across Canada and operations have been especially effective in Newfoundland. There, a helicopter "hospital ship," carrying doctor, nurse, X-ray and other equipment, services remote sections of the 900-mile coastline.

Accident-wise, Agar had his first close call nine years ago, with only 50 hours of helicopter flying time in his logbook. Attempting to spray a hilly orchard in the Okanagan Valley, he made too sharp a turn, lost revolutions and crash-landed astride

(Continued to page 282)



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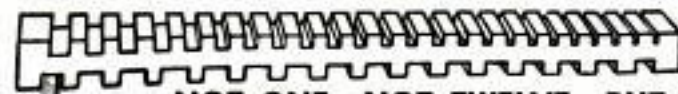


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some 6500-volt power lines. The aircraft shorted the top wires, and they crackled like pistol shots as sparks showered his plastic cabin bubble. When the upper wires finally melted, the copter dropped to those below for another round of hair-raising high voltage. When the whirlybird eventually dropped to the valley floor, the perspiring pilot breathed a prayer of thanks for having worn rubber-soled shoes and being seated on a rubber cushion.

His most embarrassing moment came when Agar flew a prominent government official to a tiny knob on the side of a mountain peak. As soon as they had landed, he told his passenger to hop out. When the door was opened, they discovered that one wheel was resting only on air. If either man had shifted his weight to that side, the copter probably would have toppled over, with nothing to stop it from bouncing 2000 feet below. And had he hopped, the official would have been Okanagan's first fatality.

"It took only a couple of minutes to put her down on all fours," Carl remembers. "Nowadays, a lot of flying is done by instruments, but our pilots still fly by the seat of their pants. If you're going to lose even a foot of altitude, you have to feel it. It's usually too late to act when you see trouble; you have to sense it in advance. It may be perfectly peaceful on one mountain peak, but you get slapped by a 60-mile gale on the next. You can't make mistakes."

Although men under 28 years old are preferred as student pilots of fixed-wing aircraft, the opposite applies to helicopters. Qualifications for acceptance at his school are a minimum of 1500 hours of flying ordinary planes and a genuine fondness for helicopter flight. Preference is given mature pilots, particularly those who are married and have children, since statistics show that added age and responsibility are important safety factors. Agar is 55 years old. The school is located at Penticton in Canada's Okanagan Valley. Fledgling daredevils take a 12-week course, 50 lectures and 30 hours in the air. The organization was established in 1951. In 1954 the first American pilots, 22 officers of the Army Transport Helicopter Battalion, were trained by Okanagan.

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"Since this is the only school specializing in mountain operation," Capt. Lloyd Watland of Ft. Riley, Kans., comments, "it's the only place pilots can come for instruction. The few of us who receive this valuable training each year spread quite a bit of the know-how throughout our branch of the services."

(Continued to page 284)

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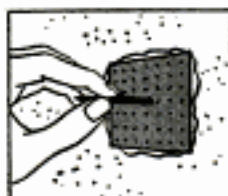
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Okanagan grads think nothing of setting a machine down on a tiny target, such as a cast-off cigarette carton, a few feet from the brink of a 1000-foot chasm and at an elevation of 8000 feet. Understandably, Agar, their instructor, has received high Canadian awards. During World War II, he taught conventional flying so well that he won the Air Force Cross. In 1950 he was awarded the McKee Trophy, presented annually in recognition of the Canadian making the greatest contribution to aviation.

In the immediate post-World War II period, Carl sold the farm he'd had for 20 years, moved his wife Anne and their two children to the coast, and went into partnership with another RCAF vet, Alf Stringer, in operation of an airplane service for fruit growers. In 1946, after selling shares to orchard owners, they switched to a helicopter, which Carl learned to fly. The "flying windmills" had proven effective and economical in flat California orchards but were a flop in British Columbia because of the hilly terrain. Carl's conquering of Mount Wahleach was all that saved the partners from financial disaster.

Not one to be complacent, Agar also has demonstrated how a copter can be set down safely with only fresh air beneath its fuselage. Although he first tried it simply for the sake of finding out whether it could be done, he and the graduates of his school now are proficient at landing astride narrow mountain chasms. This method has proven useful for landings in areas where there are no level spots of sufficient size, but where a machine can be landed safely straddle-style. If a "flying palm tree" can land on a spot, Agar can pilot it there. That's why they call him Canada's copter king. ★★★

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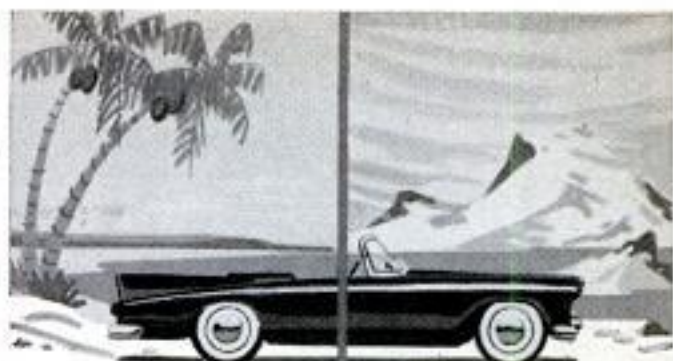
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## Eight Memorable Days in The History of Speed

(Continued from page 169)

with the average of the two being the official speed.

By 1926 the speed record stood at 150.87 miles per hour, a record set by Malcolm Campbell in a Sunbeam. He had broken his own record to do it, a record of 146.16 miles per hour, both set at Pendine sands in Wales. Thus Campbell became the first man to average 150 miles per hour.

Sunbeam came through again when H. O. D. Segrave, in the smallest gasoline car ever to hold the record, set a new mark of 152.33 miles per hour at Southport, England. The engine represented a triumph of design, it being a V12 engine of only 244-cubic-inch displacement—smaller than any eight-cylinder engine built in an American production car today. The Segrave car was no special car—it was a practical racing vehicle, the last of the normal cars to hold the record. From here on, the emphasis was on specialized cars with aircraft engines, cars designed to go extremely fast in a straight line for a short distance.

The first of this parade of monsters was the Liberty-aircraft-engine Higham Special driven by J. G. P. Thomas. It boosted the speed mark to 169.20 and started the record zooming upward after years of gradual increases (see chart on page 169 for a visual record of this turning point).

Despite the fact that the Liberty engine wasn't running right, Thomas easily smashed all existing speed records. The lesson was clear—to those interested—the way to set records was to get a tremendous engine and put it on wheels. Aircraft engines became the typical choice.

The following day Thomas ran through the mile again and raised the record to 171.4 miles per hour despite an extremely wet beach.

The Liberty engine had a 27,059-cubic-centimeter displacement (1650 cubic inches), almost seven times more than the Sunbeam whose record it broke.

From here on, the record climbed sharply. By 1927, the speed merchants discovered that the hard sand at Daytona was best for their runs. Segrave brought a twin-engined 1000-horsepower Sunbeam to the Florida beach and boosted the mark to 203.79 miles per hour, becoming the first to break the double-century barrier.

In the following year, 1928, three drivers made the pilgrimage to Daytona: Lockhart's previously mentioned and ill-fated Stutz; Keech's three-engined Triplex special, a tremendous car of great power and

(Continued to page 288)

# LUFKIN

## MICROMETERS

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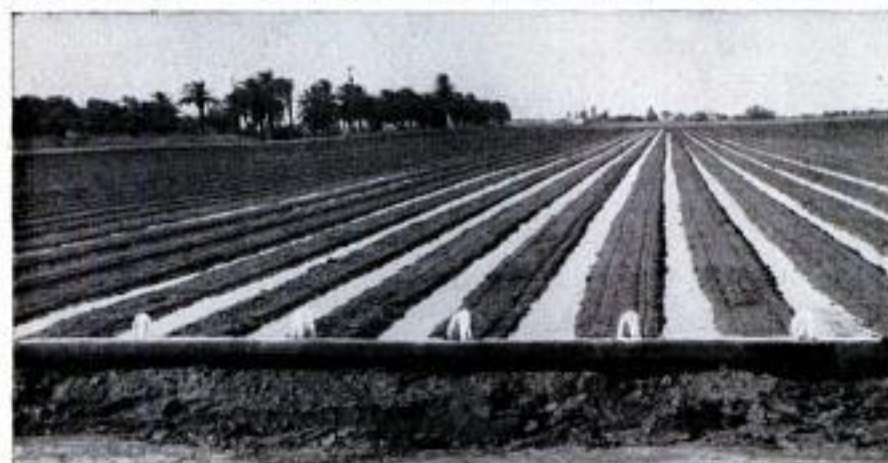
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An economy saw that performs all operations of high-priced models.

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Parallel Motion to maintain constant  
distance between table and  
blades at all depths of cut.

## TOOLKRAFT CORPORATION

400 PLAINFIELD ST., SPRINGFIELD, MASS.



little engineering; and Campbell's Napier-engined Special.

Campbell set the new record at 206.96 miles per hour. A few months later Ray Keech, an American, in the crude Triplex-White Special, raised it to 207.55.

The following year, March 1929, Segrave returned to Daytona in a Napier-aircraft-engine car, the Golden Arrow, and boosted the record sharply to 231.36 miles per hour, an achievement which won him a knighthood when he returned to England.

Malcolm Campbell then began a series of record-breaking runs which gave him a monopoly on the mark until 1937. In 1931, 1932, 1933 and 1935, Campbell set new records. Finally at Bonneville he became the first to hit 300 miles per hour with an average of 301.13.

This marked the ninth time that Campbell, (by this time he was Sir Malcolm) had held the speed record—an achievement unmatched by anyone else.

Discovery of the Salt Flats at Bonneville gave impetus to the drive for speed. In 1937 G. E. T. Eyston drove his Thunderbolt at 312.00 miles per hour to wrest the crown from Sir Malcolm.

The Thunderbolt was the ultimate in the trend toward bigness. It was a seven-ton leviathan that rolled on eight wheels and was powered by two Rolls-Royce aircraft

engines developing a total of 6000 horsepower with 73,000 cubic centimeters or 4453 cubic inches of displacement.

The following year, Eyston raised his record to 345.5 miles per hour. A month later, September 1938, the Railton Special driven by J. R. Cobb took the crown from the Thunderbolt with a speed of 350.2 miles per hour.

The Railton was different from the cars that preceded it. Its designer, Reid A. Railton (now living in California and no relation of the author), developed a completely original car for Cobb. The body was kept as small and as light as possible. There were two aircraft engines, each driving two wheels of the four-wheel drive.

Later the same month Eyston came back to break Cobb's mark and raise the record to 357.50 miles per hour. The following August, Cobb regained the crown with an average of 369.70 miles per hour.

There the record stood until after World War II when Cobb returned to Bonneville in his same Railton Special and, for the first time in history, drove a vehicle over land at a speed of more than 400 miles per hour. On his south-to-north run, he averaged 403.14 miles per hour. His north-to-south run was 385.65 miles per hour, for a two-way average of 394.20 miles per hour, the present world's record. ★ ★ ★

## WORLD'S LAND-SPEED RECORDS

### One Direction Only

Date	Driver	Car	Place	M. P. H.
Dec. 1898	Chasseloup-Laubat	Jeantaud	France	39.24
Jan. 1899	Jenatzy	Jeantaud	France	41.42
Jan. 1899	Chasseloup-Laubat	Jeantaud	France	43.69
Jan. 1899	Jenatzy	Jeantaud	France	49.92
Mar. 1899	Chasseloup-Laubat	Jeantaud	France	57.80
Apr. 1899	Jenatzy	Jeantaud	France	65.79
Apr. 1902	Serpollet	Serpollet	France	75.06
Aug. 1902	Vanderbilt	Mors	France	78.08
Nov. 1902	Fournier	Mors	France	78.60
Nov. 1902	Augier	Mors	France	77.13
July 1903	Rigolly	Gobron-Brillie	Belgium	83.47
Nov. 1903	Duray	Gobron-Brillie	France	84.73
Jan. 1904	Ford	Ford 999	Wisconsin	91.37
Jan. 1904	Vanderbilt	Mercedes	Daytona	92.30
Mar. 1904	Rigolly	Gobron-Brillie	France	94.78
May 1904	de Caters	Mercedes	Belgium	97.25
July 1904	Rigolly	Gobron-Brillie	Belgium	103.55
Nov. 1904	Baras	Darracq	Belgium	104.52
Jan. 1905	Macdonald	Napier	Daytona	104.65
Dec. 1905	Hemery	Darracq	France	109.65
Jan. 1906	Marrriott	Stanley	Daytona	127.66
Mar. 1910	Oldfield	Benz	Daytona	131.72

### Two Directions

June 1914	Hornsted	Benz	England	124.10
May 1922	Guinness	Sunbeam	England	133.75
July 1924	Thomas	Delage	France	143.31
July 1924	Eldridge	Fiat	France	146.01
Sept. 1924	Campbell	Sunbeam	Wales	146.16
Mar. 1926	Campbell	Sunbeam	Wales	150.87
Mar. 1926	Segrave	Sunbeam	England	152.33
Apr. 1926	Thomas	Thomas Special	Wales	169.30
Apr. 1926	Thomas	Thomas Special	Wales	171.02
Feb. 1927	Campbell	Napier-Campbell	Wales	174.88
Mar. 1927	Segrave	Sunbeam	Daytona	203.79
Feb. 1928	Campbell	Napier-Campbell	Daytona	206.96
Apr. 1928	Keech	Triplex-White	Daytona	207.55
Mar. 1929	Segrave	Irving-Napier	Daytona	231.44
Feb. 1931	Campbell	Napier-Campbell	Daytona	246.09
Feb. 1932	Campbell	Napier-Campbell	Daytona	253.97
Feb. 1933	Campbell	Campbell Special	Daytona	272.46
Mar. 1935	Campbell	Campbell Special	Daytona	276.82
Sept. 1935	Campbell	Campbell Special	Bonneville	301.13
Nov. 1937	Eyston	Thunderbolt	Bonneville	312.00
Aug. 1938	Eyston	Thunderbolt	Bonneville	345.50
Sept. 1938	Cobb	Railton	Bonneville	350.20
Sept. 1938	Eyston	Thunderbolt	Bonneville	357.50
Aug. 1939	Cobb	Railton	Bonneville	369.70
Sept. 1947	Cobb	Railton	Bonneville	394.20



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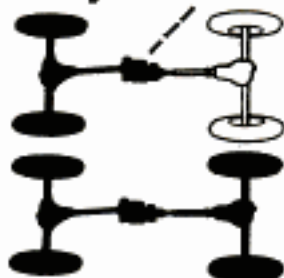
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## WARN MFG. CO.

Riverton Box 6064-A2  
Seattle 88, Wash.

## I Race in the Big Leagues

(Continued from page 200)

could take Fangio on the outside. Flat out on the straight I would be a bit better on acceleration than the Ferrari and I hoped to use this to pull ahead.

Roaring along the straight at 180 miles per hour, Collins wouldn't let me by. At 400 yards from the corner I was still hitting 180. I kept my foot down until 300 yards. Then I jumped on the brakes. Everything was fine. I passed Collins and Castellotti, then suddenly my brakes locked. For an instant I lost control. I decided to go straight ahead. I couldn't make the corner.

Just as suddenly, at the last instant, the brakes unlocked and the green Vanwall turned. In an instant I was alongside Fangio, passing on the outside.

But Fangio wouldn't let go. For one mile I stayed alongside the greatest driver of them all, fighting it out. First I was ahead by a nose, then he was. It was Grand Prix racing at its most exciting.

Then up came the curve and there was nothing for me to do. He kept his foot down and I had to let him pull ahead. I decided to tag on his tail and attack again on the last two laps.

But every time I tried to make a move, Collins would pull alongside and I was boxed. Then the Vanwall began to backfire. I knew it was the end. The bracket of the fuel-injection pump had broken. My dream was ended.

I pulled into the pits. The crowd was yelling "Schell—Vanwall." It was fantastic. They were cheering me more than him who had won. I learned that in the chase Fangio had set a new lap record of 127.29 miles per hour.

My dream collapsed, but I was not sorry for myself as much as for Tony Vanderwell and his mechanics. I had had the most exciting moment of my career.

If racing was like that all the time it would be unbearable. But there are long, tedious hours when misfortune and despair take over. No race is long when you have a chance to win. Every race is endless when you are hopelessly behind.

I was brought up in the smell of castor oil. My father and mother were involved in racing before the war. My father was killed at the wheel of his sports car. Racing seems to be in my blood.

As I plunge along the straight at Reims at 180 miles per hour or when I round a corner of Monza in a nice drift, I feel on top of the world. Racing is my life. I am a hopeless addict.

I began racing seriously when I was


(Continued to page 292)

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IT STANDS UP STRAIGHT  
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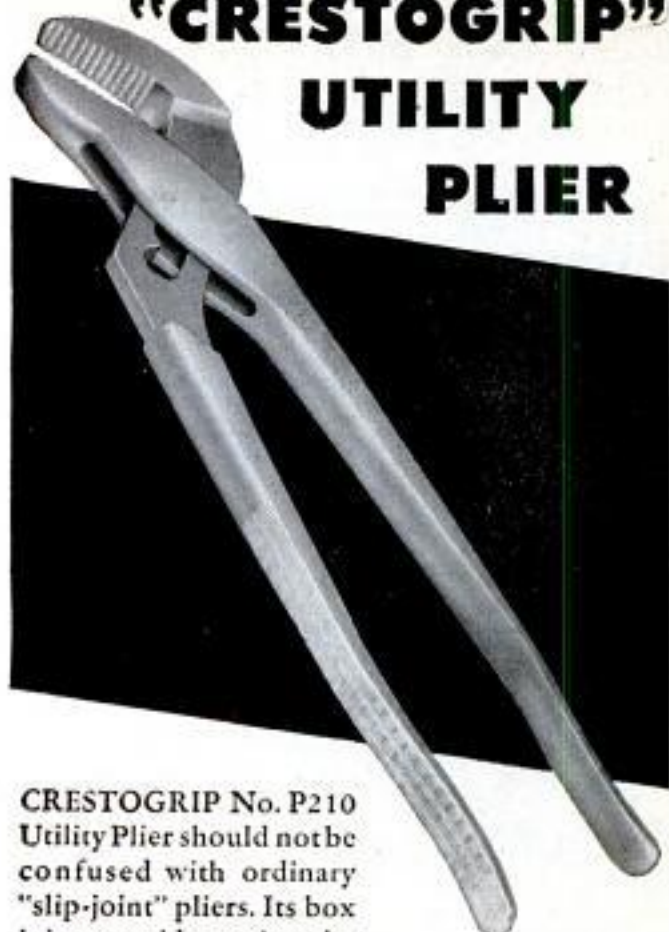
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# have fun with electronics

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released from the Army after the war. I settled in France. The only car I could afford was an old Maserati—a tired car and very difficult to drive. It eventually ended up at Indianapolis where the engine blew up on me, littering the track with bits of steel. I don't know why I brought this junk to Indianapolis against all my friends' advice. I suppose it was because I wanted to race in my own country.

In 1947 I bought a single-seater Cisitalia, but I was no winner with that. Then in 1949, I bought a sports Talbot which brought me my first victories—two in one day in Saar. But I was still a long way from the big leagues. I was still a second-stringer in the minors.

I moved along to a season of racing in a modified Maserati with Enrico Plate's team. But the cars were old and tired and we blew up in race after race.

Finally I got my first contract with a factory team (known as a "works" team). It was Gordini. Gordini is a small, not-very-wealthy builder and often runs out of money. We were not usually in the running, but I was moving up and I was grateful.

Soon I decided the fragile little blue Gordini was not going to win for me so I went independent again, buying a second-hand Maserati which had been driven previously by Fangio. Needless to say, Fangio had driven the guts out of the car. It was old and worn. Time and time again I pulled into the pits sitting in a pool of oil. The same old story of a tired, worn-out car.

Finally, the miracle happened. Maserati turned up short a driver for the Spanish Grand Prix in Barcelona. They sold me one of their cars. It was a proper "works" car, much faster than my Maserati. The race was the final leg of the championship and everybody was there: Mercedes-Benz, Ferrari and all the other great names.

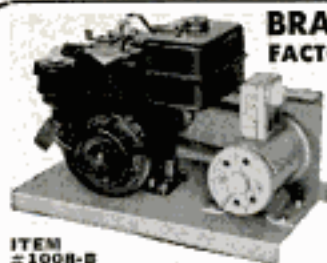
In practice, I made the third fastest time and was put in the front line of starters for the first time in my life in a championship event. I was next to Ascari, Fangio and Hawthorn.

Nobody believed my time except the Maserati owner and his mechanic. Everybody felt that the timekeeper had made a mistake. This novice American couldn't be up there, they were sure.

The team manager who had sold me the car asked me to make Ascari and Fangio break, no matter how many r.p.m.s I had to do. I was to be the pace setter. What a responsibility. I had to break the masters!

As soon as the flag dropped I shot into the lead for four laps. Ascari was on my

(Continued to page 294)



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**PORTABLE**  
**ELECTRIC**  
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**PLANTS**

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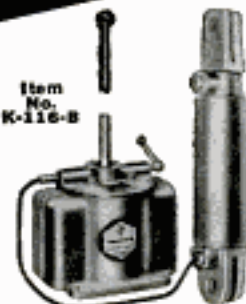
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- 1—6 Ft. length double wire braid rubber covered hydraulic hose—tested to 20,000 lbs. Item #2784..... **3.95**
- 1—Hydraulic cylinder, 3" bore, 6" stroke. Husky 3/4" solid steel shaft. Will lift 10,000 lbs. using pump pressure. Clevis mountings that take 3/4" diameter pins. May be used for double action service. Item #419 **\$12.50**
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- All necessary hydraulic fittings.
- Total ship. wt.—40 lbs.



Item No. K-116-B

**COMPLETE KIT PRICE..... 38.95**  
**ALL OF ABOVE INCLUDED F.O.B. Chicago**

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**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 un-loaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs. **AN OUTSTANDING BUY!** F.O.B. Chicago..... **23.50**



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Full alphabet A to Z, "&" and period. Precision hand trimmed deep cut, hardened **STEEL STAMPS**—in fitted Wooden Box—made to rigid U.S. Navy specifications by Young Bros.—Comparable to sets selling for \$27.00. Shipping Wt. 5 lbs. F.O.B. Chicago..... **5.95**

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ITEM #384

These all bronze Centrifugal Pumps are ideal for use as marine bilge pumps, circulating pumps, fire protection or irrigation, car-washing, dewatering, basement sump pumping, lawn sprinkling. Will pump water, oil, brine, gasoline, DDT and sulphur compounds. Equipped with 6" adjustable 'V' pulley, 2" dia. inlet and outlet, 180 GPM capacity. Inlet and outlet take hose with 2 1/4" inside diameter. Dimensions: 11" x 8" x 11".

Total head-feet	Speed	H.P.	GPM
25	3800 RPM	3	180
15	3000 RPM	1 1/4	90
20	2400 RPM	1 1/2	75

Back plate may be rotated for most convenient inlet position. Gov't acquisition cost \$98.00. Shipping weight 31 lbs. F.O.B. Chicago..... **29.50**

**HOBART 2 H.P. 12-24 VOLT ELECTRIC MOTOR**

**ITEM #315**—Rated 24 volts D.C. 90 amps. 4000 R.P.M. Has 1/2" spline shaft on both ends of motor, ball bearing construction, as specified for use with electric wheelchair design Popular Mechanics March issue, 1953. Convertible for use on 6 to 12 volts. Shipping Wt. 21 lbs. Dimensions: 11" x 5" x 6 1/2". F.O.B. Chicago..... **13.00**



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**ITEM #255** Silent, high efficiency, Helical Gear Type Ball Bearing. Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M.—Delivers 1000 P. S. I. Using 6 H.P.—Reversible Rotation—3/4" Pipe Thread Inlet and Outlet Ports—1/4" Drain Port—3/4" shaft with keyway and flat for either direct or pulley drive. Dimensions—5 1/2" high, 7 1/4" long, 5 1/8" wide. Shipping weight 18 lbs. F.O.B. Chicago..... **52.50**



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tail and passed me on the fifth lap. For three more laps we stayed together. It was a real thrill, a battle with Ascari.

What I had been dreaming of for years was happening. I fought as hard as I could. Then Ascari's car blew up. I was in the lead with 12 seconds on Hawthorn and Trintignant and 25 seconds on Fangio.

The Maserati pit gave the blue flag every lap—faster, faster, faster.

But Hawthorn and Trintignant were too much for me. For an hour we jockeyed back and forth. First they were ahead, then I was. Finally, I slid off the road and broke a rear axle. That ended it.

But despite great disappointment, I couldn't have been happier. It had been my first real clash with the greats. There I was, an independent, ahead of all the team cars. And the car that was ahead was painted blue and white—the colors of the United States. It was a proud moment for an American overseas.

In Grand Prix racing I have been in many countries. I am still a long way from a success, measured against such greats as Fangio. But I am in this game for life and I hope some day to bring the championship to America.

There is one thing I can assure you. It's no game for relaxing. The night before a race, you don't sleep much. You think about this corner, about how you are going to take that curve; how you are going to pass another driver or if you are going to slide off the road. And if you do, how you are going to get out.

I believe every driver, even the greatest, is nervous at the starting line. I walk around the cars for the five minutes before the start, kidding with the drivers so I won't think about the race. Two minutes before the start I jump into my car and don't look at anything except my watch and the flag.

Then comes the 30-second signal. At 20 seconds, I put on my goggles. At 10 seconds I put the car in first gear. Then comes the short but endlessly long count: 5—4—3—2—1—GO!

It's fantastic. Instantly I relax and the thrill of the sport begins. Suddenly I am alert, unafraid. It is an amazing experience, this transformation of a tense, jittery driver into an utterly relaxed person in the second it takes the flag to drop. Anyway, that's how I feel when I'm at the wheel and I'm sure others feel the same.

From then on it's a battle of men and machines. The battle for the Grand Prix—top honors in the big league of racing. Top honors in a sport that, like a drug, makes you an addict and won't let go until either you or it wins out. ★ ★ ★

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CUSHMAN MOTOR WORKS, INC.**  
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## Parade of '57 Cars

(Continued from page 170)

previous year. Performance should be better because pounds per horsepower dropped from 18.4 in 1956 to 16.6 in 1957.

How was horsepower increased? In the classic manner: more displacement. There's no substitute for inches, as the saying goes.

Average displacement for 1957 is 306.5 cubic inches, up sharply from the 290.2 figure of 1956.

Over-all lengths jumped also although only 1.1 inches. But when you consider the increase in over-all length in the 15 years from 1941 to 1955 was only 2.7 inches, a one-year jump of 1.1 inches looks big.

Actually three cars (Chrysler, De Soto and Plymouth) are shorter this year, although the Plymouth is shorter by a mere 0.4 inch, hardly enough to be noticed. Ten cars are longer in 1957. Eight of the 1957 cars are wider and four are narrower.

What is happening is that the big cars are getting shorter and the small cars are getting longer. In 1953, for example, the longest car was 237 inches over-all, the shortest car was 181 inches, a spread of 56 inches. This year, the longest car is 227 inches over-all (a decrease of 10 inches) and the shortest car is 191 inches long (an increase of 10 inches) to make a spread of

only 36 inches. If the trend continues, the obvious result will be that all cars, regardless of price, will be the same size.

Inside there are changes, too. Most noticeable when you first get into a 1957 car is the decreased height of the seats. This was done in order to provide headroom in the lower bodies. Yet front-seat headroom, on the average, decreased from 35.9 inches last year to 35.27 inches this year. Rear-seat headroom dropped from 34.8 inches to 34.5 inches.

Front-seat legroom increased sharply from 42.05 inches in 1956 to 44.8 inches this year. But the story is different in the back seat where legroom dropped from 44.8 inches in 1956 to 42.05 inches in 1957.

Prices went up in 1957 much more than over-all length. The buyer of a 1957 car will have to pay 7.17 percent more than he would have paid for a comparable model in 1956.

Only two of the cars have lowered prices on comparable models. They are Hudson (down 11.2 percent) and Nash (down 9.4 percent). Biggest increases were in Oldsmobile prices which jumped 11.4 percent and Lincoln prices which jumped 11.78 percent.

The over-all percentage increase would be greater if it included such new models

(Continued to page 298)

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This useful group of Western Pine shelves and cabinets houses Hi-Fi equipment, records and books.

Clean-cutting, smooth-surfaced and economical Western Pine woods are a joy to use in any workshop project. They are carefully selected and well seasoned, take all finishes without grain raising. See them at your local lumber dealer.

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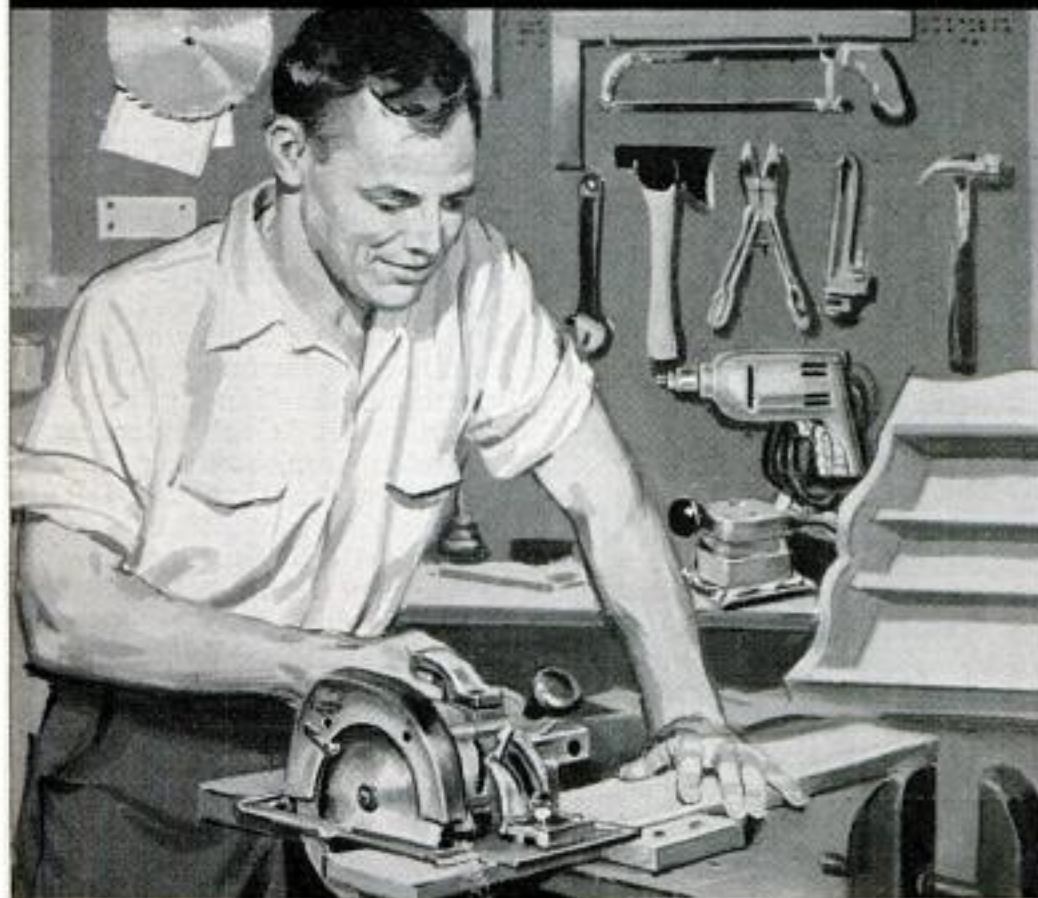


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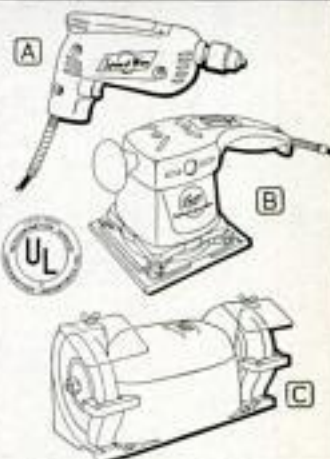


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Model 450 6½" SpeedSaw is at home in the carpenter shop or the home workshop. Cuts 2 x 4's at 45°. Highest quality ball and anti-friction bearings throughout. Easy adjustments for depth and angle cuts. Powered by Thor's stallproof motor.

When you check the electric saw market, you'll find just how much more value Thor packs into its SpeedSaws. Even more amazing are SpeedSaw prices—just about half what you would expect to pay for tools of this quality.

Thor's new model 450 & 475 SpeedSaws are rugged tools, perfect for the contrac-

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Both saws are powered by stallproof Thor-built motors—plenty of zip for the toughest cuts. Other Thor SpeedSaws from \$29.95 up. Speedway Mfg. Co., a division of Thor Power Tool Co., Aurora, Illinois.



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MODEL 475  
7¼" SPEEDSAW  
JUST  
**\$64<sup>95</sup>**



Model 475 is priced at about half what you would expect to pay for a saw with these features: 1.75 h.p. All ball-bearing construction for heavy duty service. Weight just 14 lbs. Cuts 2 x 4's at 45°.



as the hardtop station wagons of Buick, Oldsmobile and Mercury, the new Ford Fairlane 500 line (which was not built last year) and the new Mercury Turnpike Cruiser line as well as other higher-price new models such as the Rambler V8. These were omitted from the average because no comparable models were built in 1956.

The most important engineering development for the year is the adoption of torsion bars for front-end springing by the entire Chrysler family of cars. This marks the first major change in front-suspension design in many years, with the single exception of the Packard torsion-bar suspension system introduced two years ago.

Other engineering innovations were relatively minor factors in the over-all car market. Chevrolet announced it had fuel injection for its entire line, but few, if any, 1957 Chevrolets have been built with it at this writing months after introduction date. Most of the limited number of fuel-injection engines (and Chevrolet is not releasing production figures) are expected to go into competition models of the Corvette. It is extremely unlikely that fuel-injection engines will appear in Chevrolet dealers' showrooms in quantity during 1957.

Cadillac also is announcing its air-oil-suspension system on the super-deluxe Brougham, but that \$10,000 car can hardly be considered an important factor in the total car market.

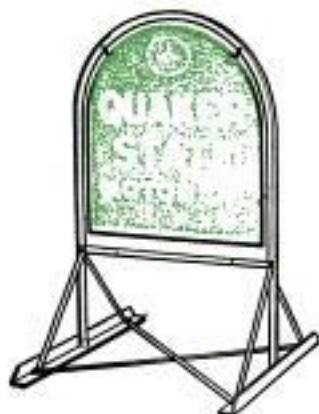
Business for the whole car industry was down during 1956 but, experts say, it will increase in the 1957 model year. General Motors increased its share of the total market in 1956 by 3.3 percent, thanks principally to the amazing sales record of Chevrolet and Cadillac during the year. GM made in 1956, 53.6 percent of the cars built in the nation. Ford Motor Company increased its percentage slightly, by 0.1 percent. Chrysler Corporation's share dropped 2.6 percent. American Motors (down 0.2 percent) and Studebaker-Packard (down 0.6 percent) also declined. (All these figures are as of November 24, 1956.)

Packard, the fine car of yesteryear, died quietly during the model year 1956. Whether it will be reincarnated in 1958 is still uncertain, but the 1957 model is simply a deluxe Studebaker with trim changes. It is being built in South Bend on Studebaker assembly lines.

It is impossible to conclude this summary of the 1957 automobile picture without a mention, at least, of the Volkswagen. For the first time, PM includes a foreign car in its parade of new cars. And with reason. The Volkswagen during 1956 actually outsold at least seven domestic cars in this country. ★ ★ ★

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Now, power-cultivate your garden with the new Gravelly Rotary Cultivator—one of seven NEW attachments for the Gravelly. Never before have you been offered such versatility, such power for your jobs!

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**MOOG INDUSTRIES, INC.**  
St. Louis 14, Mo.

Manufacturers of the most complete line of "under-the-car" parts.

## Do Small Cars Make Cents?

(Continued from page 193)

The Lloyd averaged 35.45 miles per gallon during the test for a weekly gasoline bill of \$3.30 and a fuel cost per mile of less than one cent,  $\frac{9}{10}$  cent to be exact. In the special economy test it averaged 41.59 miles per gallon.

Extremely small, the Lloyd is easily maneuvered in traffic, but it rides hard and is not designed for comfort. It is, perhaps, just a little too elemental for American drivers.

### Renault Dauphine

Newest of the French Renaults is the Dauphine. It is an excellent car to drive either on the highway or in traffic. It has four doors, (it and the Magnette being the only imports tested with four doors) and is easy to get in and out of. Visibility is excellent all around and, although the water-cooled four-cylinder engine is in the rear, you'd never guess it from its styling.

Gasoline economy is excellent. Over-all it averaged 35.08 miles per gallon, only slightly lower than the Lloyd. This gave a weekly fuel bill of \$3.34 and a cost per mile for gasoline of  $\frac{9}{10}$  cent.

In the special economy trial, the Dauphine averaged 40.73 miles per gallon.

Some of the outstanding characteristics of the Dauphine are its amazingly quiet four-cylinder engine that is scarcely audible while idling, its excellent and quick-acting hot-water heater, its large rear window for good rear visibility.

Altogether it is a fine car and it will maintain a fast highway speed apparently without effort.

### Volkswagen

Best-selling foreign car in this country, the Volkswagen is powered by a four-cylinder, rear engine that is air cooled and somewhat noisy. It is an extremely nimble car and is one that tempts you to drive at its limit at all times.

The VW consistently made better time in the test than any other car (including the American models). It is most pleasant to drive, being a happy combination of sedan comfort and sports-car handling. It can be driven all day at 65 miles per hour. Its four-speed transmission, when properly used, enables you to scoot through traffic.

Over-all gasoline mileage was 31.22 miles per gallon for a weekly gasoline bill of \$3.75 and a cost per mile of gasoline of 1.0 cent.

In the special economy run, the Volkswagen mileage jumped to 41.16 miles per

(Continued to page 302)

ROCKWELL-BUILT

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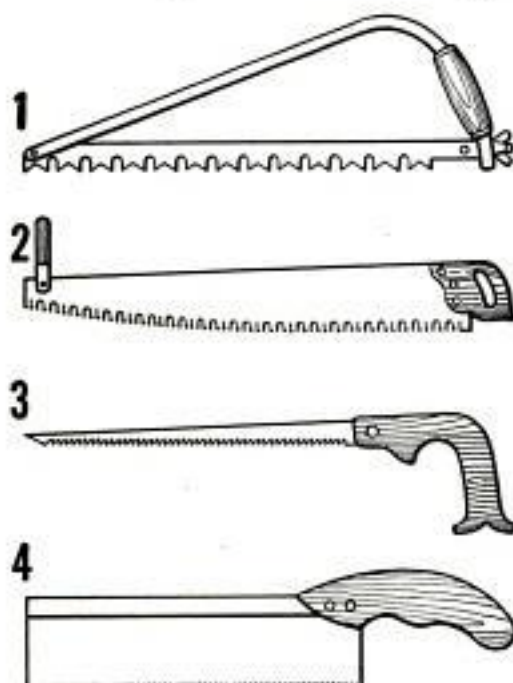
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# Nicholson Saw Quiz

How many of these saws do you know?



Answers: 1. Pruning Saw. 2. One-Man Cross-cut Saw. 3. Keyhole Saw. 4. Dovetail Saw.

EVERY craftsman knows that there's a saw for every cutting job. And there's a Nicholson or Black Diamond file that's been designed for keeping teeth keen on every saw made—files for hand saws, crosscuts, chain saws, circular blades. You name the saw, we've got the file to keep it in topnotch cutting condition.

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gallon, an indication of how hard it was driven in the main test. This was the biggest jump (almost 10 miles per gallon) of any car in the test.

Rear visibility on the VW is extremely limited by a very small rear window. An outside mirror is essential for driving in traffic. Heater operation has been improved considerably in the past two years and the current model seems quite adequate in this.

Handling is very good as is the ride over rough roads. It has independent suspension all around. Workmanship is excellent and the body is sturdy. Doors open and close nicely.

## Borgward Isabella

The Borgward, by the standards of the "small" cars that precede it in this story, is big. It is also well-built and carries a much higher price tag (over \$3000). Interior appointments are excellent and the ride is superior. Comfort is unexcelled.

It averaged 25.18 miles to the gallon during the test for a weekly gasoline bill of \$4.65 and a gasoline cost per mile of 1.2 cents. In the special economy run, the gasoline mileage increased slightly to 28.96 miles per gallon.

Extremely fast, it has a top speed of about 100 miles per hour. The four-cylinder engine drives through a four-speed transmission. The shift lever is mounted on the steering column and on the test car it was somewhat "rubbery" in operation but this was later corrected by linkage adjustments.

## Volvo

The only Swedish car in the test, the Volvo is large enough to look like an American car of 10 years ago. It is very fast and has handling qualities unmatched by any car in the test regardless of price. The Volvo can be wheeled around corners like a sports car and yet it rides quietly and comfortably. Its heating system is excellent.

During the over-all test it averaged 24.38 miles per gallon for a weekly bill of \$4.79 and a cost per mile for gasoline of 1.2 cents. In the special economy run it averaged 28.96 miles per gallon.

Workmanship, inside and out, in the Volvo is exceptional. Its four-cylinder engine is conventional in design, built for long life and ease of maintenance.

## Metropolitan

A combination of American and British design, the Metropolitan is sold by American Motors dealers in the United States. Therefore, it has more widespread service facilities than other foreign cars. It is built

(Continued to page 304)



Design, styling, accessories, new for '57. Molded Plywoods, Ply-Lap, aluminum, cedar strip. On display at Chicago and other boat shows. FREE Catalog. **WAGEMAKER COMPANY**  
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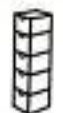
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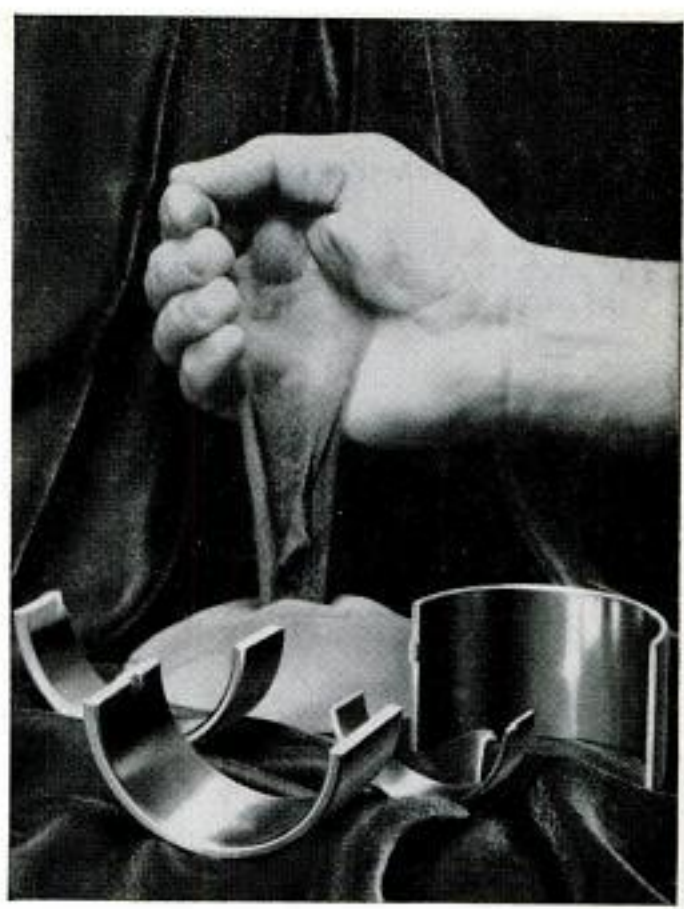
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by the Austin company in England and has an Austin engine and can be serviced by Austin dealers.

In the over-all economy test it averaged 24.02 miles per gallon for a weekly bill of \$4.87 and a cost per mile of 1.2 cents. In the special economy run, it averaged 32.58 miles per gallon.

The Metropolitan is extremely small inside and out. It is a two seater only and does not have the comfortable ride of most other cars in this test. It has excellent acceleration and, having only three speeds, can be driven around town without frequent shifting of gears, unlike many of the other foreign cars. It is a fine car for "scooting" in traffic.

On the highway it is fast and rides comfortably. On rough roads and over railroad crossings its hard riding becomes apparent.

### Magnette

With typical British luxury built in, the MG Magnette is a full-size economy car. It rides better than any car in the test (being just a shade better than the Borgward) and has the convenience of four doors. It is very roomy for four persons and can seat five without crowding.

Its average over-all was 21.53 miles per gallon. Weekly gasoline bill was \$5.44 and the cost per mile for fuel is 1.4 cents. No special economy run was made with the Magnette. It is a very durable, richly finished car both inside and out and gives the appearance of quality.

### Conclusion

The results of the test will have to speak for themselves. You will have to decide if the gasoline saving is enough to make the small car enticing to you.

You must remember that, while the American cars use more gasoline, they perform some of the work for you. The automatic transmission shifts itself and, in traffic, that is desirable to some. However, in the three 1957 American cars tested, the driver's left foot was kept busy most of the time operating the foot brake because of the tendency to over-accelerate due to the big engines. There is some question as to whether the amount of driver effort saved by the automatic shift is important because of the added work of braking.

Wheel turning is easier and faster on the small cars and you will be less tired from maneuvering. But you can get a similar help in the American cars by ordering power steering. However, you will still have to do more wheel turning in all except the Plymouth.

There are other nonfinancial advantages

(Continued to page 306)



*now, in power tools, too,*  
**if it's Remington, it's right!**



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**\$500** in 4 months  
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to the small car. One is the fact that it does not fill up the garage and, probably for the first time in years, you will have room for the kids' bikes, the lawn mower and the car at the same time. It is also easier to park, to wash and to polish.

Thousands are finding the small car ideal as a second car. Many admit that very soon, the second car becomes the first car because of its ease of handling.

There it is: The case for the small car. If you're looking for a car to commute, look over the small-car field. You may find that you like one of them. ★★★



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In five minutes' time a hydraulic tower can be raised 75 feet in the air, to assist in remote television pickups. The tower unit, designed by the Illinois Bell Telephone Company, is the first of its kind. Another truck which accompanies the tower vehicle acts as a control center during the telecasts.

**Douglas Fir Seed**

West Germany, which devotes as high a percentage of its tillable land to forests as the United States, is buying all Douglas fir seed available. These seeds will be raised in West German state forests for the lumber industry. Annually, West Germany imports 25,000 pounds of fir seed at \$12 per pound.

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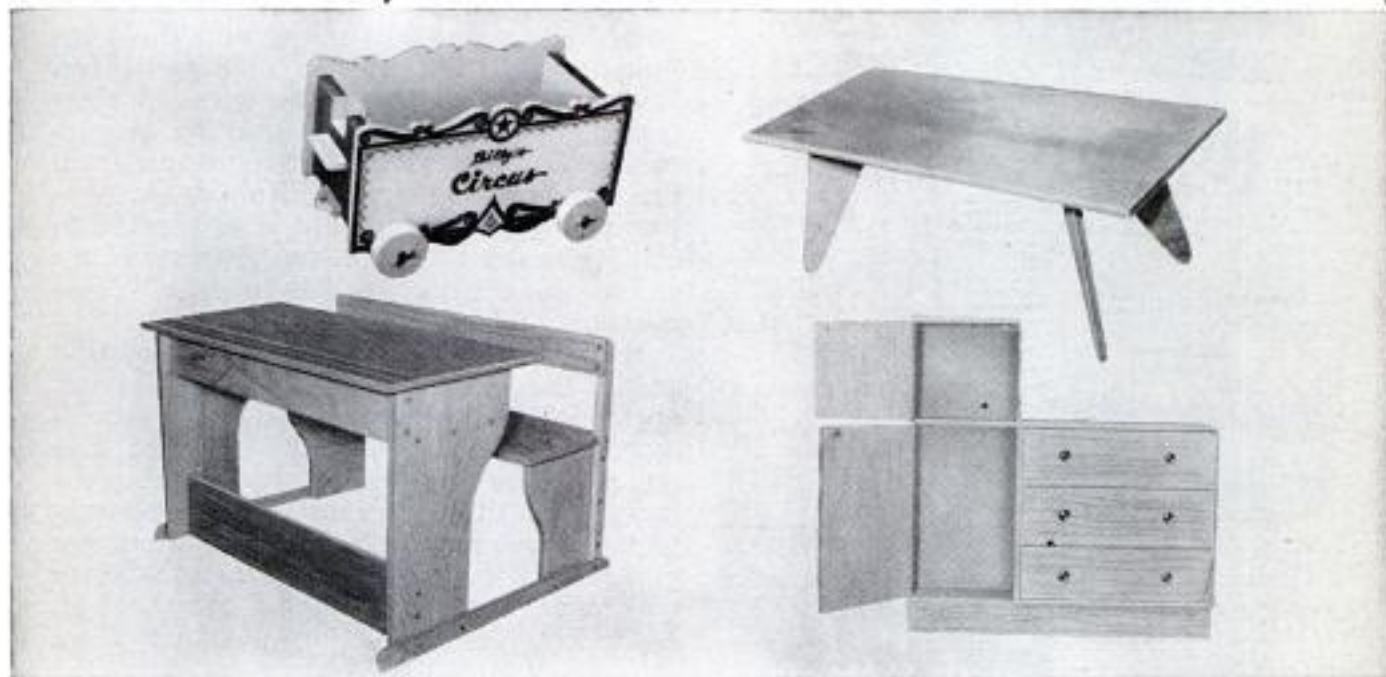
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## Detroit Listening Post

(Continued from page 195)

Turboglide) was slow getting into production. In the month of December Chevrolet built only 1200 of them while building about 42,000 cars every week! Production in January is 6000 units—a long way from enough to fill the orders.

Buick will also offer fuel injection as an option in 1958, we hear.

● Electronics will move into the auto industry in a big way in 1958 and after. Rambler started the move with its electronic-metering fuel injection (it is surprising how many "firsts" have come from the smaller companies). Nobody is prepared to price it now, but it's expected to sell for under \$300. Not too far distant are electronic controls for automatic transmissions and, maybe, ignition.

● In some ways, the most interesting part of the Auto Show was a symposium of automobile stylists sponsored by the American Society of Industrial Designers. The stylists came from every automobile company and they presented the industry viewpoint. It was the question-and-answer period that was interesting. The audience was made up of professional designers in all fields. What were their questions? Here are some:

"Do sales managers ever know anything but what has gone by? Why should they be permitted to influence design?"

"Is there any chance of a car being designed as a 'safety' car?"

"Why has the Rambler grown larger?"

"Why do cars look so much alike?"

"Is there any chance of a trend toward less horsepower?"

"Why all the chrome?"

These were typical questions. The answers defended the industry's attitudes. These stylists were right when they stated that Detroit builds the type of car that the public wants. Mr. Churchill of Studebaker-Packard stated about the same thing when he said that in 1957 Studebaker has a car that is styled within the trend of the industry. What he means is that it's in style with what the public wants.

Annual style changes, the industry men said, actually save the customer money by creating demands which make big production runs possible, reducing unit costs.

But, cautioned the GM stylist, you can't go too far with changes. You must not make the owner of your last year's car too unhappy or he'll lose his feeling of attachment with your company and he won't come back. He doesn't want to feel that you are deliberately "obsoleting" the car he has invested his money in. ★ ★ ★

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Many other plants, generators. Get catalog.

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Bargains in surplus finest quality hydraulic pumps, cylinders, valves. Also irrigation pumps, plastic pipe-fittings and air compressors, air tanks, regulators, gauges, paint spray, etc.

- Farm hyd. cylinder \$14.95. 1500-lb. gauge, \$3.40. Blackhawk hyd. system \$24.95. Control valve \$12.95. Air Compressor \$19.95. Air Tank \$8.79. Gauge 160-lb. \$1.89. Air Regulator \$3.29. Air Filter \$2.99. Many other air items.
- Irrigation Pump 3 1/2" \$44.37. Plastic Pipe 1/2" \$2. 3/4" \$2. 1" \$2. Rotary Gas Pump \$22.96. All of the above prepaid.

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Modern handset dial telephones. Use for extension to main phone on private systems.

- You can receive or originate calls. Has no bell. Use where main line ringing can be heard. List \$29.60.

SALE ..... \$8.61 Ppd.



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- Prtbl blower-htr 100,000 btu ..... FOB \$92.75
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- Invald Chair, 6 or 12 v motor FOB \$14.99
- Window Display Motor 20 rpm 110v Ppd \$2.71
- Burglar-Fire Alarm System... Ppd \$13.95
- Electric Alarm Bell AC-DC... Ppd 73c
- Pneumatic Tree Trimmer 10'... FOB \$8.59
- 545 1/2" Electric Drill 110v... Ppd \$30.95
- Farm-Industry Gas Hand Pump FOB \$9.71
- Finest Plastic Water Pipe 1 1/2" Ppd 8c
- Weed Sprayer, 5-row complete... Ppd \$97.65

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NO NAILS NO SCREWS NO BOLTS

Now a sawhorse in a jiffy! Just use Jiffy Brackets and 2x4s. Sold by hdw. and bldg. supply stores everywhere, or order direct. \$1.95 A pair.

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Fits all portable drills; converts drill to bench grinder. Sharpens round shank drills from 3/32" to 1 1/2" diameter. Grinds 4 different drill point angles. Recessed guides eliminate use of protractor or fussy set-up work. Stand, \$6.95. Sharpener, \$2.95. Complete set includes stand, sharpener, wheelguard, clamp for drill, grinding wheel, arbor... \$8.95 PPD.

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Super Filer No. 11 joints and sharpens hand and circular saws 6" to 10" with all teeth correct in height, depth, pitch, bevel. When file hits steel roller, teeth are finished. Saw runs true with no side pull. Includes 8" file. \$9.95 PPD.

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The Dremel Moto-Tool has an excellent record as a precision tool in industry. Fastest, most powerful tool of its kind—27,000 rpm. Buy a Moto-Tool—it will pay for itself in no time. See your dealer today.



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Includes Model No. 2 Moto-Tool, 23 accessories (high-speed-steel cutters, grinders, polishers, etc.) in a steel case.....\$25.95

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**ROTO-HOE & SPRAYER CO., Dept. P-19, Newbury, Ohio**

## Backstage Wizardry of the TV Commercials

(Continued from page 126)

rim, but the tire stayed whole. Finally, we took a sequence of a pile driver whomping down on the wheel, with the same result. The demonstrations were so spectacular on TV that, even if the tire had come apart, the film could have been great commercials for whatever broke it."

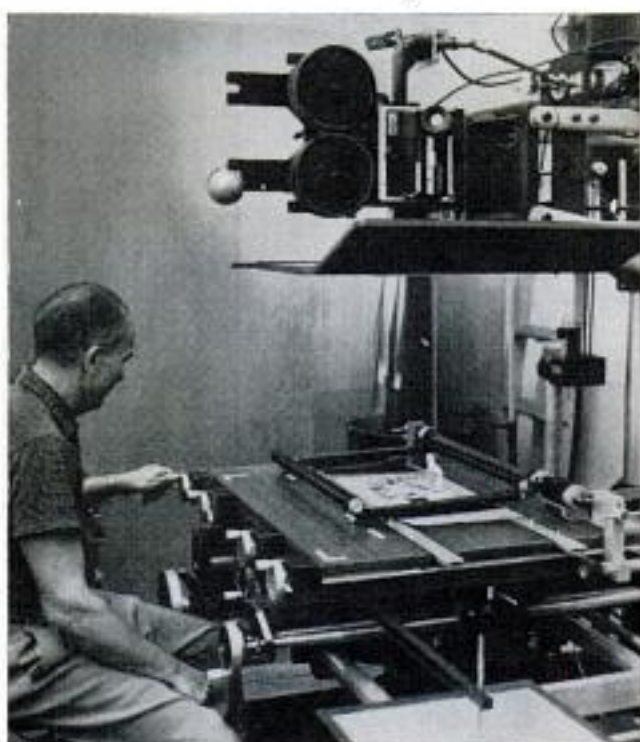
### Complete City in Studio

Most studios making TV commercials have discovered that it's usually cheaper to build a complete city in the studio, where power and facilities are available, than to shoot on location. Transfilm, to get a few seconds showing the inside of a refrigerator, built a refrigerator interior without any walls; shelves were suspended by invisible wire and shot against a black background. Prop rooms of TV-commercial studios are warehouses for model villages, sections of houses, complete rooms, mountain streams, whole woodlands of artificial trees and ferns, and enough food to stock a supermarket. Walk into Steve Elliot's prop room, and he may throw a man-size boulder at you. Don't duck. Catch it and heave it back. It's hollow rubber and weighs four ounces.

To achieve realism, TV-commercial producers have to be inventors, entrepreneurs, good businessmen and sometimes magicians. Typical was the time Steve Elliot got

(Continued to page 312)

Animation is achieved via Oxberry stand, compound and camera with motorized zoom, handwheel control





**AH-H-H-H!** Never before such a perfect blending of beauty, strength, and performance in a boat! Arkansas Traveler's new **FORWARD SWEEP** brings you a "Years-ahead" concept in boat design. You *must* see it! Write.

ARKANSAS TRAVELER BOATS, 2006 E. 14th, Little Rock, Ark.

*Arkansas* **TRAVELER** ALUMINUM BOATS

## HOW TO BUILD Your Own GARAGE

Save Up to 50% of Usual Cost!

Get Popular Mechanics' brand new book **How to Build Your Own Garage** by Wayne Leckey, Assistant Shop Notes Editor, and find out how you can build your own garage at savings of 50% of usual cost. Leckey tells in clear step-by-step instructions and shows in big, clear photos, drawings and diagrams how to perform every building operation from laying the concrete to installing the final trim. There are 25 designs. Brick, frame, and concrete block fully covered. Send \$3.50 for your copy. 7-day money back guarantee.

POPULAR MECHANICS PRESS, 200 E. Ontario, Chicago 11, Ill.

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Over 300 books on Fishing, Hunting, Home Repairs and Improvements, Bricklaying, Welding, Home Workshop, Power Tools, Hobbies, Crafts, Home Building, Trades, Making Money at Home, Furniture Making, Woodworking, Carving, Photography, Art, Drawing, Mechanics, Engineering, Refrigeration, Plumbing, Radio-TV, Electricity, Automobiles, Farming, Livestock, Gardening, Decorating, Painting, many, many more. Send for yours today.

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### SEE YOUR DEALER

Two steps to professional results in your workshop: (1) check POPULAR MECHANICS for helpful "how to" suggestions; (2) discuss your project with you dealer. He knows the importance of working with quality products. They're advertised in POPULAR MECHANICS.



FEBRUARY 1957



*It's easy  
to have  
MODERN  
KITCHEN  
VENTILATION*

There's nothing like a Trade-Wind Ventilating Hood to make any housewife happy... and comfortable while she cooks. Keeps the kitchen as well as the entire house, free of greasy fumes and odors.

Powerful Trade-Wind blower units install in a cabinet over the range, or in the ceiling. Many styles to choose from. And a Trade-Wind is fun to install in new or existing homes... or your electrician can do it for you.

Mail the coupon for full color brochure.

**YOU GET more WITH TRADE-WIND**

Trade-Wind Motorfans, Inc. Dept. PM  
7757 Paramount Blvd., Rivera, Calif.

Please send full color brochure on Trade-Wind equipment.

Name \_\_\_\_\_

Address \_\_\_\_\_

AGAIN CONSTANTINE BRINGS YOU  
AMERICA'S NEWEST AND FINEST

**WOOD**  
TOOL, MATERIAL  
AND CRAFTSMAN  
SUPPLY MANUAL



### 145th ANNIVERSARY EDITION

This new catalog is the biggest and best woodworking and hobby-book America's leading supplier to craftsmen has ever published. Everything for the woodworker at lowest prices. Plans, projects, patterns, How-To-Do-It Articles, sections on newest power and hand tools, finishing materials, inlay borders and panels. Over 83 inlay designs; wood identification panel shows 60 different woods in natural color. Woodworking's finest book, invaluable to homeowners and craftsmen. Send for your copy today!

126 pages — Full Color. Complete selection of Rare and Fancy Imported and Domestic woods, veneers, inlays, carvings, mouldings, hard-to-get items, hardware, upholstery supplies, and Do-It-Yourself Information.

**ALBERT CONSTANTINE & SON, Inc.**  
2058H EASTCHESTER ROAD NEW YORK 61, NEW YORK

### MAIL COUPON TODAY

**ALBERT CONSTANTINE & SON, INC.**  
2058H Eastchester Rd., New York 61, N. Y.

Please send copy of 1957 Master Manual. Enclosed is 50¢ (refunded on first order) to cover postage and handling.

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# FREE PLAN

Tells How to Start  
Your Own Business

## FILING SAWS



Saws come  
from 20 and  
30 miles

Files Thousands of Saws  
in Spare Time

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."  
—Charles H. Smith

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back with repeat orders."  
—Len Crego.

### FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays up to \$3 to \$5 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also hand and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Saw Filer came out 100%. I think it is a marvel of perfection."—writes Clarence E. Parsons.

"**MONEY MAKING FACTS**" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think—with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Get the facts—send coupon today for this practical, money making plan. No salesman will call.



Send for **FREE BOOK**

FOLEY MFG. CO., 216-7 Foley Bldg.,  
Minneapolis 18, Minn.

Send me free book "**MONEY MAKING FACTS**"

Name \_\_\_\_\_

Address \_\_\_\_\_

a story board for a soap account. The script called for a flying fountain of cherubs all spouting water from their mouths. They made Celastic cherubs without trouble, and rigged wires to make them fly. "The trick," explains Steve, "was to get water up in the air without visible pipes, and have it spout from the little angels without flooding the studio." The dilemma was solved by a studio genius who remembered the old magician's trick of the magic spigot. Thin glass tubes were run from floor tanks up to cherubic mouths. Water pumped up inside the tubes flowed over the top and down the outside, in a perfect imitation of free-flowing streams. They emptied into the same tanks they sprang from, in a continuous-flow operation.

### Can't Fool Public

The struggle for realism can reach fantastic proportions—especially in food commercials. "The public doesn't like being fooled," explains one producer. "Most sponsors and agencies now insist on real live food."

This policy gave a six-aspirin headache to Transfilm last winter when a frozen-food account wanted a 60-second commercial showing fresh crops being picked and processed—from garden to freezer. "We built a whole truck garden and processing plant in the studio," recalls Phil Frankel, Transfilm production man. "Trucks dumped tons of soil on the floor, at the same moment studio hands were dismantling a bathroom where a pretty model had been taking a sudsy soak for a bath-salts commercial the day before. Nearby greenhouses supplied bean, spinach and strawberry plants. Fresh fruit was tied to proper bushes and trees. Within a few hours a flowering farm grew under hot light, and pickers moved in for the cameras. The only tough part of the processing procedure was the washing. We piled the picked vegetables in a bin, put a plastic shower curtain around the camera and caught the high-pressure spray in a flume that drained off to a sink 100 feet away. The cameras shot through a gap in the curtain and we hardly got soaked at all."

### Tricks Achieve Realism

In spite of the insistence on realism, producers still must resort to some tricks, especially since natural food doesn't always look as appetizing on TV as it really is. Whipped cream after an hour under the hot klieg lights looks awful; shaving cream looks delicious, and that's what many producers use on their cakes. Real coffee looks pallid; plain water and aniline dye

(Continued to page 314)



## AMMUNITION



Reload a whole carton for the cost of a few rounds of factory ammunition. Shotgun shells, rifle and pistol cartridges can be reloaded safely and easily with an inexpensive set of famous IDEAL Reloading Tools. 164 page IDEAL Reloaders Handbook ... \$1.00, postpaid. Free folder on request.

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MIDDLEFIELD, CONN.

**SMALL! POWERFUL!**

**ECONOMY TRACTOR**

Unequaled value! Low price! America's finest tractor. Ruggedly built. Easy to operate. 700 lbs. Borg-Warner clutch, trans, and diff 140 to 1 reduction. 40% more drawbar pull than ordinary tractors 8-1/4 H.P. engine. 20 quick change implements. HOOD, FENDERS.

Thousands In Use Write for complete details.

Engineering Products Co.  
915-K-2 Niagara Ct.  
Waukesha, Wisconsin

**Exclusive Double-Bearing HEAVY-DUTY PUMPS**

IRRIGATE • DRAIN • CIRCULATE • SPRAY  
Up to 7,500 GPH. 3,000 GPH from 25" well. Use 1/4 to 1 HP motor, 1 1/4" inlet; 1" outlet. Stainless shaft. TYPE X—2 oilless bronze bearings. **\$10.95**  
Won't rust.

TYPE XB—Ball bearing model. **\$12.95**  
Postpaid if cash with order. Rush your order today

**MONEY BACK GUARANTEE**  
Centrifugal and Gear Pumps in All Sizes  
**LABAWCO PUMPS, Belle Mead 2, N. J.**

**ELECTRIC WELDER** AC or DC 110 Volts

The "Little Marvel" all-metal welder. 5-year written guarantee. Welds 1/4" metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Complete with everything—rods, unit, eye shield, directions. \$46.95 plus 50c postage. Flame torch necessary for soldering, cutting, brazing \$3.95 complete with carbons, brass rods, flux. \$2.00 Deposit on C.O.D. 75 ampere 1/4 inch Transformer Welder \$21.95 F.O.B.

**ESSAY MFG. CO., Dept. 51, Quincy 89, Mass.**

**\$695** Complete

## HOME PAINTING TIP No. 8



### PAINTING FURNITURE?

Stretchy "SCOTCH" Masking Tape hugs curves, keeps edges neat. Strips cleanly;

paint will not bleed through. Get 39¢, 69¢, 98¢, \$1.69 sizes in handy cutter-edge carton wherever paint is sold. Made by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.

# KLEINS



## AID TO YOUR CRAFTSMANSHIP

These three pliers—a Klein Side Cutting Plier, Long Nose Plier and Oblique Cutting Plier—belong in every workman's kit.

They put the exclamation point after your good workmanship! For a century Klein has stood for the finest in pliers and Kleins are still the standard of comparison by which other pliers are judged.

There is a type and size of Klein Plier for every job—all famous for Klein quality "since 1857."



Your hardware store has Kleins in stock or can get them for you quickly. Look for this new display board. It shows the most popular items in the Klein line.



**Mathias KLEIN & Sons**  
Established 1857 Chicago, Ill., U.S.A.

7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

# It's Tops...



Sizes  
for any  
pipe cutting  
need



for quick clean cuts . . .

## RIDGID Heavy-Duty Pipe Cutter

Powerfully built—guaranteed not to warp or break, always tracks perfectly . . . Famous RIDGID thin-blade or heavy-duty cutter wheels of tool steel roll easily, cleanly through any pipe. Special wheels for stainless steel, cast iron. Every cutter factory-tested. For your work or home, it's most for your money—buy it at your Hardware Store!

Genuine  
**RIDGID**  
The World's Most  
Popular Pipe Wrench



# RIDGID

Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

are what you usually see on the TV screen. Since steam won't photograph decently, there's usually a cigarette smoking up neatly behind the cup. Steam from a boiling pot won't show up; but that's easily remedied by dropping dry ice in the pot. Cake is always an "appetizing" mocha color; icing is usually green, because green comes out much whiter (real white or pale blue glazes, and black shimmers, so dark green is used instead). Most fresh vegetables get a coating of oil to make them sparkle and look delicious. And the beautiful fresh steaks you see are probably coated with petroleum jelly, because without it even the best one would look dull on the screen. But the food is fresh!

### Snowflakes Individually Selected

Detailwise, for a simple soapflake spot, Science Pictures' staff once spent 34 days picking out individual flakes the right shape and size, coating each one with fluorescent paint and dropping it into water while cameras ground away under black light to show how nicely the flakes dissolved. The final sequence, showing the perfect flake dissolving perfectly, lasted less than 10 seconds.

It takes about 90 feet of film for a 60-second commercial, but a producer may shoot anywhere from 2000 to 8000 feet on retakes before everyone is happy.

In soap commercials, showing ladies luxuriating in bathtubs, the property man periodically spruces up the suds around milady with a compressed-air hose or bicycle pump to make the soap look extra sudsy and hide the strapless bathing suit the model is wearing.

### Shoot Picture in Reverse

"Lots of times, we shoot things going backwards, then reverse the film," explains Transfilm's Phil Franke. "If you want to drive a car up to within an inch of a wall and stop dead, it's easier on the car's grille and the wall to start at the wall, back away and reverse the pictures. Also, if we want to make something look like it's hanging in the air, we can set it on the ground and shoot it upside down. Saves time and money."

Technicians at Science Pictures were told to figure a way to show a new tire tread "squeezed" to a panic stop on pavement. After weeks of false starts, they finally wound up with a huge piece of specially made plate glass 2½ inches thick and suspended on a steel framework. The camera looked up under the glass. The car was on top; its rear end was jacked off the glass while wheels were set spinning. As

(Continued to page 316)

## Automatic Saw Set...

### MAKE EXTRA PROFITS!

Set 400 teeth per minute on hand or band saws, 4 to 16 point, with the BeMaCo Automatic Saw Set. Fast, accurate, true hammer-anvil action sets teeth uniformly, eliminates tooth breakage. Used profitably by saw shops and manufacturers everywhere. Every machine positively guaranteed! Write for details—today!

Saw  
Machine  
Division  
26-C

**BEAVER MFG. CO.**  
800 ISIS AVENUE • INGLEWOOD, CALIF.

## GARDEN TILLERS at LOWEST COST



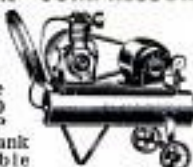
3 models light weight deep tilling  
EASY gardening with 1 power tool.  
EASY to assemble Model 5K only \$59.00 less engine.  
EASY to operate 8" and 12" models—powerful engines.  
EASY to order by mail—immediate delivery.

Also riding tractors, 2-wheel garden tractors, riding and power mowers. FREE CATALOG. Buy direct from:

**RED-E TRACTOR CO.**  
RICHFIELD 9, WISC.

## BUILD YOUR OWN AUTOMATIC AIR COMPRESSOR

#K-55 Complete Automatic Air Compressor Unit: Knocked Down, 3 CFM Air Compressor 1/2 HP AC Motor 12x24 Stainless Steel Tank on Wheels: Pressure Switch, Air Regulator, Gauge, Check Valve, Safety Valve, Hose & Tire Chuck, UNIT COMPLETE (\$150 Value) ONLY \$97.00. Same as above 1 HP Unit 9 CFM Twin Cylinder Compressor Tank on Wheels, All Accessories, You Assemble #SK-100, ONLY \$169.50.



Order from THIS AD. GUARANTEED. FOB Chicago  
C. MARSHALL SALES, 3546 Fullerton Ave., Dept. P-2, CHICAGO 47

## ONE-MAN SAWMILL LOW \$50.00 AS... 50 DOWN



Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for home and farm—sell to local yards—make up to \$50 a day custom sawing for neighbors. BELSAW lasts a lifetime. No crew needed. Power with tractor or auto engine. Beginners get excellent results. Send today for FREE BOOK.

**BELSAW MACHINERY CO.**  
3457 Field Bldg., Kansas City 11, Missouri

## YOUR DEALER CAN HELP YOU

He makes it his business to know the right equipment and materials for you. They're advertised in POPULAR MECHANICS

**PM TAG of INTEGRITY**



## WELD IT YOURSELF IN A JIFFY!

Weld, Cut, Braze, Solder; Iron, Steel, Brass, Bronze, Aluminum and other metals safely and easily. Make your wrought iron furniture, porch railings, fences, knick-knacks and other metal specialties. With this fine equipment anyone can do professional-like work with little practice. Tool and equipment breakdowns are annoying and costly. Don't let them bother you. The Dynamic will pay for itself quickly in both time and money and is designed to operate from any properly wired 110 volt AC line.

Order your Dynamic Industrial type transformer Arc Welder for Workshop or Industrial use today. Order from this ad.

Literature on larger equipment available on request.

**DYNAMIC WELDER COMPANY, 1808 S. Federal Street, Dept. D2-B, Chicago 16, Illinois**

## You Can't Beat this POWER TOOL VALUE!

### "ARCO JIG-SAW"

WITH EXCLUSIVE  
CIRCLE-CUTTER  
& RIP GAGE!

ONLY  
**\$10.95**  
with Blade



FITS  
ANY  
1/4" DRILL

### CUTS ANY SHAPE • SAWS ANY MATERIAL

"Arco Jig-Saw" with adjustable Circle-Cutter & Rip Gage cuts perfect circles up to 20" diam., rips accurately to 10" wide. Cuts intricate patterns—however large—in wood, metals, plastics—even cuts 2x4's! Has same capacity as \$55 jig-saws! "Air-Jet" blows away sawdust. Converts to Table Saw with "ARCO STAND" Sturdy Casting & Clamp... \$2.95 & Extra Blades for wood, plastics, metals... \$1.95 At Your Dealer or order direct on 10-DAY MONEY BACK GUARANTEE. Send check, M.O. (ppd.) C.O.D. + post.

## ARROW METAL PRODUCTS CO.

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SAVE 1/2 THE COST

Now added to the famous U-Mak-It Boat Kit line—Easy to assemble

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Greatest line of kits in our 29 years of boat kit pioneering.

30 models — prams, row-boats, runabouts, cabin cruisers and the new lapstrake skiffs.

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PHILIPPINE LUMBER PRODUCERS' ASSOCIATION, INC., Manila



**MORE POWER  
IN YOUR GRIP**  
with **P & C**  
**PLIERS!**

You've got real gripping power with P&C Pliers... rugged, highest quality alloy steel, deeply milled sharp teeth, hardened steel bolt, perfect jaw alignment. Chrome plated, easy-grip handles let you work faster, easier with less effort. Buy P&C.

BUY YOUR TOOLS from the  
P&C Merchandisers, in over  
12,000 stores coast to coast.  
Send 10c for tool catalog.

P&C . . . the best tools  
money can buy



**P & C**®

**TOOL COMPANY**

Box 5926, PORTLAND 22, ORE.  
SCHILLER PARK, ILL.

the camera ground, the jacks dropped the car; tires squeeged and, after a few thousand feet of film were shot on retakes, the sequence was ready.

Animation, made famous by Walt Disney, is a simple, tedious business of making up and photographing some 1440 separate drawings for a one-minute spot. The job may take eight to ten months and cost up to \$12,000. Larger studios use electronically operated cameras that shoot the drawings a frame at a time as finished sketches are fed into them.

### Stop Motion for Puppets

Stop motion, even more expensive, may involve the use of little puppetlike dolls. After each single frame is shot, technicians make microscopic changes in positions of puppet arms, legs and faces. When the 1440 frames (for a 60-second spot) are run off, the minute consecutive changes turn the puppets into walking, talking, gesturing dolls that carry the sponsor's message across the country. Stop motion may show a milk bottle lifting itself up and pouring its contents into a glass seemingly without benefit of human hands. One gadget, used by Universal Pictures to make a bar of soap unwrap itself, is a vast jungle of jointed steel rods that take up half the area of a good-sized studio.

Technical problems aren't all that beset the "spot" producers. Once a certain story board called for a Swiss cheese. All the studio could find was solid American cheese, so they decided to drill holes in it. The suggestion sparked a minor jurisdictional dispute over whether it was a job for carpenters or prop men. Where else could this happen but in the turbulent world of TV commercials? ★ ★ ★

### Tin Cans Cool Wind Tunnel

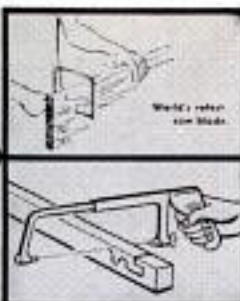
Eight million tin cans have been poured into the air-storage section of a new wind tunnel to act as a radiator to keep air temperature nearly constant during tests. At North American Aviation, Inc., Los Angeles, Calif., the cans now fill eight steel spheres, each 36 feet in diameter, where 200,000 cubic feet of compressed air is stored. Without these cans air temperature would drop about 200 degrees F. during tests, seriously affecting results; the cans reduce this temperature dip to a workable 30 degrees. In this single tunnel, research is to be conducted in subsonic, transsonic and speeds up to 2500 miles per hour.

☐ Smelting a ton of aluminum requires enough electrical energy to supply needs of an average American home for 10 years.

most amazing blade you ever saw!

# Tyler SPYRAL BLADE

SAWS METAL, WOOD, PLASTIC, ETC.  
up or down, right or left, even in circles!



Does what no other Blade can Do. Fits Standard Coping Saw or Hacksaw Frames. NO special adapters needed! World's safest saw blade.

You'll find hundreds of uses for Tyler Spyral Blades. There's nothing like them! The first important improvement in blades since the invention of the saw. Fun to use... cuts so fast and easy; no chipping or tearing—leaves clean smooth edge.

Ask for TYLER SPYRAL BLADES at  
HARDWARE, LUMBER, AUTO & VARIETY STORES  
Everywhere

TYLER MANUFACTURING CO. 1005 W. Arbor Vitae Ave., Inglewood, Calif.

## I CAN SAVE YOU 94%!

REAL  
LOW  
PRICES

Send for NEW 1957 Illustrated BOOK of BIG WAR SURPLUS BARGAINS for mechanics, farmers, gadgeteers.



### AIRCRAFT STARTERS

Makes excellent winch for lifting, wagon unloaders, pulling stumps, stretching fence or moving heavy objects—1001 uses at home, farm or factory. Operates on 6 to 32 volts or manually. Built-in reduction gear (140 to 1) and clutch. High torque, low speed. Mfg. by Bendix at many times this price.

P.O. Box York (wght. 42 lbs.)  
only \$14.89

**WAR SURPLUS  
BARGAIN FREE!**



Make your own conversion

K. ORT, Dept. P2M, York, Pa.

## Print Your Own



Cards, Stationery, Advertising, Circulars, labels, photo and movie titles, church work, tags, etc. Save money. Sold direct from factory only. Raised printing like engraving, too.

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Print for Others, Good Profit. Have home shop. Junior press \$15; Senior \$29 up. We supply everything. Easy rules. Pays for self in short time. Write for free catalog of outfits and all details.

KELSEY PRESSES, C-37 Meriden, Conn.

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ANYONE can be an EXPERT with

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## WOOD FINISH

Deft SEALS, PRIMES, FINISHES. Dries in 30 min. No thinning, nothing else to use. BAR TOP, semi-gloss interior finish.

Free Booklet

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DESMONDS, 1826 W. 54, LOS ANGELES 62, CALIF.



DREMEL  
MOTO-  
JIG SAW

## Family Fun Starts Here!

Woodworking is a happy family hobby, with a Dremel Moto-Jig Saw. You don't need special skills. A card table can be your workbench.

The Dremel is not a toy—it's a professional-quality tool. It cuts wood 1 3/4" thick. It has a super-safe blade guard—a tilting table—and a Rotary Motor, not a reciprocating vibrator. It operates on a new rocker-action principle—actually outperforms more expensive jig saws!

These features have made the Dremel No. 1 choice in home workshop, Cub Scouting, elementary schools, 4-H, etc. Be sure the jig saw you buy not only looks like a Dremel—be sure it is a genuine Dremel!

Write for FREE folder describing 8 new pattern packets of fun-to-make jig saw projects and new power tool catalog.

- Model 15  
15" throat ..... \$29.95
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8" throat ..... \$23.50

SEE YOUR DEALER: If he cannot supply you, order direct from factory on 5-DAY TRIAL, MONEY BACK GUARANTEE. We ship postpaid.

DREMEL MFG. CO., Dept. 117-B, Racine, Wis.



**NEW!**  
**SHAW**  
RM 24 MOWER  
WITH AMAZING  
MAGIC  
DRIVE

Three Speeds  
forward  
neutral & reverse

Wide range of speeds, complete gear selection gives you outstanding mowing control for any terrain, any type mowing. Low cost!  
3 sizes, cut 24, 32 and 36".

See your Shaw dealer or write for free literature.

Dealer inquiries invited.  
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DU-ALL  
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**MAKE YOUR OWN  
BOLTS, BRACES,  
HANGERS!**



now available  
**GALVANIZED!**

**REDI-BOLT®  
THREADED STEEL RODS**

Save repair and construction time. Just cut to length; heat and bend; add std. nuts. Seven sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", and 3/4". Handy lengths of 24" and 36". Available in galvanized or blue rust-resistant finish.

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Buy nationally advertised products. Ask with confidence for the brands advertised in POPULAR MECHANICS



**POWER GALORE FROM TINY  
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No. 1049 Gear Train with Hi-Drive Motor delivers high power at approx. 6 RPM on 3 volts—higher speeds on higher voltages. No. 2000 gives many speeds from 30 to 400 RPM. For hobby uses, research and small industrial devices. This list of quality motors and power kits may help solve a gift or technical problem for you.

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- No. 9-100 Same for 6-12V. . . . . \$3.00
- No. 3-100 Tiny Atom Motor, 1 1/2-3V. . . . . \$2.00
- For higher voltages. . . . . \$2.50
- No. 3113M Tiny Atom motor assembly kit with many acc. . . . . \$3.50
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**The Tricks He Plays on Trees!**

(Continued from page 116)

dwarfing—have been grown by European gardeners for hundreds of years. They are now easily available from nurseries in this country. The work his staff has done at Arnold has aimed at new ways for dwarfing apples and pears, and better results with the rootstocks for dwarfing peaches and plums. Whatever the method, he sees little excuse any more for burdening the countryside home with large fruit trees. He figures it this way:

"On a garden plot large enough to grow four standard trees, it's possible to grow 16 dwarfs. Instead of two standard varieties of apple, one pear and one peach, it's possible to grow four varieties of apple, four peach, four pear and four plum—with some space left for raspberries and grapes."

**Tips for Gardeners**

And he has tips for the do-it-yourself gardener. Knotting the tree's trunk is usually done ahead of budding a desired fruit variety onto young rootstock. But even the tree a few years old can be restrained, without any grafting know-how, simply by

(Continued to page 320)

Here Doctor Sax uses a piece of cotoneaster to join rootstock and bud that were not "compatible"



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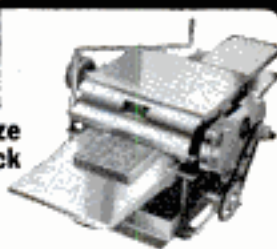


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looping upper branches, or tying them together with string or rubber bands so that they form arches or bridges.

A version of this has been practiced in the Balkans for centuries. It's the simplest way to discourage upright growth by checking sap flow. Or you can try older ways — tying the branches to walls or fences, espalier fashion; or pulling a pear's upright branches out horizontally with strings anchored in the ground.

If you learn the simplest kind of grafting, called budding, there's more leeway for fun and profit. For example, you can then manufacture your own peaches and plums — trees that fruit quickly and are the right size for a lawn or for handy tubs.

### Nanking Cherry Provides Roots

Sax has discovered the Nanking cherry to be ideal rootstock. It's a common ornamental from China, hardy, inexpensive, a low shrub producing small sour cherries. Plant their seeds and they sprout like mad, giving you loads of seedlings for rootstock.

Bud scions from desired peach or plum varieties "catch on" to this rootstock easily and start fruiting the second year. At eight years, Sax picks 100 full-size peaches off a tree only six feet high, although for extra-special specimens he recommends thinning fruits to hang six inches apart.

Here are Sax's eight basic steps for simple grafting: 1. Make a vertical cut into the

(Continued to page 322)

Setting out a row of dwarf trees five feet apart





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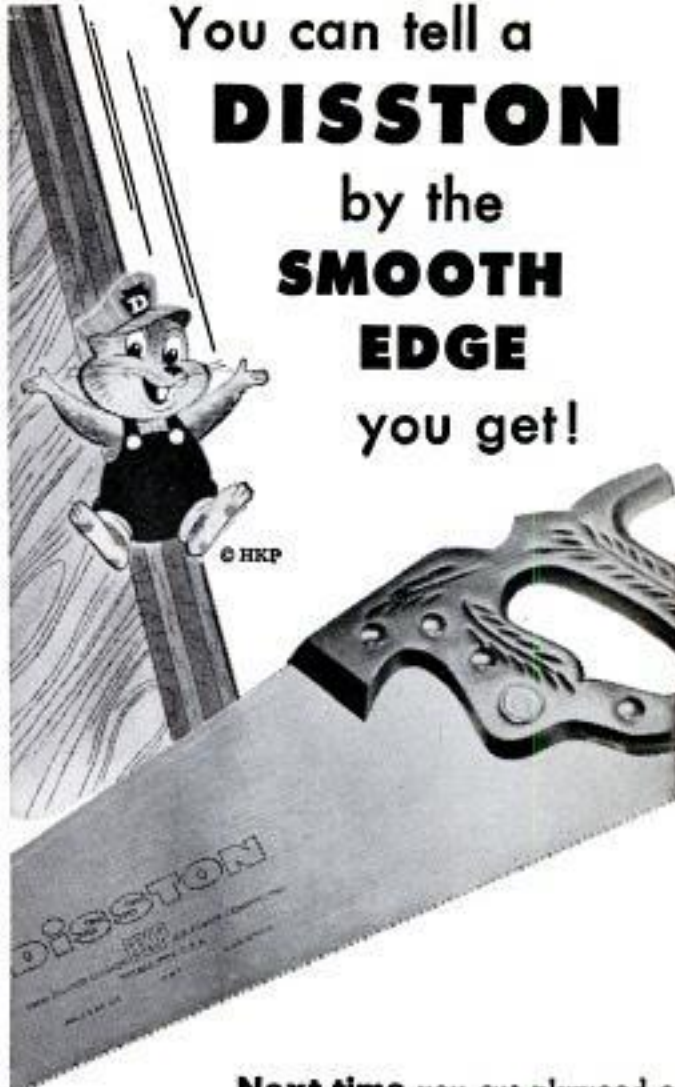
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bark of sapling selected for graft. This cut should be two inches long and from two to four inches above ground. 2. Make a half-inch horizontal cut at the top of the vertical cut, forming a T. 3. Pry open the T-cut with a knife. 4. Slice a fat "bud stick" 1½ to 2 inches long with the bud in the center. 5. Make sure grafting sliver contains bud, bark, cambium and wood. 6. Insert bud stick in T-cut with bud pointed up. 7. Cut off excess part of sliver above tee. 8. Tie up graft with rubber band.

Through another, more conventional method known as "double working," Sax also originates dwarfs in special cases where rootstock and the desired variety's bud don't join together well. This incompatibility is solved by using a third specimen as "middleman."

For example, there's the old saying: "Plant pears—plant for your heirs." Sax, however, gets fast-fruiting dwarfs. His trick here is to bud ordinary cotoneaster on hawthorn rootstock, then bud pear on the cotoneaster part. At five years, such a tree is less than five feet high and laden with fruit.

All such dwarfs are planted in soil the ordinary way. But they needn't be. How about potting dwarfs so that you can move them where you want them, when you want them?

For more than 1000 years, the Japanese have skillfully used "Bonsai" pot-binding methods for turning normal trees into beautiful midgets. But this is an intricate and patient art involving root pruning, frequent transplantings, pinching buds here and training branches there.

By contrast, potting the modern dwarf is easy. The container can be anything from a gaily painted old washtub to a pot of long-lived redwood which you can buy in knockdown form and assemble quickly. Sax's own favorites come from a brewery. He gets wooden kegs, which are being replaced by aluminum ones, and saws them in half.

He's also grateful for polyethylene plastic. It saves lots of watering work. When it's wrapped around the balled and burlapped roots of a tree or shrub being transplanted, hardly any water can evaporate from the soil.

You can set the dwarf out in soil of the garden or lawn, with that plastic wrap staying on to limit root growth. Or into a pot, and it will need watering only once or twice a month. This factor alone is enough to excite any amateur botanist.

Another plastic blessing that Sax points out: You can safely transplant any time—even when the tree is in full bloom. ★ ★ ★

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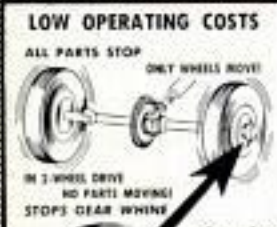
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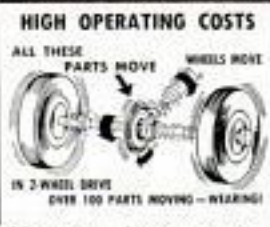


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**AIR FORCE 2000 WATT POWER GENERATOR**



IDEAL FOR USE ON FARM, IN CAMP, CABIN, HIRE AS A RELIABLE STAND-BY POWER SOURCE!  
Delivers 20 V, DC at 70 amps. Rated capacity is 2000 Watts. Driven by a single cylinder, air-cooled 2-cycle gasoline engine. Turns at 3600 R.P.M. Comes complete with built-in voltage regulator and voltmeter. Available in rope or push-button start. by battery. SAVE - Order NOW!

Size: 21" x 18-1/2" x 18-1/2"

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G-1 Type, Stainless Steel, Shatterproof and rustless. Built to withstand up to 400 PSI with high safety factor. Has 1/4" pipe ports. Ideal for use in Air Storage for painting, spraying, etc. Can also be used for water storage, as a buoy, etc. Size: 12 1/2" diam. x 24" length. . . .

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**85 to 1 GEAR RATIO**  
For use where tremendous power at a low take-off speed is desired. Drives thru a train of 6 gears rotating on self-lubricating, hi-speed roller bearings. Take-off shafts are 1/4" and 3/8" NEW in excellent condition. **5.95 USED 8.95**



**AIR CORPS 2500 LB. LIFT WINCH HOIST**



Now **29.50**  
Ideal for use in garage, shops, boat yards, on trucks, etc. Has bronze worm gear drive with 24 to 1 ratio and 3-speed crank. Comes with 18 ft of 3/16" high tensile steel cable and crank. Capacity 2500 lbs. WINCH HOIST—Some on above but has a free-spool, pull-out clutch. HOIST MOUNT FRAME - **4.50**

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1/8" ALLOY STEEL CABLE - 7 x 19 Strand. . . . per foot - **9/16**  
3/16" STAINLESS STEEL CABLE Aircraft Quality - Rust and Corrosion Proof. Finest you can buy!  
7 x 19 Strand . . . . . per ft. - **23c**  
We also carry a complete line of fine quality ALLOY STEEL cable from 1/16" to 9/32" and STAINLESS Steel from 1/16" to 5/16". Write for prices.

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**RIPS - CROSSCUTS CUTS A FINISHED 2x4 LIKE A KNIFE THROUGH BUTTER**  
COMPARES TO SAWS SELLING UP TO \$49.50 **19.98** Complete with 5-1/2" Blade

A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable 0 to 6" rip fence. Safety-trigger switch on handle. Full 1/2 HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6 1/2 lbs. Thousands already sold. Your satisfaction guaranteed.

**NEW EXTRA SAW BLADES - Available in Rip, Crosscut or Combination. Please Specify **2.25 EA.****

**NEW DRILL DRIVEN BAND SAW**



17.95 VAL.  
Easily operated by any 1/4" (or larger) drill and can be adapted to any other similar drill. Saws straight lines or curves. Makes corners, cabinets, toys, etc. Full 10" throat, cuts to the center of 20" board. Has a tilt table, oilite bearings, adjustable high impact, phenolic pulleys, 3/16" saw steel blade, die-cast aluminum housing.

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**HI-LINE 6000 WATT PLANT**  
(Item 162) Push Button Start 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14.6 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. With crank start. **\$585.50**  
Factory price...  
Same plant, but with self-starter, **\$645.00**

## BATTERY CHARGING GENERATOR

**Push Button Start**  
A husky, 750 watt plant designed for charging 6 or 12 volt batteries in just minutes. When mounted with two 6 volt batteries, it provides a terrific cold weather motor starting unit, also perfect as a 12 volt light plant on boats! Charges all batteries anywhere—no hi-line current needed. Ideal for service stations, contractors, fleets, boats and farms. With ammeter and cutout. (Item 821) Wt. 120 lbs. Reg. **\$295.** Comes complete **\$119.50**



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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. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).  
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10" Pipe, wt. 7 lb. .... **\$8.85**  
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12" Fan, wt. 10 lbs. (Item 106)..... **\$12.95**  
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**"PEXTO"**  
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Special factory price.....



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**700 WATT PLANT**  
(Item 24) **PUSH BUTTON START**  
115 v. 60 cyc. AC Powered by a rugged 2.2 HP. easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. **\$143.50**  
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**COMPARE!** This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209) High pressure type 14 c.f.m.) Large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, stressing, sand blasting, etc. Piston type 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. 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. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE.** Low factory prices. 1 1/2 HP Model (cap. 85 lbs.)..... **\$109.50**  
Reg. \$175. (Item 209).....  
2 1/2 HP heavy duty model, Reg.-Inst. motor & unloader switch (Item 209a)..... **\$129.50**



**MASTER DC ARC WELDERS**  
Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 3" plate using from 1/16" to 1/2" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, heating and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY - DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item..... **\$119.50**  
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**1500 WATT PLANT**  
115v. 60 cyc. AC Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22) Wt. 110 lbs. Reg. \$475 value. Factory price... **\$239.50**



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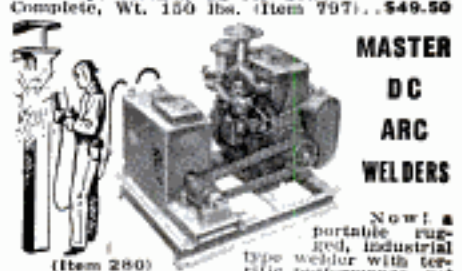
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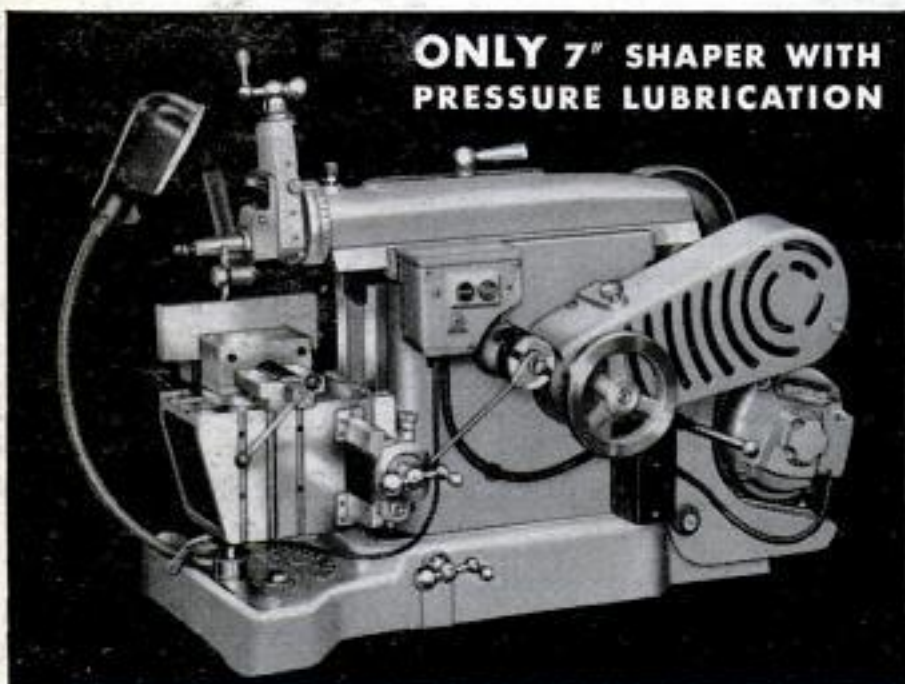
**MASTER DC ARC WELDERS**  
Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 3" plate using from 1/16" to 1/2" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, heating and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY - DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item..... **\$119.50**  
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**WELDER ONLY - INDUSTRIAL MODEL** same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b)..... **\$139.50**  
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Factory Special.....  
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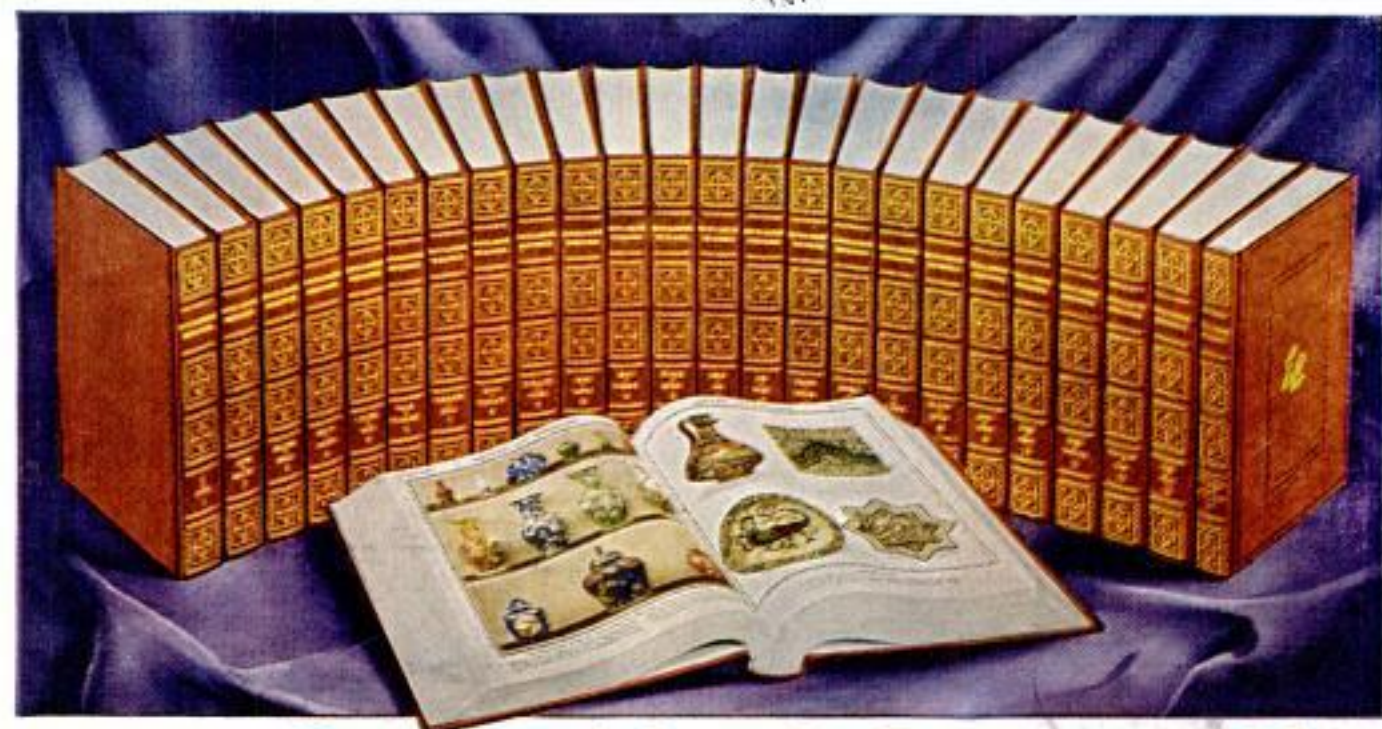
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