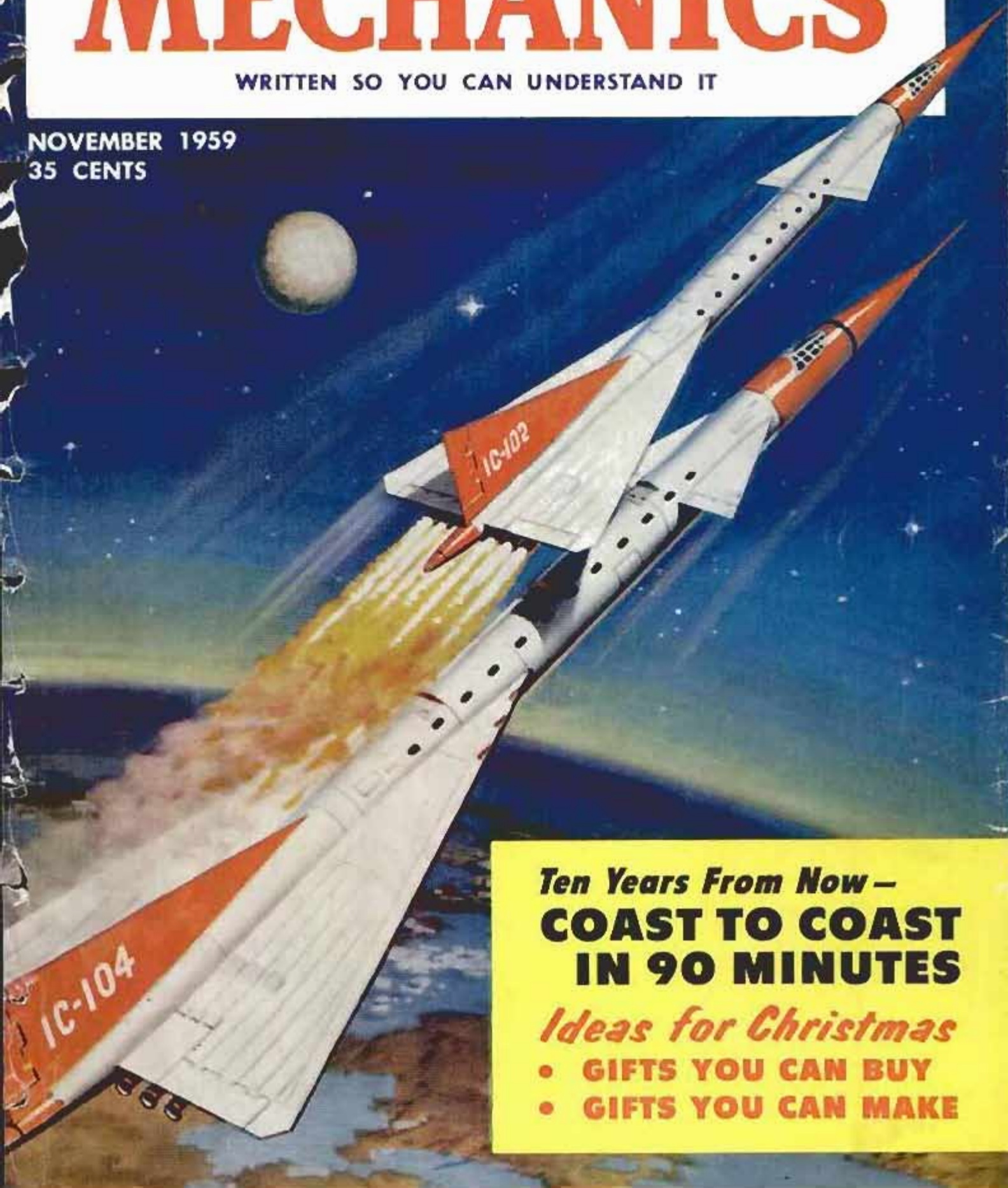


POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

NOVEMBER 1959
35 CENTS



Ten Years From Now—
**COAST TO COAST
IN 90 MINUTES**

Ideas for Christmas

- GIFTS YOU CAN BUY
- GIFTS YOU CAN MAKE



great to get . . .



A POPULAR GIFT with plenty of practical appeal. Rugged construction. Unbreakable Tenite head and handle. All exposed metal parts nickel plated. Forged steel jaws.

1950 Ratchet Brace \$7.35



MAKE A MAN A CRAFTSMAN with these fine chisels. Four sizes: 1/4", 1/2", 3/4" and 1". Plastic pouch. Forged blades and balsters.

1434 Wood Chisel Set \$6.95



4 TOP QUALITY SCREWDRIVERS — 4" and 6" standard, 3" cabinet and 4" Phillips. Convenient plastic pouch. Tempered chrome steel blades. Shock-proof Tenite handles.

8514 Screwdriver Set \$3.95



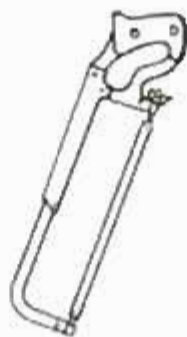
YOU CAN'T GO WRONG with this accurate 9" pocket level. V-grooved bottom for use on round material. Extra tough magnesium frame will not warp or rust. Perfect for handymen, electricians, plumbers.

290 Torpedo Level \$2.95



NEW! 6 SAWS IN 1 — jig saw, hacksaw, coping saw, ripsaw, crosscut and keyhole saw! Straight lines, curves, circles and intricate shapes are sawed easily in woods, metals, plastics.

360 Jig Saw \$29.95



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ACCURATE ANGLES ARE EASY with this rugged mitre box. Select hardwood bottom and solid steel back. Quick-adjusting clamp locks saw at any angle. For use with regular hand saw or back saw.

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\$20 Tool Certificate FREE!

A REAL CHRISTMAS BONUS! With the purchase of either the 888 or 1114 Power Units, you'll get a special Tool Certificate that can save you up to \$20. It entitles you to \$2 off the regular price of any one of the ten attachments that convert these power units into complete power workshops. Act now! Limited time only — offer expires January 31, 1960.

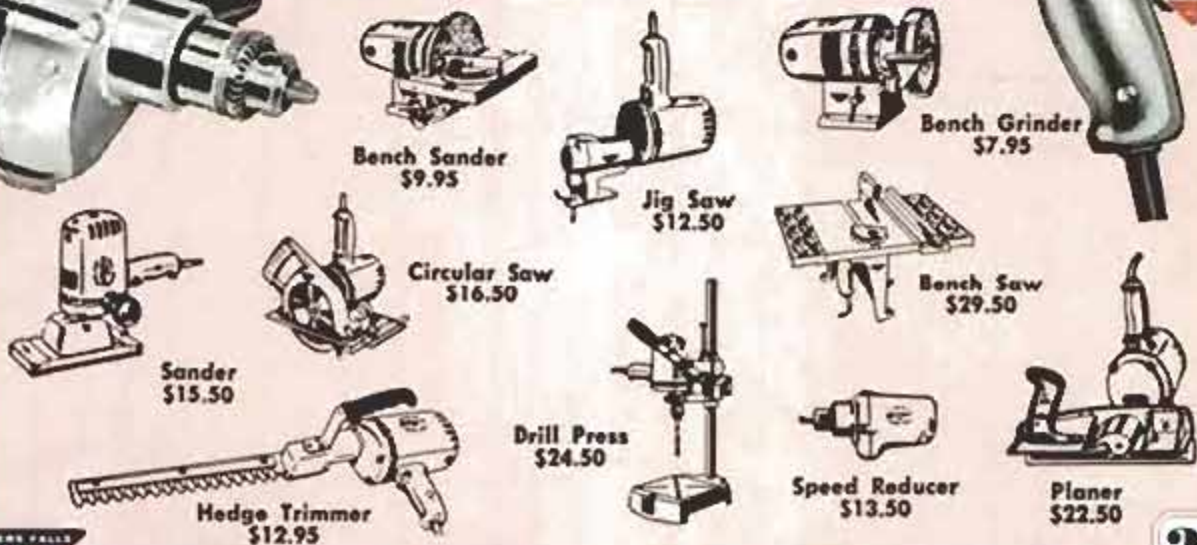


888 Power Unit
\$39.95



1114 Power Drill
\$22.95

SAVE \$20 — GET ALL TEN ATTACHMENTS



Bench Sander
\$9.95

Jig Saw
\$12.50

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\$7.95

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\$16.50

Bench Saw
\$29.50

Sander
\$15.50

Drill Press
\$24.50

Speed Reducer
\$13.50

Hedge Trimmer
\$12.95

Planer
\$22.50

GOOD FOR \$2 OFF REGULAR PRICE ON EACH ATTACHMENT SHOWN

20

FREE Plane-'R-File worth \$3.49

Millers Falls will give a handy Plane-'R-File to the lucky guy who gets any one of these 3 fine tools for Christmas. There's a card with each — and when it's sent to Millers Falls, a free Plane-'R-File is mailed immediately. Good way to say Merry Christmas twice! Offer expires January 31, 1960.

IT'S A PLANE!



IT'S A FILE!

THIS CAN SAVE YOU MONEY, HONEY!

BARGAIN REMINDER

THIS COUPON MEANS BIG SAVINGS!

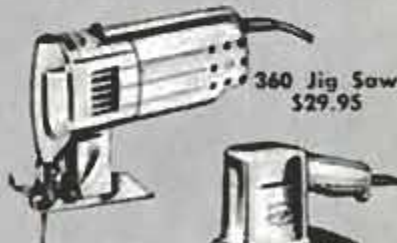
Keep it to remind yourself of the Christmas specials now featured at leading tool centers. For name of Millers Falls dealer nearest you, simply write Dept. PM-32, Millers Falls Company, Greenfield, Mass.

FREE \$20 CERTIFICATE

Savings of \$2 on any one of 10 attachments for the 888 or 1114.

FREE PLANE-'R-FILE

A bonus worth \$3.49 when you buy a 360 Jig Saw, 580 Sander or 626 Saw



360 Jig Saw
\$29.95



580 Orbital Sander
\$39.95





Give the 1



JOY ALL YEAR LONG to the man who receives this rugged 1/4" drill. Full 2.7 amp. rating gives it all the power needed to drive 14 different quick-change accessories and attachments.

1114 Power Drill \$22.95



GOOD GIVING 'N' GETTING, TOO! Contains everything needed for drilling, sanding, polishing, and sawing: 1114 1/4" Drill, Jig Saw attachment with 4 Blades, 3-piece Drill Set, 5" Rubber Pad, 5" Polishing Bonnet, two 5" Sanding Discs, in steel carrying case.

**1118 Deluxe Drill Kit
Regular \$44.50 — Special \$39.95**



A REALLY WANTED GIFT for men and boys. This kit contains the same items as the 1118 Deluxe Kit with the exception of the Jig Saw Attachment.

**1117 Basic Drill Kit
Regular \$34.50 — Special \$29.95**



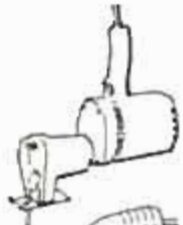
ANY FELLA WOULD APPRECIATE this precision-made plane. Excellent for hardwoods and end grain. Adjusts to cut a nickel plated screw and locking lever. long, 1 3/8" wide.

1455 Block Plane



3 TOOLS IN ONE! A powerful 3/4" 6-inch portable disc sander, and 6-inch orbital sander. Becomes complete, 17 tool, power shop with wide assortment of attachments.

888 Power Unit



CUTS ANY SHAPE in wood or metal. Fits to the 888 Power Unit or 1114. Cuts own starting hole in wood. Complete with 4 blades.

886 Jig Saw Attachment



S-M-O-O-T-H-I! This speedy finishing attachment puts the professional touch on any project. 12 times faster than hand sanding. Fits both the 888 and 1114.

882 Orbital Sander Attachment



Tools that are



• **MAKES LIGHT WORK** of heavy jobs. Whether cross-cutting or ripping, this 6" saw attachment for the 888 slices through 2" dressed lumber. Quick, easy adjustments for depth and angle. **8811 Portable Saw Attachment \$16.50**



• **CUT AWAY** hours from those big time projects with this rugged 6 1/2" power saw. Packed with quality features. 1 H.P. motor. **626 Circular Saw Regular \$54.50 — Special \$49.50**



• **A SURE HIT** for any man. Precision hardened and tempered alloy steel head. Octagon shaped hickory handle. Beautifully balanced and finished. Weight 16-ozs., 13" long. **716 Claw Hammer \$4.50**

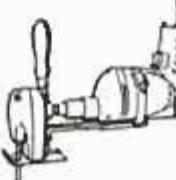


• **HOBBYIST'S DELIGHT!** Automatic drill with quick-action chuck locks or releases drill points instantly. Unbreakable Tenite handle holds up to 12 drill points. **170 Automatic Drill \$4.00**



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1200 Combination Square . . . \$2.95



• **ANY DRILL IS A JIG SAW** with this versatile attachment. Saws all sorts of decorative and odd shapes in wood or metal. Equipped with 4 blades.

2140 Universal Jig Saw Attachment . . . Regular \$11.95 — Special \$9.95



• **FINE FINISHING** made fast and easy with this professional sander. A real Santa special too, with **2 FREE tungsten carbide sanding sheets.**

580 Finishing Sander \$39.95



• **HAPPY HOBBY DAYS** are his with this high quality bench plane. 9 inches long with 2" cutter. Quick, easy depth and side adjustments provide precise control of cut.

90 Bench Plane \$6.95

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MILLERS FALLS
TOOLS

SINCE
1868





Miller's Falls



A GOOD RULE FOR GIVING is to give the best with this fine 50' tape rule. Easy, one-finger winding. Extra strong, rustproof case. Clear foot and inch markings.

2050 Tape Rule \$3.29



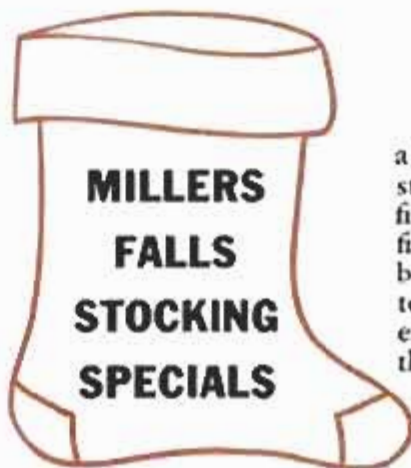
FITS ANY 1/4" DRILL. 5" circular saw attachment rips, crosscuts, trims, bevels, and mitres. Adjustable rip guide. Telescoping guard.

2170 Circular Saw Attachment . . .
Regular \$14.95 — Special \$12.95



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1170 Circular Saw Attachment . . .
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MILLERS FALLS COMPANY, DEPT. PM-32, GREENFIELD, MASS.



★ See special offer on cover.

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RICHARD E. DEEMS

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Makeup

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Eastern Editor

RICHARD F. DEMPEWOLFF

Room 4104, Empire State Bldg., New York City 1

Western Editor

THOMAS E. STIMSON, JR.

Suite 1007, 3100 Wilshire Blvd.

Los Angeles 5, Calif.

Advertising Manager

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Advertising Offices

Chicago: 200 E. Ontario St., WHitehall 4-0100; New York: Empire State Bldg., 350 Fifth Ave., LOngacre 5-7580; Detroit: General Motors Bldg., TRinity 5-8711; Cleveland: Hanna Bldg., 1422 Euclid Ave., PRospect 1-0456; Los Angeles: 3460 Wilshire, DUnkirk 2-8458; San Francisco: Russ Bldg., 235 Montgomery St., YUKon 2-0823.

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Volume 112

NOVEMBER 1959

Number 5

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Next Month...

YEARNING FOR A HOUSEBOAT? You can build it yourself. Next month we present the first of a series of articles telling you in construction detail how to build a 24 by 8 foot boat—just right for a family summer afloat. A leading marine architect drew the plans, Popular Mechanics built the houseboat and launched it to prove every step of the construction before we offered it to you. Don't miss the December issue!

ROUNDUP

Hitch up your horse, pick up the boys, and head for the nearest store to git a pack of **PHILLIES. CHERROOTS**



WHY HERE'S A CIGAR AS FRESH AS A NEW BORN COLT.

A spankin' new size and shape and it's

MIRACLE MILD

*Slick on the draw
and big as your trigger finger!*



Rustle up 28 cents and buy yourself a pack of 5. If you gotta wait in line and your horse starts chompin' at the bit- tell him "whoa"- you ain't getting back in the saddle 'til you get your CHERROOTS!



The low beam of G-E SUBURBAN Headlamps



OLD LOW BEAM

25 feet beyond those approaching headlamps there's a barrel in the road. It's not yet within the range of the low beam of any previous 2-headlamp cars.

has a "spotlight" effect, so . . .



NEW G-E LOW BEAM

There's the barrel—225 feet away! This is how the low beam of G-E SUBURBAN Headlamps (made only for 2-headlamp cars) helps you see in spite of oncoming lights.

you see better in spite of other cars' lights

Three-fourths of all night driving is now done with the low beam!

When there wasn't a great deal of nighttime traffic, you used the *upper* beam most often because it pushed a lot more light farther down the road. So, headlamp manufacturers put the upper beam filament on focus for maximum beam control.

Since nighttime traffic has increased tremendously, motorists find they must use the *low beam* more and more. So, General Electric now puts the *low beam* filament on focus to give maximum beam control where it's needed most—to provide a "spotlight" effect which directs more light down the right side of the road. That's why the low beam of new General Electric SUBURBAN Headlamps lets you see past the oncoming car when you're 75 to 200 feet apart. Only General Electric SUBURBAN Headlamps have this feature for 2-headlamp cars. General Electric Company, Miniature Lamp Department M-912, Nela Park, Cleveland 12, Ohio.



ATTENTION ALL OWNERS OF 2-HEADLAMP CARS!

For approximately the same results as the four-headlamp systems in brand new cars (whose low beam filaments are also on focus) . . . have a pair of new G-E SUBURBAN Headlamps installed and aimed today. Tonight you'll see better in spite of the other cars' lights.

Progress Is Our Most Important Product

GENERAL  ELECTRIC



How we retired in 15 years with \$300 a month

We're having a wonderful time, Betty and I. We're doing all the things we've always dreamed of doing. We enjoy our home. Summers, we pack the car and take trips. And it's all thanks to a check for \$300 that comes by mail, as regular as clockwork, every month!

Luckily for me, I was only forty when Betty began to worry about our future. "You're going to want to slow up in a few years," she'd say. And I'd laugh. Because I felt fine. "But you won't always want to work," she'd say. "Well, I still have fifteen good earning years ahead of me," I'd answer.

But one day she stopped me. She asked me how much I'd earn in the next fifteen years—not counting raises. I did some quick arithmetic, multi-

plying my salary by fifteen. It ran up into *six figures!* I grinned.

Betty wasn't impressed. "How much of that do you think we'll save?" she asked. I had to be honest. We were always paying off on a new car or a radio, or going places. "A thousand or two," I admitted.

"That's just our trouble," she said. "We can't seem to save. You ought to take out one of those retirement income plans right now."

So I looked into the subject and discovered the Phoenix Mutual Retirement Income Plan. It was a way I could make part of my salary *now* buy me a retirement income *later*. All I needed was to start in time. With a Phoenix Mutual Plan, I could get a check for \$300 a month for life, start-

ing in fifteen years, when I reached fifty-five. I applied immediately and qualified.

The big day came fifteen years later, when our first Phoenix Mutual monthly check for \$300 arrived in the mail. *I retired*. Now Betty and I are having the time of our lives—with no money worries.

Send for Free Booklet

This story is typical. Assuming you start at a young enough age, you can plan to have an income of from \$50 to \$300 a month or more—starting 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.

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OVER 100 YEARS

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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 _____

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Over the Editor's Desk



Auto Show in Color

In this, the most exciting automotive year in a generation, *PM* presents color photographs of all the new cars. It's the first time we have done it and, as far as we know, it's the first time any magazine has done it.

To make it possible, *PM* photographer Don Honick spent days locked inside Detroit proving grounds—often on weekends. One such weekend was the Fourth of July.

But Don didn't mind—it was safer than last year's Fourth when he burned his shutter hand lighting a sparkler for his son, Scott. ☆ ☆ ☆

Casting around for Christmas ideas? For the head man, the lady of all work, the youngsters? Turn to pages 166-181 for some suggestions. And we'd like to tell you about a new book your 8 to 12 year olds would read with fascination. Written by our own Assistant Managing Editor, Clifford B. Hicks, "First Boy on the Moon" is not only good reading but will teach a "space world" of facts about astronautics to those youngsters who'll grow up in an outgrown world. Wait till you read how a stowaway frog saved our first mission to the moon and its stowaway boys! Publisher: John C. Winston Co.

To the Editor:

I've just read the excellent article [July, 1959] by Mr. H. F. Unger, "Karate—'Gentle Art' of Self Defense" and enjoyed it thoroughly. As a Judo-ka (student of Judo) however, I have noticed an item which seems to run contrary to my own training: I think that Mr. Unger has given the name "Gentle Art" to the wrong sport. To clarify my point and give my reasons, it might be appropriate to investigate a little of the history of Japanese sports.

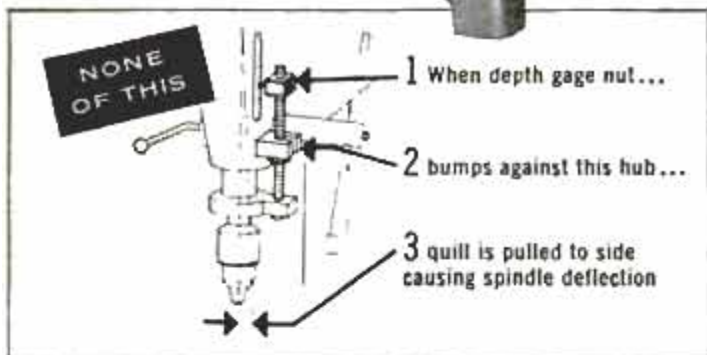
Karate, as Mr. Unger has pointed out, is a very lethal martial art. Jujitsu, on the other hand, is not. While the two are frequently confused, Jujitsu actually makes use of, and in fact was the origin of, the throwing techniques that we associate with much Japanese combat. The word "jujitsu" when translated means "gentle art," and refers not to the severity or ease of defeating an opponent but to the principle upon which jujitsu throwing techniques are based.

Judo, the sport which I practice, is a modern-day derivative of jujitsu, devel-

(Continued to page 8)

NOW!

no spindle deflection



South Bend's design eliminates the major cause of inaccuracies common to all drill presses—spindle deflection resulting from depth gage pressure. *There is no depth gage collar on the quill.* Travel of the quill is controlled by an exclusive Rack Type Depth Gage that limits the rotation of the quill feed shaft. Write for more details about South Bend's exclusive features.

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LATHE

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Shapers, Drill Presses, Pedestal Grinders
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BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." THAT'S WISHFUL THINKING!

You know that the "breaks" go to the man or woman who is *prepared* to take advantage of them—to the person who can fill the better job and who is worth more money. He makes the "breaks" instead of waiting for them.

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There is a field of business which has never been overcrowded—it's the ACCOUNTING FIELD. And the demand for skilled accountants—men and women who really know their business—is increasing. State and Federal legislation requires much more efficient accounting from business. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, and Federal Income Tax. Men who prove their qualifications in this important branch of business are promoted to responsible executive positions—given an opportunity to earn real salaries. The range is \$5,000 to \$10,000 a year—even to higher income figures.

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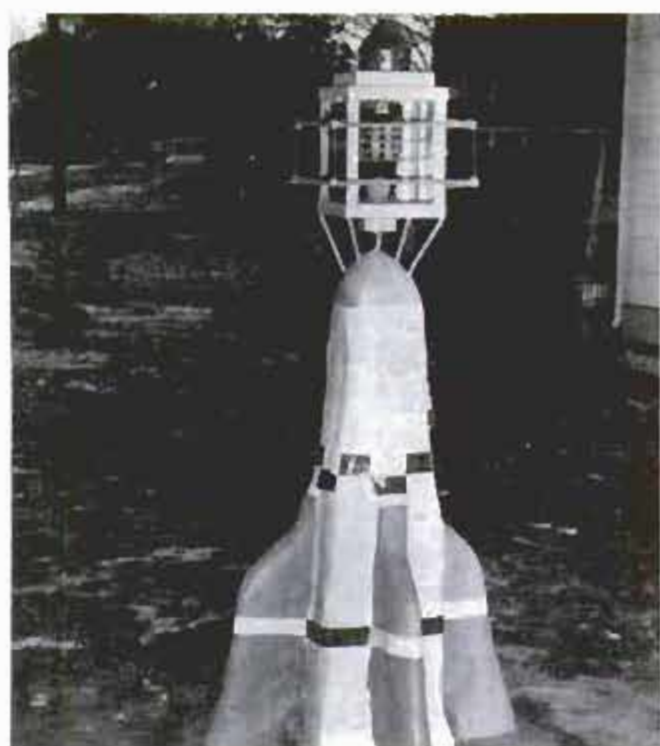
oped by Jigoro Kano in the 1800s. Mr. Kano succeeded in refining and making safe the old jujitsu, as well as giving it a high moral purpose. The resultant sport, known as Judo or more correctly, the Kodokan Judo, utilizes throwing, choking, holding and arm-bending techniques in individual competition between friendly opponents all over the world. This is the sport that the world knows as the "gentle art." Its influence is such that the uniforms the Karate students wear in the article are known as Judogi, or Judo-cloths. Mr. Kano himself explained the idea of gentleness best with the following illustration:

Suppose we measure the strength of men in units of ten. If, then, my strength is 7 units, and I attempt to push a man who has 10 units, I shall be pushed back. However, if I yield to his force, and at the same time pull him slightly off-balance, I shall be able to throw him to the ground.

Because of the reasons I have given, and because striking techniques, while taught to Judoka, are never used in competition for fear of injury, I submit that Judo and jujitsu are the actual gentle arts, while Karate deserves the reputation for deadliness that Japanese sports have attained.

Gordon S. Kirkpatrick,
Centralia, Wash.

Rocket "Lighthouse"



Solomon B. Meserve built a lamp for his yard in Framingham, Mass., with a home-made "rocket" for the base. The frame is of wood covered with hardware cloth, then Portland cement, and painted over. The lamp itself was made of scrap metal.

(Continued to page 10)

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Mr. M. O. Wilson, Dept. PM-11
Universal Schools, 6801 Hillcrest Ave.,
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Address.....

City.....Zone.....State.....

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N.R.I. sends kits of parts to build this Signal Generator. You get practical experience, conduct tests to compensate Radio frequency amplifiers, practice aligning a typical I.F. video amplifier in TV circuit, many other experiments.



YOU BUILD Vacuum Tube Voltmeter

Use it to get practical experience, earn extra cash fixing neighbors' sets in spare time, gain knowledge to help you work in Radio, Television, Color TV. With N.R.I. training you work on circuits common to both Radio and TV. Equipment you build "brings to life" things you learn in N.R.I.'s easy-to-understand lessons. 64 page Catalog FREE, shows all equipment you get.



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"I am Chief Engineer of Station KGCU in Mandan, N. D. I also have my own spare time business servicing high frequency two-way communications systems."

R. BARNETT, Bismarck, North Dakota.



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"I am doing very well in spare time TV and Radio. Sometimes have three TV jobs waiting and also fix car Radios for garages. I paid for instruments out of earnings."

G. F. SEAMAN, New York, N. Y.



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"We have an appliance store with our Radio and TV servicing, and get TV repairs. During my Army service, NRI training helped get me a top rated job."

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*— the spark plug that cleans
itself while you drive!*

To the Editor:

(Continued from page 6)

A famous old ship which has outlived almost all of the men who sailed her will soon begin a new career in North Atlantic waters.

The 85-year-old former Coast Guard cutter *Bear* is at Halifax, N.S., where the Shaw Steamship Co. plans to re-engine her for work as a sealer and Arctic trader. The company says the *Bear* has been found as sound of hull as ships one third her age.

Built at Dundee, Scotland, in 1873, the *Bear* sailed with the Newfoundland sealing



fleet before being purchased by the U.S. government in 1884 to head an expedition looking for Lt. A. W. Greely of the U.S. Army. Greely had led an expedition to Lady Franklin Bay in the Arctic and had been unheard from for almost two years.

Teaming up with the sealers *Thetis* and *Alert*, the *Bear* sailed along the northwest coast of Greenland and helped locate the last few ragged and starving survivors of the Greely party.

Famous for her many rescue missions in the Arctic and the Bering Sea, the *Bear* sailed the Far North for almost 40 years!

(Continued to page 18)

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Because CTI training is so *practical*, you'll soon be making profitable service calls. Perhaps you'll work on your own. Or, you may prefer to get a part-time job with a local appliance dealer or air conditioning contractor. You can add to your present income this way. With extra cash, you can buy additional shop equipment, pay your tuition, even bank money.



You could go in business and be independent

Own a business—and enjoy independence! Thrill to the satisfaction of being the boss. Give orders—not take them! The refrigeration field is ideal for getting started on your own. You can make friends as you make service calls. In time, you'll have a list of potential customers. You can also sign service contracts with food stores, taverns, restaurants, etc. Ever so many CTI graduates have their own successful shops. Most of them began with nothing more than their new training and pluck. You, too, can start small and grow big. Be a business man!

You could get into the profitable new auto air conditioning field

Hundreds of thousands of new cars are being equipped with air conditioners. Auto dealers are advertising for skilled refrigeration mechanics, offering premium pay, to set up service departments. Or, you can go in business for yourself, and contract with auto agencies to do this type of installation and repair. You can make big profits either way.



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You get all these quality mechanic's tools



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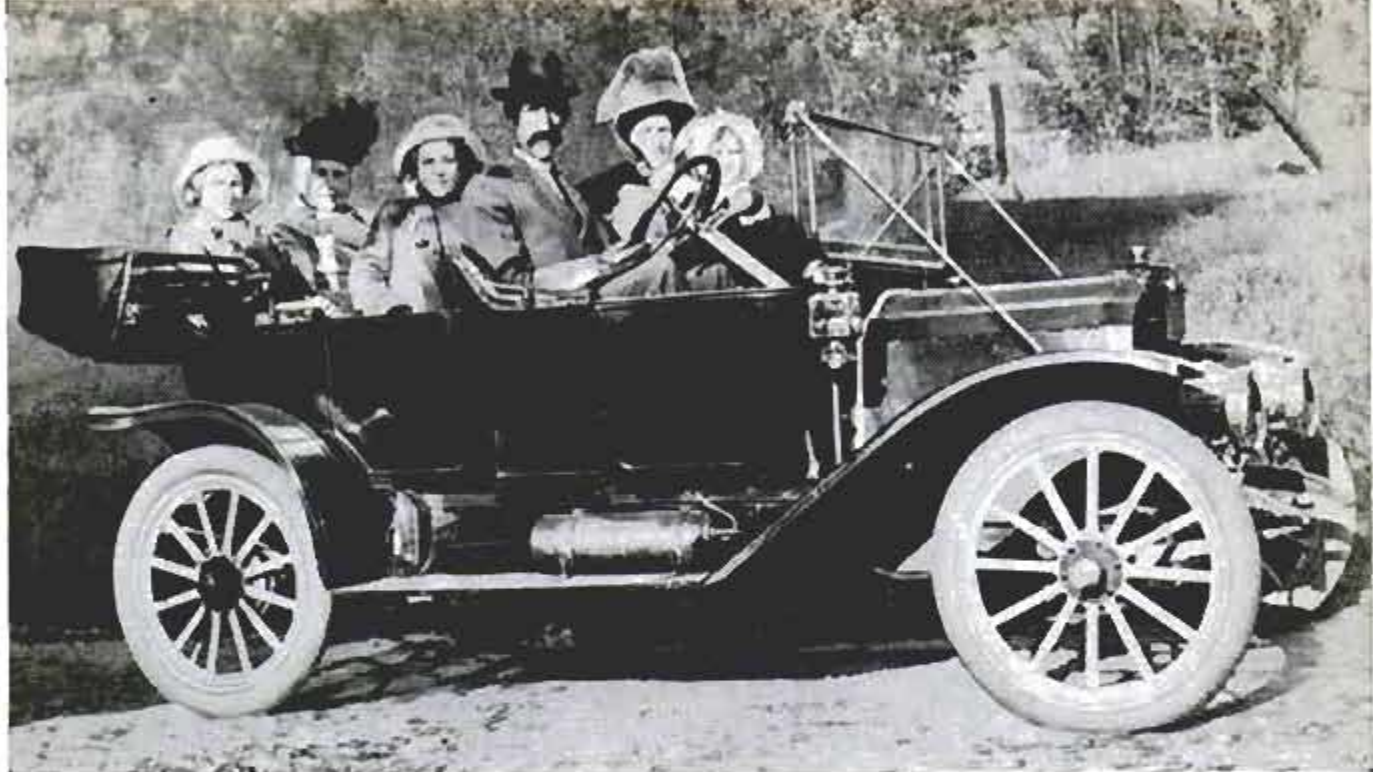
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into a truck, smooth tires, Presto-Lite head lamps, a four-cylinder engine with a dry-cell battery for starting spark and a bulb horn that could be heard 50 feet away on a still day. Answer on page 252.

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Men 17-55

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You meet them almost every day . . . the men who want to advance out of humdrum, low-pay, or no-future jobs. Some are men who had to quit school too soon; men just out of school with no idea of what to do; or men looking for help in planning a better future. Yet, many of them could—can, if they're 17-55—train at home, in their spare time, for an exciting career with real money and an inspiring future in the field of Electronics. And the tragedy of it is: they don't know it! They think they need an advanced education, or some special experience, or a lot of money, to start—but what they need most is the will to win. Maybe you're a man like that. Well, here's great news! It's not too late! Electronics offers men like you, when trained, dozens of different job opportunities—from guided missile control to running your own radio-television service shop. Get the full story of the jobs you may prepare for . . . NOW . . . BEFORE the years and responsibilities close in on you. Send coupon today—no obligation.

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By James S. Thistle

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Although he became one of the world's richest men, he never felt right about making money from a substance that was capable of destroying human life, so in his will he set up a fund of \$9,000,000, the interest of which he directed to be used annually for world prizes.

These prizes are awarded for noteworthy achievements in physics, chemistry, medicine, literature and the advancement of world peace. Each award consists of a gold medal, a citation and about \$30,000 to \$40,000. The prizes do much to stimulate original research and unusual talent.

*These letters, unscrambled,
spell the name of this
month's Great Pioneer
in Science:*

FONDLEBLEA

(First and Last Names)

Write the correct name here:

Now turn to page 265 for the answer.



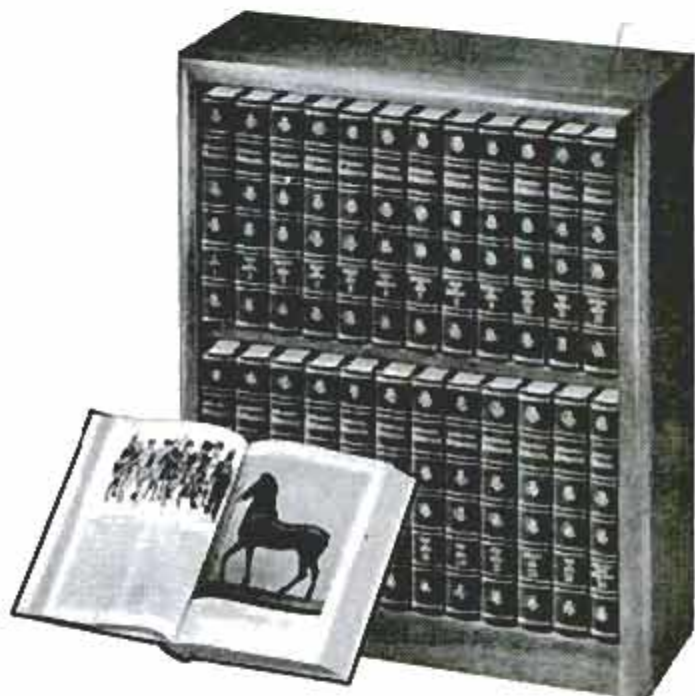
ARE YOU GIVING YOUR CHILDREN MORE THAN YOU HAD?

A THOUGHTFUL DISCUSSION by Dr. D. Alan Walter

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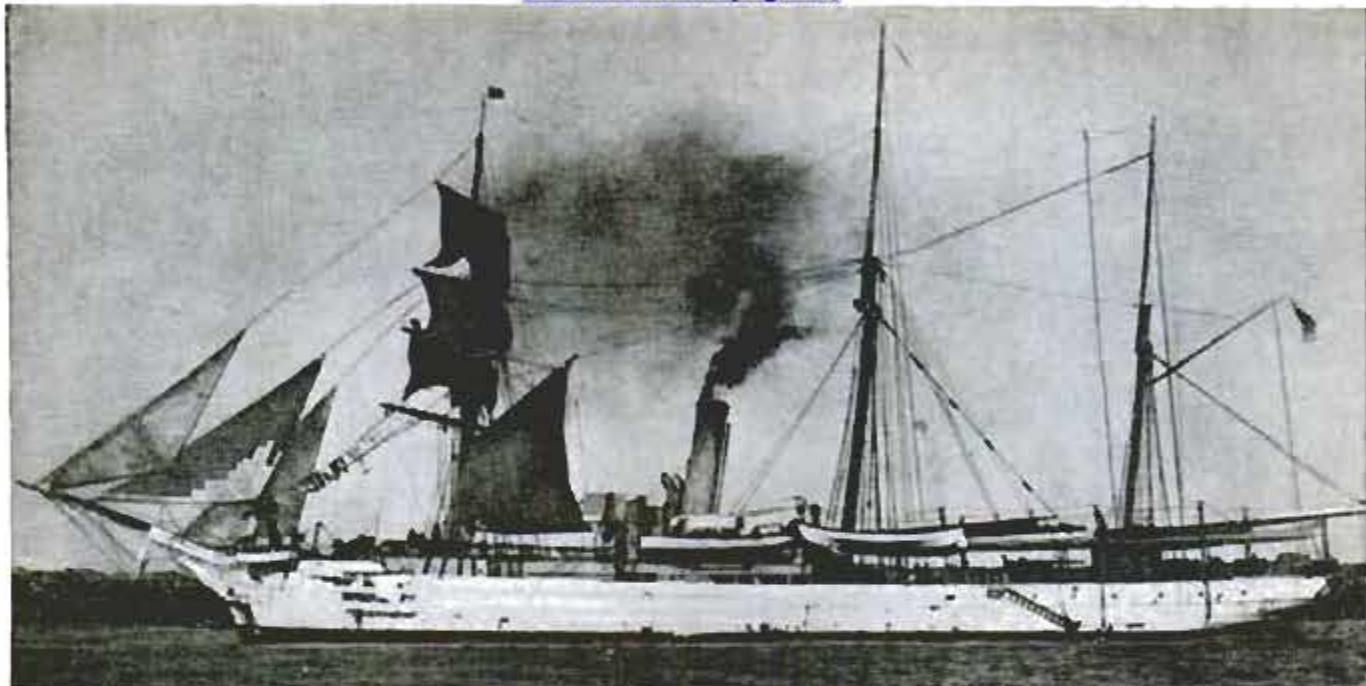
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For all of her active career the *Bear* was a barkentine with a steam engine for auxiliary power. When she goes back to sea again, she will be powered by a diesel engine.

John Bunker,
San Diego, Calif.

(Continued to page 31)

A tree for his future!



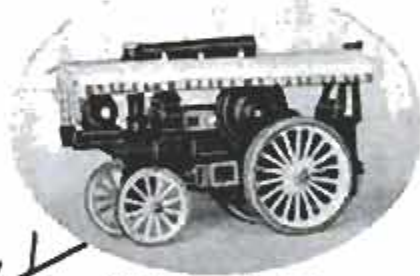
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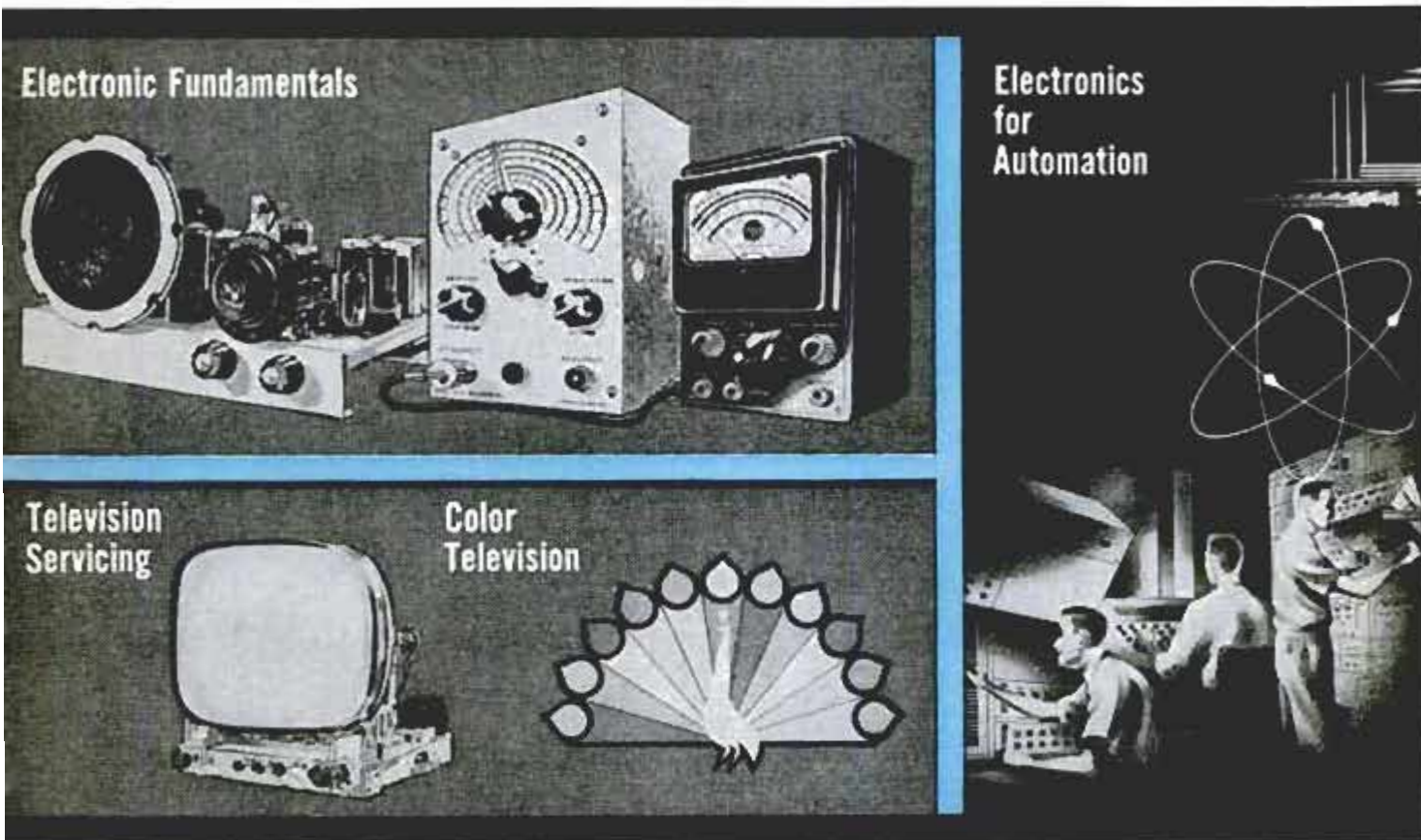


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New York 16, N. Y.

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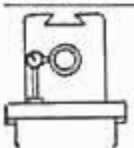
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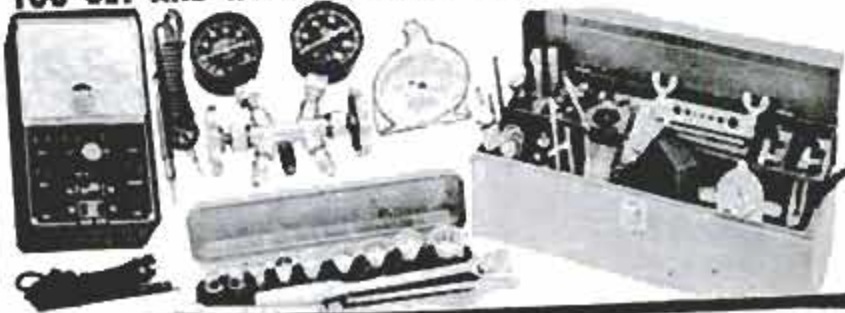
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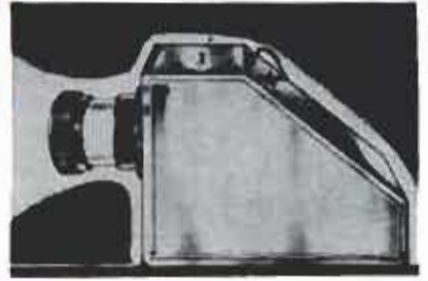
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summer home, my Cadillacs, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; out of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept

something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

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I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turn-

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Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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To the Editor:

I look forward with great interest to receiving *PM* each month. Firstly for the very good ideas for home improvements, also the items on art, which are of special interest to me as I do wood carving over here and have sold quite a number to tourists from your country.



I am enclosing a photo of just a few of my things which are based from the knots in the wood, to represent faces or eyes. They are of quite modern design as you can see.

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Home-Built Snowplow

We are inclined to agree with Paul D. Lesnick of Rochester, N.Y., that his latest project is "very useful around the yard." The snowplow-tractor, shown here in charge of his 11-year-old son, has a cut-down Crosley rear end and transmission with a chain drive. It is powered by a 1 $\frac{3}{4}$ horsepower motor and cost Mr. Lesnick about \$30 for junk parts—plus a little spare time.

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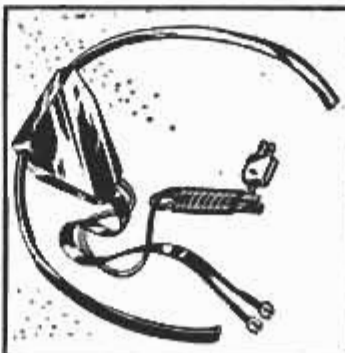
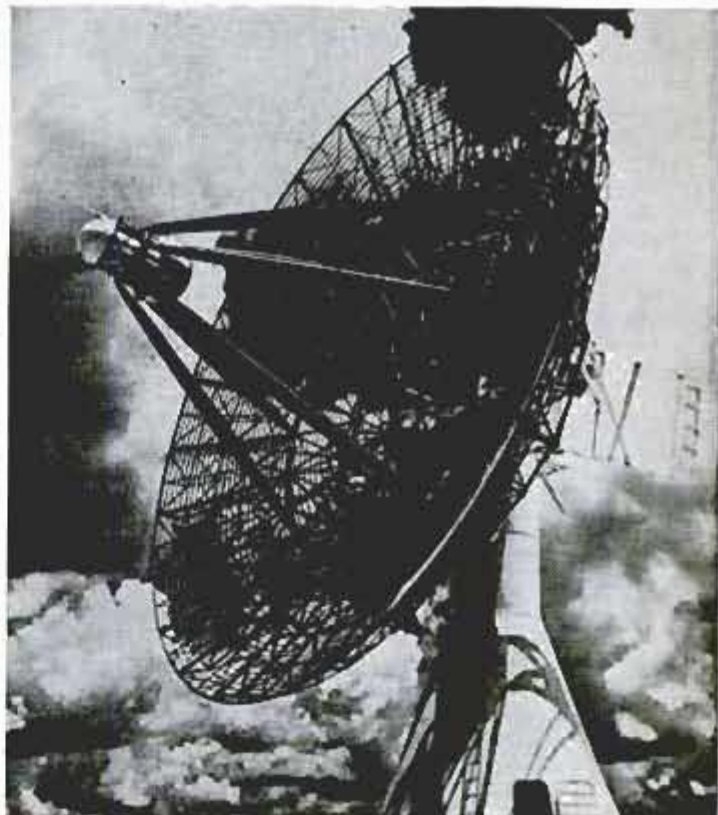
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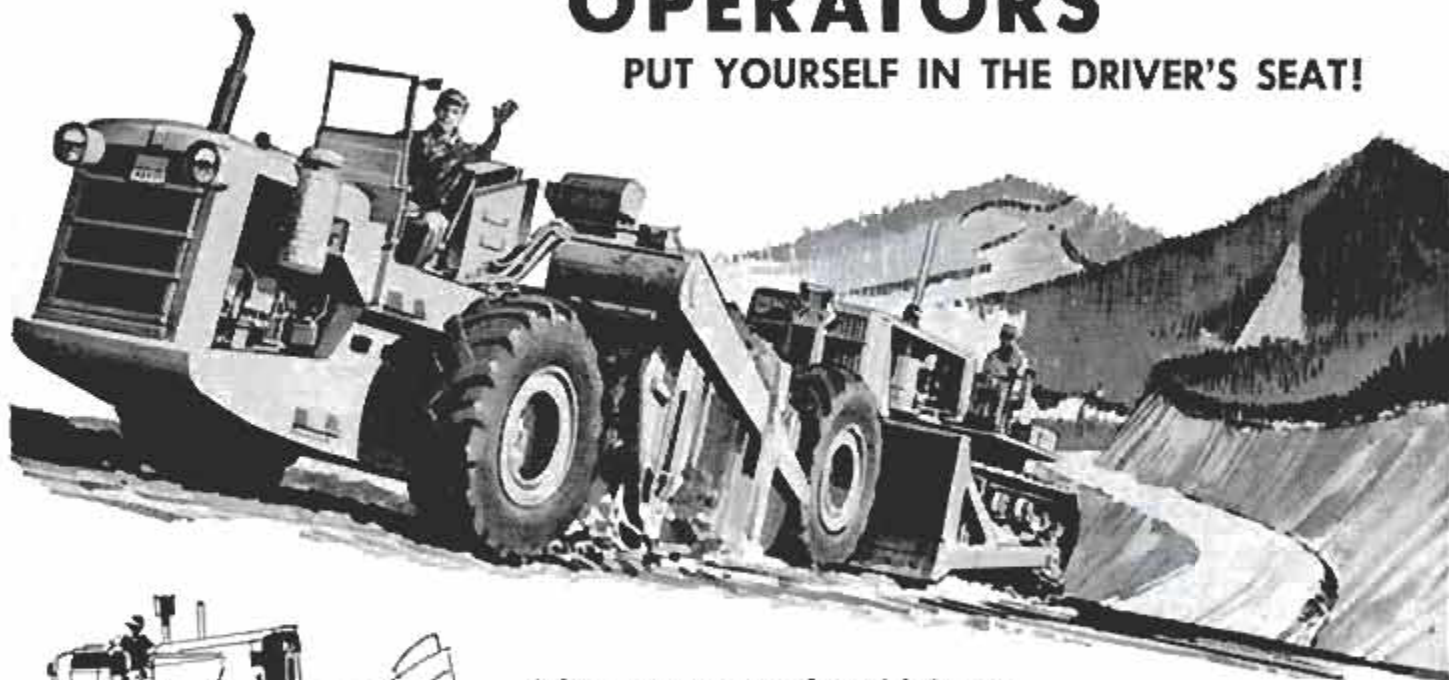
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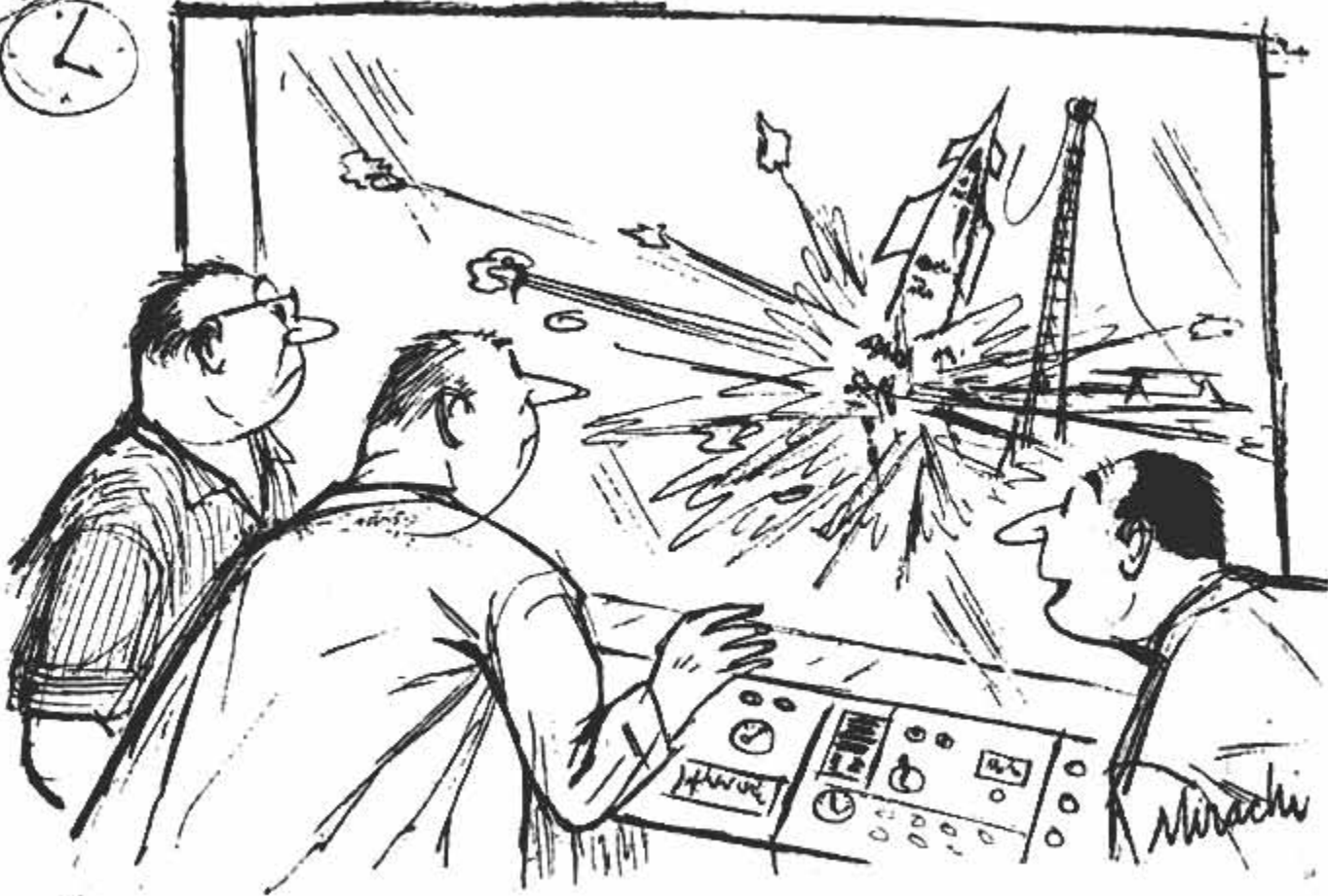
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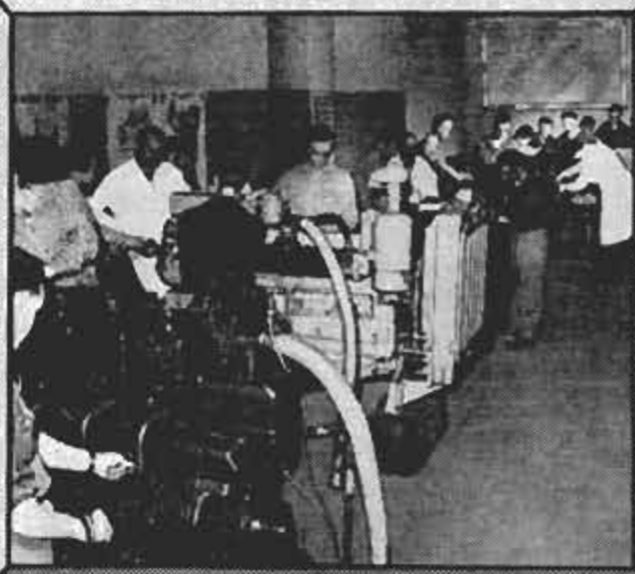
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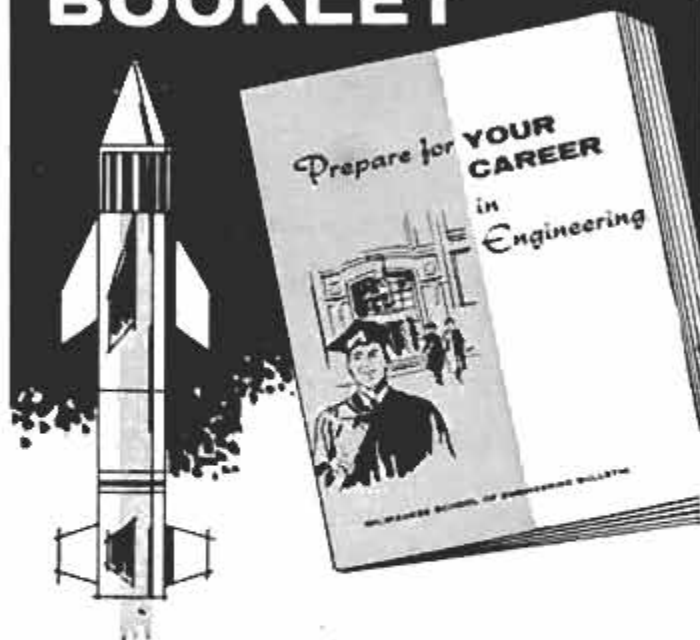
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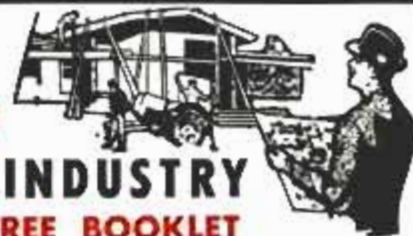
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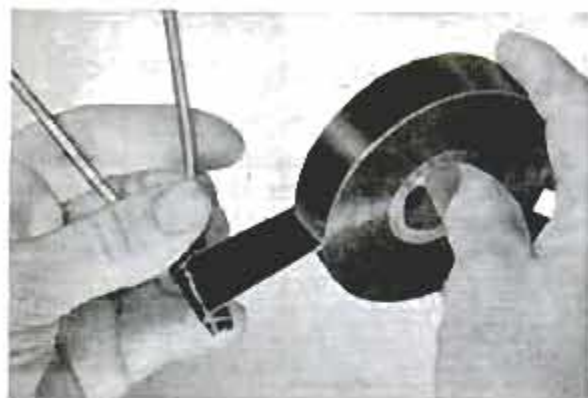
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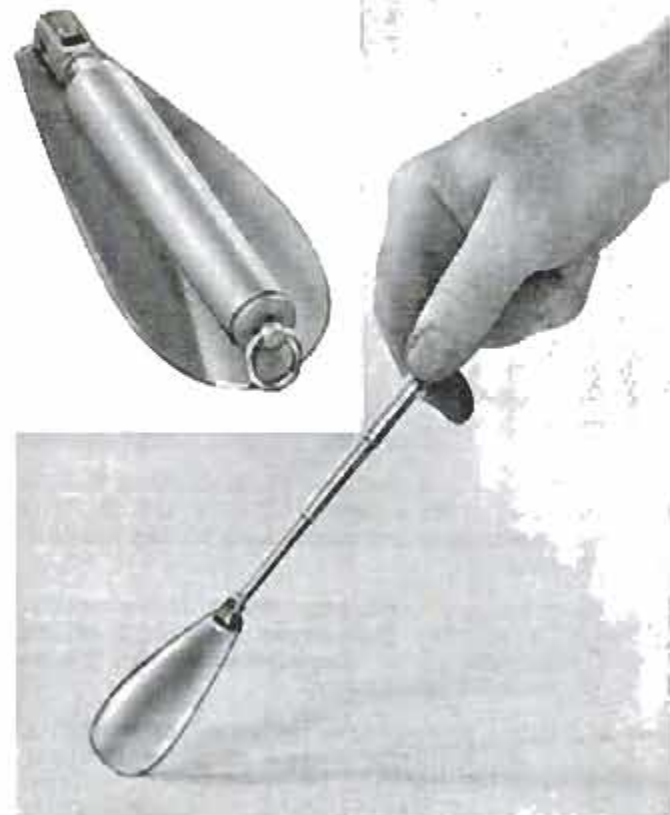
Within the next five years the United States will face an acute shortage of mathematicians. Dr. J. Sutherland Frame, head of Michigan State University's mathematics department, estimates that by 1963, some 70,000 mathematicians, including 10,000 with doctoral degrees, will be needed for computer work alone. He said it is highly unlikely that there will be even 5000 Ph.D.'s in mathematics by 1963, and most of them will be working in other phases than computing.

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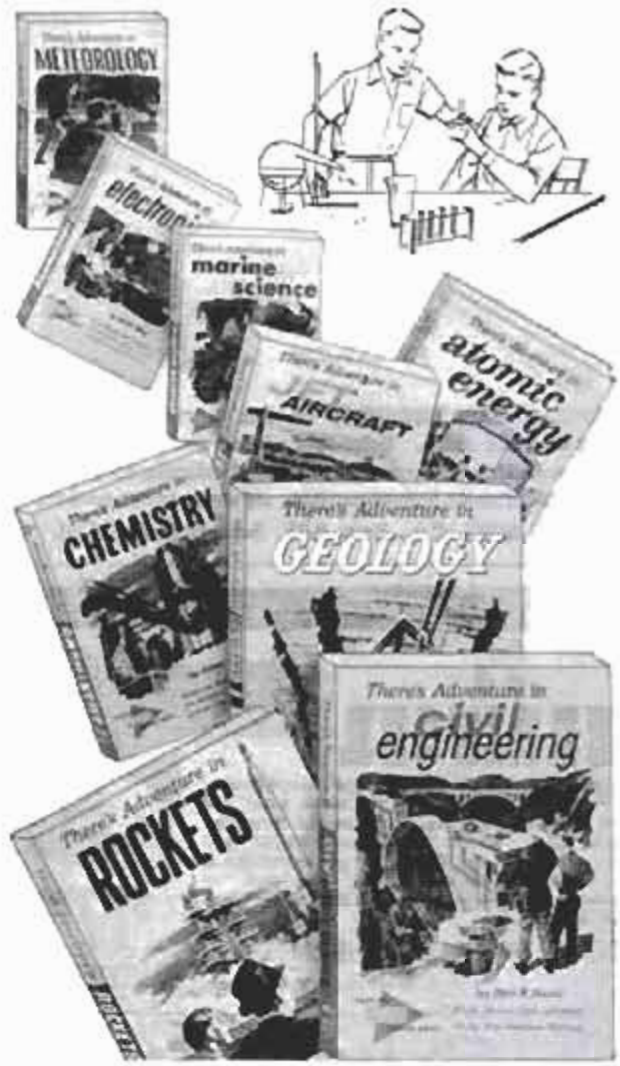
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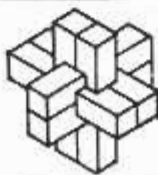
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Borg then told me that his power of memory would probably amaze me—and I had known him, while we were studying law together in Paris, to have the most deplorable memory.

So he went to the end of the dining room and asked me to write down a hundred three-figure numbers, calling each one out in a clear voice. When I had filled the edge of an old newspaper with figures, Borg repeated them to me in the order in which I had written them down and then in reverse order, that is beginning with the last number. He also allowed me to ask him the relative position of different numbers: for example, which was the 24th, the 72nd, and the 38th, and I noticed that he replied to all my questions at once and without effort, as if the figures which I had written on the paper had been also written in his brain.

I was dumbfounded by such a feat and sought in vain for the trick which enabled him to achieve it. My friend then said: "The thing you have just seen and which seems so remarkable is, in fact, quite simple; everybody has a memory good enough to do the same, but few indeed can use this wonderful faculty."

He then revealed to me how I could achieve a similar feat of memory, and I at once mastered the secret—without mistakes and without effort—as you too will master it tomorrow.

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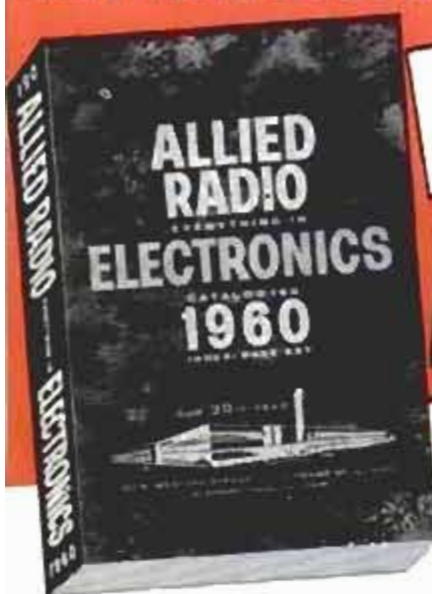
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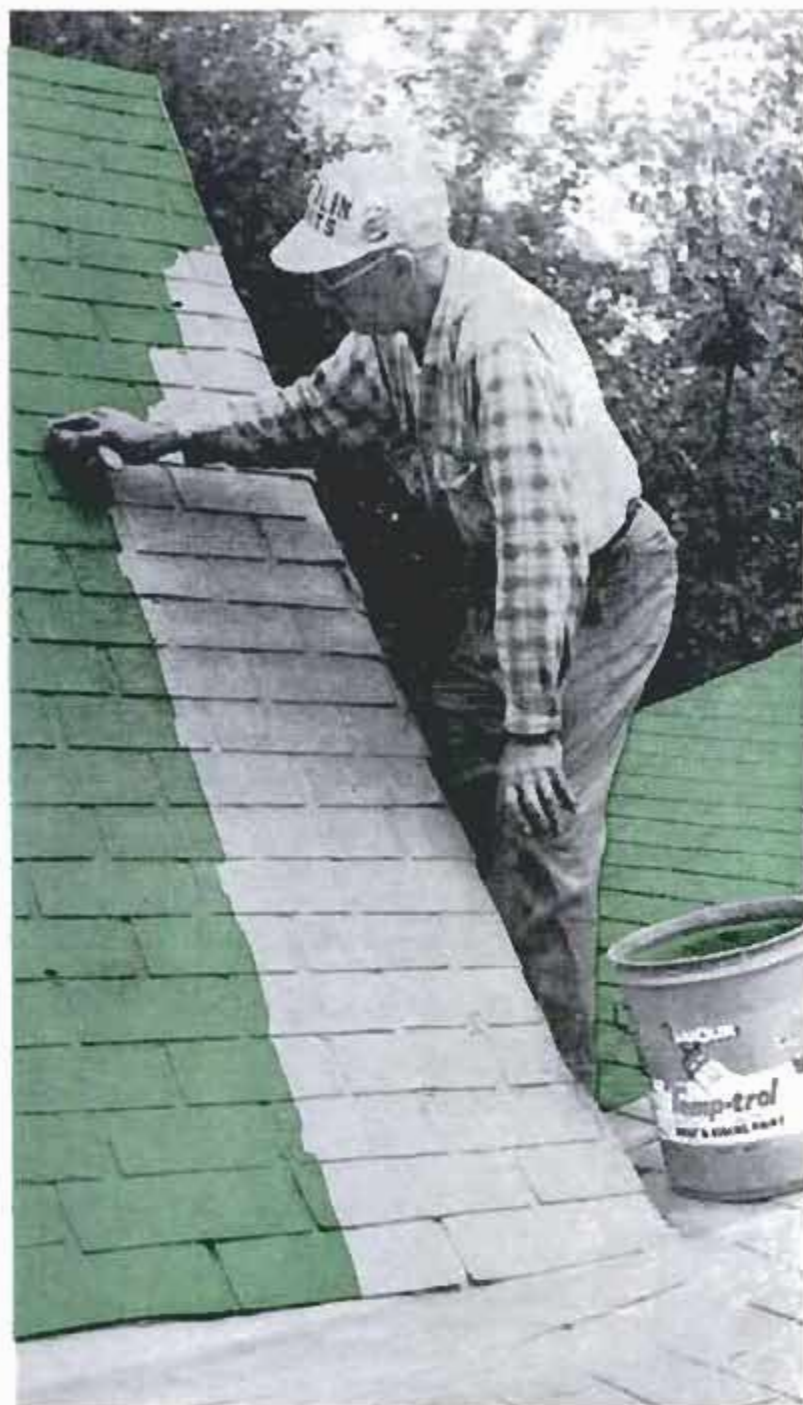
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Smaller, More Sensible Cars Lead 1960 Parade

Some cars are bigger, some more luxurious, some more expensive, but three small cars are the most exciting



Valiant

Longest of the three new small cars (yet it has the shortest wheelbase), Chrysler's Valiant boasts a classic look. To permit a lower hoodline, the six-cylinder engine is tilted 30 degrees to the right. Detailed story of this car is carried elsewhere in this issue.

Corvair

Radically new, the Chevrolet Corvair claims these modern American firsts: First air-cooled engine; first no-tunnel floor; first rear engine; first flat six; first full-independent suspension; first transaxle. Only four-door sedans are offered now, but variety will come later.





Most conventional of the three new small cars, the Ford Falcon is designed for ease of maintenance and economy of operation. Its styling is simple yet modern. It alone of the three has only two headlamps. Coil springs are used in front, leaf springs in the rear. Seats offer chair-height comfort and its unit body (with bolt-on front fenders) is quiet.

Falcon



Thunderbird

Riding a success wave, the T-Bird is little changed. Grille has added several chrome bars. There are six rear lights instead of four. A European-type sliding roof panel is optional on hardtops. Convertible tops are fully automatic for the first time.

Chevrolet styling has "matured" a bit. Rear-deck change lowers the trunk sill 1.5 inches for easier loading. Front floor hump is lower and narrower. Front-end styling is simplified—the overhanging brow is gone. Brakes are greatly improved. Standard V8 has been made more economical, other engines are virtually unchanged.

Chevrolet





Buick

Buick looks more massive. Squared off are the sharp 1959 lines. "Portholes" are back as fender ornaments. Engine options include a regular-gas economy model and a "hot" premium-gas model. Lower floor pan adds to front-seat height. Muffler sits crosswise behind rear axle and is as big as a hot-water tank. Instrument panel adjusts, like a mirror, to match driver's eye level.

Chrysler

All is new at Chrysler. Body is now of unit construction with stub frame bolted ahead of firewall to carry front-end chassis elements and engine. Styling is in Chrysler tradition with a 300-type grille and bold fins. Additional details are found elsewhere in this issue.



Edsel

Gone is Edsel's controversial grille, but that's not the only change. It is 5.5 inches longer, 2.7 inches wider, an inch lower. Interior room is improved, especially width. Getting in and out is easier as no windshield post intrudes into entryway. Engines have cross-flow radiators for lower hoodlines. Only two series are offered: Villager, the wagons; and Ranger, all others.





Studebaker adds two new bodies for 1960. This convertible and a four-door wagon. Both available with either Six or V8 engine. Style changes are minor. Single headlights are retained. Carburetion is new in both engines for added economy. The Six has combustion-chamber modifications. Hawk V8s are larger, now have 289 cubic inches instead of 259. More details elsewhere in this issue.

Lark



American

Rambler's American series now has three models. This two-door station wagon (roof rack standard equipment); a two-door sedan; and a new four-door sedan. All have 100-inch wheelbases. Power steering now optional, if you insist. Gas tank has been enlarged to hold 22 gallons.

With all-new sheet metal, Rambler stays in character. Front end is flatter, tailfins fold quietly around bigger taillights. Squared trunk lid adds to luggage space. New three-seat wagon has rear-facing third seat, but no tailgate—instead the back opens on vertical hinges like a normal door. More details elsewhere in this issue.

Rambler





Plymouth

Brightly styled in a new unit body, Plymouth retains its characteristically bold fins. Stylish "bare knee" front fenders with reverse-curve wheel openings add an eager, lunging look. New overhead-valve six is built on a 30-degree angle to permit a lower hoodline. V8 is little changed. More details elsewhere in this issue.

Dodge Dart

Dodge's new Dart comes in three series: Seneca, Pioneer and Phoenix. Last named comes as a V8 only, others offer a new overhead-valve six as well. Darts share wheelbase and price class with Plymouth. Styling is distinctive as you can see.



Ford

You won't believe it until you measure it, but the 1960 Ford is 5.7 inches longer than last year's. To the eye, it looks smaller. Styling is the great fooler. Handling and ride are much improved as Ford has its first all-new chassis in three years. Engines remain basically unchanged, although only two V8s are offered instead of three as in 1959. More details elsewhere in this issue.





De Soto now has only a 122-inch wheelbase (last year it had 126 also). Two series (Firelite and Adventurer) come in three body styles (no convertibles, incidentally). Length and height are reduced, width increased. Engines and transmissions are little changed, but a high-performance ram-induction intake manifold is optional, as are seats that swing out automatically when the door opens and a player for standard "45" records.

DeSoto



Ambassador

Ambassador, like the smaller Rambler, has changed a lot but a little. Sheet metal is all new, yet the Rambler image remains. Horsepower is down slightly (as in the Rambler) for added economy. This car now will run on regular gas. Also new are rivetless brake linings.

Dodge comes in two sizes. The smaller Dodge Darts have 118-inch wheelbases. The bigger model (below) has a 122-inch wheelbase. However, it is 4.8 inches shorter, 2.0 inches narrower and 1.9 inches lower than last year. High-performance D500 model has a ram-induction manifold to boost power in middle-speed range. These big Dodges are called Matador and Polara.

Dodge





Oldsmobile

Oldsmobile lowered its profile by removing the fins from rear fenders and shortened its length by front bumper and fender changes. Interiors are new. Front floor hump is lower and narrower. New this year is a three-seat wagon with the third seat facing rearward. Optional economy V8 has low compression ratio, stingy carburetor and uses regular gasoline.

Mercury

Mercury's new look hides a refined chassis. Under-the-skin changes give it an even quieter, smoother ride, devoid of harshness. Gas economy is up 10 percent and with regular gas. Instrument panel lifts out for servicing simply by removing two screws.



Imperial

Imperial has all-new sheet metal, but its body shell is retained. Interior room is improved by new seat design. Cushions are now six inches of luxurious foam rubber. In the LeBaron, the rear window is very small, bringing a revival of the privacy that limousine owners enjoy. Vent windows in front doors are power operated. Steering wheel is flattened top and bottom for more driver kneeroom.





Pontiac

Pontiac has a new front end with emphatic horizontal lines. Body shell is unchanged except that the front floor hump is reduced for more interior room. New engine-cooling system eliminates hot spots in the block. Steering wheel is smaller. Instrument cluster is redesigned and the speedometer is a horizontal bar. Interesting is the use of a piece of genuine wood (mahogany) for decorative purposes on the dash.



Lincoln

Lincoln's rear deck has been lowered and its canted rear fins capped with brightwork. The roof panel is new. Other styling changes are minor. Engines and transmissions have been refined. Rear suspension is new with leaf springs and a Hotchkiss drive replacing the former coils and trailing arms.

Cadillac

Cadillac fins are more restrained. Other styling changes are minor. Front floor hump is lower, narrower. Rear brakes are finned for cooling. Vacuum-release parking brake goes off automatically when transmission is put into gear with engine running. Turn-signal indicator lights (formerly on dash) are now atop front fenders.





Low and stylish, the Valiant has no economy look about it at all

WHAT KIND OF CAR IS THE VALIANT?

By Art Railton

WHAT IS THE Valiant's outstanding characteristic? Handling, says Jack E. Charipar, Valiant chief engineer who has been in on its design from the start.

This car goes around corners with a pleasing flatness. It does everything that way—there is no pitch, no sway, no flip-up, not even on the most dipseydoodle roadway.

Some say the Valiant is the most European of the new small cars. If so, certainly part of the reason is Jack Charipar. He was liaison engineer between the Italian body builders and Chrysler Corporation from 1953 until 1957 (when the Valiant project was started).

He probably knows as much about European cars as anybody in Detroit. He studied the foreign-car industry from axle ratios to wage rates during his four years overseas. His study, first of several that lead up to Chrysler's negotiations with Simca, was the one that put the Valiant in gear.

The Valiant, as you can see for yourself, looks more continental than either of its competitors. Yet, unlike most European cars, it doesn't look small or even compact (whatever that is). To the eye, it appears a full-size automobile. To the tape measure, however, it comes out a surprisingly small 184 inches long over-all.

Its styling is genuinely automobilish. It looks like

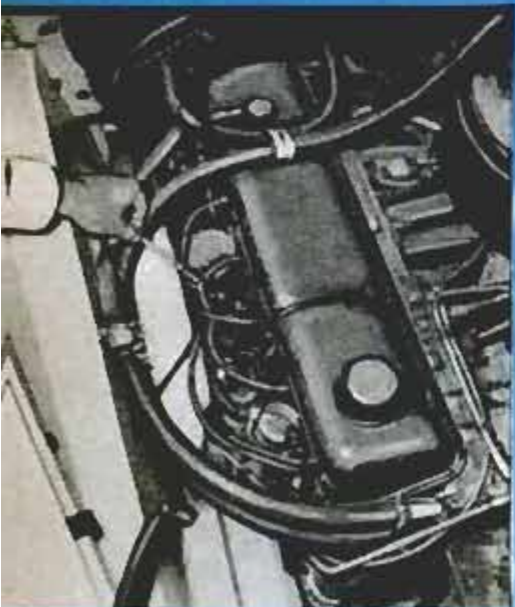
Every inch is made to count. No waste space here. Top right, the front-seat access is excellent; no windshield dogleg to bang your knee against. Center, all doors are thin so they don't intrude on inside space. Bottom, even rear-door foot-entry room is adequate





Above left, spare fits in trunk well. Valiant's trunk is largest of the three small cars. Above, profile has an eager, lunging look

Left, right hand falls naturally on the floor-mounted shift lever and shifting up and down through the three speeds is fun again



a strong, healthy automobile, not like an austere, economy-muscle facsimile.

It not only looks bigger than it is, but it "feels" bigger. The Valiant's big-car sensation surprises everybody who drives it for the first time. Many things combine to create this feeling, but one very important item is its engine, which has the largest displacement of the three new small-car engines. The block is big, substantial and well-jacketed. It takes 14 quarts of water, compared with 9.3 quarts for the Falcon and, of course, none for the air-cooled Corvair. It takes more oil than the others.

Thus the engine is surprisingly unstrained, surprisingly muscular in response and agile in performance.

Unlike the Corvair which is technically exciting and bold, or the Falcon which is sensible and economical in character, the Valiant seems more luxurious, more substantial, than it has any right to be.

There is no evidence of austerity, no look of miserliness. It provides as much comfort as the biggest car, even on long trips, says Charipar (who has taken many in it). It is just as durable, just as solid.

Actually, in many ways, it is a better car than its bigger brothers. The value curve of the automobile,

Left, engine tilts to the right. All service items except carburetor and generator are on low side. Pencil points to the distributor

Below, despite a relatively soft ride, the Valiant corners flat and has virtually no pitch on bumps. Front suspension is by torsion bars





Inside the Valiant there is no feeling of smallness. It has ample room for a couple and four children

like the power curve of an engine, is not a straight line. Per pound of machinery, the bigger is the better only to a certain point. The Valiant, says Chrysler, comes at the point in the curve above which you begin getting less per dollar spent.

While the Valiant has a lot of Europe in its background, it avoids the austerity feeling that is considered unacceptable to Americans. It has none of the noise, sluggishness or claustrophobia that are associated with economy-type transportation.

It is an interesting contradiction that while the Valiant looks most European of

the three new cars, it feels and acts least like a European import.

It is a full-bodied, all-American-boy type of car under its Italian styling.

The continental look is due, says Charipar, to the fact that Chrysler's top stylist Virgil M. Exner has done as much to make Italian styling what it is as the Italians have. There has been a two-way exchange of ideas between Exner and such body makers as Ghia and Farina for about 10 years.

As an example of this, Charipar points to the well-known and handsome Volkswagen

(Continued to page 270)

Circle on rear deck is an imitation spare-tire cover. The gas tank filler cap is just behind wheel opening





Sleek lines make the Ford Galaxie look smaller even though it is five inches longer than last year's car. Headlights mount inside the wide, low grille and parking lights are located in the edges of the fenders



Top, wagons have sloping rear end, providing lots of luggage room even behind forward-facing third seat. Above, front-seat knee-knocker is out

Ford Is Longer, Wider

FEW WILL RECOGNIZE the 1960 Ford, so changed is it. Gone are its conservative styling, its squared-up personality. Gone, too, is the kneeknocking wraparound windshield (it now curves upward into the roof).

Although 5.7 inches longer and 220 pounds heavier, Ford's modern styling camouflages the added size. The new car actually looks and feels smaller, lighter and more nimble.

The 11.8-inch-longer frame is the same cow-belly design used previously, but it now extends all the way from bumper to bumper. Tread is wider (61 inches front, 60 inches rear) and over-all width of the body is 81.3 inches, 5 inches wider than in 1959. Shoulder room is 3 inches greater in front, 4 inches greater in back.

Body mounts and engine mounts are redesigned to give the quietest, most vibration-free ride in Ford's history. Handling has been sharply improved also. Suspension, front and rear, is new, although conventional. Longer rear left springs are now mounted sharply unsymmetrically with one-third in front of and two-thirds behind the rear axle, providing a softer ride, yet with less windup during acceleration.

Front fenders bolt on. Actually, they are mostly vertical panels as the top part of the fender is formed by the extremely wide hood (which, by the way, is now hinged in back in a conventional manner).

All engines have been modified for improved performance, but basic designs are unchanged. The 332-cubic-inch optional V8 has been dropped. Continued are the 292-cubic-inch standard V8 and 352-cubic-inch optional V8 (plus the 223-cubic-inch six, of course).

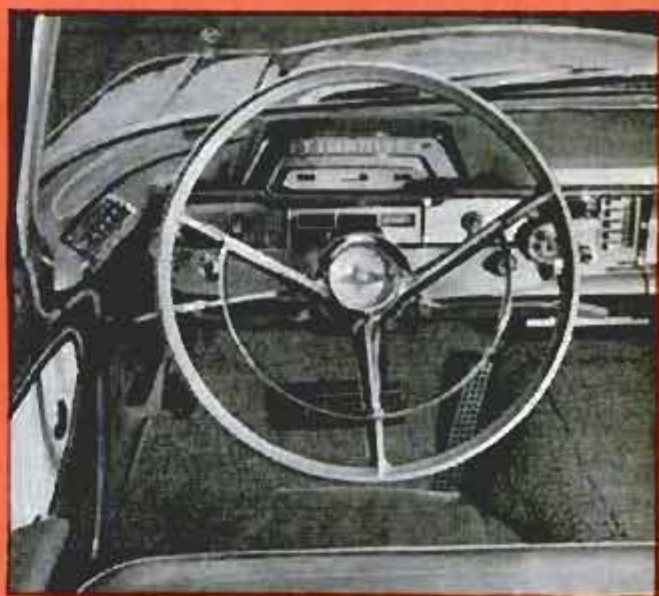
The radiator is of cross-flow design and water is poured into a separate tank rather than into the radiator itself. This separate mounting of the tank permits the lower hoodline of the 1960 styling.



Rear styling has a flat, finny look. Taillights are lower and smaller than previously. There's no retractable hardtop this year



None of the previous Mercury image remains except the roof panel and glass area. Beneath the new look, there is much new engineering, ranging from a jet-action defrost system to a more accurate spark advance



Left, dual headlamps are set widely apart. Right, removable instrument panel will please mechanics. Loosen two screws, disconnect speedometer cable and one wiring plug and the all-printed-circuit panel lifts out

Mercury Gets Smoother Look, More Economy

NO LONGER does Mercury have boldly sculptured styling. It is smoother, quiet in appearance—and operation as well.

Taillights are built into the rear bumper and cant outward. The grille is formed of concave vertical bars (see page 87). Dual headlights are widely spaced. The only major sheet metal piece that has not been changed is the roof panel.

Only two-barrel carburetors are offered, no four-barrels being available. Two of the three engines are designed for regular gas: The 312-cubic-inch V8 with 205 horsepower and the 383-cubic-inch V8 with 280 horsepower. The 430-cubic-inch V8 requires premium fuel and develops 310 horsepower. All engines have a 12,000-mile disposable gas filter built into the fuel lines.

Spark plugs mount deeper in the combustion chambers which were reshaped for added turbulence. Intake valves are slightly smaller for more fuel-charge velocity.

Chassis changes give an even quieter, smoother ride than Mercury had in 1959. Seat cushions are softer and depress more for added headroom and comfort.

Accelerator pedal operates the throttle linkage from its pivot at the bottom rather than from the usual position at the top, in this way eliminating a hole in the toe-board.

Windshield wipers are electric and work at three speeds. Wiping action is parallel. There are no blind spots between the arcs. Windshield-washer fluid is squirted by a new pump through the blade arms directly onto the glass so the liquid doesn't blow away at high speed.

Spot defrosters are a valuable safety item. As soon as the defroster is turned on, two powerful jets of heated air clear two spots directly in the driver's line of vision, instead of defrosting the glass from the bottom up.



Concave transom area, vertical taillights and stubby tailfins make the Edsel distinctive from the rear. The body is lower and longer—so much so that this four-door sedan looks lower than hardtops did last year.

Edsel Takes on a New Personality

DROPPING ITS trademark, the vertical grille, Edsel has adopted a low, wide design in front that is very similar to that of a highly successful 1959 car (see page 83).

From the rear, the Edsel is new also with a massive rear window that has 63 percent more glass area. Vertical taillights and backup lights stand side by side, jutting above the rear-deck line. Crisp side-panel sculpturing ends in subdued, flattened fins.

Like Ford (whose shell it shares), Edsel has increased its body length by more than five inches and lowered its roofline by one inch. It's a lot easier to get into the front seat, thanks to the absence of the dogleg caused by the former wraparound windshield. This year, front entrance room has been increased almost 10 inches.

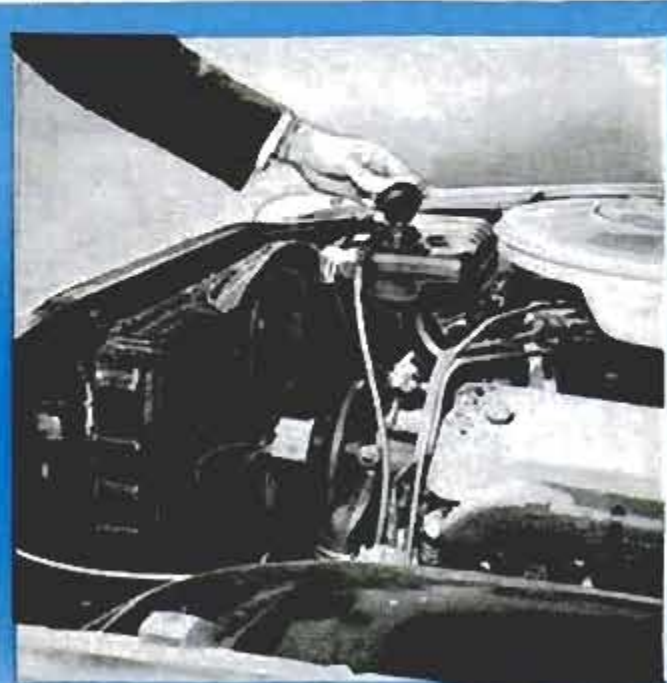
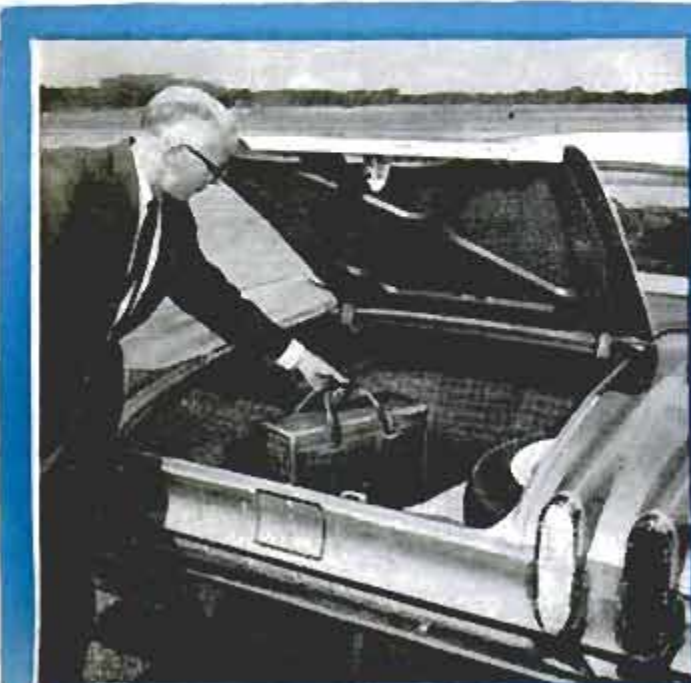
Two different roofs are available. Two-door hardtops have a fast-back design that slants smoothly from roof to rear deck. Four-door models and two-door sedans have a wider rear pillar and a more vertical rear window.

The second seat of the six-passenger station wagon can be folded to form a flat load bed quickly with one motion. The nine-passenger wagon has three forward-facing seats and its third seat is cushioned only by a foam-rubber pad that slips off when the seat back is folded down into the floor.

Standard V8 is the 292-cubic-inch model. An optional 352-cubic-inch V8 with four-barrel carburetor comes with a three-speed automatic transmission if desired. The 223-cubic-inch six is retained.

Edsel's longer and wider frame permits the trunk to be 6.5 inches deeper and 6 inches wider than in 1959

To enable the stylists to lower the hoodline, engineers separated the radiator tank from the cross-flow core





Sculptured fenders, squared-off rear deck, flatter roof, give Rambler a new look. Right, front-seat entry room is greater

Rambler Gets Three-Seat Wagon

CLEAN AND CRISP, Rambler's new styling is in character. Despite all-new sheet metal, the car remains readily identifiable.

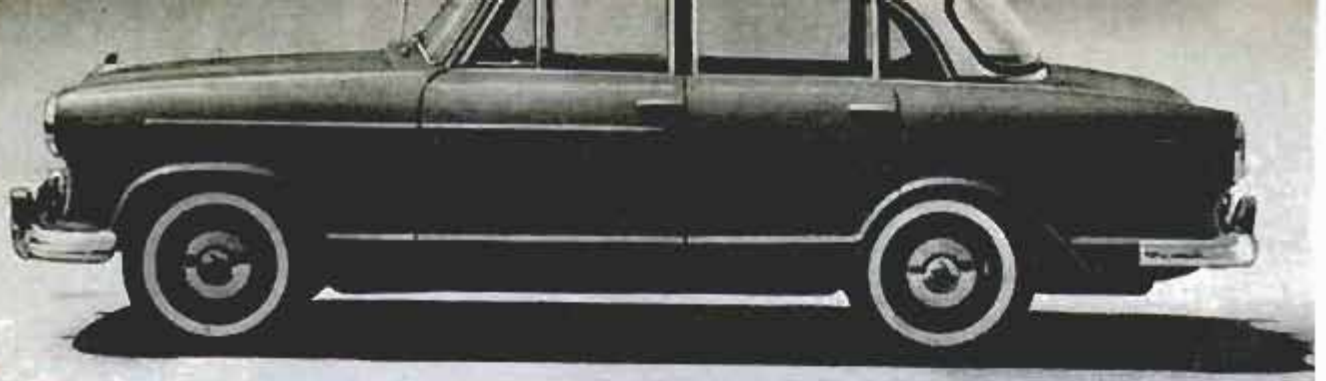
Available for the first time is a three-seat wagon in which the usual tailgate has been replaced by a side-hinged door that swings open to simplify access to the rear-facing third seat. On this model (in which there is no space for an extra wheel), captive-air tires eliminate need for a spare.

Flatter roof lines and narrower vertical posts increase glass area slightly. Instrument panel is new. Push buttons are used for automatic-transmission control. Reclining seats and headrests are optional. Horsepower is reduced to 200 on the Rebel V8.

Ambassador models have compound windshields that wrap upward into the roof.

Below, new wagon has rear-facing third seat. Right, its rear door is hinged on the side, replacing the two-piece tailgate

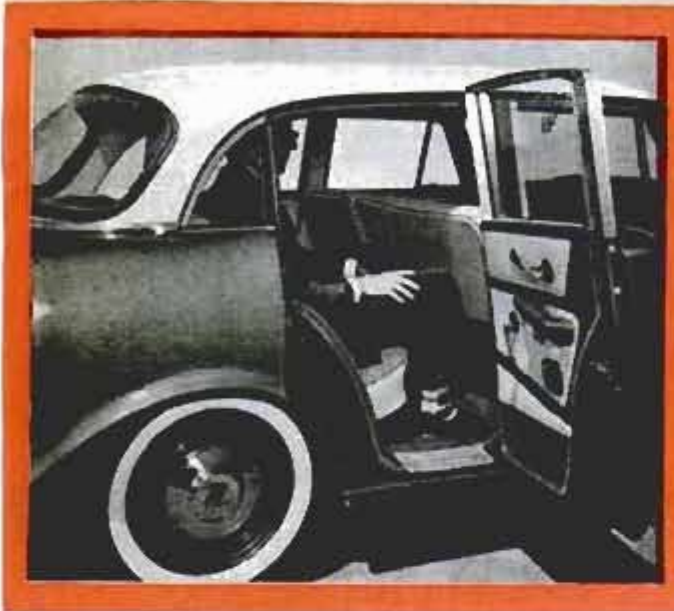




Rambler American four-door sedan. Left, despite a 100-inch wheelbase, rear-seat entry room is good

American Gets Four Doors

NEW IN THE Rambler American series this year is a four-door sedan to go along with the two-door sedans and station wagons that accounted for 25 percent of American Motors' 1959 production. Restyled only slightly, American has doors that open wider and more glass area. It retains the 90-horsepower, six-cylinder L-head engine.



Studebaker Adds Lark Convertible, Four-Door Wagon

ENCOURAGED by its 1959 success, Studebaker has added two models to its Lark line: A flashy convertible (the only one in its field); and a four-door station wagon. Continued is the low-slung Hawk series.

All Larks offer a 90-horsepower, L-head six, a 180-horsepower V8, both virtually unchanged, plus a 195-horsepower option.

Two-door wagons are continued. Glass

area in the rear side windows and the rear-transom window has been increased. The upper half of the tailgate automatically locks in position when opened. Roof luggage racks and a rear-facing third seat are available. Three-seat wagons have Captive-air tires, since there is no room for carrying a spare.

Styling is virtually unchanged for 1960.

Studebaker Hawk, with only trim changes in styling, now offers a larger V8 that develops 210 horsepower





Reclining seats and headrests are optional on all Larks. This convertible and the four-door wagon are new

Among several engineering changes, the Lark six carburetor is new, having been designed for improved operation under extreme weather conditions. The starting motor has also been modified to assure cold-weather starts.

Legroom in the rear seat is improved somewhat by cushion changes. Accelerator pedal is now at a more comfortable angle.

The bigger Hawk V8 develops 210 horsepower. Dual exhausts and finned brake drums are standard equipment on this car.

Retaining single headlights, the Lark has a new screen in its grille. Other than that, styling is unchanged





Above, Windsor two-door hardtop. New Yorker models have slightly different grille. Below, new dash has glarefree electroluminescent lighting. Push buttons (for transmission and heater) are mounted horizontally



Chrysler Has Sports-Car Look

QUIET AND WELL-MANNERED on even the roughest roads, Chrysler has a roomy unit body that eliminates all frame but a short front stub. This stub bolts to the body at the firewall and supports engine and suspension. Exterior styling features a sporty look with a race-car grille. Electroluminescent lighting is used on the hemispheric instrument panel. In it, dials and needles are the light sources, rather than illumination by bulbs.



Plymouth Has New Overhead-Valve Six

FEATURING AN ALUMINUM intake manifold, the new six-cylinder Plymouth engine inclines to the right at 30 degrees. This lean-to design allows a low hoodline, low center of gravity, and lets engineers mount the water pump beside the block rather than ahead of it, thus shortening over-all length. Styling is all new, but recognizably Plymouth. Other options include automatic door locks, automatic swivel seats and an automatic-changing record player.

Above, there's lots of room to slide under and see over the squarish steering wheel that is optional on Plymouth. Below, unlike some companies, Chrysler Corporation retains its fins—Plymouth's most of all

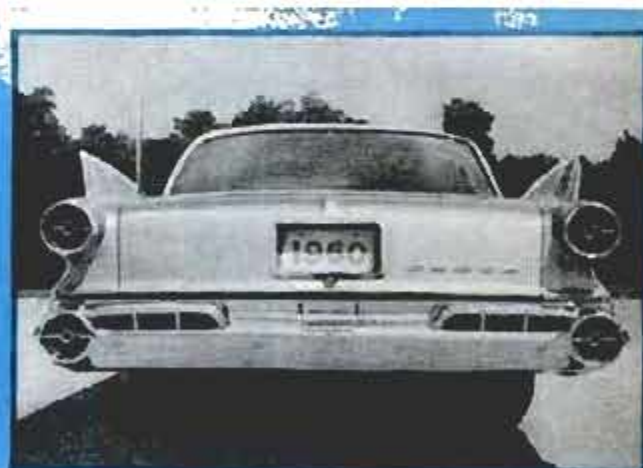




Above, the Dart has a Dodge look, but front and rear-end treatments are distinctive. Wheelbase is 118 inches. The bigger Dodge, below, is on a 122-inch wheelbase. Both series have jet-tube rear fenders, big taillights

Dodge Offers New Dart

DODGE ENTERS the low-price field (not to be confused with the small-car field) with its new Dart series. Built on a Plymouth chassis with Dodge appearance, the Dart is available as either a six or V8. The six is the Corporation's new overhead-valve tilted engine. Dodge's big cars have new names: Matador (361-cubic-inch V8) and Polara (383-cubic-inch V8). Ram induction is optional.



DeSoto Adopts Unit Body

THERE'S MORE ROOM in the 1960 DeSoto, thanks to its unit body. The floor plan is lowered, giving more legroom and permitting seats to be higher. Entry and exit is easier because the windshield pillar has been moved forward out of knee's way. Optional is a safety lighting system that flashes all four turn signals on and off continuously to warn approaching traffic of the parked car.



Tailfins cant outward on DeSoto. Styling is simple, without clutter. Windshields are bigger, so are rear windows. Swivel seats swing out automatically as the door opens. An automatic record player is optional





Ribbed aluminum decorates panel below the trunk lid. Left, wheel has no horn ring. Pushbar built into each spoke operates the horn



Cadillac Gets New Rear Styling

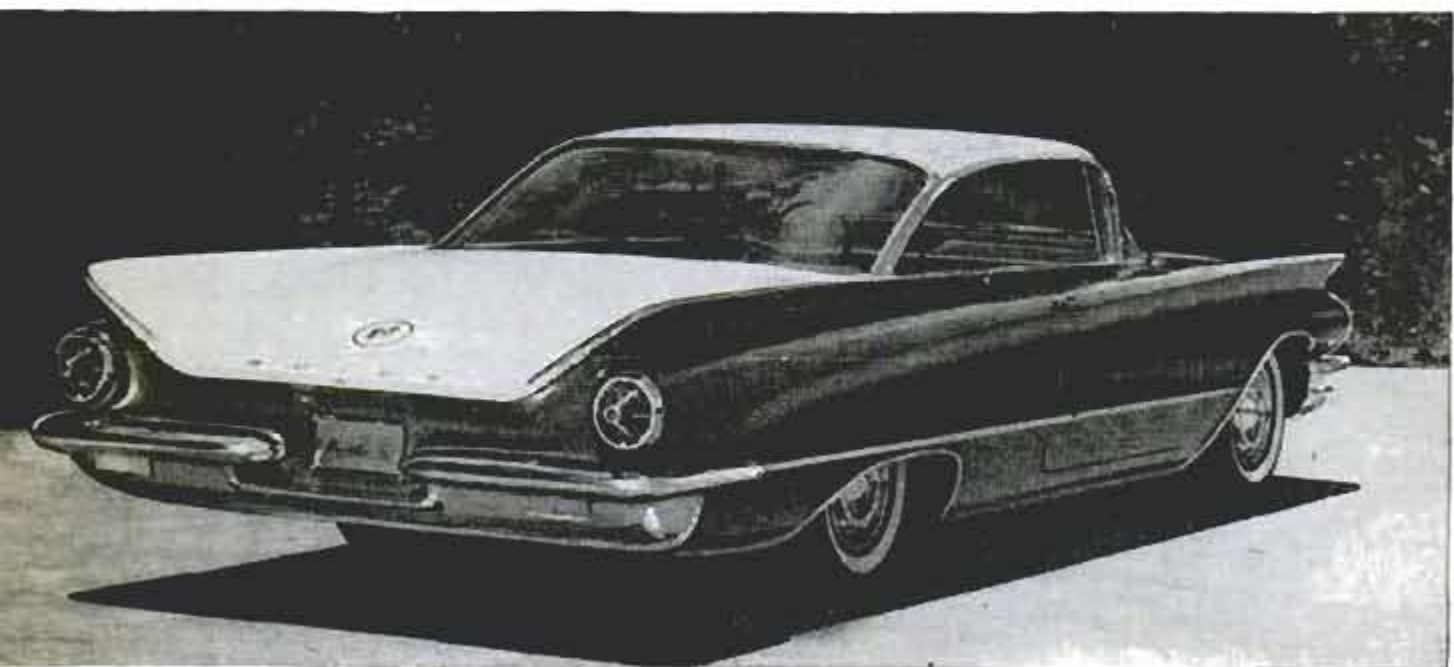
BORROWING FROM the Eldorado Brougham, Cadillac has given its famed fin a more sedate look. Taillights are faired neatly into the reverse slash of the fin. Additional lights mount in neat ovals at the bumper ends. Front-floor hump has been reduced and pedal room increased for driver comfort. A cantilevered spring has been added to each lower arm of the rear suspension.



Buick Adds Many Refinements

UNDER ITS less-rash exterior, Buick has made many changes and refinements. Regular-gas engines are optional. The triple-turbine transmission is dropped. A shutoff valve has been added to the rear-seat heating duct. The engine now has 29 pounds of aluminum parts. There's even an optional switch that turns on headlights automatically when darkness falls, should you forget.

Left, headlights are horizontal, no longer diagonal. Below, fins are "toned down." Almost all exterior sheet metal is new



Editor's note: This month Art Railton's page becomes, instead, the "Frankfurt Listening Post." We sent him to Europe to report by cable on the European cars exhibited at the greatest of overseas automobile shows at Frankfurt in West Germany.



By Art Railton

FRANKFURT, GERMANY—Bigger, fancier, more glass, more room and more luxury, that's the automotive trend in Europe, if the evidence of the Frankfurt Automobile Show can be believed. As Detroit begins to make more sense than ever with smaller, more practical designs, the Europeans move towards greater luxury, greater opulence.

The trend is unmistakable. Two years ago at the Frankfurt show, Germans were excited about the minicars which were to replace the dangerous, uncomfortable motor scooters. Germans with money in their pockets milled around tiny automobiles—cars that were just a little more than scooters. But that was two years ago. This year, minicars are scarce and scooters virtually nonexistent.

Except for the slow-to-give-up Messerschmidt, which admits partial defeat by emphasizing its four-wheel model instead of its three wheeler, the minicars are represented only by the Goggomobil. And even Goggo has bowed to progress with a new model, the Isar, which starts in at 600 cubic centimeters, one of the few cars still being built near a half liter.

Two years ago one-half liter engines were as common as beer and sausage at the show. This year they are the very smallest. It is apparent that Europe is being bitten by the same bug that infested the United States after the war. Cars are becoming bigger, engines are bigger.

Windshields (like the new DKW) wrap around, fins (like the Mercedes) sprout from the rear fenders, taillights (like the Fiat) are brighter and bigger. And the people love it. Here we see the result of the fast-rising standard of living. Soon German scooter and bicycle makers will have to ship their wares to India, or to China.

Driving on the Autobahn, no longer do you thread your way around motorbikes and tiny three wheelers. Today traffic is fast and heavy, consisting of cars from Volkswagen size and up, rather than down. Four years ago, the VW was an upper-middle class car driven by doctors, lawyers and businessmen. Two years ago, it had become the car of the skilled workers, the

factory supervisor, the technician. Today it is the car for the worker.

Parking lots at the VW plant are filled with new Volkswagens. The long rows of bicycle racks are virtually empty. Never before have so many Germans crowded into the VW exhibit at the Frankfurt show. Never before have so many been anxious to look at, to feel, to sit in the car that is more common in Germany than Chevrolets are in the U.S.A. (one of every three cars here is a Volkswagen).

Now they touch it and plan to own one. Once they merely looked but now they plan to buy. Volkswagen officials are pleased, not worried by this. They see this as broadening the base of a market that has made this company the miracle child of postwar Europe. It will mean greater sales, more orders, they are sure. To satisfy this demand, another assembly line and another plant are being built.

What about the American owner? Will the American sophisticate who now drives a VW be content when it is the car of the masses of Europe? Dr. Heinz Nordhoff, brilliant and articulate head of Volkswagen, is not worried. He looks upon his car as the answer to the transportation needs of all countries, of all classes; the true international automobile—a car at home in all countries among all classes. As Coca-Cola is becoming the universal drink of the world, perhaps Volkswagen is becoming the universal automobile.

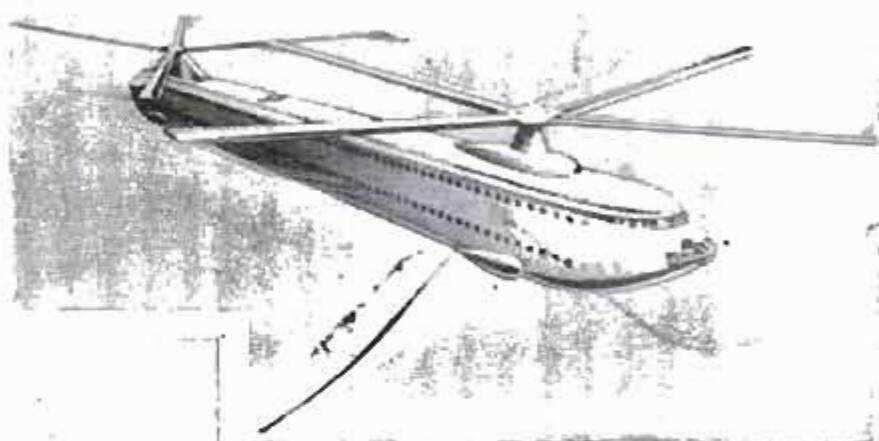
At a press conference at the Frankfurt show, Professor Nordhoff told a group of American automobile writers that he would not change the Volkswagen specifically to meet the demands of the American market. America, he emphasizes, is only one of 110 countries in which the car is sold. Although America is the best customer in volume, the car cannot be modified to please one country at the expense of the others.

Yet Nordhoff did announce that VW will make optional this spring a Saxomat automatic clutch which will eliminate the clutch

(Continued to page 264)



Sikorsky S-60 crane helicopter will do major moving and lifting jobs for Army. Twin-engine, piston-driven S-60 has detachable passenger and cargo pods. Flight vibration is virtually eliminated by cushioning device between cabin and airframe proper



Studies have been completed by Bell Helicopter Corporation for giant nuclear-powered copter with fuselage 300 feet long. As troop or cargo plane it could cruise at 200 miles per hour



←Using cable sling, HR2S-1 Marine Corps helicopter lifted 5615-pound damaged aircraft from New River, N. C. to Cherry Point, N. C. for repairs. Sixty-mile trip took only 51½ minutes

Weighing only 350 pounds, Adams-Wilson HobbyCopter can be built by owner from engineering information and component kits. Single seater has two-blade main and tail rotors and top speed of 60 miles per hour. Power comes from motorcycle engine



HELICOPTERS MAKE STRIDES

Designed primarily to lift sling loads, crane helicopter built by Britain's Westminister has tubular steel fuselage. Shown here lifting section of portable bridge, flying crane can handle loads up to 14,000 pounds. Its fuselage can be covered for transporting troops or cargo



Two 1940-horsepower turbine engines will power YHC-1B helicopter designed for Army by Vertol. New transport will have length of 50 feet and cabin capacity of 1600 cubic feet. Rear ramp will lend speed and flexibility to loading and unloading of troops and cargo. It will carry 40 troops

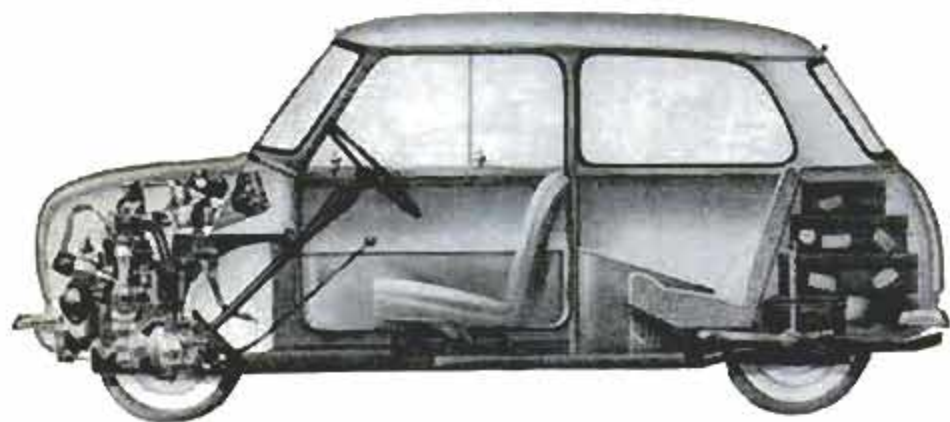


Three-turbine SE-3200 helicopter built by Sud-Aviation has single rotor with anti-torque tail rotor. Capable of carrying 20 to 30 passengers, SE-3200 also can be used in cargo-transport, casualty-evacuation, surveillance, antisubmarine warfare, boat and vehicle towing, and dredging

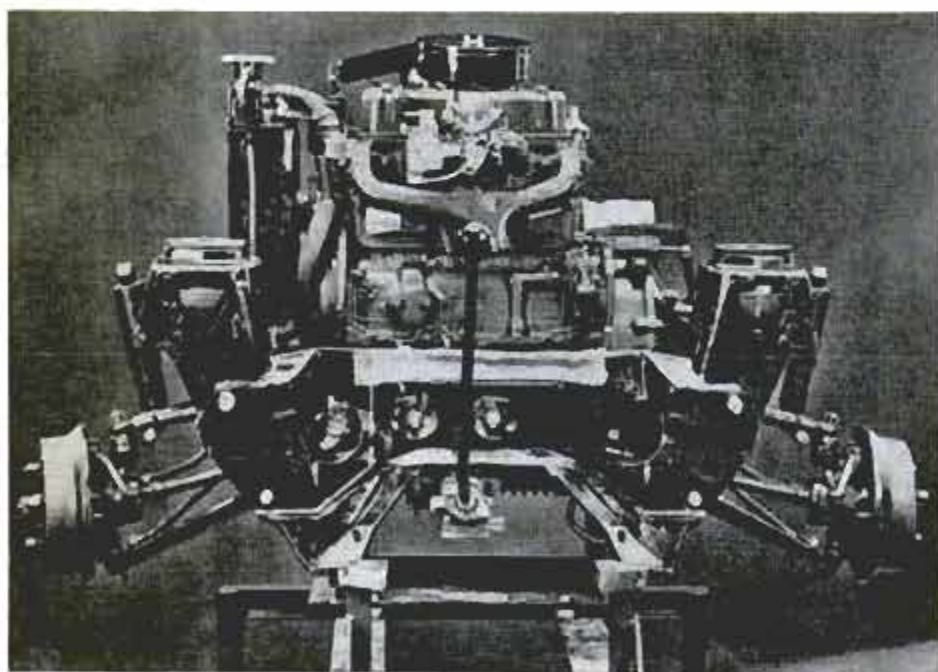




Despite no overhang, the small car has a surprising amount of trunk space due to absence of differential in rear. All four wheels are independently sprung with greaseless rubber springs. Drive is by front wheels



Above, engine, transmission and differential occupy only two feet of the car's ten-foot over-all length. They share one oil supply. A small tunnel runs along floor, enclosing exhaust pipe. Spare tire, battery and gas tank are in rear. Below, stubby engine mounts crosswise between front wheels. Radiator faces left. Shift lever is directly in center



British Car Has Front Drive

With rare boldness, the British Motor Corporation has brought out two baby cars that have front-wheel drive and an inline engine mounted crosswise between the two front wheels.

By this transverse mounting of the engine, BMC is able to seat four adults in reasonable comfort in a car that is only 10 feet long.

Available as either the Austin Seven or the Morris Mini-Minor (only difference is in trim), the tiny car is expected to sell in the United States for \$1300, well under the prices of the new American compact cars.

Wheels are only 10 inches in diameter and the car, despite its front-wheel drive, will turn around in under 30 feet.

The water-cooled inline overhead-valve four develops 37 horsepower and since the car weighs only 1260 pounds, performance is said to be nimble.

Next Month

The PM Houseboat

CUSTOM-DESIGNED for *Popular Mechanics* readers

TEST-BUILT for simplicity of construction

HERE'S the ideal craft for the recreational boater—a combination of seaworthy boat and vacation cottage.

DESIGNED by a leading naval architect for the handyman with ordinary tools and abilities, it's built of common lumberyard materials and marine hardware.

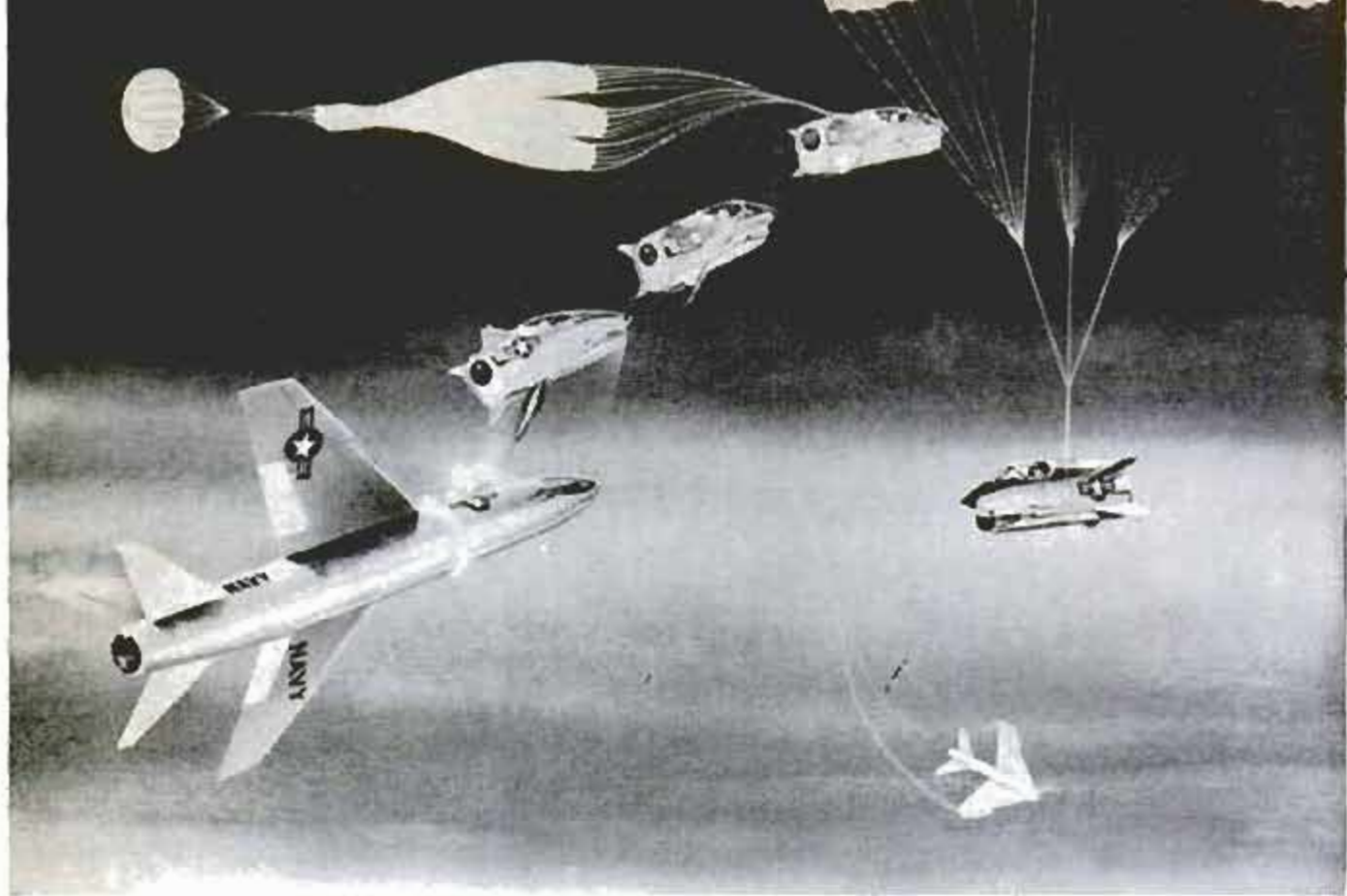
Here Are Just a Few of Its Features:

- Marine plywood planking
- Complete galley, head, and closet space
- Sleeping room for five
- Size: 8 foot beam, 24 feet long
- Designed for any outboard power combination
- Inside, forward controls



COMPLETE detailed plans, materials list, and dozens of photographs of the PM houseboat will begin in the December issue of **POPULAR MECHANICS** on your newsstand November 27th.

**POPULAR
MECHANICS**



Plane's Forward Section Becomes Escape Capsule in Emergency

Navy pilots will be protected in flying emergencies by a forward-section capsule that can be separated from the rest of the plane and parachuted to land. The capsule, newly developed by Chance Vought, relieves the pilot of having to wear or carry such equipment as oxygen mask, pressure suit, parachute, life jacket and raft. The capsule is sealed off from the rest of the

plane and is independently pressurized. In emergency separation, a rocket boosts the capsule away. Retractable fins stabilize it, and force-sensing drag brakes decelerate. At or below 62,000 feet and about 500 miles per hour, a first-stage parachute deploys. At 14,000 feet and 220 miles per hour, a second-stage cluster of chutes opens to handle the remainder of the descent.



Police Gun Barrel Mounts on Car Hood

Texas Rangers are hoping for straight, sure aims with a unique gun that is premounted on the hood and fired from inside the police pursuit car. Invented by C. A. Stockholm, the weapon has the trigger located at the center of the dashboard. Stockholm introduced the gun to the Rangers at the Hondo, Tex. Air Force Base. In a test showing, he fired bullets into a "getaway car," a station wagon covered with armor plate, with great accuracy.

French Saucer Dives 1000 Feet

Advanced underwater research is expected with a French diving saucer that is capable of diving 1000 feet into ocean depths. The saucer, christened "Denise," can stay submerged for six hours at a time. It is presently based at Marseille.

Birth of Life

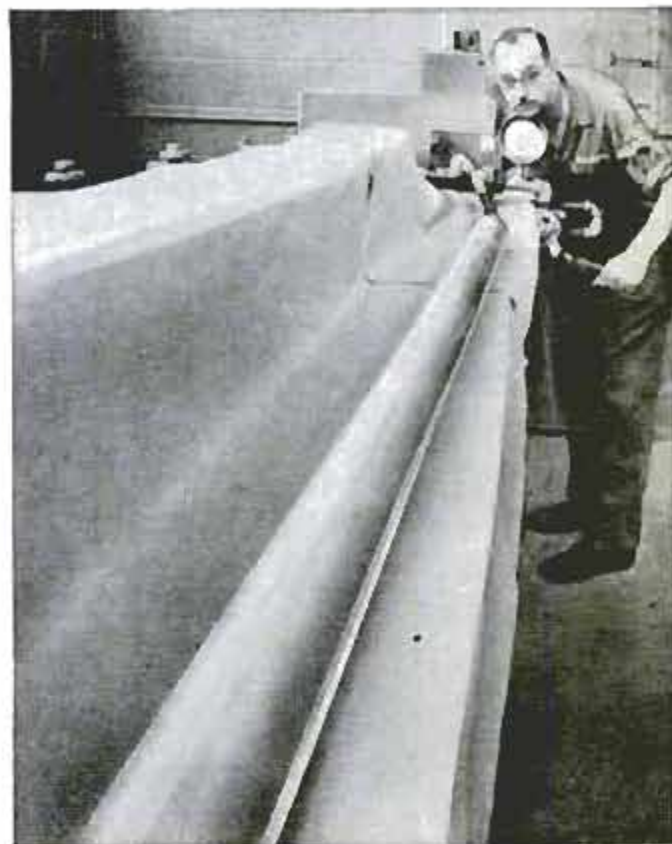
Two leading world scientists say it is most likely that the beginning of life occurred in the mud of tidal river estuaries rather than in the sea, during the time when the seas were still hot.



Metal Tubing Shipped Flat, "Blown Up" on the Job

Called "Strubing," an inflatable metal tubing has many advantages in easy shipping and handling. It is easily installed to form air ducts, conduit, downspouts and irrigation pipe, and can even be used as a packaging material for frozen foods. It is shipped in rolls. The user cuts off the length needed and inflates it with air or hydraulic pressure, or by mechanical means. Strubing is manufactured by cold-rolling con-

ventional tubing into ribbon form and forcing it to extrude lengthwise without increasing its diameter. It will eventually be available in diameters from 1/16 inch to six feet, with walls from foil-thickness to standard pipe weight, and in continuous lengths up to 15,000 feet. Enough Strubing for the ductwork on a seven-room home can be packed in a box the size of an orange crate.

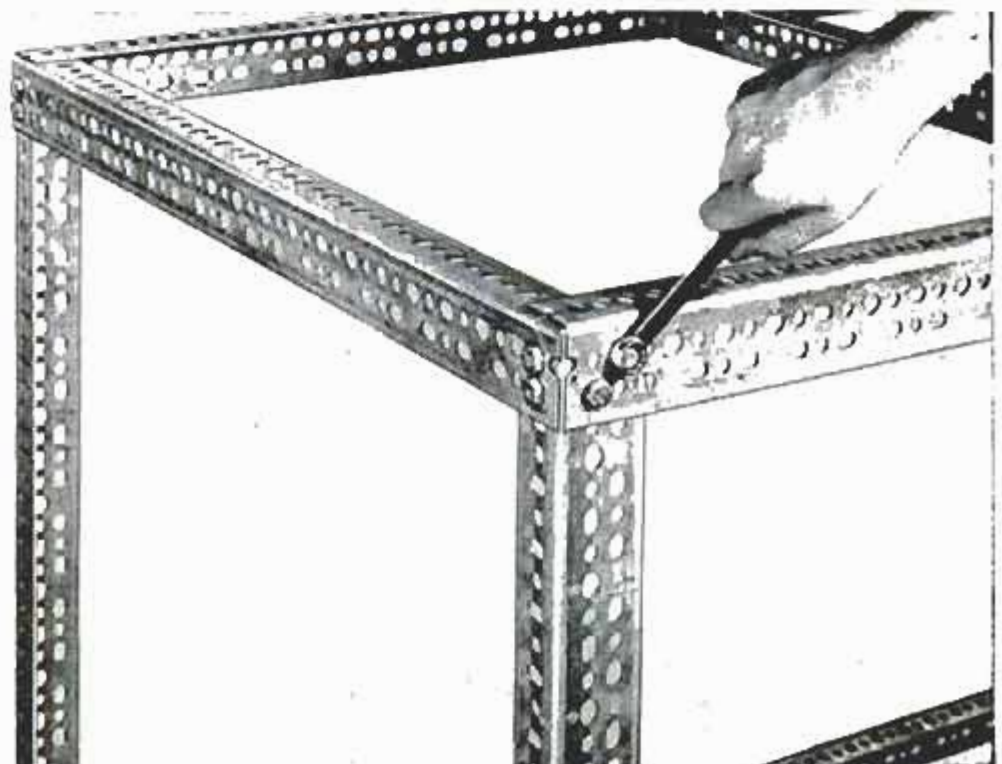




Mobile office or camp quarters are adapted from boat trailer by erecting sections of do-it-yourself steel

Your Toy Construction

Now the home craftsman or shop engineer can build fancy furniture, camp trailers or factory rigs with a king-size assortment of nuts, bolts and slotted bars.





One of the slickest of do-it-yourself steel comes in channel bars like that used to build this modern table

Set Grew Up

By
Richard F. Dempewolff

RECENTLY, A GROUP of engineers at a large steel company clustered around a kit containing an assortment of steel bars punched full of holes, and a collection of nuts and bolts. It looked like a king size version of junior's construction set—and that's just what it was. Instead of making toy derricks, bridges and skeletal towers, however, these men set to work with a small wrench and a cutting tool to demonstrate the useful versatility of something new in construction kits. Within an hour or two, merely by changing the arrangement of pieces and the location of nuts and bolts, they had built and dismantled a usable flatbed trailer, a boat trailer, a camp trailer fitted with upper and lower berths, and a variety of playground equipment.

Those particular slotted and drilled bars are called "Metal Lumber" by Republic Steel Corporation, which makes up kits in quantities of 100 feet (complete with nuts and bolts). They are only one of several brands of tricky structural steel products specially fabricated for quick, easy assembly by amateurs—into anything from trim modern furniture to dump truck bodies. "The very nature of the material," as one

manufacturer puts it, "provides plenty of room for the handyman's own creative bent. All he needs to do is make a sketch of the item he wants to build, cut the material according to the selected dimensions, and assemble the unit just as a youngster would bolt together the pieces of a toy construction set."

Most of the do-it-yourself steel, like Republic's Metal Lumber, consists of drilled or slotted (sometimes in combination) angle bars. Along with these, and the bolts for fastening, may come a variety of accessory pieces—joint plates for special corners, casters (in case you're making a tool table, or a dolly), a long-levered cutting tool for snipping the bars cleanly and precisely to provide made-to-order lengths, sprocket wrench for easier and faster bolt-tightening, and so on.

One system, called Flexangle, provides steel bars in two gauges—one for heavy loads, the other for more normal ones. This producer and Acme Steel, which makes a slotted angle called AIM, have an impressive array of charts showing ways in which bars may be combined to form channel steel, T-beams, I-beams and other configurations that can provide structures of



To add bunks to trailer, Metal Lumber bar is bolted down center and another piece is added across back. Canvas bunk platforms are rope-lashed through grommets to holes in side rails

Close-up of metal cutter shows how long-levered slicer neatly severs bar of AIM slotted angle. Wrench and hacksaw are sufficient for do-it-yourselfer who wants to build with steel



unbenvenable strength—an made with nuts, bolts and simple two-inch angles. A four-foot rack or table made with AIM's I-beam configuration, would support four medium-priced family cars piled one on top of the other. If you prefer it in pounds, a made-up I-beam of this material will carry anything up to the crippling load of 27,200 pounds!

For most consumer uses, however, single bars are plenty. A three-foot span of just the plain angle bar will support one ton. And it goes together with startling ease. On almost any project, the builder will start by bolting together a rectangular frame—the top of his table, the bed of his trailer, etc.—and build up or down from this basic form.

Versatile Trailer Built

In their recent demonstration, Republic's engineers started with the bed of a trailer, designed to fit an axle they had procured. A plywood panel bolted to this frame made it a functional flat-bed trailer. Then, four short corner posts were quickly bolted in place, after being cut to size by the single snip of a cutting tool. "A hacksaw will do as well," they admit. For the trailer, two bolts at each joint were enough to keep the framework rigid, but the men point out that in cases where extra strength is needed, it is a simple matter for the builder to cut and bolt diagonal bracing across the corners. Horizontal rails fastened to the posts gave the trailer a third dimension, with protective rails for hauling luggage and other cargo. With plywood panels bolted to the side frames, it became a truck body for hauling soil, rocks, loose produce, etc.

By raising the side rails, lowering the rails in front and back and replacing them with bars in the form of a "V"—a job consuming about 15 minutes—the unit suddenly became a boat trailer capable of carrying a 14-foot outboard runabout. With the addition of peaked steel gables at each end, and a ridgepole of tubing, canvas was laced to the framework and the trailer grew into living space for one man. Finally, adding to the height of the corner posts by the simple process of bolting on extra pieces, the demonstrators raised

the roof and produced a double-decked camp trailer large enough to sleep four people. "You can go on forever," they reveal, "depending on your imagination and your requirements."

This Type of Steel Not New

Oddly, do-it-yourself steel isn't as new as it seems. Most companies producing slotted angle have been doing it for years for industrial use, and you've probably seen it dozens of times without knowing it was there. Almost every shop uses it in the "back room" as shelf framing for storage of parts and stock items. It's used to make steel stairways and galleries in storerooms. Military outfits have been using it for some time. Out at Wright Air Development Center in Dayton, Ohio, planes had to be grounded every time their interiors were modified to accommodate new electronic gear being tested—until a few years ago when a group of technicians devised a system of drilled steel angles, adjustable at the turn of a few bolts to make "instantaneous" custom-built racks to accommodate any kind of gear.

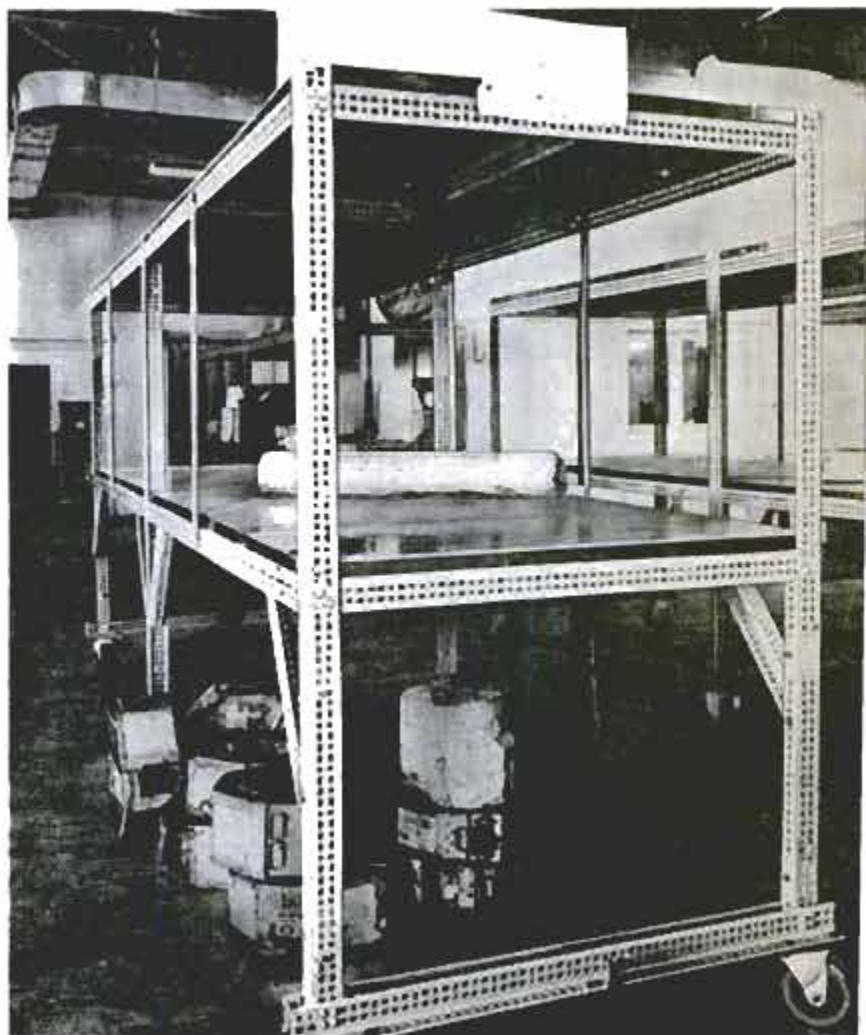
"Now," boasts the Air Research and Development Command, "when a plane lands, tested equipment is removed bodily. Racks, already adjusted to new equipment ready for testing, are bolted to plates in the floor and ceiling of the aircraft, the electrical system is plugged in, and the plane takes off." The system, which allows impromptu racks to be quickly assembled above or around seats, desks and other obstructions in the crowded test planes, gives it what ARDC calls an "Erector Set characteristic," which saves the Center an estimated half-million dollars each year on its 27 test aircraft.

Only a Wrench and a Hacksaw

One of the slickest do-it-yourself steels so far available, is not slotted angle, but a channel steel called Unistrut. More complicated than its cousins, this material uses unique spring-held clamping nuts that slide into position inside the channel and, hence, are hidden. Framing fittings are required for corner joints, and the channel steel comes in five different shapes and sizes for different purposes. But the material has a "finished" appearance that makes it readily adaptable for

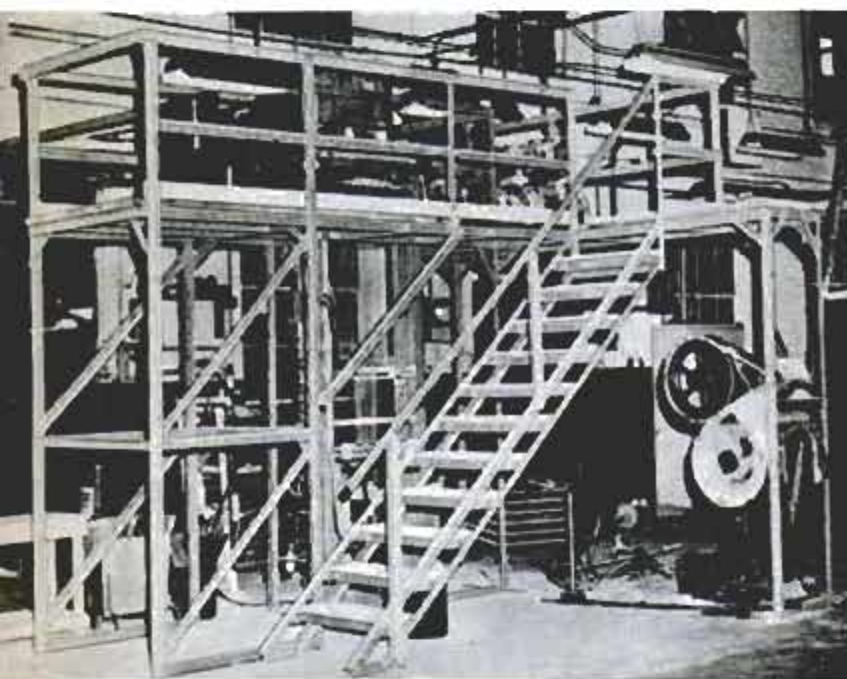


Office on boat trailer is five feet high. Peaked gable sections at each end are bolted in place, and lightweight ridge-pole of tubing supports canvas cover. Mobile rack below is example of how do-it-yourself steel is applied industrially





Wooden desk and cabinets built into framework of channel-type steel were made with wrench, hacksaw and woodworking tools



Easily assembled stairway and catwalk above illustrate versatility of lightweight steel. Below is electronic rack developed by Wright Air Development Center for test planes. Idea has saved base \$500,000 annually in modification time



framing for wall partitions, and trim shelving that you wouldn't mind using in the living room. With a wrench, a hacksaw, and a minimum of spare time, the Uni-strut people claim you can build nifty glass-topped tables, chairs, ping-pong tables, classic workbenches, room-dividers with colored plastic panels that fit in the channels, classy workbenches, good-looking framing for porches, entryways and lean-to greenhouses—or almost anything else you set your mind to.

Use Corner Brackets

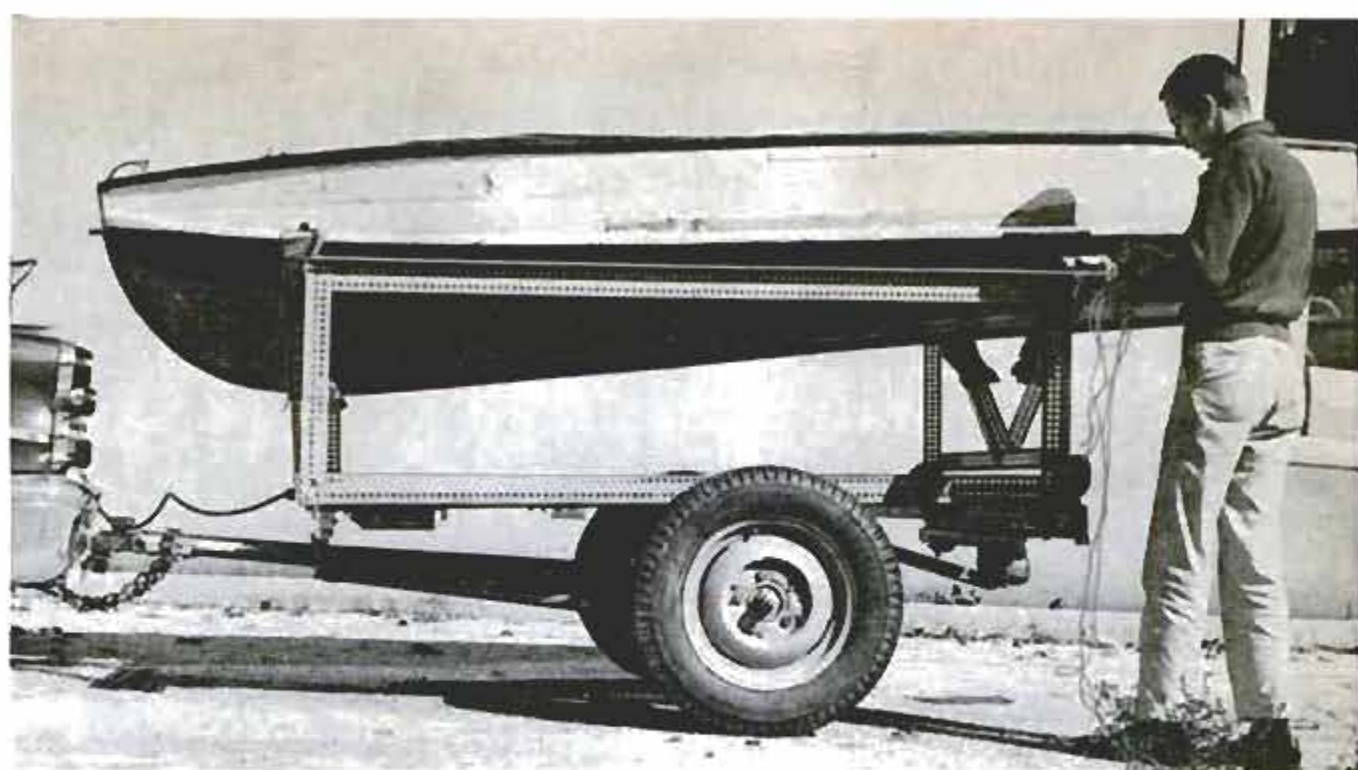
Corner joints on things made with the channel steel bars are usually mitered, so that a finished project is trim and uncluttered. By using corner brackets on the underside of the channel, there's no need to pierce the steel with drilled holes. The three outside faces of the channel are solid, with no projecting nuts or bolt heads. And if you want a super-flush job, special flat-head machine screws, which countersink into specially milled corner brackets can be used instead of the standard bolts and plain brackets.

If you're given to imaginative, hard-to-build ideas, this system includes a hatful of accessory "extras" that endow it with unusual versatility. For instance, by using a set of special triangular steel brackets bolted to a pair of plain channel bars fastened to the wall, you can produce any desired arrangement for contemporary hanging shelves. Want to build a wall, or room divider? Special clamp fittings that slip into the channel of the steel bars are designed to hold laminated wood or plastic panels in a limitless variety of sizes and shapes.

Metal Construction Now Easy

Until recently, most amateurs have shied away from metal construction because it required expensive equipment for welding and machining the ornery material—not to mention technical skill in handling and shaping it. Now, with requirements calling only for wrench and hacksaw, anyone can take advantage of the strength and rigidity that steel has to offer.

Where can you buy do-it-your-



Boat trailer evolves from truck body by removal of front and rear top rails and substitution of "V" rails

self steel? Don't expect to find it on the shelves of local hardware stores, because few shops are equipped with storage space enough to stock such bulky merchandise. Except for Metal Lumber, none of the do-it-yourself steel comes in consumer kits, either. Most manufacturers still concen-

trate on the bigger industrial applications. However, all varieties, including the kit type, are available through hardware wholesalers. Local shopkeepers, according to the manufacturers, should be able to find the kind of do-it-yourself steel you need if you ask them.

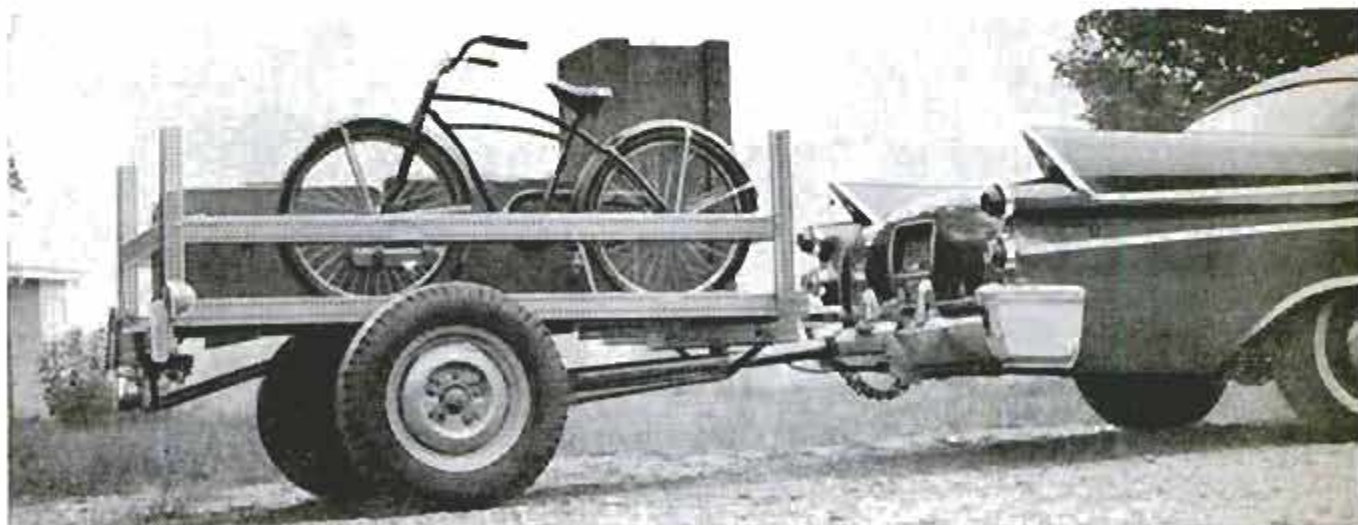
WHERE TO BUY DO-IT-YOURSELF STEEL

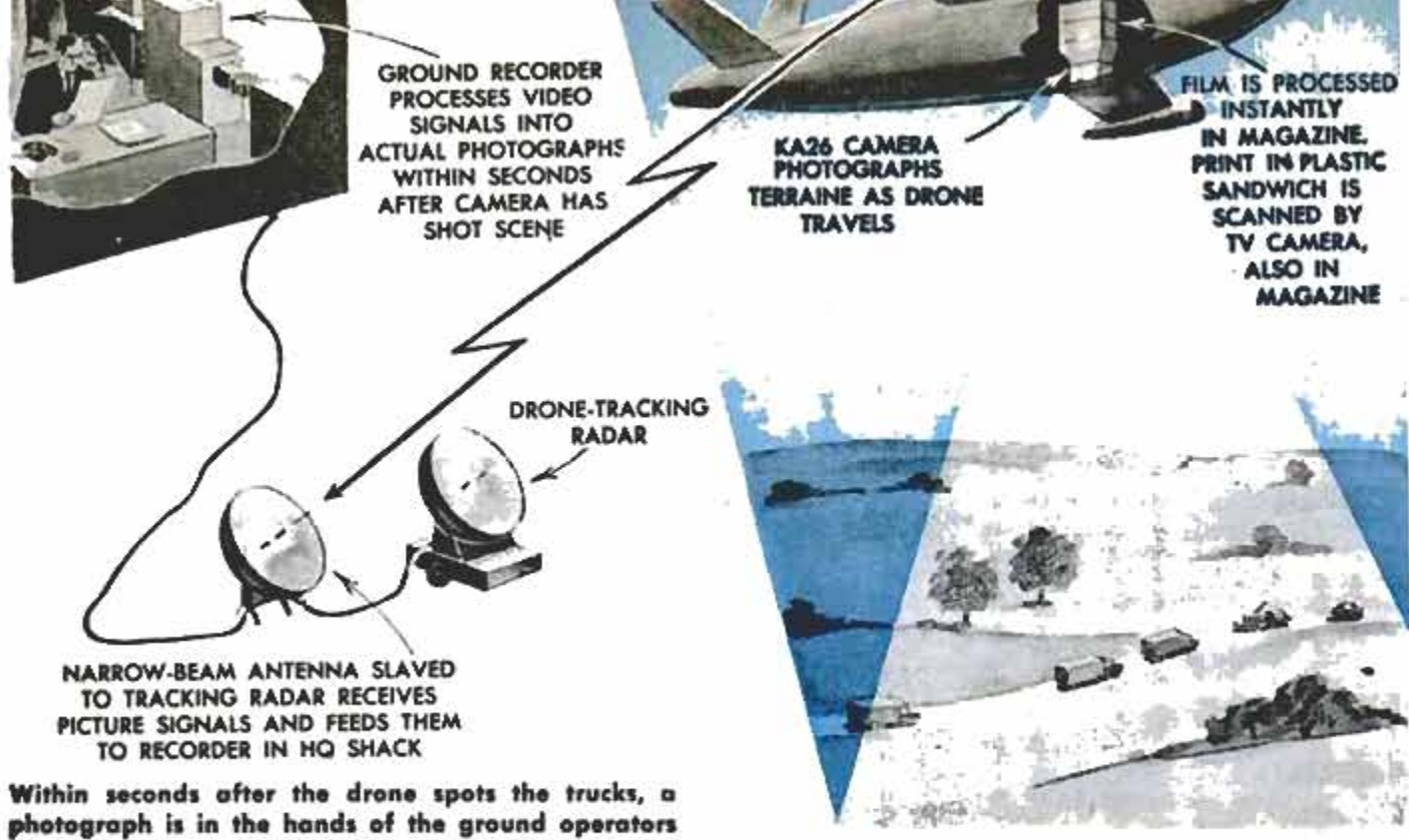
Ask your neighborhood hardware store if he can supply your needs in "do-it-yourself" steel. If he cannot, write to the following companies for information on how to obtain their products—

METAL LUMBER—Republic Steel
 Republic Building, Cleveland 1, Ohio
FLEXANGLE—FlexAngle Corp.
 3760 Oakwood Ave., P. O. Box 418
 Youngstown 1, Ohio

AIM—Acme Steel Co.
 135th St., and Perry Ave., Chicago 27, Ill.
UNISTRUT—Unistrut Products Co.
 933 W. Washington Blvd.,
 Chicago 7, Ill.

By adding upright posts to trailer frame, flatbed trailer is turned into luggage carrier in 10 minutes

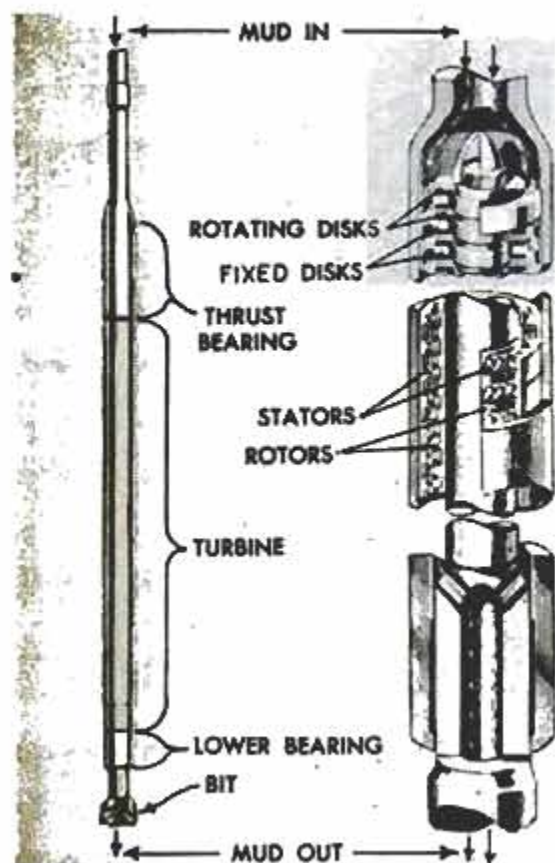




Aerial Photos Are Viewed Instantly on Ground

Automatically and almost instantaneously, a Signal Corps photo-reconnaissance system being developed by Fairchild Camera and Instrument Company takes aerial pictures and reproduces them on the ground. An airborne unit photographs with a 70-mm. camera, then develops and scans

the pictures to convert them to radio signals that are transmitted to a mobile ground station. Exposed film in the ground camera can be processed for viewing in a matter of seconds. The original pictures can also be studied when the drone returns to base.

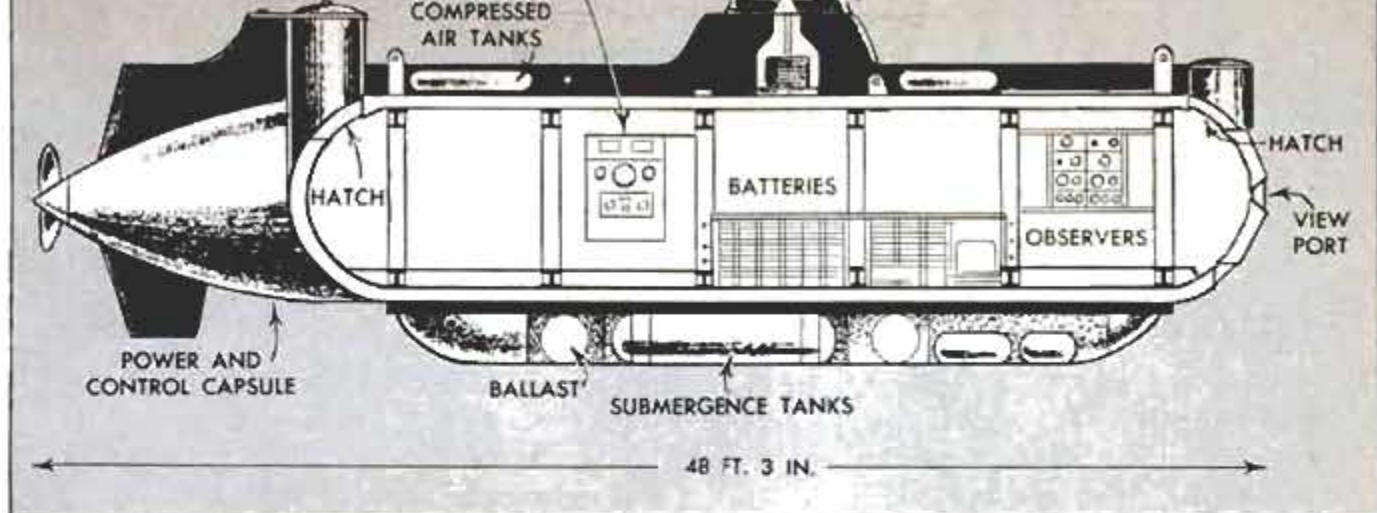


Turbine Powers Oil Drill

Powered by a mud-actuated turbine, a new diamond-studded drill bores for oil twice as fast as conventional equipment—and at 30 percent less cost. Mud pumped down from the surface rotates the turbine, located immediately above the drill bit. In conventional drilling, surface engines rotate the entire length of drill pipe.

Shell Oil Company





Aluminum Submarine May Dive Three Miles

Exploration of the ocean bottom to a depth of three miles may be possible with Reynolds Metal Company's aluminum submarine, the *Aluminaut*. It will carry three men and 3400 pounds of equipment on 100-mile, 36-hour trips. Since 60 percent of the ocean floor is within its depth limit, the sub is expected to fulfill the dreams of oceanographers who have long wished for a manned submersible free from surface tenders.



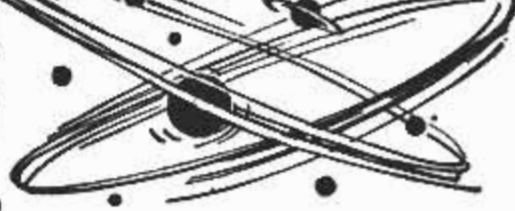
Cycle Rides Snow On Ski and Tracks

If you want to travel cross-country over deep snow and don't have a team of dogs to pull a sled, a young inventor in Oslo, Norway has just the thing for you—a "cold rod," or winter motorcycle. The inventor, whose name is Reidar Berg, added a ski to the front wheel of his motorcycle and tracked belts to the rear wheels.



☐ Census-taking zoologists recently used a helicopter as an aid in counting 14,000 seals and sea lions off the southern California coast.

AN EYE ON SPACE



By Dr. Dan Q. Posin

PROFESSOR OF PHYSICS, DE PAUL UNIVERSITY
SCIENTIFIC CONSULTANT AND ADVISOR, COLUMBIA BROADCASTING SYSTEM

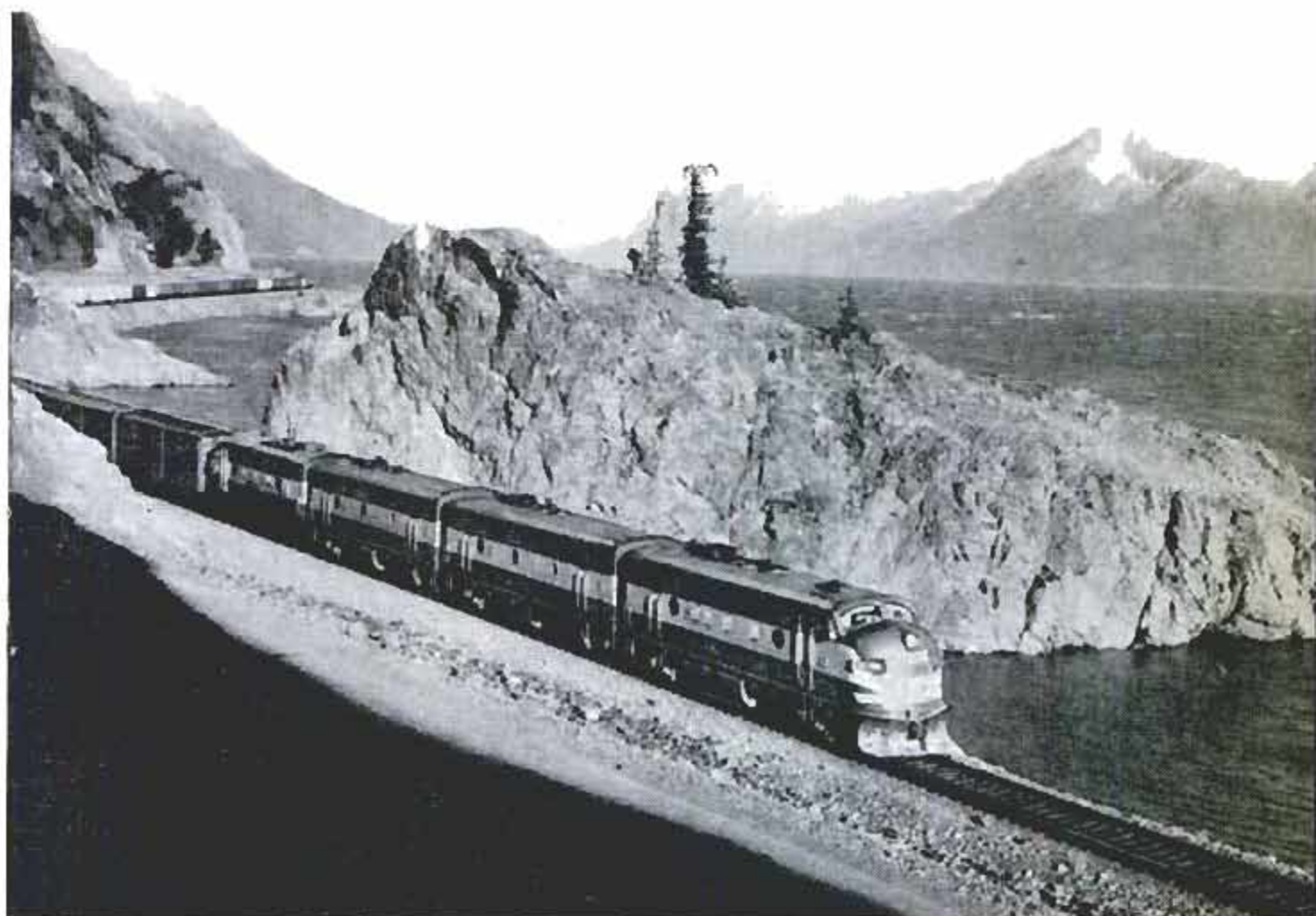
THE RUSSIAN SUCCESS in hurtling an 860-pound object out into space and smack onto the moon puts into interesting perspective our August story, "The Race to the Moon." The many letters from *Popular Mechanics* readers displayed an intense concern with our situation in respect to space travel and rocketry. A few readers doubt that Russia has achieved all she claims. The moon shot should allay their doubts.

The moon shot is impressive for two things—the power of the launching rocket and the guidance system. In order to project the 860-pound instrument capsule (not to mention the more than 2400-pound empty last stage) to the moon, a lifting thrust of something like 800,000 pounds must have been achieved. Regrettably, as yet we have nothing like this, although plans for even more ambitious thrust do exist. The guidance system was equally meritorious. It seems quite clear that much of the guidance of the streaking payload was from the ground. What it took to do this was a powerful transmitter, with a huge beaming antenna which concentrated its radio waves into a narrow searchlight-like shaft of coded energy. But when the capsule was distant from home, its own guidance took over. All this implies a relative hugeness. The flying guidance system was intricate, replete with computers and with a radar exploration system. As the capsule neared the moon, it no doubt sent out radar pulses which bounced back from the surface. The time between sending and receiving gave the distance yet to be covered (half the total time, multiplied by 186,000 gives the distance in miles—which operation, of course, the robot computer performs without blinking a robot eyelash). This guidance system had the elements of a "homing" device.

Some wishful thinkers have raised the possibility that the capsule did not strike the moon, but had a timer which shut off the radio to simulate impact destruction. The capsule was traced via its radio signals by the British Jodrell Bank telescope all the way, and the changes in its speeds were observed throughout. As it left Earth it had a speed of about 25,000 miles per hour, which then was cut down by Earth's pull-back. As it reached the equilibrium region (where Earth's pull-back equals the moon's forward pull) it had a speed of about 1.5 miles per second. As it crossed this region it began to accelerate, and finished at about 2.5 miles per second (7000 miles per hour). Any device that could simulate all these changes of velocity would be more intricate than the guidance system.

The Russians are not ahead of us in science. They are ahead in this particular but spectacular area—space propulsion. But they need not remain ahead even here. What is needed to overcome their lead is simply this: A deep desire in our young people to understand the universe in which they live, a love of science, and a determination to perpetuate the sense of human freedom. This does not come from some superficial stimulus, such as the launching of an object into the sky. This comes only from inspiration and a much improved school system. If we are dedicated to a thorough and robust educational system, and genuinely desirous of knowing the universe because of its unending mystery and excitement, then we will never panic at every shot fired round the world or at the moon by anyone else, nor close our eyes and moan "I don't believe it."

Toughest Railroad You Taxpayers Own



Powered by a modern diesel locomotive, a freight train snakes along Turnagain Arm on Alaska Railroad

By George X. Sand

UP IN THINLY SETTLED Alaska the government is operating—at a profit—500 miles of hazardous and extremely frustrating railroad. This is done for grateful interior residents who otherwise would be cut off from the outside because private stateside capital wouldn't take the risk. It is being accomplished in a safe, informal and at times deliberately inefficient manner that makes push-button-minded trainmen elsewhere squirm.

Last fall I rode through the interior wilderness on one of the modern trains of the Alaska Railroad. To my surprise, the diesel streamliner made an expensive stop deep in the wilds to take aboard a pair of roughly garbed Alaskans who had been waiting at trackside with their high-powered hunting rifles and somewhat gory trophies. When I inquired about the trophies—two huge sets of caribou horns, each with skull

still attached, and the meat from the quartered carcasses—the grinning conductor promptly invited me to visit with the successful hunters.

The men had chosen to ride in the baggage car with their prizes and they told me they often made trips like this, catching a train into the bush in the morning, flagging down another to return the same afternoon. Moose, bear, sheep and other big game can be killed within rifle shot of the tracks.

I was even more surprised when these hunters told of an old trapper who'd asked to be dropped near his lonely cabin, many miles from the nearest town, but had fallen asleep. When the conductor discovered the sleeping man he not only stopped the 10-coach train but had it backed *three miles* to let off his bearded passenger with apologies. At the time I hadn't learned that you



Moose find it easy walking along the tracks in winter but add to the engineer's problems

It's 470 miles from the port of Seward through the port of Anchorage and past the foot of Mount McKinley to Fairbanks, largest inland city; 470 scenic miles



don't seem at such incidents along the sprawling frontier of Alaska.

Annual snowfall ranges from 40 to 70 feet along the ARR's tracks. Landslides are a constant winter-time threat. Veteran conductor Claude Douglas tells how he and 165 passengers were trapped at a wilderness bridge spanning a mountain gulch 300 feet wide and 45 deep.

"It was snowing hard and we'd had a 'snow fleet' working right ahead of us. The light got so poor that the men operating the plow could hardly see. They halted the plow on the big trestle where it couldn't get bogged down—they thought. Then they walked back to the train to have coffee with us and wait for the blizzard to let up.

"An enormous slide let go somewhere overhead. It roared down right at the snow fleet, sweeping everything into the gulch below: bridge, plow and both its engines. The bridge disappeared right in front of the passenger train's cowcatcher, but nobody was hurt. The rails hung down over the edge of the gulch like twisted spaghetti."

The equipment represented taxpayers' money. Deep snow in the gulch appeared to have acted like a cushion, so the trainmen got help and packed it down. They laid temporary tracks. Hauled out, the snow fleet was soon back in service.

Conductor Joe Axes proved less fortunate while riding his freight. Along for the ride was an Air Force major. A slide blocked the train near Curry. The two men swung down from the caboose to inspect the obstruction when the main avalanche descended.

The conductor dove beneath a nearby gondola. The airman tried to grab altitude by clambering up the car's steel ladder. A dozen feet of snow closed overhead.

Brakeman Bill Shake ran almost two miles for help in nearby Curry. Men grabbed shovels and leaped aboard a yard engine to race back to the disaster scene.

The rescuers heard a faint tapping—Axe's switch lantern being struck against the bottom of the car. They dug furiously and rescued him. The major was found plastered like a gingerbread boy—still climbing.

Remote bridges of the ARR must be specially built. The openings between the supporting railroad ties are carefully decked over to make it easier on the feet of—you'd never guess—moose. These shaggy 1000-pound animals gallop over the narrow trestles ahead of approaching trains. Should their long legs get caught between the ties the frantically braking engines are derailed. It's happened.

In deep snow, moose become easy prey for wolves. Therefore they tend to congre-



The conductor dove under a gondola car for safety when a slide hit this train. Brakeman ran two miles for help

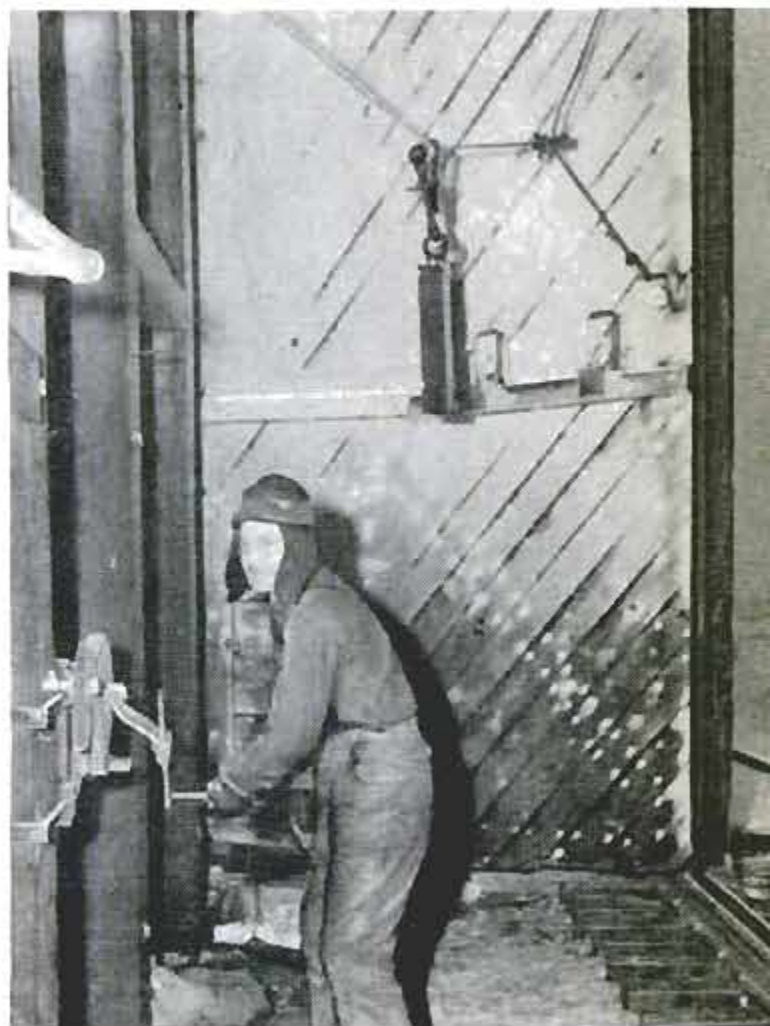
gate along the ARR's cleared tracks. Result: Hundreds of the prized game animals are struck each year. More are killed this way than by Alaska's many hunters. The carcasses, when salvageable, are used to feed the needy. Humane section crews, concerned over the slaughter, bulldoze inviting run-offs through the banked track-side snow. The moose (like bear and other animals) refuse to use these. Nor is it practical to erect miles of fence.

Moose follow the tracks to town, too. Two springs ago a big bull, frightened by an approaching freight, darted from behind the station building at Montana. A flatcar was derailed, losing its wheels and stopping the long train.

The ARR was hammered into existence 40 years ago by determined construction men who ignored terrible winter temperatures, broken bodies, even violent death to show a skeptical outside world it could be done. Today the willingness to provide for those in real need despite personal sacrifice sets apart the hard-fisted Alaska railroaders from less dedicated men elsewhere.

These government trainmen serve as sole contact with civilization for many Alaskans who live in the wilds, even if it be only the dropping of a dated newspaper or the relaying of an important message. One 70-year-old hermit, prospector Tom Sisson,

Huge doors at tunnel entrance help keep tunnels warm, prevent freezing of glacial water that drips constantly from roof. Ice might otherwise derail train. On occasion, doors have been smashed to splinters by trains when left shut by a forgetful workman





When glacial moraine thaws, mud slides send tons of boulders tumbling down on tracks for crews to remove

hadn't been seen at trackside for three weeks when I rode the train. Crewmen were prepared to search for the old man—on their own time.

Obliging trainmen shop (without pay) for necessities for these isolated dwellers (both whites and Indians) who may not find it possible to come out for months to

scrawled order for supplies hanging beside the track, usually inside a crude willow hoop. The baggagemen, who know each sourdough's faint trail like a Manhattan taxi driver knows his streets, slip their arms through these hoops as the train speeds past. Train crews then spend hours filling such orders at Fairbanks and Anchorage, the modern cities located at the northern and near the southern ends of the main line. They pick up false teeth and repaired watches; purchase medicines or match swatches of dress and curtain material. Occasionally, to their grinning delight, they buy wedding rings, even dainty underthings. Such items, dropped off without stopping, are always paid for later.

Conductor Claude Douglas, I discovered, was aiding a helpless Indian woman. He'd arranged a sales outlet for her handmade parkas and mukluks in Fairbanks, 150 miles away.

"Why not?" asks one veteran railroader. "These folks would do the same for us. This is still a frontier. You learn to depend on your fellow man."

Once, not thinking, a man hung up a pair of heavy and well-worn sledge hammers—his pride and joy—that he wished to have refinished in the city. The unsuspecting baggageman, reaching for the hoop, nearly broke his arm.

Such kindness is repaid. For example, when enginemen Boyd Crune and Earl Simpson dropped from a freight near Cant-

Rotary plow is almost hidden in deep trench it has cleared. Annual snowfall may exceed 70 feet in some spots





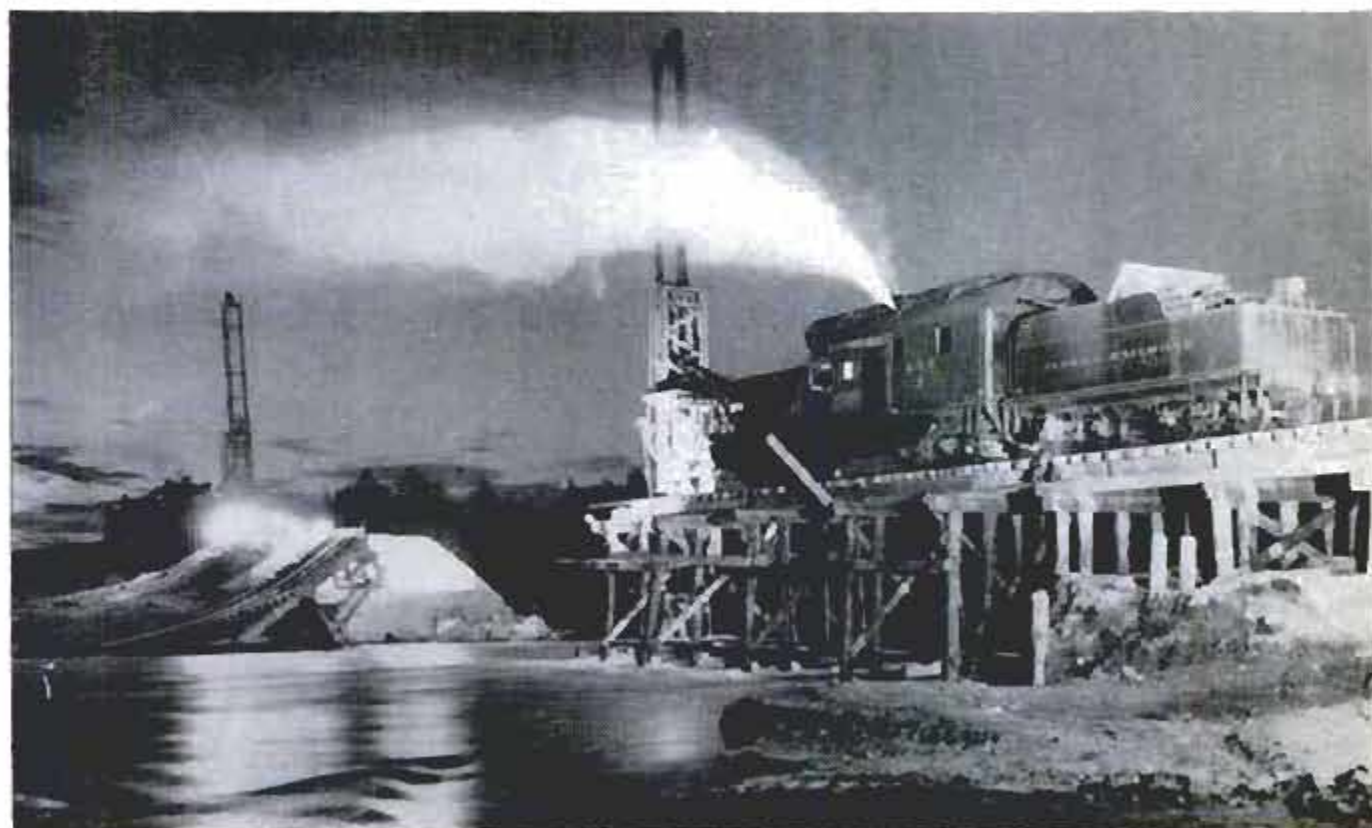
Rails are left hanging in air after a flood washed out bridge supports. Floods present a constant threat

well last year to go sheep hunting, they discovered a car would be needed. A stranger, learning they were from the ARR, promptly offered his. "You can drop me at work and keep the car all day," he told them. "On the way back this afternoon bring my kids home from school, that's all."

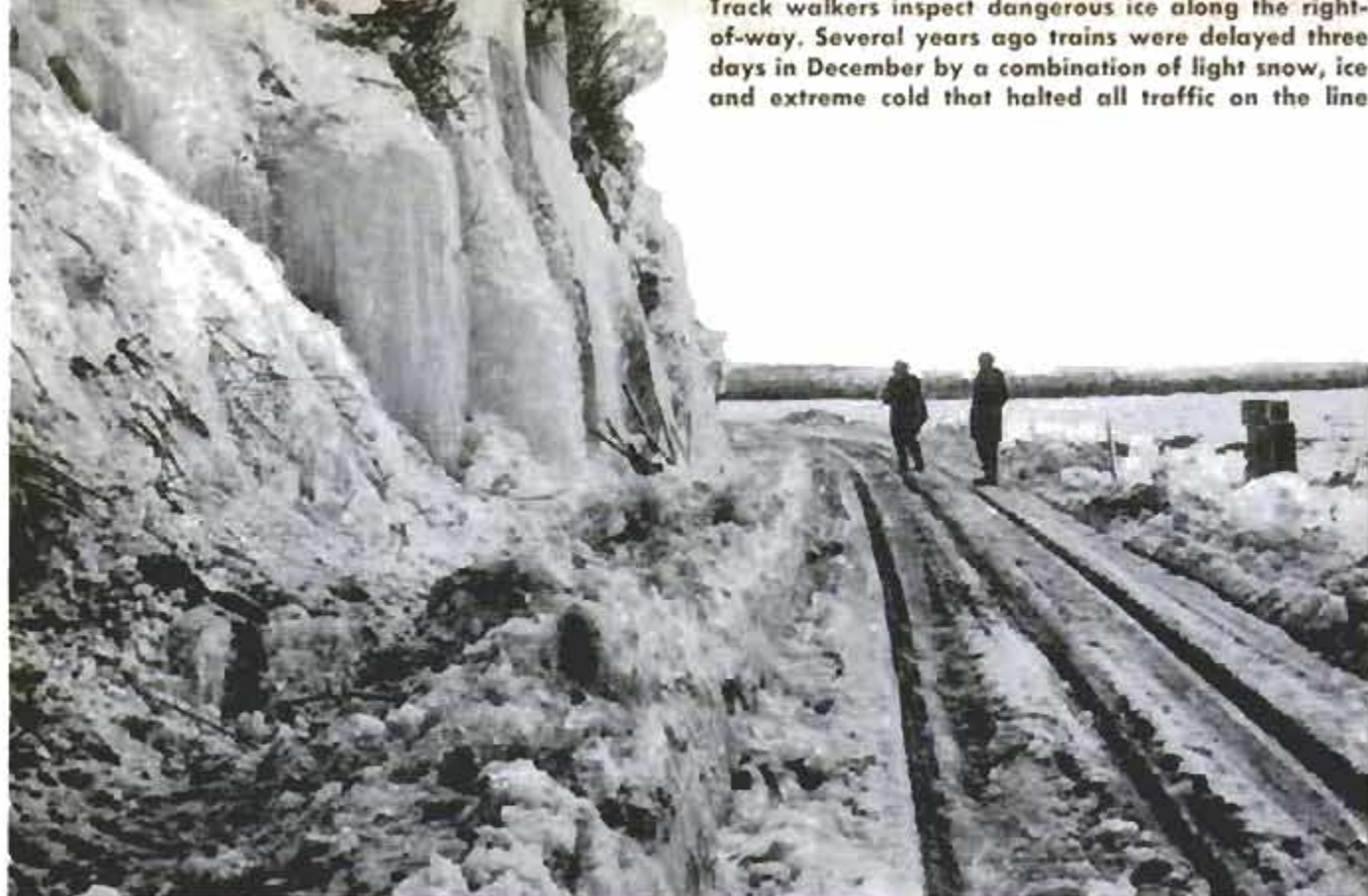
To go on giving taxpayers such unprecedented return for their money these government employees in the land of the northern lights must overcome tremendous weather obstacles. Their railroad muscles

its way from the ice-free Pacific port of Seward nearly to the Arctic Circle, and temperatures vary from the upper 90s in summer to 72 below in winter. White men cannot stand such bitter winter cold and must be replaced with Eskimos and Indians. Like human blood, the oil in machines slows dangerously. Metals become brittle. Locomotive traction falls off so badly that a freight engine is apt to pull but 60 percent of its normal load. Even the air brakes freeze unless alcohol is added.

Bridge washout at Milepost 199 brings out the engineers for emergency repairs at night under floodlights



Track walkers inspect dangerous ice along the right-of-way. Several years ago trains were delayed three days in December by a combination of light snow, ice and extreme cold that halted all traffic on the line



Biggest trouble, year 'round, are the level sites where the bright blue and yellow diesel engines pass over "perma-frost"—frost 2500 feet deep and 25,000 years old in some places. Here repair crews must "dig" with live steam instead of pick and shovel. During summers the gravel roadbeds and embankments laid over these spots soak up heat from the almost round-the-clock sun. The roadbed sinks like a hot poker laid on a cake of ice. Thousands of tons of fill are required.

It's not unusual to encounter gangs of section men working against time through the long polar nights to prepare the track for an expected train. Freezing earth can expand in but one direction—upward. Result: "Frost heaves" buckle the rails. To correct this, work crews drive large wooden shims between the steel and the railroad ties. Some of these wedges may be eight inches high. Tie rods and bridles hold the elevated rails in a straight line.

Such numbing work becomes especially disheartening when additional freezing throws the track completely out of line again, perhaps the following night. The conscientious workers will return, however. They know that Alaskan families—the U.S. government itself—are counting on them to keep the line open. There are no other railroads serving Alaska.

Frost plays other tricks. It lifts telegraph poles, bridge pilings, even concrete building foundations right up out of the ground unless special precautions are taken. As the

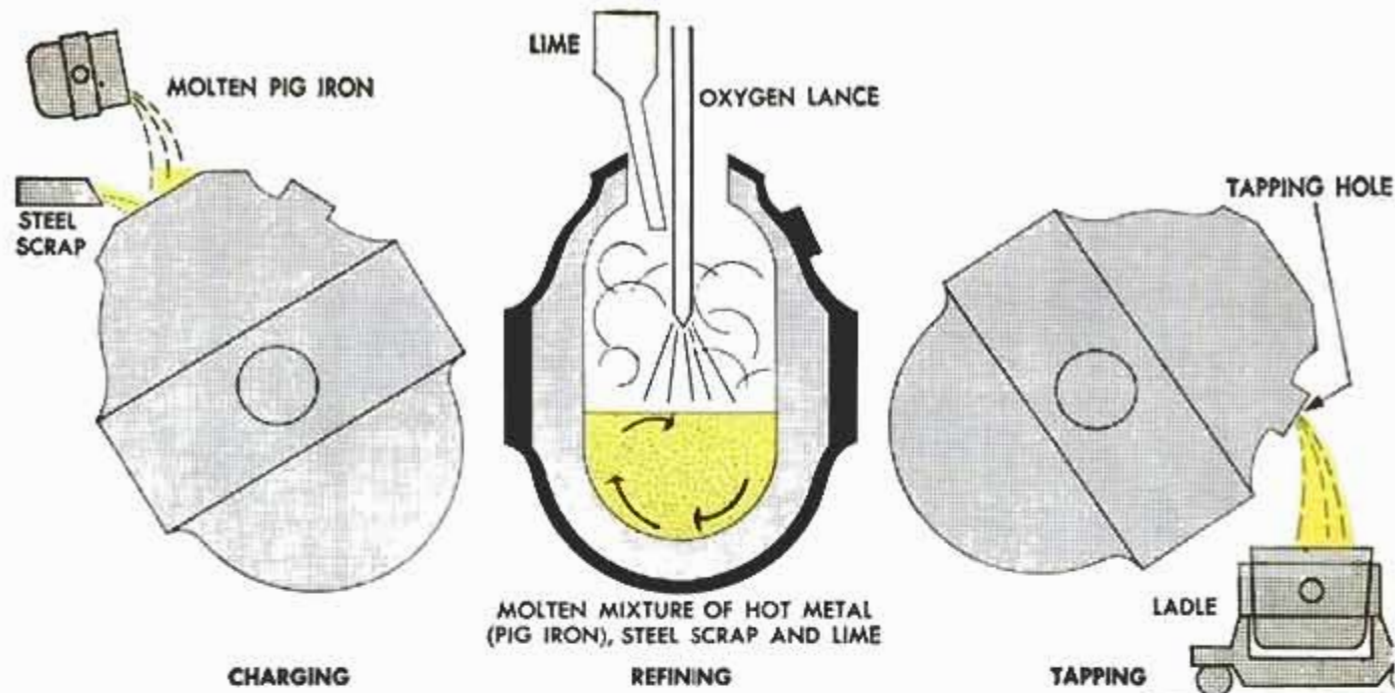
frost first forms it adheres to the pole or other object where it enters the earth. This grip is so strong that as the temperature skids downward and the frost crust thickens upward it raises its victim with it, regardless how deep it may have been set.

The men of the ARR combat this by using screened gravel between foundations and earth. The freezing ground can then slide past without adhering. Another technique, used for communication line poles, is to make tripod bases, with the three legs only slightly dug into the ground.

The annual "Lake George Flood" is also a natural phenomenon to be reckoned with. Some 35 miles north of Anchorage is a large field of creeping glaciers. Each spring they unite to form a seven-mile "river" of ice. This crawling white avalanche (sometimes 300 feet high) eventually encounters an even higher sheer mountain wall. When this happens the outflow of Lake George is choked off.

A triggering action takes place when the rising lake reaches a certain level. The huge ice dam, honeycombed and undermined by the water, gives way suddenly. Masses of glacial ice come toppling down to be carried end-over-end in a crushing, grinding channel of their own making. A cubic mile of flood water is sent racing toward the railroad tracks, 15 miles away. The tracks are inundated, despite the fact that new bridges have been built, old ones raised.

(Continued to page 234)



Oxygen Blast Cuts Steel Production Time

HIGH QUALITY STEEL is being produced in minutes instead of hours by a new process that uses a blast of oxygen to help speed up the change from pig iron and scrap to steel.

The new "oxygen" furnace that turns out 100 tons of steel an hour does as much work as four open-hearth furnaces that produce 225 tons every nine hours, according to steelmen.

Cost of an oxygen furnace is about half that of an open-hearth furnace and requires only a third of the usual scrap steel per charge, they add.

Largest installation in the world is at the Kaiser Steel Corporation's Fontana plant in California. There three 100-ton furnaces and an oxygen plant double Kaiser's ingot capacity to 2,933,000 tons a year.

The low-carbon steel created by the oxygen method is especially suitable for cold-rolled sheets, a big tonnage product widely used for automobile bodies and household appliances.

The basic principles of the oxygen process are shown in the diagrams at the top. During the charging stage, white hot molten pig iron and steel scrap are poured into the 26-foot-high furnace. During refining, the furnace is returned upright and lime is charged in through the lime chute.

A jet stream of high purity oxygen then is fed into the furnace through a 40-foot-long lance and directed over the surface of the molten metal.

The flaming oxygen burns out impurities and starts a mixing action that refines the mixture into steel. More than six tons of oxygen, enough to satisfy the needs of a human being for more than four years, are

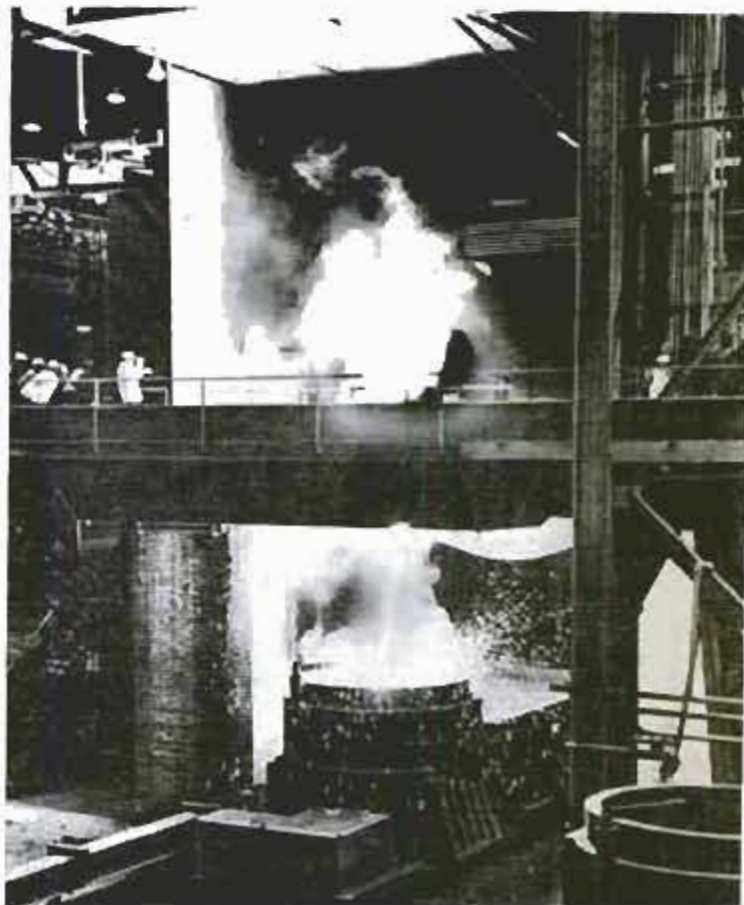
injected into the furnace during a 25 minute period.

By that time the temperature of the metal has risen to 3000 degrees F., and the furnace is ready for tapping.

Developed in Austria eight years ago, the oxygen steel process is being used in 14 countries. Today's output is 11 million ingot tons a year.

By 1965, new installations should allow production of 45 million tons annually in the United States alone.

Low-carbon steel, refined speedily in an oxygen blast furnace, is poured into the teeming ladle





The most direct course isn't the quickest or the easiest when it takes a ship through an area of heavy seas or severe storms. New Navy ship-routing techniques are realizing important savings in fuel, time and money

The Shortest Route May Be the Longest

By
William V. Kennedy

Wave plotters and weather prophets are saving hours of travel for ships crossing the Atlantic

ONE MARCH NIGHT this year, two commercial passenger liners ran head-on into one of the worst Atlantic storms in recent history. Both were a day late in making port with their loads of storm-shaken passengers, some of whom were injured.

Two U.S. Military Sea Transportation Service transports passed through the same storm area that night. Both reached port on time, without damage and without injury to passengers, crew or cargo.

The liners were sailing by shipboard navigation, aided by a few radio weather reports. The military transports were sailing a course plotted by a former Army Air Force pilot working from a desk in Washington.

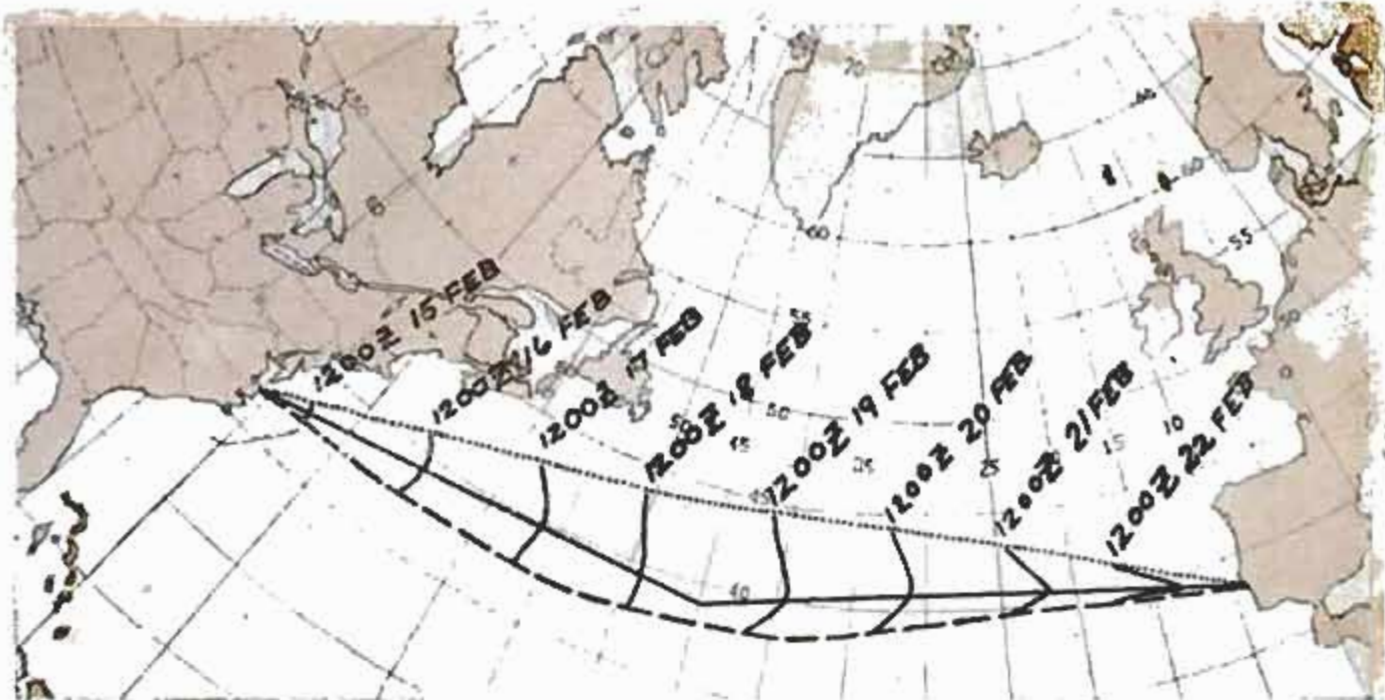
To many salt-water skippers the idea that a ship's course can be plotted better from

"the beach" than from the navigation deck is outrageous. To the several score who have followed the advice of Dr. R. W. James' Optimum Ship Routing Service, however, the "invasion" of command authority has saved days, dollars, seasickness and damage.

The Navy's new ship routing service began as a doctoral thesis submitted by Dr. James at New York University in 1955.

After World War II AAF service, Dr. James, already a meteorologist, introduced a rudimentary ship routing system while working for a commercial weather forecasting service.

"Our track predictions," Dr. James recalls, "were based mainly on weather forecasts. I was convinced that with the worldwide weather, wave-prediction and other hydrographic data available to the Navy,



Following the "optimum course" (solid line) recommended by the Navy's new ship-routing service, the USNS *Sgt. Morris Crain* sailed from Norfolk to Lisbon in 192 hours. This was 22 hours shorter than the time required by another vessel on a northerly course (dotted line), where waves over 20 feet high were encountered, and 16 hours faster than a ship on a southerly course (broken line)

the route prediction system could be worked out to a much finer science."

Working from a basement office in the Navy's Hydrographic Office, Suitland, Md., Dr. James and a small staff plotted 450 Military Sea Transportation Service crossings during the winter of 1957-58.

Once the "optimum route" had been plotted to avoid storms, rough seas and high winds, subsequent corrective messages were radioed to the ship, based on new weather and wave forecasts and on regular weather and wave reports sent by merchant ships.

Primary Interest in Wave Conditions

"We weren't interested in the shortest map distance between two points," Dr. James comments. "We were interested primarily in wave conditions—the key factor affecting ship speed and safety."

The first job was to find the most desirable wave conditions for ship passage. Dr. James determined this from a study of ships' logs, in which speed and height of waves were recorded throughout the voyage. Most ships, the study indicated, could maintain close to maximum performance against waves as high as six to eight feet. In that area, performance began to drop off gradually, or sharply, depending on the beam width and other characteristics of ship construction.

The next job was to predict wave heights in excess of what a particular ship could be expected to overcome with ease. The pre-



From an office ashore, the Navy now can route ships better than by the conventional shipboard navigation

diction had to be made in time to plot a crossing or to warn a ship already underway.

Dr. James and his colleagues started with five-day weather forecasts prepared by the U.S. Weather Bureau. Next, synoptic wave charts were prepared by plotting the wave observations reported by merchant vessels, oceanwide. To these charts were added data on currents, ship speed and characteristics of various ship designs. In areas where actual observations were scarce or non-existent, seasonal wave conditions were determined by a study of past weather conditions and known current factors.

(Continued to page 242)



Six Suitcases Fit Into Volkswagen's Fiberglass Roof Trunk

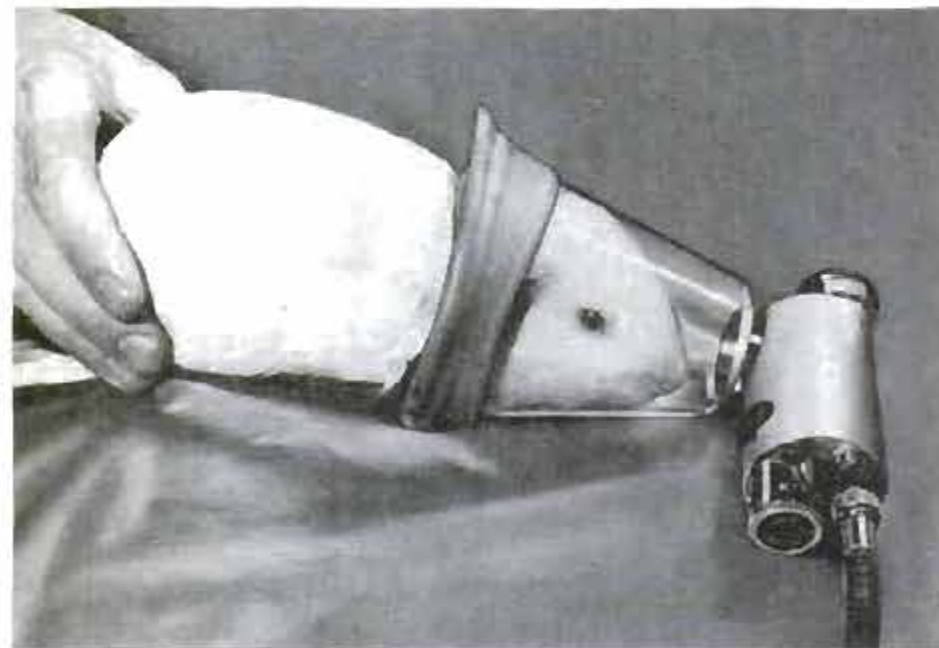
As many as six suitcases fit into a weatherproof enclosure contoured to fit the roof lines of the Volkswagen sedan. Clipped onto the rain gutters and sprayed to match the car paint, the roof-top trunk blends into body lines to minimize wind resistance and

noise. The trunk, made in Germany of lightweight resin-bonded Fiberglas, opens near the rear window and can be locked. Such a trunk provides passenger space in the rear seat that would otherwise be taken up by baggage.



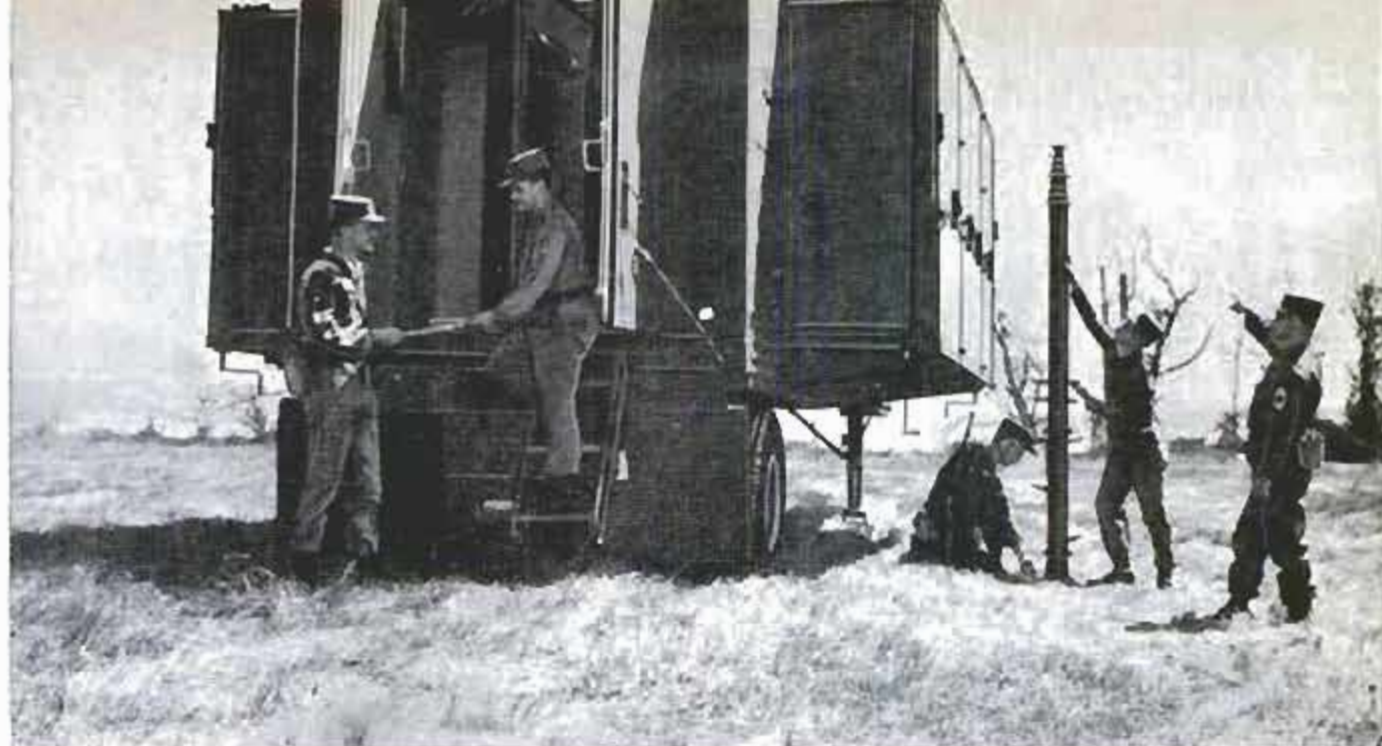
Remotely Controlled Release Trips Shutter A Mile Away

Photographers can work at distances up to a mile away from the camera with a solenoid release, which trips the shutter to photograph wild animals, explosions and other subjects that require the photographer to leave his camera. Built for the 35-mm. camera shown, the unit is adaptable for other cameras as well. A remote signal light is available.



Tiny Resuscitator Provides Oxygen

Only three inches long, the world's smallest resuscitator is the first developed especially to help save the lives of newborn babies that have trouble drawing their first breaths. The resuscitator is so sensitive that it automatically can adjust to lung capacity as small as that of a mouse. It can force life-giving oxygen through an opening the size of a pin-hole.



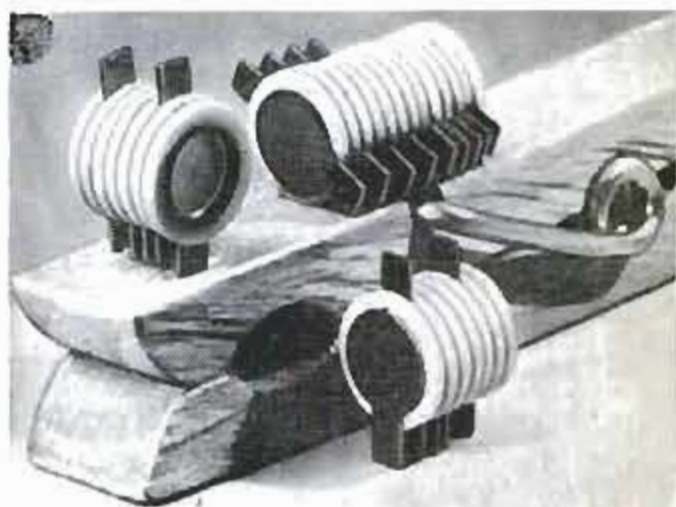
Mobile Communications Unit Has 3000 Mile Range

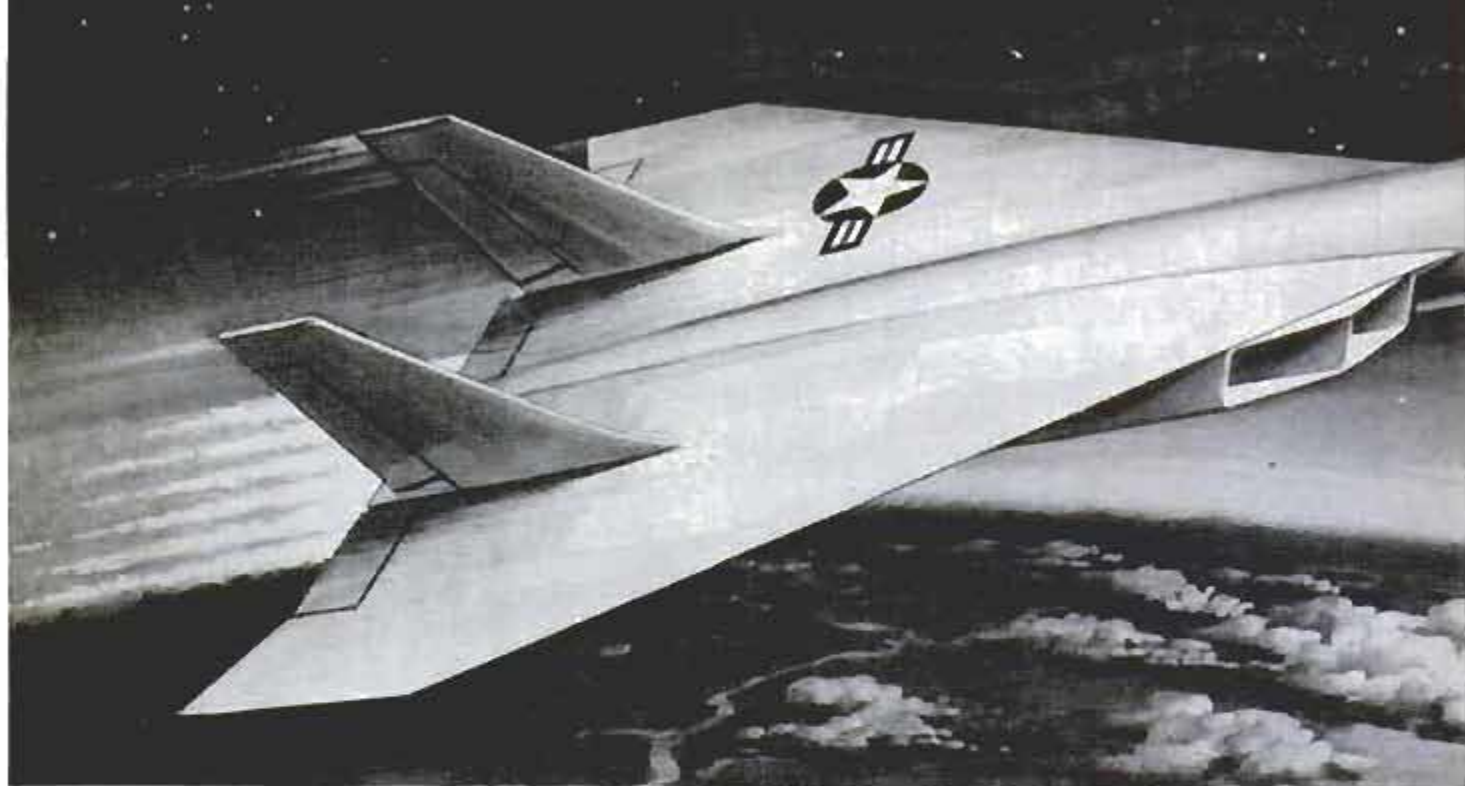
Geared to the sudden demands of limited wars and brush-fire combat operations, the Army's new Transportable Communications Central, the TSC-16, gives combat commanders a long-range communications capability equal to a large fixed-radio installation in a package that can be assembled, loaded and airborne in 12 hours. On arrival, it can begin limited operations in four hours, and reaches full capacity in two days when its big rhombic antennas are erected. In operation, it provides 16 teletypewriter circuits and two voice channels. Its one to three-thousand-mile range allows it to join the Army's global communications system from anywhere on earth, and allows the field commander to have almost instant contact with his headquarters or Washington. The unit consists of two communications vans, a field power unit, two officers and 46 technicians.



Miniaturized Circuitry For Space-Research Vehicles

Like tiny electronic building blocks, these ceramic stacked modules can be used in any combination to provide miniaturized electronic circuitry for space-research vehicles. They're based on an entirely new concept—instead of trying to get rid of the heat produced by electronic equipment, they confine the heat and use it to operate vacuum devices, taking full advantage of the high frequency and reliability of thermionic electron tubes. They were developed by General Electric.





Artist's conception of B-70 Mach 3 bomber; 2000-miles-per-hour passenger planes are based on its design

Ten Years From Now: *Coast to Coast in 90 Minutes*

The jet age is still in diapers, but already our engineers are doodling over paper plans for airliners that will fly at Mach 3—2000 miles an hour or better

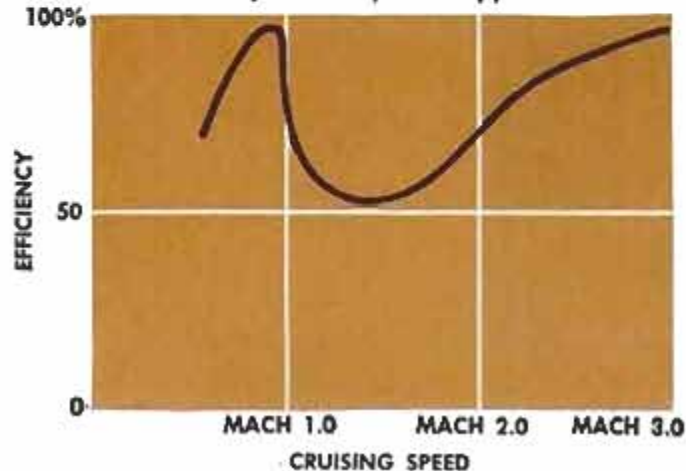
By Thomas E. Stimson, Jr.

OUR BRAND NEW jet airliners are much too slow and it's silly to dawdle across the United States in four and a half hours.

That's the opinion of some of the engineers who designed the present jets.

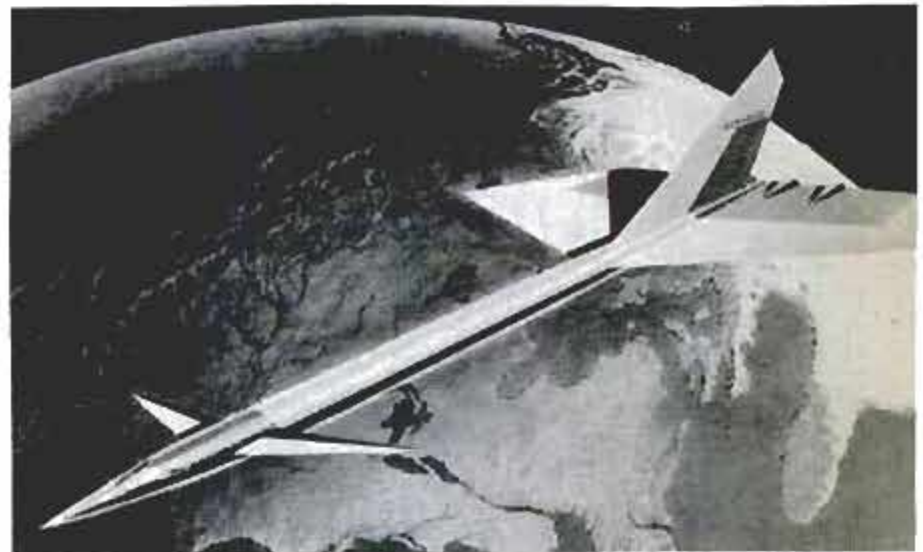
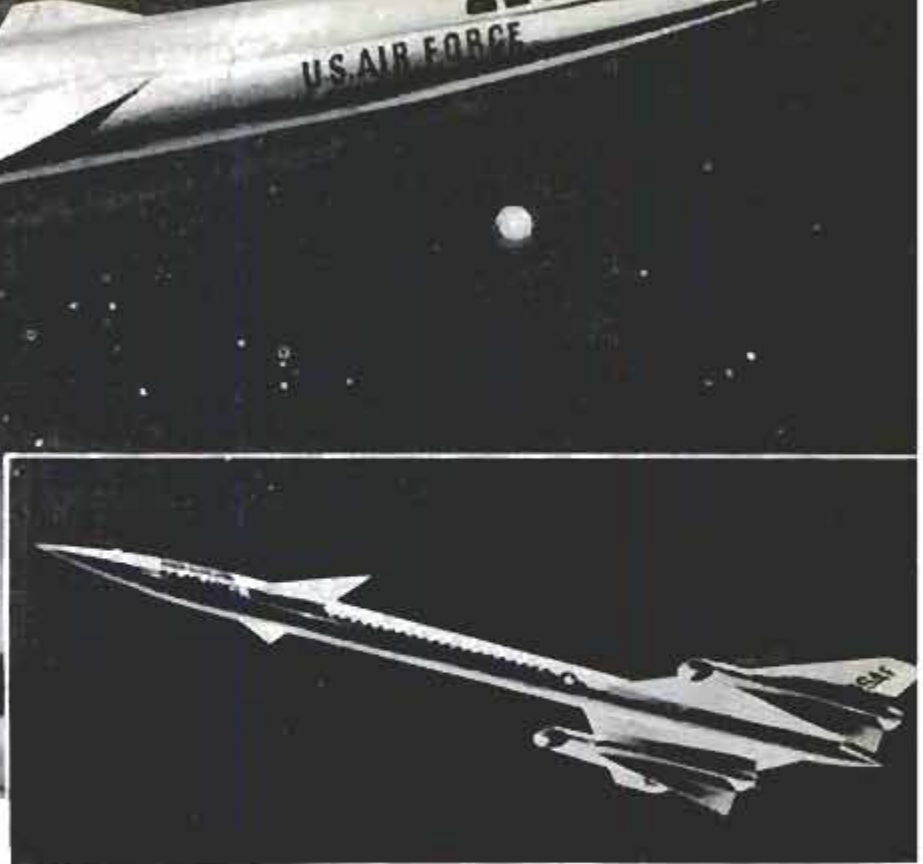
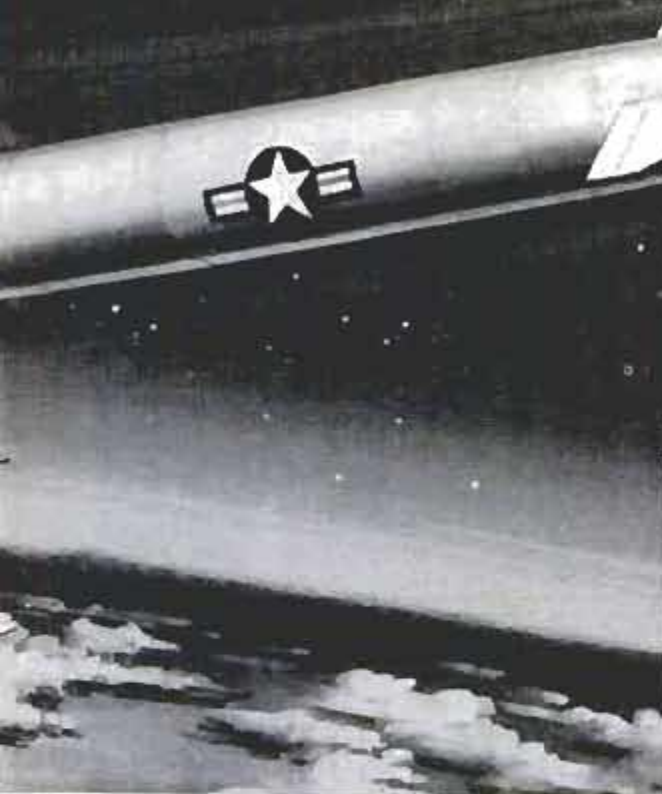
They say that within 10 years we'll be traveling from New York to Los Angeles in 90 minutes, from New York to Paris in a little more than two hours. We'll fly at three times the velocity of sound, a speed that only a few skilled pilots of experimental rocket craft have attained so far.

Propulsive efficiency drops at Mach 1 and climbs to Mach 3. This is why Mach 3 planes appear favorable



R. C. Sebold, Convair engineering vice president, says that in the 1970s a New York business man will be able to leave home half an hour later if his nine o'clock appointment happens to be on the west coast instead of in Manhattan. Leaving New York at 9:30 a.m., he'll fly faster than the sun and reach Los Angeles at eight a.m., a full hour ahead of his appointment time.

Engineers at Boeing, Douglas, Lockheed, North American Aviation and Convair have been spending hundreds of thousands of dollars in research on the next generation of airliners.



These drawings show varying designs for future 2000-mile-per-hour airliner. From top to bottom are designs of Air Force's Air Research and Development Command, Lockheed, Convair and Rocketdyne Division of North American Aviation. Latter firm would use both rocket and jet power for take-off and climb, and jet power alone for cruise

Hundreds of "paper airplanes" have been painstakingly designed and exhaustively analyzed. Scores of models have been flown in wind tunnels, and numerous mock-ups of structures have been built and studied.

Lumping their conclusions together, here's what the engineers foresee: A 75 to 150-passenger transport having a long slender fuselage with a delta-shaped wing at the rear. Another version calls for a long slender shape almost identical with the airplane that you fold from a piece of paper for throwing across the room. In this case the narrow triangular wing extends along the fuselage almost to the nose. Either shape probably would have drooped wingtips and a small canard airfoil near the nose that will serve as elevators and trim surfaces. The plane will have a range of 3500 miles and will cruise most of the way at 2000 miles per hour, some 14 miles above the earth's surface.

On many trips the plane will be in the air for so short a time that its captain may call for landing instructions at his destination before

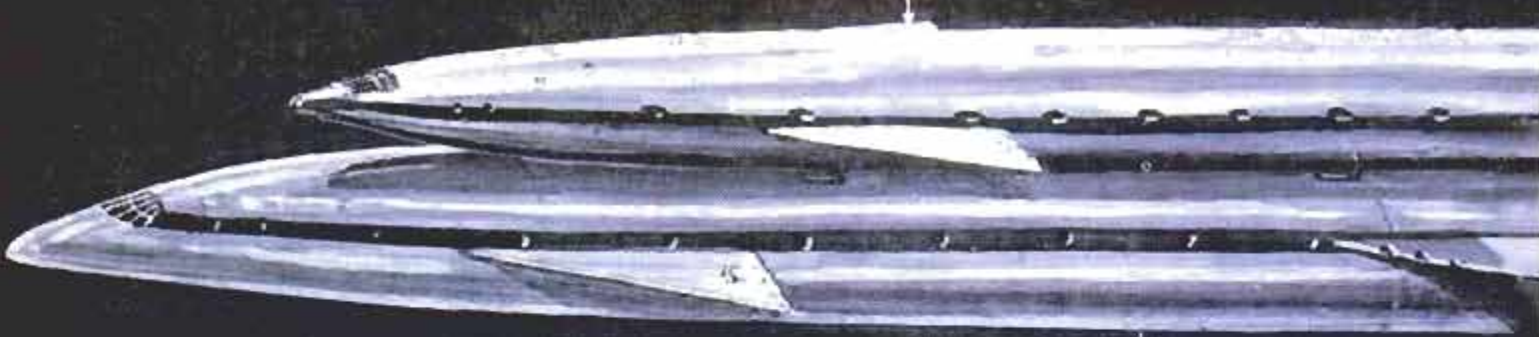
OVER-ALL LENGTH: 175 FT.
WING SPAN: 110 FT.

TWO 60,000-LB.-THRUST
ROCKET ENGINES

TWO 30,000-LB.-THRUST
DUCTED TURBOJET
ENGINES

BOUNDARY-LAYER
CONTROL FOR
MANEUVERING

AERODYNAMIC CENTER AT SUPERSONIC SPEEDS



HIGH-ALTITUDE MACH 7 AIRLINER (UPPER COMPONENT) WOULD WEIGH APPROXIMATELY 160,000 POUNDS AND CARRY 100-130 PASSENGERS. IT WOULD BE CARRIED BY LOWER COMPONENT TO ABOUT 90,000 FT. BEFORE RELEASE

RAPID-CLIMB LIFT-AIRCRAFT WOULD WEIGH APPROXIMATELY 240,000 POUNDS

BRITISH SHOOT FOR MACH 7

HEIGHT (FT.)

140,000—
130,000—
120,000—
110,000—
100,000—
90,000—
80,000—
70,000—
60,000—
50,000—
40,000—
30,000—
20,000—
10,000—

OPERATIONAL HEIGHT IS APPROXIMATELY 130,000-140,000 FT.

PASSENGER LINER CLIMBS TO OPERATIONAL HEIGHT

PRESENT-DAY TRANS-ATLANTIC JET AIRLINERS OPERATE AT 28,000-33,000 FT., PISTON-ENGINE AIRLINERS AT ABOUT 20,000-25,000 FT.

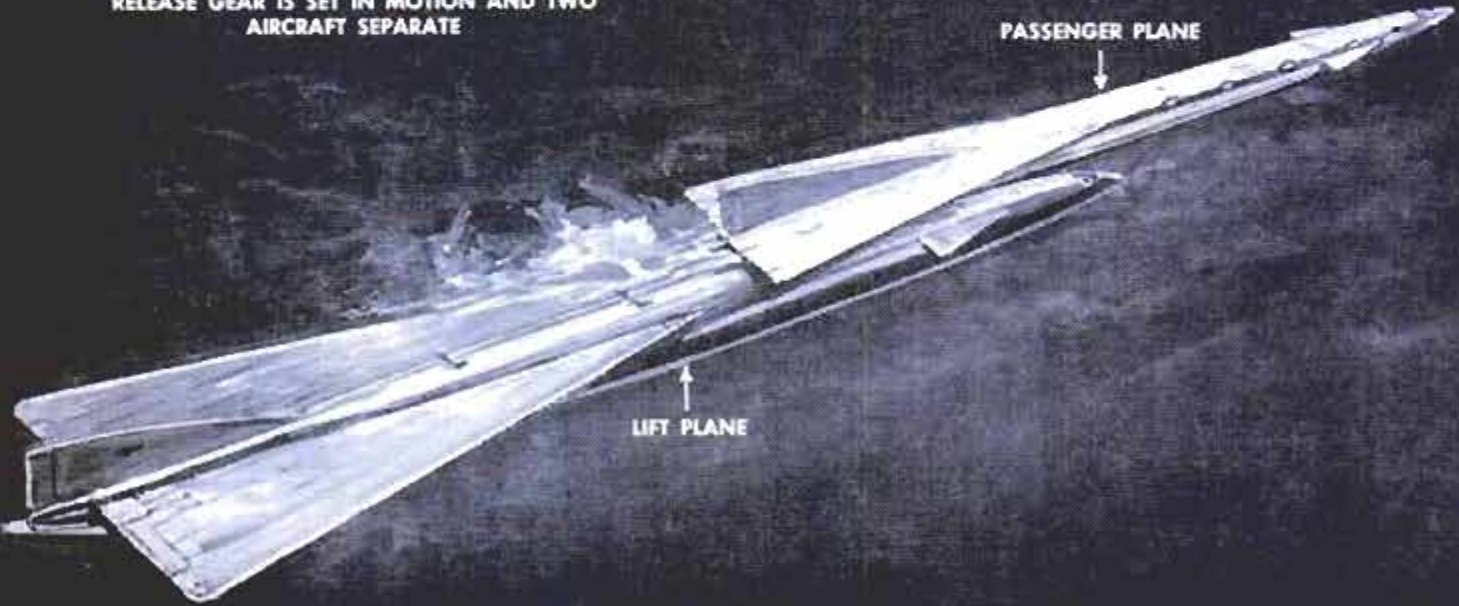
TWO PLANES SEPARATE AT 90,000 FT.

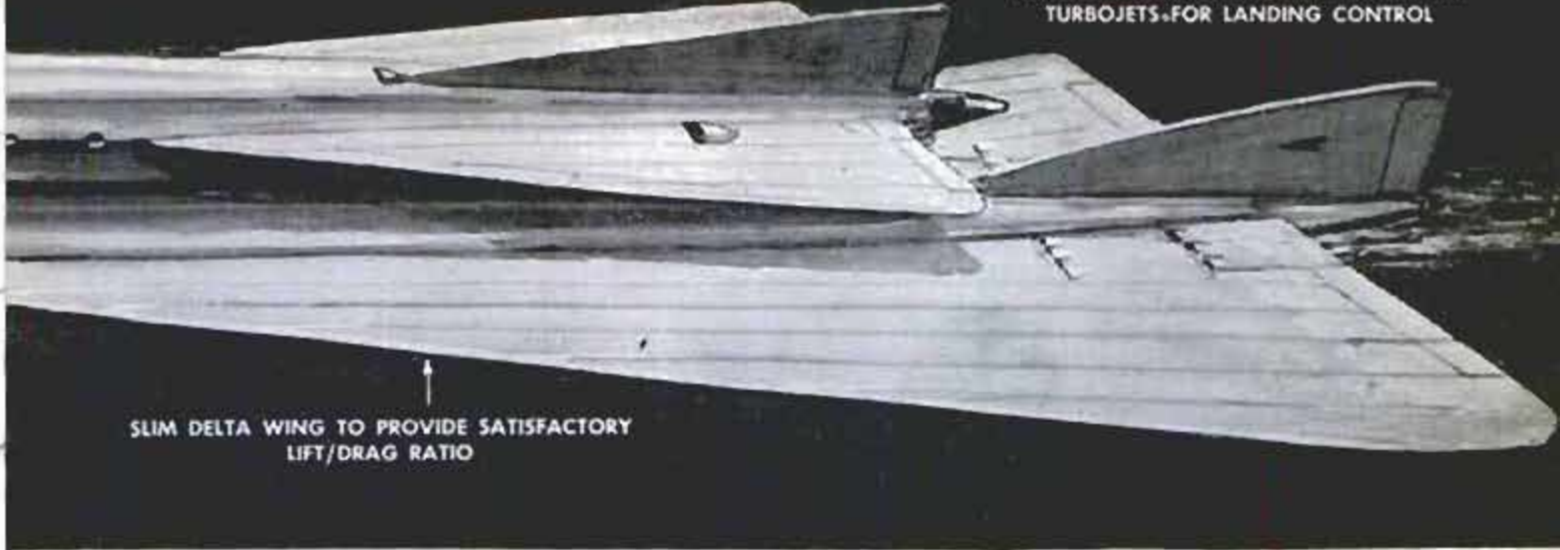
PIGGYBACK AIRCRAFT CLIMBS FAST

LIFT-AIRCRAFT TURNS AWAY AFTER RELEASE

BACK AT BASE, LIFT-AIRCRAFT PREPARES TO TRANSPORT ANOTHER PLANE

AFTER LIFT-AIRCRAFT (LOWER COMPONENT) REACHES 90,000 FT., ITS RAMJET ENGINES ARE SWITCHED ON AND, AT SIGNAL FROM CAPTAIN, RELEASE GEAR IS SET IN MOTION AND TWO AIRCRAFT SEPARATE





SLIM DELTA WING TO PROVIDE SATISFACTORY LIFT/DRAG RATIO

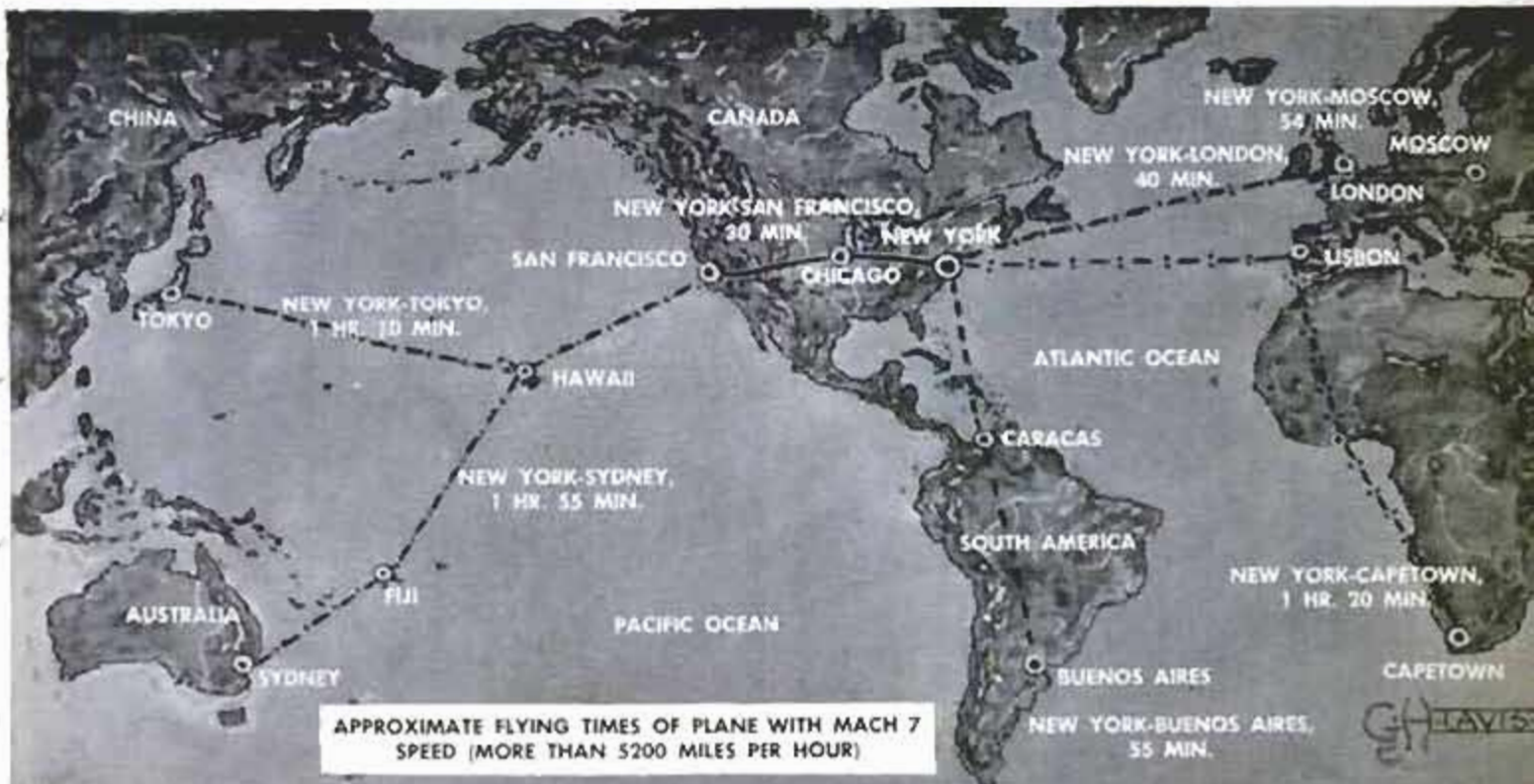
EXCLUSIVELY FOR *Popular Mechanics*, British artist G. H. Davis created this design of a pickaback airliner based on an idea of Dr. R. R. Jamison, British aeronautical engineer, who envisions a plane that would be capable of Mach 7 speed, or more than 5200 miles per hour. Davis based his conception on existing hypothetical plans for supersonic aircraft.



DESCENT OF MACH 7 AIRLINER WOULD START HUNDREDS OF MILES AWAY SO GLIDE PATH WOULD NOT BE TOO ACUTE, AND SET UP FRICTIONAL HEATING WHEN REACHING AND PASSING THROUGH DENSER ATMOSPHERE

AT LOWER ALTITUDES, AUXILIARY TURBOJET MOTORS WOULD BE USED TO AID LANDING CONTROL

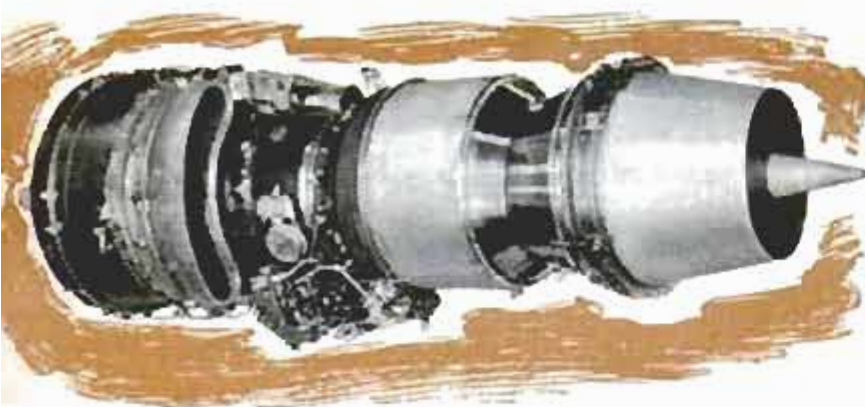
HEIGHT (FT.)	ATMOSPHERIC PRESSURE
130,000	.093 IN. "
120,000	.139 IN. "
110,000	.211 IN. "
	MERCURY
100,000	.326 IN. "
90,000	.51 IN. "
80,000	.82 IN. "
70,000	1.32 IN. "
60,000	2.13 IN. "
50,000	3.45 IN. "
40,000	5.55 IN. "
30,000	8.90 IN. "
20,000	13.78 IN. "
10,000	20.59 IN. "



G. H. DAVIS



Turbofan engine on Boeing 707 has wide ducting to let extra air flow around engine. Turbofan, below, shows duct near end



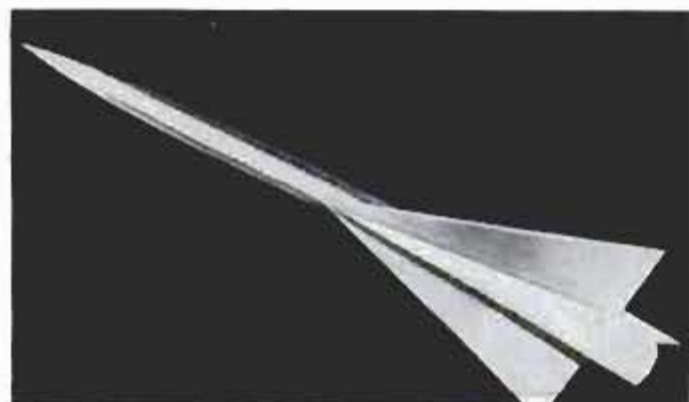
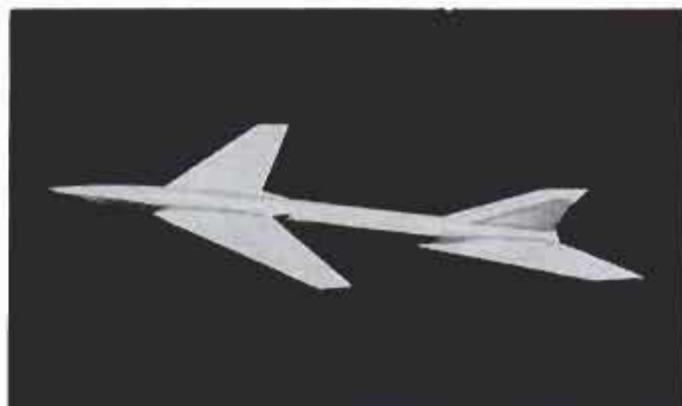
he takes off. And instead of handling the controls it's more likely that the crew will simply monitor the automatic devices that do all or most of the actual flying.

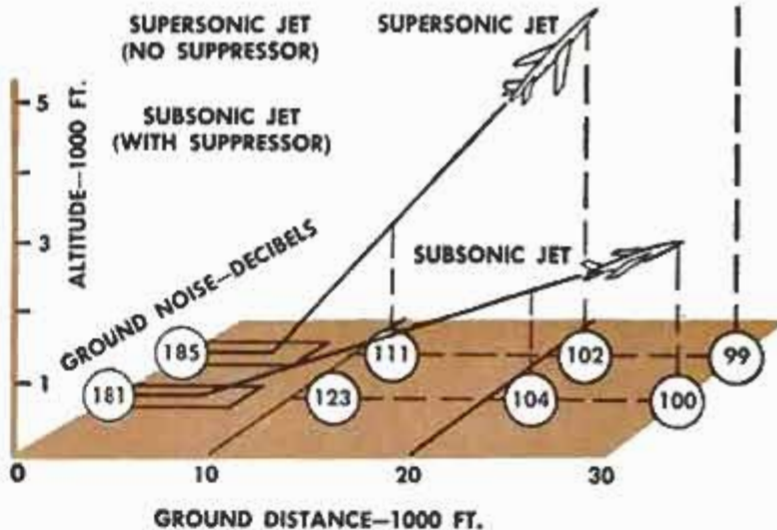
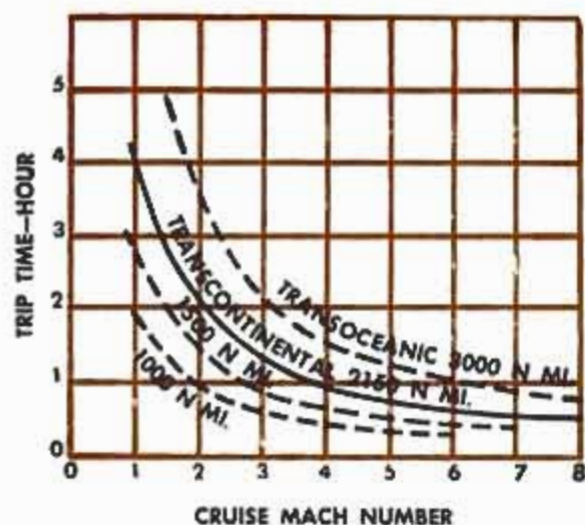
"The pilot may elect to accomplish his climb by pre-programmed tape operating through the autopilot," says M. L. Pennell, chief engineer, Boeing transport division. "Navigational equipment may include digital computers that avoid the necessity of the pilot solving a mathematical problem to arrive at his position, which is changing about 30 miles every minute. All messages to the airplane could be received on the airborne radioteletype. Voice reporting and manual note-taking are impractical at Mach 3 speeds.

"The effect of headwinds is quite small because of the short mission time. From Paris to New York, for instance, a 50 mile per hour headwind would increase the trip time by only three minutes."

Another possibility is an inertial-guidance system in the airliner to control its flight. This type of guidance was developed first for missiles. In an airliner it could be connected to a visual display in the cockpit in the form of a map on which a moving dot of light would constantly show the plane's position.

WING AND BODY ARRANGEMENTS



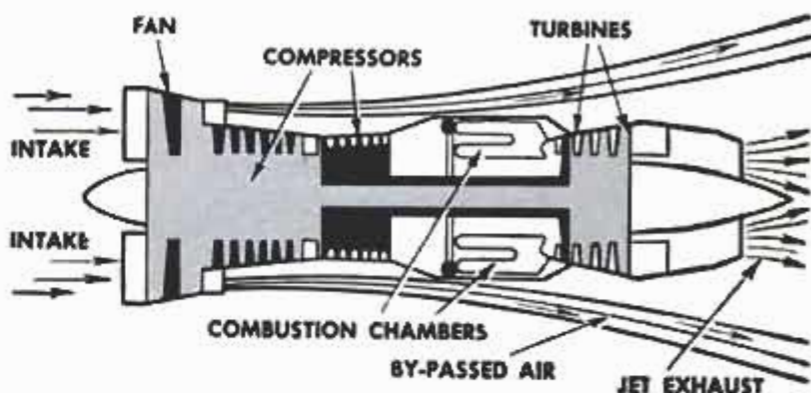


Relating speed to trip time, graph indicates how trip time flattens out beyond Mach 3

Lockheed drawing shows climb paths of supersonic and subsonic jets from airport, also noise in decibels created on ground

Passengers will find little difference between the Mach 3 airliners and the present jets aside from a few novel details. During the climb to altitude they'll prefer to remain in their seats, for the planes will climb at such a steep angle that walking is difficult. And it may be that in place of the windows they'll have flat-plate TV for entertainment. At 70,000 feet they wouldn't be able to see much anyway, and windows are a real headache to structural engineers.

Unless a passenger has a technical background he'll find it hard
(Continued to page 251)



This drawing of Pratt & Whitney's JT3D turbofan engine shows how fan section was added to standard jet engine. The addition betters air performance, boosts power and is economical

POWERPLANT INSTALLATION





Steel fingers strip the entire bean plant onto a conveyor belt; a blower removes the leaves and stems

Twins, 17, Invent Successful Bean Picker

BRUCE AND BERNARD PAULSON, of Clear Lake, Wis., set out in 1957 to design a string bean picker. The odds against them seemed long—the job was considered nearly impossible and the twin brothers were only 15 years old—but they wanted college money.

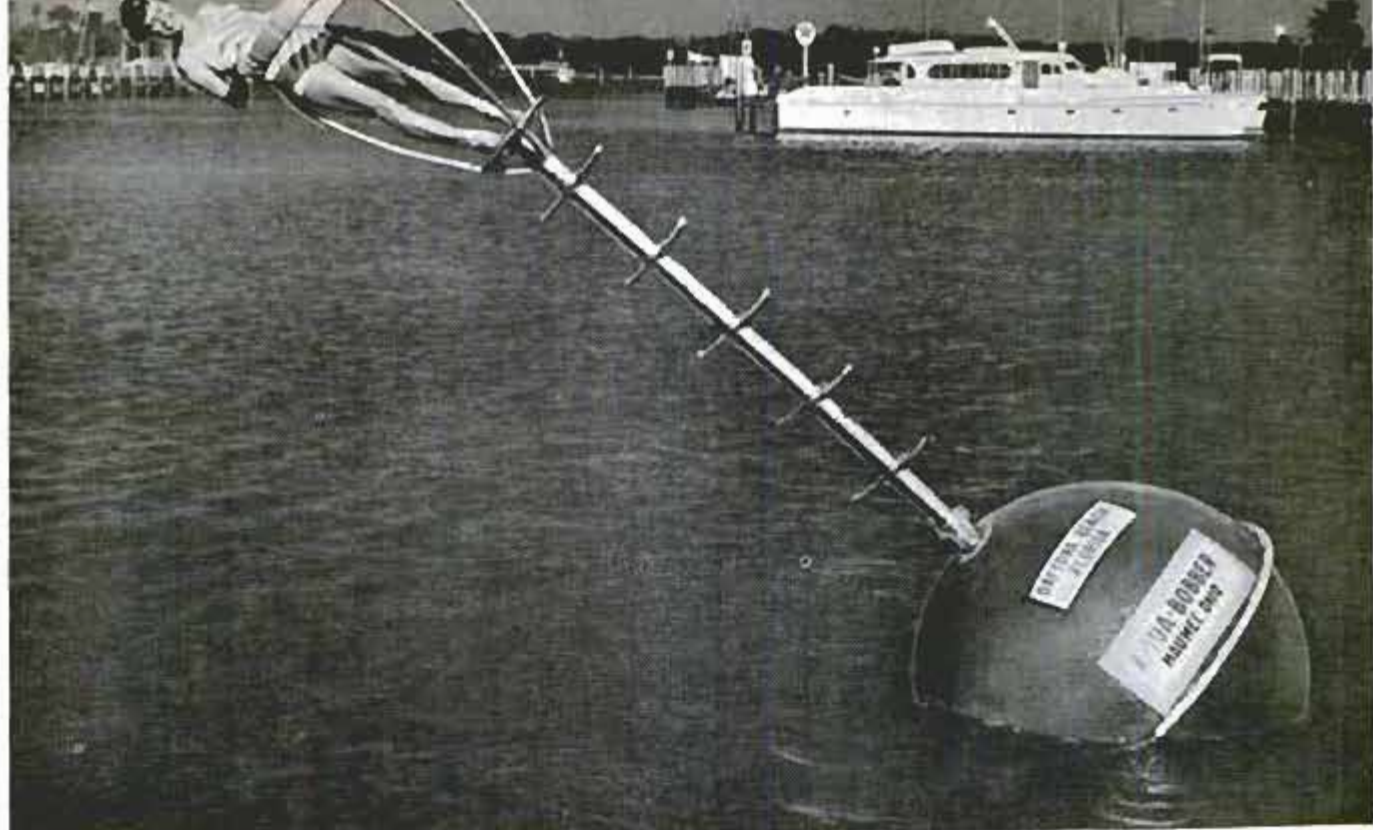
By Christmas they had produced a promising working model; by early 1958

the first prototype was finished. In July it proved it could do the work of 20 hand pickers. Efficiency was high, the cost low.

The brothers, now 17, have formed Paulson Brothers Industries, Inc., which has shipped 40 pickers all over the country and is working top speed to fill back orders while the twins attend engineering school.

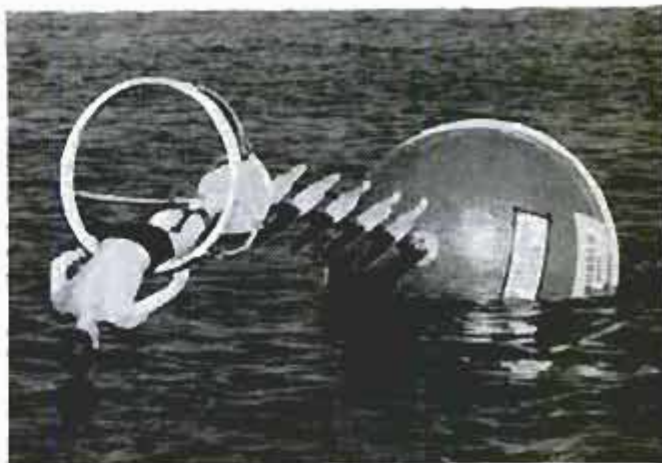
Bruce and Bernard Paulson, left and right, flank their father, Howard, beside a Paulson bean picker





Swinging Crow's Nest Provides Water Thrills

Water frolickers have a new outlet for their energies—the Aqua Bobber. It consists of a crow's nest atop a 14-foot aluminum mast and a floatable sphere made of molded glass fibers. By shifting his weight back and forth in the crow's nest, a person can cause the Aqua Bobber to swing like a pendulum in reverse and even dip him in the water if he wants it to. Inside the sphere are 2200 pounds of concrete.



Pilotless Version of B-47 Stratojet Bomber Developed for Air Force

Latest version of the Boeing B-47 Stratojet bomber is the pilotless QB-47. The six-jet drone, developed by Lockheed and Sperry Gyroscope, is capable of 600 miles per hour and is controlled by high-frequency radio signals with a range of about 200 miles. Controls for takeoffs and landings come from a ground station mounted in a truck. Airborne control is maintained from a director aircraft.

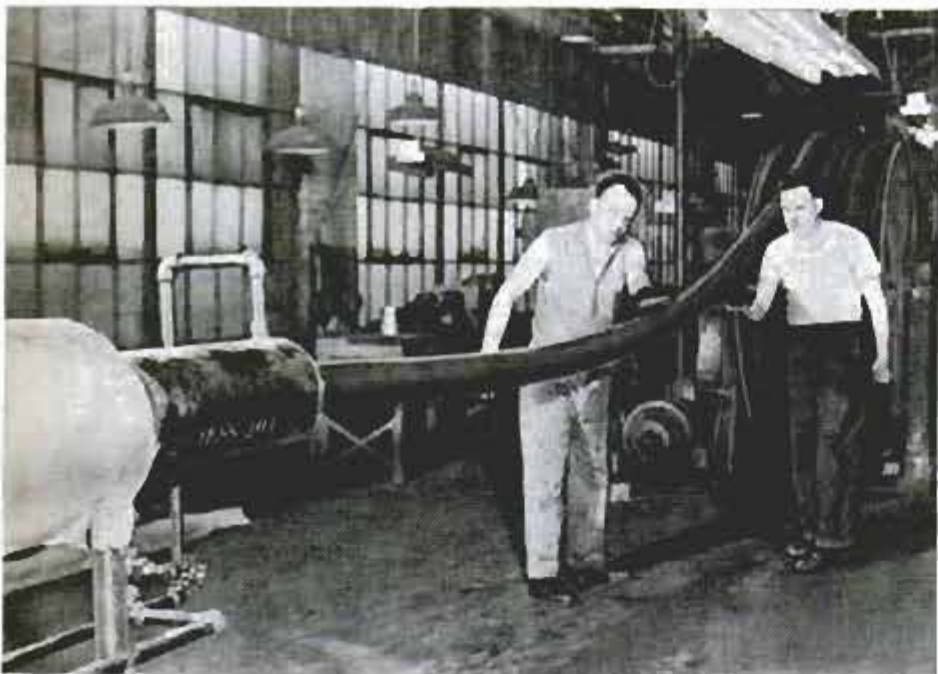
quency radio signals with a range of about 200 miles. Controls for takeoffs and landings come from a ground station mounted in a truck. Airborne control is maintained from a director aircraft.





Atomic Plumbing For "Hot" Waste

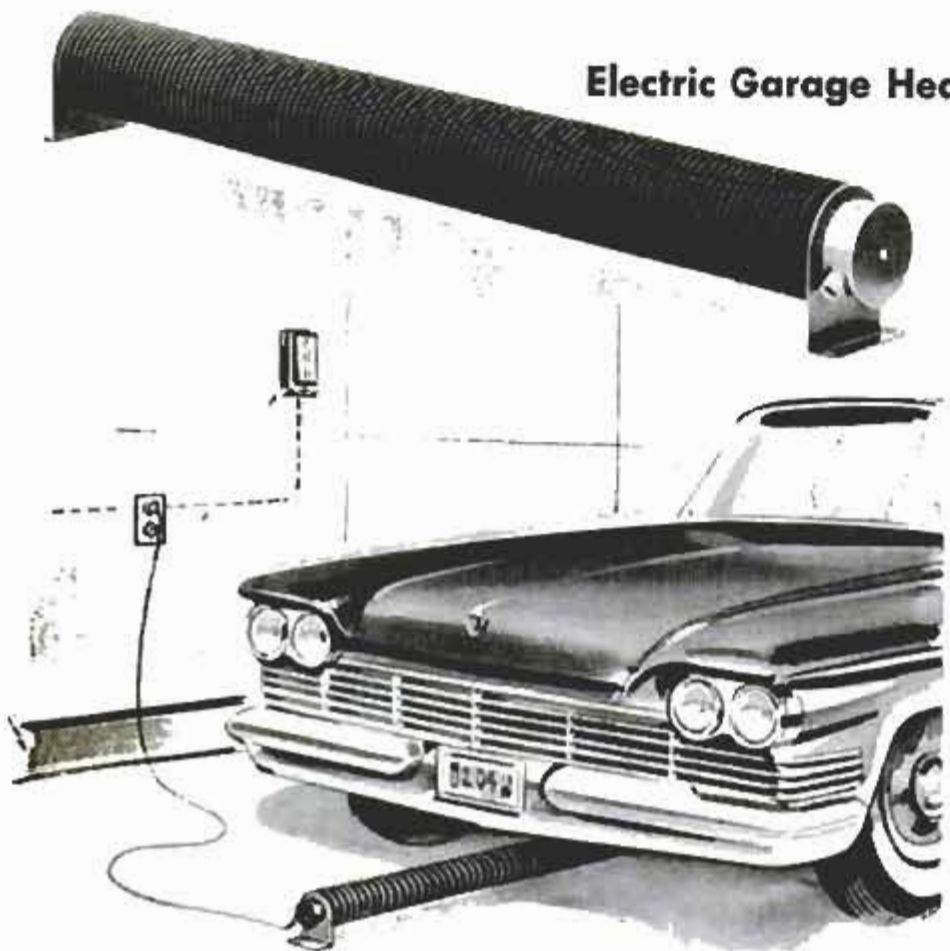
To carry "hot" atomic waste from the new Atomic Research Establishment at Winfrith Heath, England, this pipe is being used to lay an eight-mile pipeline that will run underground from the research center to a discharge point two miles offshore in the English Channel.



Unspliced Hose In Any Length

Production of rubber hose of unlimited length without splices has been developed by Goodyear Tire and Rubber Co. While previously no hose has been built in unspliced lengths over 100 feet, the new system can turn out nonstop lengths with no splice-weak spots. Hose of two to eight-inch inside diameters can be produced that can handle all known chemicals and fuels.

Electric Garage Heater Warms Car Engine



Constant warming of the car engine is assured with a portable electric heater that keeps the engine warm while the automobile is in the garage. The heater, which is 40 inches long, is placed on the floor beneath the engine and radiator. Its large heating area results in a low surface temperature, thus preventing explosion hazards. A garage thermostat can be set at a desired temperature so that heating begins as soon as the temperature drops below the selected level. The heater switches off when that level is again attained. Equipped with a 500-watt element, the heater weighs 26 pounds.



Air Holes in Fins Increase Blimp's Speed and Range

Punching holes in blimps increases their range and speed, according to naval researchers. By placing holes in the fins and along the intersection of the fins with the helium-filled bag, air from the surrounding

layer is sucked in and ejected from the tail to give the ship more push. Scientists expect the holes and other modifications to triple the ship's range and increase its speed by 40 percent.

Transparent Plastic Globe Maps Celestial Movements

Made of transparent plastic, a three-dimensional celestial globe presents a complete and accurate picture of movements of the sun, moon, planets, stars and artificial satellites. With the earth centered inside the globe, all celestial bodies move with its axis. Eighty constellations, including the Milky Way, are described on the globe. The sun, marked by a red ball, can be positioned to obtain times of sunrise and sunset. The sun's highest altitude can be read with an altitude indicator. In addition, the globe, which is 12 inches in diameter, traces the shift of constellations, rising, setting, waxing and waning of the moon, eclipses of the sun and moon, and movements of planets and artificial satellites.



Biggest Boat on the



Nearly two million dollars' worth of sleek brute force, the M/V *United States* is the first of a new class of super-towboats that will move more barge cargo on the Mississippi faster than ever before

BY THE TIME Federal Barge Line's new super-towboat *United States* had completed her first round trip from St. Louis to New Orleans last fall, river boatmen everywhere had agreed that St. Louis Shipbuilding had built "the granddaddy of 'em all"—a towboat powerful enough to handle the biggest barge tows through any Mississippi current. At right, boiling upstream with a "medium-sized" tow a third of a mile long, her wake testifies to the tremendous thrust of her 8500 horsepower—2500 more than any other towboat on the river.

First of a new class of super-towboats, the *United States* is 180 feet long and 58 feet in the beam, and is capable of shoving 40 or more barges from New Orleans to St. Louis in a third less time than any other boat. The payload runs into fantastic tonnages. A single big oil barge will carry over 4000 tons of oil, and a 40-barge tow can involve three million cubic feet of cargo—enough to fill ten 100-car trains.

Maneuvering a load like that around sharp bends and through bridges against the tricky river currents calls not only for immense power but for split-second agility. Each of the *United States*' four big diesels

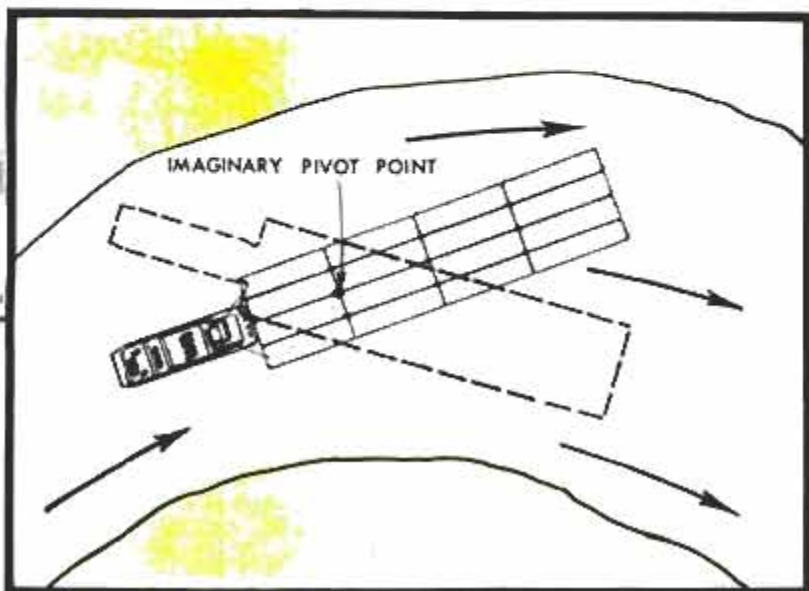
drives a nine-foot screw inside a venturi shroud that increases its thrust by 25 per cent and aids maneuverability by directing the resultant jet of water into the 10 steering and flanking rudders. The combination of reversible engines, counter-rotating screws and multiple rudders allows the pilot to turn an entire tow in its own length or even move it sideways.

The *United States* and her skipper, Captain Jesse Marks (opposite page, top right), have every modern navigational aid, too—radar, electronic fathometers, and even an automatic pilot. The pilot also has direct control of the engines and constant radio contact with his dispatcher and other boats.

An example of the delicate maneuvering of a tow around a downstream bend is shown on the opposite page. As he enters the bend, the pilot backs his engines, holding the pivot point of the tow stationary, while the current takes the head around the bend. Then he applies full power to keep the tow in the new channel. One error in judgment can ground the tow or ram the bank, tear the tow apart and send the barges drifting downstream alone. And with the capacity of the *United States*, the pilot's responsibility can involve millions.

River

By
Louis M. Reitz



Captain Jesse Marks, above, heads upriver with a 30-barge tow. Though river boatmen stopped towing and started pushing cargoes a hundred years ago, the words "tow" and "towboat" are still used on the river



Bulldozer?

An Elephant Will Do

By Julie Divine

Photos by Tom Dewberry

In a Florida cypress forest, a wintering show elephant named Alice wrestles a stubborn tree trunk loose



HAVE YOU EVER wondered what show elephants do in winter when the midways are silent and the Big Top stored away?

Most of them have a fairly dull time of it, but not Alice, Mona and Marge, three elephants with the James E. Strates Brothers Show. They marched in President Eisenhower's last inaugural parade and have appeared on Ed Sullivan's television show and in several movies. Now, under their trainer, Burt Pettus, they have learned a new profession: land-clearing—not unusual for elephants in other countries but unique in the United States.

These talented elephants winter near Taft, Fla. with the rest of their show. Someone in the show conceived the idea of a small zoo to help support the performers in the winter. A two-acre tract of land was found nearby, but a cypress forest would have to be cleared away without a large capital outlay. Pettus said his three elephants could do the job.

Mona, who was 35 when they started work, and Alice, 32, were easy to train in commands like "Push it down! Push it down! Up, Mona! Alice, trunk! Feet! Feet!" In fact, they often would size up a job for themselves, deciding whether to walk up a tree trunk until it snapped under their great weight, or work together, pushing and pulling until the tree fell.

Baby Marge, only 14 and partially trained, took a more light-hearted attitude and frequently confused the work with a circus performance. She liked to stand about, trunk lifted and one foot raised daintily, while Mona and Alice strained at a stubborn tree. When the tree gave way, Marge would quickly abandon her pose and scamper for safety.

After a few hours' work in the hot Florida sun, Pettus rewards his labor crew with a swim in a cool stream between the cypress forest and a nearby railroad track. There the elephants wallow in the sand, sometimes sliding down the embankment into the water. Once in the water, they roll and blow in one another's ears and generally have such a good time that Pettus has to be quite persuasive to get them to leave. If a

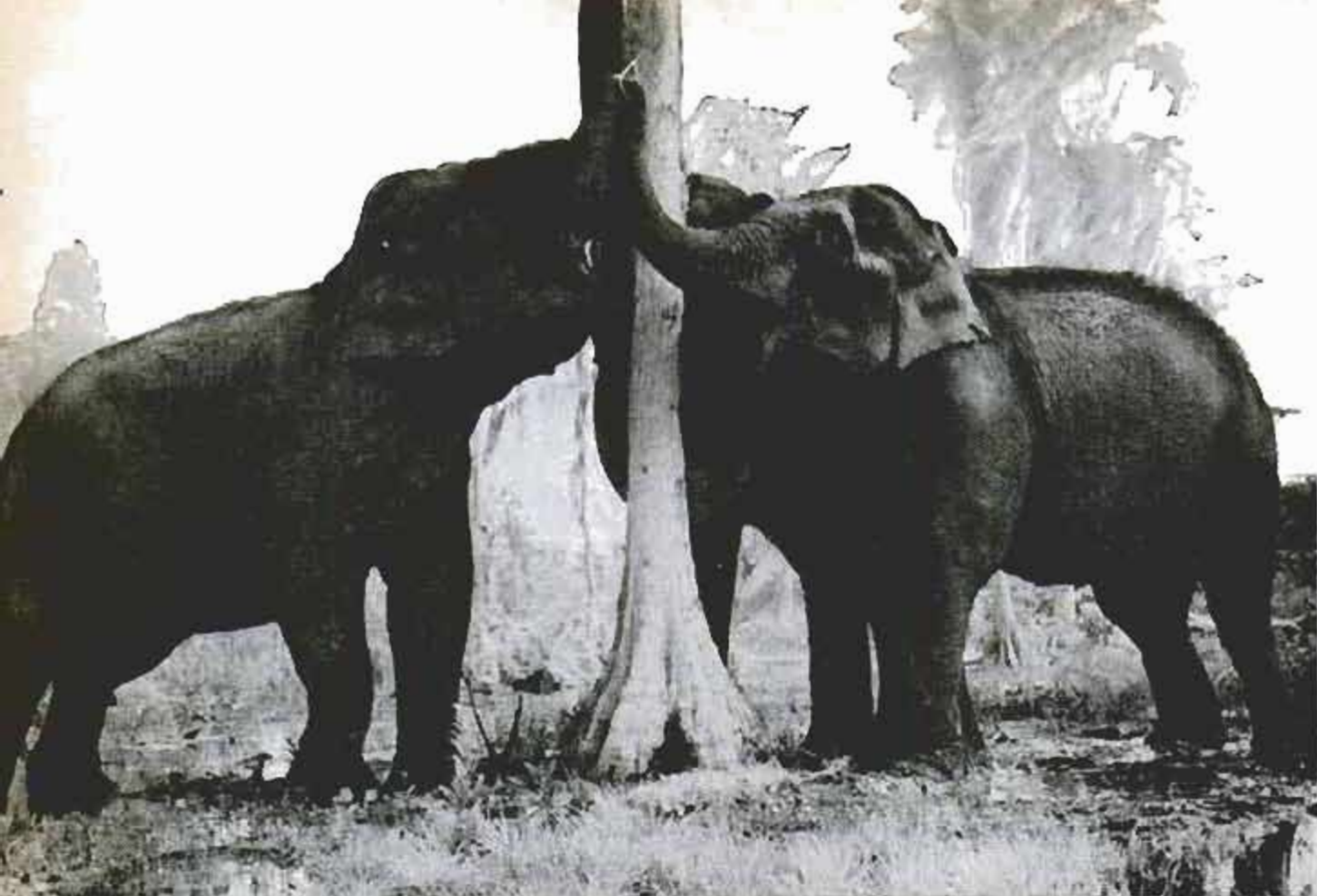


Elephants fell trees in different ways. Marge, right, enwraps, and Mona, center, butts. Alice brings force with her tusk



Above, Mona continues to struggle while the other two elephants look for next challenge. Below, they clear away debris





Mona, left, reaches high to exert leverage on a good-size cypress tree while her co-workers try to help

train comes by while the elephants are in the pool, Pettus faces them toward the engine so that they can see it. This keeps them from being frightened by the noise.

After the sand and water bath, Pettus puts Alice, Mona and Marge through a short rehearsal of their regular show routine—just to keep them in practice. ★ ★ ★

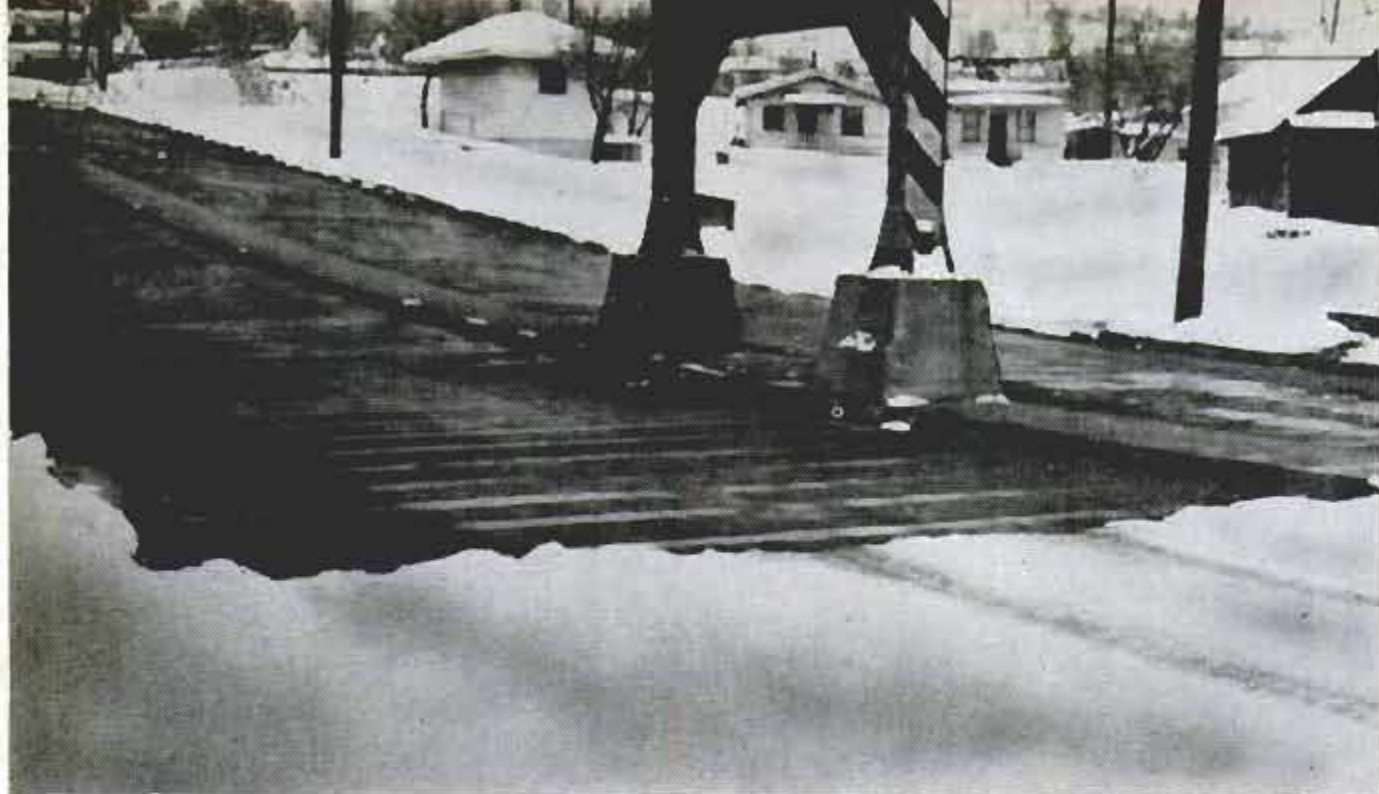


Burt Pettus, who has been training elephants ever since 1926, gives Alice, Mona and Marge a change of pace by rehearsing their circus act



The last tree is felled, it's fun time and elephants start sliding down a sand slope for a cool dip in

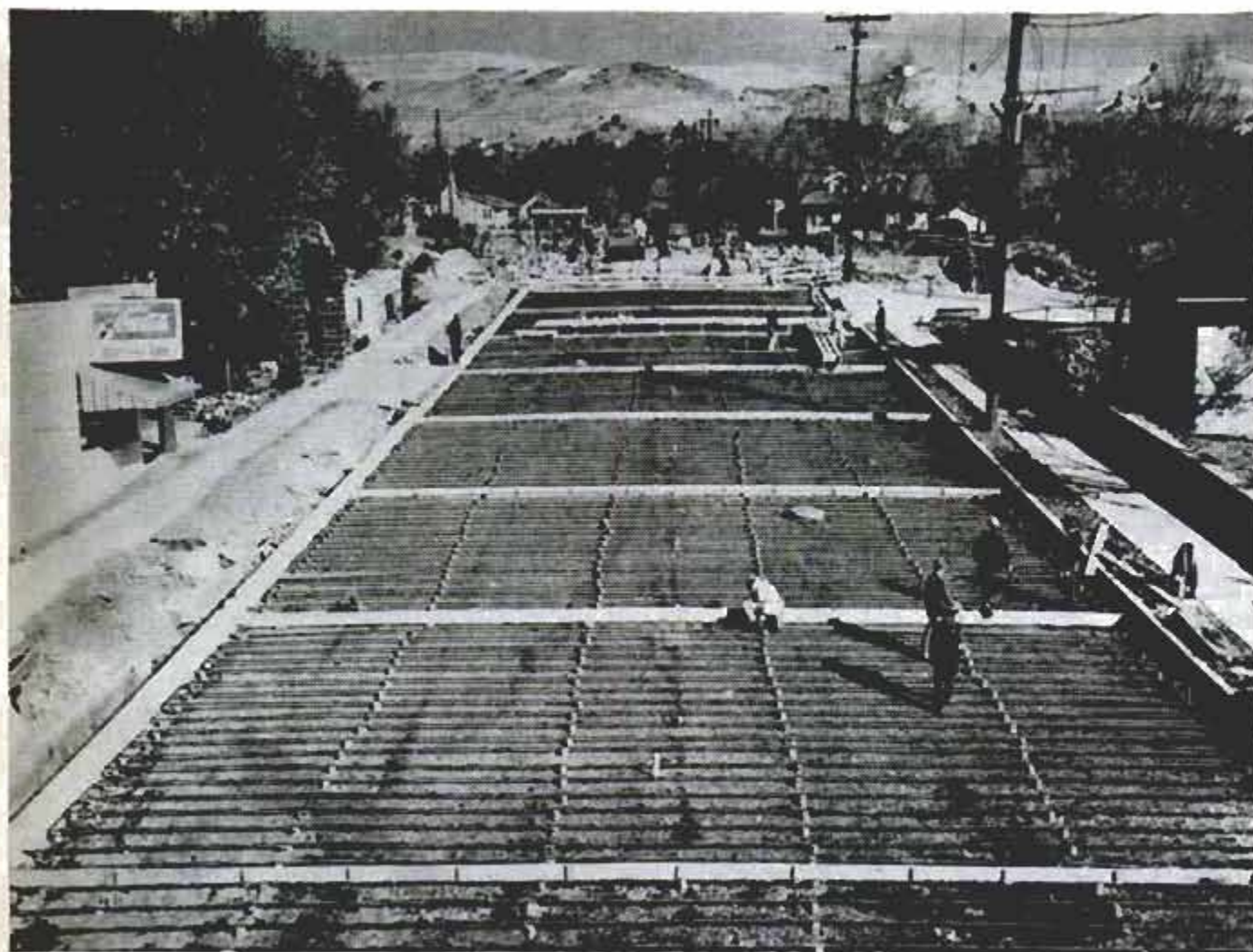




Hot Springs Keep Graded Section of Street De-Iced

ENGINEERS knew the basin formed under a railway bridge by their new road at Klamath Falls, Ore., would become a snow trap and skating rink, so they tapped a hot spring 425 feet beneath the surface. Since the sulphurous water would corrode

pipes, a heat-exchanger deep in the well transfers most of the mineral water's 180-degree warmth to pure water, which circulates through the street's concrete slabs in a network of pipes. Water enters at 130 degrees, drops to 65 degrees afterward.





Lens for Still Cameras Zooms for Close-ups

Owners of single-lens-reflex 35-mm. cameras can now bring photographic subjects as close as desired while standing in one place by using an all-purpose lens that zooms in or out on any scene. By merely turning the ring adjustment, you can photograph a subject in any size wanted, just as a television camera does. Wide-angle effects are also possible with the lens. Three variations adapt the unit to most every single-lens-reflex camera on the market. Filter attachments and adapter will be available. There are 14 elements to the lens, which has a maximum aperture of f:2.8. Price: about \$300.



Altimeter Gives Readings On Tape Instead of Dial

In a new altimeter developed by Bulova Watch Company, altitude readings are shown on a continuous logarithmic tape instead of on a dial. Said to cut reading time in half and virtually eliminate reading errors, the instrument indicates altitude with an error of less than 10 feet at sea level. Raising or lowering the altimeter by hand as little as two feet gives a visible indication on the scale when one is at or near sea level. The tape, about 40 feet long, ranges from minus 1000 feet to plus 65,000 feet and is driven by a servomotor. It is read through a window. The altimeter's sensing elements are aneroid capsules, their output is transferred to the indicating mechanism electrically.





COMPLETE PICTURE SHOWS WOMAN ON THE MINIATURE SET—REDUCED TO SCALE

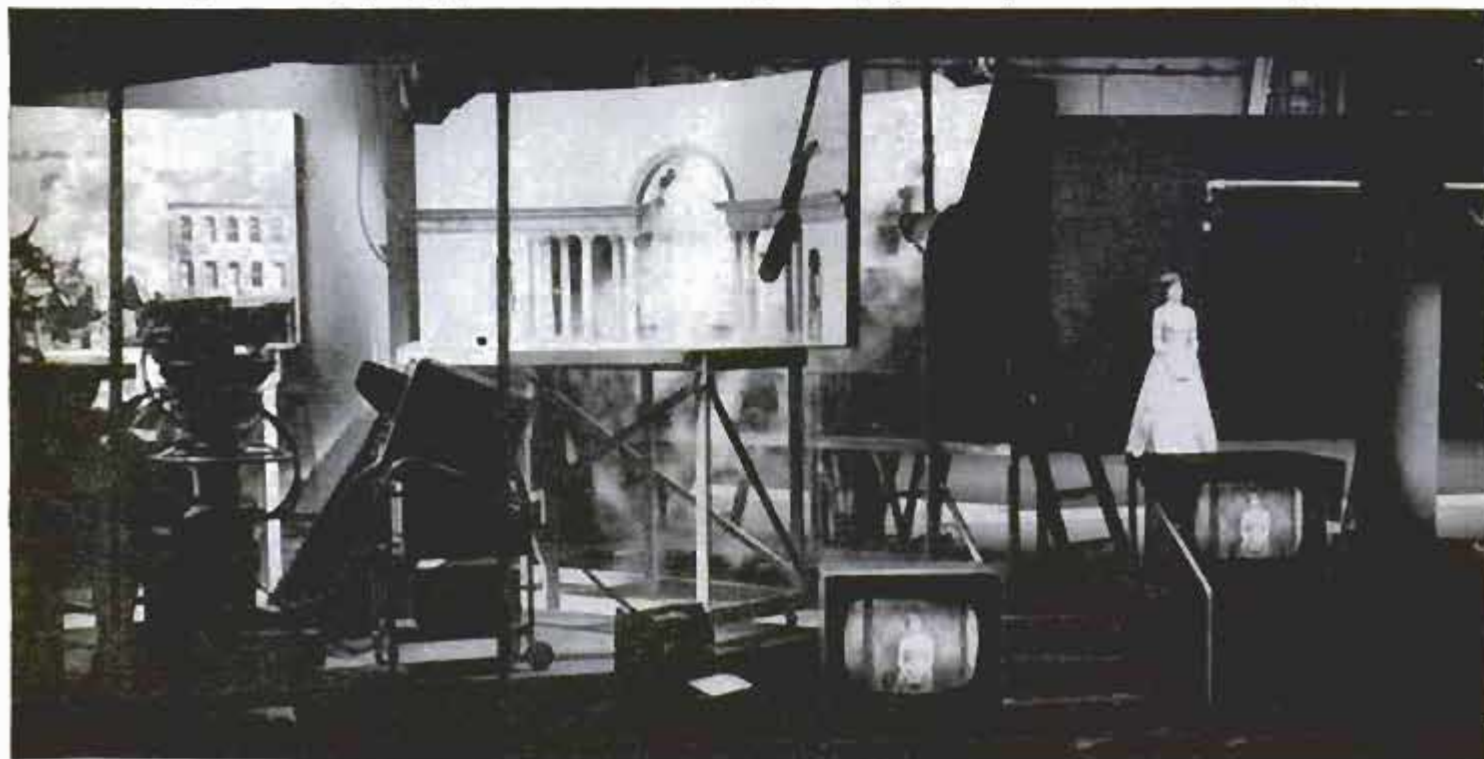
FULL-SCALE SET USED BY ACTORS



MIXING MONITOR IN CONTROL ROOM GETS BOTH PICTURES, SUPERIMPOSES ONE ON THE OTHER

TV's Tiny Spectaculars

Combined images of singer, right, and miniature setting, center, produce picture on set in foreground



MASTER CAMERA, WITH OPERATOR, IS FOCUSED ON FULL-SCALE WOMAN ON STAGE. STAGE HAS REFLECTIVE BACKGROUND, WHICH BLACKS OUT IN THE PICTURE

SET TO 1/8 SCALE



SERVO LINK—AS MASTER CAMERA PANS, TILTS OR ZOOMS, SATELLITE CAMERA FOLLOWS ITS EVERY MOVE ON MINIATURE SET, REQUIRES NO OPERATOR

SATELLITE CAMERA FOCUSED ON MINIATURE SET FEEDS PICTURE TO MIXER

WALK INTO the carpentry shops of CBS Television these days, and you'll have the distinct impression that the carpenters are busy indulging a personal hobby on company time. You'll see skilled men industriously building precise scale models of houses, streets, mountains and broad vistas of wide open spaces. The detailed perfection of their craftsmanship would raise the envy of any model railroader. Intricate scrolls cap Doric columns on an elaborate Grecian colonnade two feet high. Fragile, postage-stamp-size shakes are tacked to the sides of a desert ranch house in a miniature ghost town. Six-inch windows have real glass panes set

in hairline mullions. Delicate paper cherry blossoms on a 12-inch-high tree grace a Japanese garden in an Oriental village about six feet square.

The highly detailed models, built to one-sixth life-size scale, are nobody's hobby, however. They are actual sets on which live actors will perform—in perfect scale. The people will be shrunk to set size by a new piece of electronic trickery that will enable telecasters to bring the whole outdoors into even the smallest studios quickly and economically.

"For years the TV camera has been frustrated by the confines of the studio," explains Carlton Winckler, director of pro-

Right, miniature sets take as much time to build and cost as much as full-scale sets, but let great panoramic backgrounds be used in a small TV studio

Video scene of a live dancer superimposed over a background picture of two-foot Grecian columns illustrates realism that can be achieved by this method





Giants and lilliputians are no problem with miniature sets—an actor on the tiny set looks huge, or one televised by the satellite camera can be superimposed on a full-sized scene for many unique special effects

duction operations at CBS. "When a script called for a 'cowboy and Indian chase' across the desert, it either had to be done at great expense on location or be killed since we couldn't provide proper studio background. One Western we produced took up all of our studio stages for several days. Street scenes are a continual headache because you can't control passers-by on location, and no TV studio is big enough to build a whole city street—even if we could afford it."

Now with the tiny sets, created by Winckler and his production manager, Paul Wittlig, live actors can be superimposed on a nearly limitless variety of scenes, all packed into the confines of even

a small studio. This unique system, called "VideoScene," uses a missile-tracking technique applied through a servo mechanism, which links two cameras and synchronizes their movements. While a master camera, operated by a cameraman, focuses on a completely blank full-scale stage on which the actors really move and perform, a "satellite" camera in another part of the studio covers the miniature sets, following every movement of the master camera automatically via the servo link. In the control booth an engineer, sitting at a console studded with buttons, mixes the two pictures into a single composite, which goes out over the air to your

(Continued to page 252)

Workman prepares a miniature old-West street scene. Most of the models are built one-sixth life size

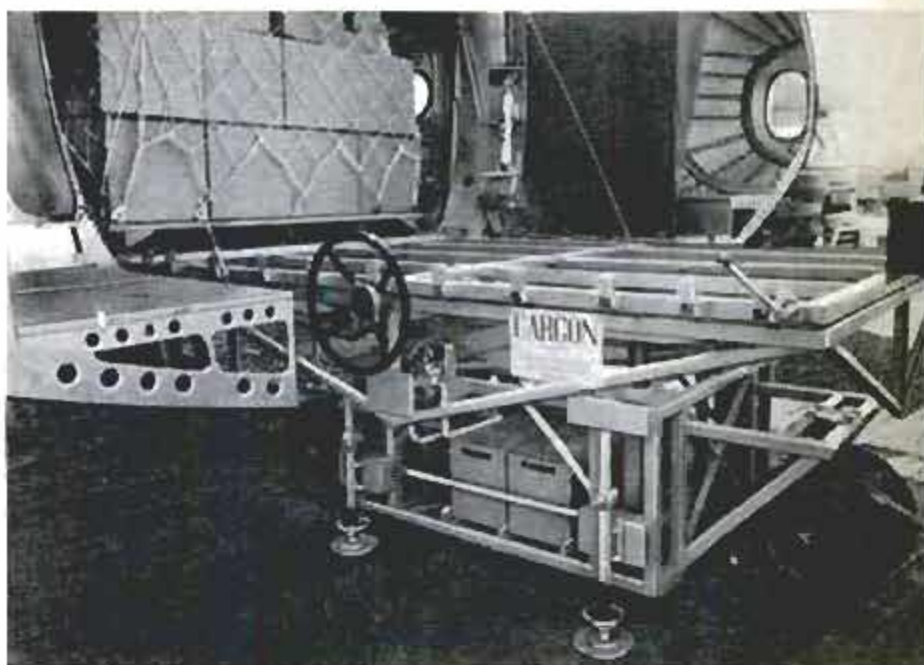
Finishing touches go in place on a Japanese garden, complete to the blossoms on a 12-inch cherry tree





Mobile Cargo Stand Speeds Aircraft Loading

Preloaded pallets of cargo can be rolled quickly into transport aircraft with this new English loading stand and a simple adaptation of a flatbed truck. Built on five sets of rollers, the preloaded pallet is mounted on matching rails on the truck, then driven to the waiting plane. The mobile stand bridges the gap, and since the rails fit the seat studs that are standard on all planes, the cargo can be rolled in easily by one man. The system is said to cut loading time to a fraction of that for other methods.



Antiaircraft Missile For British Army

Powered by a rocket engine, the Thunderbird is the first British-designed and British-produced missile to be employed by the British army. It will see service as a special anti-aircraft weapon. At the present time, the missile is being used by British soldiers in training at the School of Antiaircraft Artillery at Manorbier, South Wales.



A Scientist Blows Square Bubbles

—and from his research appears a promising new method of exploring the earth's crust

By Thomas E. Stimson, Jr.

A SCIENTIST who blows square bubbles when he wishes, and who can burst a tiny rubber balloon with the explosive effect of a couple of pounds of TNT, has devised a new way of looking into the earth.

His "subsurrex," or subsurface explorer, uses beams of sound to draw profile pictures of underground strata with a clarity and detail not even approached by older seismic methods. With modifications the apparatus can show the location of underground water and even follow the course of mineralized veins.

The new method of exploring the earth's crust was developed by Louis R. Padberg, Jr., a specialist in anti-submarine warfare at the Navy Electronics Laboratory in San Diego. Portions of his invention are so closely allied to advanced echo-ranging techniques that the patents he holds were held up for several years until parts of the information could be declassified.

Ordinarily in geophysical prospecting, an explosive charge is detonated at the surface, creating vibrations that travel through the earth. Some of this wave energy bounces off underground strata, including faults and anti-clines, and is reflected back up to the surface where it is recorded. Among other uses, these seismograms pro-

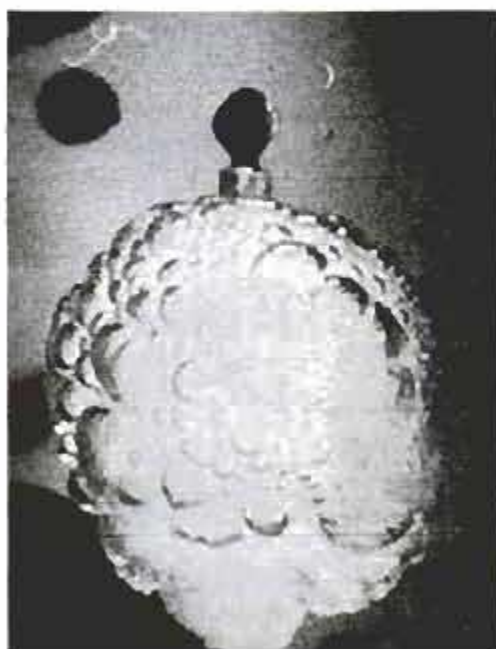
vide information that helps locate structures where petroleum might be found.

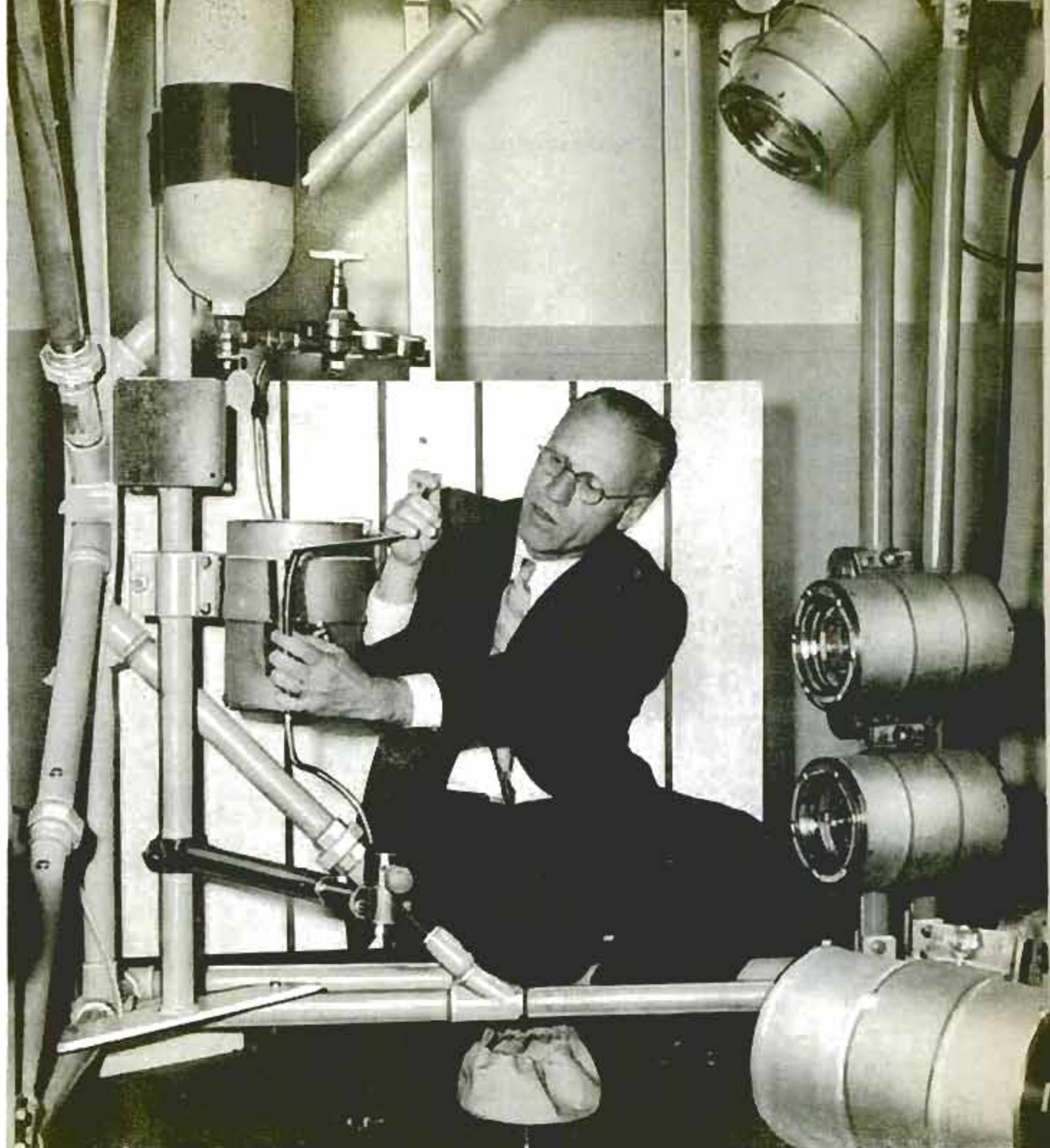
Lou Padberg uses short bursts of high intensity sound instead of seismic waves, eliminating all the hazard and much of the expense of earlier methods, and obtaining results that are easier to interpret. He creates his sound under water, in some cases by exploding momentary cavities in the water. His methods already are in use by several oil-exploration companies.

To demonstrate one of his techniques, Padberg takes his visitor into an unclassified portion of the laboratory where a large tank of water rests on the floor. He lowers a pair of electrodes into the tank, then presses a firing button. WHAM! There's an explosion in the tank and the floor of the room vibrates from the concussion. Several hundred thousand watts of electric power, discharging between the electrodes for a tiny fraction of a second, had created a cavity or bubble in the water, and it was the explosive creation of the bubble and its implosion that produced the sound wave.

To demonstrate another method of producing high-intensity sound under water, he attaches a small, thick-walled balloon to a CO-2 cartridge and lowers the mechanism into the tank. "Stand back," he directs you,

High-speed photos, made at rate of 3000 pictures per second, show detonation of underwater sound bomb





Metal cage used in studies of explosions includes high-intensity lamps to permit high-speed photography

"the balloon is going to blow water all over the ceiling."

He yanks the cord that discharges the CO-2 gas into the balloon and again there's a sharp explosion. The 1200-pound water tank jumps off the floor and water splashes all over the room.

You begin to think that a larger balloon would make a very good depth charge and you mention this.

"There are several interesting military possibilities," Padberg answers, "but I can't talk about them. What I can discuss is the usefulness of this pneumatic sound source

in geophysical prospecting. It happens that the balloon produces sound of very low frequency. The noise you heard had a frequency of about 35 cycles per second, and it's possible to produce a sound having a frequency of only one cycle. The frequency is controllable and increases with the depth at which the explosion occurs.

"An amazing thing is that the balloon and the CO-2 cartridge, weighing about a pound, develops a greater pressure than does another type of low-frequency sound source that weighs seven tons.

"This underwater sound bomb concen-



Sound bomb consists of rubber balloon plus gas cartridge. Inflated under water, it has explosive power of TNT



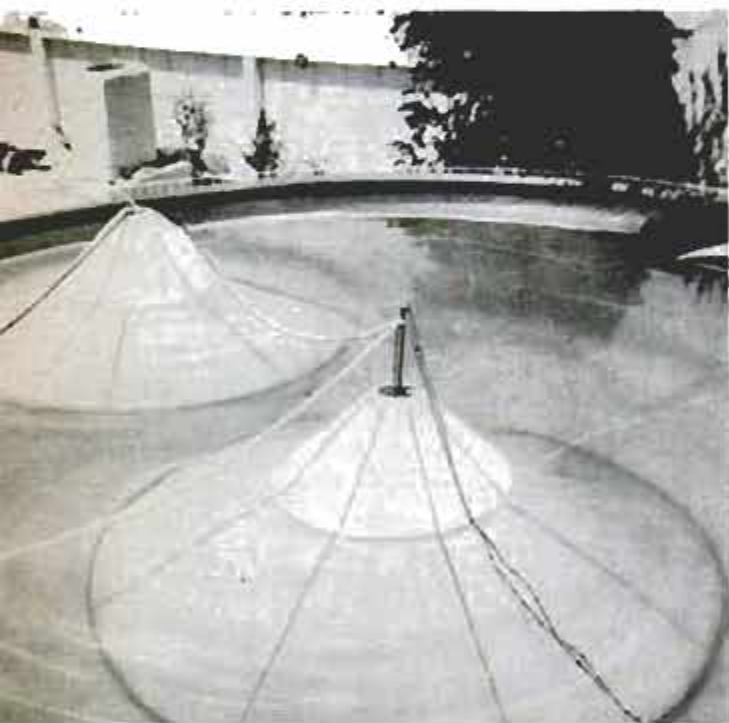
Louis Padberg inspects spark gap he places in 1200-pound water tank to make underwater sparks

trates all its energy at a single frequency, while an ordinary chemical explosion creates sound at almost all frequencies. You have to filter out the frequencies you don't want and so most of the energy is wasted."

It takes ultra high-speed photography to show what happens when the balloon blows up under water, for the entire action occurs in only a few thousandths of a second. Pictures made through a thick glass port of Padberg's laboratory tank, of a balloon two feet below the surface, show that the balloon grows from its original one-inch diameter to six inches. Then the membrane ruptures and a large bubble is created, squeezing the surrounding water with tremendous force. Almost immediately the water pressure causes the bubble to oscillate and then collapse, generating another pressure wave.

Still another way in which Lou Padberg

Conical reflectors in Padberg's backyard swimming pool were used in early studies of spark explosions



creates underwater sound is with a transducer, a magnetostriction device that contains thin laminations of nickel. These expand and contract, creating sound waves of a desired frequency.

What about the square bubbles that Padberg produces? "In some of our underwater spark experiments," he explains, "we mounted the electrodes on bracket arms so that we could very accurately adjust the width of the gap. The arms of the bracket were parallel. When the underwater spark occurred, creating the bubble, the bracket arms restricted its shape. Instead of a sphere the bubble was essentially a cube, with square sides. This can be seen only by means of high speed photography."

Used Backyard Swimming Pool

Some of Padberg's first studies with underwater sound were done in his backyard, in a large plastic swimming pool. To project the sound downward into the earth he used a large conical reflector to concentrate the energy into a beam 15 degrees in diameter. A similar reflector was used to receive and concentrate the sound waves that bounced back from underground strata. In other studies parabolic reflectors were used.

To create a picture that shows, pictorially, a cross section of the ocean and the earth below it, Padberg installs either an underwater spark apparatus or a magnetostriction device on board ship, then steams ahead in a straight line at six knots, meanwhile transmitting short pulses of high powered sound vertically into the ocean.

The echoes that are reflected back up to the ship not only show the depth of the water but give an indication of the composition of the bottom and also show the stratification of the earth's crust below the

(Continued to page 236)



Hinged Tail on Transport Planes Speeds Cargo Loading

Bulky freight loads easily into two swing-tail cargo transport planes being built by General Dynamics Corporation for military and commercial use. The 635-

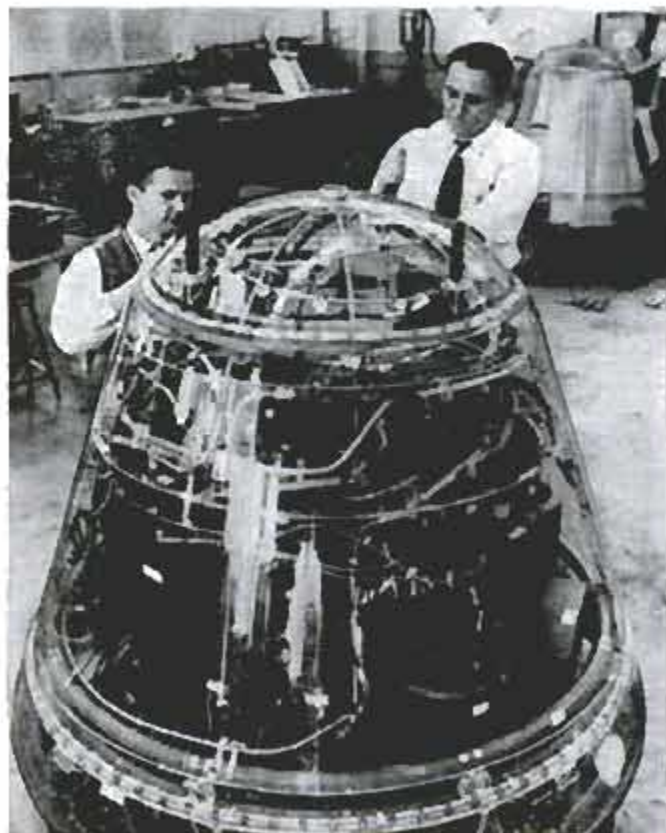
mile-per-hour Convair "600" turbojet and the 400-mile-per-hour Canadair turboprop retain a straight-tube fuselage; the hinged aft section allows easy rear entry.

Peer Into Missile Model

Engineers can study the component parts of a full-scale model ballistic re-entry vehicle through its transparent skin. Most of the visible equipment is part of the telemetry and re-entry stabilization systems. The model was built for the Air Force.

Revolving Seat Aids Barber

Riding a revolving saddle, an arthritis-afflicted English barber moves around his customers with ease. The specially designed "scooter saddle," which glides on two wheels, is attached to the barber chair with a wood and metal swivel and follows a circular path around the chair.





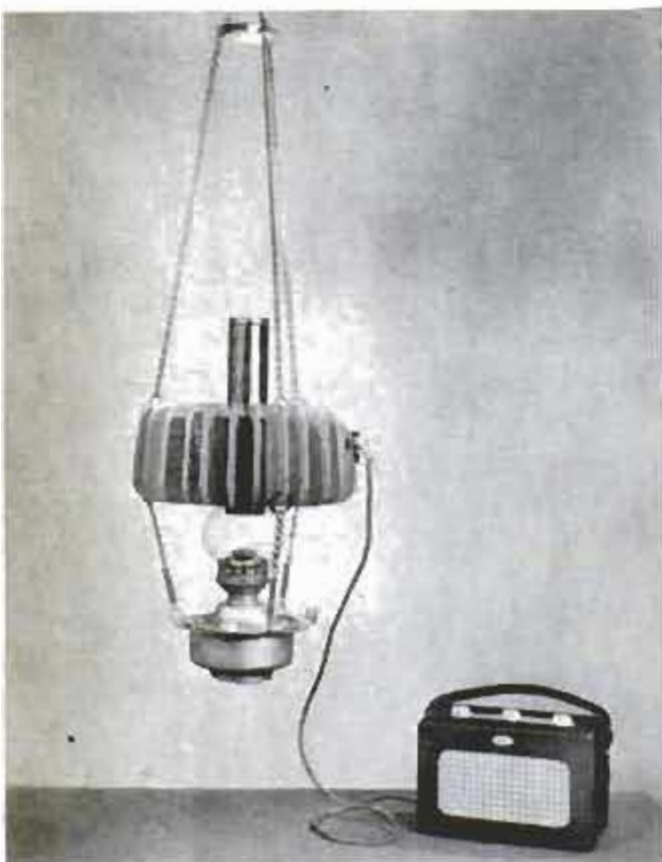
Camping Trailer for Six Mounts on Truck Chassis

All the comforts of a 27-foot house trailer are contained in a super camping top that mounts on the chassis of a one-ton truck. There are full accommodations for six people including an upstairs bedroom over the cab and a sun deck on the roof. The demountable coach has a refrigerator, built-in oven, four-burner butane stove, butane space heater, shower and toilet with septic tank. It has its own 50-gallon pressure water supply and carries a power-plant for 110-volt lighting.



Russian Kerosene Lamp Generates Power for Radio

Fitted with a junction-type, two-watt thermo-electric generator to convert its exhaust heat into electricity, this Russian kerosene lamp provides light while generating enough electricity (80 to 90 anode volts) to operate a portable radio. The inventor is Professor A. F. Ioffe of the Institute of Semi-Conductors in Leningrad.



Phosphorus May Be Mined In Sea off California

University of California scientists are investigating the possibility of mining large deposits of phosphorite rock found in many areas off the West Coast. They have dredged a half-ton of the mineral from the ocean bottom just west of San Diego. If the phosphorite rock can be mined and processed commercially, it can provide the basis for a fertilizer industry on the West Coast. Phosphorus now comes primarily from Idaho and Florida.



Not all of Streit's work is done with peach stones—these books and bookends shown above were carved from a block of acrylic plastic. Streit adds final touches to a "hear no evil" monkey. He spends from two to 15 hours on an individual carving, depending on details.

Peach-Stone Sculptor

By Don Oliver

ROBERT J. STREIT, of Neenah, Wis., makes a hobby of a specialized branch of sculpture—he carves peach stones. He claims that it isn't really sculpture—just carving—but shaping rock-hard peach stones into the objects below is the work of a real artist.

Streit allows the stones to dry thoroughly, then removes most of the crevices with a file before going to work with his collection of over 40 jeweler's files and power tools. He uses a jeweler's magnifying glass for the most delicate work. He polishes the finished carvings with a buffer to get a gemlike luster.

Right, closeup of finished chalice shows delicate detail work. Light-colored carvings in the group below are plastic, but the rest are from his collection of intricately carved peach stones.





Powered Log-Splitter Trails Behind Car

Logs up to 30 inches long can be split by a new seven-horsepower machine that can be trailed behind a car or truck. Weighing under 500 pounds, the splitter nevertheless has 18 tons of force in cutting tough and knotty pulp or firewood logs. It has automatic two-speed hydraulic action and a choice of manual control or continuous automatic stroking. The wheels are raised and lowered by power to avoid the "dead" lift of large logs.



Chicken House Just a Bubble

Agriculturists at Rutgers University have built a plastic-bubble chicken house. It's made of a large sheet of polyethelene plastic film that is kept puffed out by a motor blower. No inside supports are needed. Built to test effects of heat on chickens, the bubble house can be used as an isolation laboratory, controlled - environment chamber, chicken brooder or emergency housing.



Propane Burner Yields Electricity

Scientists have developed a thermoelectric generator that converts the heat of a burning fuel directly into electricity on a scale large enough to light an average room. The generator, developed by Westinghouse for the Air Force, will be used to power electronic installations in isolated areas. About the size of a medicine ball and weighing 40 pounds, the generator burns propane and operates at a temperature of 850 degrees Fahrenheit.



Sternwheeler Revives Old River Days

With only a picture as his guide, a Louisiana man built a 36-foot copy of his family's old sternwheeler. Powered with an 18-horsepower gasoline engine, the vessel has a cruising speed of 12 miles per hour. Its paddlewheel turns through chain-drive

controls of a Jeep's rear-end mechanism, with remote steering from the pilot house. Two false stacks and a ship's bell give the craft an authentic look. Fourteen persons can be seated in the cabin of the little sternwheeler, which is used for outings.

Passers-by Get Phone Report Of Construction Progress

Sidewalk superintendents at the construction site of Western Electric's new building in Manhattan get a running account of progress by telephone. The account is on a tape recording that is changed frequently to keep pace with the construction of the building.

Number, Please!

Whenever you write us to

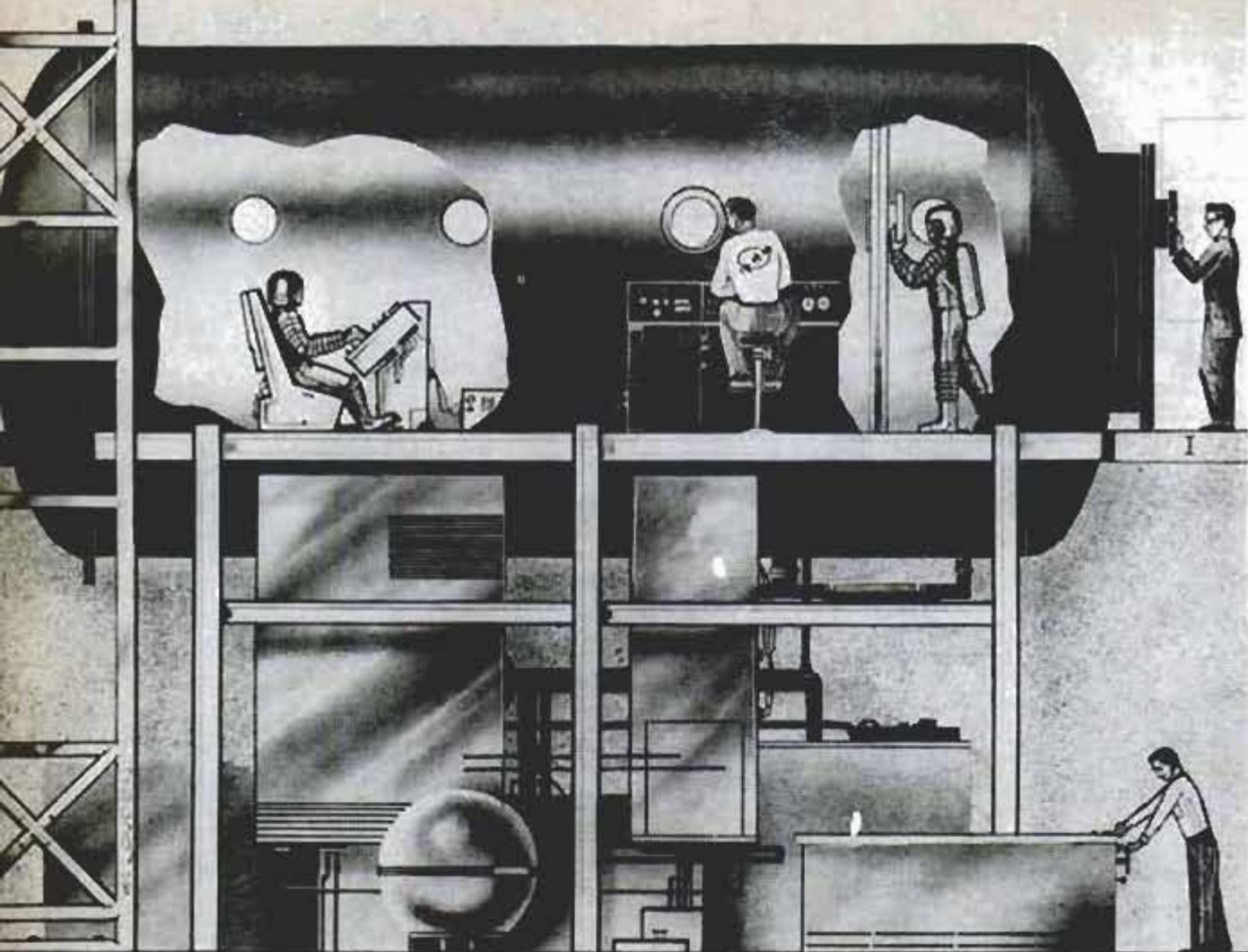
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*This insures better delivery
It helps you and it helps the postman.*





Test Chamber Will Take Man 150 Miles Up

Space suits, men and material will be tested in a chamber capable of taking a human 150 miles above earth. In the sketch above, technicians are measuring peripheral vision and mobility of the space-suited man as he responds to various test se-

quences set at an outer control panel. The two men at the right are safety monitors. The space-environment chamber, which will measure 14 by 30 feet, will be built into Republic Aviation Corporation's astronautics research center at Farmingdale, N. Y.

Pilot and Ground-Control Exchange Information by Push Button

Air safety and traffic control have taken a step forward with the development of an automatic communications system that enables a pilot and a ground-control station to exchange information by pressing buttons.

By means of a data-handset, the controller can compose and send messages in pulse-code to aircraft. The messages are displayed on the pilot's control panel. A two-way exchange can be made in an instant.



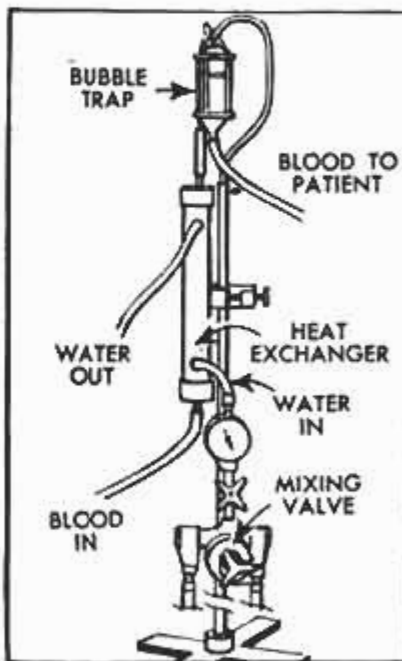
Sunbeam Sports Model Built for U.S. Market

Offering American luxury with a European sports-car flair is the Sunbeam Alpine. Designed primarily for the American market, the Alpine includes, as standard equipment, wind-up windows, wrap-around windshield, large bucket seats, occasional rear-passenger seat and disk brakes. A removable hardtop is optional on the car. The four-cylinder engine is equipped with an aluminum high-compression cylinder head with balanced induction and exhaust manifolds. Unit-constructed, the Alpine has an 86-inch wheelbase and is 155.25 inches long. Maximum horsepower is 83.5. Sunbeam is a product of Rootes Motors, Inc., of England.



Blood Heat Exchanger Cools Temperature Fast

Lowering body temperature 10 degrees in five minutes, a heat exchanger quickly regulates blood temperature during heart operations. Lower temperature cuts a patient's oxygen requirements and lessens damage to his blood cells. Previously, it took patients as long as two hours to cool with ice packs. After the operation, normal temperature is achieved in 10 to 15 minutes. The exchanger has 24 steel tubes mounted inside a cylinder through which blood is kept flowing during the heart operation.



Glass-Fiber Door Lights up Garage

Homeowners can "light up" their garage with a door made of translucent glass fibers. Admitting light much the same as frosted glass, the new door has tempered, extruded aluminum frames to provide strength, yet weighs just one-third as much as conventional wood garage doors. It resists weather and will not shatter or warp. The appearance of the door can be maintained with an occasional garden-hose spraying. It comes in several decorator colors and in 10 sizes to fit all openings.





Inflatable Rings Keep You Afloat

Inflatable plastic rings that slip on the legs and arms make any nonswimmer unsinkable while he floats atop the water. First shown at a West German fair, the rings can be carried in the pocket when they are deflated.

Syrup for Polio?

Syrup vaccine for immunization against poliomyelitis is being studied by the U. S. Public Health Service and other agencies, and three types are under test in Africa and Russia. The vaccine, unlike the Salk type widely used now, contains live viruses and before it can be approved the authorities must be satisfied that it will build up antibodies and will not cause the disease, and that persons given the syrup cannot transmit the disease to others.



Stainless Steel Caps Protect Cow's Teeth

"False teeth" made of stainless steel are expected to add several years to the life of a breeder cow. Steel caps are crimped over the cow's eight anterior teeth in dental cement. Up to now, the life span of many a cow was shortened when her teeth were worn away by abrasive material in grass and she was no longer able to feed herself. The new caps stop loss of enamel and prevent exposure of nerves and destruction of the jaw.



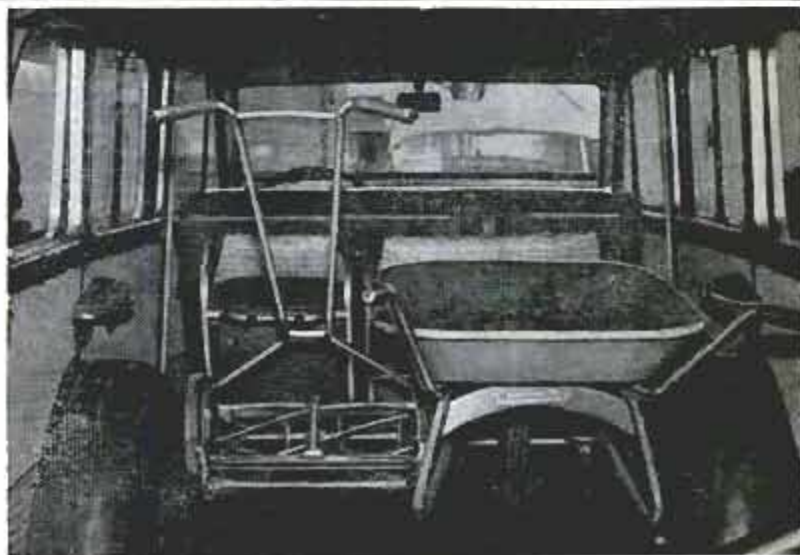
Cleats Held to Tires By Inflatable Bag

Designed to keep trucks from getting stuck in mud and snow, a new version of traction cleats are held in place by a nylon bag that slides between dual tires and is then inflated. The bag, reinforced with metal and covered with tread gum, can be blown up in a few seconds with about two pounds of air taken from the outside tire by means of a four-foot hose. The hose is attached to the valve stem of the tire and to the bag. It has a thumb bolt at one end and an air chuck at the other, plus a pressure gauge. The cleats fit all standard makes of dual wheels.



Economy Wagon Added to Jeep Line

Providing maximum inside space with minimum outside dimension, the Maverick Special station wagon adds an economy car to the Jeep line. Its price is \$1995, making it the cheapest six-passenger station wagon made in America. With the rear seat folded, there is enough room inside the wagon to carry a wheelbarrow and lawnmower, plus many other items. It has a standard Jeep engine.



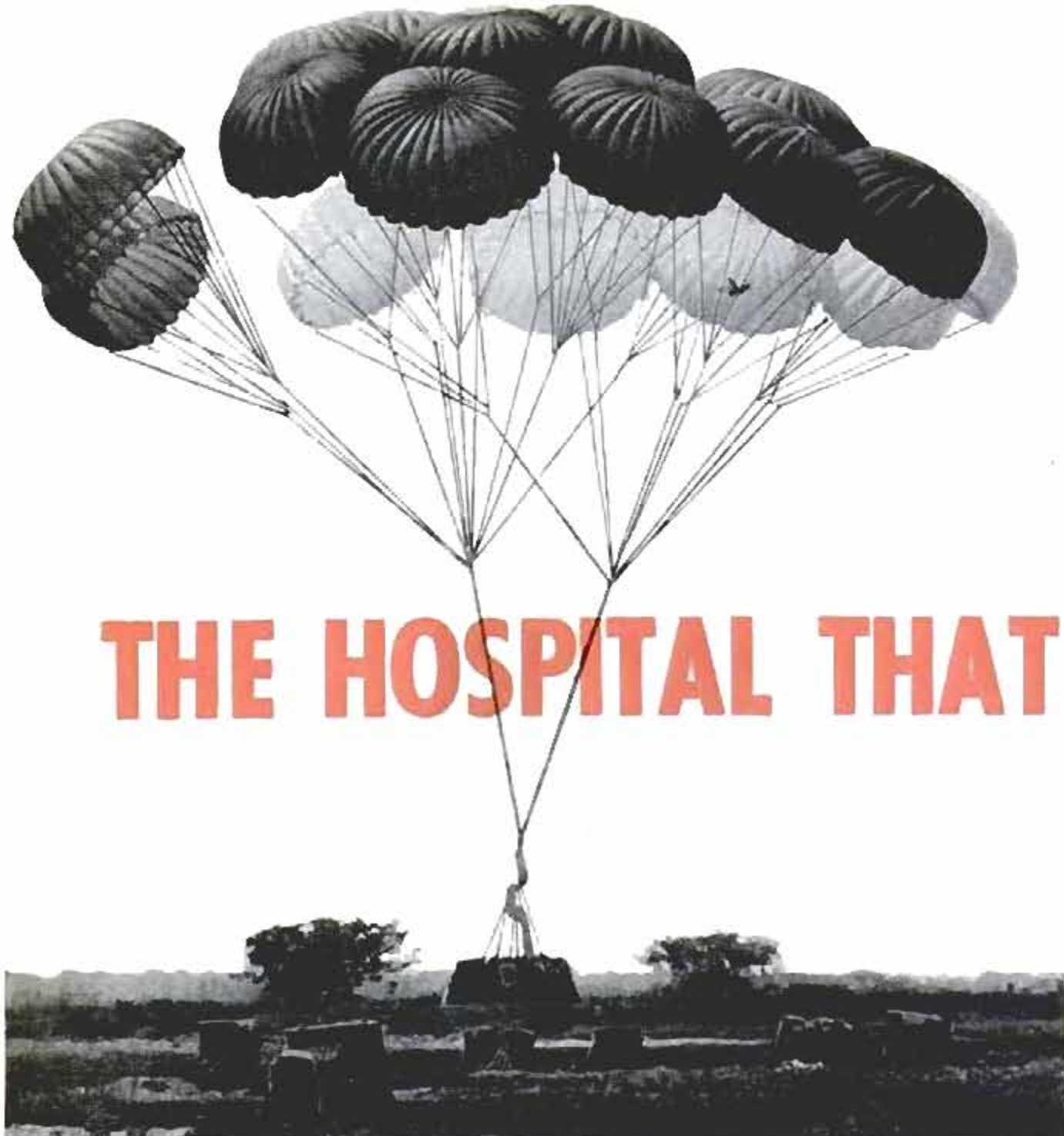
Compressed-Air Bottles Give Skis Jet Power

Now jet power has come to the aid of the skier. A pair of skis, made in Austria has, in effect, "jet-assist engines" to increase speed. A compressed-air bottle, mounted on each ski, sends a high-pressure jet of air blasting along the center groove beneath the ski. The jet is said to reduce friction between the ski and the snow, thereby increasing the speed.

Skin-Diving Cameramen Check "Hot" Waste Disposal

Skin divers will take underwater pictures of simulated radioactive waste materials, dumped into the ocean for disposal, to learn whether the packages leak or disintegrate. For the tests, a colored dye that registers on color film will be used in place of the wastes themselves. Other studies include the speed and direction of currents at the dumping grounds, and sampling of bottom sediment and salt water. Possible absorption of the radioactive materials by crabs and other bottom dwellers also will be studied.





THE HOSPITAL THAT



Complete field surgical hospital lands on a field in Thailand during a recent SEATO exercise. As many as 20 parachutes must be used in a "dandelion seed" cluster to support the heaviest pieces of equipment

Photos by
French Air Ministry,
James Pickorell

Members of the French 10th Airborne Division Surgical Team go into action, inflating their "hospital" as soon as they hit the ground. Compact, generator-powered blower pumps inflate the tents in three minutes

COMBAT EXPERIENCE in North Africa taught the French Army the difficulty of providing medical support to troops during the early hours of an airborne assault. Shown on these pages is their answer—a complete field surgical hospital that can be parachuted from a single transport aircraft and set up in minutes near the drop zone, ready to handle battle casualties in the all-important first few minutes after injury.

Two officers and seven enlisted men make up the special Airborne Surgical Team that is now a regular part of each French airborne division. The key to their fast operation is three inflatable hospital tents of the British "Numa" type—one large unit of 1750 cubic feet volume and two smaller tents of 430 cubic feet each. For ground transportation they are supplied with a quarter-ton Jeep ambulance, a motor scooter and a collapsible trailer.

A single French Air Force Nord Atlas,



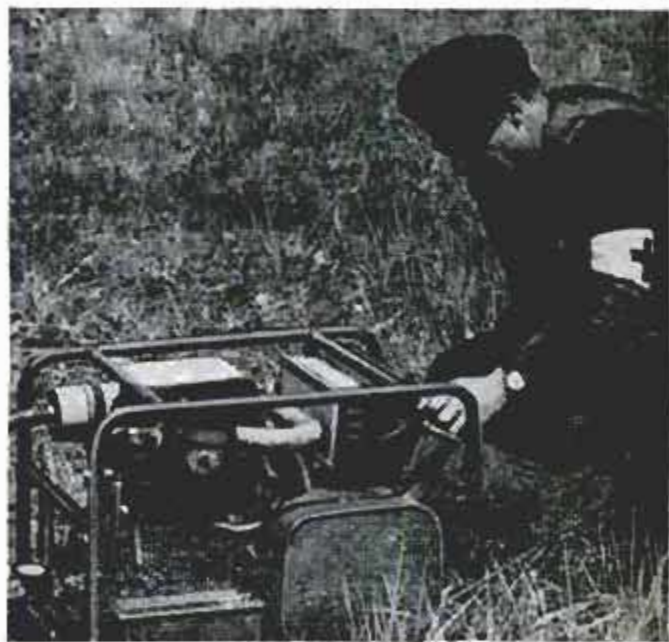
Medics assemble the lightweight folding operating table as the other team members inflate the tents

DROPS FROM THE SKY

their version of the U. S. C-119 transport, delivers the entire hospital unit—nine men, 400 pounds of tents and equipment, three vehicles and 3000 pounds of medical equipment and supplies—by parachute.

Inflatable rubber ribs form the framework of the fabric tents. Once on the ground, the team spreads the tent walls and floors in position, starts a portable 0.5 kilowatt power unit, and uses blower pumps to inflate the framework. The job only takes about three minutes, and in the meantime other team members assemble the folding hospital gear, including a full-scale operating table, which is ready to wheel into the "hospital" by the time it's inflated.

The entire operation, from the time the chutes touch down until the hospital is ready to receive casualties, takes only 20 minutes. ★ ★ ★



Above, airman starts 0.5 kilowatt generator. Below, hospital and ward tent ready to handle casualties





Thickness of Fat on Live Pig Gauged by Ultrasonic Waves

It's now possible to measure the thickness of fat on the back of live pigs with sound waves. Employees of the British Oil and Cake Mills in England perform this test with the help of an ultrasonic-wave machine. The pig in the photograph may look suspicious, but the machine is said to be humane and painless, as well as accurate.



Plastic Guard Locks Plug In Electrical Outlet

Plugs can be locked in outlets by plastic guards that take only a minute to attach. Held in place by a single screw, the lock keeps children from disconnecting freezers, refrigerators, timing devices and other household appliances.

Elastic Strap Holds Clipboard on Arm, Freeing Both Hands

Now you can hold a clipboard with no hands. The board is attached to the arm with a strap, freeing both hands to do the work. The adjustable strap is made of elas-

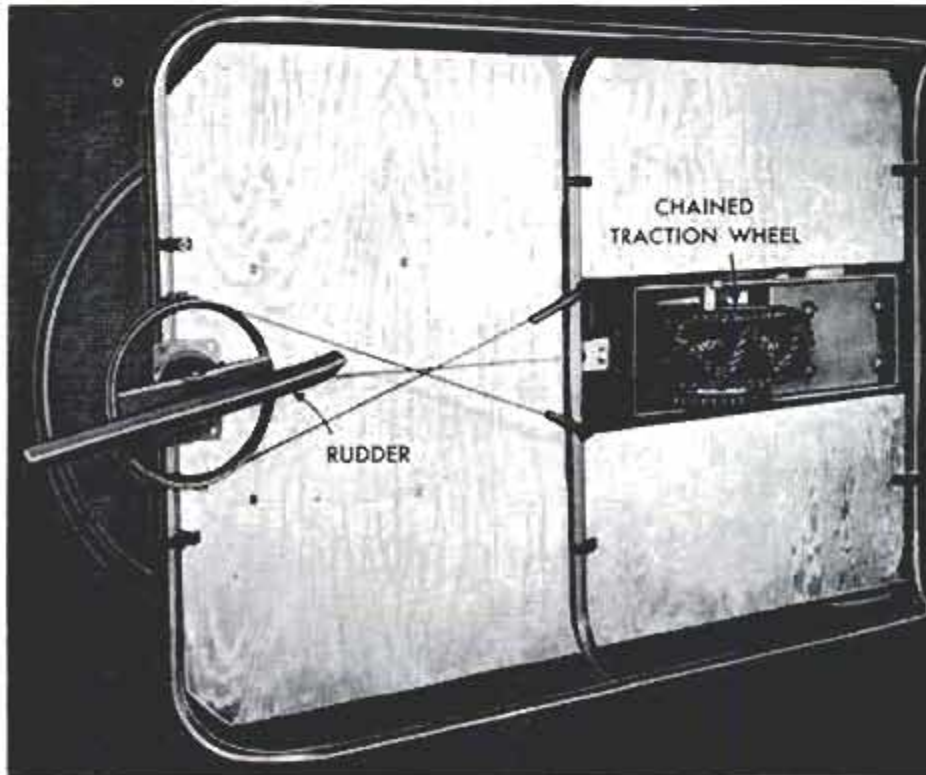
tic webbing. The elasticity and grip of the webbing hold the clipboard in any position. A large clip at the bottom of the board holds down the paper.





Speeding Ice Sled Turns on a Dime

Making split-second turns on ice at 35 miles per hour or sweeping gracefully on wide curves are some of the thrills that can be obtained with a high-speed icesled. Constructed of steel and electrically welded tubing, the sled has a $2\frac{1}{2}$ -horsepower, two-cycle engine mounted at the front, with the driver's seat at the rear. A chained center wheel provides traction on the ice and snow while movement of the sled is controlled by an airplane-like steering wheel that guides a steel rudder. An extremely low center of gravity assures safety at high speeds. The sled balances on case-hardened steel side runners, while a steel guard rail around the rider keeps him from sliding off the sled. Finished in two-tone enamel, the sled, which is 30 inches wide and 48 inches long, can be carried in the car trunk. It will carry loads up to 350 pounds.



Automatic Reader Translates Data

Developed to speed processing of military information, an Air Force machine can read and translate typewritten pages into electrical signals at the rate of 200 characters a second, or 2400 words a minute. The machine reads both upper and lower case letters, numerals and punctuation symbols. The signal output can be in the form of punched paper tape or cards, or the signal can be fed into an electronic computer. Thirty readers will be able to process 10 million pages a year.



INEXPENSIVE UNDERWATER CAMERA is made of a tough, corrosionproof plastic that won't break when dropped or banged against the cement sides of a pool and will withstand water pressures at depths up to 100 feet. It takes both color and black-and-white pictures
Healthways, 3609-7th Ave., Los Angeles, Calif.



MAGNETIC ATTACHMENT holds the plug end of power cords fast to steel-cased household appliances for neat storage. The attachment fastens to the plug and needn't be removed to operate appliance
General Electric Co., Wiring Device Dept., Providence 7, R.I.

Shop Here



PHOTO END TABLE displays an enlargement made from the customer's print, slide or black-and-white negative. Four coats of gloss lacquer protect the picture. The table top measures 16 by 20 inches. It's mounted on 16-inch legs
Wampum Specialties, Wrentham, Mass.

FILM EDITOR AND SPLICER are built into this 8-mm. projector. The motorized editor, with a six-inch viewing screen, operates by button or hand crank. Splicer makes dry splices with tape
Keystone Camera Co., Inc., Hallett Square, Boston 24, Mass.



BIRD FEEDER has a transparent cone for the seed supply plus four water troughs. A hi-fi record of bird calls comes with it
Dowst Mfg. Co., 600 N. Pulaski Rd., Chicago 24.





"FRIED EGG CHAIR" offers plenty of comfortable leg room for the sitter. The "formpressed" shell, cast in plastic, is covered with foam rubber which is glued in place. The chair is upholstered with handwoven Danish fabrics

Design Galleries, 324 N. Wells, Chicago.

for Christmas

UNIPOD locks automatically at whatever height the leg opens, and collapses back to carrying position when it's turned upside down. The unit also has a tilting head and carrying strap

Smith-Victor Corp., Griffith, Ind.



RELIEF MAP of the United States can be painted or drawn on, then washed clean. Dimensions of the plastic map are 18¼ by 28¾ inches. Water areas are turquoise blue and land areas yellow

Panoramic Studies, 6122-24 N. 21st St., Philadelphia 38, Pa.



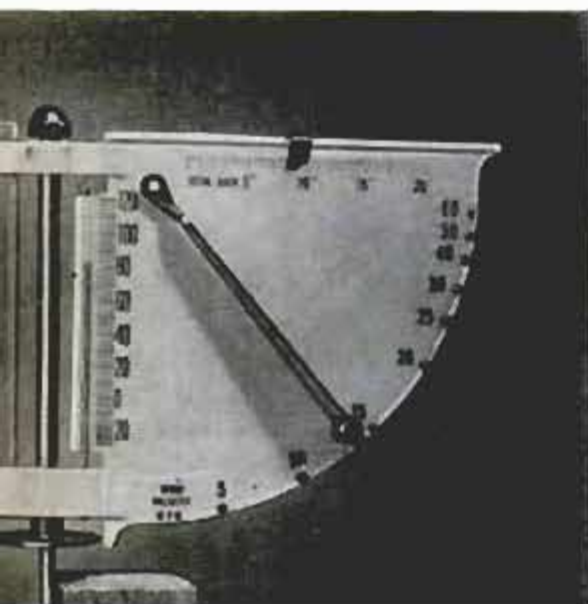


"SATELLITE" TRANSISTOR RADIO, above, sits on its desk-top stand or hangs by the antenna from a ceiling. The radio, enclosed in a transparent plastic ball, has two transistors. Earphones are supplied
The Brownlee Company, P. O. Box 636, Yucaipa, Calif.

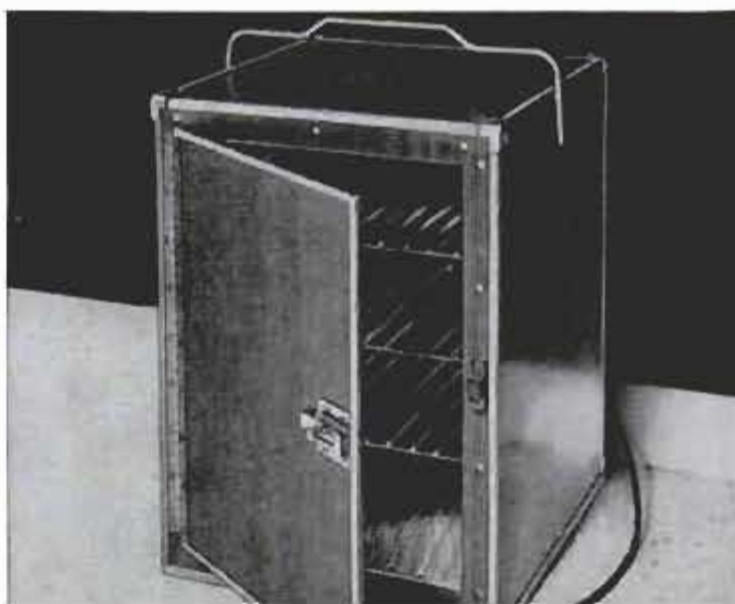
AIR RECIRCULATOR has a treated filter that traps and kills airborne bacteria. This model, with two filters, handles 500 cubic feet of air per minute. The germicidal filters, made of cellulose-acetate fibers, are available in more than 300 sizes for furnaces and air conditioners

Fram Corporation, Providence, R. I.

TINY WEATHER STATION shows at a glance the local rainfall, snowfall, temperature, wind speed and wind direction. Constructed mostly of plastic, the little weather indicator is easy to mount on a post, building or vehicle
D. Corrado, Inc., 26 N. Clark Street, Chicago 2, Ill.



ELECTRIC WARMER keeps foods hot until mealtime. Adjustable thermostat maintains heat at 150 to 190 degrees. The warmer is made of marine mahogany with an abrasion-resistant finish. It is lined with aluminum and insulated with fiber glass. Inside dimensions are 14 x 14 x 18 inches
Brinkman & Cook, Inc., The Merchandise Mart, Chicago, Ill.





GOLFER'S WATCH keeps game score as well as the time. The player records strokes by pushing two buttons which cause numerals to move into place in windows on the face. Watch has Swiss movement and a sweep second hand

Gruber Co., 27 W. 38th St.,
New York 18, N. Y.



COOLER-HEATER brings quick heat to chilly spots—and fast cooling to sweltering rooms. The three-speed combination cooler and heater also filters, circulates, ventilates and humidifies. As a winter humidifier, it evaporates up to 12 gallons of water per day

Metalair Products Co., Phoenix, Ariz.



MUSICAL BIRD PERCH starts to play when a pet bird alights on the bar to admire itself in the mirror. When it flies away, an automatic shut-off stops the music. The perch hangs inside a bird cage where the Swiss musical movement in the wood housing can be wound easily from outside

Marco Music Crafts, Co., Inc., 325 W. 16th St., New York 11, N. Y.

PORTABLE WIENER ROASTER plugs into a car lighter to roast two wieners while it heats two buns. The 12-volt unit is packed in an over-the-shoulder bag which is also fitted with four nested plastic tumblers, two plastic plates, a mustard container and a stainless steel knife and fork

Vogue of California, 585 Howard St., San Francisco 5, Calif.





OLD-TIME SURREY is the pattern for this two-passenger pedal toy. It has a steel frame and chain drive
 Universal Manufacturing Co., Inc., Box 5128, Bossier City, La.



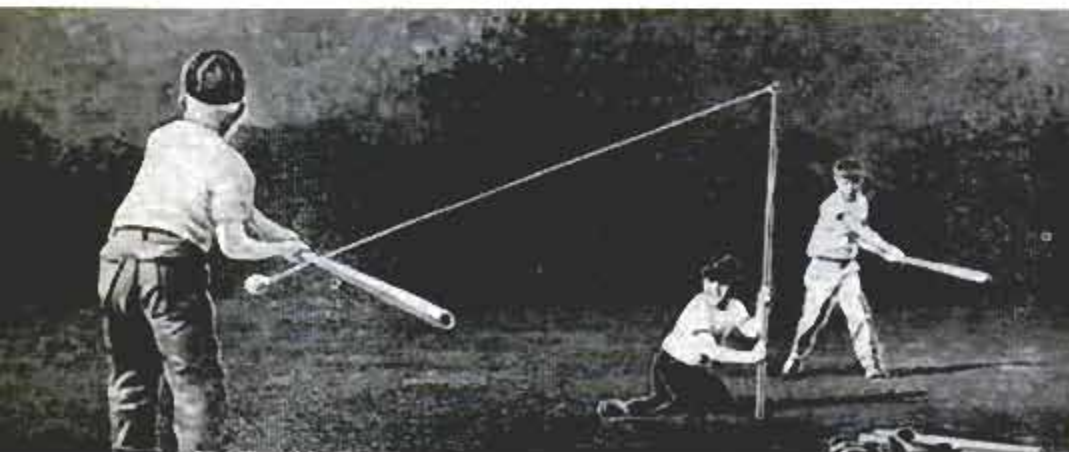
WALKING HOBBY HORSE moves forward on hinged metal legs as the rider's body motions supply power
 Hubley Manufacturing Co., Lancaster, Pa.



Shop Here



CHILD'S TABLE doubles as snack bar and play desk. It's made of strong fiberboard and protected with a tough plastic coating that water and colors won't harm. The top is an ample 18 inches square, and the table stands 7½ inches high
 The TOD Company, 1711 Happ Road, Northbrook, Ill.



BASEBALL BATTING game offers lots of safe practice for young sluggers. By manipulating an aluminum pole, the "pitcher" swings the rubber ball in a wide circle, delivering curves, fast balls and so on to the batters
 Aluminum Specialty Co., Manitowoc, Wis.



BUMBLE-BEE KIT makes a true-to-life model of the insect. There are 49 separate plastic pieces in the kit which fit together like the parts of a model airplane or ship. The model is eight times life size
Ideal Toy Corporation, 200 Fifth Ave., New York, N. Y.



MODEL MISSILE soars up 400 feet and descends by parachute. The kit includes a missile, launcher and three motors
Model Missiles, Inc., Denver, Colo.

for the Youngsters

HELICOPTER LAUNCHER on an 11-inch flatcar sends a 'copter into the air by remote control. A manually-wound spring on the platform supplies take-off power
Lionel Corporation, 15 E. 26th, New York, N. Y.

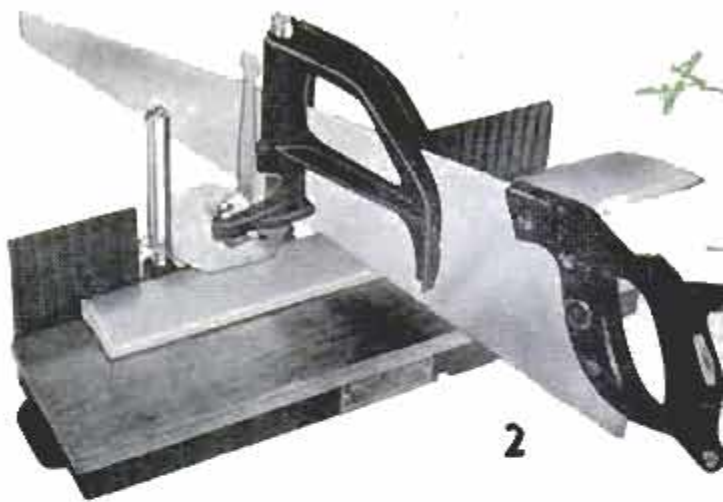


BALLS IN HOOPS are kept gyrating by a circular motion of the performer's hands. The toy consists of two enameled aluminum hoops and plastic balls
Mirro Aluminum Co., Manitowish, Wis.



COMPUTER CIRCUITS in this kit are assembled with nuts and bolts; they operate on a single flashlight cell. The instructions can be grasped by a 12-year-old
Science Materials Center, 59 Fourth Ave., New York 3, N. Y.





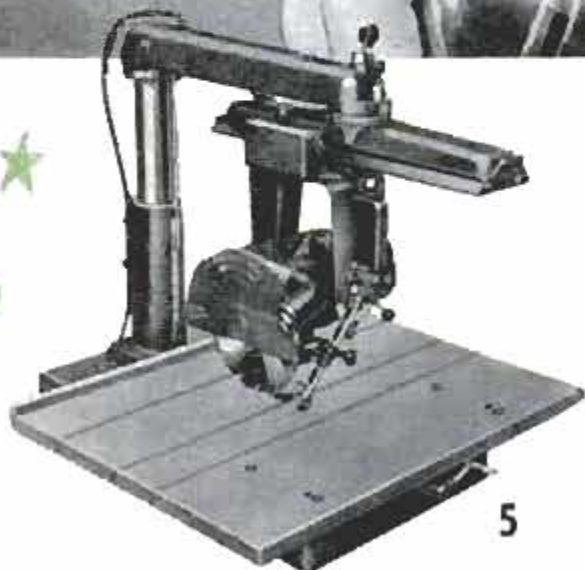
1. LIGHT, PORTABLE SPRAY UNIT handles paints, enamels, insecticides and certain other sprayable materials such as liquid fertilizers, weatherproofing and mothproofing in liquid form. Spray gun can be detached and compressor and hose used for inflating air mattresses, beach toys, inflatable swimming pools
Thomas Industries, Inc., 410 S. Third St., Louisville 2, Ky.

2. MITER BOX is designed to be used with any ordinary handsaw. Adjustable to any angle from 0 to 45 deg. Saw guide swings right or left as may be required by the work and locks securely at any of the commonly used angle positions. Saw guides and frame are of cast aluminum and steel. Weighs only 9 lb.
W. A. Gerrard Co., Inc., 4400 Lyndale Ave. N., Minneapolis 12, Minn.

3. STUD DRIVER seats both plain and threaded pins in masonry. Transmits hammer blows uniformly to head of pin. Pins are available in 11 sizes, are heat-treated, plated, and are made extra sharp for easy penetration in masonry. Just the thing for fastening furring strips, shelf brackets, wall cabinets
Fastway Fasteners, Inc., 1627 E. 28th St., Lorain, Ohio

4. BALL-BEARING DRILL CHUCK requires only an easy finger-tip twist to lock the bit firmly. Releases bit with light pressure in opposite direction. Eliminates the problem of the misplaced chuck wrench, employs the same locking principle as that used in drill chucks available on industrial equipment
Sears, Roebuck & Co., 925 S. Homan Ave., Chicago 7

5. RADIAL SAW takes 9-in. blade, cuts stock 3 1/8 in. thick. Has two-piece overarm supported on 3-in. column which is provided with depth gauge. Table-leveling adjustments can be made from top of table and column is raised and lowered by crank located at front of table. Has 1/4-hp. double-shaft motor
Toolcraft Corp., Plainfield St., Springfield, Mass.

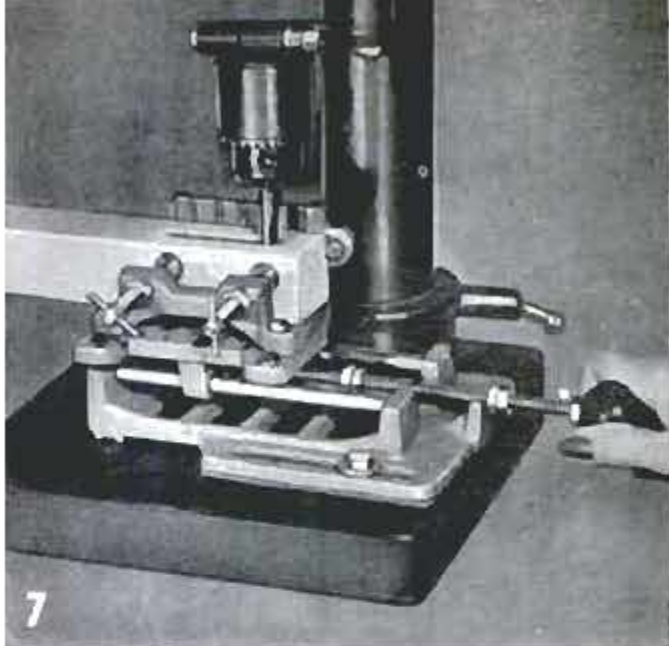




6

6. HEAVY-DUTY KIT is built up around a $\frac{3}{8}$ -in. portable drill. Kit includes over-sized accessories for polishing, buffing, grinding, sanding, wire-brushing. Also included are a 5-piece spade-drill set, a 12-piece high-speed twist drill set, a 6-piece arbor set and bench stand, all in neat carrying case

Cummins Portable Power Tool Co.,
Div. of John Oster Mfg. Co., Milwaukee, Wis.



7

7. MORTISING JIG for drill press makes the routing of an accurate mortise as simple as drilling a hole. The jig consists of a frame supporting a carriage which slides on guide rods. The sliding carriage is fitted with clamps for holding the work securely in place as the mortise is cut. Stops are adjustable

Akron Precision Equip. Co., P. O. Box 5256, Akron 13, Ohio

8. PORTABLE BELT SANDER takes 2½-in. belt, weighs only 7½ lb. Abrasive belts can be interchanged easily, making it possible to work through several grades of grit from coarse to fine or to change from wood to metalworking abrasives without loss of time. Bearings, drive mechanism require no lubrication

Porter-Cable Machine Co., 125 Exchange St., Syracuse 4, N. Y.



8

9. RADIAL-TYPE LEVEL is only 1½ in. in diameter, can be carried in the pocket or mounted on machines, cameras, instruments and scientific apparatus. It also can be attached to a straightedge for use in construction and maintenance work. Unit is made entirely of acrylic plastic. Liquid is sealed in case

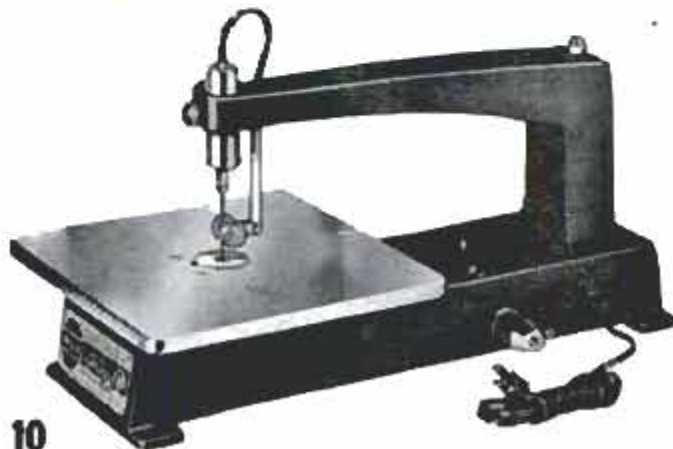
Johnson Products Co., Milwaukee 2, Wis.



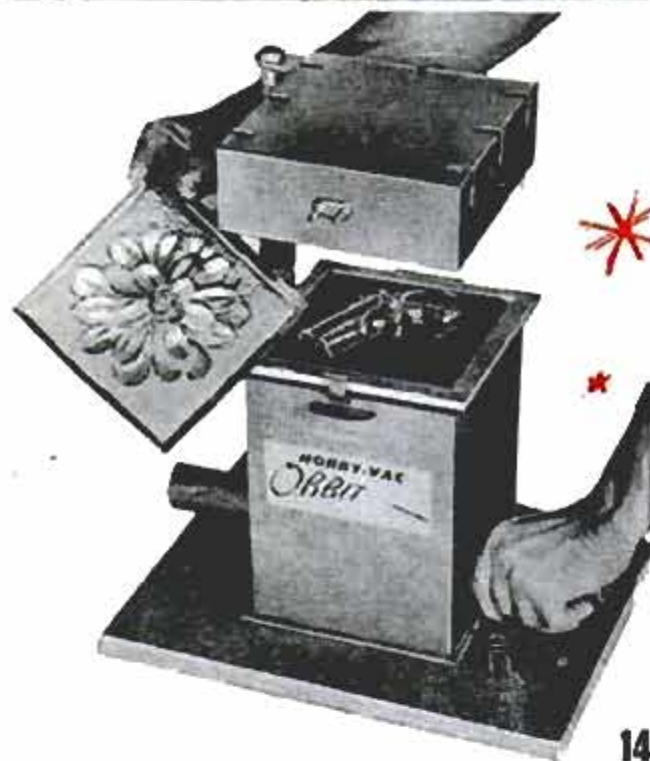
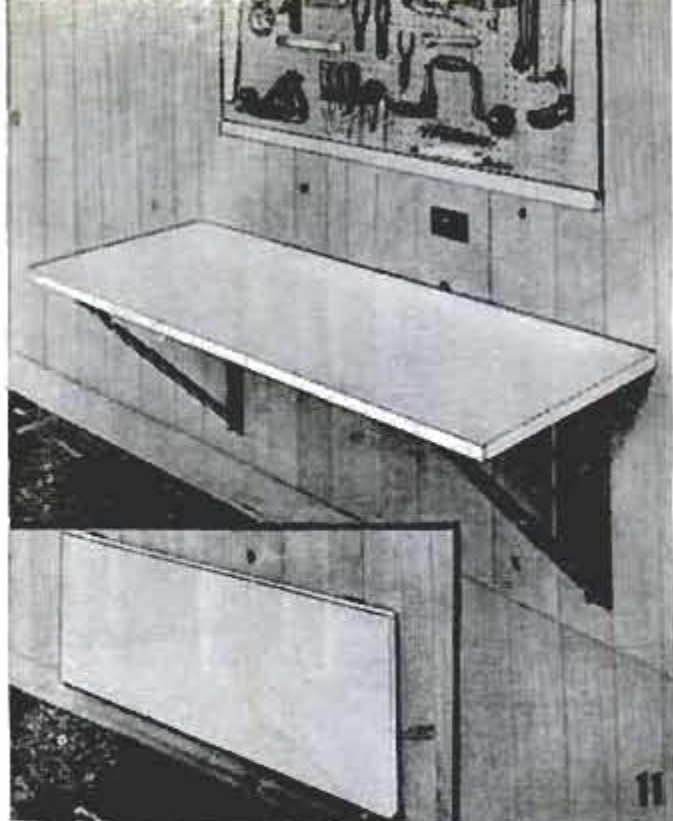
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10. BENCH-TYPE JIGSAW cuts to center of 24-in. circle with overarm in place. Has built-in rotary motor with projecting shaft to take ¼-in. drill accessories for sanding, grinding, drilling, polishing and buffing. Has wheel-type hold-downs and a built-in blower

Stuyvesant Sales Co., 1021 Ostwood Ter., Union, N. J.



10



11. WORK BENCH folds flat against wall when not in use. It can be located almost anywhere there is clear wall space, in utility room, garage, basement. It can serve not only as a workshop bench, but also as a utility table for laundry, sewing or hobby room. Top is 60 in. long, 24 in. wide, 1½ in. thick
Sturdi-Bilt Steel Products, Inc., 2501 W. Peterson, Chicago 45

12. TWIST DRILLS of high-speed steel come in a set of 13 in sizes from 1/16 to ¼ in. and packaged in a neat plastic case which closes tightly and when opened forms a rack which will stand upright on the bench. When closed case is pocket size. Drills are held securely, won't fall out when case is opened
Henry L. Hanson Co., Worcester, Mass.

13. UNIVERSAL MILLING TABLE for use on drill press, shaper and milling machine provides for almost unlimited position control of work. Precision ground work surface of table is 4 in. wide and 8⅞ in. long and has four slots for clamping work in place. Dovetails are equipped with full-length gibs for takeup
South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind.

14. VACUUM-FORMING MACHINE for home and light industrial uses operates on heat and vacuum principles similar to those used in large industrial machines. Reproduces from natural objects without special dies or molds. Will make name plates, boxes, tubes and will skin-pack and bubble-pack items for store display
Orbit of California, 211 Low Molinos, San Clemente, Calif.

15. SAWHORSE LEGS come in sets, fold for compact, space-saving storage or transport. Capacity tested to 2000 lb. Any 2 x 4 or 2 x 6 cut to any desired length can be used for the horizontal member, or ledger board. Made from aluminum, leg sets can be fitted with extensions to raise height to 30 in. or more
Trojan Products Corp., 1131 E. 25th St., Indianapolis 5, Ind.



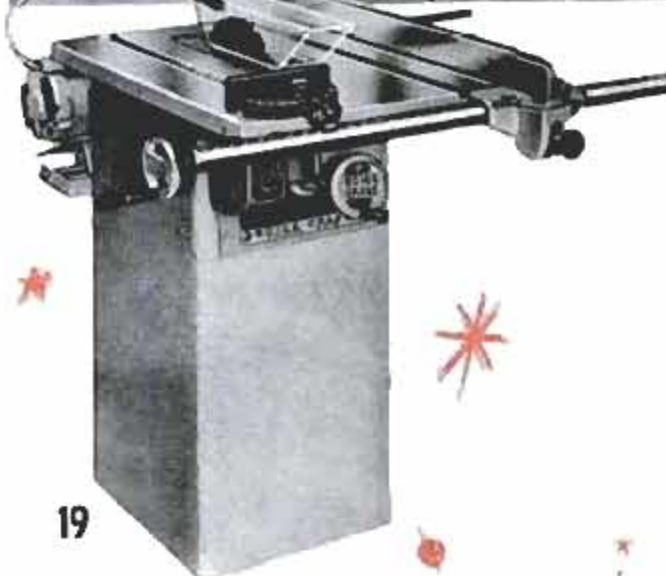
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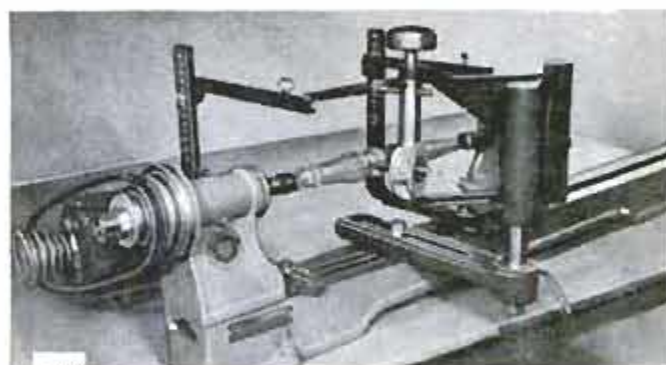
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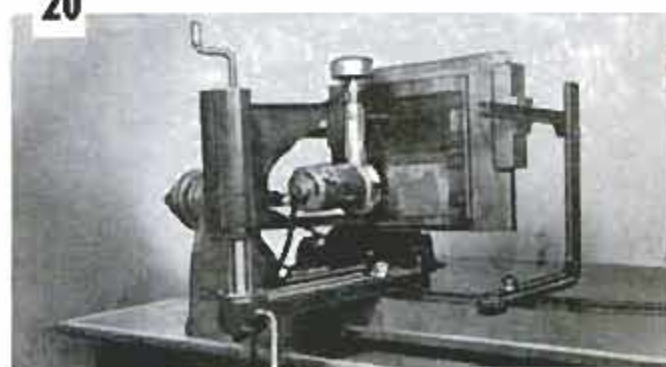
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16. AUTOMATIC SPROCKET-TYPE CLUTCH installs on engine for direct chain drive to ground wheel. Easily installed requires only two screws. Special design of housing eliminates chain lash. 12-tooth, $\frac{3}{8}$ pitch sprocket is casehardened for long life. Construction is simplified to permit easy replacement of parts

Mercury Clutch Div., Automatic Steel Products, Canton, Ohio

17. ADJUSTABLE HEX WRENCH is similar to a pipe wrench but has angular, flat faced jaws which grip valve-packing nuts and unions, square and hex nuts of various sizes without any tendency to slip or round the corners. Jaws and frame of wrench are minimum thickness to permit working in hard-to-reach places

Ridge Tool Co., Elyria, Ohio

18. SPEED CHANGER for drill press, bandsaw or lathe provides approximately 50 speeds ranging from 265 to 10,900 r.p.m. This is accomplished by means of a double reduction V-belt drive and matched sets of V-belt pulleys. Assembly is attached to motor by means of bracket. Can be attached to motors up to 1 hp.

Multispeed Co., 3420 Meadowbridge Rd., Richmond 22, Va.

19. HEAVY-DUTY TABLE SAW takes 10-in. blades, comes complete with floor stand and a frictionless, floating drive that permits the blade to tilt without tilting the motor. New-type drive maintains constant uniform belt tension with arbor in any position, eliminates vibration of belt. Table extensions are available

Holce-Crane Co., 943 Central Ave., Toledo 6, Ohio

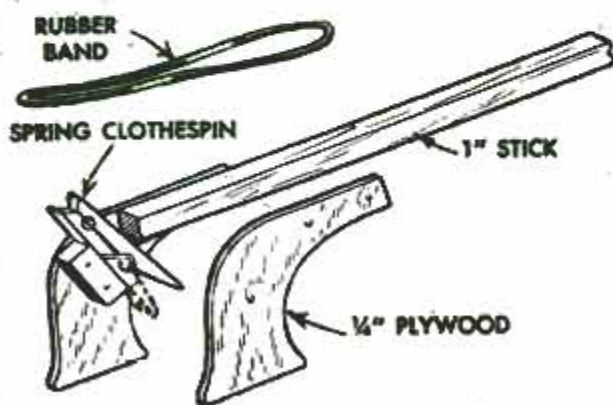
20. TURNING-CARVING-ROUTING ATTACHMENT is designed to be mounted on any small wood or metal-working lathe. As will be seen from the two views at right, it works from a template to reproduce contours from an original design, or direct from original itself. Also makes turnings from template or from an original

Turn-O-Carve Tool, Inc., 3227 Fairmount Ave., San Diego 5, Calif.



RUBBER-BAND GUN

Thousands of boys have used one or another version of this simple rubber-band gun for back-yard target shooting. Length of the barrel depends on the stretch of the "ammunition" being used. The trigger, which is a clothespin, is disassembled to screw its back half to a wood block in the handle. For a fancy version, make the block the full size of the handle so you can round the edges. For a two-shot pistol, use a double barrel and two triggers. Stretch one rubber band over the notched end of each barrel. Finish and decorate the gun as desired

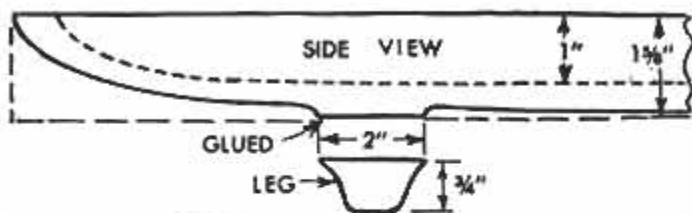
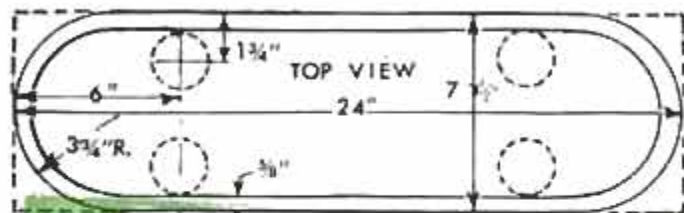


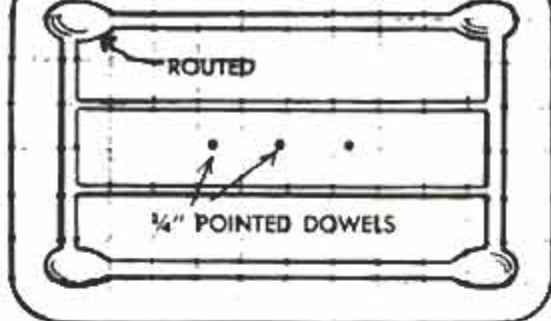
12 GIFTS TO MAKE

HAWAIIAN PIG BOARD

From our 50th state comes this different gift for the barbecue or dining table. Originally, Hawaiian pig boards were huge shallow bowls carved from logs. They were both the dish and dining table. This miniature version may be used for fruit or salad, as

a bowl for flower arrangements or for part of its original use—serving the main dinner course. You can make one to the dimensions given below from a length of 2x8 softwood or mahogany plank. Center is hollowed out, leaving the chisel marks for effect





BIRCH PLYWOOD

CARVING TRAY

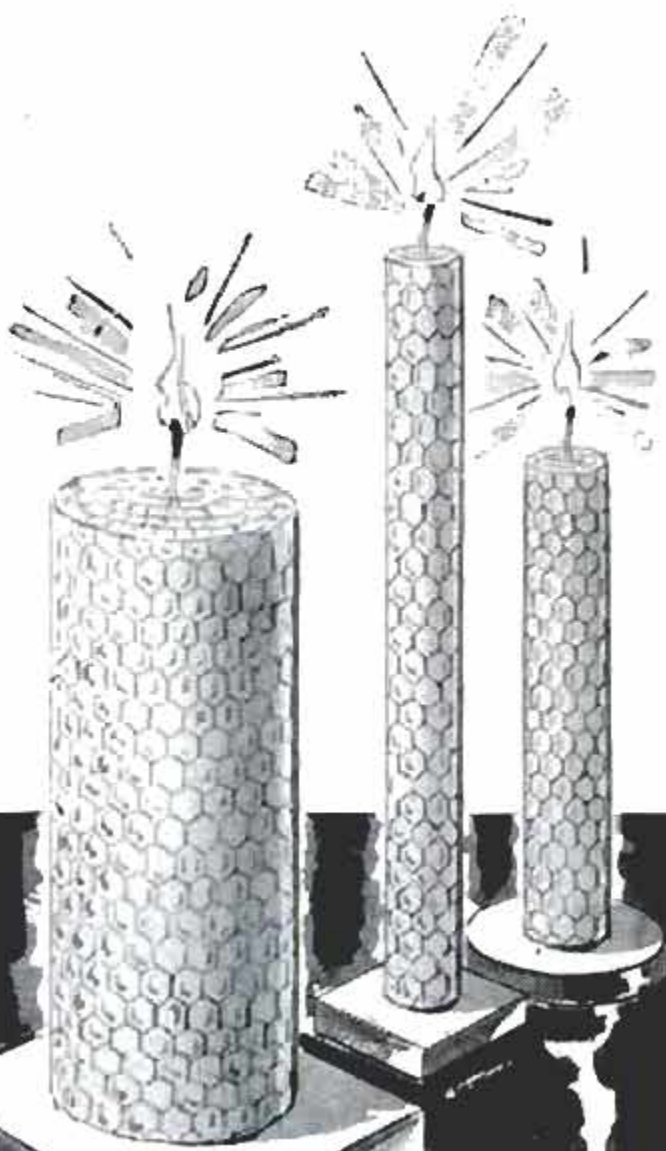
A carving board large enough to really handle a holiday bird or roast will be appreciated throughout the year, especially if it can be flipped over to use as a breadboard. This one is made from a 16 x 24-in. piece of $\frac{3}{4}$ -in. birch plywood to the pattern given, which is laid out on 2-in. squares. First, the corners are rounded, after which the gravy grooves are cut with a core-box router bit, adjusting bit to cut to a depth that will not expose a glue line of the laminations. Short carving pegs of $\frac{1}{4}$ -in. dowel are installed on the center line, and are removed when turning the board over as a breadboard or pounding board



FOR CHRISTMAS

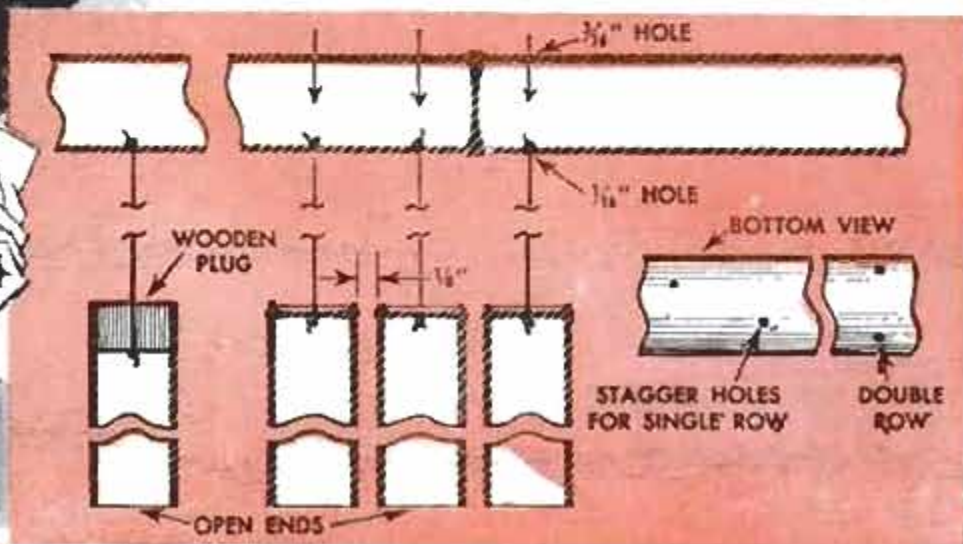
BEEWAX CANDLES

Beeswax candles are a festive and welcome gift at Christmas time. To make them inexpensively, buy plain unwired brood foundations from a beekeeper's supply house, or one of the large mail-order stores. The foundations are flat honeycombed sheets of pure beeswax. Get the largest sheets available, about 8 x 16 in. On a flat surface, fold one end of a wax sheet around a wick and then roll it up. Crimp and smooth the honeycomb against the wick at the candle ends, and then smooth the edge of the roll by crimping its honeycombs back into the candle with the point of a pair of scissors. Rolled up on its longer side, one sheet will give a taper 16 in. tall. Two sheets rolled up on the short side give a thick 7-day candle. Dip the wick end of the candle in wax for easy first lighting



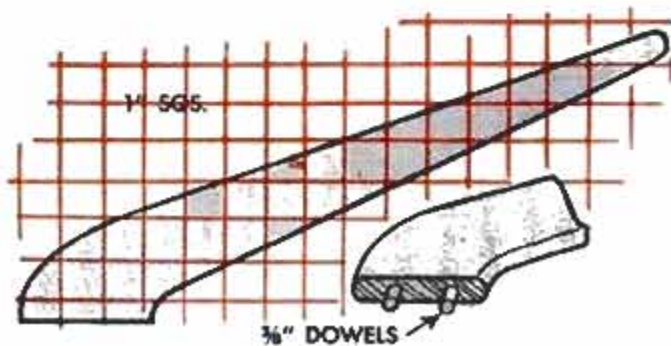
BAMBOO CHIMES

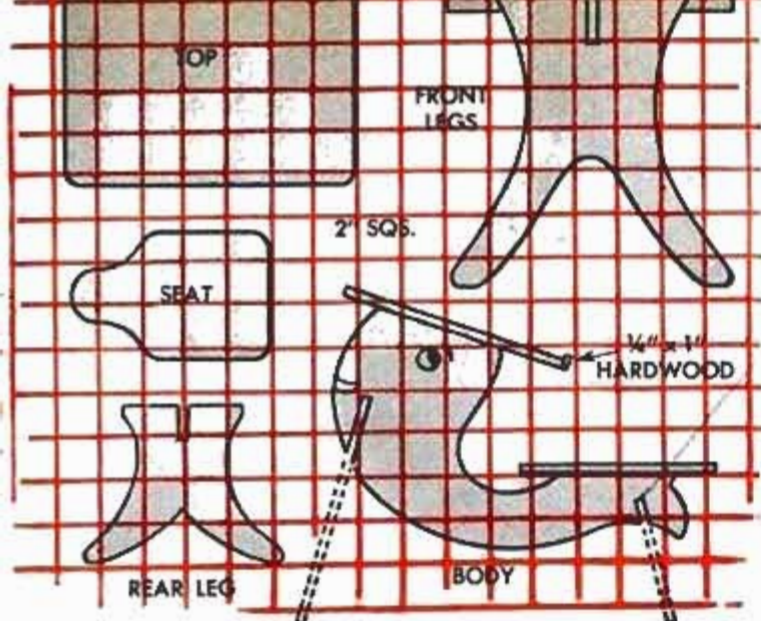
A gift idea from the Orient, these bamboo chimes are hung from a porch beam, patio roof or a tree. In a breeze they strike together to give surprisingly clear tones. Two types are shown. The "organ" chimes at the left use sections of bamboo cut off just above the joints, which are drilled through the center for knotted strings for hanging to a horizontal bar of bamboo. For straight tubes, far left, cut off the joints and glue in wooden plugs, which are drilled and strung in the same way. Cut the horizontal bar just behind a joint so it has open ends. Then the knotted strings of the outer chimes can be pulled through the open ends. For the center chimes drill larger holes through the top of the bar so the strings may be pulled down inside the bar



SEWING STAND

Here is a modern sewing stand that sits at a comfortable chair height, and is so light in weight it can be carried easily from room to room. It consists of nothing more than a wicker basket fitted with legs. Get a picnic hamper or similar basket about 11 x 16 in. x 9 in. deep that has fairly straight sides for attaching legs. These are boomerang-shaped and are cut from any clear 3/4-in. softwood or mahogany. A 3 x 18-in. piece will do for each of the legs, which are doweled and glued together in pairs. Round all edges with a rasp and, after varnishing, lacquering or waxing, attach each pair of legs to the basket with four small wood screws and washers from the inside. If desired, plywood or ready-made plastic button trays may be fitted inside the basket





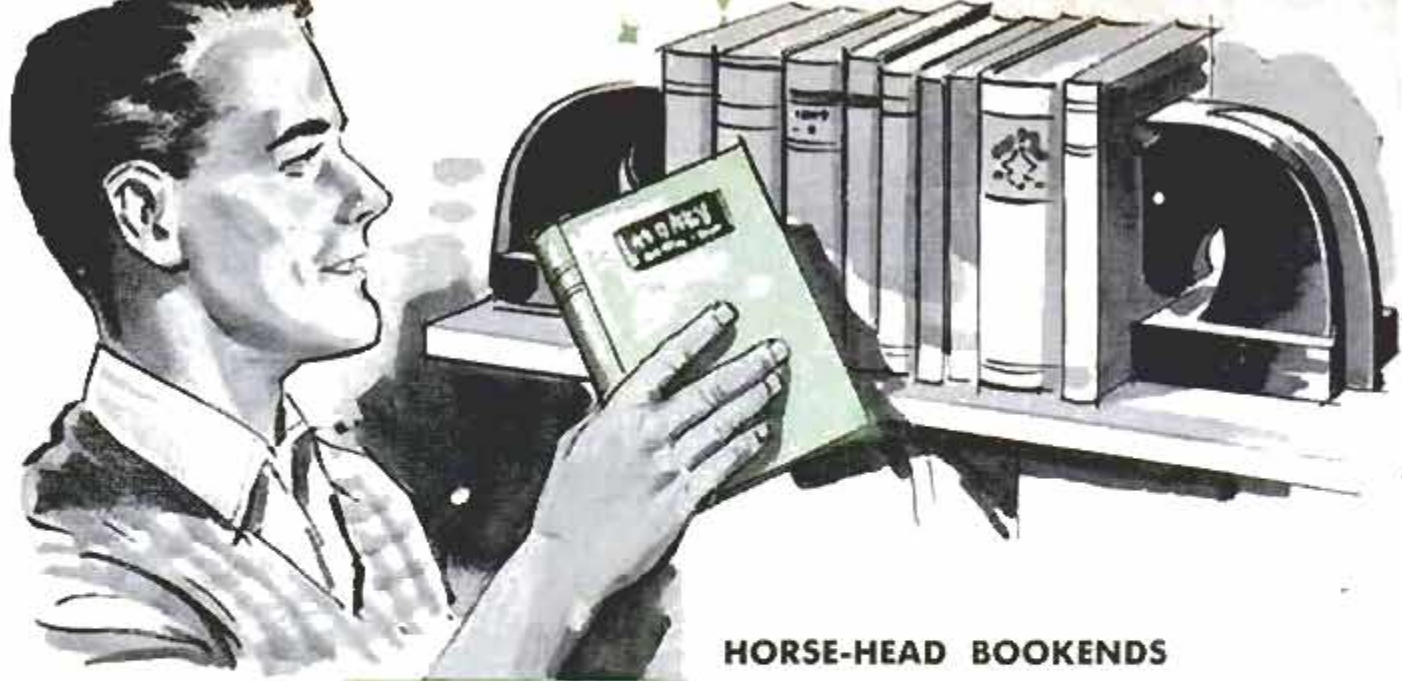
CHILD'S DESK

Providing a private place for coloring with crayons, modelmaking and just plain puttering, this "fishy" desk will delight any 3 to 9-year old boy or girl. It is steady and strong for the energetic squirmer, and can be built over a weekend. One piece of $\frac{3}{8}$ or $\frac{1}{2}$ -in. plywood 4 ft. square will provide all major parts. GPX Yellow or similar plastic-surfaced fir plywood is best as it gives a smooth, hard surface for the desk top and for painting. Bend a thin wood strip into place to lay out the longer curves on the plywood, and cut out the pieces according to the diagram above. The dolphin's mouth and eyes are painted on later. Notch the legs and body as shown to interlock, and then assemble with glue. The top and seat can be attached with glue and screws from above, or with glue and angle brackets from below

DRIFTWOOD CANDELABRA

Just a gnarled piece of driftwood, this modern candelabra will delight any homemaker. If some of the bark is still attached, it can be removed and the piece weathered with a wire scratch wheel. Or the piece can be sandblasted, giving it a white, highly bleached appearance. The small candleholders are available at hobby and garden shops. They screw into any wood base. Or you can turn holders on a lathe of some contrasting hardwood, and use a flathead wood screw down through the center of each to secure it to the driftwood base. The number of holders depends on the shape of the piece. If the candelabra has a tendency to rock on a table top, one or two rubber-headed tacks or small wooden pegs attached to the underside at critical spots will help to level it

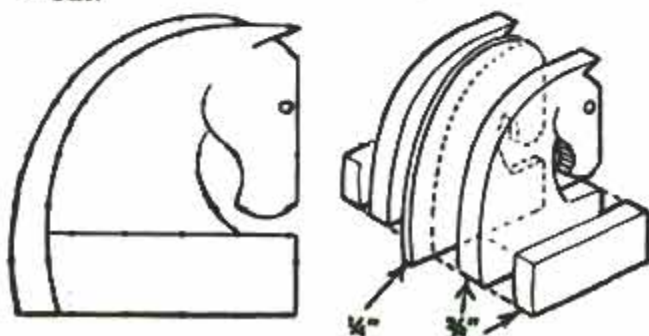




HORSE-HEAD BOOKENDS

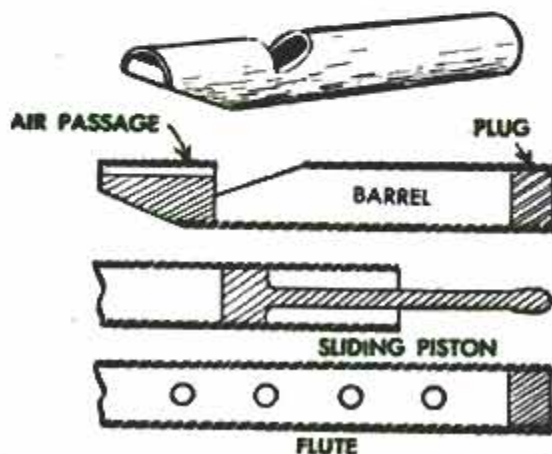
Attractive in almost any setting, but especially appealing to the man interested in horses, these book ends can be made in a couple of evenings. Each head is made of three laminations cut to the size and shape given at the left. The long curve of neck and mane are cut first, after which the pieces are glued together, and the head and inside of the neck cut as one piece. The completed book ends may be left in natural finish, some unusual effects being obtainable with just the wood grain. Or they may be painted to suit. Eyes are transparent plastic

1" SQS.



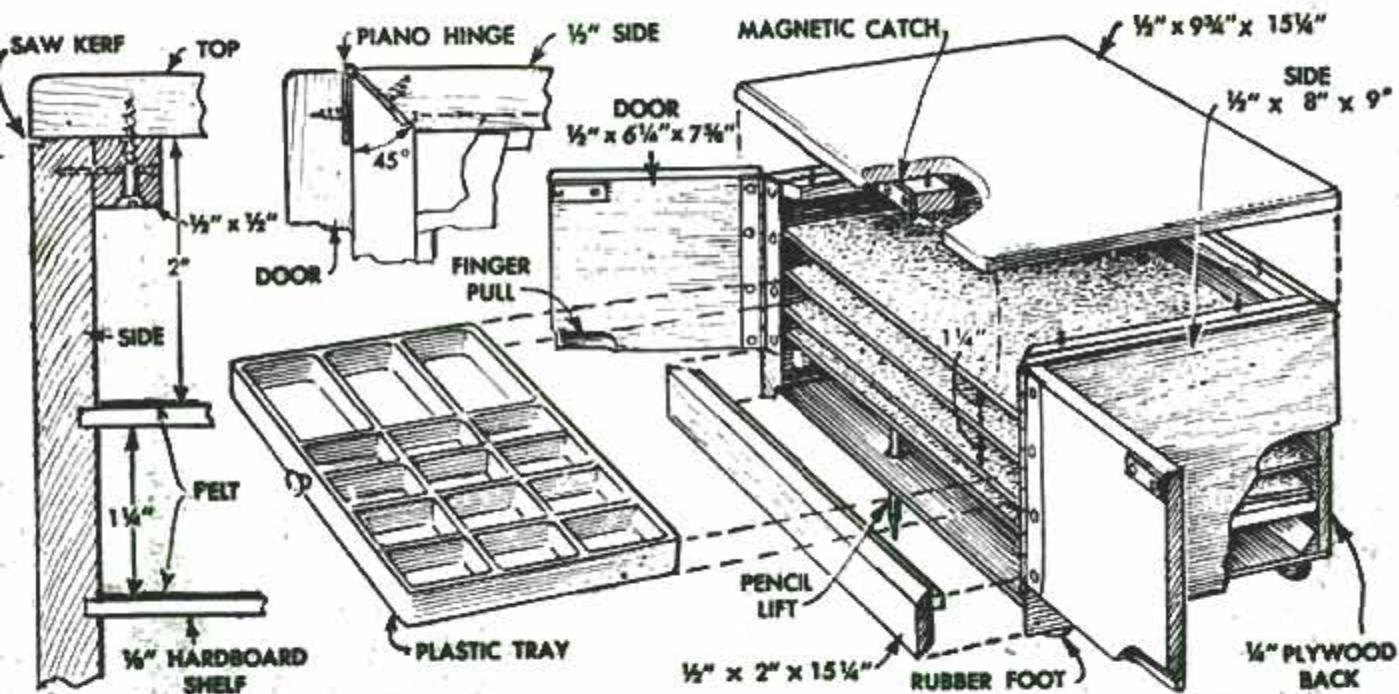
WILLOW WHISTLE

To make this old favorite, cut a piece of green willow about $\frac{1}{2}$ in. in diameter and 4 to 5 in. long. Wet and pound the bark gently to loosen it. Cut off the bark about $\frac{1}{2}$ in. from one end to provide a finger grip, and then twist and pull out the wood. Whittle a mouthpiece from the wood as shown with a flat cut on top for an air passage. Also cut a short plug for the other end. There are many variations. Drop a pea into the barrel to have a whistle with a warbling sound. To make a slide whistle, whittle a sliding piston to replace the end plug. Or, have a flute by drilling fingerholes of the right size through the top of the barrel



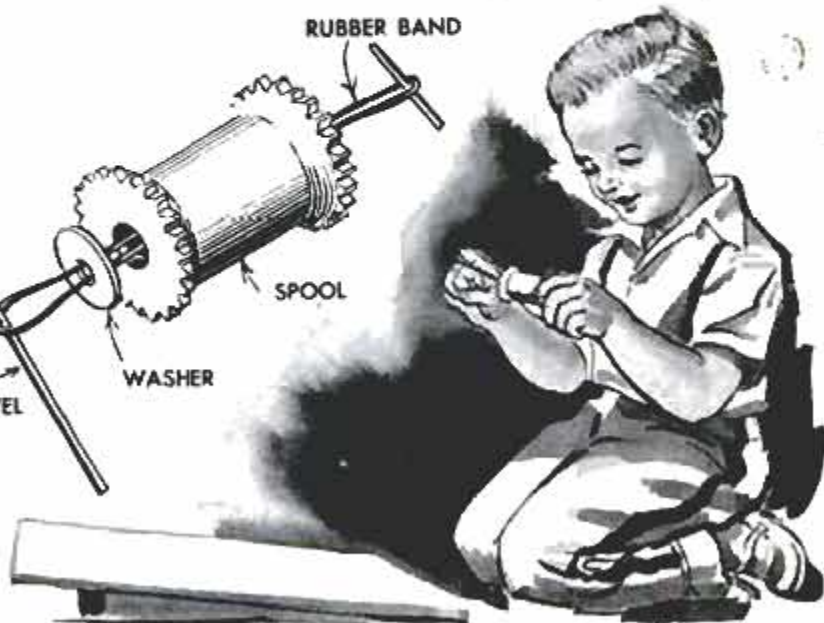
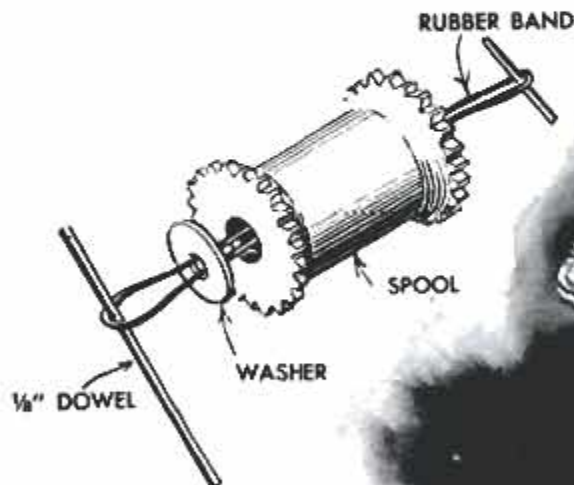
JEWELRY CASE

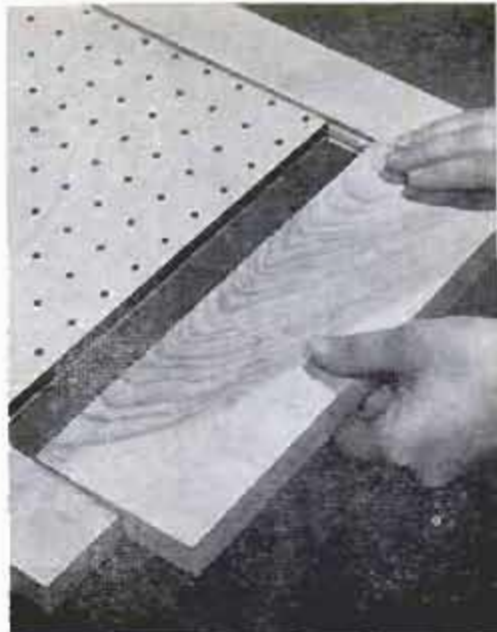
With its clean lines and no external hardware, this luxurious little gift contains four large jewelry trays and a secret compartment at the bottom. The case is built from 1/2-in. hardwood, and the tray shelves are 1/8-in. hardboard. Three fit in grooves in the endpieces. The lower shelf rests on cleats for removal to expose the secret compartment. All shelves are covered with felt. The exact size of the case depends on the four plastic jewelry trays, which are available from dime and department stores. Note in the lower left detail how the case is assembled with cleats, screws and nails. Doors are hung on piano hinges and are kept closed by one magnetic catch. A finger pull on the lower edge of the door of the door is cut on a circular saw. Note that a small saw kerf is run along the outer top edge of each side. This matches the slight clearance needed at the top of the doors. To open the secret compartment, the lower jewelry tray is removed and a pencil inserted into a hole in the shelf to lift it



SPOOL-TANK TOY

This toy will move realistically over a rug, climb a steep incline and provide endless entertainment for the young "driver." It requires only a thread spool with notches cut in the rims, two rubber bands, one thick washer or button with a large hole drilled through it, and two pieces of small dowel or matchstick. The rubber bands are looped over the longer dowel, slipped through the washer and spool, and over the short dowel. The washer is soaped or waxed to turn easily, and the other end of the spool is notched so the short dowel will not turn. To operate the tank, wind the long dowel





1. End sections of folding screen have double-wall panels of perforated hardboard with enough clearance between panels for inserting hanging hooks

2. Multipurpose folding screen has perforated hardboard paneled end sections for hanging clothing changes, and insulation board paneled center section that serves as bulletin board

Hang-up, Pin-up Folding Screen For Youngsters of All Ages

By Elma Waltner

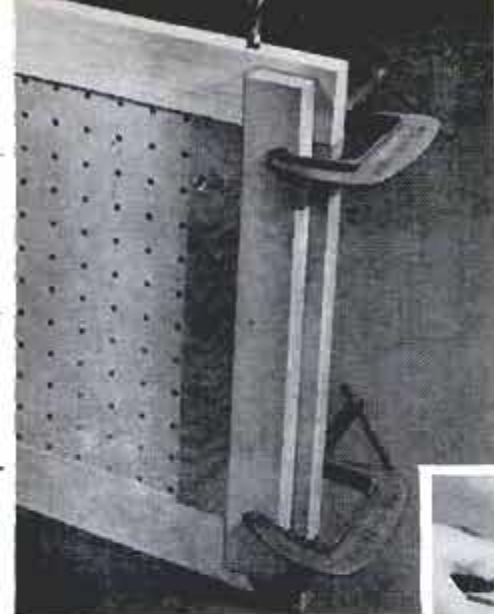
CHILDREN from tots to teen-agers can get a lot of use out of this multipurpose folding screen. End sections of perforated hardboard provide a convenient means of hanging clothing changes, while the center section of insulation board serves as a large bulletin board, Fig. 2. The entire screen can also be used as a room divider, and since both sides are identical, one youngster can be accommodated on each side without interfering with the other. Suction cups mounted on the bottom edge of each section help keep the screen upright in the desired position when placed on a smooth surface. The screen is lightweight and can be folded flat for compact storage in a closet.

The screen is easy to make, requiring relatively inexpensive stock materials and no special shop tools or skills. All three sections of the model illustrated are framed with 1-in. birch lumber, although

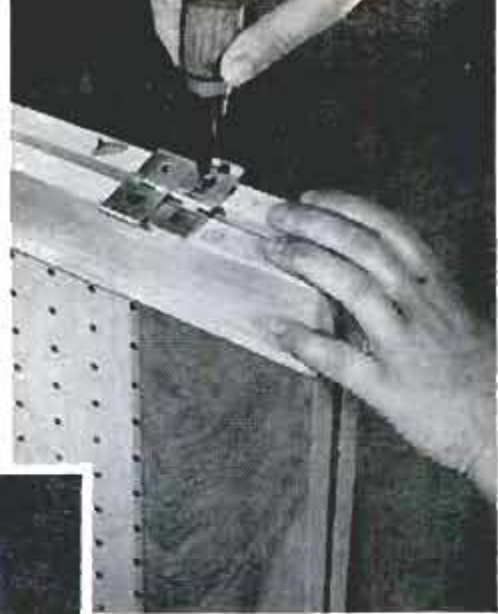
most any other wood could be used. Birch-grain, prefinished hardboard is used in the end sections and insulation board in the center section.

Begin construction of the screen by cutting the frame members according to the dimensions given in the drawing. The hardboard and insulation-board panels are fitted in dadoes or grooves cut on the inside edges of the frame members as shown in Fig. 1 and the details. Note that the hardboard panels are spaced to provide adequate clearance between them for inserting hanger hooks. All dadoing can be done on a table saw, making several adjacent cuts to produce the 1/2-in.-wide groove for the insulation-board panel. Of course, if you have a dado attachment, this job can be done more expeditiously.

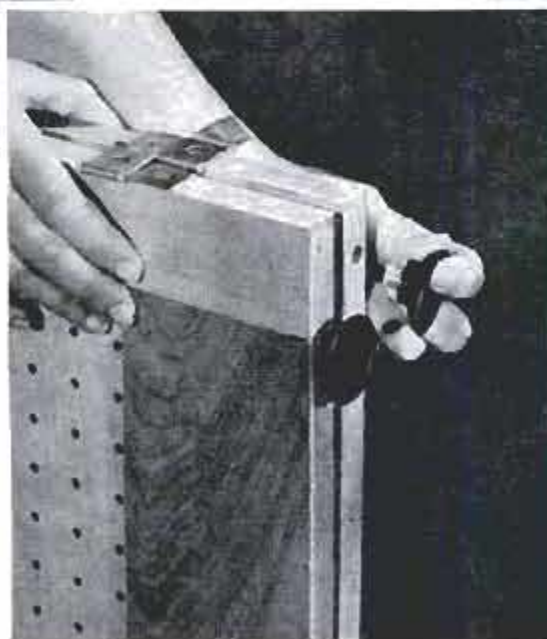
When all frame members are dadoed and the panel insets are cut to size, assemble each section and glue and screw the corners together as indicated in the detail



4. Screen sections are joined together by means of double-acting hinges that permit folding them in either direction to suit the occasion



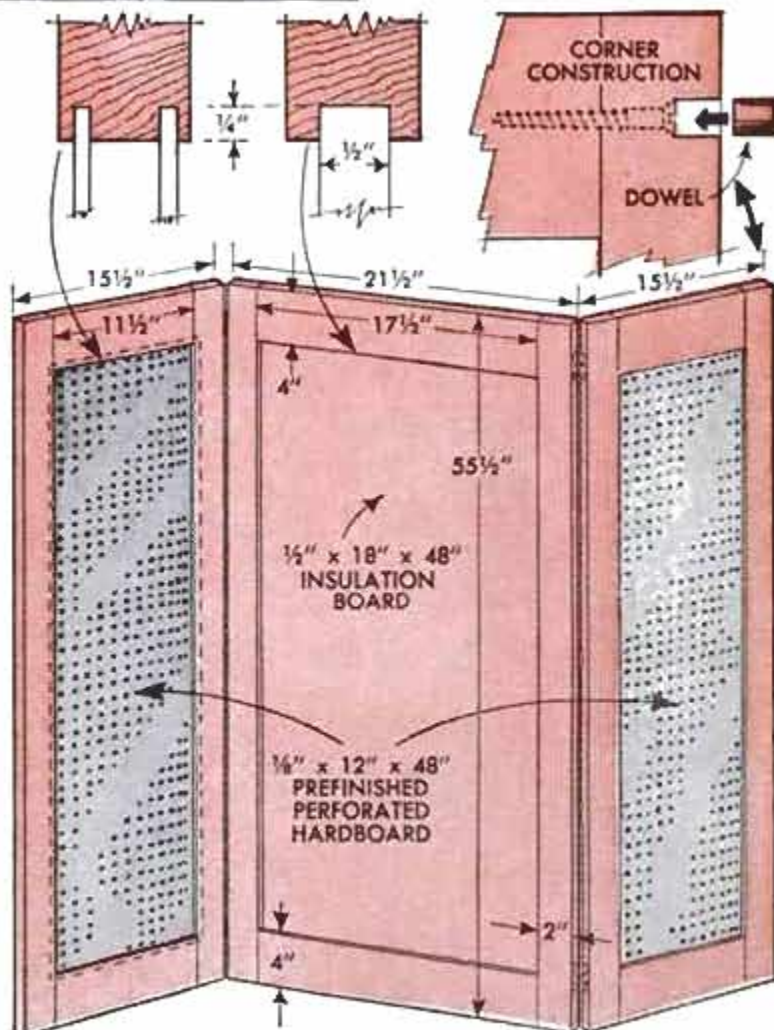
3. Scrap lumber clamped on both sides of screen end holds members of corner joints in alignment when drilling pilot hole and counterbore to take screw fastening, dowel plug



Suction cups, used as feet that keep screen in place while things are being attached to bulletin board, are staggered to clear one another when the sections are folded flat

at right. This is done by sliding each of the end pieces in place and then clamping them in the manner shown in Fig. 3, to permit accurate drilling of the pilot hole and counter-bore for the screw. After the glue has set, the screen sections are joined together with double-acting hinges as shown in Fig. 4.

Next two suction-cup feet are installed on each section, fitting them in holes drilled in the bottom edge of each section. Cup locations on adjacent sections are staggered so as to bypass each other when the screen is folded flat, Fig. 5. The completed screen may be stained and varnished where prefinished material is not used. To personalize the screen, attach letters to it spelling the child's name as in Fig. 1. This may prove to be especially beneficial when there are two children using the screen, each of whom is assigned a side. Use decal or plastic letters for this purpose, which are available at marine supply and variety stores. For later adult use, simply decorate the panels with wallpaper. ★ ★ ★





Wooden Strips Clamped Together Used for Measuring Doorway

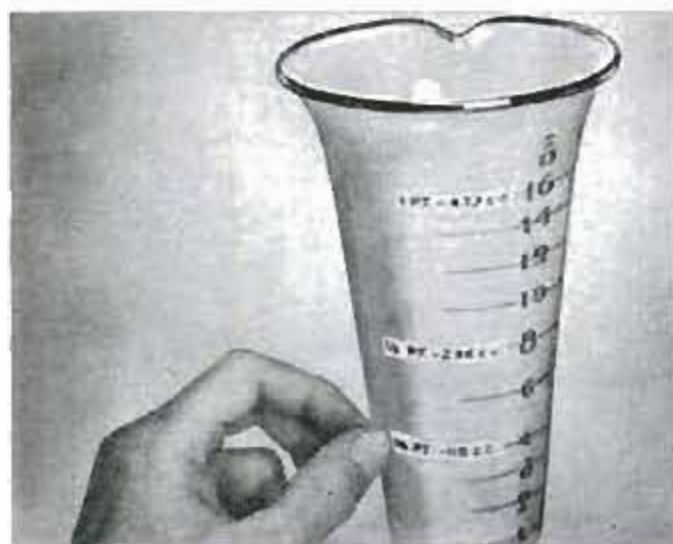
Have you ever tried to measure the exact distance between doorway moldings or other places where it is impossible to place a rule next to the points between which the distance must be determined? An easy way of doing this is to clamp two strips of wood together so that the ends are in contact with the surfaces between which a measurement is desired as shown in the photo. Then measure the clamped strips, or transfer the distance from the strips directly to stock, if a member must be cut to fit. Be sure the clamp screw is turned tight on the overlap of the strips when transferring a measurement. A small aluminum C-clamp is ideal for this purpose.

Wayne Judy, International Falls, Minn.



Extension Pieces on Slide Ends Are Slide-Rule Aid

Small wooden extension pieces glued on the ends of the slide in a slide rule as indicated at left make it easy to push the slide past center position, when normally the slide would be flush with the rule at both ends. After the extension pieces are glued in place, sand them to the same dimensions as the slide.



Conversion Data on Graduate Saves Reading Time

When measuring liquid in a graduate marked in ounces, it is often necessary to convert the readings to cubic centimeters or pint fractions. To save time looking up reference data, or figuring the equivalents, one lab assistant inked them on tabs cut from masking tape. These were then applied on the graduate opposite the appropriate ounce numbers as shown in the photo. Several coats of clear lacquer protect the tabs from moisture.

H. Hanscom, Elmhurst, Ill.



Pattern Formed From Wire Solder To Duplicate Curve on Part

Duplicating the curved outline of a part is easy when a length of 50-50 wire solder is formed to the surface to be copied and used as a pattern as indicated in the photo. The above type of solder is easy to form and retains the desired shape while a tracing is being made. The ends of the solder should be taped to the drawing paper or stock while tracing.

Versatile pedestal ash-tray unit may be used as receptacle for tobacco ashes, or as a base for a decorative dish or bowl after tray is removed

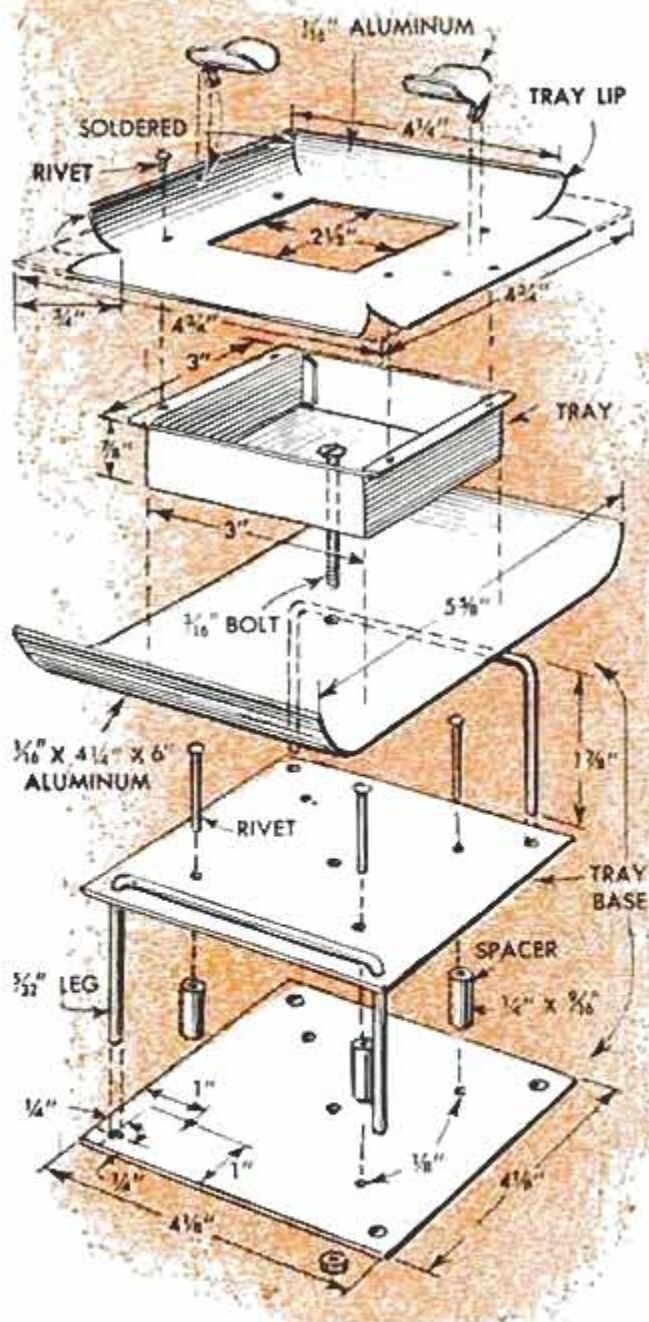


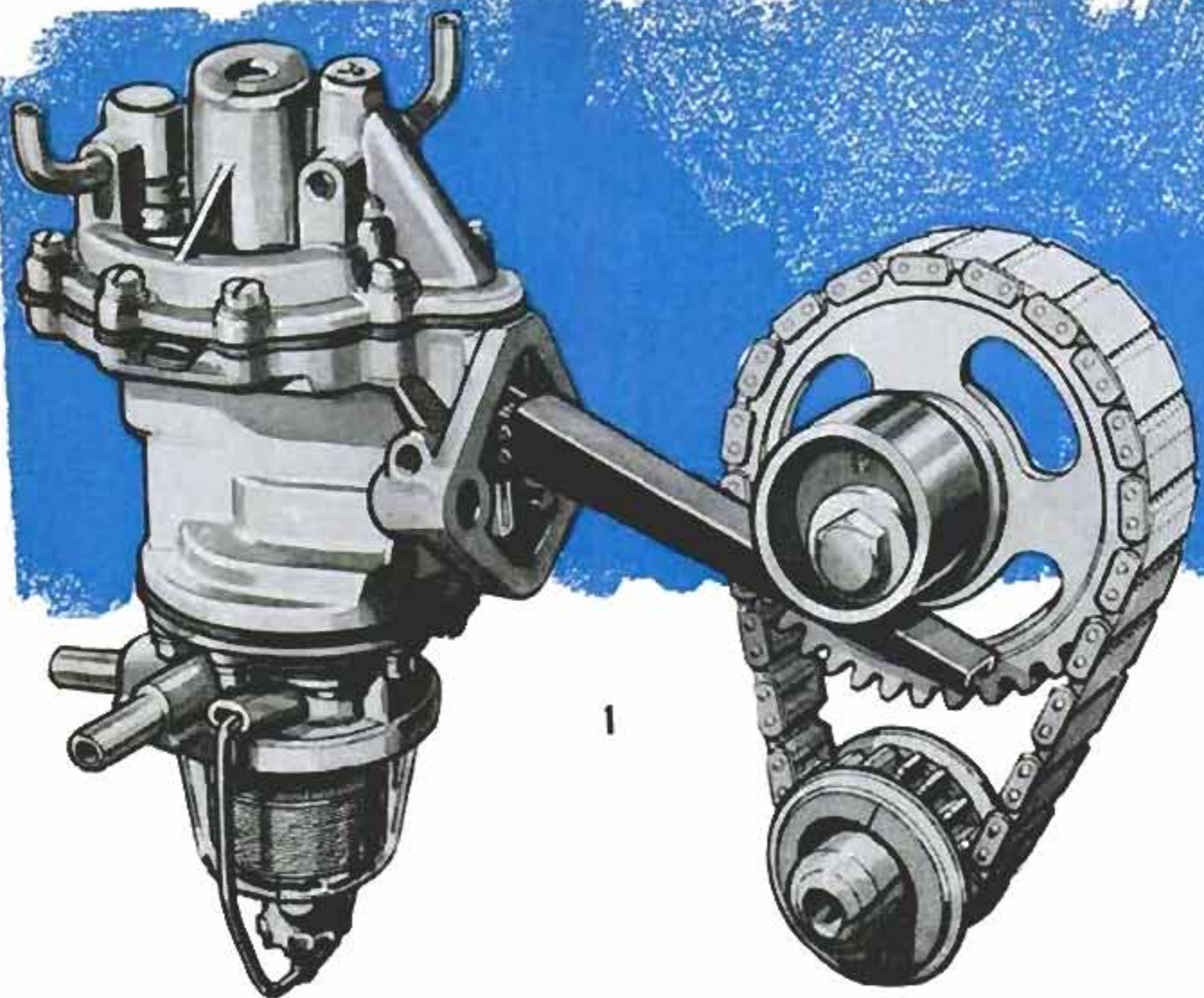
PEDESTAL ASH TRAY

By Walter E. Burton

HERE IS A NOVEL approach to an ash-tray design that, with its column-supported tiered arrangement of flat, square parts and upturned edges, is strongly reminiscent of a Chinese pagoda. The lower part of the tray unit also can be used as a pedestal for a decorative dish or bowl as shown in the photo directly above, in which case the ash tray is removed. This is accomplished by removing and replacing the bolt that fastens the ash tray to the base of the unit.

All parts of the unit are made of aluminum, using $\frac{1}{16}$ -in. soft sheet stock for the tray and flat pieces of the base, $\frac{3}{32}$ -in. wire for the legs, and $\frac{1}{4}$ -in. tubing for the spacers as shown in the drawing. Rivets used for assembling the two lower parts of the tray base are $\frac{1}{8} \times \frac{3}{4}$ in. All joints on the tray lip and tray are fastened with liquid-type cold aluminum solder. When doing this, it is necessary to clamp the joints until the solder sets. Rubber bands are excellent for this purpose. The completed unit may be left unpainted, or enameled in one or more colors to go with the decor of the room in which it is to be used. A suggested color scheme is as follows: Black on the tray base and outside of the tray, bright red inside and natural finish on the legs and spacers.





THE VACUUM-BOOSTER PUMP

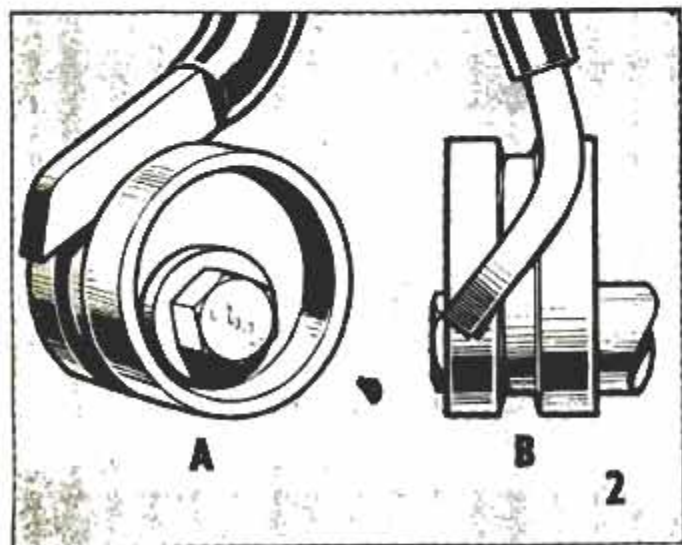
By George R. Willys

ALTHOUGH SOME MAKES of automobiles have electric windshield-wiper motors, the majority of cars use wiper motors powered by vacuum. Earlier models of cars had the wiper motors connected directly to the intake manifold of the car engine, using its vacuum for power. The disadvantage of this arrangement is that at high speed, or when an engine is accel-

erated rapidly with wide-open throttle, the manifold vacuum drops to only one or two inches. A wiper motor then operates very slowly, or not at all. To overcome this problem vacuum-booster pumps now are used.

In late-model cars the booster usually is the upper end of a so-called "double ended" pump, Figs. 1 and 4, which contains both a fuel and vacuum-booster pump. Both the fuel and vacuum ends of the pump are actuated by the same rocker arm which, in turn, is operated by the engine camshaft, but separate linkage on the pump end of the arm permits the two pumps to operate independently of each other, Fig. 4. The fuel-pump end of the unit works constantly while the engine is operating. The rocker arm pulls the pump diaphragm up, but it is forced down by its spring when the pivoting-rocker arm releases its pressure. The diaphragm spring, by keeping pressure on the arm, forces it to follow the contour of the camshaft lobe.

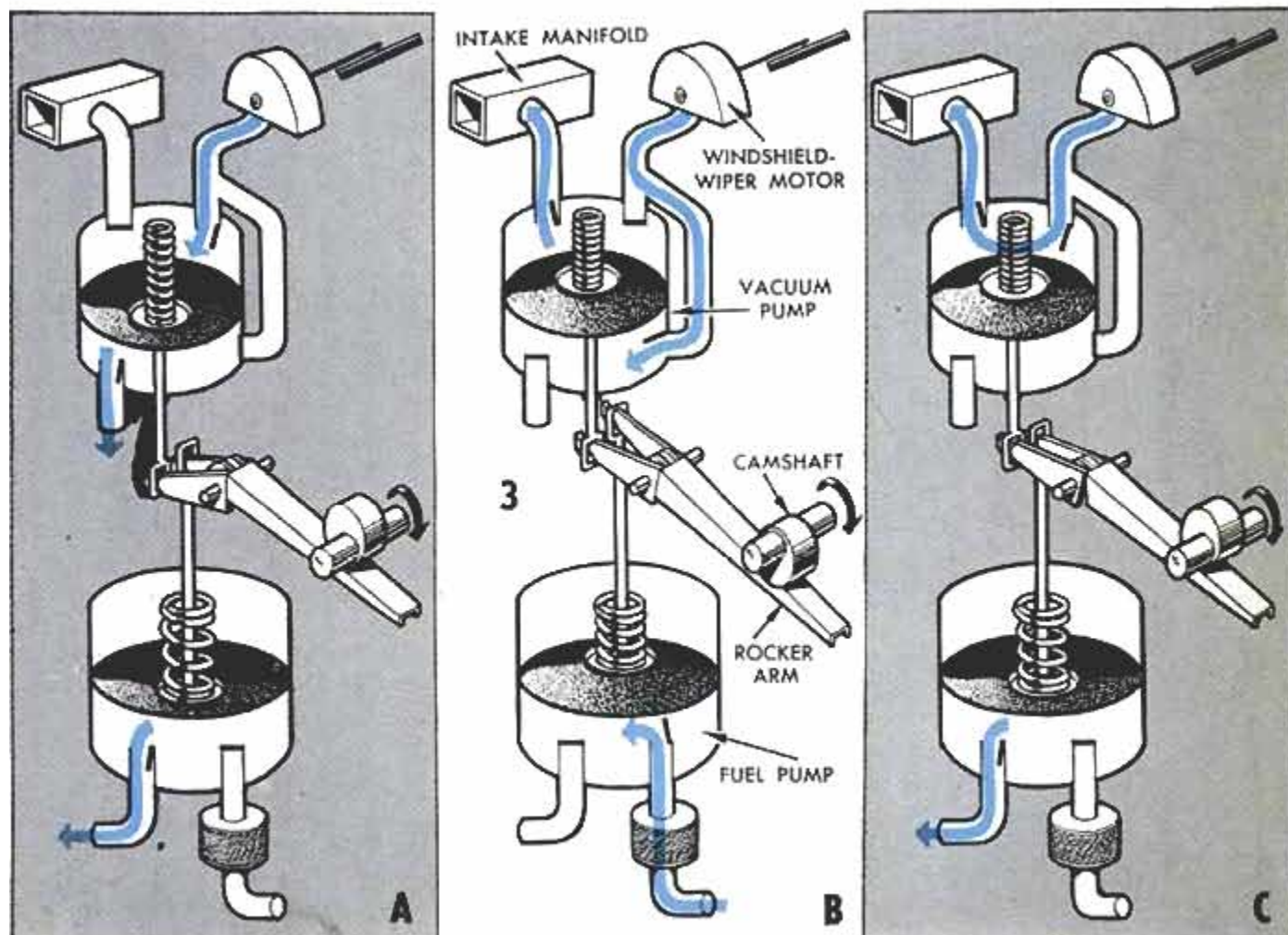
The vacuum-pump end of the unit operates only when vacuum in the intake

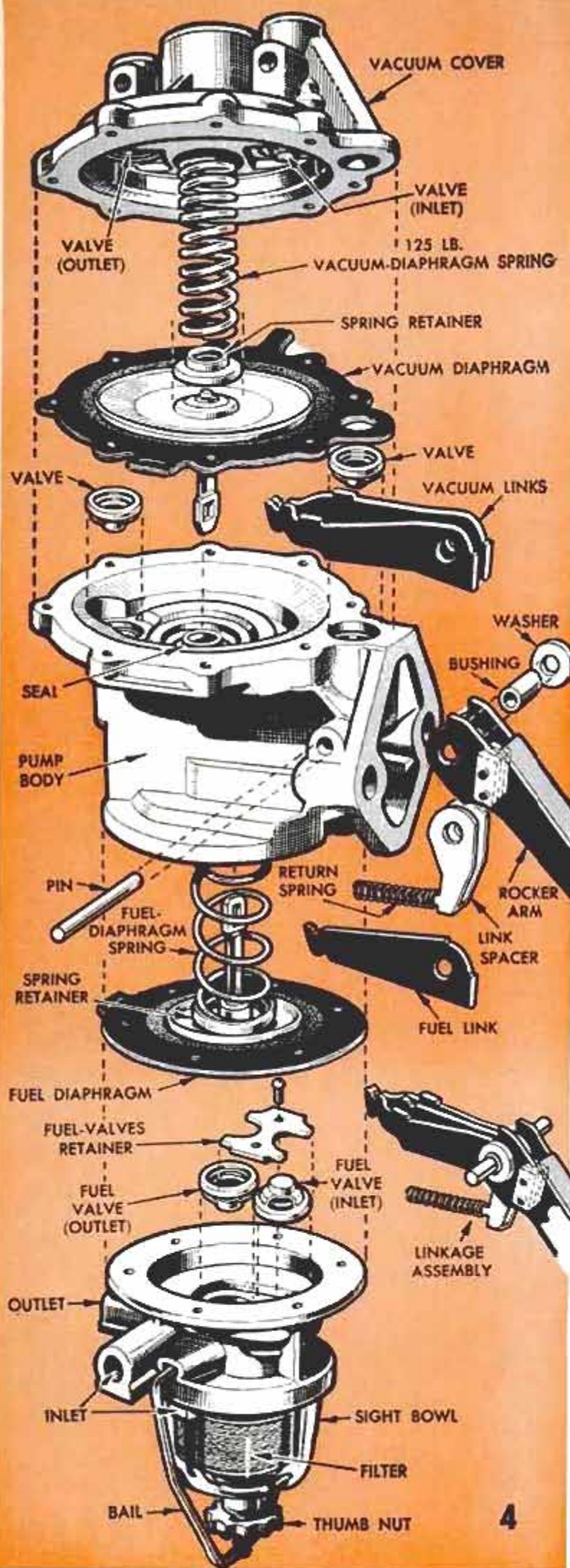


manifold becomes too weak to operate the windshield-wiper motor, and to hold up the diaphragm of the vacuum pump. Under normal conditions of idle, or moderate speed, the diaphragm is held up by the manifold vacuum which, in turn, keeps the diaphragm spring under tension. The spring exerts a pressure of approximately 125 lb. If the wiper motor is used under these conditions vacuum is supplied to the wiper motor directly from the intake manifold, as in detail C of Fig. 3. Note in this detail that the rocker arm has released the rod of the fuel-pump diaphragm and the spring is pushing down the diaphragm which pumps gas up to the carburetor. The vacuum-pump links on the rocker arm, Fig. 4, are "free wheeling" and not operating. Should the accelerator pedal suddenly be depressed, opening the throttle completely, vacuum in the intake manifold drops and the diaphragm in the vacuum booster is released. This permits the diaphragm spring to force it down. As in detail A of Fig. 3, the diaphragm now pumps vacuum from the wiper motor on its downstroke, the valve leading to the intake manifold being closed. The underside of the diaphragm is under pressure and this pressure is exhausted through a valve into the pump body from where it is discharged into the engine crankcase. The vacuum booster is a "two way" pump,

meaning that vacuum is pumped on both the upstroke and downstroke of the diaphragm. As the diaphragm spring now is holding the diaphragm down, the vacuum-pump links are held against the rocker arm, and as the arm moves up, detail B, Fig. 3, the diaphragm is pumping vacuum on its underside. Pressure on the upper side of the diaphragm is discharged into the intake manifold. Automatic action of the valves now permits vacuum to be pumped from the wiper motor through a bypass channel in the pump casting. Note in detail B of Fig. 3 that the upward movement of the rocker arm also operates the diaphragm of the fuel pump, pulling gasoline from the tank. In detail A, the spring action is pressing the diaphragm down, which forces fuel up to the carburetor. The actions of the various valves in both the fuel and vacuum pumps are shown in the details in Fig. 3, the valves themselves and their locations are shown in Fig. 4.

When the diaphragm of a vacuum pump becomes cracked, it can cause engine troubles that seem in no way related to it. First, of course, the wiper motors will work slowly, or perhaps not at all. If the car is equipped with power brakes—they require vacuum for operation—more pressure is required to depress the brake pedal. But, at the same time, the engine may suddenly start using an excessive amount of oil, spark





plugs will become fouled with oil and there will be heavy deposits of carbon on the pistons and the walls of the combustion chambers. Finally, after a time, the fuel pump will not deliver enough gasoline to keep the engine running.

In some cases installing a new pump will solve the fuel-shortage problem temporarily, but eventually, the pump will stop delivering fuel. What has happened is that the rocker arm has worn a groove in the camshaft lobe, and the stroke of the arm no longer is great enough to actuate the pump. The trouble starts with the leaking diaphragm in the vacuum pump that cannot be held up by the vacuum from the intake manifold. The heavy diaphragm spring then exerts a constant pressure on the rocker arm and it is this pressure that wears a groove in the camshaft lobe, as in detail A, Fig. 2. When it is known that the groove exists, a temporary repair can be made by bending the rocker arm slightly so that it straddles the groove as in detail B, Fig. 2. In extreme cases it may be necessary to replace the camshaft. This is true of in-line engines that have the pumps bolted to the side of the block. A short rocker arm readily reaches the camshaft that is located off-center in the block, close to one side. On V8 engines the camshaft is in the center of the block and it is necessary to mount the fuel pump on the cover of the timing chain. The eccentric that actuates the rocker arm of the pump is a separate unit that is bolted to the face of the camshaft gear, as in Fig. 1. In this case, should the eccentric become grooved, only the eccentric need be replaced, rather than the complete camshaft.

A grooved camshaft also will result when a malfunctioning vacuum pump is bypassed by connecting the hose from the windshield-wiper motor directly to the intake manifold. With no vacuum to hold up the diaphragm, the rocker arm will wear a groove.

When the vacuum-pump diaphragm is cracked, oil vapor from the crankcase is sucked into the pump, then discharged into the intake manifold where it is burned and becomes carbon deposits or fouls spark plugs. ★★★

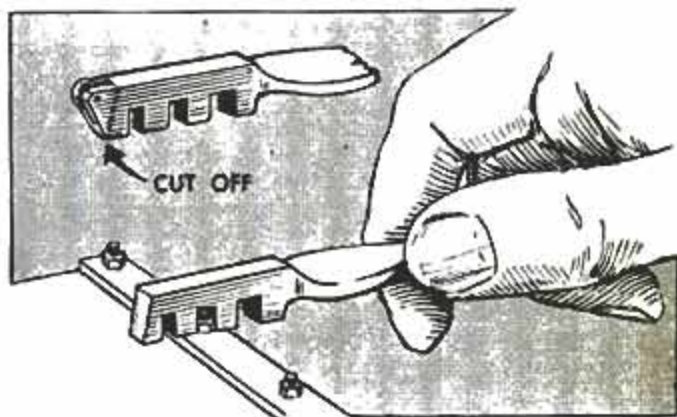
Vacuum Cleaner Provides Blower For Shop-Made Forge

"Forced draft" from a discarded vacuum cleaner eliminates the need for a manually operated bellows for this forge, keeping both hands free for working. Built by Aldo Albericco of Orland, Calif., the forge has a firebox made from a truck wheel. Openings in the wheel disk were closed by welding in pieces of steel plate. At the center of the disk a number of $\frac{3}{16}$ -in. holes were drilled in an area about 4 in. in diameter. A 2-to-4-in. pipe reducing coupling was welded on the underside of the bowl formed by the modified wheel, positioned to cover all the drilled holes. To control the amount of air, a butterfly damper was fitted in a 6-in. pipe nipple that was screwed into the reducer. On the lower end of the nipple is fitted a tee, the lower end of which is fitted with a pipe plug that can be removed to clean the pipe. From the tee run a reducer to fit the vacuum cleaner.



Improvised Open-End Wrench

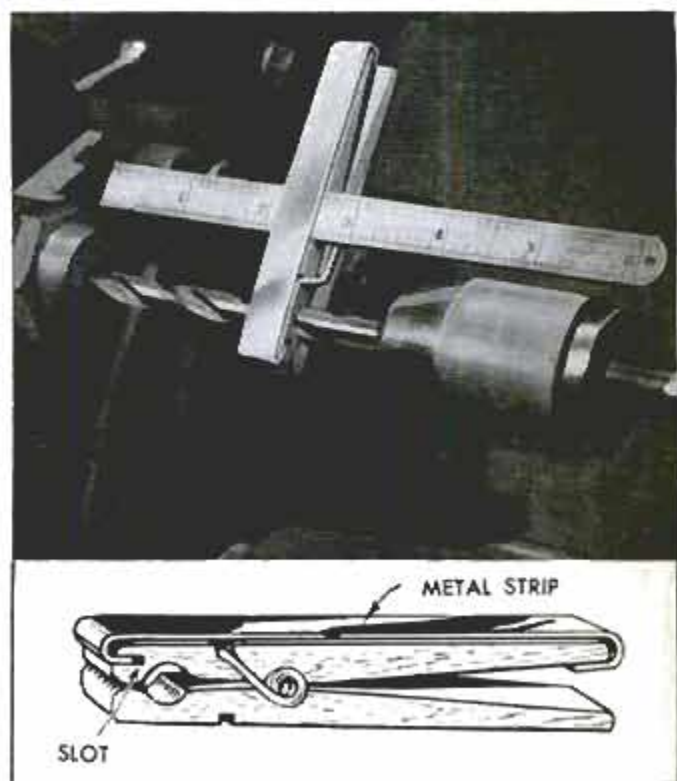
Modelmakers who need a wrench for working with small nuts, bolts and cap-screws can improvise one from a wheel-type glass cutter. If the cutter wheel is dulled and worn out, simply grind off the end of the cutter as indicated. If the cutter is still sharp it need not be modified. The various sizes of chipping notches in the side of the glass cutter will fit several sizes of bolts or nuts. The cutter handle will provide plenty of torque for sure tightening.



Accurate Depth Gauge Improvised For Drill Setup in Lathe

When drilling in a lathe it sometimes is necessary to know exactly how deep the drill bit is entering the work. The scale on the tailstock cannot always be relied on because the quill may slip back or the drill bit may slide into the chuck under pressure. An accurate depth gauge can be improvised for this setup from a spring-type clothespin fitted with a strip of sheet metal on one leg. A short metal scale is slipped under the sheet metal as indicated. The scale is adjusted so its end is aligned with the end of the drill bit. As the bit enters the work the scale moves with it, and a glance at the scale will show how deep the bit is penetrating. The scale must be positioned so it does not strike the rotating work. Be sure chuck is properly tightened so the bit cannot slip.

R. Hanscom, Elmhurst, Ill.



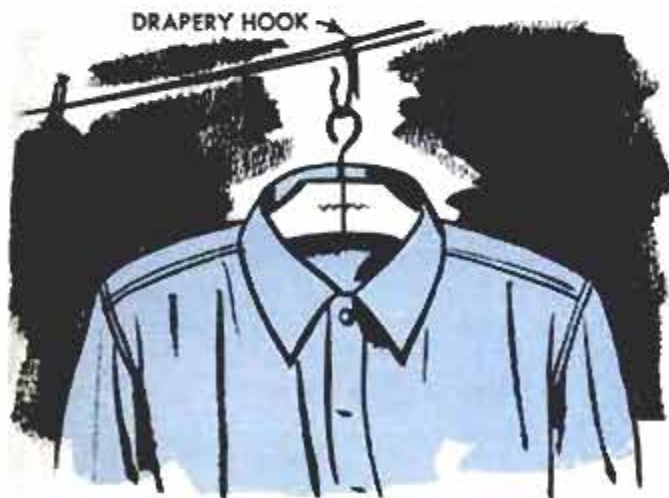
Solving Home Problems



"NOSY BOARD," is the nickname given this telephone-caller announcement board which was instituted by one family as a means of solving a teen-age phone-tieup problem. The phone user simply points to the name of the caller as listed on the board, when requested to do so by another member of the family. This way an important conversation need not be interrupted. Other uses of the board have developed since then. The word "help" is a cue for someone in the room to call the user away from a too-talkative caller. "Sh-h-h" is a request for silence. The free-form board is cut from 1/2-in wallboard. Names of frequent callers may be lettered on the preprinted board, or on cardboard strips, which are thumbtacked in place as shown

SMALL DRAPERY HOOK clipped on a plastic clothesline prevents drip-dry shirt hung on it from sliding into other clothes on the line as indicated. The drapery hook also prevents shirt and hanger from flying off the line on a windy day. Use a pair of the hooks spaced on the line to keep pant legs apart when drying wash trousers on self-creasing frames

EVER HAVE A BALL OF CORD or twine unwind and become badly tangled? You can prevent this by winding the cord on a small block of wood and securing the loose end under a strip of masking tape as illustrated below. The cord will adhere to the tape, even if one end of it should come loose. Paint the block a bright color so that it can be seen easily

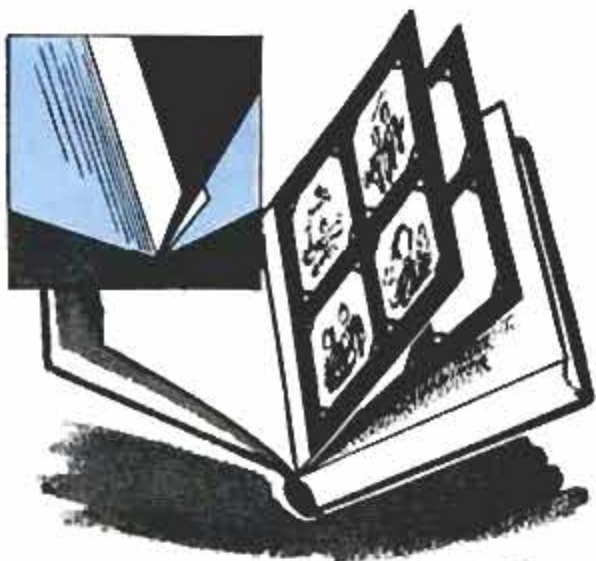




FRUIT-JAR LID

DON'T DISCARD burned-out light bulbs of the large clear-glass type. Use them as planters as shown above. First drill out the socket end of a 200 to 500-watt bulb. Then remove the filament and file the threaded-brass part to an even edge. A fruit-jar lid provides a good base for the bulb-planter, or a wooden block with a round cut out can be used

HERE IS A WAY of making a photo album from a large-size book having a good binding, but with contents that are of no interest to you. To do this, cut off the text part of the first page, leaving only the unprinted margin next to the binding. Then cut off the next 5 pages close to the binding to allow space for the thickness of photos and mounts. Cut off the next page in the same manner as the first one, leaving another narrow strip or tab, after which a sheet of photo-mounting paper is cut to the page size and glued in place between the two tabs as detailed. The same sequence is followed for the remaining pages of the book. Cover the old title with tape, after having inked the title, "Photos," on it



WHEN USING A PAPER CUP for a glue or paint pot, fasten it to a small wooden block with a thumbtack as shown below. To remove the cup from the block, pry it up with the blade of a knife. In use, the block catches drippings from the cup and permits moving it without getting glue or paint on fingers



THUMB TACK

Next time you have a need for a watertight container, line a cigar box or cardboard carton with a sheet of aluminum foil as shown above. This type of container is fine for mixing patching plaster, paints and fiber-glass resin since the lining can be thrown away after it is used. Eliminates the bothersome job of cleaning the mixing container

STRAIGHTENING A FINGER RING is easy, if you go about it in the following manner. Slip the ring on a metal sewing thimble so that it bears against the thimble snugly. Then insert a finger in the thimble and hold it on a wooden block while tapping the ring into shape with a small hammer





Keeping Hoods on Gun Sights From Slipping Out of Place

Front ramp-type sight hoods on some rifles often slide forward, especially when pulling the gun from a case, and they may even slide off and become lost. This trouble may be corrected by making a small punch mark at the front end of the ramp at the side of each groove. When this is done the hood will stay in place, but may be removed by forcing it over the punch marks. Since doing this on several of my guns, I have never had a hood shift forward, or slide off.

Robert V. Thompson, Clinton, Iowa.

☑ When using an umbrella carry a plastic bag in your pocket. It will be handy to slip over the end of the folded umbrella if it is set on the floor wet.

Piggin Made From Nail Keg Is Handy Toolbox

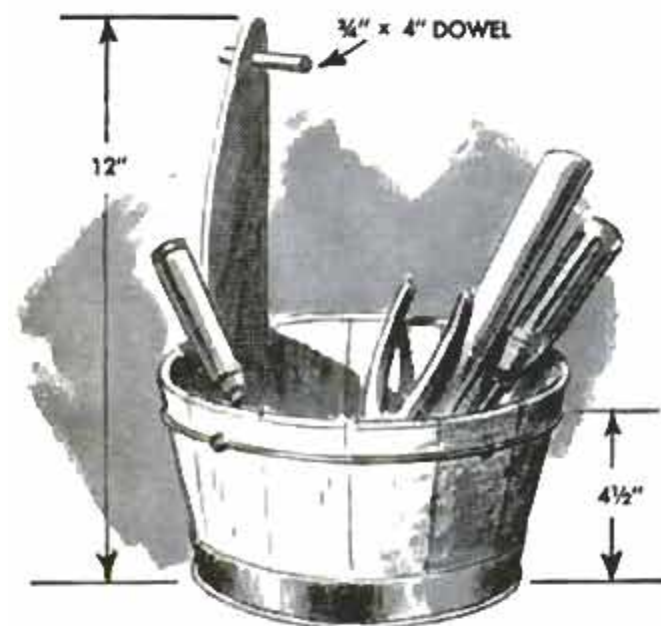
Resembling an old colonial piggin, a small tote box for carrying a few tools, garden equipment or other small items can be made from an old nail keg. First tighten the hoops and nail or staple them to the staves. Then 4 to 6 in. up from the bottom cut the keg in half. Measure the distance carefully so that you will have a uniform cut. Leave one stave full length and shape it to a rounding taper at the top. Near the top of this stave drill a hole to take a short length of $\frac{3}{4}$ -in. dowel, which serves as a carrying handle. Sand the surface of the keg smooth and finish it to suit.

W. D. Terrill, Oak Park, Ill.

Hand Warmer Aids Carpenter In Subzero Weather

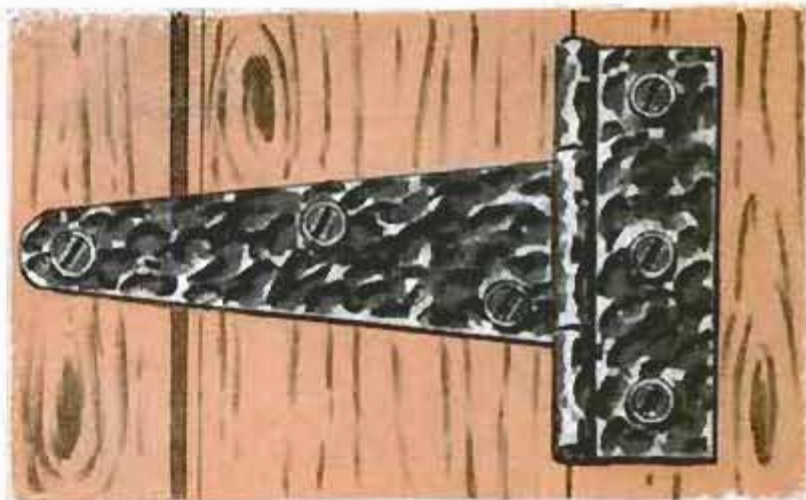
The difficulty of keeping your hands warm while doing any type of work that requires the driving of nails during extremely cold weather, may be overcome by using a commercial hand warmer. In use, the latter is kept in the nail-apron pocket, and a mitten is worn on the hand using the hammer. The hand that must be kept bare to handle the nails is held in the nail pocket as much as possible. Since the hand warmer keeps the nails warm, the combination of warmer and warm nails is sufficient to keep the workman's bare hand warm even in extremely cold weather. In fact, this idea has enabled carpenters to work comfortably in temperatures as low as 30 deg. below zero.

Wayne Judy, International Falls, Minn.



WROUGHT-IRON EFFECT FOR YOUR HOME HARDWARE

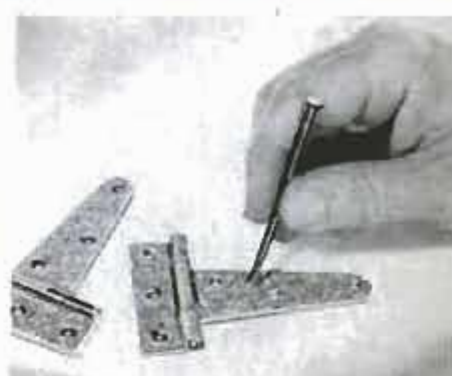
If you have a room paneled in wood with cabinets or other built-ins, and wish to change the hardware to a hammered or wrought-iron type, try simulating the desired finish on the existing hardware. A hammered finish can be simulated quite easily on hinges, switch plates and drawer pulls, with aluminum putty, which is available at dime stores. The parts are coated with the plastic, which then is indented and modeled to produce the desired effect.



Clean the parts thoroughly and then coat them liberally with the aluminum putty as below



Spread the plastic uniformly over the part, letting it go into the screw holes to obtain a uniform coating



Then indent the surface to get the desired effect. When dry punch out screw holes and paint

Helpful Gluing Hints to Remember On Your Woodworking Projects

You can prevent glue from adhering to wooden clamps by wiping them occasionally with a thin film of linseed oil. After this treatment, dried glue easily can be chipped or peeled from the clamp surfaces.

If glue is too thick to spread evenly on materials such as paper and cloth, try thinning it with denatured alcohol. The alcohol will evaporate faster than additional water so the drying time will be decreased.

Glue spread by scrubbing the work lightly with a wire scratch brush will penetrate better into the pores of the wood, and the bond between the parts will be stronger. Do not scrub too hard. Rub just hard enough to very slightly roughen the surface. Do this by hand as a power-driven brush will throw the glue.

For large jobs, apply the glue with a cheap roller of the kind sold for painting window screens. It rolls the glue on more uniformly and economically than a brush. These rollers are the type used in commercial production.

To store powdered glue so it won't harden, put it in a screw-top container, and turn the container upside down.



Old Tire Retains Fire Wood When Splitting to Stove Size

When splitting stove wood or fireplace wood much of the stooping necessary can be avoided by using an old tire as shown. It is supported above the chopping block at the desired height by three wooden legs. As each piece of wood is split it is kept from falling to the ground by the tire.

YOU CAN FINISH FURNITURE



By E. R. Haan

PART 2

Anyone can produce beautiful finishes on furniture if careful attention is given to the techniques of sanding, staining, toning or glazing, and sealing and varnishing or lacquering.

AFTER PREPARING the surfaces of a piece of furniture for finishing as described last month, you are ready to apply the finishing materials. As mentioned before, proceed slowly. At this point, especially, many home craftsmen make the mistake of hurrying. Producing an exceptionally fine finish often requires more time than building the project.

Clear Finishes on Furniture

The procedure for finishing close-grain and open-grain wood, as given in Fig. 15, is the same except that open-grain wood requires filling. Complete drying of each application is of utmost importance, as well as light sanding and scrupulous cleaning between all coatings.

Transparent top coats are applied after stain, toner and filler have been sealed.

This prevents the solvent of the top coat from softening the material underneath and allowing it to bleed. Many pigmented stains and toners are self-sealing, but are intended for use under varnish or shellac, not under brushing lacquer, which softens them. Most sealers are similarly affected by brushing lacquer. Therefore, if a lacquer top coat is desired, the procedure to prevent the above trouble consists of "fogging" a lacquer sanding-sealer over the stain, toner or filler with a spray gun. So applied, this sealer dries before it can affect the underlying material. When dry, the sealer coat is followed by lacquer coats sprayed on, not brushed on, as brushing lacquer has a retarded drying time and may dissolve the sealer coat. Lacquer cannot be applied over varnish, but in refinishing work, varnish can be applied over lacquer.



Staining or toning tends to add color beauty to wood and, in some cases, helps accentuate the grain

Stains and Staining

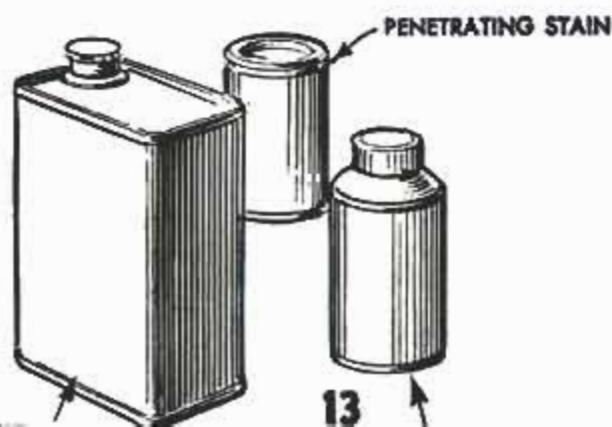
Wood is tinted by staining or toning as in Fig. 12. Getting the right color and shade is first done experimentally on scrap wood of the same kind as the furniture to be finished. Types of stains are given in Fig. 13. A pigmented stain does not have the color clarity of penetrating stain, which contains a dye. Pigment stain usually is applied by brush or cloth and is allowed to stand for 5 to 10 min. before the excess is wiped off with a clean, soft cloth. The time varies with the wood and the shade desired. If the stain gets dry or gummy before wiping, the cloth is dampened with benzine or turpentine. The stain should dry from 3 to 4 hrs. before the next finishing step. Pigment stain is more effective on softwood than on hardwood. On some softwoods, which absorb stain unevenly, it is best to first use a wash coat of $\frac{1}{2}$ -lb. cut shellac, which is allowed to dry, and then sand before applying the stain. Penetrating stains

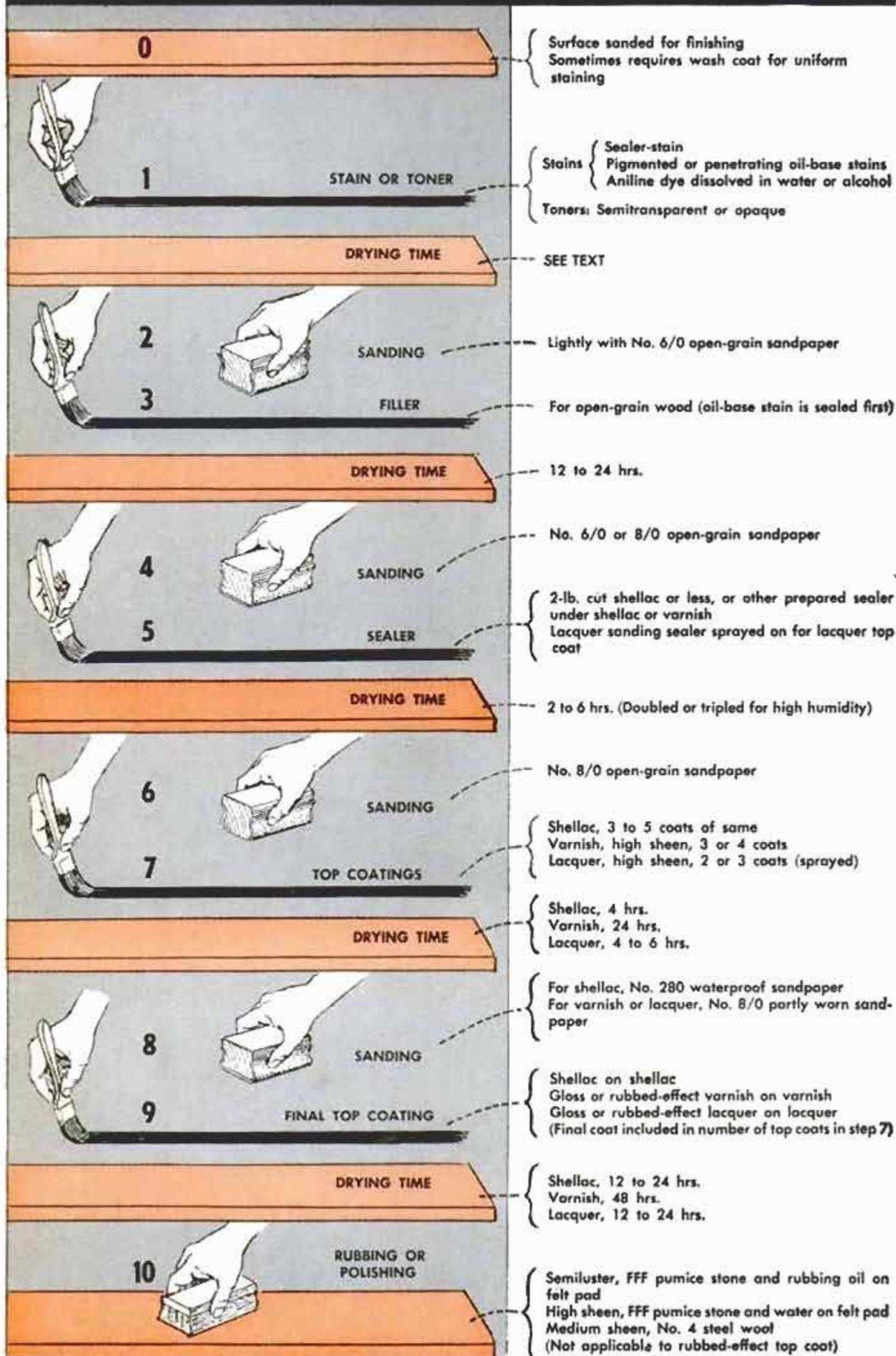
are most effective on hardwoods. Penetrating sealer-stains have become highly popular, as they stain and seal in one operation. Varnish stains should not be used on new work where the grain is to be left visible.

Stains having high-color clarity and permanence can be made by dissolving aniline dye in powder form in water, wood alcohol or lacquer thinner as in Fig. 14. These can be used under lacquer. The mixing proportions are powder, 1 oz., to wood alcohol, 1 qt., or the same amount of hot water just below boiling temperature. For lighter or darker shades the amount of the solvent is varied. After preparing this stain it should be passed through a fine strainer. Using alcohol makes a nongrain-raising stain, but if water is used, the resulting stain raises wood grain, which then requires resanding. After application, the stain is wiped to produce a uniform tone. Water stain requires from 12 to 24 hrs. of drying time. The alcohol stain dries very fast and must

Ready-mixed stains are of three general types: pigmented, penetrating and combination sealer-stain

Mix-your-own stain consists of dissolving powdered aniline dye in water or in wood alcohol





be applied rapidly, preferably by spraying, to assure uniformity. When brushed on large surfaces it should be applied in two half-strength coats with a wide brush, working fast for quick and uniform coverage. A drying time of 2 to 3 hrs. is allowed.

In using any stain, the light-colored mineral streaks in wood are first darkened, using a small brush, after which the over-all surface is stained. Stain will not penetrate glue spots, or many other spots, which should be removed previously. Bleaching new wood generally is not recommended. Instead, it is better to use lighter wood or to use toners for lightening dark wood.

Toning or Glazing

This process is practically the same as staining with pigmented stain. Colored pigments reduced to a thin paint are used to partly or wholly obscure the wood grain. By so changing the appearance of wood, less-expensive kinds often can be used.

To produce bleached or frosted effects the pigment is white, which may be tinted. It is applied over the entire surface as in Fig. 16. When the color starts to dull, the toner is delicately wiped in the direction of grain with a clean, lint-free, soft cloth, folded to suit as in Fig. 17. The amount of wiping largely controls the degree of transparency obtained although the toner itself is thin and semitransparent after it has been applied.

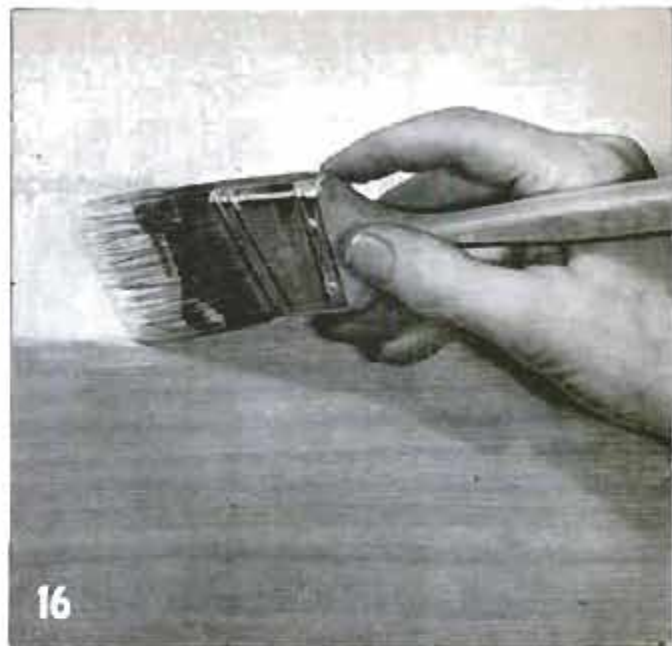
For contrasty grain effects in open-grain woods, such as oak, walnut or mahogany, toning is more opaque, with little or no wiping, and after the coating has dried, the wood grain is filled with a contrasting paste wood filler as in Fig. 18.

Toners may be pigmented sealers applied over a sealer-stain or over ordinary stain. They may consist of colors ground in japan and thinned with turpentine, or they may consist simply of flat enamel or enamel undercoater, 1 part, and turpentine, 2 parts. Toners should dry from 12 to 24 hrs., or according to the manufacturer's recommendations.

Paste Wood Filler

To make the surface of open-grained wood smooth, it is filled with paste wood filler. This is never done directly on bare wood or over an oil-base stain without a wash coat of $\frac{1}{2}$ -lb. cut shellac or other sealer. The shellac wash coat consists of 4 or 5-lb. cut shellac, 1 part, dissolved in wood alcohol, 8 parts. Filling can be done directly on sealer-stain after this has dried. The sealer or sealer-stain is sanded with No. 8/0 sandpaper before filler is applied.

The filler is reduced to the consistency of a heavy cream for large pores, and to



16
Light, semitransparent toner being brushed on. Lower part of photo shows the untreated surface



17
Above, toner partly wiped off, giving frosted effect.

Below, wiping off filler applied over dark toner



18

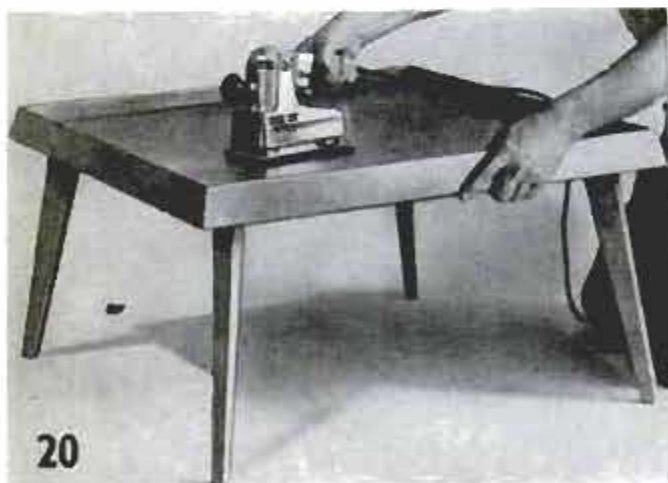


Lacquer is best sprayed on. Work should be mounted on turntable in a spray booth, or taken outdoors

that of milk for small pores. Two thin coats applied 12 hrs. apart are better than a single thick coat. A solvent may be recommended on the can for reducing the filler, or equal parts of benzine and turpentine can be used. A variety of colors can be obtained by adding stain or pigment to the filler, pigment being reduced with benzine before it is added.

Filler is brushed well into the grain, covering an area not greater than can be wiped before the filler turns flat. The excess is wiped off first across the grain with burlap, then with the grain, using a soft cloth. This is done carefully to avoid pulling the filler out of the pores. If excess filler is not all removed, the subsequent finish will appear blotchy. Rags used for wiping off filler are disposed of immediately as they are subject to spontaneous combustion. A stiff stencil brush is used to clean filler from moldings, carvings and scrollwork. Dried filler is picked off with a sharpened dowel. When dry, the filled surfaces are sanded with No. 8/0 sandpaper.

Pad sander fitted with felt shoe helps reduce the work of polishing, as well as the work of sanding



Sealing

Where sealer-stain was used and no filler over it, the separate step of sealing is eliminated. Ordinary stain is sealed before applying filler. Filler, when dry, also is sealed. Sealers should not be applied thickly, as they are brittle and tend to check.

Shellac is the "most-common sealer for use under varnish. It should be a 2-lb. cut or less. A lacquer sanding sealer is used under a lacquer top coat sprayed on. Some synthetic sealers also serve as top coats. Most sealers dry in 2 to 6 hrs., but this time is doubled or tripled when humidity is high, especially for shellac. A sealer should be so dry that it can be sanded with No. 8/0 sandpaper to a powder without clogging the sandpaper. Sealers can be applied with a soft, long-bristle brush, or sprayed. Lacquer sealers are sprayed—not brushed—over any undercoat that may bleed.

Shellac Top Coat

Although a shellac top coat is damaged easily by water and alcohol, such damage is simply repaired by recoating with shellac. A wax coat over shellac will retard the action of water and alcohol. White shellac is used on lightwood and on walnut. Orange shellac may be used on mahogany and other dark woods, but tends to darken them further. Shellac tends to discolor in a few months after having been exposed to air. It should not be applied heavier than a 2-lb. cut, and only wood alcohol is used to thin it. A good top coat of shellac is built up by three to five applications, each being allowed to dry fully and then sanded. Drying time for shellac top coats is given in Fig. 15. For sanding shellac, No. 280 wet-or-dry paper is best, applying a little light machine oil to the surface to minimize heating from friction.

Varnish and Lacquer Top Coats

A substantial top coat consists of three or four applications of varnish, or two or three applications of lacquer. The lacquer coats are sprayed on, Fig. 19. All coats should have a hard, high-sheen surface, but the final coat may be one that gives a rubbed-effect or stain finish. The stain finish should not be used for undercoats as it then will produce a cloudy appearance.

Most varnishes are thinned with turpentine, but the so-called plastic finishes require special thinners. Varnish should not be shaken or stirred before application as this produces air bubbles which are transferred to the work. Varnish is brushed on in a full-flowing coat. See Fig. 15 for drying time. Lacquer is clearer than varnish. When thinning lacquer for spray-gun

application the best grade of thinner is used. Lacquers are applied in full wet coats and can be sanded and recoated in 4 to 6 hrs. but the final coat should dry from 12 to 24 hrs. before it is rubbed.

Sanding Between Coats

Light sanding with partly worn No. 8/0 sandpaper between coats is done to cut the glaze and to make the next coat adhere better. It also removes dust specks and high spots. Care is taken to avoid cutting through the coats, especially at corners and sharp edges. Heavy runs should not be sanded until a 48-hr. period has elapsed. Care is taken to avoid heating which results in gumming and peeling. After surfaces are sanded, the dust is brushed off and the surfaces wiped with a tack rag to remove all traces of dust before applying the next coat. A tack rag is a lint-free rag dampened slightly with thinned varnish, and used when nearly dry.

Rubbing and Polishing

Proper rubbing of thoroughly dry varnished or lacquered surfaces produces a smooth, satin finish. Rubbed-effect or satin-finish varnish or lacquer should never be rubbed as they do not have sufficient hardness for this. Rubbing always is done with the grain of the wood, using light pressure. A pad sander can be used for this purpose as in Fig. 20.

Where a real fine finish is not required No. 4/0 steel wool may be used. A higher sheen is obtained by lubricating the work with soapy water. A dull satin finish is produced by rubbing with FFF pumice stone and rubbing oil, using a 1/2-in. felt pad about 2 1/2 by 4 in. in size. No other oil than rubbing oil should be used. The pad is first dipped in the oil, then in the pumice stone, which is repeated as necessary, keeping enough oil on the pad to prevent rubbing dry. All traces of oil and pumice are wiped off after rubbing. A highly polished finish is produced by rubbing with FFF pumice stone and water, using the same procedure of wetting the pad. After cleaning off the work, a rubbing with rottenstone and water on the following day will bring out a high luster. ★ ★ ★

☐ Metal lath provides an excellent guard for small trees. It is stiff and when formed into a cylinder, the lower end can be filled with peat moss or mild fertilizer, which is kept confined within the small space. When sprinkled or wet by rain, the chemicals in the fertilizer are carried down into the soil about the tree roots.



Repairing Loose Trim on Car

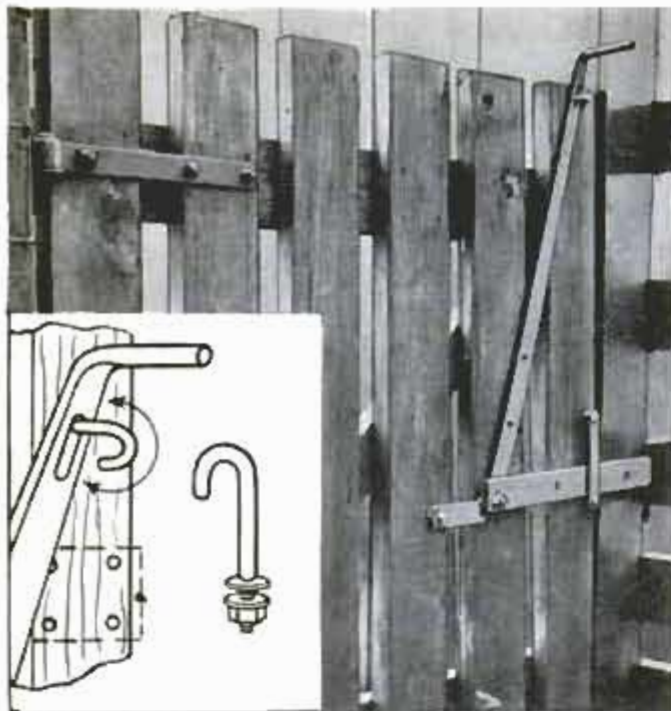
If a piece of plated trim loosens on your car because of a rusted sheet-metal nut, which holds it in place, it is easy to make a new one. Just cut a piece of sheet steel that will slide inside the trim, drill it for the screw, and then slide it into place and drive in the screw.

Horace Schatzschneider, Fort Monroe, Va.

Keep Motor-Switch Contacts Clean

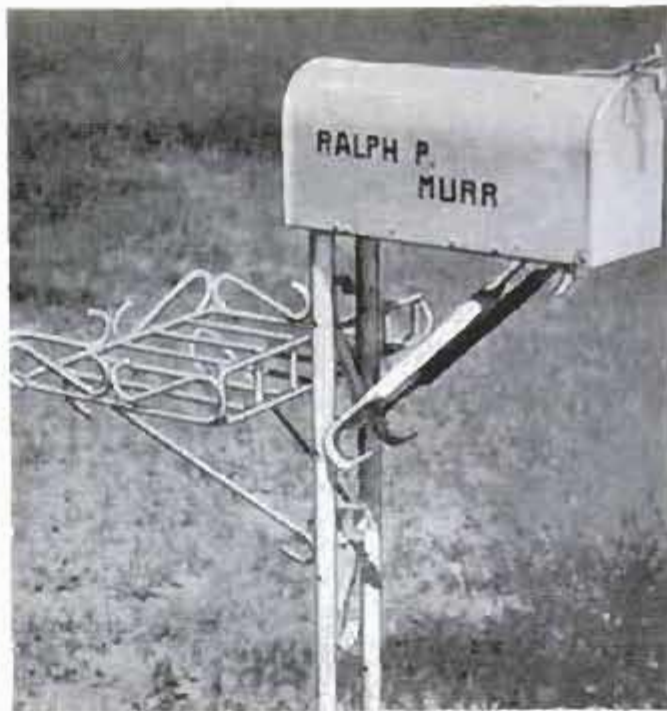
Small split-phase motors often fail, or draw excessive current when starting because of dirty contacts in the starting winding of the centrifugal switch. Periodic cleaning of the contacts with a fine ignition file, or fine sandpaper, will help prevent this trouble.





Locking Bolt for Stock Gate

Stock cannot open this latch, which makes it ideal for use on gates between feed lots. A lever attached to the bolt has a slot at the upper end that engages a hook bolt when in the closed position. The locking feature is provided by the bolt which prevents release of the lever when the hooked part is turned at right angles to the slot as in the detail above.



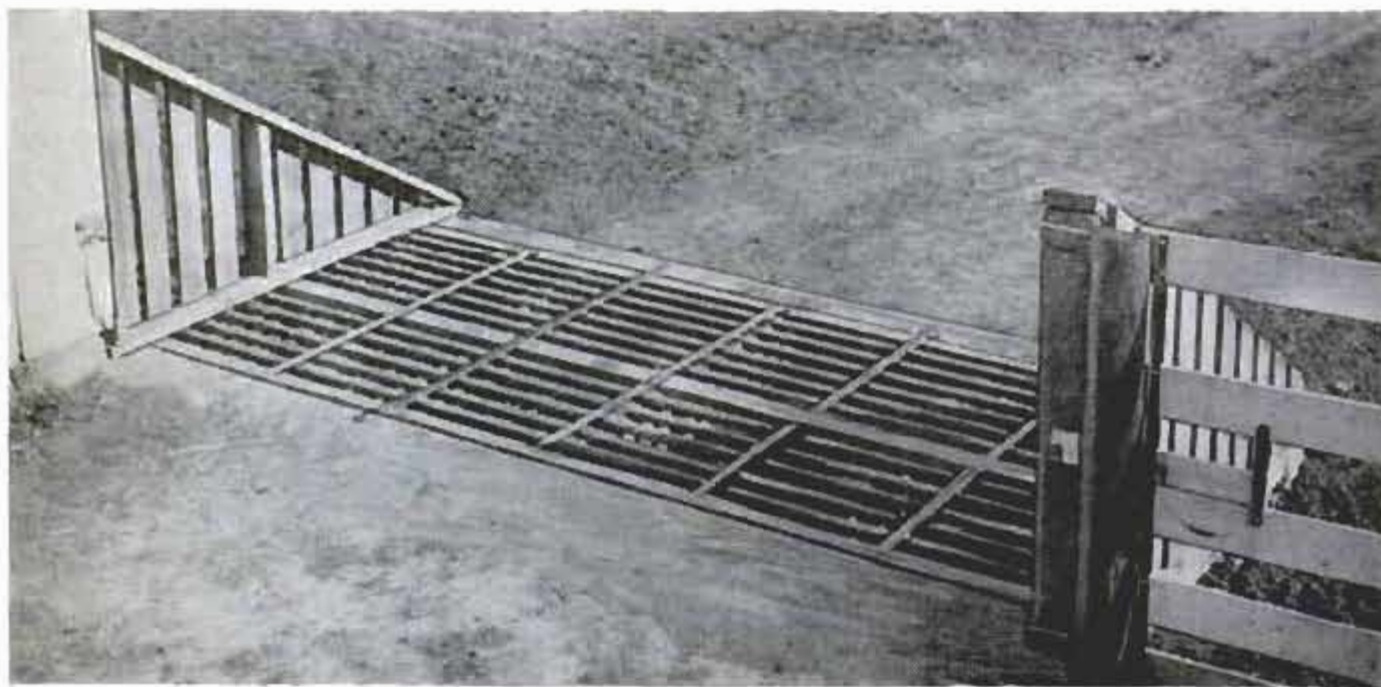
Package Rack for Rural Mailbox

Ornamental as well as useful, this sturdy package rack for a rural mailbox is constructed entirely of spokes removed from the wheel of an old hay rake. All joints are welded, including attachment to the mailbox support. Straight pieces are used for all parts of the rack, except the ornamental sides and support pieces which are formed as shown in the photo.

Wings Prevent Livestock From Stepping Over Ends of Guard

Wings on the ends of this cattle guard prevent livestock from passing through the gateway by jumping over the corners of the guard next to the fence. The wings, which are 4½ ft. high, also prevent livestock from being crowded onto the guard from the ends. A gate to one side of the

guard allows stock to be moved both in and out. The guard is 7 x 12-ft., is made of 2-in. pipes spaced 5 in. on centers and rests on a shallow concrete pit. The pipes are kept in place by lengths of flat steel welded to them at right angles as shown in the photo.—A. M. Wettach, Mt. Pleasant, Iowa.

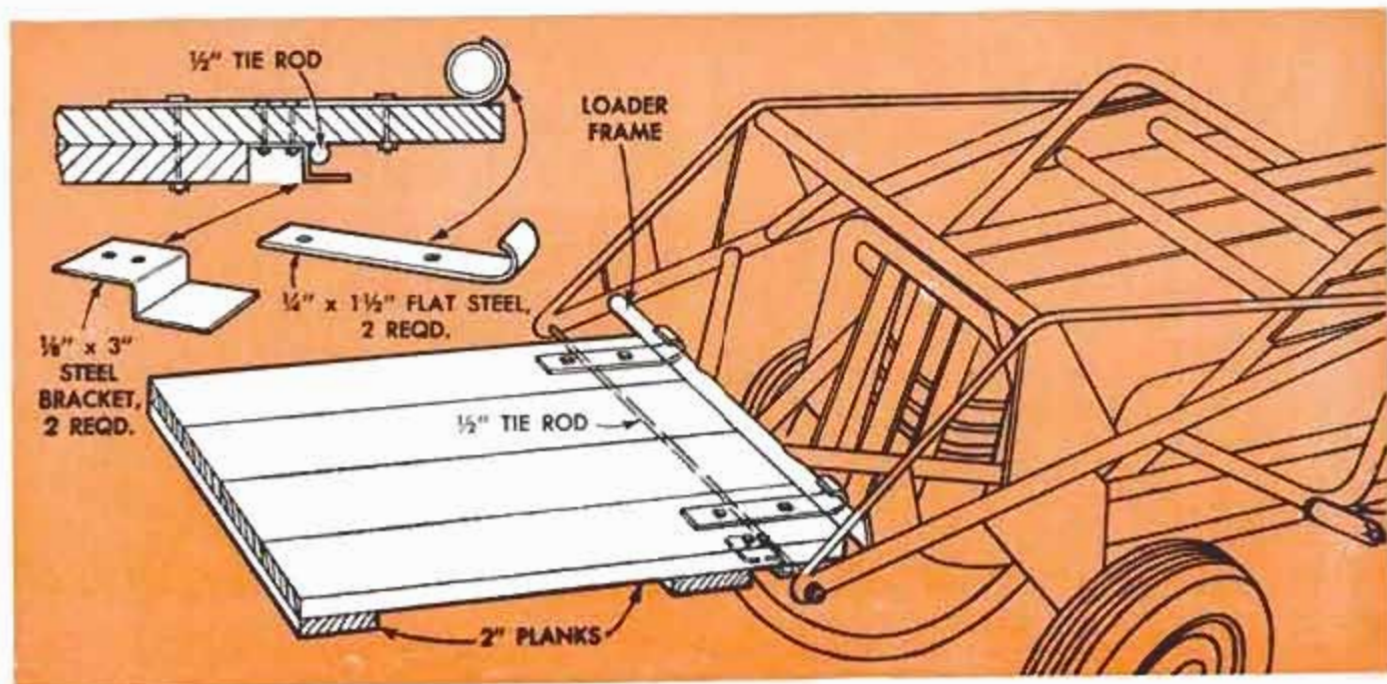


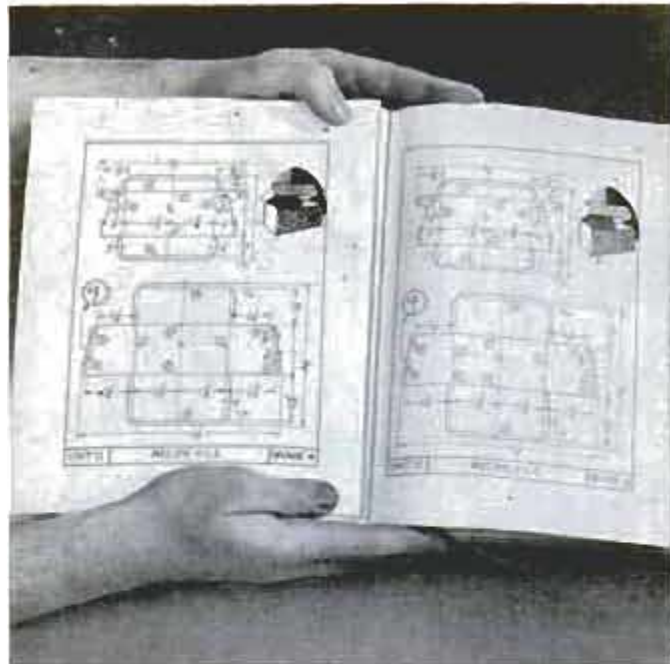
TRACTOR SCOOP HAULS FEED



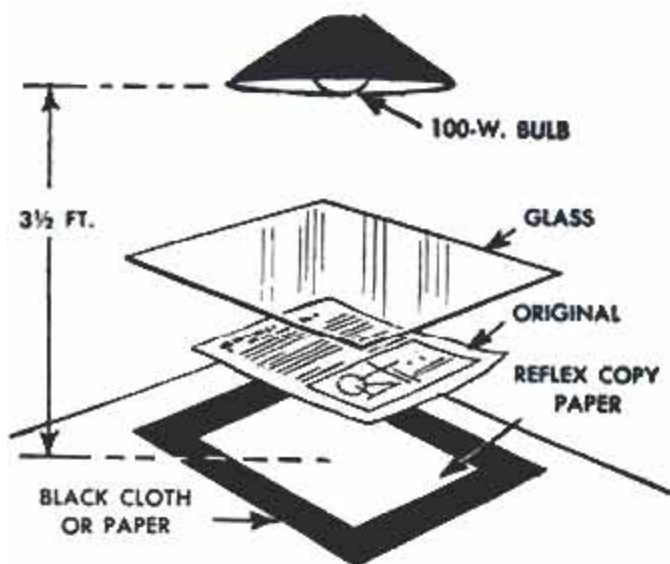
"EASY DOES IT," with this wooden platform that fits the loader frame of a farm-tractor scoop for barnyard feed hauling. The platform also is handy for carrying large timbers and other heavy objects. Made of 2-in. planks as shown, the platform is fitted with two brackets and two flat-steel hooks that engage cross members at the lower end of the loader frame, the bottom one of which is a $\frac{1}{2}$ -in. tie rod installed in place of the steel scoop. The latter tem-

porary alteration is the only one necessary. To connect the platform to the loader, simply tilt up the forward end and slip the hooks under the frame crossbar so that when the platform is released, the hooks and brackets are in the position shown in the detail. The weight of the platform acting as a lever helps to keep it in place, even when no load is being carried. Two coats of paint protect the wood and prevent sliver injuries.—D. O'Brien, Gahanna, Ohio

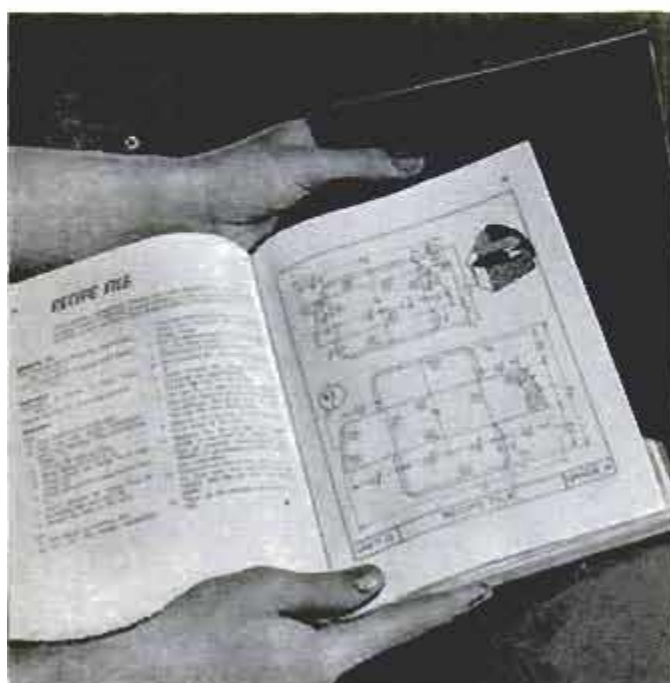




Note that copy at left is more contrasty than original at right. Lines and details are much sharper



When original has printing on both sides, back the copy paper with black cloth to prevent double image



COPYING WITHOUT A CAMERA

By Rolfe F. Schell

REFLEX paper makes it possible for anyone to copy an illustration, diagram or other drawing photographically without a camera, and directly from a book or magazine without mutilating the printed page. It can be done in a darkened kitchen or bathroom, and the chances are you already have the few items of equipment necessary.

Reflex copy paper is a sensitized paper which can be exposed only when the light source comes from the emulsion side. Light directed through the paper from the back side has no effect upon the emulsion. Only when the light reflects from the white of the prototype and back to the emulsion is the paper exposed. Reflex copy paper is available from photo and office-supply stores in sheets 8 x 10½-in. size and costs but a few cents per sheet. It must be handled in total darkness except during development which can be done in subdued yellow-green light.

As for equipment, you will need a piece of black paper or cloth, a sheet of clear glass, a 100-watt bulb and glass baking dishes to serve as developing trays. The

Develop until impression comes out boldly. If no impression shows after 30-60 sec., lengthen exposure





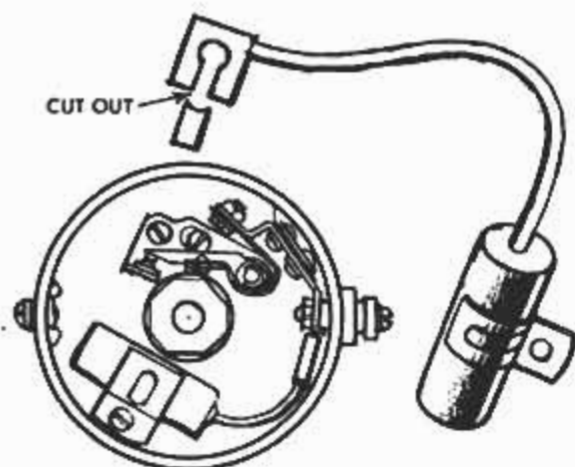
black paper or cloth is used when the original has printing on two sides. Placed underneath, the black backing prevents the light from reflecting back to the sensitized paper and picking up unwanted printing on the reverse side. The glass is placed over the original to keep it and the reflex paper in close contact so that sharp reproductions will result. The bulb should be suspended about 3½ ft. above the work and

the paper exposed for six to eight seconds. The reflex paper becomes a paper negative when developed, from which regular positive prints can be made. To reproduce copy with printing on one side only, such as a letter, remember that the paper reflex is placed emulsion side up. To reproduce copy with printing on both sides, such as the page in a book, the reflex paper is placed on the copy, emulsion side down. ★ ★ ★

When copying from curved surface such as a can label, rotate can slowly to assure uniform exposure

Copy gives view camera cannot take. Note "panning" effect apparent on copy, right, made by reflex method





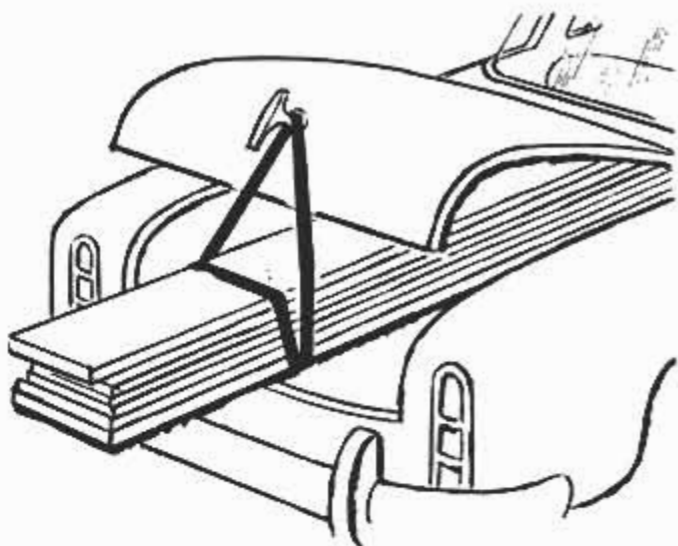
Open End Condenser-Lead Terminal Saves Installation Time

Installing a condenser in a car distributor is easy when the lead terminal on the condenser is cut to provide an open end as shown in the drawing at left. Then all you have to do when making the electrical connection, is to loosen the terminal screw or nut on the distributor, slide the lead terminal in place and tighten the screw. This saves time and temper trying to start the terminal screw since it is located in a place that usually is cramped and hard to reach.

Rubber Band Cut From Inner Tube Holds Trunk Lid Against Load

Here is an easy way of tying a car trunk lid down when carrying objects that are too large to permit closing it. Cut a band from the circumference of an inner tube, preferably along the crown. Then wrap one turn of the band around the load and loop the free end over the trunk handle as indicated in the drawing. For a trunk lid without a projecting handle, use an S-shaped hook to secure the band to a member on the underside of the lid.

G. E. Hendrickson, Argyle, Wis.



Repair Broken Car-Heater Hose With Copper-Tubing Coupling

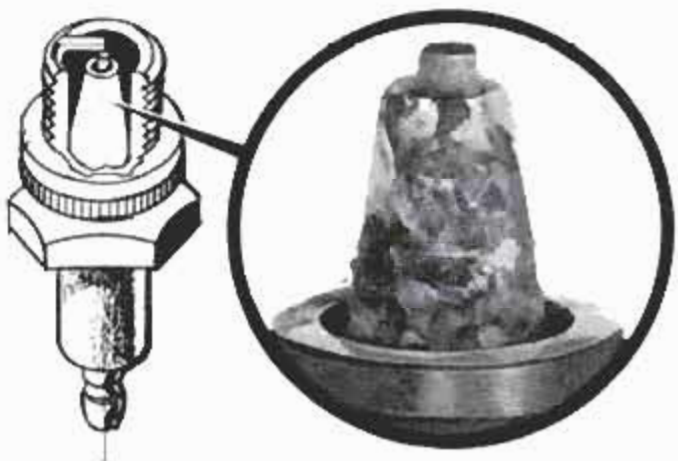
When a car-heater hose is badly worn or broken in one spot and a replacement hose is unavailable, here is a way to repair it. First cut off the defective piece. Next cut the remaining hose into two lengths, attach one to the fitting on the heater and the other one to the outlet or inlet on the engine, as the case may be. The two lengths are then connected by inserting a length of copper tubing in them, as shown at left, to bridge the gap.

H. R. Young, Fort Worth, Tex.



"Splashed" Deposits Foul Plugs

Spark plugs that become badly fouled as a result of soft, unburned fuel deposits on piston tops being "splashed" on the insulators require special cleaning, according to the service department of Champion Spark Plug Company. A 3 to 4-sec. abrasive blast usually will remove the deposit, recognized by its spotted appearance as shown at right. Old plugs should be replaced since they may have caused the deposits by misfiring at low speeds.



Cracked Battery Is Repairable

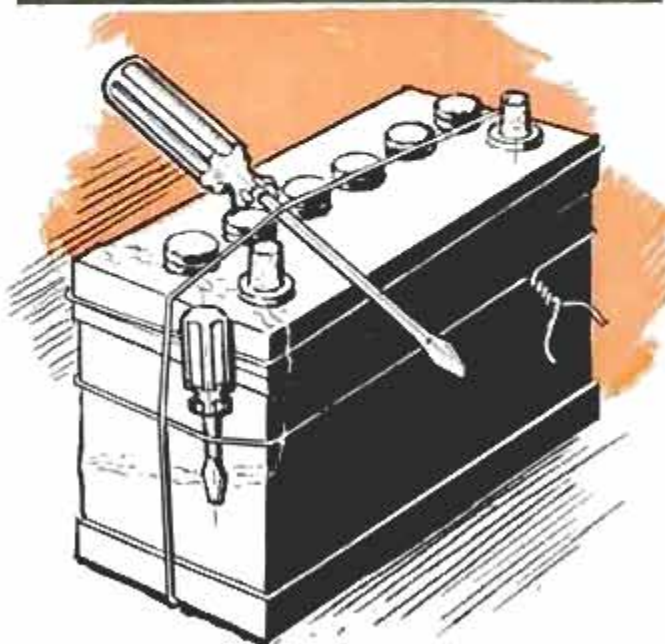


By Morton J. Schultz

NOW THE unfortunate owner of a cracked car battery need not consign it to the scrap heap and buy a new one, if the cells of the battery are in good condition. Using plastic auto-body solder to seal the breaks as illustrated in this article, the battery case can be made as good as new in a few hours.

Before starting with any repair work on a wet-cell storage battery, drain the electrolyte or battery acid into a glass container to avoid getting it on tools and clothing. Refill the battery with it when the repair work is completed.

When cracks occur along the corner edges of the case as in the example shown above, break off the cracked portion. Then drill matching holes in the exposed edges of the case and the edges of the removed piece to hold the plastic solder which, when dry, form a series of plugs that hold the broken piece in place. Holes should be spaced about 1 in. apart, $\frac{1}{2}$ in. deep where possible. Next spread the solder on the edges of the break on the battery and piece as shown in the photo, being sure to fill the holes. You must work quickly because most plastic solders are fast setting. Press the broken piece in place and clamp it tightly to the battery, using the arrangement of wire bands and screwdrivers for wedges as in the drawing at bottom right. Let the battery stand for one day before adding the electrolyte. When a single crack line appears on a battery, cut a V-shaped groove for its entire length and fill it flush with plastic solder.



THREE ONE-EVENING

Simplicity is the keynote of these useful household items, any one of which can be completed in a few hours by most home craftsmen

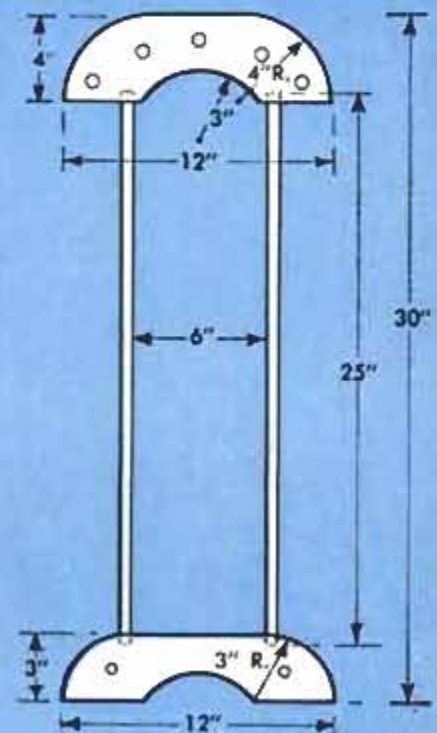
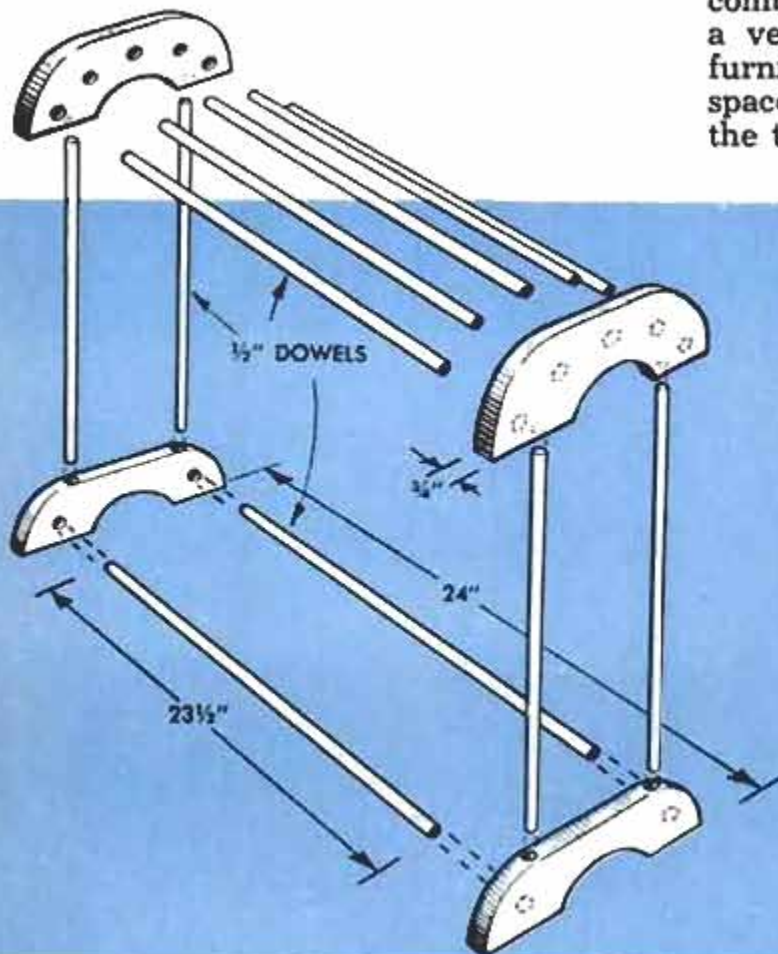
CLOTHES RACK

NOT ONLY IS THIS floor-model clothes rack convenient for drying damp towels and hand-washed clothing, but it saves the bathroom from being cluttered with them as well. The rack is the easiest project of the three, requiring only the shaping and drilling of a pair of base members and a pair of top pieces to take $\frac{1}{2}$ -in. dowels cut to the lengths given in the drawing below. While all of the dowels serve as a framework, the ones at the top also serve as a rack on which to hang clothing and towels. The easiest way of assembling the rack is to glue all horizontal dowels in place first, being careful to maintain the same spacing between the end pieces at all points to assure proper alignment of all parts. After the rack is assembled, it is sanded smooth and left natural, or finished as desired.



DESK AND BOOKCASE

Illustrated on the opposite page, is a combination desk and bookcase that makes a very attractive and practical piece of furniture for a child's room. There is ample space for reference and school books on the two lower shelves and shelf space for



PROJECTS

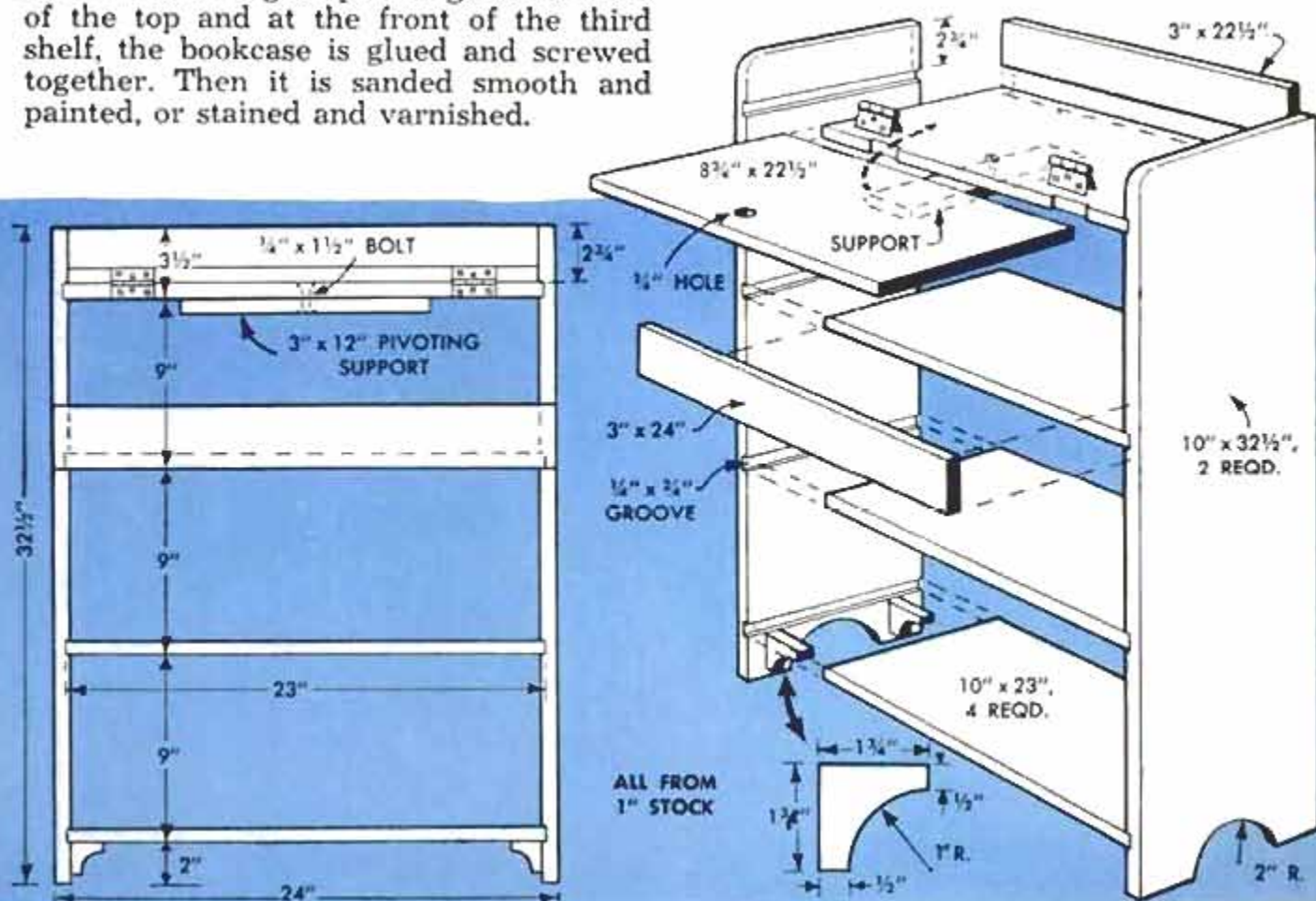
papers, pads, pencils and other school paraphernalia on the upper one.

All parts of the bookcase are cut from 1-in. lumber. Pine, or other more expensive furniture woods may be used as desired. Begin construction of this project by cutting the three shelves and top to length, using 1 x 10-in. boards that are free of knots. Next cut the end pieces according to the dimensions given, after which $\frac{1}{4}$ -in.-deep grooves are cut to take the shelves and top. If you don't have a router, or dado head that can be used on a bench saw, make parallel saw kerfs within the marked outlines of the grooves to be cut. This can be done with a sharp handsaw if you are careful, although the work will go much faster and easier on a bench saw. Four small wooden braces, attached to the bottom shelf and end members as shown, provide reinforcement and decoration.

The hinged portion of the desk top must be cut exactly to the dimensions given so that there will be adequate clearance when it is in the closed position. Note that a 3 x 12-in. pivoting arm is bolted on the underside of the top to support the hinged part when open. The pivot point for the supporting arm is located midway on the top $1\frac{1}{2}$ in. from the front. After cutting the 1 x 3-in. retaining strips that go at the back of the top and at the front of the third shelf, the bookcase is glued and screwed together. Then it is sanded smooth and painted, or stained and varnished.



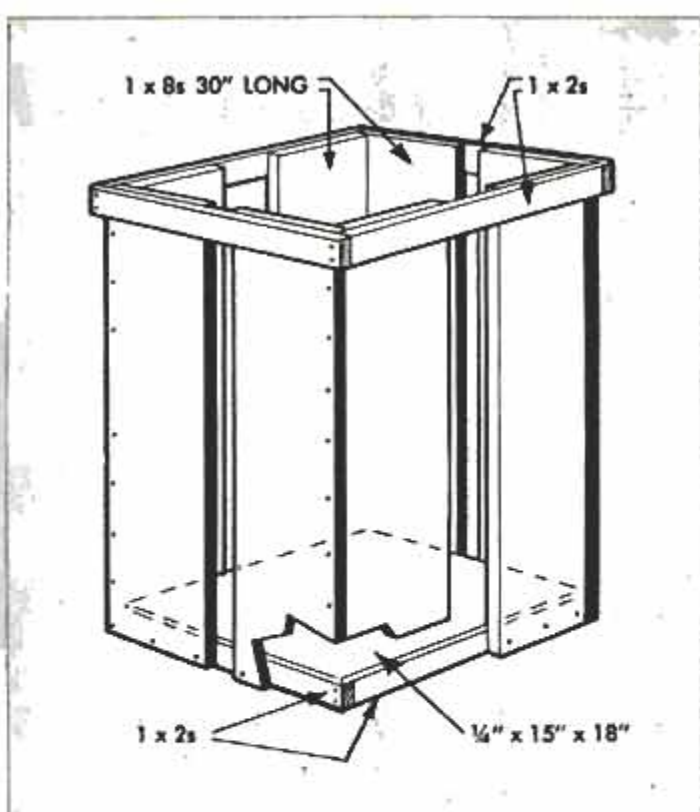
Compact child's desk and bookcase has two lower shelves for reference and school books, upper shelf for writing materials and a fold-out writing leaf





PAPER BUNDLER

A paper bundler like the one illustrated not only provides a convenient means of tying up loose papers and magazines but it provides a proper storage place for them until collection time. The bundler is made of 1-in. lumber, except for the $\frac{1}{4}$ -in. plywood bottom. The molding of 1 x 2s at the top serves as a frame and provides a con-

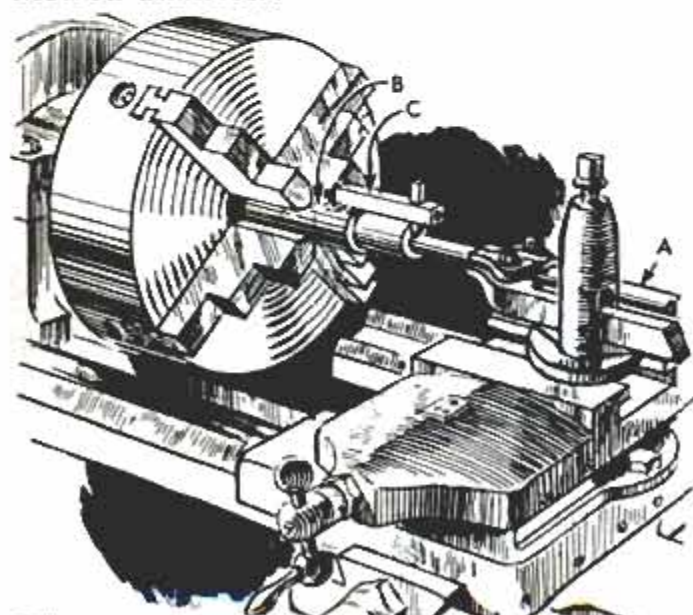


venient place to grasp the bundler when moving it. Nails only are used for assembling bundler, making it a project that shouldn't take more than two hours to complete. Painted a pastel color to match or harmonize with the walls of a utility room or basement, the bundler can be attractive as well as useful. ★ ★ ★

Ted M. Fenn, Chicago

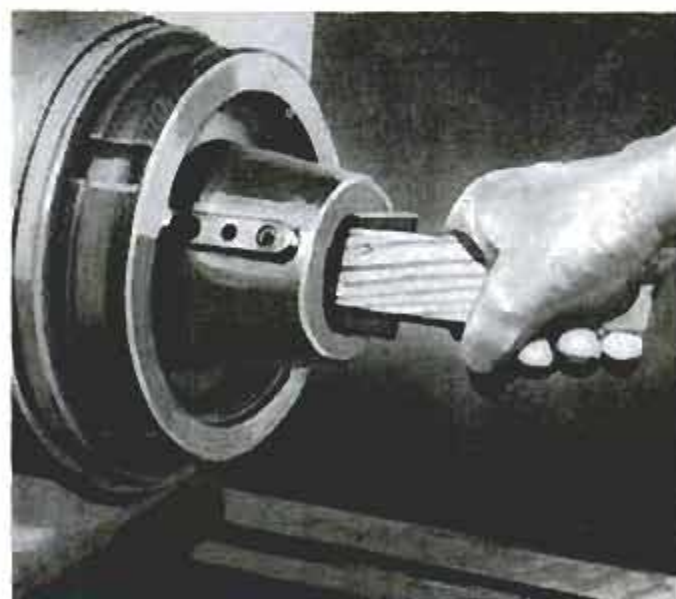
Cutting-Tool Holder for Lathe Speeds Turning of Shaft Stock

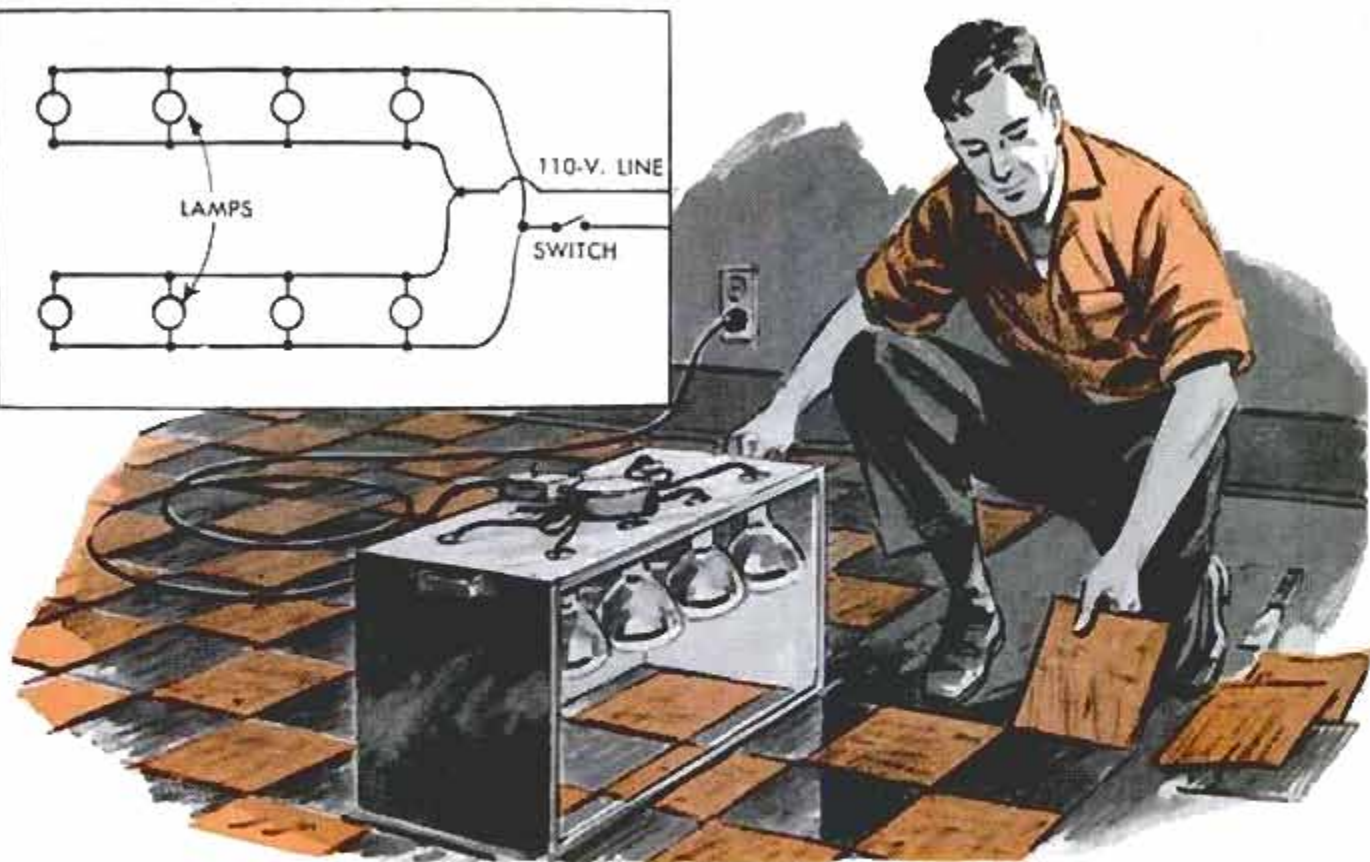
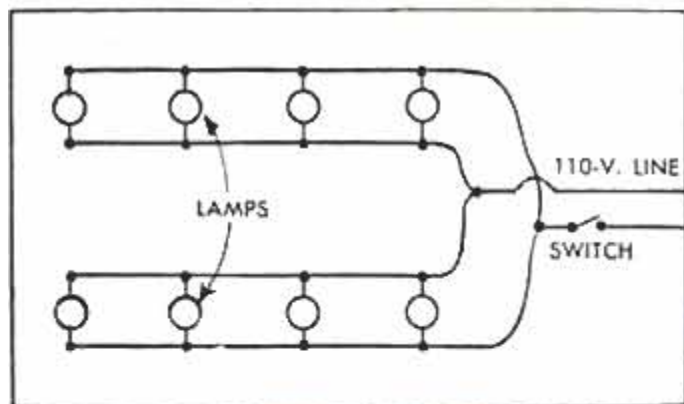
When turning or shouldering a long piece of shafting, one machinist uses the cutting-tool holder shown to speed the work. The holder consists of a length of tubing (B), to which a piece of key stock (C) is welded. A cutting tool mounted on the key stock as shown, revolves with the lathe chuck, turning the stock, A, to the desired diameter.



Leather-Bladed Cleaning Tool For Tapered Spindle Socket

Ideal for cleaning a tapered spindle socket of an engine lathe is this tool which has a leather blade cut to the same taper as the socket. When held in the socket, it wipes the surface clean in one revolution. The blade is cut from leather machine belting and tacked in a slot cut in a wooden handle as shown.





Boxed Heat Lamps Permit Safer Removal of Asphalt Tile

Designed by an Army maintenance man, this "hotbox," consisting of an aluminum box measuring 12 x 12 x 24 in. in which are fitted 8 heat lamps, speeds up the job of removing asphalt tile. Because no flame

is required, as when a blowtorch is used, the box minimizes fire hazard. For use in a home, the device could be scaled down to use one or two heat lamps to remove single tiles that require replacing.

Photo Timer "Sealed" in Plastic

Fitted over a darkroom timer, a large plastic bag will protect the unit against chemicals that might be splashed on it. When the neck of the bag is taped or wired shut, the timer also will be sealed from corrosive fumes of the darkroom chemicals. The timer levers and knobs can be operated through the plastic, so the bag can be left on the timer permanently.

R. Hanscom, Elmhurst, Ill.



Applying Sanding-Disk Adhesive

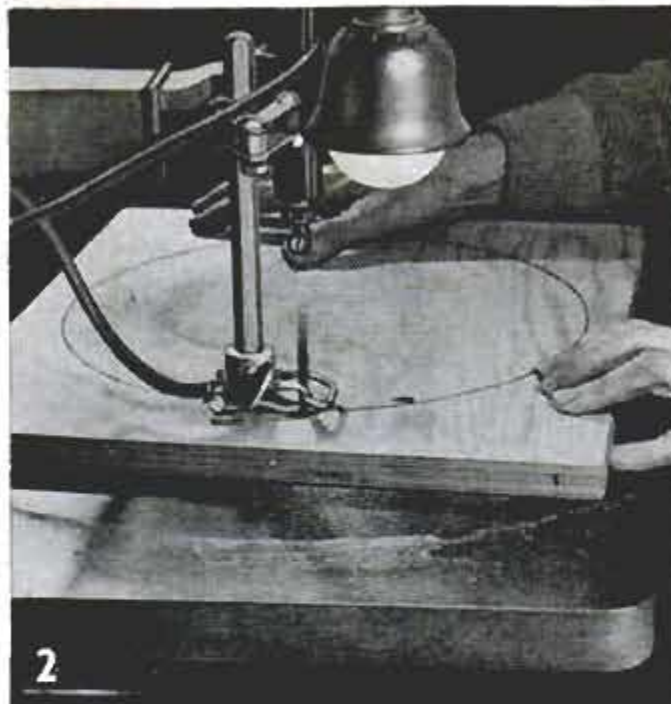
Heating a sanding disk permits smoother and more even spreading of stick adhesive for attaching the paper. Heat also assures easier removal of the paper.



SHOP NOTES

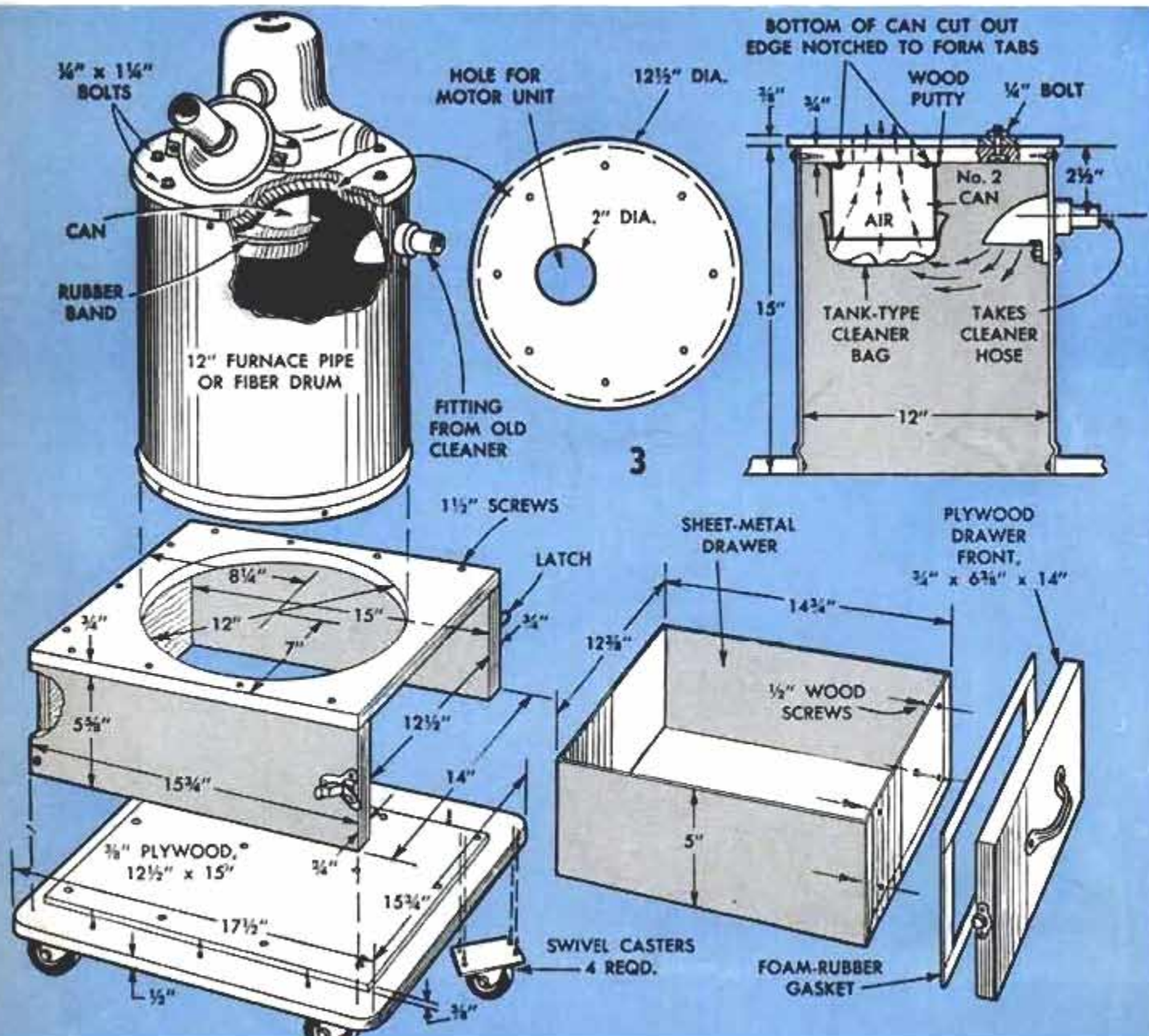


1 Select an old-type cleaner which will permit cutting away parts of main frame to form lugs for bolts



2 Disks which form the two-piece lipped top are jigsawed from $\frac{3}{4}$ and $\frac{3}{8}$ -in. hardwood-faced plywood

THIS WORKSHOP CLEANER





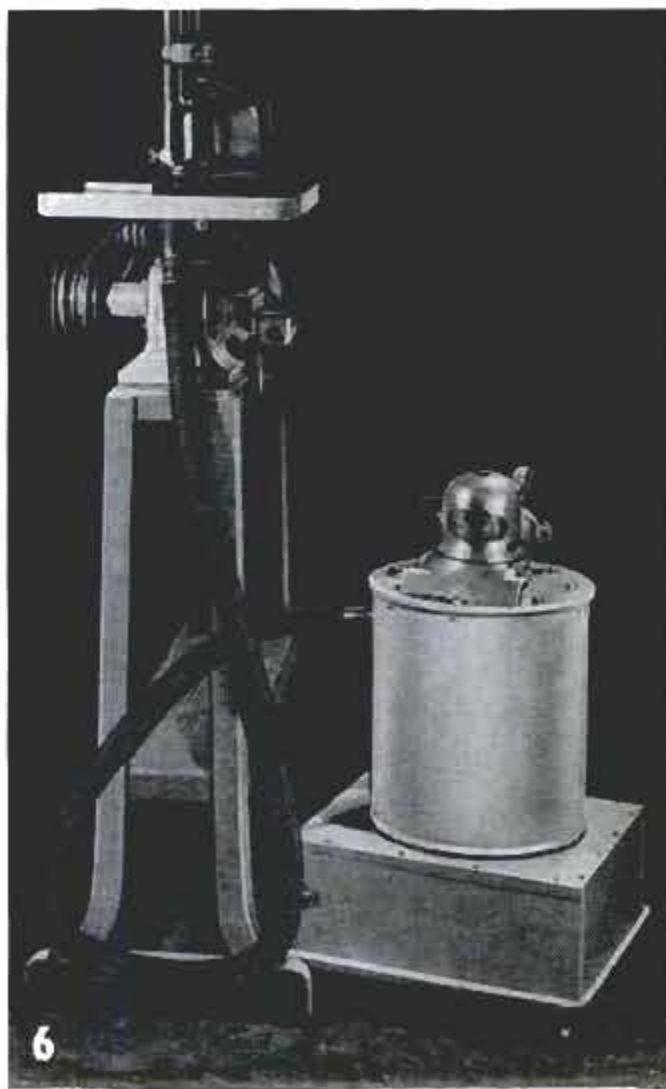
4
Plywood disks are bolted together to form rigid top. Note how cleaner-fan housing is attached to top

utilizes old-type vacuum-cleaner motor and fan assembly. Picks up chips, shavings and dust from floor, benches and power tools

By WALTER E. BURTON

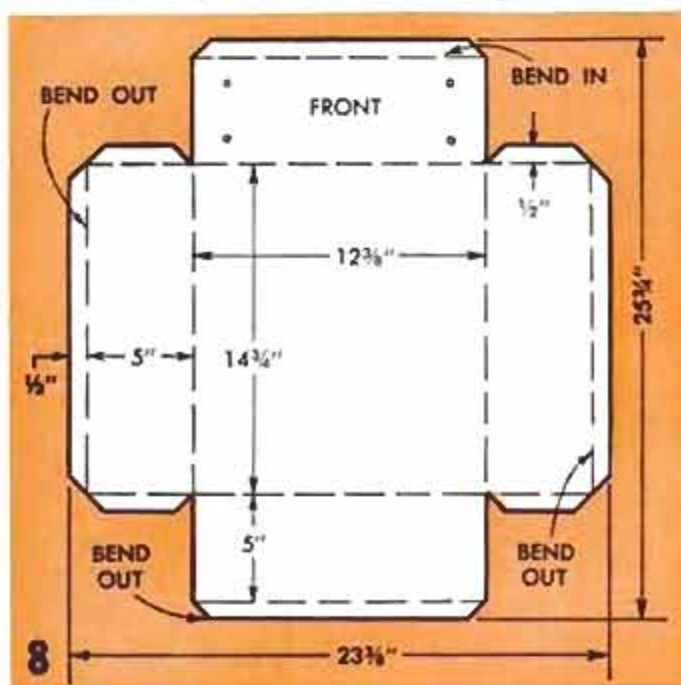
CLEANING UP the workshop is a simple chore after you've taken time out to build this shop vacuum. It picks up the chips, shavings and, most important of all, the fine dust which is so hard to get with the shop broom. Fitted with the right nozzle it will clean off the bench top in a jiffy, draw sawdust from corners you can't reach with a brush, clean shop machines so they look like new. Tightly constructed to eliminate air leaks, and fitted with ordinary vacuum-cleaner hose and fittings, it is capable of a static lift of an inch or so, which is enough to pick up dust and chips from the floor, bench tops or machines, Fig. 6.

Fig. 3 details the construction of the original unit and gives the general dimensions. As detailed in Fig. 3 and also as pictured in Figs. 5 and 6, the cleaner is made with a drawer to collect the material picked up by the vacuum unit. The drawer makes it possible to remove the collection of dust and other debris periodically without having to take off the top of the drum. In the machine pictured, the top, which supports the motor and fan, is permanently attached to the drum and the latter is screwed to the drawer compartment. In this type of assembly it is comparatively easy to eliminate air leaks which might affect the efficiency of the vacuum unit.

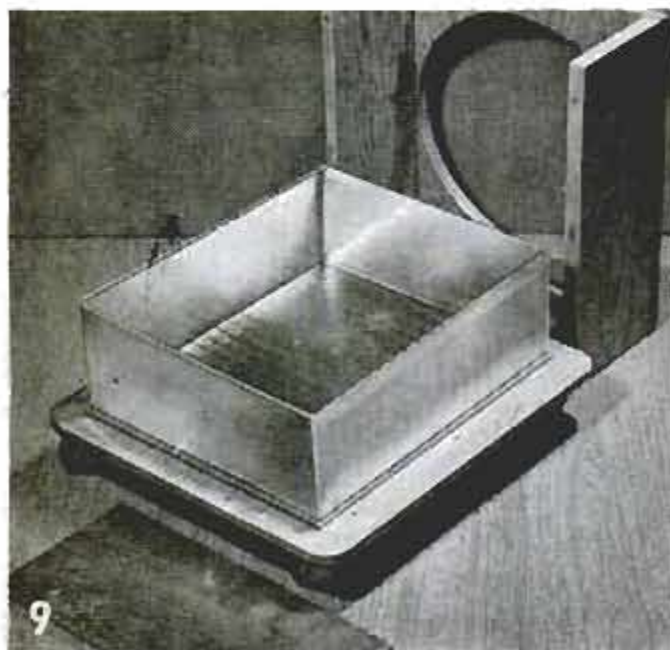




Air is drawn through cloth and cleaner bag to filter out fine dust, prevent it from entering fan housing



Drawer is made from sheet metal, cut, bent and riveted as in detail above. Drawer is fitted with a wooden front piece. Rubber gasket prevents air leaks



Selection of a suitable cleaner motor and fan is largely up to the builder. The unit pictured will offer a suggestion as to the type which is most adaptable. Figs. 1 and 4 show how the fan housing was cut away to adapt the unit to use with the dust collector. Usually cleaner units of this type permit cutting away of parts of the fan and housing to provide anchoring lugs for bolts which hold the unit in place on the disk of plywood that forms the top of the drum. If you purchase a used cleaner for the purpose of salvaging the motor and fan, make sure that it is of a type that can be adapted to the new use, and that the motor and fan are in good condition.

Note in the sectional view, Fig. 3, that the top of the drum consists of two disks jigsawed from plywood, Fig. 2, then sandwiched and bolted together. The drum can be made from a length of furnace pipe, or a small fiber drum can be utilized. Fiber drums usually are fitted with friction lids and often the friction lid can be screwed to a plywood disk and thus used as a mounting base for the motor and fan. In either case, a No. 2 can (a coffee can also will serve), with the bottom cut out, is fitted over the opening through which the fan will draw air. This provides an air chamber over which an open-mesh square of cloth and a tank-type cleaner bag are placed as in Figs. 3 and 7. The cloth and bag are held in place with a rubber band or with cord.

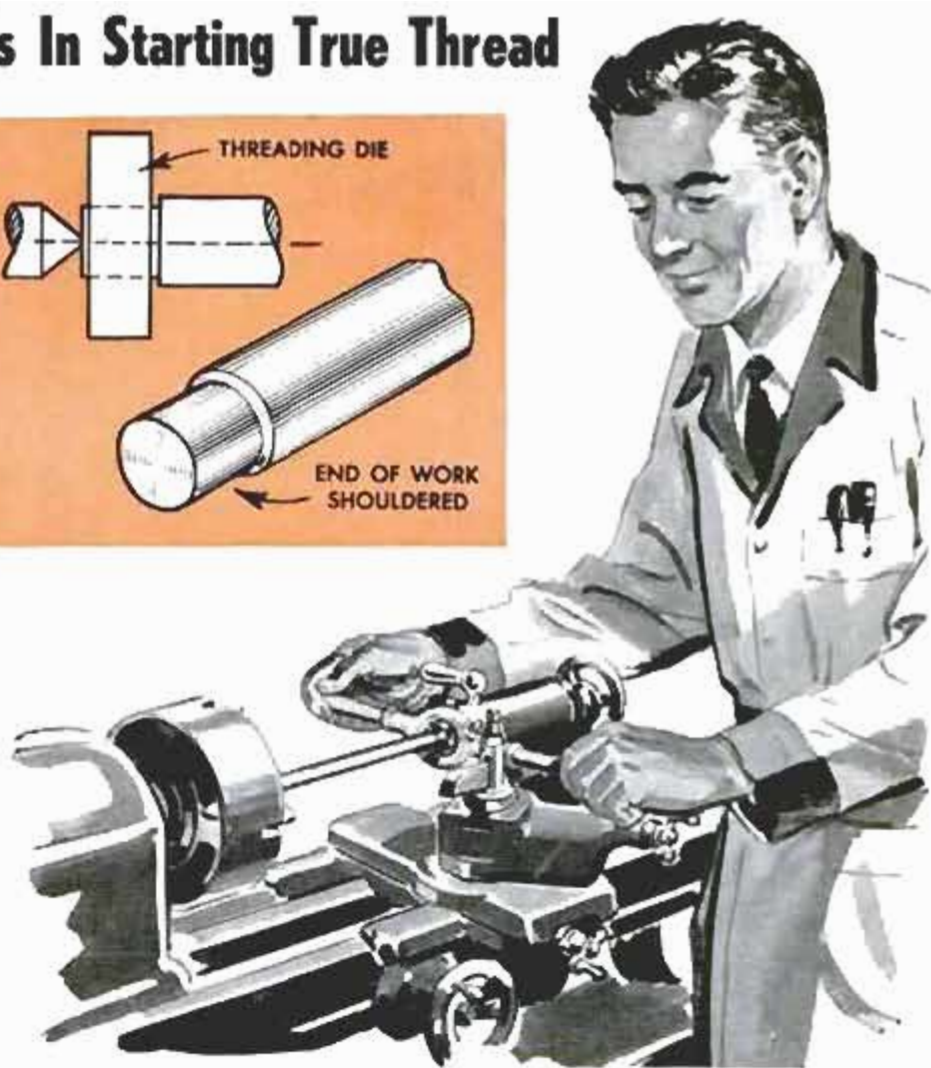
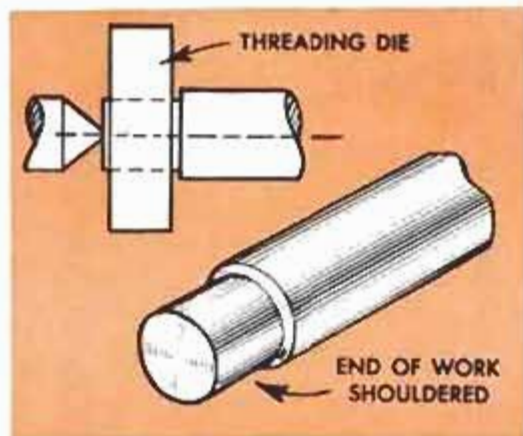
The fitting which takes the cleaner hose, upper right-hand detail in Fig. 3, often can be salvaged from an old cleaner and adapted to the new use. If not, then it is quite easy to improvise a suitable fitting by soldering a short length of tubing into a hole cut into the side of the drum about 2 1/2 in. from the top.

Note that the base is made from two pieces of plywood sandwiched and screwed together. The purpose of this construction is to obtain a rabbet at the lower edge of the drawer opening to form a seat for the rubber gasket on the inside face of the drawer front, which is of wood. The drawer, Figs. 3, 8 and 9, is made from sheet metal. Cut and bend the single piece as detailed in Fig. 8. The lapped joints at the corners can be riveted or soldered as desired. The drawer front is attached to the drawer with screws as in the detail, Fig. 3. Latches of the suit-case type (suit-case bolts) hold the drawer tightly closed. The gasket prevents air leaks into the drum.

It's important that the parts of the entire assembly be fitted tightly and sealed if necessary with wood putty. Air leakage into the drum or the drawer, even slight leaks will tend to destroy the vacuum and lower the efficiency of the unit. ★ ★ ★

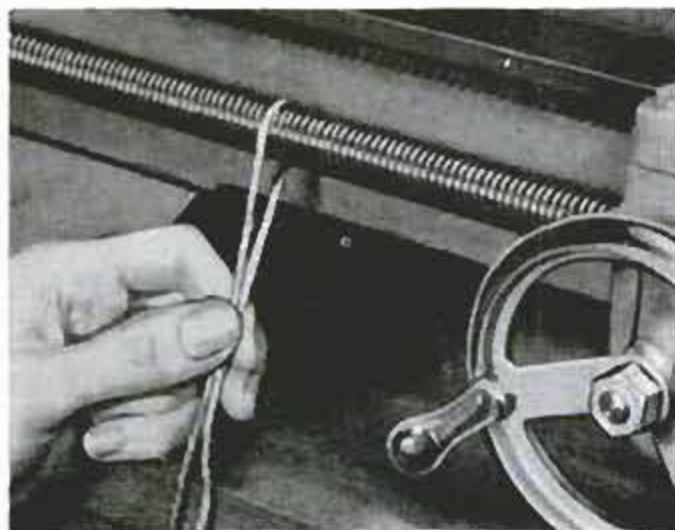
Shouldered End Aids In Starting True Thread

Starting a round die to cut a true thread is no easy trick when you have to do it by eye alone. At best, you must of necessity leave a lot to chance. When you must have a true thread on small-diameter work and there's no time to set up the lathe to do the job, mount the work between centers and shoulder it so that the die will slip onto the end. The length of the shouldered portion of the work should be slightly greater than the thickness of the die. To start the thread, run the carriage back so that you can use the toolholder to support one handle of the diestock and set the lathe to run at its lowest speed with the back gears in. Once the die is started the balance of the thread can be cut by hand.



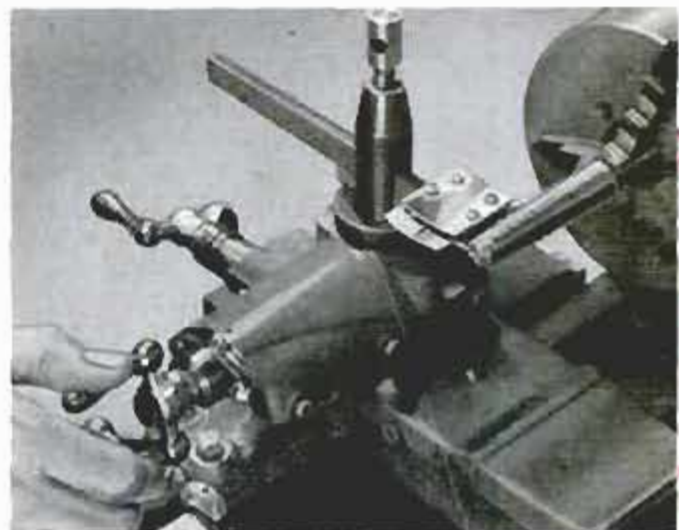
Threads on Lead Screw Kept Clean With Cord

Cleaning the lead screw of the lathe with a brush and solvent is not always the most efficient way of removing the gummy oil residues that can collect in the threads and cause rapid wear. Periodic cleaning with a cord dipped in solvent is a better way, as the cord will follow the thread when the machine is running and remove all the residues in one pass. This should be done regularly, and always after the machine has been used in a grinding operation.

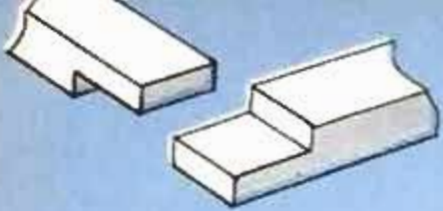


Setting Lathe Compound To Reproduce Taper

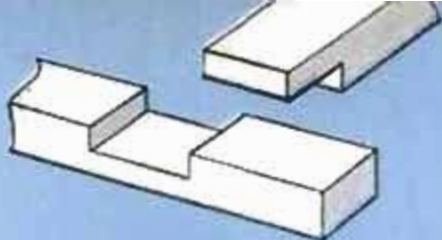
When it is necessary to reproduce a short taper from an original tapered part, the setup can be made quickly by holding the original in the chuck and mounting a dial indicator or a gauge in the tool post. Then the angle of the compound is adjusted so that the indicator reads zero when run along the taper. By using only the compound feed for the cut, a matching taper will result. When turning a taper it's important to set the tool on center.



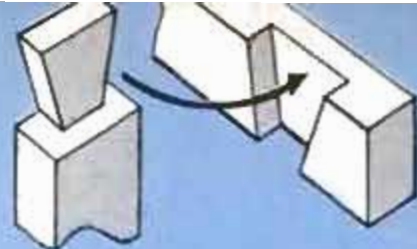
*Brown & Sharpe
Cutting Tools / Div. Providence R.I.
250 Promenade*



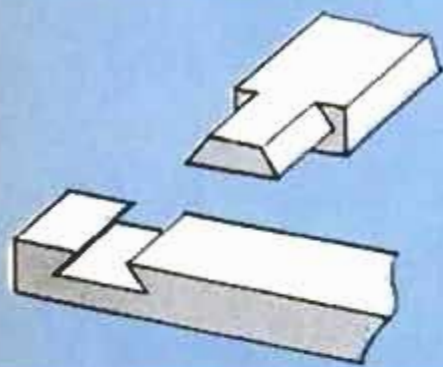
CORNER LAP. Ends of workpieces are halved and shouldered on opposite sides, joined at right angles



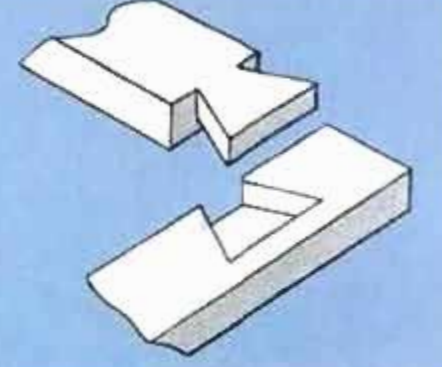
MIDDLE LAP. Used when joining rails to uprights where rails meet uprights. Joint is often pinned



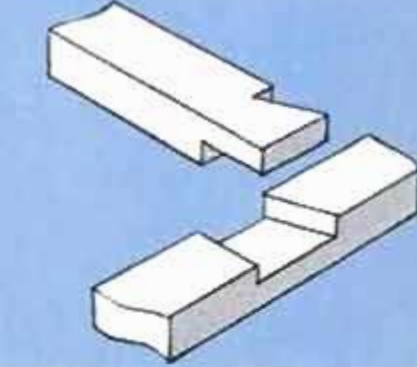
DOVETAIL LAP. Through dovetail is half-lapped onto rail or upright. Often seen in old cabinetwork



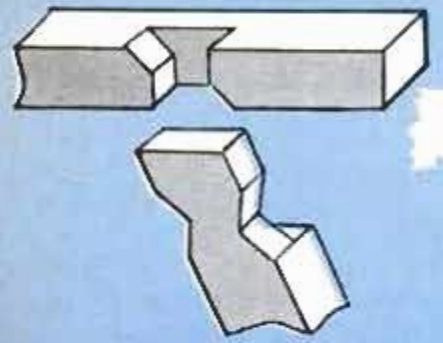
DOVETAIL LAP. Provides much greater strength than plain middle-lap joint. Should be glued, pinned



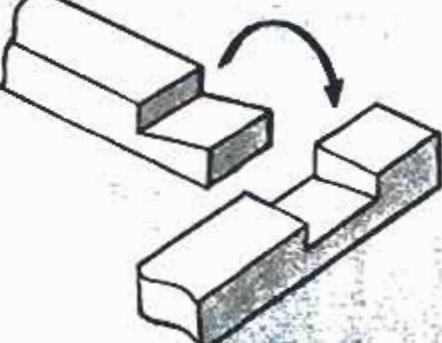
HOUSED DOVETAIL LAP. Used where end grain must be concealed in finished work. Should be glued



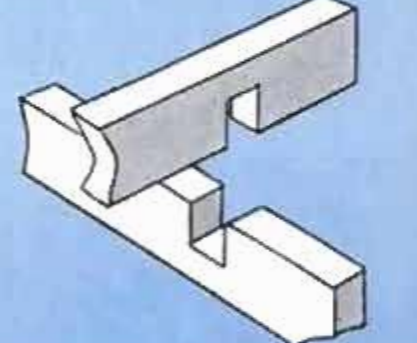
DOVETAIL LAP. Sometimes referred to as half dovetail lap. Easier to make than regular dovetail lap



TIE LAP. Somewhat similar to half dovetail joint but usually is used when joining framing timbers



BEVELED TEE LAP. Same as beveled corner lap except that members are joined as in the middle lap



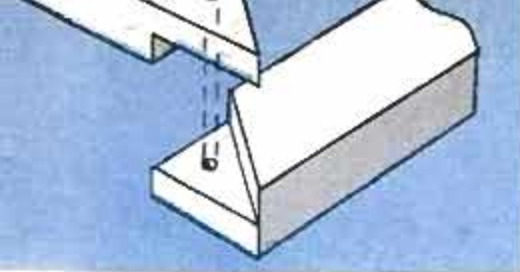
CROSS LAP—EDGEWISE. This cross lap is made with notches cut in from the edges of joining members

WOODWORKING JOINTS

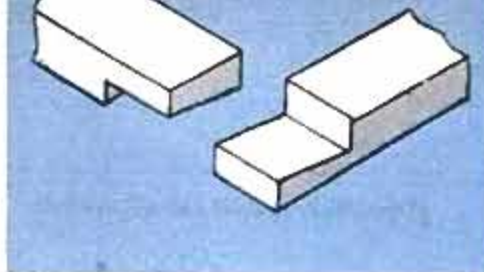
By C. W. Woodson

HERE ARE COMMON variations of the half-lap joint, most of which are still used in light joinery and heavy framing. Nearly all of the joints detailed will be found in various types of old work. The half-lap joints are quite easily made with hand tools, proceeding as in steps A, B and C in the details on the opposite page. Some joints detailed are quite similar, others differ considerably in form from the true half lap, but require essentially the same procedures in cutting and fitting. Names of the joints detailed are those in common usage, but in some cases will dif-

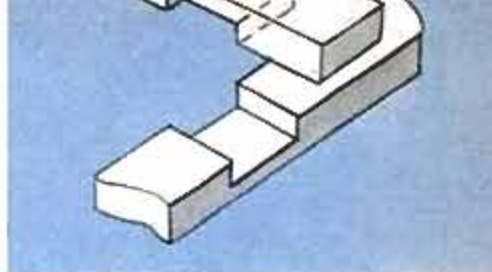
fer with names given in older works on the subject of joinery. The strength of the lap joint in any form depends on close, accurate fitting. As a rule, the joints should be pinned or glued for maximum strength and resistance to lateral strain. Nearly all of the joints detailed are effective in joining either hard or soft woods in both cabinet framing and heavy structural framing. But here again it should be emphasized that maximum strength is attained by accurate fitting of the joining members as well as by a careful selection of the hard or soft woods used. ★ ★ ★



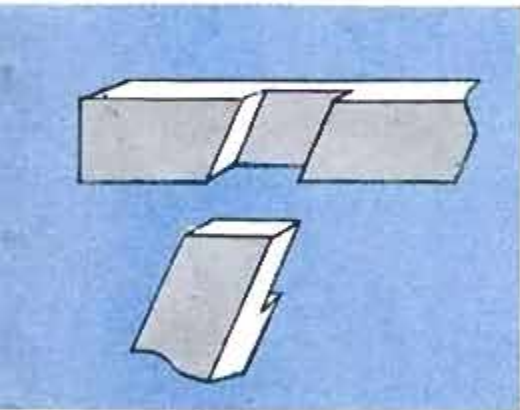
LAPPED MITER. Used when joining frames when it is desirable to have miter show only on one face



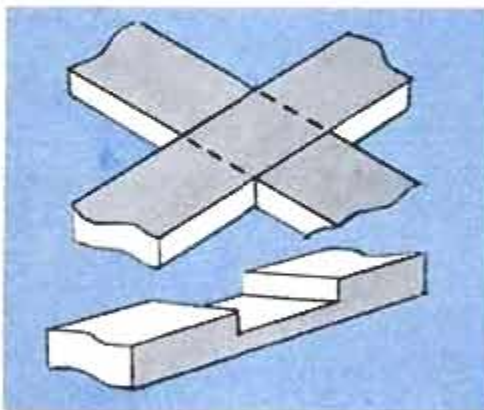
BEVELED CORNER LAP. A good joint to use where there is strain on one or both pieces. Should be glued



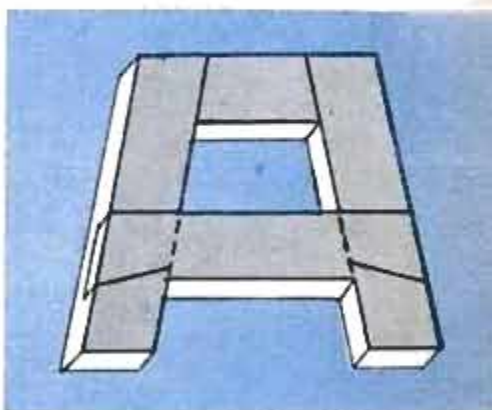
CROSS LAP. Workpieces are lapped flush at right angles. Parts must be true fit for maximum strength



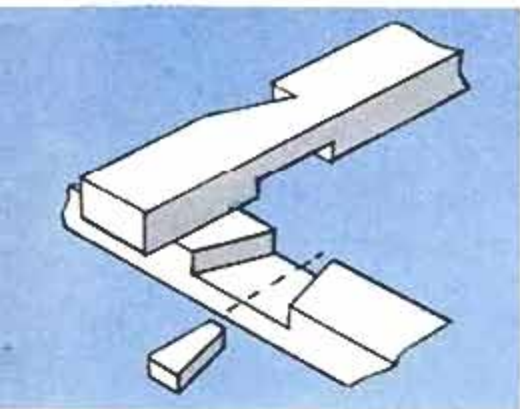
ANGLE HALF LAP. Same as middle lap except parts are joined at an angle. Snug fit is essential



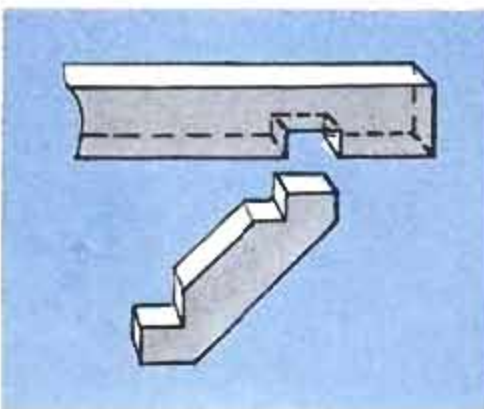
ANGLE CROSS LAP. Members are half-lapped at an angle. Sawbuck table legs are type of this joinery



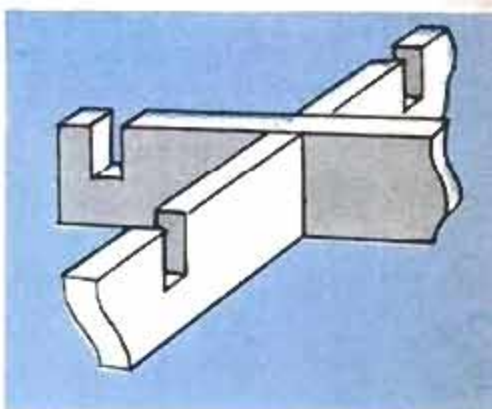
TRESTLE LAP. Joints are same as half-dovetail lap except that the shoulders are cut at an angle



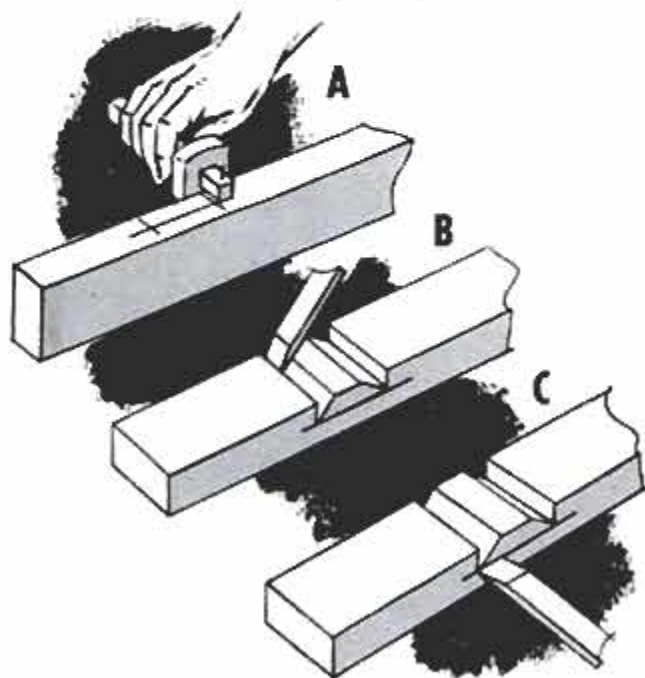
WEDGED HALF-DOVETAIL LAP. Used on framing that is assembled and disassembled frequently

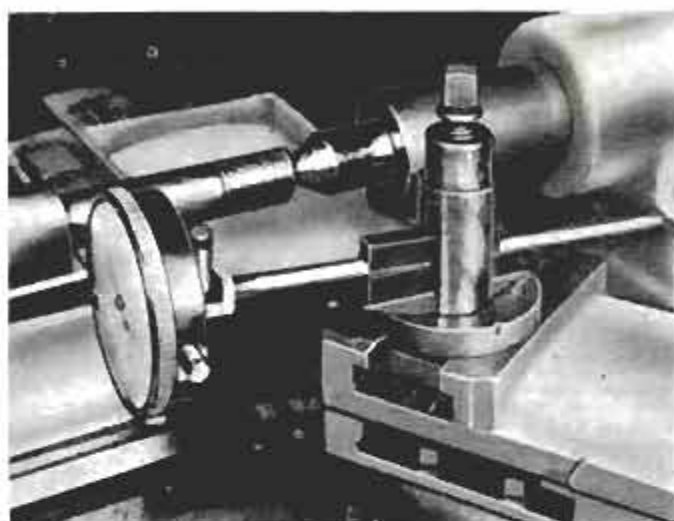


ANGLE LAP WITH SHOULDER. Its main use is in heavy framing and as brace in heavy shelf bracket



EDGE LAP. Used when making open grilles or when assembling compartments in box or tool tray



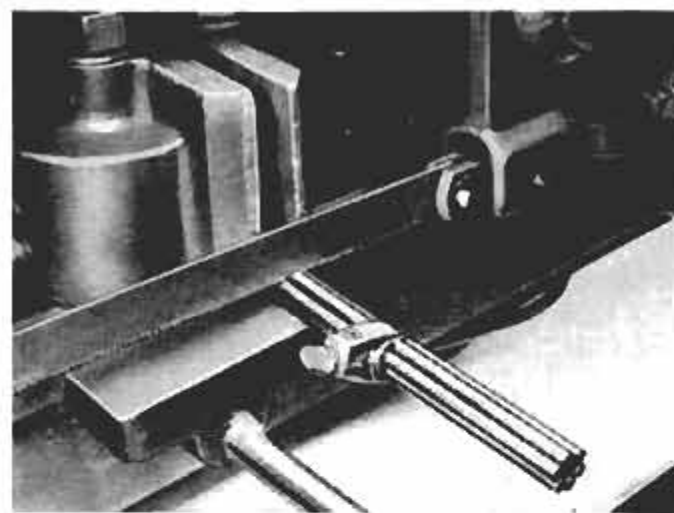
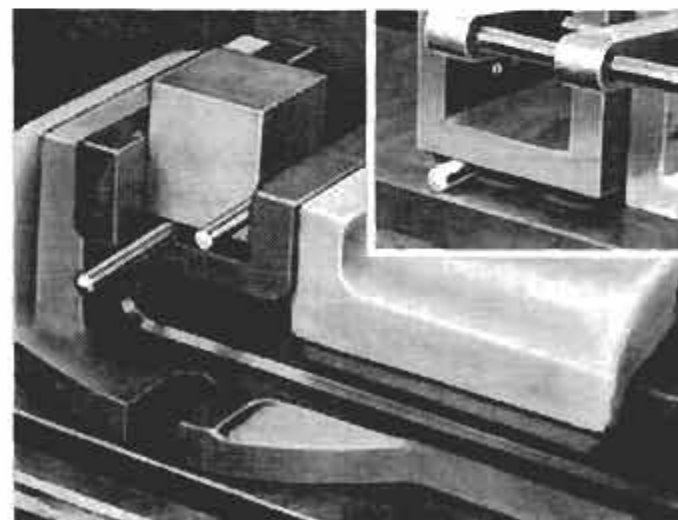


Split Block In Tool Post Holds Dial Indicator

On some types of close work machinists often prefer to mount the dial indicator on its own attachment rod, rather than use the universal mounting. This calls for a split-block holder made to fit the tool-post slot. Such a block can be made from mild-steel bar stock. The block is drilled and reamed lengthwise, the diameter of the reamed hole equaling the diameter of the attachment rod. It is then split on the center line of the hole to form two clamping pads, or jaws, which hold the rod securely.

Lengths of Drill Rod Square Work Setups

When work is to be squared by milling or grinding, toolmakers often use lengths of drill rod to make sure that the work is seated true against the fixed jaw of the machine vise. One rod is placed under the work, the other between the work surface and the movable jaw. When the work is set up on a magnetic chuck, using an angle plate as in the inset photo, a length of rod is placed under it as shown. The rod assures squareness of the work for the initial cut. All surfaces must be clean.

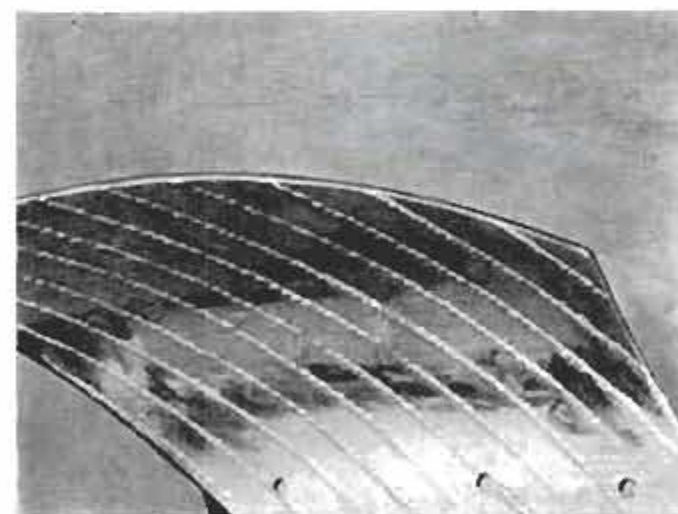


Hose Clamp Grips Rods For Power Hacksawing

If you've ever attempted to speed up a job by trying to grip a number of small rods in the power-hacksaw vise, you know that only trouble can come of it. Somehow one always ends up with irregular cuts and very likely a broken hacksaw blade. To hold as many as a half dozen rods, or even more, bundle them uniformly and grip tightly with a hose clamp before placing in the vise. In this way the bundle of rods will saw as one piece and you'll get a uniformly square cut across the ends.

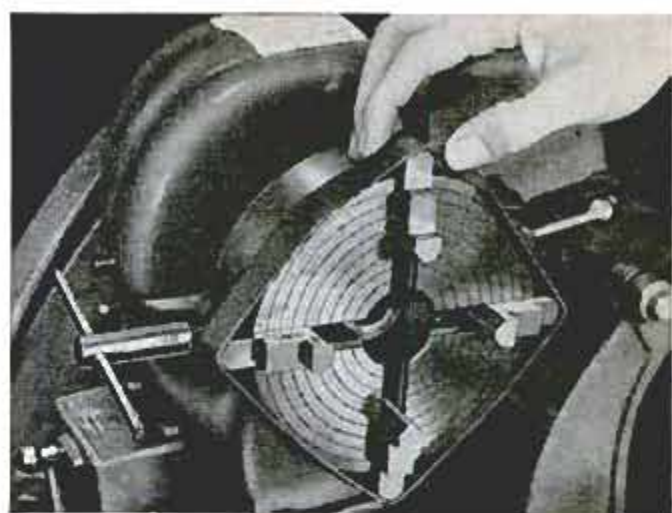
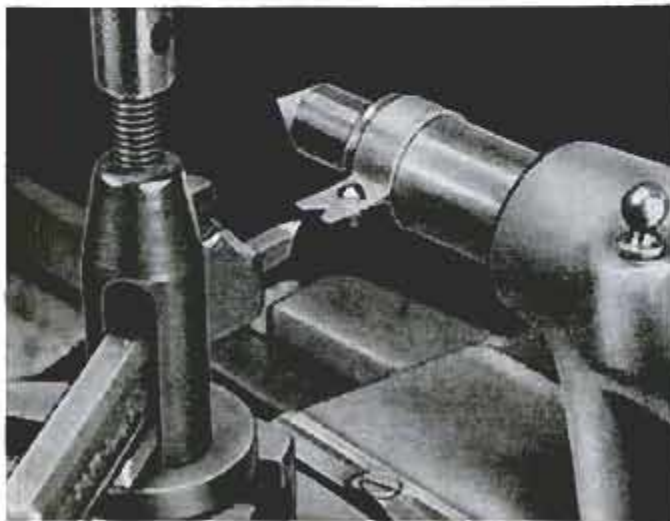
Weld Beads on Plow Moldboard Aid Scouring in Heavy Soils

In the rush season, when every minute counts, daylight or dark, nothing is more exasperating than a plow bottom that won't scour. There is not only a loss of time and temper but of fuel as well, for a nonscouring bottom can add appreciably to the load on the tractor. Experimentation has shown that a series of spaced weld beads, run continuously on the curved surface of the moldboard as pictured, will aid scouring in those difficult soils. Of course, the moldboard must not be allowed to rust.



Wide Rubber Band Guards Chuck Jaws

When it is necessary to run the chuck jaws out so that they extend beyond the body of the chuck, they should be guarded, especially when the nature of the work requires the undivided attention of the lathe operator. A wide rubber band, cut from inner tube and snapped over the extended jaws, reduces accident potential to a minimum. The band should be slightly wider than the extended portions of the jaws so that the extensions are completely covered.

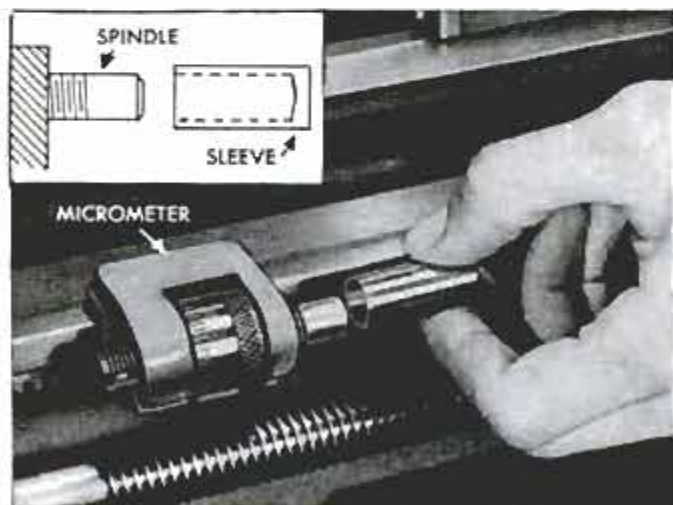


Simple Tailstock Attachment Aligns Thread-Cutting Tool

Threading tools must be located at the correct height and the 60-degree tip must be placed at right angles to the work. A locator permanently attached to the tailstock sleeve assures correct setting of the tool and saves time. It is made by filing a 60-deg. V-notch in one end of a strip of 18-gauge sheet metal about 1/2 in. wide. This is bent around the tailstock sleeve and a hole is drilled through both thicknesses for a small stove bolt which clamps the band in place when tightened.

Chart in Lid of Drill Case Gives Decimal Equivalents

Charts of decimal equivalents and cased sets of twist drills in fractional sizes belong together for ready reference. One sure way to keep both at hand when needed is to copy a decimal-equivalent chart on heavy paper, either by typing or hand-lettering, and glue this to the inside of the drill-case lid. While you're at it, it's a good idea to include the recommended speed for each drill in the set. Such a chart will give you all the information needed for any ordinary drilling job.



Sleeve Increases Range Of Lathe Carriage Stop

There are times when it's desirable to increase the range of the micrometer carriage stop without changing the setting of the anvil. This is easily accomplished by center-drilling a length of round steel to fit over the anvil in the manner pictured and detailed. The sleeve stops the carriage at one position and by removing it the carriage is free to move into the second position. The length of the sleeve determines the distance between the two positions.

Mark the setting on the sleeve.



On the
MARKET
for Do-It-Yourselfers

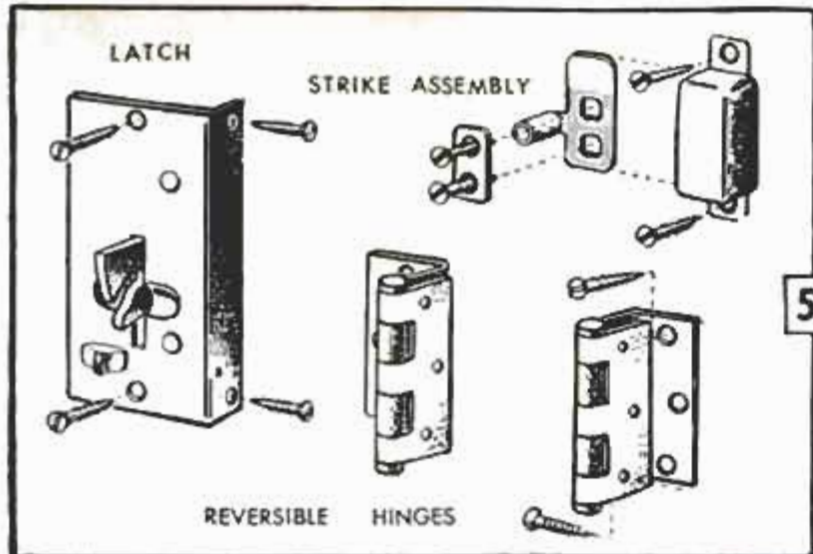
1. DECORATOR STYLED PLYWOOD PANELING comes in 4 x 8 ft. prefinished panels made from 9 different woods, both domestic and imported. The panels are V-grooved in such a way that when a series of panels is installed you get a random width planked pattern that is most attractive in any room. Synthetic finishing materials offer resistance to scratches, scuffs, crayon and ink marks. Color tones have been developed to bring out the grain characteristics of each of the fine hardwoods used in surfacing the panels
Aetna Plywood & Veneer Co., 1751 N. Elston Ave., Chicago 22

2. SILICONE SPRAY in a pressurized can has been especially compounded to lubricate and protect rubber weatherstripping and to prevent it from freezing in place in severely cold weather. Can also be used to make ignition systems sure starting in damp weather, and to reduce corrosion on battery terminals, cases
Dow-Corning Corp., Midland, Mich.

3. LUBRICANT in a pressurized can sprays as a liquid and immediately hardens into a lasting coating of grease on the surface to be lubricated and protected from corrosion and rust. Fine spray from the can gets into places that are difficult or impossible to reach and lubricate with brush or pressure gun
The Greaspray Co., 2420 Jackson Ave., Evanston, Ill.

4. MASTIC WATER STOP in a caulking cartridge prevents seepage of water through cracks and joint voids in concrete masonry. Bonds to any porous masonry surface without use of primer, dries in minutes and then can be painted with rubber base, alkyd, or oil-base paints. Won't run, sag or shrink in setting
Kle'e Waterproofing Corp., 4011 Red Bank Rd., Cincinnati 27, Ohio





5. SURFACE HANGING of doors outside the opening rather than inside the opening is now made possible by a new type of surface hardware. Offset hinges and a special striker and latch eliminate conventional knob and give door an opening and closing action quite similar to that of a refrigerator. Door action is shown in photo, hardware in details above
 The Stanley Works, 195 Lake St., New Britain, Conn.



6. PLASTIC ADAPTER SLEEVE permits use of conventional casters on tubular furniture and institutional equipment. Adapter is easily forced into the open end of the tubular leg without damaging the edges or distorting or splitting the tube. Resilience of adapter absorbs shocks and cushions load. Elimination of metal-to-metal contact gives quiet operation
 The Colson Corp., 7 S. Dearborn St., Chicago



7. BLACKTOP COATING comes in 3 attractive colors, grass green, coral red and raven black. Can be applied with an ordinary roof brush just as it comes from the container without any heating or other preparation. Designed to seal asphalt surfaces of driveways, patios, tennis courts, with a tough, durable finish. Dries dustfree in 2 hr. Use in about 12 hr.
 AL-Chroma Paint Co., Inc., Stevens Point, Wis.

8. BRUSHING ENAMEL dries ready for use in 15 minutes. Suitable for use on any interior or exterior surface, wood, plaster, metal or masonry. Resists acids, alcohol, gasoline and boiling water. Abrasion-resistant properties make it especially suitable for wear surfaces such as floors, chair seats and backs and wooden handles of garden and shop tools
 Jet-Dri Div., Consolidated Chemical & Paint Mfg. Co., Inc., 450 Driggs Ave., Brooklyn 11, N. Y.



Pay TV-



Start of an Experiment

By Lothar Stern

MOVIES without commercials; sports-casts without "blackouts"; a television's dream come true—or about to come true—for a limited number of homes in the Toronto, Canada area.

While pay-TV advocates here continue their war of words with TV networks; while the Federal Communications Commission is handing out a few permits for long-range tests of "airwave" pay-as-you-see television broadcasts; our neighbors to the north are launching a closed-circuit form of a pay-TV system which may influence the future of television in this country as well. Starting with more than 70 miles of TV cable and a potential of 13,000 homes, the present system will be readily expandable to serve an area of about 40,000 homes in West Toronto. From this small beginning the operation is expected to spread to other areas in metropolitan Toronto and trigger the expansion of the Telemeter pay-TV system throughout all of Canada.

Unlike other proposed pay-as-you-see television methods, this first commercial venture into the pay-TV field does not take up valuable spectrum space. Rather than being transmitted over the "airwaves," the pay-TV signals are carried over wires which provide a direct link between the television studio and the subscriber. The system, therefore, does not interfere with the reception of "free" television signals, nor does it reduce the maxi-

imum number of these that may be assigned to any one area. To the contrary, it literally brings three additional stations within the range of any receiver equipped with a special, coin-operated Telemeter attachment. The added stations, of course, are available only on a pay-as-you-watch basis.

Details for the transmission and reception of the pay-TV signals have been carefully and ingeniously worked out. At the Telemeter studio are three sets of motion-picture projection equipment plus "live" camera facilities. With these, up to three different channels may be transmitted simultaneously over a single cable. Before being fed to the cable, however, each program is given a code number which identifies the program and another one which fixes its price.

Leaving the studio on a single main cable, using Bell System facilities, the Telemeter signals are distributed to principal neighborhoods of a community. From there, feeder lines attached to utility company poles channel the signals to the individual homes. A series of spaced booster amplifiers, isolating units and equalizers assure a top quality signal.

At the home of each subscriber, the signals are dropped off and enter the building by means of a wall plate similar to that used for installing telephone or electric lines. Inside, the feeder wire is connected to a Telemeter attachment

whose output attaches to the antenna terminals of any TV receiver.

Small, unobtrusive, yet tastefully styled, the Telemeter attachment serves as the final link between the subscriber and the studio. Sitting on top of the TV set, it silently and continually performs the combined functions of a channel selector, a program announcer, a money collector, an accountant and a market research analyst. Here's what happens.

When the subscriber settles down for an evening of TV entertainment he might first scan the local paper for a listing of "free" television programs. Then, by way of comparison, he might turn up the Telemeter control labeled Program Information for a continuous running account, via a built-in speaker, of the fare offered on the three pay-TV channels. Should he then decide on a "free" program, he would merely set the outside Telemeter control to Broadcast and tune in the desired station on his TV set. But if he elects to "buy" a particular Telemeter broadcast, he would turn the channel-selector knob of the receiver to either channel 5 or 6, depending on which of these is not used for regular TV broadcasts in his particular area, and rotate the Telemeter channel selector to channel A, B or C. (Because of possible inter-channel interference, channels 5 and 6 are never allocated in the same area. Hence, one of these channels will always be available to receive Telemeter broadcasts.)

When the desired Telemeter channel is tuned in, the price of that particular program automatically appears in a small window underneath a lift-up lid on the front of the attachment. The proper number of coins deposited in an adjacent slot



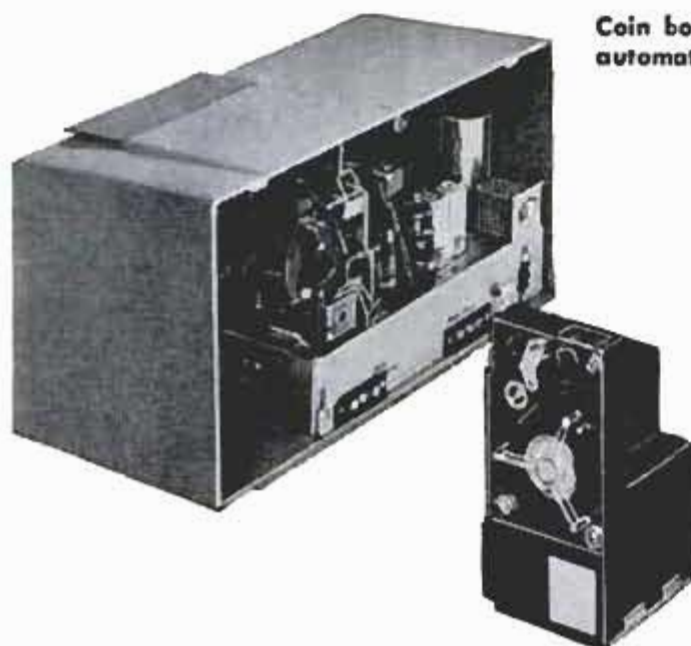
Telemeter attachment sitting atop TV set adds three optional pay-TV channels to regular free TV fare

will cause the program to appear on the TV screen.

Lack of proper change is no problem. If an overpayment is made, a "credit" which will be applied to any subsequent purchase is automatically racked up and appears in a second small window.

When the coins are deposited, a tape mechanism inside the removable coin box records the studio-assigned code number of the particular program selected. At the

(Continued to page 246)



Coin box which fits inside Telemeter doubles as tape recorder; automatically records code numbers of all purchased programs





TV goes portable. First of the long heralded transistorized TV sets to hit the market, Philco's "Safari" plays four full hours on built-in rechargeable battery as well as on regular a.c. line power. Set employs 2-in. picture tube but optical magnification increases picture size to 80 sq. in. for effortless viewing



In Time



Left: This one's automatic. RCA's 1960 "Programmer" lets you preselect a day's TV viewing in advance. Set turns itself on and off, changes channels at 30-min. intervals in accordance with preset schedule

Square-cornered 23-in. picture tubes give new look to Sylvania TV line. New tubes with bonded-on safety glass have greater picture area, reduce glare and facilitate cleaning



Dramatic innovation in TV styling permits conversion of RCA's new "Hillsborough" receiver into handsome, functional living room table at a touch of the fingertips





The speakers are built in but the sound isn't. Novel circuitry in Zenith's latest stereo hi-fi consoles actually extends the sound far beyond the confines of the cabinet itself. Special amplifier control permits listener to adjust the apparent spread of the orchestra for optimum stereo in any size living room

for Christmas

For the hi-fi perfectionist. New 30-in. speaker (woofer) used in Electro-Voice Patrician 700 (inset) is available separately for custom installations



Here at last. RCA's tape-cartridge player-recorders, announced over a year ago, are finally available. So are the prerecorded and blank tape cartridges





Unique among clock-radios, Zenith's Golden Triangle operates entirely on flashlight batteries. Mounted on swivel base, unit rotates to present three faces—the clock, the radio dial and the speaker grille

Low-cost Granco FM tuner provides high-quality FM reception when used with TV set, phonograph, tape recorder or other device incorporating a speaker-amplifier and equipped with a phono-input jack



FM stereo broadcasts transmitted experimentally in many cities can be received on standard FM tuner with Multiplex Adapter shown above. Decodes both Crosby and split-channel multiplex transmissions but requires stereo amplifier and loudspeaker system



Personalized radio communications in the newly opened Citizen's Band is relatively inexpensive with new Heath Transceiver Kit. Meets all FCC requirements for operation in the exam-free 11-meter band when built according to explicit instructions. Combines sensitive receiver and 5-watt transmitter, with range of several miles in fixed or mobile operation

Since some AM radio stations do broadcast music of high-fidelity caliber, the new EICO AM tuner can prove to be a valuable addition to any hi-fi system not already so equipped. Available in both kit and factory-wired form, unit incorporates every desirable feature for optimum AM reproduction. Styled to match widely acclaimed FM tuner by same company





For
External
Rings
Shaft Diam.
1/16" - 4"



NEW PROTO TRUARC[®] RETAINING RING PLIERS

Now you can remove and replace retaining rings simply and quickly, without damage to the rings. Proto Truarc Pliers handle the rings you find on shafts and linkages, in bores...on appliances, engines, parts and accessories, TV sets and radios.

HERE'S WHY PROTO TRUARCS ARE BEST:

- Precision ground tips, induction hardened at just the right angle, insure trouble free ring installation.
- Tips are permanent... can't lose them, don't have to set them.
- The right size plier prevents ring distortion, saves time. 12 Proto Truarcs handle nearly all applications.
- External pliers for shafts up to 4" in diameter.
- Internal pliers for bores 3/16" to 7" in diameter.
- Universal pliers handle middle range of both.

You'll find Proto Truarcs displayed soon at your Proto Dealers, including Hardware, Auto Parts, and Builders Supply stores all over the country.

For
Internal
Rings
Bore Diam.
1/4" - 7"



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Automatic pair! The camera lens "squints" in the sun, opens in the shade, as your eyes do! You turn on the projector, *it* does the rest!

HOW THE KODAK AUTOMATIC 35 CAMERA HELPS YOU GET PICTURE-PERFECT



In sun, the electric eye makes the lens "squint" to a smaller aperture.



In shade, lens opens by itself to admit more light. Up to $f/2.8$ if needed.



Indoors, lens sets itself for available light. Signal tells you when to use flash.



With flash or for special effects, you can make lens settings manually.

EASTMAN KODAK COMPANY

New Kodak team shoots and shows superb hobby pictures *automatically!*

THE CAMERA: New Kodak Automatic 35 with electric eye *automatically* sets the correct exposure!

THE PROJECTOR: The New Kodak Cavalcade changes slides *automatically* while you enjoy the show!

Wherever you are . . . whatever your subject . . . here's a team matched for the most satisfying hobby pictures ever. It lets you shoot and show them *automatically!*

Picture-perfect exposures. The Kodak Automatic 35 Camera frees you from exposure calculations—so you can concentrate on your subject. You can move from sunlight to shade, shoot indoors with room light or photofloods, yet never make a lens setting. The electric eye does that for you. It adjusts the lens to the light. It even signals you when to use flash. And all *automatically*, whether you are taking snapshots or color slides.

You can get extra-closeups. Shoot small subjects and hobby projects as near as 2½ feet! Finder allows for parallax.

You load fast. No threading. One thumb flick winds the film. And the fast *f/2.8* lens means speed to spare, even in dim light.

Perfect picture shows. The new Kodak Cavalcade Projector, Model 520, changes

up to 40 slides in succession—*automatically!* You set it just once for 4-, 8- or 16-second change intervals. Turn it on, and it does the rest. You never have to lift a finger.

Your slides stay in focus from first to last because they're preconditioned by warm air. They're kept safe, too—each held in its own steel protector.

You can point out details on the screen with the shadow arrow. Edit as you show. Lift out any slide as you go. For a second look at slides already shown, or to skip ahead, just touch the control wheel.

And all the time, you and your guests enjoy beautiful slides shown at 500-watt brilliance *automatically!*

See this great automatic pair demonstrated at your Kodak dealer's. The Kodak Automatic 35 Camera is only \$84.50, or as little as \$8.50 down at many dealers'. The Cavalcade 520, only \$124.50, or as little as \$12.50 down. Hitch this team to *your* hobby. You're sure to enjoy it even more!

RESULTS EVERY TIME



Bright-frame finder shows framing allowance for 3 and 5 feet.



You focus as near as 2½ feet. Or even closer with Kodak Portra lenses.

(List prices, including Federal Tax, and subject to change without notice.)

Rochester 4, N. Y.

NOVEMBER 1959

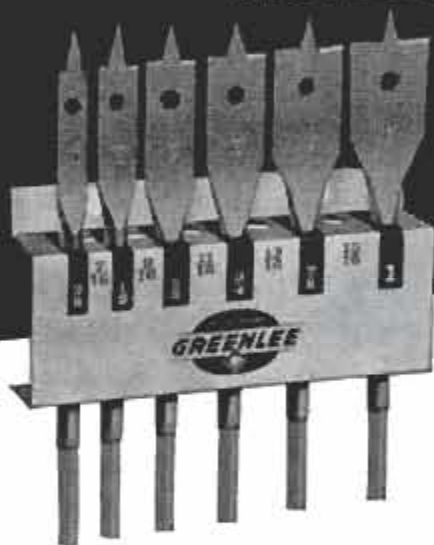
HOW-TO PICTURES—

See your dealer for a copy of the 64-page Kodak book, "How-To-Do-It Pictures," 50 cents. And write our Sales Service Division for a free copy of the catalog "Kodak Books and Guides."



Kodak
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FREE bit holder



with 6-piece Greenlee **ZIP BIT** set

Get this handy new set of wood-boring power bits with FREE metal bit holder. Keeps bits protected and in order... gives instant size selection. Holds up to 11 bits. Comes to you free with set of six GREENLEE ZIP BITS sizes $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{7}{8}$ ", 1".

Set with free holder, only **\$3.90**

ZIP BIT has nonslip **HEX SHANK** BORES IN ANY WOOD, AT ANY ANGLE, ANY SPEED

- Hex shank gives positive, nonslip drive... added strength
- Hex shank chucks quickly, accurately in any $\frac{1}{4}$ " or larger electric drill
- Cutting edges easily re-sharpened
- Heat-treated for long life

See your hardware or building supply dealer now for ZIP BITS with free bit holder.



GREENLEE TOOL CO.

1843 Columbia Ave., Rockford, Illinois

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.

Water Those Evergreens

Q—I have both a new and old evergreen planting on a high point of my large lot. There is drainage away from this planting in three directions and I've noticed that the soil dries rather quickly after a rain. I'm concerned about the new planting, particularly during the coming winter. What is the best way to assure plenty of moisture during the winter?

R.C., Minn.



A—Even though the rainfall in your locality is normal during the fall months it's always a good idea to water evergreens regularly until the ground freezes, especially if the planting is in an exceptionally well-drained area such as you describe. Here surface runoff can greatly reduce the amount of water reaching the subsoil from the normal rainfall and there is the risk that during the first cold snap of the winter the ground will freeze when it is comparatively dry. This is almost sure to cause some damage to the new planting and very likely to both plantings in your case. Perhaps the best way to water the planting is to lay the hose to the highest point in the planting, remove the nozzle and then adjust the water pressure so that the hose just runs a full stream, no more. Place a flat stone at the end of the hose to spread the stream over a wider area. Allow the water to run until the ground about the end of the hose is thoroughly soaked and water begins to run away on the surface. Then move the hose to a dry area and repeat the process until the whole area occupied by the plantings is so thoroughly soaked that it will take no more water. Continue watering in this manner at intervals until the ground freezes.

Home Shop Layout

Q—I have a space 12 x 26 ft. in one end of my basement that I'd like to partition and use as a home workshop. I want to install several small power tools on stands, a circular saw, bandsaw, jointer, jigsaw, drill press and wood lathe. My problem is just how does one determine the correct amount of working space around each machine?

E.N., R.I.



(Continued to page 230)

ANOTHER FRESH ONE FROM PONTIAC

REVS UP A NEW KIND OF EXCITEMENT FOR 1960

Here, without question, is the most provocative package of road machinery ever to bear the respected name of Pontiac.

Coming and going, the 1960 Pontiac exhibits a clean, classic look that has even the most avid customizers nodding their approval. Here is total artistry in automotive design, shaved and sharp.

For unmatched action, tap the resources of the Tempest 425 with Tri-Power! This fiery, famous power plant is one of a wide range of power packages available in the 1960 Pontiac. Every one is a finely honed

version of the respected 389 cubic inch Tempest and one (the 425E) performs on regular gas.

Tie this Tempest-tended performance to Pontiac's Wide-Track Wheels . . . and you've got the most exciting and road-wise passenger car you've ever hustled or handled.

See your Pontiac dealer soon. Rev up a Fresh-Point-of-View Pontiac and put it through its paces. You'll heartily endorse it as the most satisfying production passenger car of 1960.

PONTIAC MOTOR DIVISION • GENERAL MOTORS CORPORATION

PONTIAC THE ONLY CAR WITH WIDE-TRACK WHEELS



LOOK, MISTER!

No Hands



It's Self-Gripping

CHANNEL LOCK

No. 410

HEAVY-DUTY PLIER

How's this for gripping power? You won't know your own strength 'til you grab hold with this heavy-duty self-gripping plier. The Channellock No. 410 HEAVY-DUTY is actually a combination plier-wrench . . . and it will get into tight places you can't reach with a pipe wrench. A mighty handy, multi-purpose tool with four jaw adjustments up to 1-1/8".

ASK YOUR TOOL SUPPLIER FOR A
CHANNELLOCK No. 410 HEAVY-DUTY PLIER

BE SURE IT'S
A GENUINE
CHANNELLOCK



LOOK FOR THE
TRADEMARK
ON THE HANDLE

CHAMPION DEARMENT TOOL COMPANY
MEADVILLE, PENNSYLVANIA

(Continued from page 226)
A—As the first step it's a good idea to make a simple floor plan to a scale of, say 1 in. equals 1 ft. This means that your floor plan would be 12 in. wide and 26 in. long. On this locate in simple rectangular drawings to scale the location of the bench, cabinets and shelves for storage. Then determine roughly the floor space required by each machine. Then from the approximate center of the work table of each machine strike semicircular arcs about the front of the machine on a radius of 30 to 40 in. This will represent the working area you will require when operating the machine. On the plan these arcs must clear similar arcs around the working areas of other machines nearby. Working on a simple plan in this manner you generally can locate machines in the minimum of space without interference one with another.



Spade Garden Plot In Fall

Q—I have a small garden plot for growing vegetables exclusively and heretofore I've always spaded it in the early spring. I have kept fertility high with natural fertilizers and the soil in good condition by regular addition of humus. Now someone tells me that it is best to either plow or spade the heavy soils of this area in the fall, rather than in spring. Why?
B.L., Ohio

A—There are two main advantages of working soil in the fall months after the crop has been harvested. Dry material such as stalks, grass clippings and other vegetable matter that is to be returned to the soil to form humus can be covered deeply when spading. Also, repeated frost action (freezing and thawing) during the winter months tends to break up lumpy, difficult soils into small particles, making it easy to work the plot into a good seedbed the following spring. Compost and natural fertilizers will be pretty well broken down and incorporated into the soil by spring planting time, eliminating any possible voids in the seedbed which might cause rapid evaporation of the moisture in the soil. Another advantage is that during the fall months the work can be done at leisure, there being no need to hurry the job for early spring planting.

Weather Stripping Storm Sash

Q—My storm windows are quite old and most of them fit rather loosely and let a lot of cold air leak into the space between them and the regular window. I have thought of weather stripping them, using the spring-brass strip of the type made for doors. Do you think this is a practical idea?—O.J., Vt.

A—You do not say how many storm sashes you have but if you have, say, a dozen or more then weather stripping as you suggest would be rather expensive. It also would take a lot of time to do the job properly. Of course, there is little doubt that such weather stripping would be effective in stopping entrance of cold air to the space between the inner and outer sashes. It should be installed on the edges of the sash frame so that when the sash is in place the strip will bear against the edges of the casing, top, bottom and sides. Care must be taken when removing the storm sashes to make sure that the strip does not catch or bind in such a way that it becomes kinked. It is best to install the sashes with turnbuttons rather than hangers as a tight fit is essential. There are other materials which can be used to prevent air leaks around storm sashes. Strips of felt about 3/4 in. wide tacked to the inner faces of the stiles and rails at the outer edges contact the stops when the sash is in place and make a very effective seal. When felt is used in this manner, the strip along the bottom rail is tacked to the bottom edge of the rail rather than to the face.

You do the choosing! The Army's new "Choose-it-Yourself" System lets you pick valuable training before you enlist. Here's how it works:

1. Choose your training field before enlistment. Choose your training from fields like Aircraft Maintenance, Radar and TV Repair, Drafting, Atomics, Printing—and many more.

2. Take aptitude and physical exams before enlistment. Take aptitude and physical exams to qualify for the training you've chosen.

3. Get your choice before enlistment. If you qualify, you know you'll get the training you want. Your choice is written into your future Army record—guaranteed before you enlist.

Ask your Army recruiter to show you his complete list of available training fields.

*Want training in Aircraft Maintenance?
Communications? Engineering?*

**before
enlistment!**

Helicopter Mechanic and Instructor

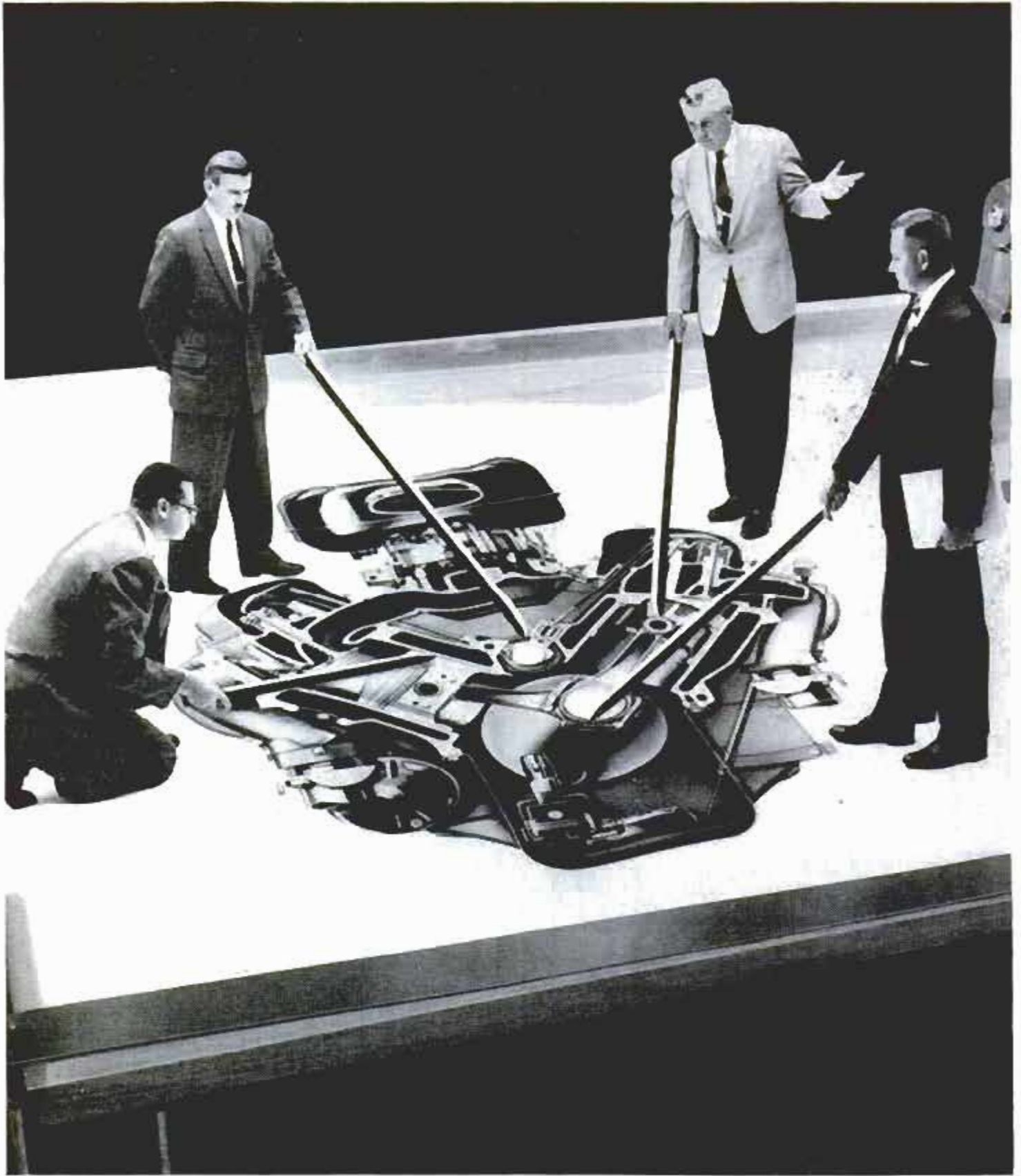
U.S. GOVERNMENT PRINTING OFFICE



VOCATIONAL TRAINING SYSTEM

US ARMY

Today's close tolerances



For the finest protection money can buy...



leave no tolerance for dirt!

That's why AC has developed the new Triple-Trapper principle of filtration — protecting critical engine areas where lubrication must not fail!

The job of an oil filter is to remove every contaminant or foreign substance such as dirt, grit, metallic bits and carbon so they won't wear away or scar finely finished surfaces. Finely drilled oil passages must not be clogged by any impurity. For example:

In many engines you will find an hydraulic valve lifter between the camshaft and the push rod that actuates the rocker arm and valves. This key component keeps "play"

or looseness out of the valve train and thus makes for quiet, efficient, split-second valving. The lifter has needle-fine valving itself which admits the oil so necessary for hydraulic operation. A tiny bit of metal or dirt could clog the opening and give you trouble. As long as an AC Triple-Trapper Oil Filter is on the job — and is changed regularly — such troubles are practically eliminated. AC conducts 96 reliability tests on its oil filters during manufacture to insure highest quality!



**AC
TRIPLE-TRAPPER Oil Filter**

*Now you can have the powerful
Triple-Trapping action devised by AC Engineers*

TRAP NO. 1 is the filtering element itself, a resin-impregnated material that traps particles as small as 1/15 the diameter of a human hair.

TRAP NO. 2 is the amount of filtering area. The AC filter has more *usable* area . . . or surface. Oil, passing through the filter, is spread out and slowed down over this greater area. Thus, the filter has a chance to catch

fine particles. The trapped particles themselves form a filter "bed" on top of the filter element. This helps trap even finer particles.

TRAP NO. 3 is the design of the filter element, a unique arrangement of folds that provides maximum filtering area, hence maximum filtering capacity. Because of this greater capacity, the filter is able to hold *more* particles.

SOLD BY 283,000 RETAILERS

AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

TRIPLE-TRAPPER Oil Filter used on more new cars than any other brand

Toughest Railroad You Taxpayers Own

(Continued from page 122)

Communications are vital in the far North where miles of the ARR's lines regularly fall victim to "silver thaw"—a kind of ice caused by warm air drifting in through the mountain passes from the Pacific. When snow falls through this warmer layer, globules of liquid ice are formed which adhere to the wires. This added weight drags the wires to earth, even though three times the normal number of supporting poles are used.

Engineer Bill Hertz remembers when an emergency message was flashed to him at Healy along those wires during a howling blizzard. A young mother was dangerously ill at a nearby coal mine. It was 45 below—too cold for a plane. She had to be taken to the hospital at Fairbanks, 112 miles away, immediately.

The intervening track, badly snowed under, had been "cleared" for the mercy run. Hertz hit it hard, dragging only a caboos behind his steam engine. Crew members fed coal steadily to the small caboos stove while the spunky woman's husband and a doctor hovered nearby.

A little over two hours later they arrived at Fairbanks, the locomotive frozen solid white. The young mother was rushed to a hospital. She died there, the frostbitten trainmen clenching their big hands in helpless frustration. They had been called too late.

Large wooden doors are used to keep some dank tunnels warm. Otherwise, the glacier water which drips constantly inside, may change quickly to ice and wreck the next train. At one time around-the-clock maintenance crews piped steam heat inside from special plants operated near the entrances. This proved too expensive.

Bears, big ones, are common. Occasionally they break into trackside buildings where blankets and emergency rations are stored for snowbound trains. A group of *chee-chakos* (newcomers to Alaska) once fled one of these buildings just ahead of a large silvertip grizzly, which climbed through an open kitchen window, took an inquisitive stroll inside, then departed unhurriedly by the same route.

"Some of those *chee-chawkers* had the nerve to write their Congressmen later," a grinning ARR brakeman told me. "They claimed the government had risked their lives. Why, that big old bear didn't hurt a thing!"

In keeping with this calm frontier philosophy is the story told by newspaper publisher Bill Snedden and his wife, who took

the daily train to Anchorage to attend a dinner celebrating the inaugural of Asiatic and European plane service to that city.

"This was a big thing for Alaska and everybody who was anybody was at the dinner, including representatives from Japan and other foreign countries. It wasn't the kind of affair you ducked out on. Besides, up here we try not to hurt people's feelings by doing things like that.

"But the time came for us to go. As we stood up I felt a sharp tug at my coat. 'Sit down, you can't leave now!' someone whispered from a darkened table nearby.

"I recognized one of the officials of the ARR. 'Got to,' I told him. 'We just can't miss our train home.'

"Don't worry,' he assured us. 'We'll just hold her up.'

"He did, too—for more than half an hour."

Today you can ride the gleaming chrome coaches of the Alaska Railroad into the very heart of the new state's 586,400 square miles. Through special five-foot panoramic windows you gape comfortably at beautiful Mount McKinley, highest point in North America. In the ever-white vastness of the awesome Alaska Range you see great glaciers, tumbling trout streams and placid lakes where moose and caribou browse. These animals look tame as cattle yet are ever ready to flee from Alaska's tremendous brown bear, the world's largest carnivore that can weigh 2000 pounds and bite its tree mark a dozen feet above the ground.

The powerful train glides past rotting river steamers, reminders of gold-rush days; totem-poled Indian villages; sod-roofed hermits' cabins with elevated food cache nearby, safe from the reach of hungry wild things.

In Alaska even the crack passenger trains stop at noon while all alight to enjoy a hearty hot lunch, sourdough fashion, in one of the railroad's trackside buildings. Blue-denim-clad workmen eat quietly at the same rough wooden tables with staring tourists who may never fully understand why these trainmen do all the things they do for others despite terrible difficulties and inconveniences.

Silver-haired Anton Anderson, presently the energetic mayor of Anchorage, helped build the railroad as an engineer. He'd come up from New Zealand to learn about such construction for use in his native country ("I'm still learning!"). He has vivid memories of that era.

Men used simple hand tools under nearly impossible frontier conditions, he recalls.

(Continued to page 238)

MAKE A "SPARKLE" TREE FOR CHRISTMAS

Use G-E Spot and Floodlamps
for exciting year-round
outdoor lighting effects!

General Electric PAR Floodlamps make this expensive, do-it-yourself "Sparkle Tree" spring to life after dark. But that's only one of many uses for these versatile bulbs. Use them this Christmas to highlight trees and shrubs—add sparkle and color to outdoor decorations and doorways. Use them later for decorative or safety lighting all year 'round.

G-E Weatherproof Spots and Floods both come in 75 or 150-watt sizes. For colorful effects that make holiday decorations even more unusual, try colored outdoor floods—now available in the new 150-watt size in six beautiful weatherproof colors.



NEW G-E YARD LIGHT KIT—Combines 150-watt G-E PAR Floodlamp with weatherproof outdoor holder—complete with ground spike, cover plate, cord and plug.



For an extra touch, conceal the Floodlamps from view by covering with an open-end, make-believe "Christmas present".



FREE PLANS FOR BUILDING YOUR "SPARKLE TREE"!

Complete instructions for building a "Sparkle Tree" plus simple directions for making your own decorations packed with every G-E "YARD LIGHT" KIT. Or write General Electric Co., Large Lamp Dept. PM-119, Nela Park, Cleveland 12, Ohio. Get yours today!

Progress Is Our Most Important Product

GENERAL  ELECTRIC

(Continued from page 152)

bottom. The echoes are recorded by two methods, as recorder traces that show depths and changes of composition, and as oscillograms that show characteristic patterns for the different materials through which the sound waves travel.

One such picture, of the continental shelf off southern California, shows that the bottom is relatively flat for some distance offshore and that it then plunges precipitously to almost 2000 feet. This escarpment is well known, of course, having been shown by various other kinds of depth fingers in the past. One of the things that is new in Padberg's picture, however, is the thick sedimentary deposit or delta that is shown at the foot of the escarpment and that extends out a considerable distance. This had been suspected but never before had been seen.

Systems Ideal for Offshore Exploration

It's obvious that these sound systems are ideal for offshore underwater exploration, but how can you produce underwater sound waves on dry land? There are several ways to do this, Padberg explains. One is to use a large plastic water container that rests on the ground, another is to dig a small hole and fill it with water. In either case the coupling between the water and the ground itself is efficient.

With the limited amounts of sound energy that have been used so far, the earth's crust has been penetrated to depths of several thousand feet. Deeper exploration depends on greater power. This year the underwater sound scientist is testing some new high-intensity sound sources in a deep Idaho lake, at depths as great as several hundred feet. The prime object of this research is to study possible weapon applications; at the same time more information about exploring the earth's depths with sonic waves will be obtained.

In addition to ordinary underground exploration, Lou Padberg foresees a number of specialized uses for his sound waves. They can be used to explore the earth under cities and in other locations where the use of explosives is forbidden. They are ideal for the shallow exploration that is now performed by core drilling at sites where tall buildings or dams or bridges are to be erected. The underwater explosions that create the sound are safer and cheaper than the explosives now used in some metal forming operations. Finally, it may even be that a new method of propelling a boat can be devised by making use of the cavitation bubbles the process creates. ★ ★ ★

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Get an easy-starting
Junior Hot Rod
that you and Dad
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Fully assembled —
car and engine
— complete \$1000
Reg. Ret.

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THRILLING AERO-TYPE MINIATURE RACER

One flip of its propeller and PROP ROD'S .049 cu. in. displ. real internal combustion engine fires into action, turning up nearly 18,000 RPMs!

You've always wanted a miniature racer! Now you can own one—at a price that an engine alone used to cost—a low-slung, streamlined model, equipped with the world's most powerful engine of its size!

PROP ROD can be raced in a circle as small as 10 feet—at speeds up to 35 mph—and on that small a circle, boy, that's traveling!

FREE RUNNING, TOO, for hair-raising thrills. No "driving circus" can com-

pete with PROP ROD'S realistic auto action when you take it off the tether and turn it loose. Buzzing off in a straightaway dash, it winds up in a slithering, sliding turn—then away it goes in another direction!

QUALITY BUILT throughout, PROP ROD has a 12 in. high impact plastic body mounted on machined aluminum frame and wheels, with racing-treaded rubber tires. There's no finer companion for Dad and Son than this exciting aero-type speedster. See Thimble-Drome's PROP ROD at your favorite hobby counter and get started in this exciting sport today.

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Spine-Tingling Dashes



Thimble-Drome BABE BEE .049 engine, world's largest selling model engine, powers the PROP ROD. Develops sensational power in less than 1/20th cu. in. displ. Available separately for build-it-yourself modelers. \$398
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LOWER! WIDER! MORE RUGGED! SAFER!



**ORDINARY
TIRES**



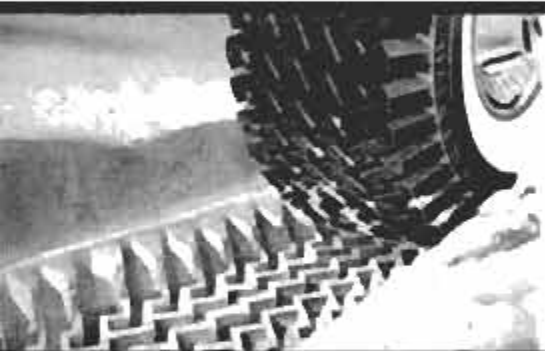
**LOW PROFILE
TIRES**

The fellow on the right has a lower, wider stance to give him strength and stability. In the same way, U. S. Royal's new Low Profile tires are lower, wider than conventional tires. They have the extra ruggedness and stability needed to keep you safe and give maximum wear—especially on today's fast, non-stop super-highways.



Above diagram shows how Low Profile tires are lower and wider than ordinary tires. Engineered closer to actual working shape. So they don't flex as much. Don't strain as hard. Run far cooler than ordinary tires.

They're safer against tire failure at high speed. Safer on turns. Safer against skids. They wear longer. Roll easier—save gas. Originally a premium-tire feature—now at no extra price. Ask your U. S. Royal Dealer.



Newest Addition to the "Low Profile Line"
THE U. S. ROYAL
LOW PROFILE WINTERIDE

Brawny, extra-deep lugs haul you through snow and mud—give you non-skid stops on wet roads. Yet with all this brute traction, the new Winteride rolls quietly on clear roads!

**NOW AT THE
LOWEST PRICES
IN YEARS!**

U.S. ROYAL TIRES



United States Rubber

Rockefeller Center, New York 20, N. Y. In Canada: Dominion Rubber Company, Ltd.
See things you never saw before. Visit U. S. Rubber's new Exhibit Hall, Rockefeller Center, N. Y.

The early roustabouts were fresh from building the first transcontinental railroad and knew their jobs. They had only picks and shovels.

"Those were men," says Anderson proudly. "In 1917 we sent 2000 of them into the hazardous Turnagain Arm area where they finished in five months a job impossible in the same time today. We'd put them ashore in scows and next morning they'd be hollering for grade stakes. Today we'd first have to find them a campsite, get a health department okay, then move in heavy air compressors for their drills.

"Our meal tickets were taken up by 'Alaska Nellie,'" Anderson recalls. "A slender, colorful woman given to salty language, she'd move her mess halls forward with us over the crude tote roads and frozen rivers as we pushed the steel deeper into the wilderness. Sometimes a hundred would sit down at once at her tables. She could hunt and run her dog team with the best, even though a big bear mauled her once."

Congress had to build the Alaska Railroad. It had purchased the Territory in 1867, and access to the interior became increasingly important as a defense measure (in addition to the almost unlimited mining, farming, lumber, fish and fur potential there). Several private efforts at railroading in Alaska had already failed. On March 12, 1914, Congress authorized the President to "Locate, construct and operate railroads in Alaska . . . not to exceed 1000 miles . . . and to connect with one or more ice-free Pacific ports."

Today, when perishable winter cargo is transferred from vessels docking at the port of Seward, refrigerator cars must be preheated to receive it. As the cargo rolls northward special charcoal heaters prevent freezing.

Spring brings new difficulties. During the breakup much ice floats down the swift rivers. There are spots where mud slides occur when slopes of glacial moraine thaw out. Tons of rock and clay, loosened by the frost, tumble onto the roadbed. In 1947 an entire mountain slid away at Milepost 351. (Along the main line all sites are designated by "mileposts," there being no other references in the wilds.) The track bed had to be restored as much as 20 feet.

Unpredictable wind storms are another menace. One spring between Portage and Whittier, conductor Bob Dorf's freight was emerging from a tunnel when a tremendous gust blew away three loaded box cars, tore up both rails for a distance of 150 feet. No one was hurt.

Begun in 1915, the Alaska Railroad was completed in 1923. World War I cut the labor force in half, boosting wages and materials so the job cost \$72 million (twice the original estimate). Politics, it is claimed, saw the builders inheriting much useless equipment from Panama (where the U.S. government operates a second railroad, a small one). At one time they found themselves with 23 different kinds of rails, including some old Krupp steel from Germany.

President Harding supposedly drove the gold completion spike—too soon—at the Nenana bridge. There are but 110 frostfree days annually and this called for laying ties on frozen ground. These gave way beneath the first trains. You can't straighten a vertically bent rail, so Alaskans had to bounce over the washboard for years afterward.

An additional \$60,000,000 appropriation has since completely modernized this steel route to the midnight sun. Rails are heavier, roadbeds wider. Freight cars now number 1200 instead of 100. Freight provides the main income. Last year the ARR netted an \$800,000 profit from freight and passenger revenue over operating expenses. Annual profits like this do not, however, include any effort to pay off the original construction and improvement costs.

"You wouldn't send a government battleship to Greenland and expect the crew to catch enough fish to pay for the ship's operation," is the way Anton Anderson explains this lack of amortization. "The Alaska Railroad was intended as a defense measure and a development agency."

There is practically no manufacturing in Alaska and supply lines remain long and costly. Fuel and equipment still must come mainly by sea. The ARR, like its competing air and highway carriers, suffers from being a one-direction road with little "back haul" revenue. ("We carry all sorts of things into Alaska, but seldom transport anything out.")

It remains a big state however; there is a constant need for heavy machinery for the mining and construction camps and the huge gold dredges. This can be transported only by rail. There appears little doubt, therefore, that this inspiring railroad which first really opened up Alaska will be around for a long time.

And that suits grateful Alaskans just fine. ★ ★ ★

☐ Anti-snakebite serum is available free of charge from the Philadelphia Herpetological Society for victims of any North American poisonous snake.

NEW QUADRI-BALANCED RIDE . . . the quietest ride you've ever tried!

For 1960, Oldsmobile brings you a new kind of ride—comfort-balanced four ways.

1. **Wide-Stance Chassis** provides a wider, lower base—gives a road-hugging, steady, stable ride.
2. **Guard-Beam Frame** gives the protection of a steel framework around the passenger compartments; permits the body to be mounted directly on the frame; eliminates "outrigger" type attachments.
3. **Nylon sleeves** inside Olds shock absorbers wear less—together with new "constant-viscosity" shock absorber fluid, produce a smoother, better controlled absorption of all bumps and bounces.
4. **Vibra-Tuned** body mountings insulate body from road noise and harshness—make the '60 Olds the quietest Olds ever!



See your local Oldsmobile Quality Dealer!



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There's nothing like a new car . . .
make yours a Rocket!

... NEW BALANCE OF POWER!

Olds engineers solved the power vs. economy question with two new Rocket Engines for '60.

New REGULAR ROCKET Engine gives traditional Dynamic 88 "Go" on regular, lower-cost gas—standard on every Dynamic 88 model for '60. Owners save about a dollar bill every fill!

New PREMIUM ROCKET Engine for Super 88 and Ninety-Eight models, gets the most in spirited action from premium fuels. Develops 315 h.p.; 435 lb.-ft. torque. Multi-Jet carburetion; 9.75-to-1 compression.

OLDSMOBILE  **FOR '60**

OLDSMOBILE DIVISION, GENERAL MOTORS CORPORATION

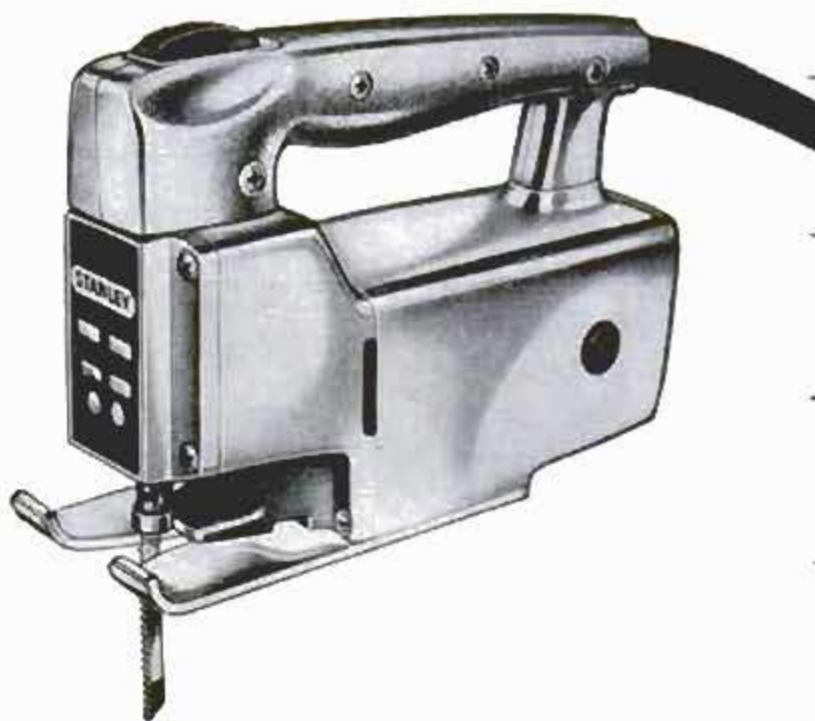
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Better Your Home with these terrific



MODEL H75



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\$6.00 off on 3-amp $\frac{1}{4}$ " drill. Reg. \$24.95 Stanley special fall price—\$18.95 Most powerful $\frac{1}{4}$ " drill for the price on the market. Plus rugged bearing construction, non-slip pistol grip, 3-jawed geared chuck, 3-wire cord.



Electric tools built for the professional,

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MODEL H36

Heavy-duty orbital sander — \$49.95
Get 2 permanent abrasives . . . FREE!
You save \$4.00 and lots of work, too. Powerful, rugged, the H36 gives satin-smooth finishes, fast!



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A \$43.25 value, now only \$38.95.
Complete with 3-amp 1/4" drill, steel case, and 19 extras, including famous SWIRLAWAY sander/polisher,

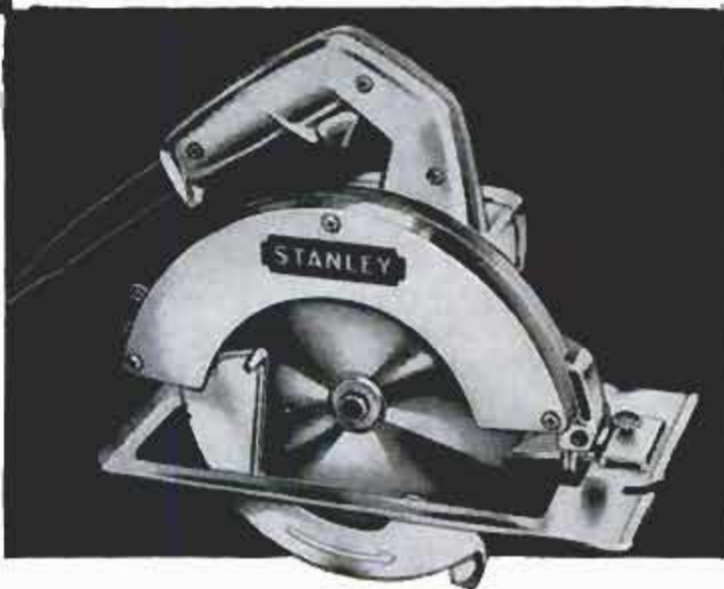


MODEL H288K

\$15.00 off on complete builders saw kit.
\$67.95 value . . . now — \$52.95
Powerful 6 1/2" saw has rear controls, Free-start guard, ball-bearings. And you get case, etc.—free!

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New Dexall Caulking Compound

- Caulks stucco, wood, concrete, brick, stone.
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Tough seal lasts for years!



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*Fast, easy, foolproof way
to repair wall cracks!*

New Dexall Patching Paste

- New, improved, ready to use, for plaster and wood.
- Won't crack; water-resistant, smooth, easy-working.
- Dries fast, anchors firmly, sands easily.

At paint and hardware stores everywhere.

Shortest Route May Be the Longest

(Continued from page 125)

Communications Are the Key

The key to the entire system was fast communications. Only by knowing existing wave and weather conditions in most or all of the area covered could an accurate forecast be made.

Applied to the routing charts in Dr. James' office, the assembled information showed what were likely to be the trouble areas. It was then simply a matter of plotting the ship's track around the worst of the high wave conditions and changing the ship's course en route as new weather and wave data became available.

The application of this research to actual ship crossings produced spectacular results.

Ships routed by what was now called Oceanographic Forecast Central, U.S. Naval Hydrographic Office, arrived at their destinations an average of 14.5 hours ahead of time. This despite the fact that the optimum ship courses were often 100 miles or more longer than the most direct route.

Dollar savings were estimated by the Navy at approximately \$2,000 per crossing, or \$900,000 for the 450 ships routed.

Warships Use Routing Service

Based on this information, Admiral Jerauld Wright, commander of the Atlantic Fleet, gave the commanders of his warships permission to use the ship routing service if they chose. Use of the service is expected to be made mandatory as more experience is accumulated. The warships are serviced by prediction stations at Norfolk and San Diego.

Wind and wave predictions from Dr. James' office made possible the delicate task of moving and emplacing the "Texas Tower" early warning radar stations off the New England coast. Ice predictions from "Forecast Central" enabled convoys to land critical supplies for the Distant Early Warning radar stations in the Canadian Arctic.

The final proof of the effectiveness of the combined wind-wave-weather prediction service, however, was the safe passage of the Navy ships in the storm last March.

"Once the commercial skippers are won over," Dr. James states, "the application of ship routing techniques can eliminate perhaps one half the danger and discomfort still attending a sea voyage." ★ ★ ★

☞ Liquid hydrogen, described by Air Force scientists as an "ultimate chemical fuel," is now in large-scale production in Ohio, California and Florida.

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You get: ★ The Finest Cutting Edges
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Plastic pocket kit - 6 sizes \$10.30
Most complete line of Chisels, Gouges and Carving Tools
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MAGNETS

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL

Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as guns, tackle from fresh or salt water; tools from tanks & drains. **GUARANTEED.** Try any magnet one week.

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M-710 (Wt. 53 oz.) Has pull of 225 lbs. on steel block... \$18.00
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More aluminum, lighter weight, better performance, beautiful styling. Still Worlds Lowest Priced Car. Drive it for 75c a week. Rider Agents Wanted. If no dealer near you send 25c for 32 page picture book, full details, dealer price. Or send \$1 (refunded first order) for this and Service Manual plus Repair Manual and 15 5 x 7 photos of car and factory.

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ENGINES LIKE YOURS LAST 200,000 MILES IN CABS AND TRUCKS



Fleet operators know the secret—replace key parts regularly . . . get like-new power!

Fleet cars and trucks are driven hard—around the clock, on short hauls and cross-country trips. At 50,000 miles or so, their stock engines are tired, yes—but *not ready for the scrap heap!* An overhaul by a skilled mechanic . . . new key parts like bearings and rings—they're off and running smooth and sweet for thousands *more* miles.

WORN BEARINGS . . . SICK CAR

Worn engine bearings have up to 25 times normal oil clearance! Excess oil slips past piston rings, burns to heavy carbon and sludgy varnish. These choke ring grooves and oil holes, foul plugs and valves. Result: your engine burns oil, misfires, pings and knocks. You get poor gas mileage; lose pep and power. Cure: a complete overhaul, including new Federal-Mogul bearings.

"OVERHAUL" INCLUDES BEARINGS

Every good mechanic knows that an overhaul without new bearings is a waste of time and money. So it's wise to do the job *right* at first! You'll get back many times the small extra cost.

ASK FOR FEDERAL-MOGUL BEARINGS

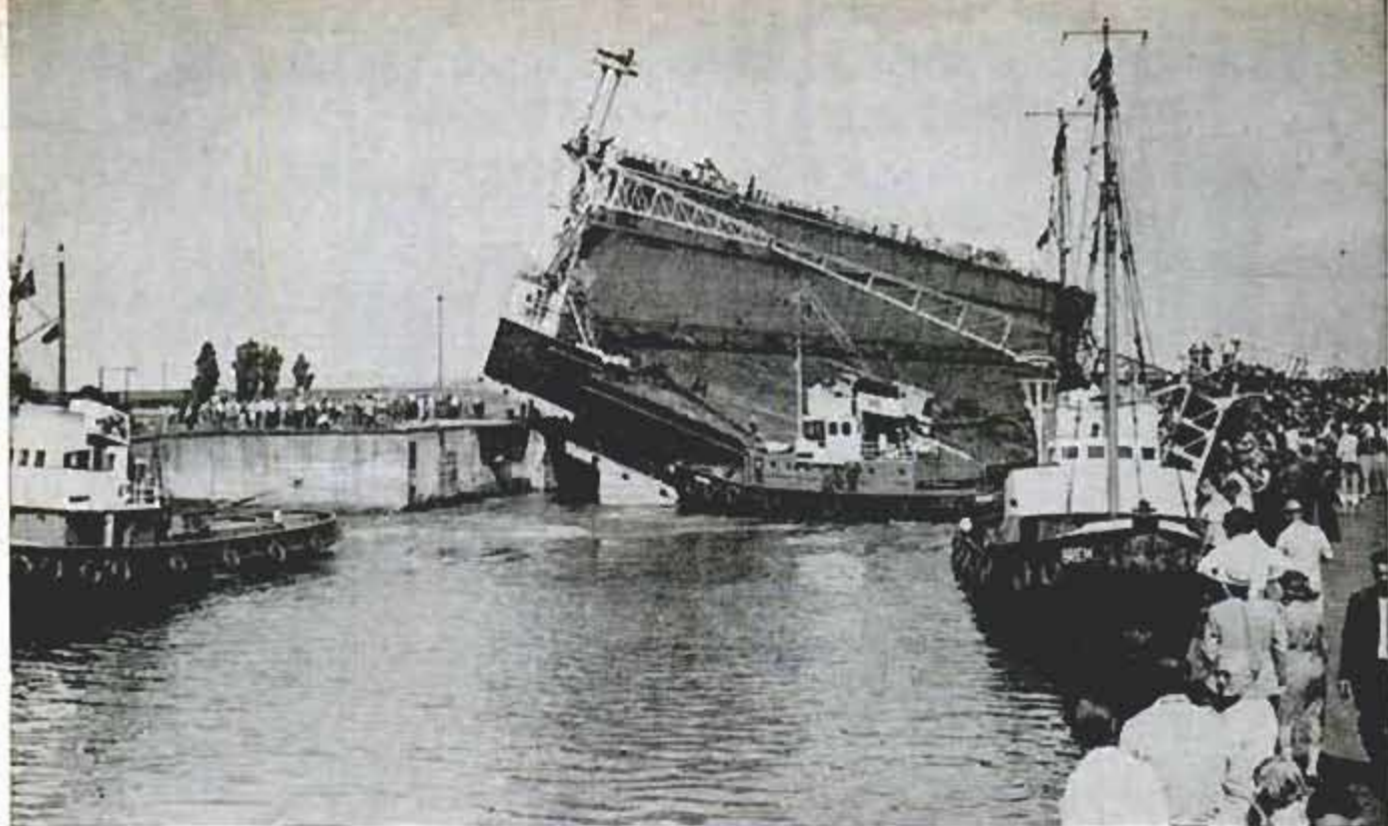
Main, connecting rod and camshaft bearings are the heart of your engine. Yet it costs no more to use the *best*—Federal-Mogul Engine Bearings. Ask your mechanic!



FEDERAL-MOGUL SERVICE



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Giant Drydock Tilted for Squeeze Through Narrow Lock

Tilting a giant drydock 22 degrees enabled it to squeeze through the lock at Bremerhaven, Germany. The drydock, 150-foot wide, was too wide to pass through the lock. Even though tilted, by means of 15,000

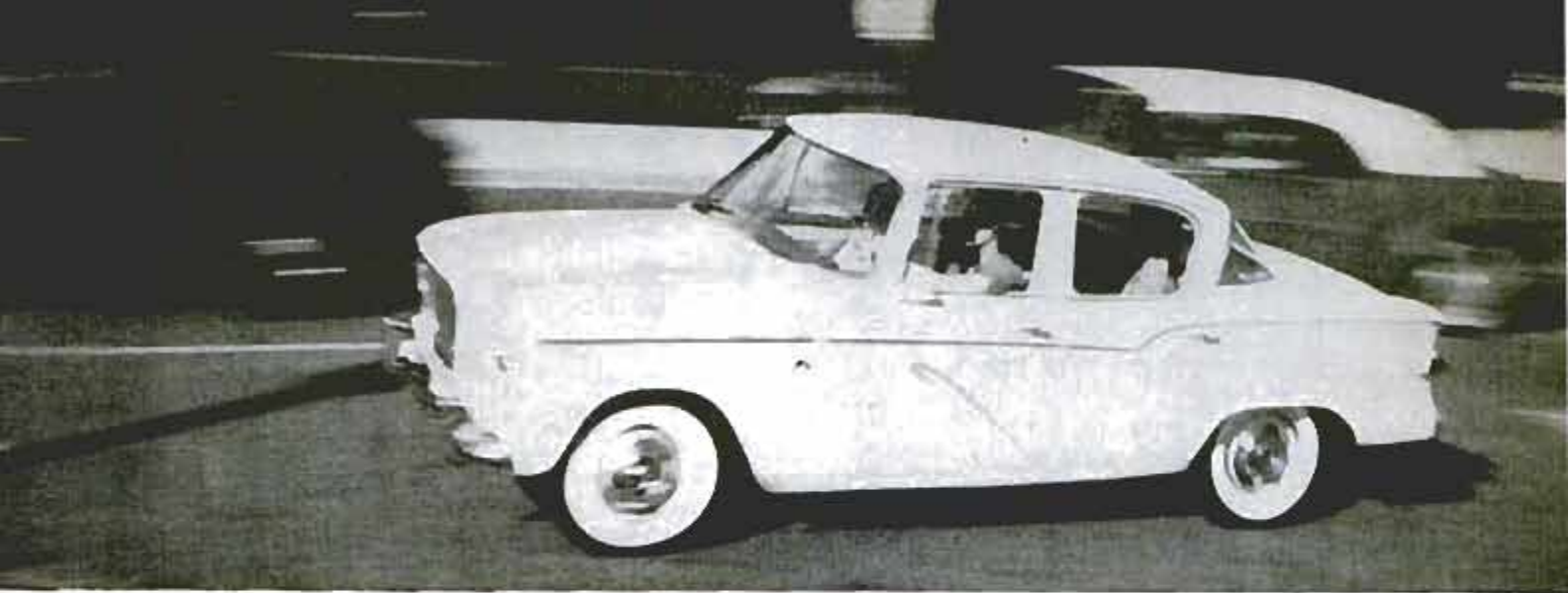
tons of water ballast, the drydock just managed to clear the lock wall. Originally built for a Greek shipowner, the drydock is easily capable of handling ships up to 26,000 tons.

Pint-Size California Car Weighs Only 1100 Pounds

About half the size of a Jeep, the Crofton Bug weighs only 1100 pounds but carries a quarter-ton payload. The Bug, designed as a small utility auto, is powered by a 35-horsepower overhead-cam engine with four cylinders, a version of the engine first used

on a Crosley. The little vehicle is 111 inches long and 48 inches wide. It has a wheelbase of 63 inches. The Bug finds use among campers, hunters, yachtsmen or store owners. Made in California, the car sells for approximately \$1350.





WHAT DOES THE LARK HAVE THAT THE OTHERS DO NOT?

➤ **PROVEN BY 750,000,000 MILES OF CAREFREE OWNER USE:** All over the United States more than 100,000 Americans have been driving their Larks under every conceivable condition of road and weather. Lark repair and maintenance costs are considerably below the automobile industry average. Proof that The Lark is rugged!

➤ **POTENT PERFORMANCE, EXTRA ECONOMY:** Zero to sixty in 9.5 seconds with The Lark V-8 and 4-barrel carburetor. 22.28 miles per gallon of regular gas with the V-8 in last year's Mobilgas Economy Run. Naturally the "Six" does even better. Take your choice!

➤ **SIX BODY STYLES:** the world's only full line of new dimension cars . . . Convertible, Hardtop, 4-Door Station Wagon, 2-Door Station Wagon, 4-Door Sedan, 2-Door Sedan. Who else has them? And with pleated vinyl or fabric upholstery and new sophisticated colors!

➤ **LIST OF OPTIONS LONG AS YOUR ARM:** Three transmissions (automatic, synchromesh, overdrive), limited slip differential (Studebaker's Twin Traction), headrests, reclining seats, choice of axle ratios, 4-barrel carburetor and dual exhausts, many, many more!

THE LARK OFFERS MORE OF WHAT YOU WANT THAN OTHER NEW DIMENSION AUTOMOBILES.
SEE YOUR STUDEBAKER DEALER FOR THE EVIDENCE, NOW!

LOVE THAT **LARK** *BY STUDEBAKER*

Pay-TV

(Continued from page 221)

end of a 30 or 60-day period, when the money is collected, the tape is analyzed and its information is used as a guide for future program scheduling.

Cost to the Subscriber

According to present plans, the cost to pay-TV subscribers will be nominal indeed. There will be no charge to the consumer for the Telemeter attachment other than a \$5.00 installation fee which is comparable to a telephone connection charge. Therefore, the subscriber pays only for actual number of programs he elects to watch. And the price of these will vary, depending on the attractiveness of the entertainment offered. There will be no charge at all for some programs which, replete with commercials, may be sponsored by local firms. But all pay-as-you-watch programs will be free of interruptions.

The Future of Wired Pay-TV

How far and how fast wired pay-TV will spread may depend a good deal on the reception it gets in the West Toronto area; but officials of Famous Players Canadian Corporation, Ltd., sponsors of this initial installation, are confidently enthusiastic. So are the officials of the International Telemeter Company which developed the present telemeter equipment. Since the wired system requires no spectrum space, it is not subject to FCC approvals and meets, for the present at least, no legal obstacles. The door, therefore, is wide open for the installation of wired TV in any area. With regard to the U.S., according to L. A. Novins, president of International Telemeter, several attractive situations have been under active consideration, and decisions concerning the first U.S. market for Telemeter are expected in the near future.

However, even Mr. Novins concedes that the economic advantages of wired TV over "airwaves" TV broadcasts apply only to installations covering relatively small, compact communities or neighborhoods. In the opinion of J. S. Wright, president of Zenith Radio Corp.—a long-time advocate of pay-TV via the "airwaves"—the costs of wiring up a large area, such as San Francisco, Los Angeles or New York, in some huge coaxial network are fantastic.

But Telemeter is ready even for the ultimate advent of broadcast pay-TV in major "saturation" markets. If and when

the FCC finally authorizes "over the air" pay-TV broadcasts, the individually wired Telemeter areas could easily be incorporated at no extra cost to the subscriber. In such an event, the broadcast TV signal would be unscrambled at the Telemeter studio and retransmitted over one of the three Telemeter channels. The other two channels could still provide local-interest programs to the wired areas where saturation broadcasts over an extended area would prove far too costly.

The Canadian experiment will be watched with intense interest by advocates and opponents of pay-TV. Its acceptance or rejection by the subscribers will determine not only the spread of the Telemeter system but may influence FCC decisions which will determine the entire future of pay-as-you-see television. ★★★

Is Carbon Dioxide Warming the Earth?

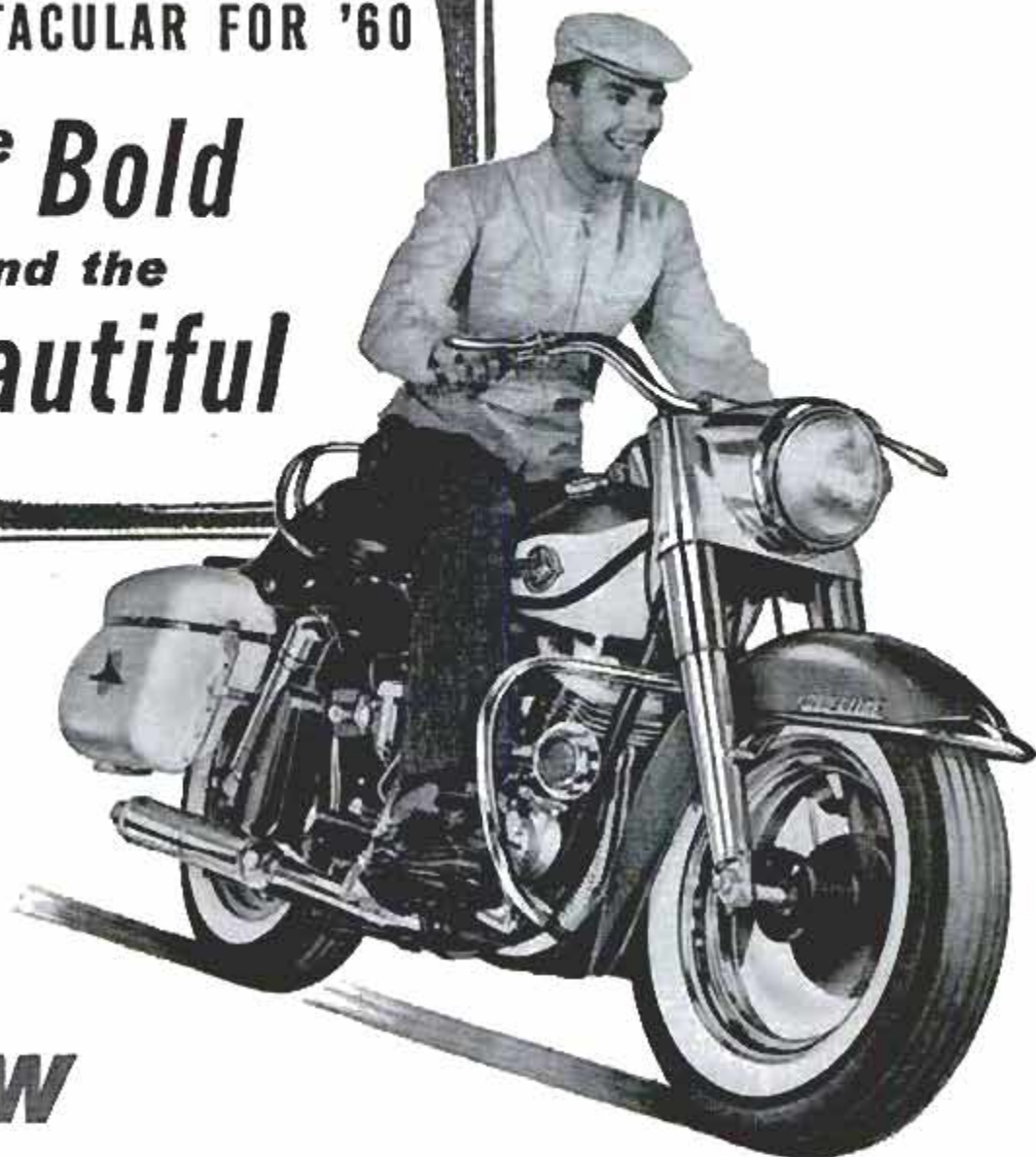
Civilization is adding carbon dioxide to the atmosphere at a much higher rate than had been supposed, and this may be having an effect on the earth's climate. Dr. Bert Bolin of the University of Stockholm, Sweden, reports that the burning of coal, oil and gas is adding carbon dioxide to the atmosphere at the rate of one half of one percent a year and that a 25-percent increase in the amount of carbon dioxide in the atmosphere will have occurred by the year 2000. It is suspected that the earth has warmed up by two or three degrees in the last 50 years, and it is possible that the increase in carbon dioxide is responsible. The gas acts like the glass of a greenhouse to keep heat from escaping into space while allowing the sun's rays to pass. Dr. Bolin suggests that further studies should be made regarding the increase of carbon dioxide in the atmosphere and its possible effects on future climate.

Rare One-Eyed Fish Found in Gulf of Mexico

Scientists have in their possession a one-eyed fish so rare that it is only the second one-eyed vertebrate ever reported living in nature. The first was a ray described in an Italian journal 75 years ago. The one-eyed fish, found in the Gulf of Mexico near Yucatan, is a member of the family that includes bright-colored, coral-reef damselfishes. Scientists say that the single eye was the left eye at an early stage of formation, and that the right eyeball was probably lost during the fish's early skeletal development.

SPECTACULAR FOR '60

The Bold
and the
Beautiful



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**HARLEY-DAVIDSON
DUO-GLIDE**

We've put this "show" on the road—the world's finest motorcycle made better than ever by the world's finest craftsmen.

Spectacular styling with gleaming new headlight nacelle of aluminum alloy. Flowing back from the nacelle, new twin-flare tank paneling adds dash to the famous Duo-Glide look. Spectacular new performance is the result of a host of new mechanical improvements . . . quieter engine, longer bearing life and faster starts.

Harley-Davidson

MOTOR CO.
MILWAUKEE 1, WISCONSIN

Perfect Mating of Man and Machine.

Your Harley-Davidson dealer is *pre-viewing* the new Duo-Glide now. He will show you the many other new features that make the Duo-Glide for '60 the greatest "road show" ever. Or mail the coupon for free, colorful folder.

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on the Duo-Glide for '60

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Truck Designed for Turnpike Hauls Three Trailers

Carrying a payload of about 60,000 pounds, an extra-long truck designed exclusively for turnpike travel consists of a tractor and three trailers. The superhighway tractor, built by the White Motor Com-

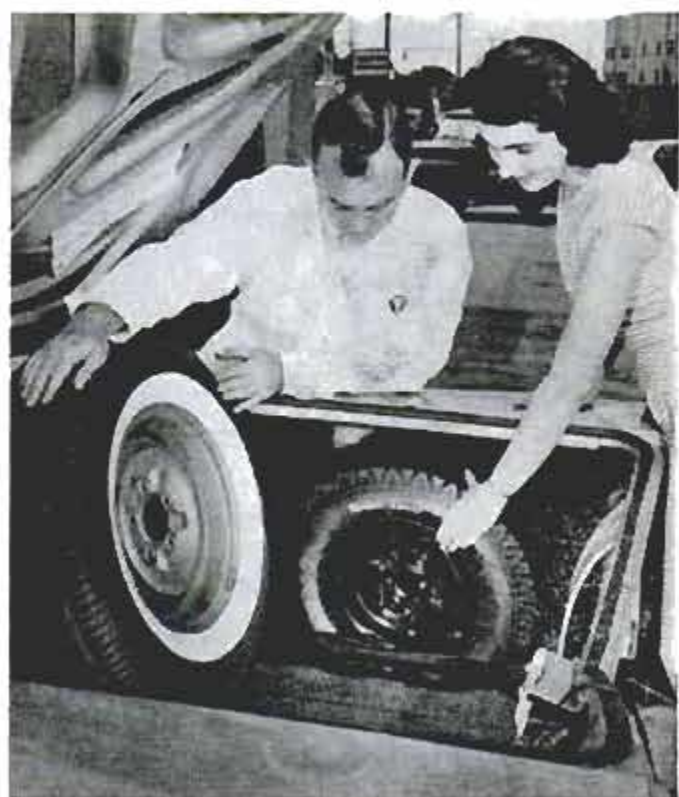
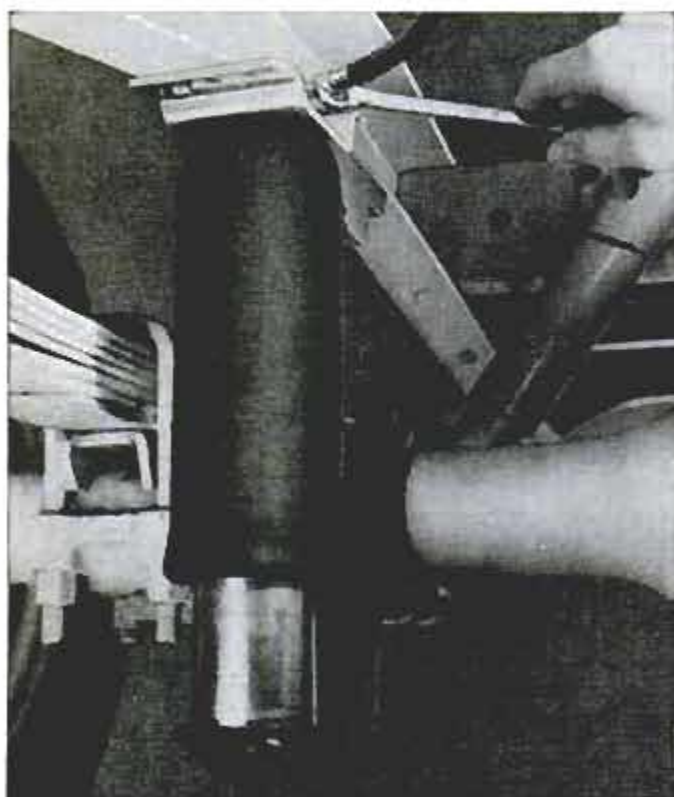
pany, has an extra-short, light Fiberglas cab, a 335-horsepower diesel engine and tandem-drive rear axle. Extra trailers on the tractor can be detached to comply with length limits in certain states.

Air Springs Adjust to Load

Overload air springs that function only when activated by compressed air help make a truck ride normal whether it is overloaded or carrying a light load. When the truck is overloaded, the driver lets air into each spring. The two springs operate independently. He can deflate them when his load is light, thus making the truck ride even.

Midget Spare Tire

Taking up half the space of a conventional spare, a smaller pneumatic version is sufficient for a highway emergency. Developed by Firestone, the tire and wheel unit for replacing a 7:50-14 conventional tire is 22 inches in diameter compared to the 27-inch normal tire and wheel and weighs 20 pounds compared to 39 for the regular unit.



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you enjoy the taste.



Play it smart: Know what you're getting in a cigarette. Know right now that what you get in a Lucky is the finest tobacco in America... the most famous taste in smoking. You get it clear through—in every Lucky. Can you say that much for the brand you're smoking now? Play it smart: **Get the honest taste of a LUCKY STRIKE**

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GALE PRODUCTS, GALESBURG, ILLINOIS • DIVISION OUTBOARD MARINE CORPORATION

Coast to Coast in 90 Minutes

(Continued from page 133)

to realize that the air pressure outside the plane is so low that his blood would boil except for the fact that he is traveling inside a pressurized space chamber. Sitting comfortably in his shirtsleeves, he wouldn't believe that the outside air temperature is 65 degrees below zero, or that, in spite of this, only clever engineering prevents him from roasting to death. At Mach 3 the skin of the airplane is heated to 600 degrees or more by aerodynamic heating, friction with the thin air.

Why the big jump from the 575 miles per hour, at which the present jets cruise, to almost four times that speed? Why not build 1000-mile-per-hour transports as the next step, then others in the 1200-1500-mile-per-hour class?

Speed and Propulsive Efficiency

The answer lies in the way that propulsive efficiency is related to speed. This efficiency is quite high at Mach 0.8, the speed of the present jetliners. But it drops abruptly at Mach 1, the speed of sound, then very slowly begins to climb again. At Mach 2, just under 1400 miles per hour at cruising altitude, efficiency is somewhat increased, and is greatly improved at Mach 3.

A 1400-mile-per-hour transport would have one advantage: it could be built of naked aluminum, since aerodynamic heating is not too severe at that speed. The 2000-mile-per-hour airplane must be clad in titanium or stainless steel as these hard metals are less affected by heat. In spite of the greater expense the engineers agree that the Mach 3 airliner is the most attractive. Besides, adds Fred A. Payne of North American Aviation, a few Mach 3 airliners could handle the same amount of traffic as a larger number of slower craft by making more round trips per day.

It's pretty well agreed that the Mach 3 transports are apt to be the fastest for some time to come. A speed increase of an additional 500 miles per hour would create tremendous structural and insulation problems. At 2500 miles per hour the skin of the plane would heat up to 2000 degrees, the temperature at which copper melts.

Even the triple-sonic airliners will require special designing to keep passengers and crew comfortable. Lockheed has studied this problem in detail and is thinking in terms of a double-walled cabin with glass fiber insulation on one of the walls. Cold air would be circulated between the walls to remove the heat radiating inward from the skin. A test section of this construction, eight inches thick, was remarkably effi-

cient. Its inner wall remained at a comfortable 70 degrees even though the exterior wall was maintained at 600 degrees. Water-cooled walls are a different approach that has been discussed.

The air that is taken into the plane for ventilation is another real problem. It, too, heats up to 600 degrees because of ram effect. The answer seems to be to admit only minimum amounts of outside air, bring down its temperature by evaporative cooling, and to re-circulate it in the cabin. Cockpit windows and the passenger cabin windows, if any, would consist of thick, multi-layer panels of high-temperature glass with cooling air circulating between the panels.

It also may be necessary to find a way of removing ozone from the air that is taken in if this poisonous gas is found to exist in injurious amounts at 70,000 feet.

To a large degree the practicability of the supersonic airliners is based on a bomber that so far exists only on paper. This is the B-70 on which North American Aviation is just starting construction. Still very much on the secret list, it represents a great deal of research by National Aeronautics and Space Administration and other agencies, in addition to the prime contractor. It is classed as a Mach 3 airplane with inter-continental range. Its mission is to carry various bomb loads, including big hydrogen bombs having a destructive force equal to 10 million tons of TNT. It is also designed to carry large air-launched ballistic missiles fitted with nuclear warheads and capable of traveling 1000 miles from the launch point.

The B-70 will be powered by G.E. J-93 jet engines that are expected to develop in excess of 30,000 pounds of thrust per unit. Still in the development stage, the engines are described as being surprisingly conventional. They will use ordinary jet kerosene as fuel, and may use a liquid-fueled rocket engine for additional thrust at take-off.

These same engines, it is expected, will also power the Mach 3 transports.

The big engines are going to be a lot noisier than the present jets and engineers are saying that we'll just have to get used to the noise.

The sonic boom created at Mach 3 is a separate problem and it is pretty well agreed that the airliners will climb out from an airport at subsonic speeds, accelerating past Mach 1 after they have attained 35,000 feet or so. Below that altitude the shock wave could be both destructive and frightening on the ground. One engineer is not entirely joking when he says "People on the ground would need bullet-proof

(Continued to page 256)



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QUAKER STATE OIL REFINING CORP., OIL CITY, PA.

TV's Tiny Spectaculars

(Continued from page 148)

television screen. The picture you see will show the actors moving about amid the tiny scenery in perfect scale and coordination.

Composite Pictures Not New

Actually, there is nothing new about composite TV pictures, but until now they have been severely limited, since the master camera could not be panned, tilted or zoomed to follow action or vary the background. Actors had to move in precisely predetermined areas or they might come out on your home TV screen walking through a box of breakfast food. With VideoScene, however, the servo link to the satellite camera enables the background to move in proper relationship to the movement of the actors on the big stage.

Background Must Not Show

Naturally, if the tracking is going to work, none of the background on the big set must show—only the actors. Hence, they perform against a plain indigo-blue reflective material, developed for CBS by Minnesota Mining and Manufacturing Company. Instead of being picked up, the reflected light enters the camera and, due to its peculiar characteristics, becomes an optical signal, which is automatically converted by the camera into a "blackout." The actors, illuminated by normal light, come through loud and clear and appear to be floating in space on the monitor in the control booth. Here the mixing operator superimposes the picture of the actors on the picture of the miniature set, and the show is on the road. ★★★

Do You Know This Old-Timer?

(answer to quiz, page 12)

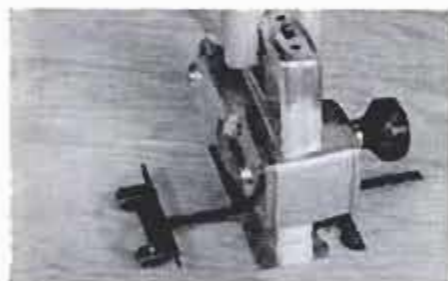


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Here's why every automotive engineer is now studying the new Ford *Falcon*

Now that the new-size cars are out, expert engineers and drivers have looked them all over—tested them on turnpikes, tortured them on high speed tracks. Here's a typical test driver comment. Don Stewart, Detroit editor of *MOTOR LIFE*, said, "... the Falcon is completely capable of gliding over a wide assortment of terrain. This car is no boulevard prima donna! ... Arriving at a sensible compromise between economy, passing power and sufficient weight mass, the new Falcon instills in its driver that sense of security rarely found in cars of its dimensions ..."

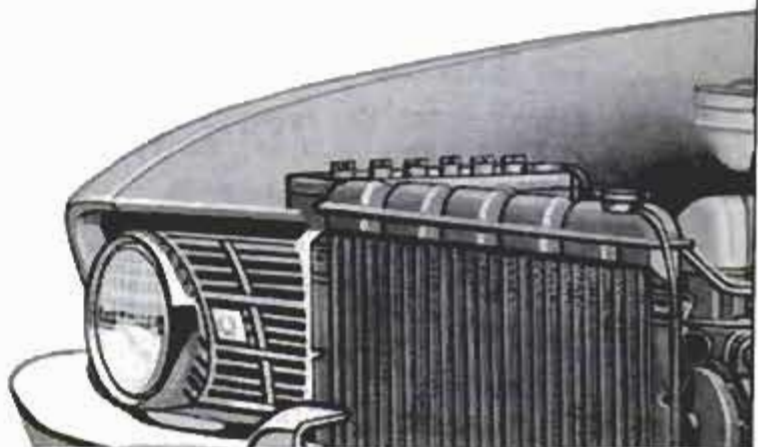
Front engine or rear? This debate is as old as the earliest automotive patents (back around the end of the 19th century), but for 1960 it's hotter than ever with two of America's leading car makers taking diametrically opposite positions. Ford's front-engine design has general advantages in safety and stability over rear-engine cars. In addition:

1. A bigger and more convenient baggage space is an obvious advantage of front-engine cars. Wheel wells and steering column dictate small, oddly shaped baggage compartments in rear-engine cars.

2. In the event of a forward collision, front engine's mass absorbs impact, provides greater safety to car's occupants.

3. Gas tank located more safely in the rear is another front-engine advantage. Some rear-engine cars have gas tanks up forward, in front of passengers.

"Do-it-yourself" simplicity. Here again Ford has taken a different route from that followed by its major competitor. The Falcon six-cylinder engine is a dependable, proven design. It



CAR IN THE WORLD TO OWN

has a single carburetor . . . eliminating the problem of synchronizing two carburetors. Vertically mounted for the greatest accessibility, it has a one-piece, cast-iron cylinder head and intake manifold for greatest simplicity. Servicing is a snap . . . no need, for example, to remove engine for valve or ring work. The Falcon Six will present no mysteries to mechanics, even the do-it-yourself variety. Other Falcon advantages: self-energizing brakes have 30 fewer parts. Fenders bolt on for inexpensive, easy replacement.

Economy and convenience without austerity. The Falcon's fresh-air, hot-water heater doesn't burn extra gas to reduce your mileage figure as do gasoline heaters. Standard gearshift lever is located conveniently on the steering column, not on the floor where it limits passenger room. Comfort features such as dual sun visors and arm rests are *standard*. Insulation, seat cushioning, and interior trim are considerably superior to the Falcon's nearest competitor.

The Test Program: Experience Run, U.S.A. After three years and three million miles of steady automotive sadism that put the Falcon to every test the wildest-eyed engineer ever dreamed of, Ford sped a fleet of 16 Falcons over every last mile of numbered Federal Highway.

The Falcon drivers, hard-nosed automotive types, sent back reports like these:

" . . . running 28 miles per gallon at turn-pike speeds with the automatic transmission, which is very, very exceptional."

" . . . handles beautifully . . . takes the curves just like they weren't there. We go over the mountains and hills with terrific ease . . . carrying about 400 pounds of baggage and equipment in the back now. You couldn't ask for any more room."

" . . . gotten as high as 31.1 miles per gallon and we've been doing terrific!"

"What oil? This automobile doesn't use any oil. 3000 miles so far and we haven't had to hardly look at that oil stick. This engine is sensational."

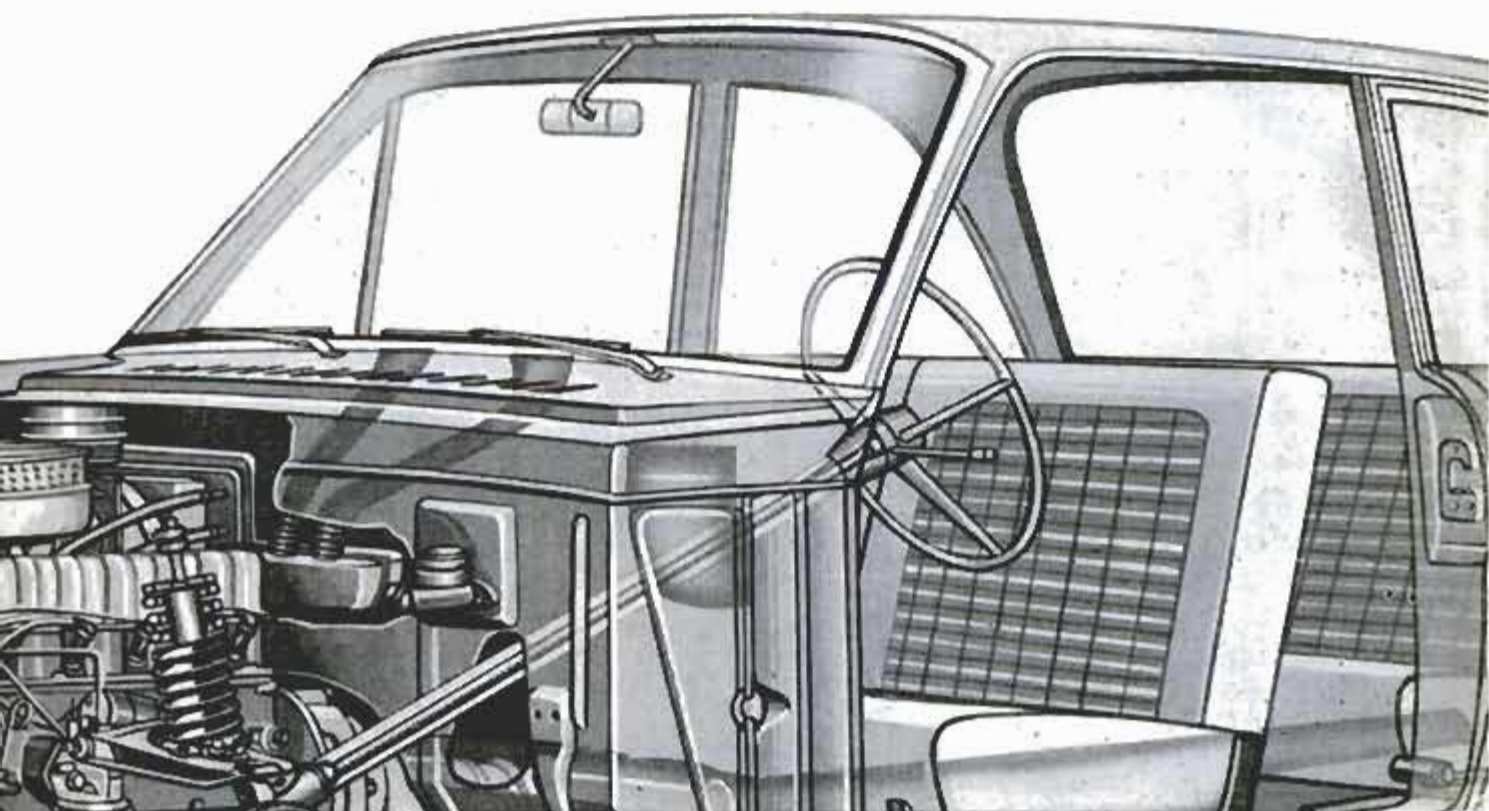
"It's got plenty of power. When we came over the Continental Divide the other day you couldn't ask for any more power . . ."

It's a beautiful piece of engineering. Simple, clean, all automobile. Try it at your Ford Dealer's and bring the whole family. There's plenty of room for six.

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(Continued from page 251)

windows, stainless-steel 'china,' and permanent ear plugs." Once the plane attains cruising altitude, however, its shock wave would be heard on the ground only as a gentle boom. Whether the shock wave from one supersonic transport would be destructive to another flying close by is not yet known.

Supersonic Transport in 1965?

Hall Hibbard, senior vice president of Lockheed Aircraft Corporation, says that an operational supersonic transport could be available in 1965, a scant five years from now, as far as engineering and construction are concerned.

It's doubtful that the airlines will be in that much of a hurry for new equipment. They still have the big job of paying for their new subsonic jet fleets. And little by little the present jets are being made more efficient. The latest improvement, not yet in general use, is the turbofan or by-pass engine. In essence this is a stock jet engine with a built-up section in the compressor that draws in extra amounts of air. Once it is compressed, this air is by-passed around the burner sections of the engine and mingles with the hot exhaust from the turbine wheels. The effect is to vastly improve the propulsive efficiency of the engine.

This is translated into greater thrust, which can be used for shorter take-offs, greater range, and greater fuel economy. It will not mean more speed with the present airliners, whose airframes are designed for subsonic flight. A separate advantage of the turbofan is that it is substantially quieter than an ordinary turbojet engine.

The Boeing 707s being delivered to British Overseas Airways Corporation are powered with Rolls Royce Conway turbofans, and the new medium-range Douglas DC-9 jet transports will be equipped with Pratt & Whitney fan-type engines. Most of the airlines expect to re-engine their present fleets with turbofans as the new engines become available.

Another reason why the airlines may not be ready for supersonic transports in five years is the tremendous cost of the new planes. One estimate is that a Mach 3 transport will cost \$20 million as compared to the \$5 million price tag of a subsonic DC-8 or 707.

Ten years from now instead of five years seems the more realistic date for the inauguration of supersonic passenger service. Besides, it's going to take that long for a lot of us to get used to the idea of whisking across the continent in an hour and a half!

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Shining Sun Will Darken Windows in Home of 1970

Windows that automatically darken as the sun shines on them are forecast for homes of the 1970s. Dr. James E. Archer, of Pittsburgh Plate Glass, says that the same principle can be used for interior walls of glass so that rooms would be optically separated or joined, depending on whether the walls are adjusted to be transparent or opaque. An electric control knob could be turned to obtain either effect. Dr. Archer also foresees glass panels that would be energized to produce heating or cooling effects or that would permit a flow of air from one room to another by means of "micro-openings." In a parallel forecast of what will be available to future home builders, Dr. S. W. Herwald of Westinghouse Electric suggests that homes of the '70s will be heated, cooled and lighted by "solid state" devices. Thermoelectricity, in which heat or cold is produced by current flowing through certain dissimilar metals, would be combined in a single wall panel with "electroluminescence," a type of lighting produced by applying electricity to phosphor materials embedded in the panels. The color of the illumination, as well as its intensity, could be varied at will. Plastic plumbing is another possibility for the future, as are office buildings that would bear all their loads on their exterior walls or skins, eliminating the present structural frames that take up valuable interior space.



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Rambler American Station Wagon



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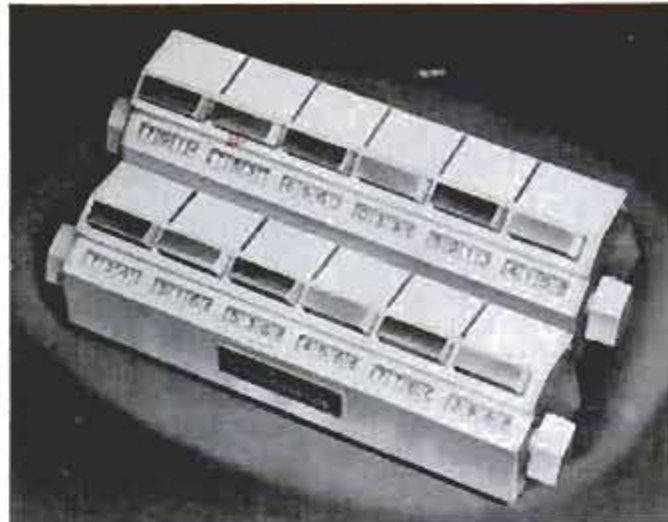
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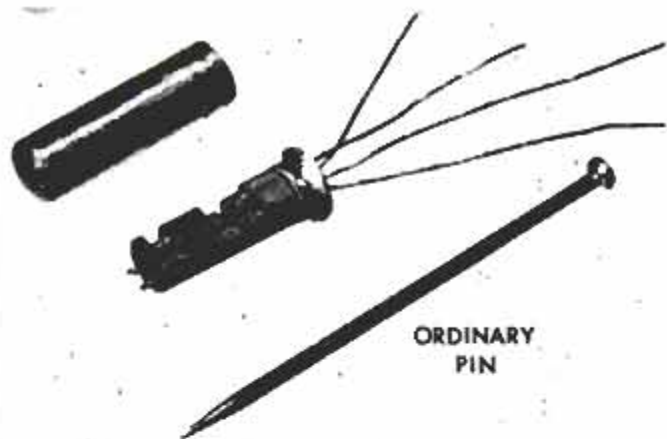
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Temperatures close to absolute zero can be measured by a tiny but highly accurate thermometer that is shorter than an ordinary straight pin. The diminutive device, known as a germanium resistance thermometer, may be used in a space vehicle to report temperatures beyond the earth's atmosphere. Scientists at Bell Telephone Laboratories developed it to study how various materials behave in extreme cold. They run a small amount of electricity through it, and since germanium's resistance increases as temperature drops, they can determine the temperature by reading a resistance meter.

What
glue
for



Made especially for mounting plastic table tops and bonding many dissimilar materials.

Send stamped, self-addressed envelope for Free copy of "Elmer's Guide To Good Gluing". Write The Borden Company, Dept. 11G, 350 Madison Ave., New York 17, N. Y.

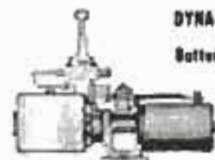
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MAKE HOME IMPROVEMENTS NOW

SAY Merry Christmas

with train boards, tree platforms, Santa Claus, his sleigh and reindeer, Christmas Greetings displays
Make them yourself—with foolproof patterns

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Put a sleigh in front of the Christmas tree, to hold the gifts. Use the 5' x 8' panel for a sound-deadening train board; for a tree platform—your dealer will cut Homasote to the size you require.

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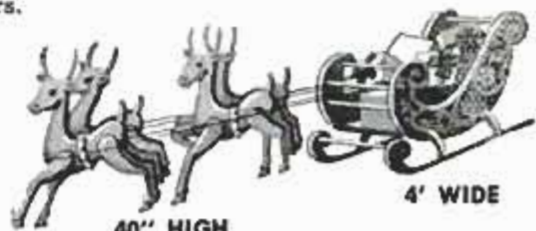
Homasote is the oldest and strongest insulating-building board on the market, saws and nails easier than wood, takes any paint or stain, lasts for years.

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(Continued from page 101)

pedal entirely. This will appeal to Americans more than any other group. He would not disclose the price but guesses are that it will be between \$50 and \$75 extra.

He denied published reports (including those here) that Volkswagen is thinking of a bigger car. At the moment there is a backlog of orders equaling six months' production.

Why should we change? he asks. We will make changes, he says, only for one or two reasons: (1) If an engineering solution of great merit presents itself, and (2) If it becomes necessary to stimulate sales. Otherwise we will simply continue to improve our product, he says.

This year's VW is an example. It is quieter and better riding, there is less engine noise, less road noise in the car.

Nobody shouts about it, but VW trucks and buses have a new engine-transmission. The engine design is capable of up to 30 percent more horsepower; transmission has synchromesh first gear. It is likely that sedans will be so equipped by early 1960.

What of such new German cars as the BMW 700, the DKW Junior, the Ford Taunus 12, the Opel 1200, all of which are competitors of the little beetle from Wolfsburg? Many Germans are looking at these cars seriously for the first time because they want something different. When everybody wears a uniform, even a pair of overalls may look better. There is a saying here that the Volkswagen looks like a Volkswagen, but the Opel looks like a car. The people may be looking for a car that looks like a car. All these new cars which cost slightly more than the VW are in the new style that is more Italian than German. They have straight lines, flat roofs, wide windows, large trunks. These cars inevitably make the Volkswagen look old-fashioned.

However, until the day comes when the VW is no longer in greater demand than supply, it will not be changed drastically, says Nordhoff, who should know. In any case, he says, the five-millionth VW will look just like the three-millionth which was made this summer.

Two years ago he told this reporter that the four-millionth VW would look the same. There's no sign of haste here. But the day for change may be sooner than is publicly admitted. When it does come, no doubt, they will be ready. Nordhoff stated that each year his engineers design a new car and each year the new design has been scrapped as unnecessary. One day, perhaps sooner than Nordhoff will admit, the scrapping must cease. ★ ★ ★

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This Month's "Great Pioneer in Science"

(Page 16)



Alfred Nobel (1833-1896)

NOVEMBER 1959



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WRITE for free, colorful shooting fun literature. Crosman Arms Co., Inc., Dept. PM-35, Fairport, New York.



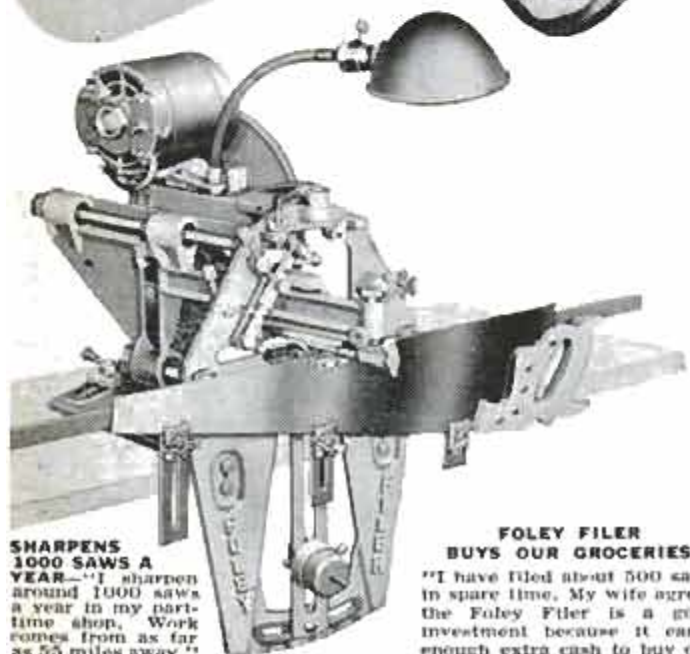
WORLD'S LARGEST MANUFACTURERS OF CO₂ GAS-POWERED RIFLES AND PISTOLS

265

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Tells How To Start
Your Own Business

FILING SAWS



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1000 SAWS A
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around 1000 saws
a year in my part-
time shop. Work
comes from as far
as 50 miles away."
—Joe H. Walker.

FOLEY FILER BUYS OUR GROCERIES

"I have filed about 500 saws
in spare time. My wife agrees
the Foley Filer is a good
investment because it earns
enough extra cash to buy our
groceries." — H. J. Kreuser.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays from \$3 to \$6 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. J. C. Deibert wrote us: "Since I got my Foley Filer five years ago, I have averaged 4 1/2 saws each day over all this time." Howard Kuhns says: "We operate 2 Foley Filers, and our business averages about 500 saws per month. The count last year was 5,798 saws."

The new model 200 Foley Saw Filer (shown above) is the first and only machine that automatically sharpens combination (rip and cross cut) circular saws—also all hand saws, band saws and crosscut circular saws. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. Exclusive jointing action evens up irregular teeth—old saws cut like new!

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Nature Pulls Plug— Lake Loses Water

By James J. Cox

Residents of the central west coast of Florida have a natural phenomenon in their midst which they compare with a volcano. Their "home grown" excitement simply acts inversely to a volcano. Instead of blowing her top, Mother Nature in this case "pulls her stopper."

Just what happens when Lake Tarpon loses its water nobody knows for sure, but, for one thing, within a few days the five-mile-long lake changes from fresh water to salt water.

After about a week of high tides rushing in and fresh lake water dashing out, the billion-gallon underground exchange is over. But it takes several weeks for the old gal with the split personality to come to her senses and get the salt out of her system.

The last time Lake Tarpon showed her trick was in August of 1957. Old-timers could see it coming. After nearly 10 inches of rain in July, the lake was at the highest point it had been in years. And when the water load got unbearably heavy, Lake Tarpon just let it fall through.

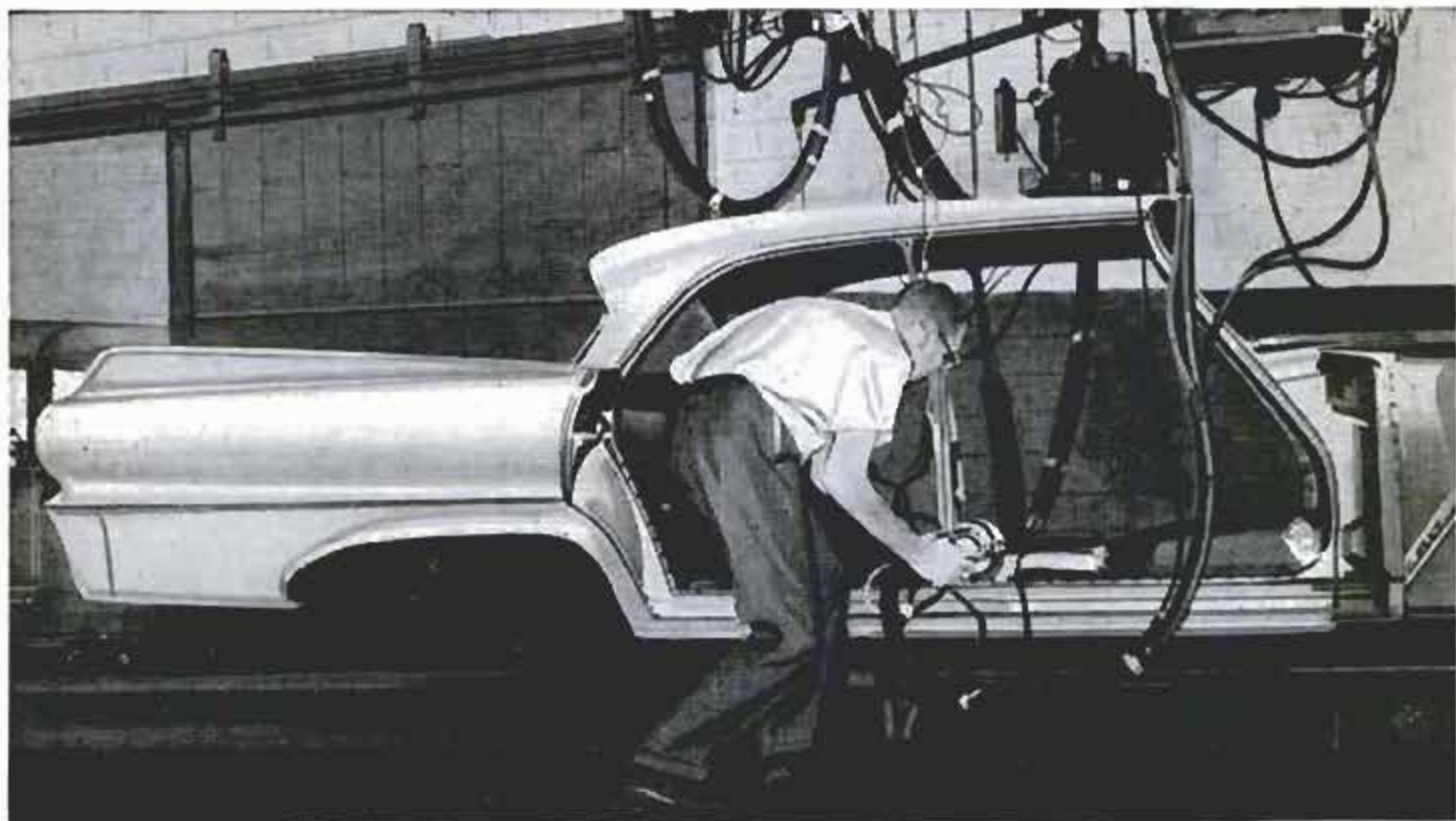
The United States Geological Survey made a study in 1945 to explain the mystery of Lake Tarpon in scientific terms, but it could come up with no better answer than the Florida natives could: There is a big hole at the bottom of the lake.

Former County Engineer W. A. McMullen, Jr., found the hole in 1945. Sixty feet from the west shore line, McMullen dropped a plumb line 115 feet before it hit bottom. He further determined that the sink was about 90 feet in diameter.

It was reasoned that the gigantic gash gets plugged up with silt, sod and debris. But when the lake balloons out, from high water, the stopper is blown through the hole into subterranean passages. That's when the fun begins.

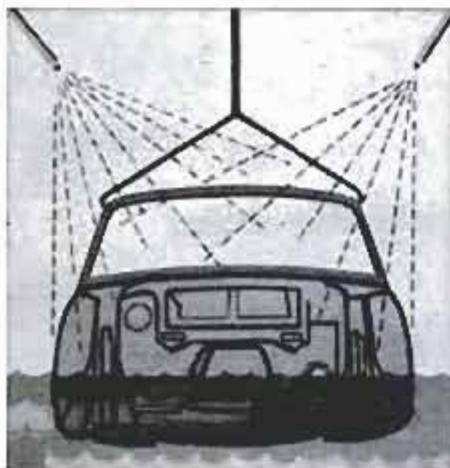
When Lake Tarpon pulls her plug, people in Spring Bayou and Tarpon Springs, towns near the lake, have a fishing jamboree. The water boils with snook, bass and bream that have just taken an underground ride. While fresh water is changing to salt water, people pull in some surprising catches—salt-water blue crabs, spotted trout and mangrove snapper.

NEW Low-Priced Dodge Dart Features Revolutionary **ALL-WELDED** Unibody Construction



Roominess and riding comfort took a big step forward with the announcement of the new low-priced Dodge Dart. The more efficient one-piece Dart Unibody scored a major breakthrough in boosting interior room and

comfort by eliminating space-wasting side rails and crossmembers. Strength and durability are integrated into the body itself. Conventional squeak and rattle-causing attachment of body to external frame eliminated.



Notice how new integrated strength puts more usable space inside. There's more room for feet, hips, shoulders, hats. Seats are deeper, thicker. Doors are bigger, open wider.

Long-lasting beauty and a higher trade-in value are assured by 7 separate rust-preventive dips, four sprayed-on coats of primer and Lustre-Bond enamel for a tough fade-free finish.

In conventional body-frame design, strength is concentrated in the frame. Weak body is subject to squeaks, rattles. Unibody equalizes the strength through the entire structure. Body squeaks and rattles are a thing of the past.

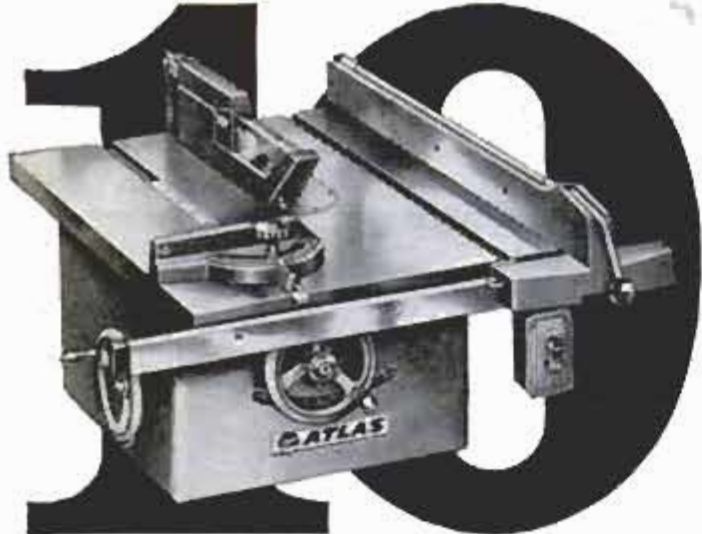
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Slightly higher West of Rockies.

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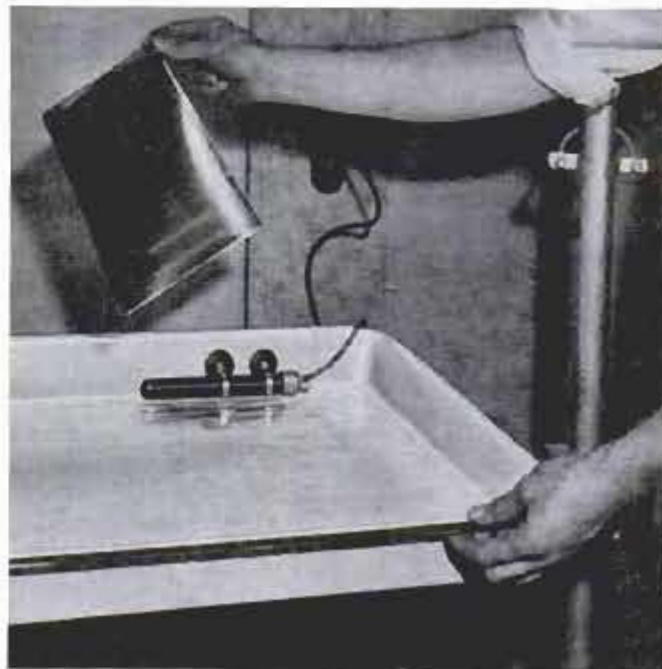
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Plastic Cards Go to Laundry

Plastic playing cards that will not burn, crack, warp, chip or fade can be laundered in the automatic washer. The cards, covered by a special plastic laminate, will outwear a minimum of 573 ordinary decks of cards, according to the manufacturer.



Inexpensive Thermostat Sets Film-Bath Temperature

Film-developer bath temperatures can be regulated by an inexpensive variable thermostat instrument that is plugged into the nearest outlet. About the size and shape of a king-size cigar, the thermostatic elements are inside a heatproof tube that is held in place by clips and suction cups to the back side of the developer tray. The temperature setting can be adjusted quickly, and the instrument is accurate to within one degree.



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without rubbing

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furniture, wall cabinets and paneling

Flows on silken smooth, leaves no brush marks,
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pale, nonyellowing, nonstaining—sets up dust-
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Light Decomposes Water Into Oxygen and Hydrogen

Water can be decomposed into oxygen and hydrogen by means of a beam of light, it has been discovered at New York University. In an experiment, a tiny crystal of anthracene — related to the chemical used in moth balls—was mounted in a window between two tanks containing salt solutions, and a beam of ultraviolet light was directed at one face of the crystal. A measuring device connected to the salt solutions showed that current was being produced. The power was extremely small, being of the order of a millionth of a millionth of a watt. The fact that current flowed through the cell was evidence that water was being decomposed, with hydrogen forming on one face of the crystal and oxygen on the other. The experiment seems to confirm the theory that chlorophyll behaves like an electric battery when exposed to sunlight, activating the photosynthesis process in plants, by which solar energy transforms carbon dioxide and water into carbohydrates. The conclusion of the NYU scientists is that it is indeed possible for light to decompose water directly if the light is first intercepted by a material of the appropriate molecular structure.

Cut it with WISS



As versatile as they are powerful, Wiss Snips are an all-purpose cutting tool no home work bench should be without. Above: No. V-13, seven-inch pocket size \$2.50. Others from 8" to 17" in aviation, combination, and solid steel styles. At hardware and department stores.

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The PROOF is on your dipstick

See for yourself! If your oil shows dirty before it should—you'd better change to Hastings. Hastings Oil Filter Cartridges keep oil clean from filter change to filter change, when replaced as normally recommended. This is proved by tests conducted in accordance with U. S. Bureau of Standards.

Here's the reason: Only Hastings has DENSITE filtering material. Millions of selected, pressure-packed cotton fibres trap and hold even the most microscopic dirt particles. Your dipstick will prove it!

The next time you change oil, change your filter, too—and be sure it's Hastings, the filter cartridge that assures clean oil—less engine wear and subsequent repair bills—as no other filter can. Yet Hastings Cartridges cost no more.

U. S. Patent Nos.
2,797,811; 2,584,771



HASTINGS MANUFACTURING COMPANY
HASTINGS, MICHIGAN

Oil Filters, Piston Rings, Casite, Spark Plugs

The Valiant

(Continued from page 91)

Karmann-Ghia coupe. This, he says, is actually an Exner design. It was designed by Exner as the Chrysler Special back in 1951. Ghia built it for the Corporation. When Volkswagen asked Ghia for a small coupe design in 1955, Ghia (with Chrysler's permission) picked up the Exner design and modified it slightly to fit the VW chassis.

There's also a lot of the Citroen DS-19 in the greenhouse area of the Valiant and a touch of Mercedes in the back end.

But, you are asking, isn't this supposed to be an economy car? What about its economy?

At this writing, PM has not conducted an economy test of the Valiant (it will be made as soon as production cars are available—we don't test prototypes). The Valiant, Charipar claims, will give over 50 percent more gas mileage than a 1959 Plymouth six.

It is capable of 30 miles per gallon, but being capable of and delivering in normal driving are not the same, as anybody who reads economy-run results knows.

Informed guesses are that the Valiant will average about 24 miles per gallon on trips, about 20 miles per gallon around town.

Charipar says the Valiant weighs about 1000 pounds less than the 1959 Plymouth six (actual weight figures have not been released at this writing). This would put its weight at about 2300 pounds, extremely light for such a heavy-feeling car.

It will go over 90 miles per hour quietly and was designed for comfortable, long-distance driving as well as for around-town use.

What about the possibility of an aluminum engine in the future? Use of the lightweight metal would cut as much as 100 pounds from total engine weight—a move in the right direction, says Charipar. It is coming, no doubt about that, but it won't be for a couple of years. The Valiant design was laid down with the aluminum engine in mind so no major engineering changes will be necessary to make the swap. Even with aluminum, the front end will still have the slight weight advantage that gives what Charipar considers to be the desirable heavy front end.

Air conditioning will not be available at first, but will be offered later if necessary to keep sales up in the southwest.

Power brakes and power steering are optional, but are certainly not necessary, says Charipar. They are offered because some people have grown so accustomed to them, that they won't buy a car without these assists. An automatic transmission is optional also, although it too is far from necessary.

The floor-mounted gearshift of the three-speed manual transmission is a pleasure to operate.

Now you have seen and, by stopping in a dealership, you can drive each of the three new small cars. These cars are the result of your rebellion against the bigness, the thirst, the expense of previous models. These cars are the industry's answer to the charge that cars should make sense.

Each of these three new cars has its own personality, each its own characteristics. Never in recent years, has a buyer had so much choice. This, the year of the consumer, promises to be a great one.

Which car will you buy? You hold all the cards—play your hand. Everybody is waiting. ★★★

Hail Me an S-T-O-L!

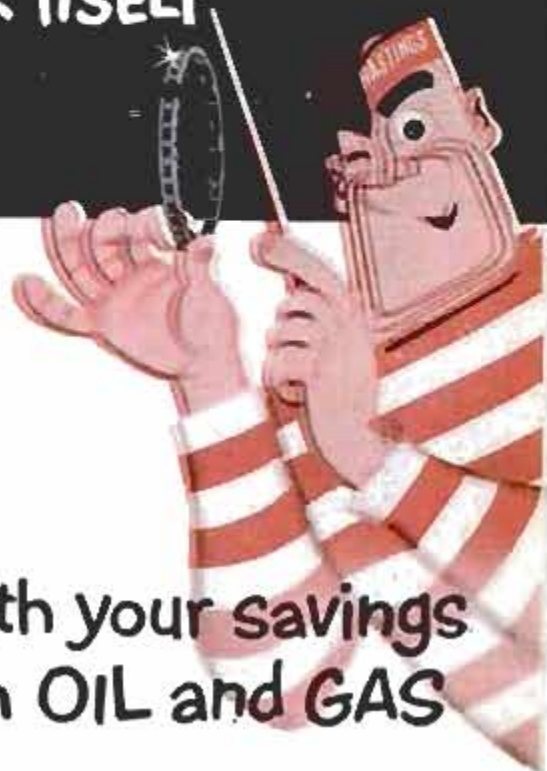
It was cheaper to fly across town by aerial taxi than to hire a cab on the street to attend the recent Hanover Industries Fair in Germany. The airport is about eight miles north of Hanover, the fair six miles to the south of the city. A cab ride across the crowded city costs some 20 Marks (\$4.80) and an hour's time. You could cut the travel time to six minutes and the fare to 15 Marks (\$3.60) by taking the air taxi. Two four-passenger STOL (short-takeoff-and-landing) planes performed the shuttle service all day. They were the German Dornier DO 27's, developed in Western Germany since World War II. Powered by a 275 horsepower American Lycoming engine, the Dornier can take off in 125 yards, land in 93 yards, with a speed range from 36 miles an hour to 155.

Scorer Clocks "Hits" On Missile Misses

Fighter and bomber pilots now are learning how to miss targets. Due to the high cost of targets, air-to-air missile students program their lethal rocket weapons to miss the bull's-eye by a hair. The pilot's score is determined by his "miss-distance"—a hard thing to calculate from a zooming jet.

Technicians at the Air Force's Air Proving Ground Center at Elgin Air Force Base Fla., have come up with an electronic "proximity scorer" that does the job, revealing efficiency of both pilot and missile. The 8½-pound unit, mounted in towed or free-flying targets, surrounds the target with electro-magnetic radiations. As the missile hisses by, it reflects the radiations, which in turn trigger a relay that transmits the "miss-distance" to receivers on the ground or in the plane.

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in OIL and GAS

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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 says you need new piston rings be sure you get Hastings. They're engineered exclusively for replacement service . . . to provide the additional lubrication worn engines need . . . to stop oil-pumping, save gasoline, restore lost performance.

Get new car power and performance from your present car—with Hastings. Truly your best investment for many thousands of extra miles of trouble-free driving pleasure.

TOUGH
on oil pumping

GENTLE
on cylinder walls



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HASTINGS, MICHIGAN

Piston Rings, Casite, Oil Filters, Spark Plugs

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FOR LAWN, PORCH OR ROOF

colorful patterns you can paste on fir plywood

Make your home a holiday show place with these delightfully different Christmas decorations! Durable paper patterns printed in bright colors are specially made to use on fir plywood. Simply paste on plywood and cut out with saw. It's easy. Strong, weatherproof Exterior plywood makes figures last for years. Make wonderful gifts. Order several today! Supply limited.

JUMBO CHRISTMAS CARDS—new, different! (45" x 70") 1. "Joyous Noel," shows child carolers. 2. "Season's Greetings," shows ornaments. Includes 104 letters to personalize with your family name. 50c each.



TRADITIONAL NATIVITY SCENE. 16 figures (only 4 shown) include Christ Child, Mary, Joseph, wise men, shepherds, animals. Tallest figure 47" high. Beautiful, life-like. Entire set, only \$2.00.



JOLLY SANTA, SLEIGH AND REINDEER will delight young and old alike! Wonderful inside or out! Jolly 6' Santa, 50c each. 6' long Sleigh, 50c each. 5' long Reindeer, 50c each.

ORDER NOW! Supply is limited. Allow 2-week delivery. Sorry, no orders after Nov. 30. No stamps or C.O.D.'s. U. S. A. only. Complete instructions included. Individually wrapped, shipped prepaid. Order today. Money back if not delighted.

Douglas Fir Plywood Association, Dept. 9X, Tacoma 2, Wn.



Robert Paul

Midget Motor Scooter Transports Jet Pilot

A pint-size homemade motor scooter that putts along at 25 miles an hour is the preferred ground transportation for Lt. Jack Noble, 26-year-old Air Force pilot from Morrisville, Pa., who regularly flies 1200-mile-per-hour jet fighters. The 50-pound scooter, two feet tall and two and a half feet long, easily transports the 205-pound pilot. While stationed on Okinawa, Lt. Noble came across a discarded small bicycle frame, modified it, made some parts, added a one-horsepower engine and wheelbarrow tires, and within a month he had his miniature vehicle for a total outlay of \$75. Since there was no make or model number on the scooter, Noble had a difficult time registering it with motor vehicle authorities; it finally was logged in a special file, "Homemade Vehicle." The sturdy two-wheeler holds only a gallon of gas and runs 10 days on a full tank. "It costs me a dollar a month to run my putt-putt," said the flier. "I usually buy a dime's worth of gas and oil at a time."

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here is the sensor, a high-frequency, low-power radio transponder sealed in a weatherproof vacuum-tube envelope. The sensor responds to intruder disturbance of the controlled radio frequency field pattern and transmits a signal over a cable to a sensitivity control box nearby. The control box has day and night settings which make it responsive to disturbances typical of daylight or nighttime emergencies. During daylight, the system is sensitive to such acts as willful tampering, but not to normal activity. Switched to night operation, the system provides security against intrusion. From the control box, the signal is carried to a monitor unit in a central guard station, where a red light and buzzer indicate an alarm. Since the sensor can detect movement up to thousands of feet away, a study is being made of its application to aircraft as a proximity warning indicator.

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Power Companies of Future May Pay YOU for Electricity

Someday power companies may pay you, instead of charge you, for electricity. That's the suggestion of Dr. Lawrence J. Giacoletto of Ford Motor Company's scientific laboratory, who says homeowners might use solar cells to generate electricity from sunlight. Since there is no cheap way to store this power, surplus amounts of it might be turned back into the powerlines for daytime industrial use, with the homeowner receiving credit for the amounts of energy he supplies.

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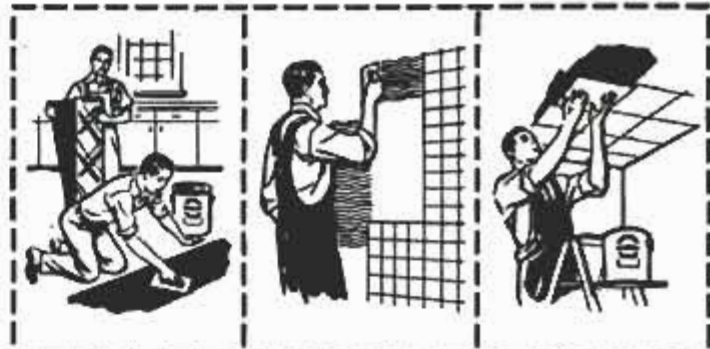
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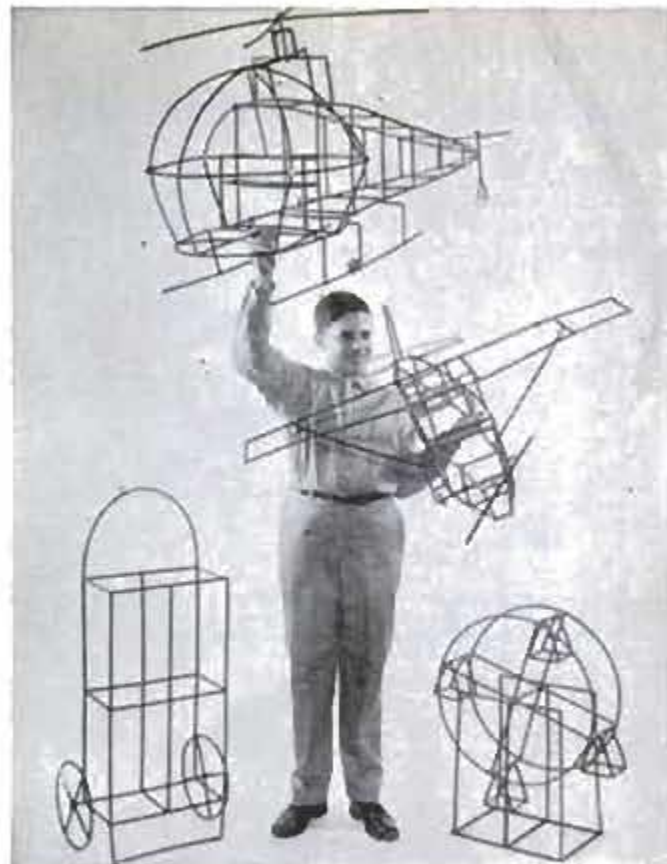
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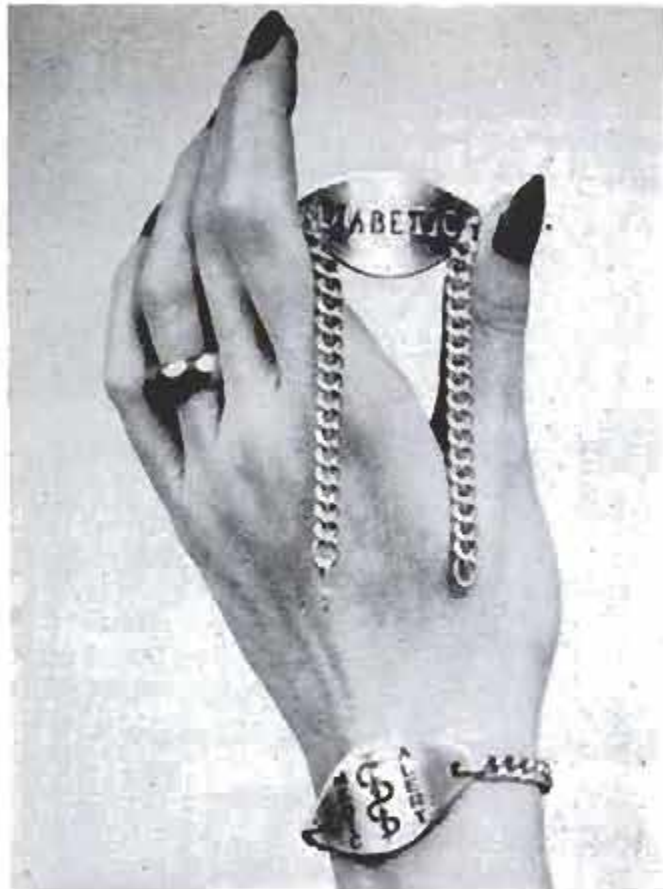
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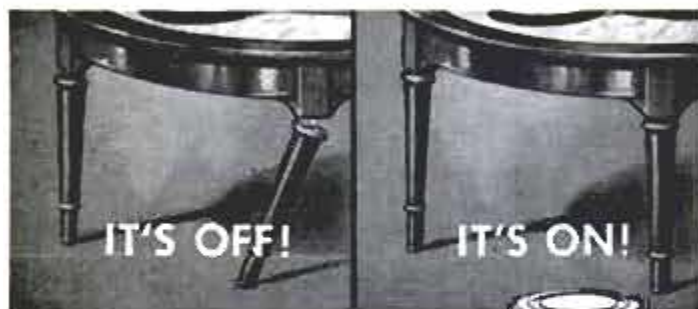
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SET 6 different sizes H. S. Slitting Saws, 2 3/4" 2A dia. x 1/4" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. Plus special Mandrel which enables use of saws in 1/4" or 1/2" elec. drill. \$25.00 value, PPD only **\$4.95**

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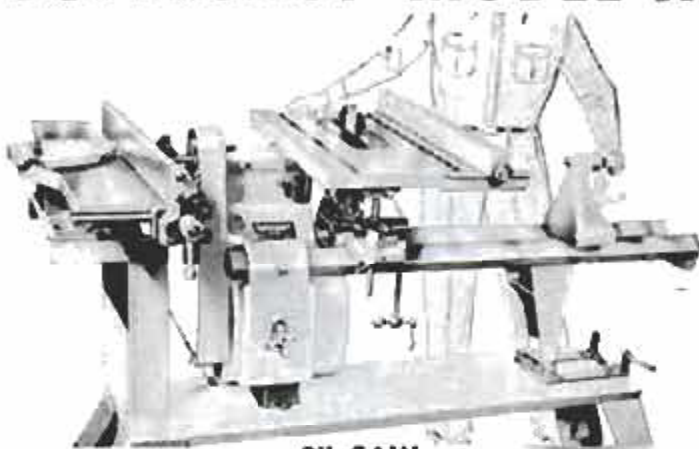
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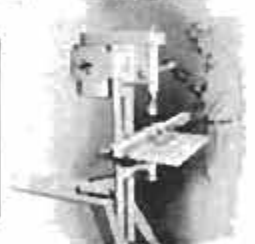
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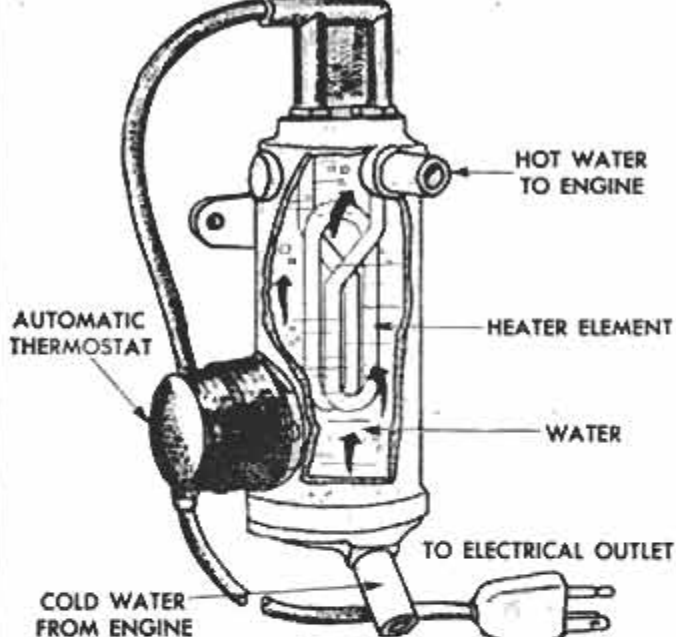
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Copper Oxide vs Smog

After two years of experiments, Dr. Srinivasa Sourirajan of the University of California has discovered that nitric oxide and hydrocarbon gases, the two biggest contributors to atmospheric contamination, may be eliminated by the use of a copper oxide catalyst in automotive combustion chambers. Dr. Sourirajan learned that the copper oxide decomposed nitric oxide into nitrogen and oxygen, and hydrocarbon gases into carbon dioxide and water—both gases losing their polluting effects in the change. An attempt is being made to design a practical injector for use on cars in smog areas.

Soybean and Linseed Oils Form Coating for Metals

Films made from soybean and linseed oils provide tough, flexible coatings for aluminum and black iron, chemists of the Agricultural Research Service in Peoria, Ill., report. They produced the coatings by reacting fatty alcohols made from soybean and linseed oils with acetylene to produce vinyl ethers; the vinyl ethers were then joined together by polymerization to form the giant molecules that make up the films. The tough film is flexible, withstands heat, and resists abrasion, alkalis, acid and such solvents as alcohols, mineral oil and benzene.

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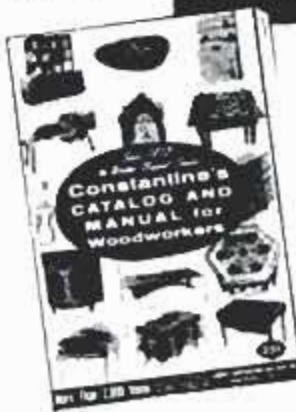
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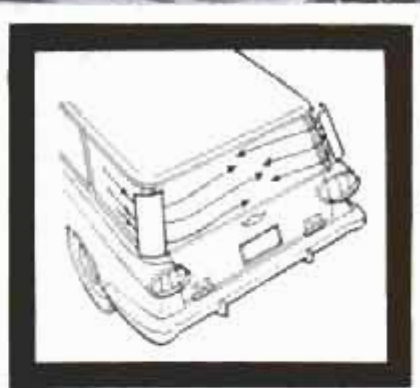
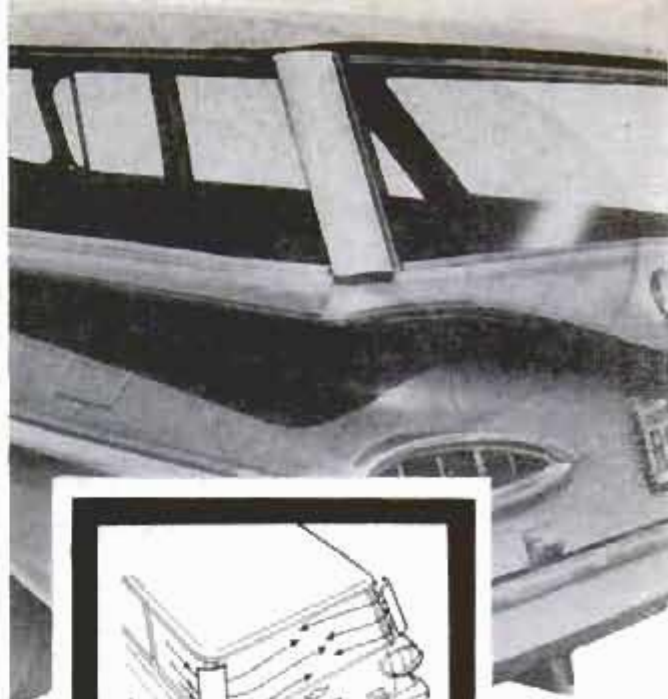
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Deflectors For Windows "Detour" Dirt Deposits

Air deflectors which direct a high-velocity stream of air across the rear window of a station wagon keep the window free of the rain, dirt, snow and mud which often block rear vision. The air deflectors counteract the dirt-depositing vacuum created at the rear of station wagons, pick-up trucks and ranch wagons. The attachments also keep exhaust fumes from the interior when the window is open. The deflectors, made of chrome-plated steel alloy, can be installed without special tools.

Jet-Engine Reliability Proved by Records

Jet airliner engines are several times as reliable as piston engines, according to a study of Pan American and TWA flight records. TWA's domestic operations totaled 48,380 jet engine hours in five months with only two precautionary shut-downs in flight. Pan American's overseas records showed 64,000 engine hours in a 10-month period with just five failures. TWA canceled only two jet flights since acquiring the Boeing 707's, completing 99.8 percent of scheduled trips. Experts say such records make jet engines about 20 times more reliable than piston engines.

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 G.-1 150-250 amp 30V New \$17.50 used \$9.95
 G.E. 200 amp 30 Volt Good Cond. . . \$13.95
 H-1 300 amp G.E. new \$24.50 Good C. 15.50

Accessories Kit For Arc Welder for above generators has helmet, gloves, elect. holder, volt reg. rheostat, RC relay voltmeter, Gr. Clamp, & switch \$19.50. With G.E. 200 amp gen. \$26.00

New Reactor Coil Arc Stabilizer with #4 N Copper for R-1, P-1, G-1 & ACDC. Wt. 11 lbs. \$10.95. Incl. engine throttle solenoid control \$14.95

AC-DC WELDER KIT #511 G.E. Generator. Makes 1250 Watts AC light plant and 200 amp. DC welder and battery charger. Includes all items listed in accessories kit, AC-DC generator & instr. \$39.50

COMPLETE PK. ACCESSORIES For Weld. & Batt. Charging incl. arc stab., cable all 11 items with 300 amp gen \$46.50 with 200 amp gen \$37.50 with 160-250 amp gen \$33.50

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 Offers fluid drive of varying power, consist of 2 new Vickers p.d.s. pumps ea. .410 cu. in. rev. 3750 RPM 1000 PSI 375 GPH where one pump is belt driven as motor, 1 four way c. valve with variable speed control, reservoir, filter, gauge, hose & fittings. Value \$98.10, \$49.95

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DRAINS BASEMENTS Pump water with Rotary pump #107 400 G. P. H. 3/4" ports adj. to 100 P.S.I. reversible, 5 1/2" x 3 1/2" x 7", Incl. mt. base, \$8.95

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#300 2 3/8"	6 1/2"	1 1/2"	7 lbs.	\$10.95
#511 3 1/2"	2 1/4"	1 3/4"	15 lbs.	\$24.50

NEW HYDRAULIC SYSTEM KIT
 #400 K. Heavy duty Power Driven, rated 14,000 lbs. lift. Consists of 2 D.A. hyd. cylinders, 3" bore x 24" stroke, each rated 7000 lbs. with 1000 P.S.I., 1 four way hyd. control valve with built in relief #821, 1 Vickers hyd. pump, 400 G.P.H., 1500 P.S.I., 3750 RPM, 1 hyd. 2 gal. reservoir, 1 Purulator hyd. filter, 1 gauge 0-2000 P.S.I. all hose, & fittings. Value \$184.10, save \$90.00, kit price \$94.10. Kit with two #511 cyl. \$79.95. Kit with two #300 cylinders \$59.95

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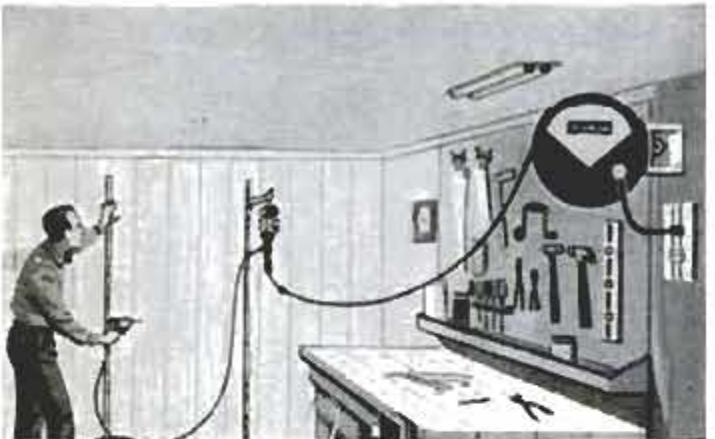
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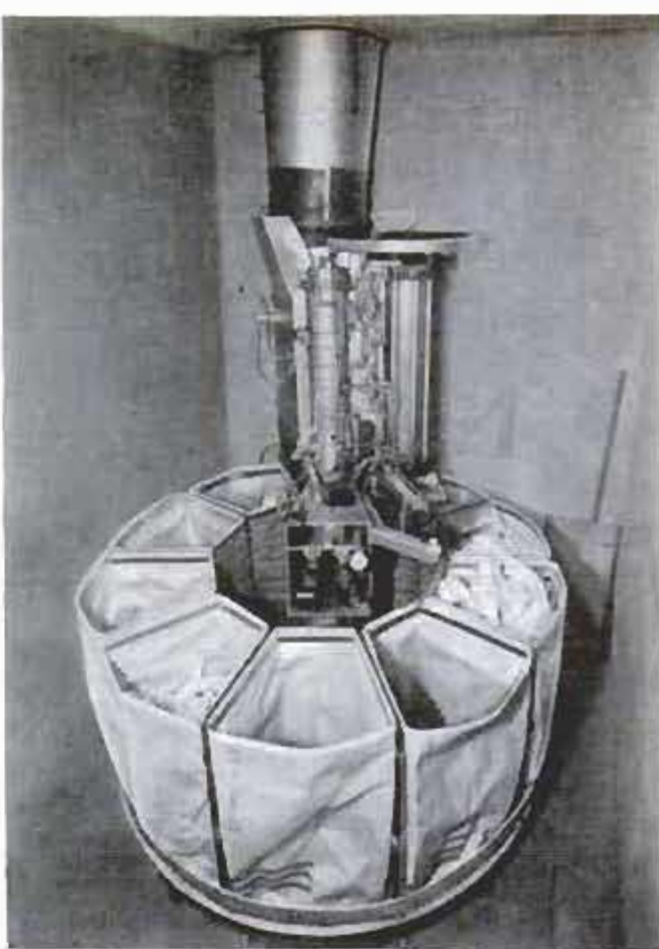
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Waste Collector Packages Trash

Paper sacks that catch waste dropped down a chute are automatically moved into position as the preceding sacks become filled in an automatic "trash can." The device, developed in England, is located in the basement of a building and receives waste from the floors above. As each paper sack fills, a pneumatically powered turntable brings an empty into position. When all sacks are full, the contents are compressed pneumatically and the sacks sealed for removal.

Faraway Moving Targets Detected by Army Radar

Radar that can detect moving, long-range targets in fog or darkness will soon provide the U. S. Army with a supersensitive "movement monitor" that can be set up at a frontline position in less than a half hour. The new radar will spot a rolling tank at 10 miles or a soldier crawling two miles away. Each type of target produces a characteristic sound in the radar. When the operator hears a suspicious sound, he zeroes in on the target and narrows the radar beam. An indicator-light under a map shows the target's position, then numerical dials pin down the target with greater exactness.

140-1 REDUCTION GEAR For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car. DC motor & clutch. Easily reversible wiring diagram furnished. 11 torque, 105 RPM. Runs on 6-12 or 24 V. Wt. 65 lbs. gross. Approx. GOVT. COST \$300. Like NEW, \$12.00. Matched splined gear for above—\$3.00 ea.
*225-1 Reduction Gear—\$13.50

"SUPER 9" 200 AMP WELDING KIT
With Deluxe accessories consisting of one 200 AMP. Gen., adjustable helmet, electrode holder, 30' welding cable, rheostat, giant toggle switch, voltmeter, voltage reg., 1 pr. heavy-duty welder's gloves. All units guaranteed pre-tested. Approx. GOVT. COST — \$500. Most items new — all perfect. \$26.00.

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Consists of 160-250 AMP. Gen., voltage reg., ammeter, shunt, adjustable helmet, electrode holder, pr. welder's gloves, 30' welding cable, reactor coil, giant toggle switch, rheostat. Approx. GOVT. COST \$650. All units guaranteed pre-tested, \$24.95 complete.

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Kit incl. 1 Navy NEA-5 Gen. combination AC-DC type. AC 115 V. DC 24 V. 200-300 Amps. 2 complete generators in 1. yet no larger than reg. gen. Ideal for home, shop and farm lighting plants. Delivers 1200 Watts AC, DC side for charging batteries, welding and operating war surplus motors. Also in kit: 2 Voltage Regs., AC & DC, Reverse Current Relay, 30' New Welding Cable, 1 Ammeter, Rheostat, Electrode Holder, Toggle Switch, Welder's Shield, Wiring Diagram for kit. Wt. under 100 lbs. Approx. GOVT. COST \$650. Kit—\$37.50. Navy NEA-5 Gen. as above, purchased separately, \$23.50.

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Mfd. for govt. antarctic expeditions for jeeps and half-tracks. Heating unit puts out over 20,000 B.T.U.'s. Burns any type gas. 6 volt system. Fuel consumption extremely low, 1 gal. per 8 hrs. Terrific for trucks, boats, tractors . . . farms, warehouses, ranches, boat houses, cabins, etc. Complete with service & installation manuals and over 360 components. Approx. GOVT. COST \$550. Shpg. wt. 120 lbs. gross. NEW. \$39.95. Limited quantity.

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Wrenches snap onto T-bar in 3 different positions. The only wrenches for hard-to-get-to places. Mfd. by Plomb Tool Co. for U.S. Armed Forces. Finest case hardened tool steel. No shop mechanic should be without this set. Approx. GOVT. COST \$47. NEW. \$5.95 ppd.

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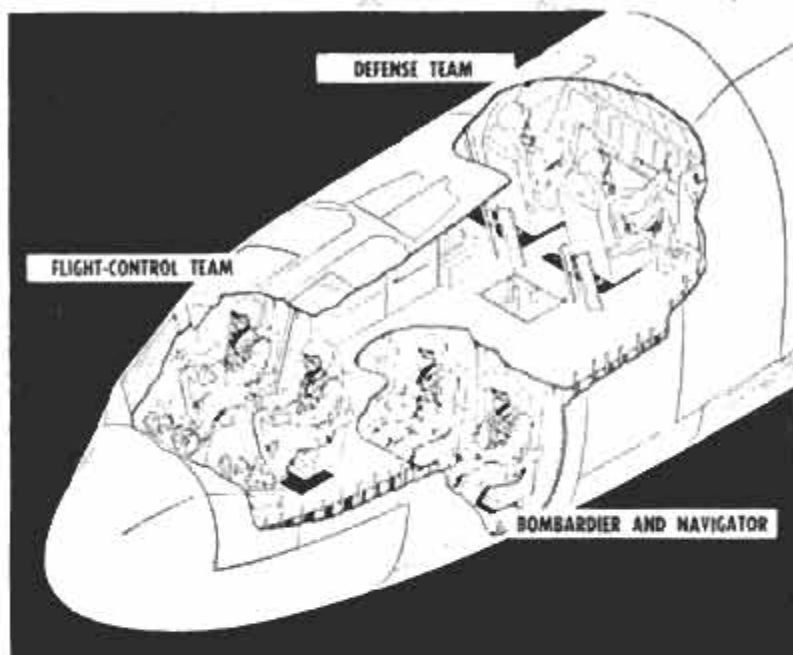
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Not just an ordinary 2, 2 1/4 or 2 1/2 amp unit, but a powerful full 2.9 AMP drill to do every heavy duty job in home, shop or industry. Built to take years of rough-tough use. Newer, more rugged motor gives 1 1/2" capacity in hard wood and 1 1/4" capacity in steel with a full load speed of 1200 R.P.M. Durable mirror finished, lightweight aluminum housing. Features Universal, series wound AC-DC motor; heavy duty multiple thrust ball bearings; automatic release trigger switch with locking pin; 6 ft. 2 conductor, UL approved cord and plug. Standard 115 V. AC-DC. This powerhouse measures 9" in length yet weighs only 3 1/2 lbs. Limited quantities. **MONEY BACK GUARANTEE** Send Check or M.O.—C.O.D. Plus Fee **SCOTT-MITCHELL HOUSE, INC.** Dept. HC18, 415 South Broadway YONKERS, NEW YORK

Three Two-Man Teams Operate Missile Bomber



Crewmen in the new Boeing B-52G missile bomber are positioned in two-man teams up front. This gives the crew immediate access to all equipment and allows continuous personal contact. The arrangement differs from that of the earlier B-52 in that the manned tail-turret position has been eliminated and the gunner has been moved forward. With the electronics-countermeasures operator, the gunner now makes up the defense team. He remotely controls tail armament. Pilot and co-pilot are the flight-control team, and bombardier and radar-navigator, seated on the bomber's lower deck, the offense team. Each position has food, oxygen.

TV Camera on Doctor's Head Shows Students Details of Examination

Doctors have taken to wearing TV cameras on their heads. The use of the camera enables several students to see critical areas within the ears, nose, throat and other body cavities. Normally, only one person can look into a body cavity at a time. While permitting others to see

on a nearby television screen the very same area the examiner sees, the small TV camera doesn't hamper the examiner's view of the field. Also, it allows him a normal range of motion. A pilot model of the camera is being used at Northwestern University.

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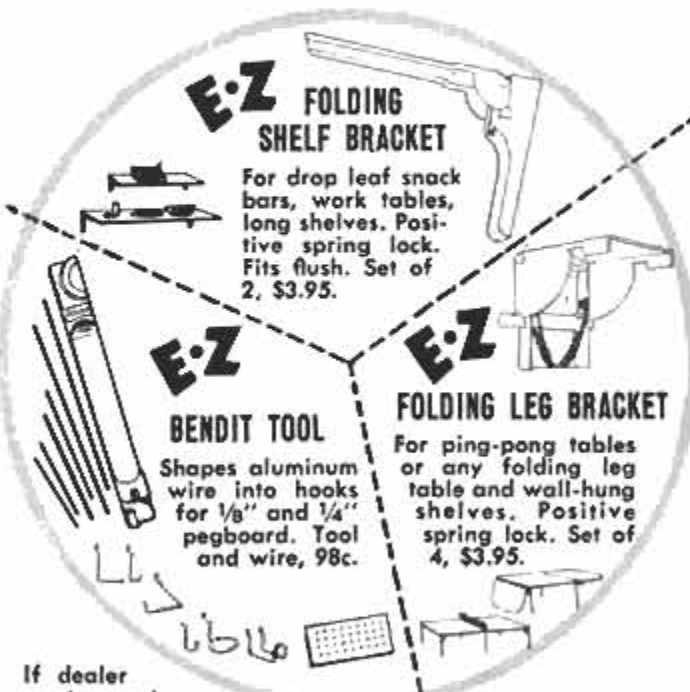
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Normal driving causes deposits of carbon, gum and sludge to accumulate in your fuel system. Even when the system is in perfect adjustment, these deposits will cut down on your performance and economy. And, unless these deposits are removed, it is impossible to effectively adjust or tune your engine.

The proper gasoline additive will clean your fuel system and keep your performance alive. And regular use of an additive will help provide you with consistently good performance.



Since many additives leave deposits of their own, and others do only a partial job, the world's largest manufacturer of original equipment carburetors has researched and tested a new additive, CARBON-X 77.

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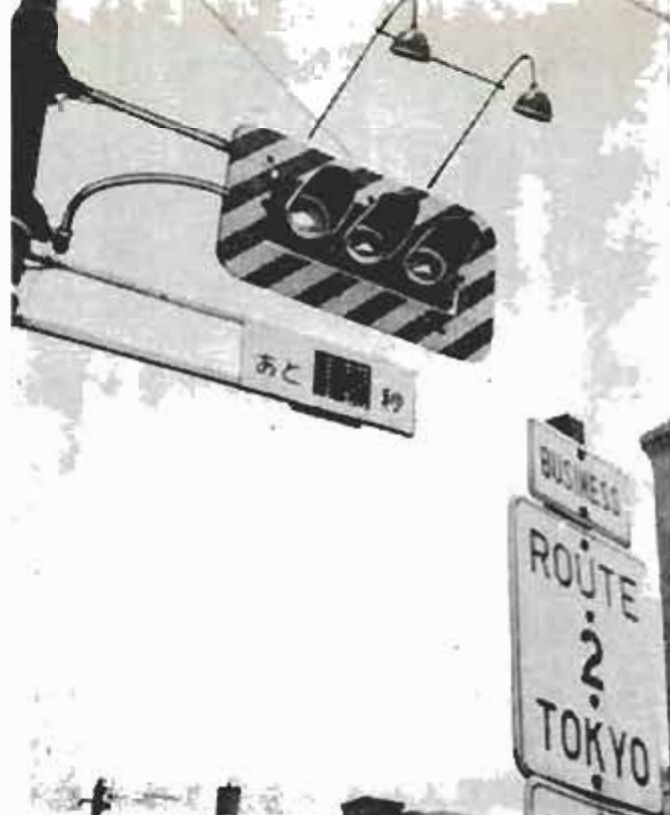
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Traffic Light Gives "Countdown"

Tokyo pedestrians now can tell exactly how much time they have to cross an intersection before the traffic signal will change. A signal being tested at a downtown intersection "counts down" the number of seconds left before the light changes. The timed traffic light was built at a cost of \$1389 by the Tokyo Metropolitan Government's traffic division. If experiments prove successful, it will be adopted for general use at main pedestrian crossings.

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* Item #715. Modern hi-efficiency attractive dial phone. Use for extension to main line on private system. Use several for complete private system, etc. Complete. Work on any system. Govt. cost \$25. SALE **\$9.95 Ppd.**

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* Item #701. Install your own private system. Fine for motels, factories, stores, apartment, etc. Connect any 2 lines together by pressing key. Capacity 12 lines. Can be connected to your local system. Beautiful walnut finish cabinet. Latest design, finest equipment. Brand new. Complete with one phone. Wt. 90 lbs. Govt. cost \$451.50. SALE **\$97.50 FOB**

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Operates on 24 volts DC at 1.35 amps. Direct drive fan blade turns 4700 RPM. Fan has central intake and two opposed exhaust ports. Fan housing is 8" in diameter. Motor is 3"x 3" **388**

BLOWER/EXHAUST FAN
Miniature type. 4" diam. fan forces air thru 5inch long housing. Has 1/100 HP, 27.5 VDC electric motor, tandem mounted behind fan blade. Lifetime bearings. For ventilating closed compartments, darkroom, etc. **488**

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Here's a real "workhorse" in a compact, heavy duty gearhead motor. The gear ratio is 100-to-1 giving the 24 volt DC motor tremendous power. A reversible clutch is set at 375 foot-pounds. Take-off shaft is double-keyed and is 1-1/16" dia. **ONLY 2450**

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Shrinking Chilean Glaciers Indicate Climate Is Warming

Working from recent measurements of five glaciers in Chile's North Patagonian Ice Field, six American scientists have theorized that the climate of the Southern Hemisphere has been warming for over 50 years. The major glaciers in that field, 900 miles south of Santiago, were found by a January expedition to have shrunk up to six kilometers (3.7 miles) in the past 80 years. This supports evidence from our own Northern Hemisphere that our climate is undergoing an over all warming trend.

Dolphins Hitch Free Ride

Those playful dolphins you saw racing your transatlantic ship and leaping into the air weren't just putting on a show for you. Dr. P. F. Scholander of the Scripps Institution of Oceanography, while making a study of icebergs near Greenland, took time also to analyze the antics of the dolphins. He came to the conclusion that they swim alongside ships to get a free push from the vessels' bow waves, and they leap into the air for the simple purpose of breathing, which they do even as you and I.

1500 WATT PLANT
115v. 60 cyc. AC Push Button Start. Powered by a 4 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**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price... **\$279.50**

MASTER-LITE 2500 Watt Plant
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price \$645.00 (Item 21) Factory Price... **\$329.50**

GIANT METAL SHEARS

"PEXTO"
Nine inch cutting blade made of special high carbon alloy steel, perfectly aligned and ground. Easily cuts steel plate up to 12 gauge or 3/8" thick. Overall length 40". Wt. 23 lbs. (Item 156) Regular \$49.50. While they last... **\$14.95**

EXTENSION CORD

2 Conductor No. 14 general purpose power cable. Neoprene jacket, very flexible; 100 ft. complete with male and female fittings. (Item 185)... **\$6.95**
2 Conductor No. 12 heavy duty power cable. Neoprene jacket. Takes rugged service. Includes male and female fittings; 100 ft. (Item CC1)... **\$7.95**
3 Conductor No. 10 general purpose power cable. May be buried under ground if desired. Enclosed in tough flexible Neoprene jacket. Standard terminal lugs on each end. New Surplus—100 ft. length (item ce21)... **\$13.95**
200 ft. lengths (item ce22)... **\$23.95**
300 ft. lengths (item ce23)... **\$33.95**
3 Conductor No. 6 extra heavy duty power cable. Sheathed in tough flexible Neoprene jacket. Impervious to soil, acids and water. May be used above ground as a general purpose power cable or may be buried for underground service. Ends equipped with heavy lugs. 100 ft. length (item ce3)... **\$42.50**

Double Acting Hydraulic Cylinder

A powerful cylinder mfr'd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3 3/8" O.D. with 5 1/2" stroke—standard heavy duty clevis on both ends. Has standard 2 1/2" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value. Special... **\$14.95**

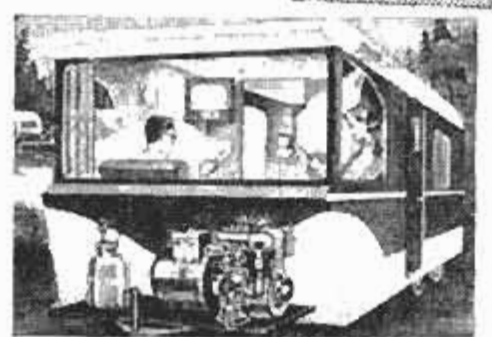
OTHER DOUBLE ACTING CYLINDERS
8" stroke — 3" bore... **34.00**
10" stroke — 3" bore... **34.80**
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24" stroke — 3" bore... **47.50**

We have all sizes of cylinders available.
HYDRAULIC CONTROL VALVE — 4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1 1/2" on cylinder outlets. Easily mounted. Finer HP control. Wt. 16 lbs. (Item 822)... **\$21.95**

HYDRAULIC KIT

Complete Hydraulic Kit consists of (a) hydraulic hand pump which develops 1500 psi and displaces 1.5 cu. in. per stroke. (b) separate 2 gal. reservoir. (c) item 802 double acting cylinder described above. (d) Release Valve. (e) 2 hydraulic hoses to connect pump to reservoir. This kit is ideal for rams, presses, jacks, snowplows, etc. & is terrific value at... **\$39.50**
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Kit less cylinder—Item 836a... **\$23.50**

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700 WATTS PUSH BUTTON START
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1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine... **\$199.50**
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THE POWER MASTER
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 2" 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, brazing 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. **\$119.50** (Item 38a.) Wt. 110 lbs. \$450 value
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COMPLETE POWER MASTER (Illustrated above) powered by a 16 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing \$1200. **\$449.50** Factory Special.
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. **\$10.50** Sold only with welder at...

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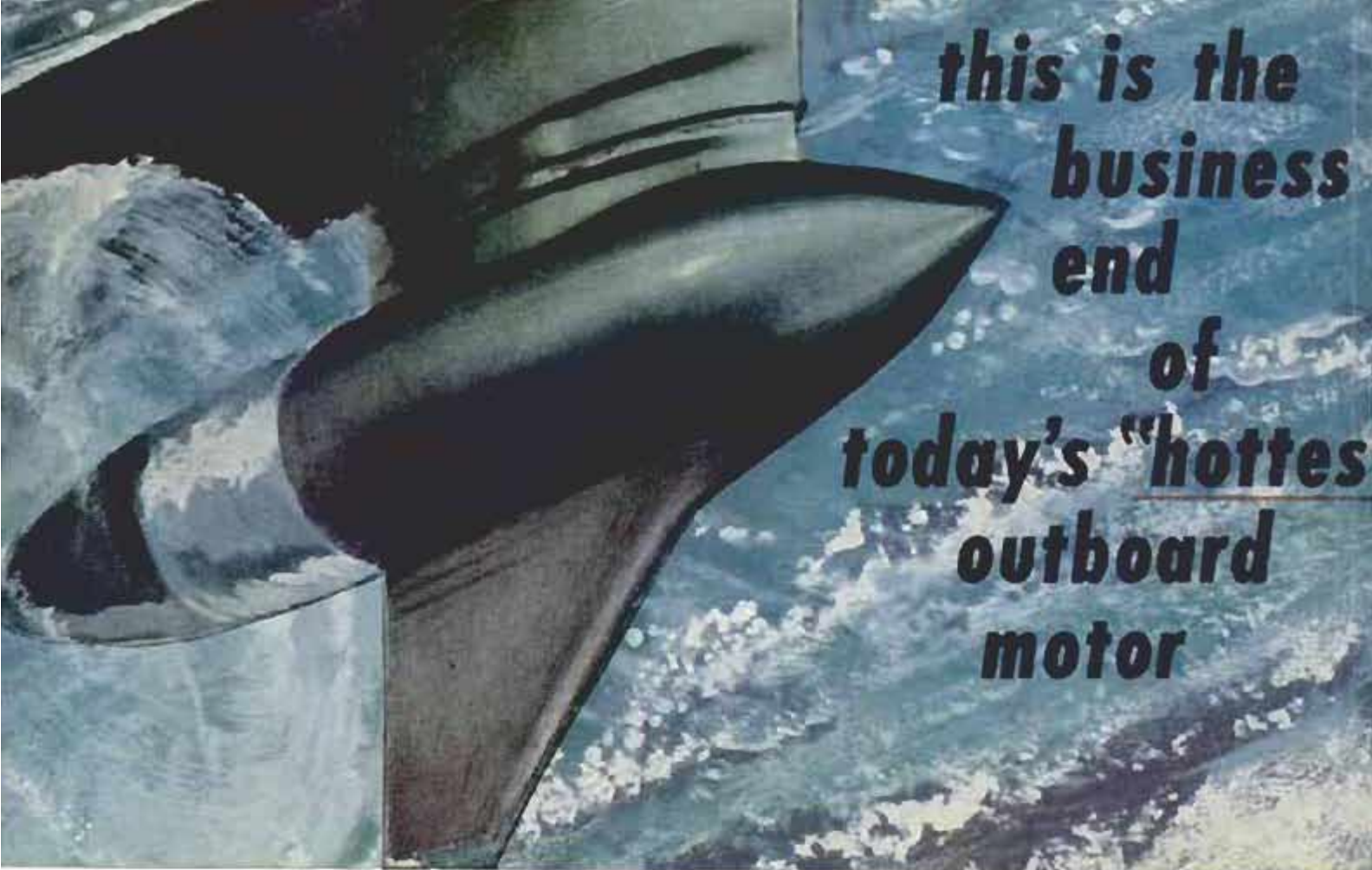
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